U.S. Department
of Transportation

FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

FOR THE

Federal Aviation
Administration

PROPOSED MASTER PLAN UPDATE DEVELOPMENT ACTIONS

AT

Port of Seattle

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Volume 3 - Appendix G

This statement is submitted for review pursuant to the requirements of Section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq); E.O. 11990, Protection of Wetlands; E.O. 11998, Floodplain Management; 49 USC Subtitle VII; 42 U.S.C. 7401 et seq; Department of Transportation Act Section 4(f) - 49 USC 303 (c); 49 U.S.C. 47101 et seq; Washington State Environmental Policy Act (RCW 43.21C); and other applicable laws. This Supplemental Environmental Impact Statement (SEIS) is a combined National Environmental Policy Act and Washington State Environmental Policy Act (SEPA) document. With regard to SEPA requirements, this Supplemental EIS represents the third step of a phased environmental review which began with publication of the 1992 Flight Plan Final EIS, which assessed alternatives for addressing regional aviation needs, and the issuance of the Final EIS for the Master Plan Update. This Final Supplemental EIS also contains a final conformity analysis, as required by the Clean Air Act amendments.

The Port of Seattle, operator of Seattle-Tacoma International Airport, has prepared a Master Plan Update for the Airport. The Plan shows the need to address the poor weather operating capability of the Airport through the development of an 8,500 foot long third parallel runway (Runway 16X/34X), separated by 2,500 feet from existing Runway 16L/34R, with associated taxiways and navigational aids. Other needs include: extension of Runway 34R by 600 feet; establishment of standard Runway Safety Areas for Runways 16R/L; development of a new air traffic control tower; development of a new north unit terminal, Main Terminal improvements and terminal expansion; parking and access improvements and expansion; development of the South Aviation Support Area for cargo and/or maintenance facilities; and relocation, redevelopment, and expansion of support facilities. The EIS assesses the impact of alternative airport improvements, including installation of navigational aids, airspace use, and approach and departure procedures. With the exception of the 34R runway extension, the proposed improvements would be completed during the 1997-2010 period, with initial 5-year development focused on the proposed new parallel runway, and existing passenger terminal, parking and access improvements. The proposed improvements and their alternatives would result in wetland impacts, floodplain encroachment, stream relocation, impacts to locally significant historical sites, social, noise, water, and air quality impacts.

This Supplemental EIS was prepared to address the environmental impacts that could result if the most recent growth in aviation activity levels continues.

Responsible Federal Official:
Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave, S.W.
Renton, Washington 98055-4056

Date: May, 1997

SEPA contact:
Ms. Barbara Hinkle
Health, Safety and Environmental Management
Port of Seattle
P.O. Box 68727
Seattle, Washington 98168

APPENDIX G

PUBLIC AND AGENCY COMMENTS ON THE

FEBRUARY 1997 DRAFT SUPPLEMENTAL EIS

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APPENDIX G

PUBLIC AND AGENCY COMMENTS ON THE FEBRUARY 1997 DRAFT SUPPLEMENTAL EIS

Upon release of the Draft Supplemental EIS, a 45-day public comment period was conducted. This appendix presents all comments received.

A public hearing was held to provide an opportunity for the public to present oral and/or written comments concerning the social, economic, and environmental effects of the proposed Master Plan Update Draft Supplemental Environmental Impact Statement (Draft Supplemental EIS). The public hearing was held on March 4, 1997 in the Airport Auditorium at Sea-Tac Airport from 4 p.m. until 8 p.m. Testimony was provided by 33 individuals and the hearing was attended by about 70 people.

This appendix presents the entire public hearing transcript as well as approximately 85 correspondences received by Mr. Dennis Ossenkop, of the Federal Aviation Administration, Regional Airports Office.

Table G-1 provides an index to the individuals and organizations that submitted written comments during the comment period. **Document number 32**, beginning on page G-40, is the public hearing transcript. Page 1 of this document lists the individuals that testified at the hearing.

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TABLE G-1

TABLE OF CONTENTS OF COMMENTORS

TABLE G-1

TABLE OF CONTENTS OF COMMENTORS

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2/18/97

DEAR MR. OSSENKOP:

PLEASE SEND ME A COPY OF THE COMMENT/RESPONSE DOCUMENT FOR THE DRAFT SUPPLEMENTAL FINAL ENVIRONMENTAL IMPACT STATEMENT FOR SEATTLE - TACOMA INTERNATIONAL AIRPORT, SEATTLE, WASHINGTON.

THANK YOU.

PETER ALLAN
4 BARRY LANE
SHORT HILLS, NJ 07078

G-4

REC'D ANI
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MAR 04
A. 610

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DOCUMENTS DEPARTMENT - KW
THE LIBRARIES
COLORADO STATE UNIVERSITY
FORT COLLINS, CO 80523-1019
(970) 491-1879
FAX (970) 491-1195

February 27, 1997

Mr. Dennis Ossenkop
ANM-611, Federal Aviation Admin.
Airports District Office
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Dear Mr. Ossenkop:

If available, please send us one copy of the following document. The citation for it is listed in the February 13, 1997 Federal Register. (We have the citation. Please send the document).

Draft Supplemental Environmental Impact Statement for
Seattle-Tacoma International Airport, Seattle, Washington

including all supporting appendices and documents.

Before sending the document, please inform us if there is a charge or if you cannot supply. Please return a copy of this letter with the requested document or your reply.

NOTE: If we are on a mailing list for this publication or have already requested this piece please do not send duplicate copies.

Thank you.

Fred C. Schmidt (klw)
Fred C. Schmidt
Head, Documents Dept.

FCS/klw

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North East District Council
5214 University Way N.E.
Seattle, WA 98105

MAR 04 1997

ANM-610

February 12, 1997

SEIS sent out on Mar 5/1997 Do.

Dennis Ossenkop
Northwest Mountain Region
Airports Division
Federal Aviation Administration
1601 Lind Ave. S.W.
Renton, WA 98055-4056

RE: Supplemental E.I.S.
Third Sea-Tac Runway

Dear Mr. Ossenkop:

Please send to us at the above address a copy of the "Draft Supplemental Environmental Impact Statement for the proposed Master Plan Update improvements, including the third parallel runway and other airport facility improvement to the Seattle-Tacoma International Airport" pursuant to your notice published in the Seattle Times on February 9, 1997, in order that we may comment more fully thereon.

In the interim, based on media comments of its contents, we are submitting as a preliminary comment the comment that we had made on the Draft Environmental Impact Statement, dated July 18, 1995, and mailed to you on that date. You declined to consider it then, although timely. Our comments are still pertinent. Exhibit "A" cited in our letter is not enclosed inasmuch as you already have several copies: one delivered with the scoping comments; the second with our comments on the DEIS, dated July 18, 1995; and third with our follow-up letter, dated August 7th.

Yours truly

Bob Klug
Chair

I-G5-1

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North East District Council
5214 University Way N.E.
Seattle, WA 98105

August 7, 1995

Dennis Ossenkop
Environmental Specialist, Airports Division
Federal Aviation Administration
1601 Lind Ave. S.W.
Renton, WA 98055

RE: Environmental Impact Statement
Expansion of Seattle-Tacoma International Airport

Dear Mr. Ossenkop:

Last July, we sent to you a comment on the draft environmental impact statement being prepared by the Federal Aviation Administration for expansion of Seattle-Tacoma International Airport by constructing a third runway and other projects. The letter enclosed our earlier comments on the scoping process as an attachment; this letter encloses a copy of our July letter without the scoping comments since you already have them. Our comments were timely in light of the federal court order extending the time for citizens to comment.

In reviewing the appendices to the Environmental Impact Statement, we do not find any acknowledgment of our July letter, nor is it published. Our review of the Environmental Impact Statement shows that many of the points that we had made are not responded to at all. Had you mailed to us the appendices to the Environmental Impact Statement or supplied a copy to local branch libraries, we would have discovered your omission sooner.

The National Environmental Policy Act requires federal agencies to publish comments received and to respond. We therefore call up you to delay taking any further action on this project;and to go back to the comments received, including our July 18, 1995 letter; to research the issues raised; and to prepare a supplemental environmental impact statement addressed to our comments and to those of any other citizen organization that you have ignored.

Yours truly

Bob Klug
Chairman

cc F.A.A. Administrator
Senator Patty Murray
Hon. James McDermott

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North East District Council
5214 University Way N.E.
Seattle, WA 98105

July 18, 1995

Dennis Ossenkop
Environmental Specialist, Airports Division
Federal Aviation Administration
1601 Lind Ave S.W.
Renton, WA 98055

RE: Draft environmental impact statement
expansion of Seattle-Tacoma International Airport
by constructing more runways
and extending a runway etc.

Dear Mr. Ossenkop:

A task force of our district council, composed of members of several of our member councils, reviewed the draft environmental impact statement prepared in connection with the proposal of the Port of Seattle and the Federal Aviation Administration ("F.A.A.") to construct a third runway at Seattle-Tacoma International Airport ("Sea-Tac"), extend an existing runway, and build other facilities at Seattle-Tacoma International Airport (entitled "Proposed Master Plan Update Development Actions"). This letter calls the document the "DEIS." The task force found that the DEIS is inadequate and recommends that the F.A.A. prepare another and recirculate it afresh with copies supplied to community groups.

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BASIC FAILURES

The task force found many basic failures in the document, among them, the following six subjects:

Sameness--
The DEIS uses for all alternatives for the next twenty-five years the identical number and type of aircraft, the identical number of passengers, and the identical methods of surface transportation to the airport. It is an assumption without foundation and contrary to the reality that the third runway will increase airport capacity by thirty-eight percent (38 %)(380,000 to 525,000). Sea-Tac has its current volume of flights and passengers because the Port engages in aggressive promotion and makes extensive subsidies to airlines to use Sea-Tac as a hub for transfers between flights and as a base for activities.

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As long as Sea-Tac has excess capacity in quantity, the Port will continue and augment its all out promotional practices; but, if capacity be scarce, the Port will become selective using demand management techniques. Moreover, airlines will change their behavior using airports with ample capacity (such as Grant County International) for hubbing, cargo and transfer flights, and it will help those airports to expand their services in the Northwest. Their expansion will reduce the pressure upon Sea-Tac and further the greater good of the entire region.

One-liner --
The DEIS bases its analysis of noise, air pollution, and surface transportation on a single figure of the number of flight operations. It should give a range of figures. Using just one figure presents a line --- not a full picture. The F.A.A., the Port, and the Puget Sound Regional Council have made predictions that show a very large divergence. The DEIS should give the environmental analysis over the range of the spectrum, including the "worst case" and not simply the "best" case for expansion.

Simply statistics --
The DEIS presents a false image of reality. It reduces people and communities to statistics, making them nameless victims; its text regards statistics as to effects on people as just another set of impersonal numbers; and then it devalues numbers on pollution and harm to people as subordinate to numbers on possible gross revenues for airlines and airport activities. Its methodologies pretend that the pervasive pollution caused by aircraft take-offs and overflights is confined to a narrow zone: the 65 DNL with noise, the immediate vicinity of the airport with air pollution, and particular intersections as to traffic congestion. It then sets a high threshold of "significance" to blind its analysis further. It further isolates one or two aspects of the pollution (those that federal rules explicitly require it to consider) disregarding others. The cumulative impact of its approach is to filter out as much of the adverse impacts as the sponsoring agencies can do.

Conclusion frames issues--
The draft environmental impact statement designs its definition of the issue to suit its recommended solution. A draft environmental impact statement should take a broader definition of the objective, e.g. further mobility to the region. Its consideration of alternatives at pages II-36 and II-37 measures

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all alternatives (including the configuration of Sea-Tac in the Flight Plan Project draft environmental impact statement) by another test, i.e. does the alternative set up two simulataneous parallel streams of arrivals to Sea-Tac? That criterion becomes the de facto objective. The DEIS summarily rejects from detailed analysis in the text every alternative that answers "no" except one: the no-action alternative which the National Environmental Policy Act expressly requires every EIS to consider. It ignores the independent runway that the F.A.A. had recommended in the 1980's. As a result that criterion has in fact set the scope of alternatives considered. Alternatives are at the core of the environmental analysis. Cutting back the analysis of alternatives by using a sole criterion edits the process and debases the utility of the document, itself.

Cost figures --

The DEIS lacks estimated dollar costs for the various construction alternatives, and for the extension of the existing runway. The extension is folded into all expansion plans, and is not revieved or evaluated as an independent development, capable of deletion. Expenditures for the project absorb the area's limited financial resources; costs are a major factor any prudent person (whether in business or just living within a budget) would consider in evaluating alternatives. For example, consider the issue of extending the existing runway. If the cost of the extension of the existing runway were $ 50 million, a return of 5% per annum would be $ 2,500,000 per year. The DEIS predicts that in twenty five years 681 flights would be affected. $ 2½ million divided by 681 yields $367 per fight 25 years from now. That same $ 50 million could insulate about 2500 homes or insulate ten schools, and provide an immediate return to the residents through better housing or less disrupted education. Such insulation may slow the decline of impacted communities. The DEIS supplies no data for allocating resources -- - only advocacy for the extension.

Incompatibility --

The DEIS is discrepant in declaring economic effects. It projects jobs from Sea-Tac expenditures based on gross revenues assuming the opportunity were fully exploited. For businesses and homes taken by the expansion, it uses the euphemism "displacement." Its analysis assumes that the jobs stay in the area.

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That is not always true. While jobs bring in people, it more true that people create jobs. Among those driven from their homes by Sea-Tac expanion, there may be up and coming entrepreneurs like William Boeing and Billionaire Bill Gates who could develop industries of benefit to the region. Human beings have a special value not found in numbers and people don't live on airport runs. Counting numbers "displaced" grossly understates the true dimensions of a community's loss.

Des Moines, Burien, and Normandy Park are like long-standing bushes that flourish in a garden under difficult conditions producing their bounty year after year. Only a foolish gardener would uproot such shrubs to make way for paving for saving visitors at possible peak periods a short wait. Urban renewal projects (e.g. the Yesler-Atlantic urban renewal area) have taught that bulldozing down a community causes more loss to the city and the area than the aggregate of the businesses and residences condemned by the renewal authority; and defeated urban renewal proposals (such as the Pike Place Market) have shown that the planner grossly under-valued the contribution that the current use was making to the city. The DEIS uses the same approach as the 1950's urban renewal planners and grossly underestimates the contribution of the westside communities to our region and the impact on the region of damaging them. The estimate of damage to the region by the runway expansion needs to be redone with a deeper understanding of its long term adverse economic consequences.

SCOPING COMMENTS

As part of our scoping comments, the North East District Council submitted its comment on the Draft Programmatic Environmental Impact Statement. A copy is attached; this letter refers to it as "Our Comments." We resubmit Our Comments and incorporate them in this comment on the DEIS.

The DEIS fails to respond to Our Comments although they were timely delivered as scoping materials:

+ Our Comments in our Summary, pages 1 and 2, apply to the process and the project background at pages I-1 through I-6 of the DEIS. The description of the proposal at page 4 of Our Comments has proven to be far more accurate than that made in the Flight Plan Project final environmental impact statement.

+ The Flight Track Samples in Our Comments at pages 6 and 7 are current. Exhibit "A" shows the current flight paths for April 1, 1995 (south flow), April 24, 1995 (north flow), and May 11, 1995 (south flow) (the Port graphs now draw flights as thinner lines.)

+ The critique in Our Comments at pages 8 - 9 of the narrow scope of the analysis at pages 8 - 9 is even more apt to the DEIS, p. II - 1 through II - 43.

+ Our Comments at page 9 questioned the forecasts of passengers volume at Sea-Tac. The same critique applies to the forecasts in the DEIS at page ii and I - 10 and 11.

+ Our Comments at page 12 - 13 exposed hidden premises in the argument made for Sea-Tac expansion and the claim of economic benefits. These same premises undergird the argument made in Chapters I and II of the DEIS.

+ Our Comments at pages 13 through 20 show serious errors in the analysis of the air quality impacts. The DEIS in Chapter IV presents tables of statistics and assurances that take no account of the information and objections in Our Comments.

+ Our Comments at page 20 cite mitigation measures that the Port should undertake. Those remarks apply equally well to the inadequate mitigation that the Port proposes in the DEIS, p. IV. 9-9.

+ Our Comments at page 21 - 22 raise questions about traffic congestion caused by Sea-Tac expansion on major arteries. The DEIS at page IV.15-1 through IV.15-6 limits its discussion to the immediate periphery of the airport and thereby fails to address them.

+ Our Comments at pages 21 through 41 cite proof of the impact of Sea-Tac based noise in Seattle outside the 65 DNL zone. Chapter IV of the DEIS confines its measurements to the DNL 60 zone or above and its analysis to those above DNL 65. Our Comments on noise are therefore particularly apt to the DEIS.

+ Our Comments at pages 41 through 47 discussed noise mitigation. The DEIS does not meet up to the standards in the regulations set out in Our Comments at pages 41-42; it fails to consider the mitigation

through flight track changes set out at pages 43 - 45. In fact, the Port's own "Sound Information Report" for May 1995 lists compliance with the Elliott Bay Departure at 62 % --- less than it had been in the second quarter of July 1991 (see page 44 of Our Comments (e); a 38 % failure rate after four years shows gross neglect by the F.A.A. in carrying out its procedures, and almost belies citing F.A.A. procedures as mitigation for any purpose. Yet the DEIS, p. IV.1-13 does so. The DEIS should note that, if the Elliott Bay Departure is the precedent, the public can only anticipate a 68 % compliance by the airlines or a 68 % effort by the F.A.A. at enforcement. Our comments at page 45 noted the gross inadequacy of the Port's noise remedy program. The DEIS at pages xviii and xix and Chapter IV, p. IV 2-4 through 2-7 praises its own program and promises a bit more performance. The critiques in Our Comments are current, show the Port's deeds fall far short of its self-image, and need a response based on the harsh facts, and need an honest response.

+ Our Comments at page 46 - 47 pointed out the severe limitations in the Port's Noise Budget. The DEIS at p. xix and IV.1-3 relies on the Noise Budget. The DEIS needs to acknowledge its limitations.

+ Our Comments at p. 47 noted that Sea-Tac expansion destroyed part of the housing stock, which should be replenished. The DEIS in Chapter IV.6-1 totes up statistics on "acquisition." It gives no thought to replenishment of the stock of housing nor does it give the subject an after-thought in Chapter V as a probable, unavoidable adverse environmental impact.

+Our Comments on page 48 addressed the impact on school districts, colleges, and hospitals. The DEIS p. IV.2-1 cites the Mediation document as to homes and it tabulates schools within the zone according to its restrictive measurements. The DEIS has no program for insulation or assistance as to schools and other public facilities. The DEIS needs to establish such a program or describe fully the cost to the School District and the taxpayers for its failure to do so and the impact upon education of outdoor noise. Our comment therefore applies to the DEIS.

+ Our Comments at page 48 - 51 take the Flight Plan Project to task for treating the scoping process as an opportunity for promotion of the third runway, rather than for inviting comments; for favoring proponents and inhibiting citizen organizations; and while making a pretense of soliciting public comment, for in fact,

generally seeking to disfavoring public comment opposed to expansion or concerned about its effects. The DEIS adopts the Flight Plan EIS as the initial stage in its process, and thereby subjects itself to all the critique of the Flight Plan Process. The F.A.A. process repeated the same errors, passing out its own literature at the sole meeting, rather than inviting public comment, and giving the impression to the public that it was going through the motions as a formality. It left unanswered the questions asked at pages 49 - 50 of Our Comment. According to Chapter 6, page 1 -7, the circulation of the DEIS supplied complimentary copies to the Air Transportation Association, Alaska Airlines, American Airlines, Cargolux Airlines, Horizon Airlines, and United Airlines at the outset. None were sent to the Airport Noise Group or the Seattle Community Council Federation, or the Ravenna-Bryant Community Association although each had made a timely request for one. ALthough our District Council made a timely request, we secured our copy only because of the intervention of Congressman Jim McDermott and that happened after half of the time for comment had expired.

+ Our Comments at page 51 noted that the Flight Plan Project environmental impact statement lacked an index. So does the DEIS as 40 CFR § 1502.10 (j) requires it. No copy of the DEIS was sent to the Highline School District, the Federal Way School District, the Seattle School District, the community college, or any of the special purpose governmental districts. None was sent to any of the hospitals listed as affected. The F.A.A. should send copies to these organizations immediately and extend the time for them to comment by ninety (90) days in order that affected local governments and community organizations may have the same opportunity for comment that the F.A.A. gave the Air Transportation Association, Alaska Airlines, American Airlines, Cargolux, Horizon Airlines, and United Airlines, and Weyerhaueser Aviation.

C-9-1

FOUR POST PLAN

The Puget Sound Regional Council in Resolution No. A-93-03 resolved that the region pursue a major supplemental airport and a third runway at Sea-Tac on six stipulations. Stipulation No. 3 states "The Regional Council requests consideration by the Federal Aviation Administration of modifying the Four-Post Plan to reduce noise impacts, and the related impacts on regional military air traffic." Stipulation No.

3 precedes Stipulation No. 5 that authorizes site-specific studies. Stipulation No. 3 ties consideration of modifying the Four-Post Plan to the site-specific studies including an environmental impact statement on a Sea-Tac Third Runway.

To rely on Resolution A-93-01, the F.A.A. needs to study modifying the Four-Post Plan as part of its environmental impact statement analysis. The Resolution is one entire document; the F.A.A. can not claim the benefits of Stipulation No. 5 while repudiating Stipulation No. 3. The Puget Sound Regional Council was well aware that the F.A.A. had adopted the Four-Post Plan without any meaningful environmental analysis, and that such an analysis would only be made in the context of the environmental impact statement process. If it had been the intention of Resolution No. 93-03 that Stipulation No. 3 be a severable off-hand request, the Resolution would not have assigned it a number between Nos. 2 and 5 that relate to the Third Runway.

Stipulation No. 3 shows that modification of the Four-Post Plan is important to the affected communities and to the greater region. It demonstrates that such a modification is an issue of environmental significance to local officials with respect to Sea-Tac expansion (See F.A.A. Order 1050.1 D) and as such a subject for coverage in the EIS on Sea-Tac expansion. See 40 C.F.R. § 1500 et seq. Consideration of modification is part and parcel of Resolution A 93-03 and the environmental review process for any Sea-Tac expansion. The DEIS' failure to consider modifications to the Four-Post Plan at all renders the DEIS non-compliant with Resolution A 93-03 and inadequate under federal law.

Yours very truly

Bob Klug
Chair

PUBLIC NOTICE

AVAILABILITY OF A DOCUMENT, CONDUCT OF A PUBLIC HEARING AND PUBLIC COMMENT PERIOD

FEDERAL AVIATION ADMINISTRATION AND PORT OF SEATTLE

The Northwest Mountain Region of the Federal Aviation Administration ("FAA") and the Port of Seattle ("Port") announce that the FAA and Port, acting as joint lead agencies, have released for public and agency review a Draft Supplemental Environmental Impact Statement (Draft SEIS) for the proposed Master Plan Update improvements, including the third parallel runway and other airport facility improvements to the Seattle-Tacoma International Airport (Sea-Tac Airport).

In April 1995, the FAA published in the Draft Environmental Impact Statement (DEIS) for the proposed Master Plan Update improvements. Public comments were taken on the DEIS until August 3, 1995. The Final EIS, approved by the FAA on February 1, 1996, was released to the public on February 9, 1996. Although the FAA did not solicit public comments on the Final EIS (on issues other than air quality conformity), several public agencies, community groups, and citizens have nevertheless submitted written comments for agency consideration since issuance of the Final EIS.

During the intervening months, both the FAA and the Port have determined that the forecasts of aircraft activity and enplaned passengers used in the above referenced draft and final EIS's did not adequately account for the actual growth which has taken place at Seattle-Tacoma International Airport in the past year nor the potential for faster growth rates than expected in the EIS. New forecasts of aviation demand have been prepared and the draft SEIS analyzes the impact of these forecasts and other new data on project purpose and need, alternatives, affected environment, and environmental consequences. All of the development alternatives will result in floodplain encroachment, wetland filling, stream relocation, property acquisition, as well as other impacts.

Copies of the 1997 Draft Supplemental EIS are available for review at the following locations during normal business hours:

- Federal Aviation Administration, Airports Regional Office, Room 540, 1601 Lind Avenue SW, Renton WA
- Port Of Seattle, Aviation Planning, 3d floor - room 301, Terminal Building, Sea-Tac Airport, and Pier 69 Bid Office, 2711 Alaskan Way, Seattle
- Puget Sound Regional Council, Information Center, 1011 Western Avenue, Seattle
- Beacon Hill Library, 2519 - 1st Avenue South, Seattle
- Bellevue Regional Library, 1111 - 110th Ave NE, Bellevue
- Bothell Regional Library, 9654 NE 182d, Bothell
- Boulevard Park Library, 12015 Roseberg South, Seattle
- Burien Library, 14700 - 6th SW, Burien
- Des Moines Library, 21620 11th South, Des Moines
- Federal Way Regional Library, 34200 - 1st South, Federal Way
- Foster Library, 4205 South 142d, Tukwila
- Kent Regional Library, 212 - 2nd Ave N, Kent
- Magnolia Library, 2801 - 34th Ave W, Seattle
- Rainier Beach Library, 9125 Rainier Avenue S, Seattle
- Seattle Public Library, 1000 4th Avenue, Seattle
- Tacoma Public Library, 1102 Tacoma Ave S, Tacoma
- University of Washington, Suzallo Library, Government Publications, Seattle
- Valley View Library, 17850 Military Road South, SeaTac
- Vashon Ober Park, 17210 Vashon Highway, Vashon
- West Seattle Library, 2306 - 42d Ave SW, Seattle

This document is available for public reproduction at Kinko's located at Kent-Des Moines Way and Pacific Highway (23203 Pacific Highway S., Kent) Phone, 206-878-5043

The Port of Seattle will host a Public Hearing concerning the Draft Supplemental EIS on Tuesday, March 4, 1997 from 4pm until 8pm at the Sea-Tac Airport Auditorium, located in the Main Terminal. The purpose of the hearing is to receive oral testimony concerning the social, economic, and environmental effects of the proposed Master Plan Update improvements.

Written comments may be directed to: Mr. Dennis Ossenkop, Northwest Mountain Region, Airports Division, Federal Aviation Administration, 1601 Lind Avenue SW, Renton WA 98055-4056. Comments must be received by March 31, 1997

WOOLPERT

February 24, 1997

Mr. Lowell H. Johnson
Manager, Airports Division
Federal Aviation Administration
Northwest Mountain Region
Renton, Washington 98055

Re: Supplemental EIS for Seattle-Tacoma International Airport, Seattle, Washington

Dear Mr. Johnson:

Woolpert requests a copy of the above referenced document.

Please direct the document to the attention of David H. Vomacka, Ph.D. Thank you.

Sincerely,

WOOLPERT LLP

Heather C Loadholt

Heather C. Loadholt
Marketing Coordinator

HCL/hcl

WOOLPERT LLP
409 East Monument Avenue • Dayton, Ohio 45402-1261
937.461.5660 • Fax: 937.461.0743 • www.woolpert.com

February 28,1997

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Mr. Dennis Ossenkop
Federal Aviation Administration, NW Mountain Region
1601 Lind Ave. SW
Renton, Washington 98055-4056

Subject: Protest of the Public Review Process for the Supplemental EIS (SEIS) for the SEA-TAC Airport Master Plan Update.
Reference: Telecon on Feb. 20th between the undersigned and three personnel in your office (including yourself) regarding directions and parking for the March 4th public meeting.

The purpose of this letter is to officially protest the process that your office has established for the public review and comment on the subject SEIS. I protest this review process as a "farce" and "cover-up" designed to minimize public comments on the Port of Seattle proposed actions for several reasons:

1) This SEIS is not a simple document to review and understand the real impacts on citizens living within the communities surrounding the airport. It consists of approx. 1000 pages on wetland impacts, floodplain encroachment, stream relocation as well as social, noise, water and air quality impacts. These are not subjects easily understood via a few hours sharing the few available copies of the SEIS.
2) There is not a sufficient number of SEIS documents available for public review. SEIS draft copies sell for $120.00 each. No lower priced summary copies are available as with the initial EIS. Review of copies at the local libraries is not practical because of the volume of data to review.
3) SEA-TAC Airport is the worst possible location for the public hearing on March 4 and will discourage attendance. Traffic congestion, parking problems at SEA-TAC (including cost), an unknown meeting hall and the 4PM weekday starting time are all good reasons to keep the attendance low. As we talked during the referenced phone conversation, even you nor your office staff could not give specific directions as to how to get to the main auditorium at SEA-TAC (since you had been there only once). You did not know about parking: where or about the cost.
4) A 45-day review period is too short. Considering the complexity of the problem and the poor distribution of public information on what the process is, a 90-day period would be short but more equitable.

Three or four public meetings of 2-hour duration in the evening hours held at local sites in Burien, DesMoines, Normandy Park and Federal Way would be much more acceptable for the people being impacted by this project. I hereby volunteer my services to you in setting up alternate public hearing meetings if I can help you.

Sincerely,

Jim Bartlemay

James M. Bartlemay, Vice President
Citizens Against SEA-TAC Expansion (C.A.S.E.)
P.O. Box 98732
DesMoines, WA. 98198

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Author: johngee@nmia.com at INTERNET
Date: 3/4/97 12:40 PM
Priority: Normal
TO: dennis ossenkop at ANM600
Subject: Request
---------- Message Contents ----------
Please send me a copy of the Draft Supplemental Environmental Impact Statement for the Master Plan Update at Seattle-Tacoma International Airport. Thank you.

John Geddie
8040 Bellamah Ct. NE
Albuquerque, NM 87110

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March 10, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
1601 Lind Avenue S.W.Council
Renton, Wa 98055-4056

ANM-610

Re: The Sea-Tac Airport, SEPA Comment Period

The infrastructure of greater Seattle does not support the 22.8 million passengers claimed by the Port of Seattle. Using information supplied by the Port of Seattle publication SOUND INFORMATION, and Chamber of Commerce information supplied by Orlando, Las Vegas and Greater Seattle demonstrates that there are not enough hotel and motel rooms between Olympia up to Everett to handle even a fraction of the claimed passengers.

AIRPORT	PASSENGERS	ROOMS	AVERAGE DAILY PASSENGERS PER ROOM
Sea-Tac Int'l	22,800,000	28,302	2.2
Orlando Int'l	21,147,888	83,456	.7
Las-Vegas Int'l	20,913,054	73,206	.8

C-12

Greater Seattle does not have the rooms available nor under construction to support the claimed passengers. Sea-Tac is claiming passenger populations in excess of major national tourist areas.

The AVERAGE DAILY PASSENGERS PER ROOM is the total passengers divided by 365 days for passengers per day. The passengers per day divided by the total number of available rooms for one night only. The travel of residents was not taken into consideration because the claimed passengers grossly exceeds the total population of the region.

The Greater Seattle Chamber of Commerce supplied the room data which breaks down to:

ROOMS	AREA
8,459	Central Seattle
12,502	Sea-Tac Airport, Tacoma, South to Olympia
2,813	Eastside and Bellevue
4,528	North Seattle, Aurora, U-Dist, to Everett
28,302	Total

The Orlando data includes 364 hotels and motels in three counties, Orange (Orlando), Osceola and Seminole.

The Las Vegas rooms (73,206) are within ten miles of McCaran airport and do not include a substantial number of substandard motels near the airport. Using the Circus-Circus hotel chain as an example, financial reports show the chain near 100%

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occupancy of 13,665 rooms and the company in the process of acquiring an additional 7,100 rooms. Huge rental car fleets are required to serve McCaran Airport. The rental fleets use 30 and 40 passenger busses to transport rental customers. Alamo, as another example, runs busses every 10 minutes to their terminal. Sea-Tac has no equivalent.

I lived in this area before the SECOND RUNWAY was built. The SECOND runway is also substandard and based on misleading projections. It was also an overstated economic disaster. The Port of Seattle ran out of money and the promised economic growth for the region DID NOT DEVELOP. The perimeter of the airport has remained dormant for 25 years.

Public money is in short supply. It is desperately needed for a decent surface transportation system; for restoration of public water supplies; for relocation of schools and retirement centers out of existing flight paths; for buyouts, insulation and repairs on thousands of homes and businesses damaged by the second runway default; for a new stadium and on.

RECOMMENDATION
An independent name accounting firm such as Price Waterhouse or Arthur Anderson be hired by the FAA to audit the passenger manifests. A simple reverse projection of Greater Seattle room data and using the Las Vegas .8 occupancy rate suggests that 8,264,184 passengers would be a more realistic figure.

The Second Runway was an economic flop. The proposed third runway offers more of the same.

Dan Caldwell
19547 Second Ave. S.
Des Moines, Wa 98148
(206) 824-0736

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REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 11 1997
ANM-610

Highline School District 401

Educational Resources and Administrative Center
15675 Ambaum Boulevard SW
Burien WA 98166
(206) 433-0111

September 10, 1996

Copy: Mr. Dennis Ossenkop
Federal Aviation Administration
1601 Lind Ave S.W.
Renton Wa 98055-4056

Dear Community Member:

Re: Comments Sea-Tac SEPA

A third runway at Sea-Tac Airport, as now planned, would make it much more difficult and expensive to educate the children of Highline School District. Your School Board will not allow anyone to jeopardize our children's education. The Board's focus is to assure that all steps are taken to protect students and facilities from all impacts, be they second or third runway related.

It is the responsibility of the District to stand up for our children. That is why Highline School District joined the cities of Burien, Tukwila, Des Moines, Federal Way and Normandy Park in filing a lawsuit against the Port of Seattle trying to stop the runway. We have more clout as part of this group than if we act alone. It was necessary to file the suit quickly, before our window to sue passed, so that we could keep our legal options open. The lawsuit shows how serious we are about protecting the interests of our students. Currently, the cost of this lawsuit is being borne by the previously identified cities.

Just how would the runway hurt the District? Noisy airplanes disrupting classes would require that schools be retrofitted with expensive soundproofing and appropriate air ventilation systems for sound attenuated schools. A thorough study of the needs and attendant costs is being conducted by internationally recognized experts so as to put the school district in a position to provide an informed and defensible study of what is necessary to protect its facilities, staff and students. No one has done a thorough study of what would happen to District programs and services if property values decline and levy collections are reduced.

Highline School District is not waiting idly while the lawsuit runs its course. The District is continuing to negotiate with the Port of Seattle, focusing first on receiving long overdue payment for the negative impacts of the *second* runway. The District is also trying to better estimate the cost impacts of the third runway and will be asking parents, teachers, bus drivers and the entire community for your help in identifying those impacts. I will be writing to you in the future about how to participate.

We can't accept a third runway that harms our children and limits their future. If a third runway were to be built, full mitigation would be required. You can depend on us to keep working to address these concerns.

Sincerely,

Joseph R. McGeehan
Superintendent

The mission of the Highline School District is to enable all students to acquire the knowledge, skill, values and attitudes to live productively and responsibly in a diverse and ever-changing world.

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REC'D ANM-610
PLAN, PGM, & CAP B
MAR 11 1997
ANM-610

March 9, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
1601 Lind Avenue S. W.
Renton, Wa 98055-4056

Re: Comment Period Sea-Tac Airport SEPA

Dear Mr. Ossenkop
I was in Amsterdam, Holland, shortly after the Boeing 747 cargo jet broke up and crashed. Over 240 innocent men, women and children were burned to death in their own homes. The public was outraged at the American business callousness.

The Seattle Times in an article concerning the 737 rudder reported that a jet crash occurs about once in every million flight operations. Similar statistics have been reported in Conde Nast and in various aviation journals.

Three Seattle Airports, Boeing Field, Sea-Tac Airport and Renton Airport fly more than one million operations per year in the busiest aircraft traffic corridor IN THE WORLD.
With this kind of flight activity, statistically the FAA should plan on one major crash each year in this corridor.

Traffic to and from Sea-Tac Airport is flown directly over the busier Boeing Field approximately 350 feet below. (Sea-Tac is perched on a mountain ridge)

Boeing Field operates with a variety of beginner flight schools, miscellaneous puddle jumpers, cargo, charter and Boeing Company flights on one main and one small strip. Boeing Field averages almost 80,000 more operations per year then Sea-Tac.

Private aircraft and students using the north end of Boeing Field fly under the Sea-Tac flight path and do not have the aircraft performance to endanger jets.

However. The proposed third runway will place the intersection of Boeing flights and Sea-Tac flights at a much closer proximity to the west and dangerously increase the probability of a jet tangling with a Boeing student. At that time it can be expected that the FAA will close either Boeing or Sea-Tac due to the potential for an accident that no one could foresee.

In the interest of public safety the construction of the third runway is sheer folly.

Dan Caldwell, Member of CASE
19547 Second Ave S.
Des Moines, Wa 98148

cc: Repr. Rod Blalock

David Dorough
617 S. 195th
Des Moines, Wa 98148

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Dear Mr Ossenkop

I would like to comment on the proposed third runway at sea-tac in regard to air quality and environmental impact.

I'm concerned by the projected volume of flights wether a third runway is built or not. There are quite a few families/homes around sea-tac with many new homes in construction, So with heavier traffic at sea-tac more families than ever will be impacted by the pollution and fuel dumping. I was shocked to hear that fuel dumping isn't monitored by the government, that if you notice an oder of fuel or see any your to call up the airline thats responcible. Most times you don't see or smell anything until minutes after the jet has gone over and have no idea of the airline. Also on days with little or no wind the burnt fuel odor or smoke gets strong now, I can't imagine what it would be like with double the number of flights. I believe that most of the projected new flights should be directed to a new airport with a large buffer zone planned around it and located where wind movement is more consistant.

Sincerely
David L Dorough

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March 4, 1997
Mr. Dennis Ossenkop
Federal Aviation Administration
1601 Lind Ave. S.W.
Renton, Wa 98055-4056

Re: UAL Objection To Unrestricted Flights, Sea-Tac SEPA

Based upon the interview of Gerald Greenwald, chairman of United Airlines (Times) it would appear that the opponents of the third runway, United Airlines and the Boeing Company are in substantial agreement.

Mr. Greenwald states:

> "He said United is interested in a larger jumbo jet that could bring more passengers to airports where LANDING SLOTS ARE RESTRICTED and for use on long Pacific Rim flights."

Mr. Greenwald is interested in spending up to $3 billion for either American or European build jumbo jets and possibly restarting the non-stop London flight and Hawaii flights.

The present load factor out of Sea-Tac airport is only 24.9 paying passengers per flight (Deloitte audit). There are no Boeing aircraft in production which will pay a profit with a paying passenger load that small.

One Boeing built jet ranging from a 737 through a jumbo operated efficiently by a professional airline will replace numerous smaller foreign built aircraft with greater economic benefit to the region and with safety and considerably less disruption to the surrounding cities.

Demand Management is the economic solution to replace empty aircraft.

Sincerely

Dan Caldwell
Member C.A.S.E.
19547 Second Ave. S.
Des Moines, Wa 98148

Enclosure: Seattle a Star In Airline Plan Story

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Mr. Dennis Ossenkop
Federal Aviation Administration
1601 Lind Avenue S.W.
Renton, Wa 98055-4056

Re: Vancouver Airport, Sea-Tac Airport SEPA

The Vancouver B.C. Airport dramatically brings the advantages of a privatized airport over the bandaid government owned Sea-Tac Airport operated by the Port of Seattle.

Vancouver Airport returns $30 million in rent to the taxpayers while the Port of Seattle is a welfare operation which costs taxpayers $34.6 million in property tax every year.

The third runway and all improvements at Vancouver is costing $380 million devalued Canadian dollars while the Sea-Tac runway and improvements will cost $3.4 Billion taxpayer dollars.

Vancouver is expanding with the blessings of both the Vancouver residents and businesses while for the last 15 years the Port of Seattle has fought their own residents and taxpayers to build a stop gap high risk third runway.

Vancouver is now handling 70,000 passengers per day and will be able to handle even more with a new 10,000 foot runway while the Port of Seattle handles only 62,000 passengers per day and the third runway is proposed at a substantially shorter 8,500 feet. Too short for passenger jet aircraft.

G-15

Sea-Tac offers the same dangerous conditions to citizens on the ground as Amsterdam Airport when a 747 cargo plane broke up, crashed into an apartment and burned to death over 240 people in their own homes. Over water approaches to Vancouver Airport are substantially safer for both passengers and residents.

It is time to get irresponsible mossback thinking out of the Port of Seattle and into the concept of building a new first class tax paying airport for the region.

Dan Caldwell
19547 Second Ave S
Des Moines, 98148
(206)824-0736

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Mr. Dennis Ossenkop
Federal Aviation Administration
1601 Lind Avenue S.W.
Renton, Wa 98055-4056

(13)

March 7, 1997

Re: Property Devaluation And Public Safety Sea-Tac SEPA

Enclosed is a copy of the February Home Sales published in the Sunday March 9, 1997 Seattle Times.

These home resale statistics are typical of weekly, monthly and yearly values over several years.

Please notice that Region 1 homes have the lowest average and medium sale prices of the six regions listed. These low values persist year after year despite the fact that the region has some of the finest view and waterfront property in the nation.Traffic is the least congested in the county. While the Port of Seattle claims weather problems, Region 1 is considered a banana belt due to rain protection from the Olympics.

Older and smaller Region 6 homes in Seattle average $43,000 above Region 1. Region 1 homes sell for an average of $149,937 while equivalent homes in Region 3 and 4 sell for an average of $226,400 in spite of horrendous weather and traffic problems in Region 3 and 4.

Region 1 is directly in the flight paths for two airports, Boeing Field and Sea-Tac Airport. Region 1 is a dangerous, noisy and high health risk area due to unrestricted aircraft usage. Noise has been used as a broom to force property devaluation. Because of fixed income and low property values the elderly are forced to remain in the area. Either intentionally or by apathy the FAA, Seattle, King County and to a certain extent the State of Washington are forcing their "social problems" and populations which are considered less valuable into this high risk area.

Nursing homes, retirement centers, apartments and schools are lined up like dominoes is the Sea-Tac Flight paths.

If the FAA has a concern for public safety it should not be involved in the disgraceful use of Sea-Tac Airport.

Dan Caldwell
CASE
19547 Second Ave. S.
Des Moines, Wa 98148

cc: Senator Julia Patterson

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Attachment March 7, 1997 Letter to Ossenkop

SUNDAY, MARCH 9, 1997

February home sales

Numbers in the chart below correspond to areas on Puget Sound region map at left.

	CURRENT ACTIVITY			CLOSED SALES		
AREA	NEW LISTINGS	NEW SALES	ACTIVE LISTINGS	SALES CLOSED	AVG. PRICE	MEDIAN PRICE
1	821	554	1,865	287	$149,937	$138,000
2	1,549	838	4,010	468	$153,975	$140,975
3	788	695	1,902	409	$270,593	$228,000
4	695	472	1,585	264	$182,289	$168,000
5	1,138	733	2,888	412	$161,784	$152,000
6	846	616	1,294	377	$192,952	$162,000
Total	5,837	3,908	13,544	2,217	$186,417	$159,000

New listings: Homes (houses and condominiums) put on the market during the month.

New sales: Homes taken off market after sales agreements reached.

Active listings: Homes for sale on last day of the month.

Sales closed: Home sales closed during the month. Reflects activity 60-90 days earlier.

Average price: Of closed sales.

Median price: Half of closed sales were higher, half lower.

Note: Only housing transactions handled by the Northwest Multiple Listing Service are listed.
Source: Northwest Multiple Listing Service

SEATTLE TIMES

- G-16 -

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 11 1997
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MAR 11 1997

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March 8, 1997

Mr. Dennis Ossenkop
Northwest Mountain Region
Airports Division
Federal Aviation Administration
1601 Lind Avenue S.W.
Renton, Wa 98055-4056

Re: Comment Period Sea-Tac Airport Supplemental Environmental Impact Statement

Dear Mr. Ossenkop

I have noticed along with others that neither the Port of Seattle nor the FAA respond to letters of concern in particular when public safety is a concern.

On March 4 and again on March 18, 1996, over one year ago the Seattle Water Department expressed concern that Sea-Tac mining could allow surface contaminants to "---move rapidly into the aquifer systems and beyond the range of cost effective cleanup methods.---"

This letter was attached as a filler to the SEPA document without a statement of correct action.

Mr. Ossenkop and the FAA. This letter and also a letter from the Highline Water Department are about the safety of the PUBLIC WATER SUPPLY and a hell of lot more important then an airplane schedule for a cargo airplane.

Dan Caldwell
Member of CASE
19547 Second Ave. S.
Des Moines, Wa 98148

CC: State Representative Karen Keiser

Attachment March 7, 1997 Letter to Ossenkop

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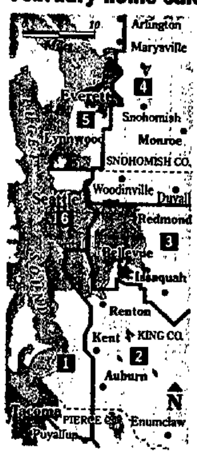
SUNDAY, MARCH 9, 1997

February home sales



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Note: Only housing transactions handled by the Northwest Multiple Listing Service are listed.
Source: Northwest Multiple Listing Service

SEATTLE TIMES

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March, 1997

Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Avenue Southwest
Renton, WA 98055-4056

RE: Draft Supplemental Environmental Impact Statement Comments

Dear Mr. Ossenkop:

The public comment period is too short and there are too few public meetings. The EIS is difficult to understand. It arrived at the librarys almost a month late. Additional hearings at more convenient places and times than the airport during rush hour, should be held.

The Supplemental EIS has not been available at the Des Moines Library. I only had a very ~~brief~~ brief opportunity to glance at the document during the public hearing.

As a former Highline Water Commissioner and as a founding chairman of the Groundwater Advisory Committee and the Regional Water Association of South King County I had expressed concerns regarding pollution into the second and third aquifers directly under the airport.

The city of Seattle wells for part of their drinking water supply is directly north of Sea-Tac. Highline Water District directly south of Sea-Tac jointly draw from ~~these~~ their (third) aquifer.

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Initially Highline Water District drew water directly from this high quality water supply without filtration. However in recent years the quality has declined due in part to contamination from the airport ~~and the~~ The Water District has been forced to add an expensive filtration system to bring the water back to standards.

I have also seen water reports from the Des Moines aquifer which is also under Sea-Tac which have coliform contamination beyond accepted limits. Water District 54 is believed to be using that aquifer.

Various hydrologists I have talked to indicate that the aquifer is quite extensive from West Seattle down to Vancouver Washington. As Sea Tac with 2500 acres directly above the aquifer, ~~which~~ an uncontrolled pollution environment of that size can have a significant impact upon the public water supply.

Dan J Caldwell

March, 1997

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Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Avenue Southwest
Renton, WA 98055-4056

RE: Draft Supplemental Environmental Impact Statement Comments

Dear Mr. Ossenkop:

The public comment period is too short and there are too few public meetings. The EIS is difficult to understand. It arrived at the librarys almost a month late. Additional hearings at more convenient places and times than the airport during rush hour, should be held.

The supplemental EIS is very scarce only about 16 copies have been released to serve 300,000 population. The public comment location for speaking was hidden on the second floor of Sea-Tac airport Parking is very expensive.

The aquifer and the impact of fill have not been addressed by professionals, hydrologist and related. For example the proposed fill will ~~require~~ require four times the volume of Kent Conte Dam. A bedrock base does not exist in the area of glacial till.

Soil creep has not been considered. Miller Creek, Des Moines creek are proposed to be altered get the impact to the companion aquifer has

(over)

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not be considered. I understand that the wetland has been ~~destroyed~~ purchased in an alternate Auburn location – 400 feet below Sea-Tac. The impact to the aquifer has not been considered. The project has the appearance of amateur.

Dan Caldwell

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COMMENT SHEET

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 11 1997

Public Hearing
March 4, 1997

ANM-610

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

(17)

We need more time to study the SEIS. There aren't enough copies available for the people who will be most impacted.

(*Please Print*)Name: FRANCES WELLS
Address: 428 SW 124th St
City: SEATTLE WA Zip Code: 98146

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

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COMMENT SHEET REC'D ANM-610 PLAN, PGM, & CAP BR MAR 11 1997

Public Hearing
March 4, 1997 ANM-610

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

I think it is ridiculous that this SEIS is so hard to get and so complicated, and then you give me so little time to comment on it.
Why is the time to comment so short considering the size and complication?

Will comment more after I have gone thru hopefully before the 31st

(Please Print) Name: DAVID WAGNER
Address: 16247 8th Ave SW
City: Burien WA Zip Code: 98166

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

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REC'D ANM-610
COMMENT SHEET PLAN, PGM, & CAP BR
MAR 11 1997

Public Hearing
March 4, 1997 ANM-610

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

Dear Mr. Ossenkop

We would like an extension. We have not seen the Environmental Impact Statement on the Third runway. We feel the comment period is too short. Can you tell me why the comment period should be extended or not. I feel there has been inadequate time to respond to such an important development in our community. I will appreciate your answer.

Thank you.

Wallace K Meyers

(Please Print) Name: WALLACE K MEYERS
Address: 14410 - 6th PL SW
City: Burien Wa Zip Code: 98166

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

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ANM-610

4916 Purdue Ave NE
Seattle WA 98105
22 February 1997

Dennis Ossenkopf
Federal Aviation Administration
1601 Lind Ave SW
Renton WA 98055-4056

Dear Mr Ossenkop:

As it was prepared by the Port of Seattle (POS), the Supplemental Environmental Impact Statement (SEIS) still avoids the fundamental question: "Why would anyone want to expand a hilltop airport embedded in an urban area?". The POS and the Puget Sound Regional Council (PSRC), in full view of the public during the purported hearings on alternatives visibly and transparently set up flawed strawman alternatives and ceremoniously knocked them down in order to declare: "There are no other alternatives to expanding SeaTac". They then have used this charade as an excuse to proceed with their ill-conceived, unaffordable, ineffective plan to sieze and violate the environment of the Southwest King County communities. As one citizen who sat through and witnessed this charade I predicted that if solid facts conflicting with this view were publicly presented they would be declared non-relevent and non-existant - which happened when the PSRC abdicated the judgement of the agreed upon expert panel. They thus avoided the fundamental question noted above. These purported public officials no longer have - in the public's eyes - any credibility in this issue in particular and, in view of their behavior on other similar public issues, little generally either. The SEIS should be a document where the FAA forces these agencies, and the relevent State of Washington officials, to fully and fairly explore the foundation for the existenace 5 pounds of profuse, detailed data paid for by our taxes mostly intended to obscure the fundamental question above and then address a true regional perspective as a first step in probing the environmental impacts of the POrt of Seatle proposal.

One sign of deliberate neglect and arrogance of the POS is the labelling of Alternative-1 in Appendix C-1 as "Do-nothing", term they have contrived to use, in spite of repeated objections, rather than "Mitigation of the Current Configuration". This label is used deliberately to depict the surrounding communities as irresponsible reactionaries when compared to the POS' "enlightened improvement" of their communities by ripping out their hearts.

One who looks at the data presented, beginning with the urgency to get started due to a purported crisis brought on by increased air traffic projections, with extreme skepticism. Concurrently, we read elsewhere that one commuter airline is beginning operations at Paine Field in Snohomish County and we remember that 40% of SeaTac operations are commuter traffic. This new site was one admantly rejected by the PSRC - thus illustrating that a number of regional

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alternatives do exist to this project. This, coupled with the increased operations at Bellingham airport, has lead, nevertheless, to no detectable discussion of regional alternatives to SeaTac expansion and increased air traffic capacity that are out of the clutches of the POS. These facts belie the "bad weather" argument and critically challenges that argument, especially when a $3.5B price tag is placed on a facility that will increase operation capacity (using thier own figures) about 10% (2% dep, 10% arr) at a devastating cost to the surrounding communities and it will have even less of a future expansion capabilty than it had before - namely none. The purported need for capacity enhancement that leads to extending the hilltop toward Puget Sound at a horrendous cost and ruinous effect cannot be justified in terms of a financial investment because of the minimal effect produced.

Such an involvement at that site would need major objective reasons and substantial long term benefits to air transport potential for building such a project beyond the POS declaring that its value is based on their say-so. Such reasons and benefits have never been objectively documented and the current document up front does not, and cannot, justify such a line of argument. This position has been presented to both the PSRC and the Congressional Hearings by established economists. The POS officials proposing these vested, unsupportable arguments have been derelict in the conduct of the process and in their responsibility and actions. The FAA, nvertheless, need not be taken in by such actions since public scrutiny into responsible use of federal public funds will expose to withering criticism any agency expending funds on such a weak project. Rather, the FAA should direct that a true regional study involving a balanced set of participants capable of a true regional (perhaps including Oregon) assessment of a responsible investment in increased regional air capacity. If this assessment is not done, the POS and the PSRC should be notified that no federal fucnds would be available and that local and state resources should be marshalled to find best use of the current configuration of SeaTac, or to carry out the project without federal involvement. If the FAA does otherwise, it is certain to be the target of severe criticism from many quarters. Remember that the "environment" consists not only of the physical but also, the social and community components.

Turning attention to the physical environmental impact of expanding the hilltop toward Puget Sound in order to produce a "dependent" runway, even if built by a magical importation of 23 million cubic yards of fill without disturbing any aspect of community fucntioning, the built configuration is a dagger in the heart of Normandy Park and Burien, disrupting every aspect of their current functioning. It also disrupts, via its flight tracks, communities up to twenty miles way due to its orientation. Highline Hospital will have a "tailpipe in its teeth" with every operation at the north end of the "dependent" runway. Regardless of the POS contention, it is my belief based upon observed POS behavior and record over the past ten years as part of "mediation", 1993 Part 150 proceedings and the Third Runway proceedings, that the POS will find some rationale to declare a critical "independent runway" situation

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and proceed to expand the project at even further ruination of these communities and their community environment. POS has worked hard in full public view in order to develop this consummately negative reputation. The communities throughout the region who have suffered through this experience will see that they live with its consequences. This absence of any trust of POS is a major community environmental impact simply due to the nature of the built project and the POS approach to the public.

Of course, the POS possesses no "magic" to construct such a project without desecrating the surrounding communities but they, in part not only in the current SEIS but also by historic behavior and previous documents, not only insult but also outrage these communities with the token $50M "mitigation" budget out of $3.3B for construction. This offer is not only incredible and totally unintelligible but also unconscionable and unsupportable on any grounds to the point of bordering on gross dereliction. This behavior has gone on for at least seven years and it is clear that the POS has no ability to learn anything new except what they originally intended. They have wilfully deceived all of the citizens groups about their intentions, since at least the time of the "mediation" process beginning ten years ago. Consequently, there is no developement of a plan under this alternative to fit the current capacity of SeaTac into a regional plan of usage of existing airports - which would be the true Alternative-1. There is therefore a wilfully false baseline. Also conspicuous by its absence, because of manipulation of the PSRC process, is "Alternative-1a" a new regional airport added for maximization of the existing capacity at SeaTac. This is included here in the defects to SEIS in order to point out the systematic, pathologic avoidance by POS of the fundamental question which must be addressed to establish true environemental impact. These restated non-expansion alternatives are injected in order to establish a true base for the community devastation that the attempted expansion of a hilltop airport would wreak on that site. The expansion alternatives listed in Table C-4-1 of the SEIS would require 24 MCY of fill provided by two options: 1) primarily onsite and 2) primarily offsite. Table C-4-3 includes a 5 yr period five days a week, 16 hrs/day, 60 trucks an hour bothways roaring through the communities. No estimate of road miles from each haul site (some 20 miles away), and attendant exposed regional population, are given nor is the number of trips to each haul site resulting from each project alternative compared to the "Mitigation of Current Configuration". The nearby cities will be devastated for five years with all of this traffic while the surrounding area - depending upon the haul site - will also for five years be subjected to this disruption for a lesser total time. Mitigation of this situation has not been given. And to what end? A miniscule increase in capacity arriving at a time when it is obsolete and a regional solution unavoidable! And the surroundiong communities ruined and no cost of this ruination given - of people not able to pursue their lives and communities unable to grow due to the unending disruption! Clearly this has been waved off in the $50 insult mitigation figure - an irresponsible number even to the most inattentive! The community objections to this seizure and violation

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is well known. The SEIS here is clearly fundamentally flawed and unacceptable.

No consideration has been given as to how this massive fill will be made stable - by clearly demonstrated sound engineering principles before a truckload is dumped. Compaction, slippage from groundwater, earthquakes and other natural processes need to be considered before extending a hilltop - not only because of the potential damage to airport function but also, more importantly, to the surrounding communities. The similar damage from "onsite" excavation also needs explanation as part of depicting the colossal disruption of construction to add to the devasation due to the mere presence of the built product.

In conclusion, to this voter who lives at some distance but clearly sees the impact on the Southwest King County communities, the SEIS has skirted the fundamental question, belittled the details of the built project on the communities, waved off the devastation of the construction process and avoided the cost question: "What does this horrendous effort buy except an obsolete marginal increase in operation capacity with no ofsetting future expansion potiential and a ruined Southwest King County?" A true regional effort is the only answer, which is what the POS has been told by the surrounding communiites for ten years. In reality the POS is the "Do-Nothing", head-in-the-sand party dead set on spending public money on an ill-conceived project. They wrongly say "Some one else will pay!" We know better and know that POS has wasted our hard-earned tax money on a fruitless, inept planning process when it could have dedicated that effort regionally - and it has tried to blame the communities as reactionary when IT is in fact the colossal reactionary and is clearly culpable for the waste of public resources. This SEIS must terminate this irresponsibility!

Sincerely,

Arden W. Forrey

Arden W. Forrey

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March 1997

Dennis Ossenkop
FAA - Northwest Mt. Region
1601 Lind Ave. S.W.
Renton, WA 98055

ANM-610

Comments on the Draft Supplemental EIS

This Supplement was issued because in the original EIS the predictions for number of passengers and number of operations were too low. When the Port opted to use the new figures suggested by the FAA, the Port used the lower range of figures rather than the higher range originally favored by the FAA. With this choice, the argument can be made that all data in this Supplement could lead to unrealistic impacts. Shouldn't the Supplement have included impacts from the WORST CASE SCENARIO. i.e. the highest FAA predicted number of passengers and operations? But the Draft SEIS has chosen to use lower figures to development this Supplement and, therefore, the commentor questions whether this document is any more credible or factual than its predecessor.

The Draft SEIS has been difficult for most affected parties to obtain and review during the limited time allowed. Will you extend the comment period?

Will you send the "Wetlands Mitigation Plan" and the "Miller Creek Relocation Plan"to the libraries so we can review them locally rather than travel to the airport or waterfront? And give us a longer comment period for these two documents?

One very basic flaw in the EIS is the explanation of the effects of the Do-Nothing alternative. The Do-Nothing alternative will automatically trigger a DO-SOMETHING process at other airports in the state. A Do-Nothing will result in opening up Paine Field to more commercial traffic, will open Bellingham Airport to more jets, and agricultural products will be cargoed from Moses Lake rather than trucked over the Cascades and loaded at Sea Tac Airport. More freighters will leave from Boeing Field and Alaska Airlines will increase its flights out of Vancouver, B.C. These are Do-Nothing forecasts which should be included in the Draft SEIS.

The Draft SEIS uses such words as "additional analysis" and "possible changes" much too often. This is the third try at writing this EIS and specifics should be included so the reviewer can make definitive comments. With the vague wording, we don't know if changes will be made after the Final Supplement is published. This third rewrite includes 4 alternatives. Shouldn't it be down to one final choice, rather than have the public on a continual merry-go-round of 4 different scenarios?

G-23

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Page 2 - Comments on the Draft Supplemental EIS

I sent comments on the first Draft EIS for the Master Plan Update and Third Runway, and I was meticulous in organizing and referencing each page. When the Final EIS was published, it was difficult or impossible to find answers to my comments. So this time you will note that my review of the Supplement is divided into subject matter rather than page number. Will this be easier for you to provide the needed answers?

Submitted by:
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24828 9th Pl. S.
Des Moines, WA 98198

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Page 3 - Draft Supplemental EIS

ROADS

The Draft SEIS should mention how many trucks come daily to Sea Tac Airport over the Cascades hauling goods which will be loaded on planes. In 2010 and 2020 with the third runway in, what will be the increase in the number of trucks? Wouldn't the use of airports in Eastern Washington for agricultural cargo and other save our roads and bridges?

The Draft SEIS should mention the percentage of passengers who stay overnight at airport hotels to assure connecting with a flight. What percentage now and what percentage in the years 2010 and 2020? As peak hour traffic numbers will increase, so will frustration with travel from afar to Sea Tac increase. Wouldn't the use of other airports in the state ease this frustration and congestion?

G-24 - 1

The Draft SEIS needs to include this information - for each new flight added (especially a large 747) what will be the increase in the number of cars traveling to the airport. This would be another way to show the environmental impact of a third runway. For each newly added air freighter, what will be the increase in the number of trucks traveling to the airport? How much more congestion will occur in 2010 and 2020?

The Draft SEIS says fewer vehicles will access the airport (113,300) with a third runway than without (114,000). How do you figure this?

On page 5-4-8 in the Draft SEIS, 1-405 is mentioned as a haul route. A Seattle Times article mentions that in the future during peak hours of traffic, cars will be slowed to 26 mph. What do you propose to do with this new information?

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Page 4 - Draft Supplemental EIS

AIR

The subject of Air is divided between the two different volumes of the Draft SEIS making it more difficult for the reviewer to comment.

Again, the Do-Nothing alternative negatively affects the environment more than the other alternatives. But "Do-Nothing/Do-Something" at other airports will be a realistic mitigation effort because this alternative will induce the airlines to take jet operations (and passengers) to another part of the state.

The Draft SEIS should mention the nearest location of a permanent monitor for particulates. Is the answer - Kent? (See attached)

(OZONE) The Draft SEIS should mention the lack of permanent monitors for nitrogen oxides near the airport. Is the nearest monitor for nitrogen oxides on Beacon Hill? (See attached)

The Draft SEIS should mention the lack of a permanent monitor near the airport for lead. Is the nearest monitor on Harbor Island? (See attached)

The Draft SEIS should mention the lack of a monitor near the airport for sulfur dioxide. Is the nearest monitor for sulfur dioxide on Marginal Way? (See attached)

The Port and FAA should recognize the lack of permanent monitors for the criteria pollutants. A few days of testing certainly can not gauge the long term health effects upon those who live around the airport day after day and year after year. And data put into a model program certainly is not as dependable as day in and day out monitoring. The community requests SeaTac Airport provide permanent monitoring stations so the surrounding communities can determine if the ambient air is hazardous to health.

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Page 5 - Draft Supplemental EIS

DIRT

The Draft SEIS still does not have the sources of dirt identified. This is a site specific EIS and the third try at it and by now the sources and haul routes should be published. When the excavation areas and haul routes are FINALLY decided on, will the affected parties have a chance to challenge and comment on the choices?

Has it been ascertained that some of the on-site excavations harbor contaminated soil? Will this soil be used on the project?

High amounts of dirt will be mined in the area south of 200th towards 216th. How close is this area to the Des Moines Business Park? How close is this area to Des Moines Creek? Will there be a hold-up on the Business Park? And what is the state law concerning how close excavations can occur to a salmon bearing creek?

The Draft SEIS still does not clarify if dirt hauling will occur during peak hours of traffic, or if mining will occur during night hours. Only with more specific information can the impact of such activities be assessed.

Des Moines Memorial Drive is of historical significance and is a memorial to war veterans. The Draft SEIS should mention this. Certainly this road should be exempt from 5 years of double trucks hauling dirt.

This is a local, narrow, protected road and Port activities such as this hauling will increase air pollution, noise pollution, access ability and generally enormously impact a road never built for such use. Massive dirt hauling should be limited to highways and freeways.

What does the term "social impacts" from truck hauling mean?

With five years of truck hauling, has the Draft SEIS considered the increase in car and truck engine emissions while idling in slowing heavy traffic?

Has the Port in this Draft SEIS adjusted for the needed volume of dirt in case there is settling?

The Draft SEIS states I-5 south of I-405 interchange can carry extra traffic. Those who commute on this road disagree, even with another lane opened, traffic will be terrible.

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Page 6 - Draft Supplemental EIS

NOISE

The subject of noise is included in Volume 1 and Volume 2 5-3 and C-3 respectively. Why break up the subject of noise into 2 parts in 2 separate volumes when published as one document. Such action of splitting the subject makes it more difficult for the reviewer to comment and shows a lack of organization of subject matter.

The Draft SEIS states "11% more people will be affected by noise" from the third runway. Does this represent number of households or number of persons? Does the 11% reside in the 70 or 65 or 60 decibel area?

Do the Draft SEIS noise estimates start with a base of the year 1994? If so, the Supplement should be updated and 1996 used as the base year. This Supplement should show an INCREASE in noise in the year 1996 because the number of stage 2 aircraft operating at Sea Tac Airport went up each quarter of that year. Predictions of noise levels in the last Final EIS are, therefore, wrong. (Stage 3 operations also increased.) There is absolutely no way the figures can be manipulated to show a decrease in noise in 1996.

The Noise Expert Panel ruled that the Port's plans to lower jet noise are not realistic. So it follows that many of the Draft SEIS statements about noise levels are also unrealistic.

Referring to the Expert Panel's decisions, what recommendations mandated by PSRC have thus far been carried out by the Port? What is the timetable for abiding by all PSRC recommendations?

Does the Draft SEIS state that the Noise Remedy Boundaries (noise contours) are based solely on a 1985 study of projected 2000 noise? Does the Draft SEIS (or the Final EIS) state that these projected boundaries are on the official Port map from which is determined just who and who does not own a home eligible for insulation? Also, was the buy-out program based on this same map? With the new buy-out program, will a map be produced showing projected noise from airport activities? If so, the projections since 1985 have been wrong, so when drawing the new map, care should be taken not to make the same mistakes. All residents living in the area of 65 decibels and up should have the choice of moving.

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Page 7 - Draft Supplemental EIS

NOISE - continued

Port maps indicate churches and nursing home which are sensitive to noise and are in the study area. What is the timetable for insulating them?

Noise impacted mobile homes should be mentioned in the Draft SEIS and the timetable for removing them as noise and air pollution increase at the south end of the airport, and especially the added impacts when the eastern runway is extended.

Where in the Draft SEIS is the information concerning the added impacts due to the extension of the eastern runway, impacts such as a wider noise contour and a wider air pollution contour?

Will the SEIS discuss the use of concrete noise barriers. They have been effective in controlling freeway noise and also could be effective in muffling on-the-ground noise.

In the years between 1996 and 2020 does the Draft SEIS note any changes in noise patterns and intensity over North Sea Tac Park.

On page 5-3-5 you state, "the noise exposure pattern of each future alternative would be between 42% and 46% smaller than the noise exposure pattern of the existing condition". Is this a misprint? Please explain more fully.

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Page 8 - Draft Supplemental EIS

SASA

The SASA Final EIS was completed in 1993. Did this document include the impacts of relocation of cargo facilities to SASA? Was SASA planned for maintenance? Will the SASA EIS be resubmitted to the public for comment?

How will jets connect from the runways to SASA? There is now a valley in between.

Has the wetland permitting process started for SASA? Has the Corps of Engineers been notified of how many wetlands will be impacted by SASA?

How much will the noise boundaries and air pollution boundries grow when SASA is in full use? Will you include this information in the Final SEIS; that is the total impact to the environment with maintenance and cargo facilities.

Will there be jet refueling of cargo at SASA? By underground or above ground tanks? The Final SEIS should include the information that fuel spills and tank leaks will be increased with the location of cargo at SASA, is that not so?

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Page 9 - Draft Supplemental EIS

WETLANDS

Removing a wetland outside its natural water basin CAN NOT be mitigated. Removal means death. How can one compensate (or mitigate) for a loss of life? There is no "in kind" replacement of a loss of life. Will you use the words "start over" instead of the word "mitigate"?

Where and when in the State of Washington have wetlands been removed and mitigated by starting new man-made wetlands in a water shed miles away?

The Draft SEIS says 712 acres of land will be disturbed by the removal of vegetation, 3,700 feet of Miller Creek will be relocated and 2,400 feet of Des Moines Creek. What environmental agency has given the Port and the FAA permission to allow such a MASSIVE upheaval to our ecosystem? Will you send all the newly uncovered facts about vast environmental damage to each member of PSRC?

The RSA project was in the Master Plan Update (not approved yet) but the Port has gone ahead with the RSA. How many wetlands were covered with dirt?

The Draft SEIS rates our wetlands:

1. Low - in flood control
2. Low - on stormwater run-off storage
3. Low - on ground water recharge

Such ratings indicate that our wetlands are extra sensitive and should, therefore, have extra protection from activities which will degrade them. Who was the consultant that rated our wetlands "low"? How often did the consultant view the wetland area, that is how many times during each season? I have never read such a description of our wetlands. Has new information been uncovered? Who uncovered this revelation?

Please provide more information about the Draft SEIS statement that our wetlands do not provide "high function" and that they "function separately"?

Our wetlands should have had increasingly BETTER function these past few years because about 150 homes have been removed just north of 216th. Doesn't a decrease in impervious surface and a decrease in residences result in less fragmentation, higher function, better retention of floodwater, and better filtration of ground water to the acquifer below? The Draft SEIS should be rewritten and a new evaluation be provided of our wetlands.

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Page 10 - Draft Supplemental EIS

WETLANDS - continued

There IS room for wetlands to be replaced in their own basin. Just south of Tyee Golf Course across 200th there is land for wetlands creation. Instead of mining dirt from that area, the site should be enriched with wetlands creation.

Our wetlands feed and filter water to the acquifer. I request the SEIS mention this important fact. Water is a precious resource, every bit as precious as another runway at Sea Tac. Removal of wetlands will have a LASTING effect on our water supply, will forever change water patterns and forever change recharge patterns

The North Employee Parking Lot Project will impact how much wetlands area? Instead of on the east of 24th, the parking lot should be built across the street where wetlands will not be impacted. The land is vacant and the environmental impact will be lessened by paving this area over.

The Draft SEIS states the wetlands should be removed because the FAA indicates a need to remove wildlife attractions. The FAA will not enforce this regulation (it never has been signed by the FAA). Many, many airports are deliberately built by bodies of water in order to relieve residential areas of noise. On one hand the Draft SEIS states a need to remove wildlife attractions and on the other hand deliberately CREATES wildlife attractions in the form of retention ponds and uncontrolled flooding. As part of the latest project - the RSA - retention ponds have been built right at the end of the runway in order to catch water sheeting off the end of the runway. Mallards and gulls are attracted. If you, the Port, really think birds are a hazard, don't scare us with stories of Canada geese. Just fix Sea Tac's flooding problems. Then Canada geese will not find the area attractive.

Netting of ponds and other bodies of water has been suggested. Tyee and Reba detention ponds which are man made by the Port have never been netted, have they?

To take the place of wetlands destruction,the Draft SEIS suggests "stormwater management facilities". The community is very leery of the Port's handling of our environment. Please elucidate on your ideas.

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Page 11 - Draft Supplemental EIS

BIRDS

Describe the study area. The area should be extended to the east of the runways as well as to the west and north and south because birds' habitats can range far and wide.

Birds fly outside the study area to forage for food, and to perch, and birds fly through the study area, do they not?

The study area seems to concentrate on the west of the runways. Actually, the eagles' nest along the shore of Angle Lake is across the street and not much further from the planned SASA base. Bald eagles are a threatened species, and as long as the pair is seen together and have a nest, baby eagles can be expected. The Draft SEIS seems to brush off the near-by eagles nest as of little importance. I request you change your description of these eagles nesting so close to SASA and other airport activities. These eagles fly to the Sound to forage and will be disturbed by a great increase in air traffic. This is a confirmed existence of a threatened species. Such a confirmation definitely calls for further assessment into impacts from airport growth.

Also sighted (I live to the south of the airport) are pileated woodpeckers, a threatened species. Owls and hawks frequently appear. How about mentioning the wren. the grosbeak, Oregon towee, varied thrush, junco. etc.

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Page 12 - Draft Supplemental EIS

SCHOOLS

Does the Draft SEIS mention impacts to the 7th Day Adventist school on Des Moines Memorial Drive around 144th?

Does the Draft SEIS mention the great impacts to Casey Treat's School k - 12 and college which are located near borrow sites and truck hauling routes?

The Port has offered $50 million of FAA funds to the Highline School District to help with the jet noise from 2 runways. But the District estimates a need for twice that amount. Will the Port provide some of its own revenue to support a better education environment for our children?

Why is the Port hesitant to offer FAA funding for air conditioning in our schools? Airports in other cities consider school air conditioning necessary.

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Page 13 - Draft Supplemental EIS

Miscellaneous

In the Draft SEIS is the third runway still described as a "bad weather"runway? And do you still state that 44% of the time only one stream of traffic is allowed with the 2 runways as they are now placed? During the "44% of the time" how many times does the number of arrivals demand 2 streams of traffic? This is an important fact for you to state in the SEIS because the public is mislead into believing that 44% of the time 2 streams of traffic are narrowed down to 1 stream because of bad weather. In truth, only a small percentage of the "44% of the time" are arrivals held up, is that not correct?

In the Draft SEIS many more jet operations are predicted than first planned for. An increase in flights means more fuel consumption. Where will the added fuel storage be located and will it be above ground or underground tanks?

On page 5-4-46 the terms "possible retaining wall concept" and "redevelopment concept sections" are used. This is a site specific EIS and has so far been written three times. By now the public and agencies should have definitive information about walls. When the Port finally accepts an engineering design and when the Port estimates the costs, will the affected parties then be able to challenge and comment on the site specifics?

5-2-11 I protest the wording the proposed "improvements". To the impacted parties, the do-nothing alternative is the only one that is acceptable. NONE of the proposals are "improvements".

5-4-5 The word "may" in reference to rehabilitation of roads should be changed to "will". By the third try at an EIS, there should be a "will" or "will not". not a "may".

5-1-6 Was the Final EIS off (in error) 5 to 10 years?

Where in the Draft SEIS are the needed fuel distribution improvements described? Old fuel lines are leaking into the ground water and that is certainly a negative environmental impact.

Where in the Draft SEIS is a discussion about ways to handle the toxic de-icing materials. Presently the glycols and urea are dumped into the creeks and the Sound.

C-29-1

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Page 14 - Draft Supplemental EIS

Miscellaneous - continued

The Draft SEIS should include more information about community mitigation. The Draft SEIS raves about how soon the third runway will "pay for itself". The REAL costs will be to the environment and the airport communities. I attended several HOK meetings and listened to consultants and read materal and charts, all of which put the REAL costs up into the billions of dollars. The Draft SEIS should devote some pages to how much of its own revenue the Port will make available to pay for these staggering REAL costs.

With "demand management" the cost of adding on to the eastern runway to accommodate few flights to Asia can be mitigated by scheduling flights in the cool of the summer evenings. The Draft SEIS must do an analysis of how many years it will take if the east runway is lengthened "to pay for itself".

The airspace conflict between Boeing Field and Sea Tac Airport was never fully explained in the Final EIS. This conflict will cause delays and therefore have an environmental impact on the community. Also, an on-the-ground study of the relationship between a third runway and accidents was briefly mentioned in the Final EIS, but no study of the increase in accidents in the air with another 100,000 flights added to the Boeing Field/Sea Tac air space was mentioned.

It is unclear why in the Draft SEIS plans were canceled for CTI to be located at Des Moines Business Park. (The Draft SEIS calls the area Des Moines Technology Center which is wrong). Attached is a map showing the area to be excavated at site #1. The map indicates the Des Moines Business Park will be mined. Is this true? The Draft SEIS should point out that impacts from mining dirt are not confined to the immediate site, but will possibly extend to a much wider area and affect creeks, wildlife, water retention, the aquifer, etc.

The maps in Volume 2 should indicate location of runways.

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EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
DATA LISTING REPORT
WASHINGTON PM10 MONITOR SITES

COUNTY NAME	CITY NAME	SITE ID	POC	STREET ADDRESS	MONITOR TYPE	DATE SAMPL BEGAN
ASOTIN CO	CLARKSTON	530030004	1	CLARKSTON STP/13TH ST AND PORT WAY	SLAMS	19930618
BENTON CO	KENNEWICK	530050002	1	KENNEWICK VSC/5929 W METALINE	SLAMS	19941001
CHELAN CO	WENATCHEE	530070005	1	SEXTON BLDG/1300 5TH ST	SLAMS	19881006
CLALLAM CO	PORT ANGELES	530090008	1	CITY LIGHT BLDG/FRONT & CHERRY	SLAMS	19890609
CLARK CO	VANCOUVER	530110013	1	MOOSE/8205 E 4TH PLAIN BLVD	OTHER	19900306
CLARK CO	VANCOUVER	530110015	1	WA ELEM SCHOOL/2908 S ST	OTHER	19911126
COWLITZ CO	LONGVIEW	530150006	2	CITY SHOPS/254 OREGON WY	SLAMS	19880801
KING CO	BELLEVUE	530330004	2	WEST & WHEELER BLDG/504 BELLEVUE WY	NAMS	19880714
KING CO	KENT	530332004	2	JAMES & CENTRAL/JAMES ST & CENTRAL AVE	NAMS	19880401
KING CO	LAKE FOREST PARK	530330086	1	LK FOREST PK/17711 BALLINGER WAY NE	SLAMS	19890602
KING CO	SEATTLE	530330057	3	DUWAMISH PUMP STA/4752 E MARGINAL WY S	NAMS	19880401
KING CO	SEATTLE	530330066	2	HARBOR ISLAND/3400 13TH AVE SW	NAMS	19880401
KING CO	SEATTLE	530330068	3	SOUTH PARK/723 S CONCORD	NAMS	19880401
KITSAP CO		530351005	1	725 BLACKBIRD DR. N.E., MEADOWDALE	OTHER	19911126
KITSAP CO	POULSBO	530351006	1	POULSBO LIONS PARK/6TH AVE NE	SLAMS	19930829
PIERCE CO	PUYALLUP	530531018	1	SOUTH HILL/9616 128TH ST E	OTHER	19911207
PIERCE CO	TACOMA	530530021	2	NE TACOMA/27TH ST & 54TH AVE NE	NAMS	19880401
PIERCE CO	TACOMA	530530031	2	ALEXANDER AVE/2301 ALEXANDER AVE	SLAMS	19880401
PIERCE CO	TACOMA	530531004	3	FIRE STATION #12/2316 E 11TH ST	NAMS	19880401
SNOHOMISH CO	EVERETT	530610016	1	HOYT/HOYT AVE & 26TH ST	SLAMS	19891030
SNOHOMISH CO	LYNNWOOD	530610018	1	LYNNWOOD/20935 59TH WEST	SLAMS	19941014
SNOHOMISH CO	MARYSVILLE	530611007	1	JR HIGH SCHOOL/1605 7TH ST	OTHER	19910927
SPOKANE CO		530632002	1	CITY HALL/E 9103 FREDERICK, MILLWOOD	SLAMS	19880701
SPOKANE CO	CHENEY	530630001	1	TURNBULL SLOUGH NATIONAL WILDLIFE REFUGE	OTHER	19920101
SPOKANE CO	SPOKANE	530630016	3	CROWN ZELLERBACH/E 3530 FERRY	NAMS	19880714
SPOKANE CO	SPOKANE	530630016	4	CROWN ZELLERBACH/E 3530 FERRY	SLAMS	19880719
SPOKANE CO	SPOKANE	530630036	2	AUTO GLASS/S 214 POST	NAMS	19880714
SPOKANE CO	SPOKANE	530631017	1	ROCKWOOD/N 9005 COUNTRY HOMES BLVD	SLAMS	19941110
THURSTON CO	LACEY	530670013	2	MT VIEW ELEM/1900 COLLEGE ST SE	SLAMS	19880801
WALLA WALLA CO		530711001	2	MEDROW FARM/WALLULA JUNCTION	SLAMS	19880714
WALLA WALLA CO	WALLA WALLA	530710005	1	FIRE STATION/200 S 12TH	OTHER	19890501
WHATCOM CO	BELLINGHAM	530730007	1	BELLINGHAM SCH DIST/305 IOWA ST	OTHER	19920502
YAKIMA CO	SUNNYSIDE	530770003	1	SUNNYSIDE SCHOOL/16TH ST & FACTORY RD	SLAMS	19911001
YAKIMA CO	YAKIMA	530770008	2	YAK VALLEY JR COLL/KNOB HILL & 16TH AVE	SLAMS	19880719
YAKIMA CO	YAKIMA	530770011	1	GARFIELD SCHOOL/612 N 6TH AVE	OTHER	19890901

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EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
DATA LISTING REPORT
WASHINGTON NO2 MONITOR SITES

COUNTY NAME	CITY NAME	SITE ID	POC	STREET ADDRESS	MONITOR TYPE	DATE SAMPL BEGAN
KING CO	SEATTLE	530330080	1	BEACON HILL RESERVOIR/CHARLESTON & 15TH	NAMS	19790604

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EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSYEM
DATA LISTING REPORT
WASHINGTON OZONE MONITOR SITES

COUNTY NAME	CITY NAME	SITE ID	POC	STREET ADDRESS	MONITOR TYPE	DATE SAMPL BEGAN
CLALLAM CO		530090012	1	OLYMPIC NATIONAL PARK	NON-EPA FE	19821101
CLARK CO	VANCOUVER	530110011	1	MT VIEW SCHOOL/1500 SE BLAIRMOUNT DR	SLAMS	19880501
KING CO	BELLEVUE	530330010	1	LAKE SAMMAMISH STATE PARK/20050 SE 56TH	NAMS	19751201
KING CO	ENUMCLAW	530337001	1	WEYERHAEUSER MILL/MAIN OFFICE BLDG	OTHER	19850801
PIERCE CO		530531010	1	MOUNT RAINIER NP, TAHOMA WOODS ADMIN	NON-EPA FE	19921101
PIERCE CO	TACOMA	530531008	1	PACK FOREST/.6 MI N OF LAGRANDE ON HWY 7	SLAMS	19850530
SKAGIT CO		530570013	1	728 RANGER STATION RD	NON-EPA FE	19960228
SNOHOMISH CO		530612001	1	GETCHELL/8426 99TH AVE NE, ARLINGTON	SLAMS	19790101
SPOKANE CO		530630046	1	E 9814 GREENBLUFF RD, GREENBLUFF	OTHER	19900401
WHATCOM CO		530730005	1	FCC SITE/1330 LOOMIS TRAIL RD, CUSTER	OTHER	19890413

0° '96

EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
DATA LISTING REPORT
WASHINGTON SO2 MONITOR SITES

COUNTY NAME	CITY NAME	SITE ID	POC	STREET ADDRESS	MONITOR TYPE	DATE SAMPL BEGAN
CLALLAM CO		530090012	1	OLYMPIC NATIONAL PARK	NON-EPA FE	19821101
CLALLAM CO	PORT ANGELES	530090010	1	3RD & CHESTNUT/250 CHESTNUT ST	SLAMS	19800101
KING CO	SEATTLE	530330057	2	DUWAMISH PUMP STA/4752 E MARGINAL WY S	NAMS	19710818
PIERCE CO	TACOMA	530530021	1	NE TACOMA/27TH ST & 54TH AVE NE	NAMS	19850618
PIERCE CO	TACOMA	530530031	1	ALEXANDER AVE/2301 ALEXANDER AVE	NAMS	19870210
SKAGIT CO		530570012	1	TEXACO S/1224 BARTHOLOMEW AVE, ANACORTES	SLAMS	19890720
SKAGIT CO		530571003	1	MARCH PT-KIESSER/ROUTE 2 - BOX 710	SLAMS	19710101
SNOHOMISH CO	EVERETT	530610016	1	HOYT/HOYT AVE & 26TH ST	SLAMS	19891101
WHATCOM CO	BELLINGHAM	530730011	1	CHESTNUT ST/CENTRAL & CHESTNUT ST	SLAMS	19830101

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9/20/96

EPA AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
DATA LISTING REPORT
WASHINGTON LEAD MONITOR SITES

COUNTY NAME	CITY NAME	SITE ID	POC	STREET ADDRESS	MONITOR TYPE	DATE SAMPL BEGAN
KING CO	SEATTLE	530330065	1	HARBOR ISLAND TEXACO/2555 13TH AVE SW	SLAMS	19830101

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Note: Not all streams in the SASA area and Borrow Source Areas as shown in the boundaries on this Exhibit would be effected by Master Plan development. For example, Des Moines Creek Tributary 0379 in the SASA area and Des Moines Creek (0377) in the Borrow Source Area 1 are not expected to be directly effected, or require relocation. The narrative in Section IV.16 describes the anticipated stream impacts, including relocation, from Master Plan development.

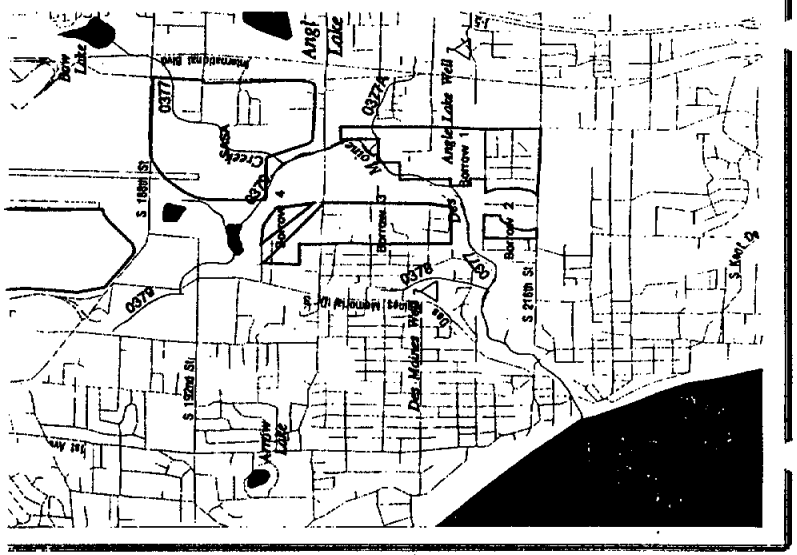
Source: Gambrell Urban, Inc. and Shapiro & Associates, 1995
King County Basin Reconnaissance Reports, 1987
King County Sensitive Areas Map Folio, 1990

Scale 1" = 2,500'

0 2500 5000
SCALE IN FEET

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

April 14, 1998



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Mr. Dennis Ossenkop
Federal Aviation Adm.
N.W.-Mt. Region
1601 Lind Ave. S.W.
Renton, Wa. 98055

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 14 1997
ANM-610

Re: Comments on Supplemental
Environmental Impact Statement

Dear Sir:

On February 26, 1992, on a foggy day, jets were taking off before the fog had completly lifted, and exhaust from ground traffic intermingled with the jet fumes. As I sat opposite the fireplace for two hours, I became sickened from fumes and had to move about. No fire, damper closed, and glass screen closed, but fumes were very present.

Since this pollution occurred five years ago, and flights from the airport and ground traffic gets ever worse, how can we possibly live in such circumstances? To live with annual flights reaching 474,000 in 2010 is despicably showing disdain to human beings who were not made for such unhealthy surroundings.

The noxious and sickening and caustic fumes attack the tender and growing mucous membranes of the noses and throats of our students in the schools under the flightlines and around the perimeter of the airport. We have children hurting from asthma, nosebleeds, allergies, and other respiratory ailments.

The Port commissioners didn't show for the Public Hearing on March 4, probably because they couldn't stand to see the anxious faces of the givers of the oral testimony and then go home with a guilty conscience.

In tests by the Department of Ecology concluded in February, 1997, Burien had the highest carbon monoxide levels in southwest King County at 1st South and 148th, nine blocks from my residence. Normandy Park residents recently complained of "lungfuls of jet fuel" and a spokesperson for the DOE said "it is not uncommon to have air pollution during periods of calm, clear weather". So whether its foggy or poor weather or calm and clear we can be sure to have pollution.

Sea-Tac Airport is located in a narrow wedge of land between Lake Washington and Puget Sound. This necessitates a predominately north-south or vice-versa, configuration of thoroughfares. In all, there are eight freeways, highways, boulevards, ways, and avenues going through our suburb cities with ever-increasing traffic. In the middle of this mix, are the two runways of the airport and to add another would be making for an over-polluted situation in such a narrow corridor.

G-33

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When jets ascend, our houses crack and creak from the parted airways as they carry the sound and fumes in all directions. Cracks are widened and nails loosened from every flight, and fifty or more years of such assaults makes one wonder what it would be like with a third runway added. We wouldn't allow a next door neighbor to batter our houses.

The dust that would arise from every dumping of the dirt for the runway would intermingle with the parted air that the jets send forth, causing a catastrophe for the schools, houses, and apartments in such close proximity, adding to breathing hazards

We are being penalized and discriminated against in this narrow corridor of land, while the other counties hold themselves as though their citizens are sacroscant. Perhaps an airstrip on a peninsula across the Sound could handle cargo planes and the cargo barged the few miles to this side. When one lives on waterways, they should be utilized to lessen the pollution.

If a reading of 7.2% per million collected from a utility pole, in outside air, you can see why I was about to be nauseated inside my house. Carbon monoxide is poisonous and breathing air containing as little as 0.5% in an enclosure such as a house, garage, hangar, or offices and schools, with no ventilation, can cause death.

Thank you for allowing us to make known our fears for the future of our cities,and the already over-burdened citizens.

Marie Feckley
Burien

mhf

23

1820 S.W. Shorecrest Lane
Seattle WA 98146
March 12, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave. S.W.
Renton WA 98033-4056

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 18 1997
ANM-610

Dear Mr. Ossenkop:

I am writing to you concerning my dismay with the Port of Seattle's ill-advised plan to construct a third runway at Seatac. Now, after reading the S.E.I.S., I am even more convinced that after devastation of the area being impacted, still no intelligent consideration has been given to many terrain features. Fragile Des Moines and Miller Creek with their wetlands and drainage basins, inadequately treated polluted runway runoff, and no concerned plan for protection of priceless aquifers far beneath ground surface are but 3 obvious oversights. Construction of a regional airport ought to be sited to improve general and overall regional conditions without totally blighting already badly abused towns and neighborhoods.

Sincerely,

Loretta M. Bowers

cc: K.C.A.A.
19900 4th Ave. S.W.
Normandy Park WA 98166

306 East Clark St. #101
Champaign, IL 61820

24

March 11, 1997

Federal Aviation Administration
Airports District Office
1601 Lind Avenue, SW
Renton, Washington 98055

ANM-C[illegible]

Dear Mr. Dennis Ossenkop:

I would like to review the Supplemental Draft Environmental Impact Statement for the Seattle-Tacoma International Airport. However, I have no access to the copies made available to the public since my residence is in Illinois. Please send me a copy of this document to the address above, so that I may be able to review it prior to the March 31st comment deadline. Thank you very much.

Sincerely,

Cecelia Youngblood cyoungbl@uiuc.edu
Cecelia Youngblood

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REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 18 1997
ANM-610_

March 13, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
1601 Lind Avenue S.W.
Renton, Wa 98055-4056

Re: Sea-Tac Airport SEPA Comment Period
Lack of Revenue For Sea-Tac Expansion

Dear Mr. Ossenkop
Generally I have commented on the proposed third runway expansion based on the Port of Seattles' own data. However I recently picked up the attached news clipping from the Orlando, Fla, Sentinel. You will note that the airfares between Orlando and Seattle are the highest of any airfares in the nation. You will also note that the airfares to Vancouver B.C. are $123 below the rates to Seattle USING THE SAME AIRLINES.

If the Port of Seattle cannot compete in the market today, how can the Port compete with the additional burden of a $3 to $6 Billion dollar cargo runway to pay off from revenues.

Airline economics are very tight. If by some fluke the third runway is actually started, the FAA and local governments will probably finish the runway as the biggest Park-N-Ride in the State.

Using data furnished in the Deloitte and Touche Audit which was prepared for the Port of Seattle. The Port does not have the income nor the fiscal credibility to take on the total cost of the proposed runway. The Port already requires a $34.4 million welfare check annually from the King County property tax funds just to stay in operation. The Port has blamed planning errors as the excuse for the latest five year delay in construction. This is only a deadbeats "I'm waiting for my ship to come in" excuse.

The Port does not have the $3.5 to $6 billion required to build the runway. The 9.4 million PAYING passengers using Sea-Tac produce only $28 million in passenger fees each year. This is barely sufficient to operate the existing antiquated airport.

The airlines are not going to shoulder the expense. Many major international flights to the Orient have already moved to the Vancouver B.C. airport. Horizon is considering commuter operations from Paine Field in Everett. Where is the money for this high risk fat cat scheme coming from? Uncle Sugar?

Dan Caldwell
19547 Second Ave. S.
Des Moines, Wa 98148
Member of CASE

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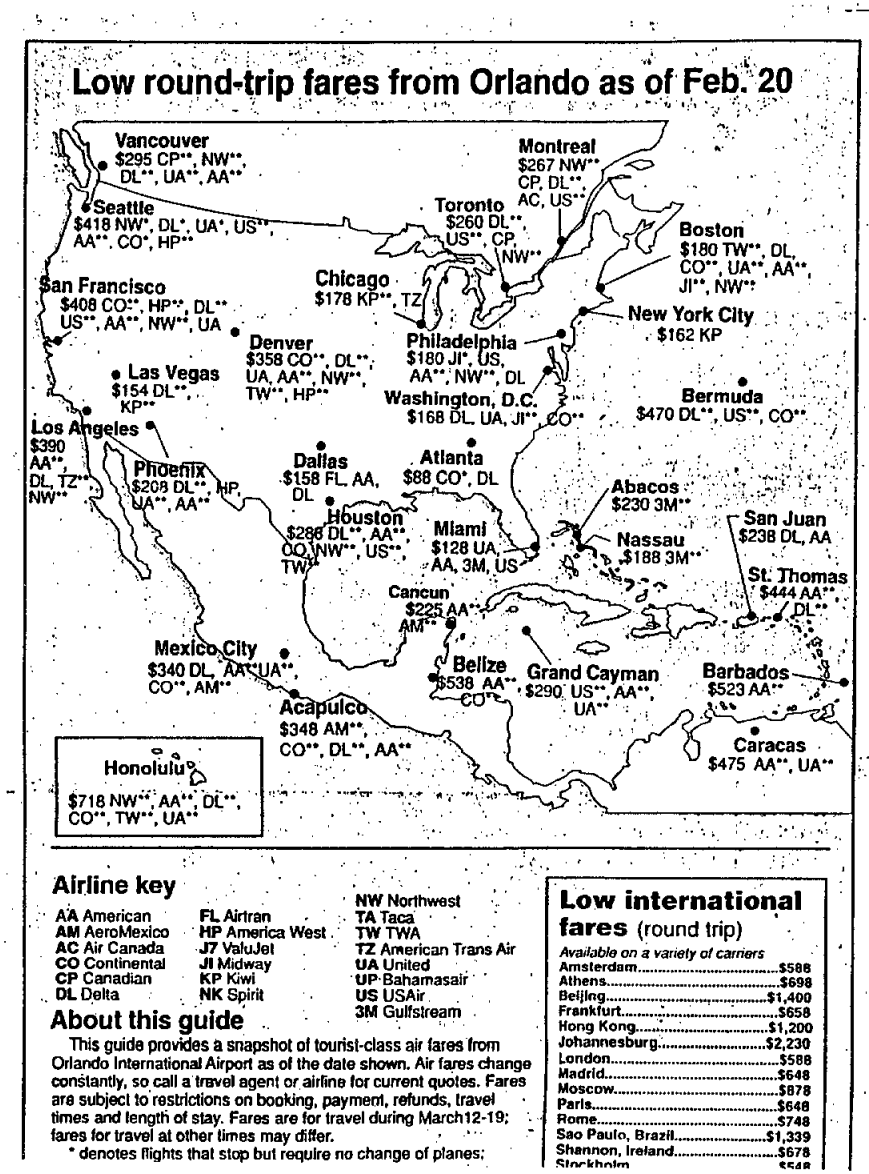

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1820 S.W. Shoreview Lane
Burien, Wa. 98146
March 8, 1997

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 18 1991
ANM-610

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave. SW
Renton, Wa. 98033-4056

Subject: Draft Supplemental Environmental Impact Statement (draft SEIS).

Dear Mr. Ossenkop

I am writing to protest the very short time allowed between the issuance of the draft SEIS and its public review and comment period. Copies arrived at the local libraries nearly one month late, to the obvious detriment of the review groups. Mr. Ossenkop, please exert your influence to increase the inadequate review period to at least 90 days.

Also, the $120.00 cost of the document is far too high and should be substantially reduced.

Yours very truly
George W. Bowers

cc:
RCAA
19900 4th Ave SW
Normandy Park, Wa. 98166

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ADAM SMITH
9TH DISTRICT, WASHINGTON
MEMBER-ELECT

REC'D ANM-610
PLAN, PGM, & CAP
FEB 07 1997
ANM-610

Congress of the United States
House of Representatives
Washington, DC 20515

February 3, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Regional Headquarters
1601 Lind SW
Renton, WA 98055

Dear Mr. Ossenkop;

As you are well aware, it has been determined that the potential environmental impacts caused by the construction of a third runway at SeaTac Airport have increased to the point where a reevaluation has become necessary. I appreciate your diligence in studying the potential noise and air quality problems in this area.

It is my understanding that there will be a 45 day comment period to give people an opportunity to review and comment on the findings outlined in the supplemental Environment Statement. It is my hope that it will be possible to extend this comment period to 90 days. When dealing with such a tremendously large project, I feel we should give every opportunity to hear from those who will be affected by these findings.

Thank you very much for your consideration.

Sincerely,

Adam Smith

Adam Smith
U.S. Representative
Ninth Congressional District

cc: RCAA
ACC

PRINTED ON RECYCLED PAPER

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RECD ANM-610
PLAN, PGM, & CAP BR
FEB 24 1997
ANM-610

CUTLER & STANFIELD, L.L.P.
700 FOURTEENTH STREET, N.W.
WASHINGTON, D.C. 20005-2014
TELEPHONE: (202) 624-8400
FACSIMILE: (202) 624-8410

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JEFFREY L. STANFIELD
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BARRY CONATY
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PAIGE E. REFFE
BYRON KEITH HUFFMAN, JR.
SARAH M. ROCKWELL*
KATHERINE B. ANDRUS
MARC R. BRUNER
FRANÇOISE M. CARRIER
CHRISTOPHER M. KAMPER*
WILLIAM G. MALLEY
DANA C. NIFOSI
BARBARA PALEY
W. ERIC PILSK
TIM A. POHLE
JOHN E. PUTNAM
THOMAS D. ROTH
*NOT ADMITTED IN DC

1676 BROADWAY
DENVER, COLORADO 80202
TELEPHONE: (303) 825-7000
FAX: (303) 825-7005

CONFIRMATION OF FAX

February 18, 1997

VIA FACSIMILE TRANSMISSION; ORIGINAL BY FIRST CLASS MAIL

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
Airports Division
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Re: Extension of Comment Period on the Draft Supplemental Environmental Impact Statement and Updated Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport

Dear Mr. Ossenkop:

On behalf of our clients, the cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila, Washington and the Highline School District, individually and collectively as the Airport Communities Coalition ("ACC"), we request that the FAA extend the period for public and agency comment on the Draft Supplemental Environmental Impact Statement ("DSEIS") for Seattle-Tacoma International Airport. Given the immense scale of the proposal and the complexity of analyzing its potential environmental impacts, the deadline of March 31, 1997 provides insufficient time to conduct a thorough and independent review and prepare comprehensive comments. Our experience with the previous environmental documentation for this project underscores the need for careful and searching review. Although we appreciate the fact that the FAA and its consultants have provided a huge volume of data in support of the DSEIS, we cannot uncritically accept either the accuracy of this data or the validity of the conclusions drawn from it.

While the FAA may have disagreed with some of our comments submitted on the original EIS, I am sure you will agree that they were substantive, thoughtful and supported by the

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views of highly qualified experts. Such comments are, of course, precisely what the environmental review process under NEPA calls for. Indeed, it is clear from some of the changes reflected in the DSEIS that our comments were in fact used to assist the FAA in its decision-making process. In order to provide similarly thorough comments on the DSEIS, additional time is necessary. This is particularly true given the change in the project as reflected in the DSEIS.

We also request an extension of the comment period for the updated draft conformity determination, included as Appendix B in the DSEIS. To date there has been insufficient public notice of the opportunity to comment on the FAA's revised air quality conformity analysis. The fact that the deadline for these comments is March 16, 1997, two weeks prior to the deadline for submission of comments on the rest of the DSEIS, is not mentioned anywhere in the document itself or in the notice of its availability published in the Federal Register. We note also that closing the comment period on a Sunday effectively shortens the comment period by one day. While our firm received a cover letter with the DSEIS which noted the different comment periods, members of the public who review the DSEIS at a public library or municipal office likely would be unaware of the distinction, and would reasonably assume that comments on any portion of the document could be submitted until March 31, 1997.

Even if one assumed that the same deadline applies to the entire document, the comment period for the updated draft conformity determination is inadequate, given the amount of data which must be reviewed in order to confirm or challenge the FAA's revised finding that emissions from the proposed project would be below *de minimis* levels. As you will recall, the comment period for the previous draft conformity determination was initially thirty days, but after repeated requests and several interim deadlines, was ultimately extended to over a hundred days. Rather than repeat the pattern of last-minute extensions, we respectfully suggest that a more reasonable deadline be established at the outset.

In light of the foregoing, we request that you extend the comment period on the DSEIS and the updated draft conformity determination for Seattle-Tacoma International Airport until May 15, 1997. Your prompt response to this request is greatly appreciated.

Sincerely,

Perry M. Rosen

cc: Mr. Kenneth Reid

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CUTLER & STANFIELD, L.L.P.
700 FOURTEENTH STREET, N.W.
WASHINGTON, D.C. 20005-2014
TELEPHONE: (202) 624-8400
FACSIMILE: (202) 624-8410

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JOHN E. PUTNAM
THOMAS D. ROTH
*NOT ADMITTED IN DC

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 18 1997
ANM-610

1875 BROADWAY
DENVER, COLORADO 80202
TELEPHONE: (303) 825-7000
FAX: (303) 825-7005

March 7, 1997

VIA FACSIMILE TRANSMISSION; ORIGINAL BY FIRST CLASS MAIL

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
Airports Division
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Re: Extension of Comment Period on the Draft Supplemental Environmental Impact Statement and Updated Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport

Dear Mr. Ossenkop:

On behalf of our clients, the cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila, Washington and the Highline School District, individually and collectively as the Airport Communities Coalition ("ACC"), we restate our previous request that the FAA extend the period for public and agency comment on the Draft Supplemental Environmental Impact Statement ("DSEIS") for Seattle-Tacoma International Airport until May 15, 1997. In doing so, we would like to bring the following matters to your attention.

Although the DSEIS was released on February 6, public library branches in the region did not make copies available for review until the end of February. This delay, while not caused by the FAA, apparently stemmed from a failure by the Port or the FAA to indicate that time was of the essence in making the document publicly available. As a result, the public was deprived of a meaningful opportunity to study the document's description of the proposed project and its environmental impacts.

Furthermore, in connection with our representation of the ACC, we have been attempting to obtain data used to support the air quality and surface traffic analyses in the DSEIS.

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Despite repeated requests for computer disks containing this TRAFFIX data, we have not received the data necessary to complete our review of the relevant sections of the SDEIS and the draft conformity determination included in Appendix B. Further hampering our review of the air quality analyses was the omission of a critical page from Appendix D, which we received only last week. In addition, discontinuity in the draft conformity determination (from the bottom of page B-16 to the top of page B-17) indicates that some portion of the text was inadvertently omitted, unfortunately at a critical juncture in the analysis.

We hope that you will keep these factors in mind in considering our outstanding request for an extension of the comment period on the DSEIS and the updated draft conformity determination for Seattle-Tacoma International Airport. Since time for preparation of comments is growing short, we would appreciate a prompt response to this request.

Sincerely,

Perry M. Rosen

Perry M. Rosen

cc: Mr. Kenneth Reid

Christopher Vance
METROPOLITAN KING COUNTY COUNCIL
District Thirteen

March 18, 1997

30

Mr. Dennis Ossenkop
ANM-611
Federal Aviation Administration
Northwest Mountain Region, Airports Division
1601 Lind Avenue S.W.
Renton, WA 98055-4056

Dear Mr. Ossenkop:

I C-39-1 I am writing you this letter in regard to your February 28, 1997 letter pertaining to comments on the Draft Supplemental Environmental Impact Statement(DSEIS) for the Master Plan Update at the Seattle-Tacoma International Airport.

The environmental impacts caused by the construction of a third runway at SeaTac Airport have increased to the point where a complete reevaluation is needed. I hope the FAA will approach this request with an open mind and devote the time and resources necessary to do a complete and thorough EIS.

Additionally, I would request that the comment period be extended to 90 days. This will be a more reasonable timeline given the size and importance of this project.

Again, thank you for your consideration on this important issue.

Sincerely,

Chris Vance
Councilmember, District 13

cc: Mr. Ken Reid, Executive Director, Airport Communities Coalition
Mr. Len Oebser, President, RCAA Board of Directors

Room 1200, King County Courthouse, 516 Third Avenue, Seattle, WA 98104-3272
(206) 296-1013 TTY/TDD (206) 296-1024 FAX (206) 296-0198

Home address: 9815 S. 203rd St., Kent, WA 98031 Home phone: (206) 852-4020

James A. Rymsza
Architect

March 19, 1997

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Mr. Dennis Ossenkop
ANM-611 Northwest Mountain Region
Federal Aviation Administration
1601 Lind Avenue S.W
Renton, WA 98055-4056

RE: Comments to SEIS

Dear Mr. Ossenkop,

Since the advent of the 4-post plan, I have noticed a steadily deteriorating situation in which more and more aircraft are being funneled over the most populated areas of the city.

The thought of additional aircraft landing over my house as a result of the 3rd runway fills me with regret. In fact, the thought fills me with a sickening sense that the Port and FAA have only one objective. They will do what they need to do to solicit aircraft to SeaTac regardless of the environmental impacts, cost or affect on the neighborhoods they impact. I feel that our elected officials, including the Mayor's office have done little or nothing to mitigate the accelerating problem of jet overflights over the neighborhoods within the city of Seattle.

Once, jet aircraft followed a route that put them over the most industrial areas of the city. The 4-post plan changed that. With aircraft landing one per minute, our neighborhood, 20 miles north of SeaTac, has become a jet ghetto. NE Seattle is becoming a less desirable place to live. The potential for loss of neighborhood stability is very real. Middle class flight to suburban locations is often the outcome when citizens feel they have lost the power to effect their immediate well being. I find myself scanning real estate adds outside the city, away from jet noise. If I move, my tax dollars and business will move as well. This is despite the fact that I love my home, neighbors and neighborhood.

As a condition for the Puget Sound Regional Council (PSRC) to approve the proposed third runway, the Port's noise mitigation efforts were reviewed by an *Expert Arbitration Panel*. Despite the Port's trumpeting that their noise mitigation is more than adequate the *Panel* found in March that the Port had not done enough noise mitigation from the second runway to permit a third. The Port is nonetheless ramming a runway down our throats that is too expensive and misguided.

The Port should be held accountable to the Panel's findings and remedy their shortcoming before any construction is permitted. As a minimum, the panel's recommendations that overflights take place over industrial areas like the Duwammish corridor and away from our neighborhoods need to be mandated and reinstated. Also:

- The opportunity exists to direct flight traffic (upon landing) over I-5, Lake Union, Downtown and SoDo. These areas are industrial, geographically more suitable or noise impacted already. A few hundred feet can make a difference concerning the number of people impacted by jet noise. Currently, flight paths are several hundred feet *east* of I-5, over neighborhoods, and miss the industrial areas.

- Landing aircraft using the Duwamish industrial corridor on clear sky days often miss their target and are as far north as 75th NW before they start their turn over the city. This brings western routes over our NE neighborhood, in addition to the eastern routes already there. The *Expert Arbitration Panel* indicated that the Port was not utilizing this existing industrial corridor fully to properly mitigate the noise over Seattle's neighborhoods.

- Increasing the landing glide slope just 1/2% (to 3.5%) would help to mitigate noise over areas far away from the airport. Our area receives no noise mitigation dollars and yet is severely impacted. This slightly steeper decent would not impact the safety of the aircraft and would be consistent with noise mitigation efforts at other airports. Enforcing the 3% slope should be done at bare minimum. Landing aircraft are frequently much lower.

Sincerely,

James A. Rymsza

6823 30th Avenue NE Seattle, Washington 98115 206 - 526 - 0707

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PUBLIC HEARING

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

(SEIS)

Taken at Sea-Tac International Airport

Seattle, Washington

Hearing Officer: James M. Driscoll

DATE: March 4, 1997

REPORTED BY: TONI L. CHRISTY, RPR, CCR CHRISTL408NM

32

INDEX OF WITNESSES

SEATTLE DEPOSITION REPORTERS
(206) 622-6661

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Seattle, Washington; Tuesday, March 4, 1997

4:00 P.M.

MR. DRISCOLL: If everyone would sit down we can start. My name is Jim Driscoll and I have been retained on contract by the Port to conduct this hearing. This is a public hearing on the draft supplemental EIS for the master plan update of the Seattle-Tacoma International Airport. The purpose of the hearing is to have the public submit comments on the draft supplemental environmental impact statement that has been issued for this project. It was issued on February 27, 1997. The lead agencies for the project are the FAA and the Port of Seattle, and they have submitted the draft SEIS which contains -- which addresses the impacts that have been identified with regard to the master plan update.

Today's hearing is for you to make comments on the draft SEIS so that those comments can be considered in the final SEIS. This is a two-pronged process. The lead agency initially issues a preliminary environmental impact statement, and then they hold this type of hearing, and then you as the public are given an opportunity to present what you consider to be the shortcomings, the strengths or what

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have you with regard to that draft EIS. The lead agency then takes these comments and they will address them in the final EIS that will be issued at a later date.

So if you come up to testify, that is the purpose of your testimony is to come and present any specific items that you want to have considered in the final EIS. It would be helpful if you could give a citation to the page that you're concerned about. If not, don't worry about it. What's more important is getting your testimony and getting your opinion with regard to the draft EIS. The procedure that we are going to follow today is that if you want to testify, you must sign or fill out a testimony registration form that is located -- they are located at the front desk. I imagine most of you who have decided you wanted to testify have already done so, but if you have not done so please go and get one of these forms, fill it out and put your name and address and they will be presented to me.

I will then, when it is your turn to testify, call out your name and you are to come to the chair directly in front of me and just present whatever testimony you have. Speak loudly, your testimony will be picked up by this microphone and members of the

audience will be able to hear it. However, the most important person in this room is not me, the most important person is our stenographer, because the stenographer is taking down all of the information that you are going to be giving, so speak slowly, slow talking is what we want here today.

So speak slowly and clearly. If you have written materials, we would appreciate a copy of the written materials because that will also become part of the record. If you are going -- if you do not want to give the written materials and you're going to read them, read slowly. People read much faster than they talk and our stenographer must take down every word, so if you have the written materials give them to her but if not, read slowly.

It is not easy to get up in front of a group of people and testify. Most people don't have that experience in their lifetime and most people or a lot of people have the fear of speaking in crowds. Please take that into consideration if you're in the audience. Give the speaker the same respect that you would want if you were in that same seat. I do not encourage any type of spontaneous outbursts. It serves absolutely no purpose to cheer, boo, hiss, scream or do anything of that nature. In fact, it impedes the

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process and it doesn't add to it, so please just keep your emotions to yourself. As soon as you get out the door you can start expressing them, but I don't want to hear them in here.

I would also request that during the testimony that we have as quiet a room as possible. As I stated we only have this one microphone, and if everyone is going to hear what other people are saying, we're going to have to have a fairly quiet room. All testimony, all comments must be given at the chair. If you want to say something just go through the procedure, but I'm not going to accept any comments from members of the audience to members who are sitting in the audience, you must be sitting in the chair itself.

When you step forward to the chair, too, please identify yourself, your address, give me your address and give me, if you're representing an organization, give me the name of the organization.

Now there's one caveat here: Don't ask me any questions, I don't know any answers. The purpose of me being here today is to direct traffic. I don't have any of the answers and I cannot give you any answers with regard to the materials in here. My purpose is to make sure that we get a record so that

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the lead agencies can work with it so that the final EIS can be issued in this matter.

There are a couple of other items. If you do not want to testify but you want your comments made known to the lead agencies, there are sheets out at the front desk called comment sheets and you can write your comments and sign your name and address and there's a white box, it's right under the clock, and you can place those comment sheets in that box.

Also, if you are shy or you don't have your comments together today but you still want your opinion known, the lead agencies are taking written comments until March 31st, 1997, and the person you address those written comments to, his name is listed at the bottom of this handout that you should have received when you came into the room.

With regard to the rest of the procedure that's going to be followed after tonight's hearing, I'm going to have Mary Vigilante, who is in charge of this process, give a brief presentation.

MS. VIGILANTE: Actually we can conduct it as if I were testifying. My name is Mary Vigilante, V-i-g-i-l-a-n-t-e. I'm president of Synergy Consultants and serve as the project manager for the consulting team preparing the environmental impact

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statement to the master plan improvements. As our hearing officer has said, after tonight's hearing as well as through the end of the comment period the consulting team, the FAA and the Port of Seattle will be reviewing all of the comments that have been received, we'll prepare responses to the comments and then issue a final supplemental EIS.

We are looking forward to the receipt of comments tonight and we have encouraged our hearing officer to solicit comments and testimony from the general public for our record so that we can respond to those comments. We have asked you to allocate five minutes for elected officials or organizations, to allocate three minutes to any individual wishing to testify, but to receive testimony of any length that is conducted in writing.

With that, I'll turn it back to you.

MR. DRISCOLL: Okay. Mary would get an A for a presentation, that's what we mean. Again, we will be -- at this initial stage of this proceeding because of the number of people either that are going to be here or are here right now we're going to limit the time for comments. Organizations and representatives, political representatives will be given five minutes and individuals will be given approximately three minutes.

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I don't have a timer but I have a watch and I'll be watching it fairly closely. Are there any questions with regard to the procedure that I'm going to be using? Yes, sir?

MEMBER OF THE AUDIENCE: Why do you have the person facing you rather than the audience when they're going to speak?

MR. DRISCOLL: Well, the most important person is the stenographer and the purpose of this is to get the information so that the Port and the FAA can go back and work with that information so we're having the witness look directly at me into this microphone so that we make sure that testimony is properly recorded.

Are there any other questions?

Okay with that, then, we will start with the first witness, Pierre Matthews?

MR. MATTHEWS: Can I defer for a half an hour or so?

MR. DRISCOLL: That would be fine. Jacob Eglin?

MR. EGLIN: I'm Jacob Eglin, 24120 22nd Avenue South, Des Moines, Washington. It's a cheap excuse I have to look at you instead of the people.

As I stated on August the 1st at the Port meeting down at the Port, this is a stupidity second to

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none to invest money in this airport. If they look at the size of the airport and compare it with the size of other airports, then they would have to come to the conclusion it's stupid to invest any more money. Towards the east you have 99 and towards the west you have a gully.

They always tell us about the third runway, now they say, oh, we can't build it yet, we need a terminal first and we need a new parking house. Just look at the street that comes from 99 into the airport. Build an additional lane, and after two sharp turns a person can hardly make it, and you certainly know you're in the wrong lane because one lane only goes to the parking house and the other goes to the corridor to unload people or pick up people. That is the mentality that exists down at the Port. A very autocratic group who only intend to keep their finger in the pie.

Now, when the airport came under the jurisdiction of the Port, of the seaport, this place here was more or less out in the boondocks and today it is probably one of the most important items, so I believe strongly that it should be separated from the seaport organization and have a group of people who deal with the problems, not just themselves, and

representing some special interest groups. They're going to have to cut dirt, and over to the west side, I don't know if you ever drove around that thing, presently the runway is supposed to be over Avenue 12. Last week I read that they may have to move it farther to the west, bring in all that dirt, and after the present winter we had, someday I see Page Miller standing down on I-5 and saying "How come that dirt came down," because the runway number three is out of service. If that makes any sense, I would like to know.

In addition --

MR. DRISCOLL: You've got about half a minute.

MR. EGLIN: That probably doesn't matter anyway, you know, because you people made up your mind.

MR. DRISCOLL: Thank you.

(Applause from the audience.)

MR. DRISCOLL: Again, the testimony I want to make sure is addressed towards the issues in the SEIS.

MR. EGLIN: Sir, if that book would have been available we probably could read it but it was not available to the public.

MR. DRISCOLL: Sir, you're out of line. Amy

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Ruble?

MS. RUBLE: Hi, my name is Amy Ruble. My address is 3600 Port of Tacoma Road, Suite No. 308, Tacoma, Washington, 98424, and I am the district director for Congressman Adam Smith.

MR. DRISCOLL: You have five minutes.

MS. RUBLE: Thanks.

Firstly, Adam Smith will be submitting his written comments by the 31st going more into detail about his concerns regarding the EIS. Secondly, his first concern at this point is the length of time that was granted for the comment period. With three things in mind, the first thing being that the project is of huge magnitude, and the second thing is that we have a concern that the people have not been given an opportunity to express their concerns reflecting the SEIS because the document was not available on a widely-known level.

In regards to this we feel that if we extend the comment period more people would have an opportunity to read the SEIS and would be able to make specific comments in regards to their concerns that they have. With a project of this magnitude people should be able to express the thoughts and concerns that they have specific to their neighborhoods and

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communities. Thank you very much.

MR. DRISCOLL: Thank you. Rod Blalock?

MEMBER OF THE AUDIENCE: Sir, with all the technology we have, I'm sorry, I cannot hear.

MR. BLALOCK: I'm state representative Rod Blalock, and for the record I am state representative of the 33rd District which includes the Sea-Tac International Airport.

I want to address one particular part of the EIS, the part that deals with Surface Transportation Impacts. Section 5-1 states in the introduction that "No significant surface transportation impacts have been identified for the preferred alternative in comparison to the do-nothing alternative for any of the evaluated intersections and freeway ramp junctions.

"If you read no further than this, you would be relieved. Unfortunately, the devil is in the details. In section 5-1-22 of the EIS there is a list of highway and road intersections around the Sea-Tac airport. The projected level of service, (LOS) for each intersection is given for the years 2000, 2005 and 2010. Ten intersections out of 36 total studied would be reduced to LOS, E or F. What this means in plain English is that the intersections will be severely congested with automobile traffic.

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"Why is this not a significant impact? The document says that it is not because under the 'do-nothing' alternative, the LOS at the affected intersections would be reduced to a similar level. By accepting that traffic will get worse, but saying it will get worse with or without the airport expansion, the Port has neatly exempted itself from any mitigation fees for surface transportation impacts. While it is true that traffic will get worse, third runway or not, nevertheless a third runway and the increase in passengers arriving and departing Sea-Tac will be a significant cause of traffic congestion. The Port of Seattle is using complicated and tortuous logic to exempt itself from responsibility for surface transportation impacts. The Port of Seattle must bear some responsibility for the decrease in LOS at the affected intersections and it must mitigate accordingly.

"The second and related issue I would like to address is the movement of fill necessary to build the proposed third runway and the impacts it will have on surface transportation. Section 5-3, page 5-4-3 of the EIS states that 1.2 million truckloads of fill will be necessary to complete the third runway. Page 5-4-2 states that transport of fill material could occur 'as

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much as 270 days per year and 16 hours per day...It is anticipated that during peak periods, haul could occur more than 16 hours per day.'

"The report concludes that because of construction traffic in five (5) intersections will be reduced in LOS to F, the most congested level, due to construction traffic. These include southbound, I-5 between 518 and South 188th Street during the afternoon rush hour; SR 18 westbound between I-5 and 167 during all hours except at night; southbound 167 between 405 and Southwest 34th Street during afternoon rush hour.

"How can the Port of Seattle state in one section of the EIS that there will be no impact on surface transportation, then say the opposite in another section? Is the Port prepared for the public outcry that would result from 1.2 million trucks driving on our highways and streets? We already have a problem with rocks and gravel flying all over the roads, cracking people's windshields. Is the Port prepared to address the issue of 1.2 million trucks driving on our highways, rocks and dirt blowing off of them? Will the load cover laws be strictly adhered to, or will driving in the area become even more hazardous? We already face the problem of super-aggressive, speeding drivers of enormous trucks

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on our roads. Is the Port prepared to address the issue of 1.2 million extremely large trucks driving on our roads? Where is the mitigation for 1.2 million heavy trucks driving on our roads, cracking and ruining them? 1.2 million trucks will have a significant impact on our roads. They will ruin them.

"Section 5-3, 5-4-19 of the EIS lists mitigation for the impacts related to fill haul. It lists 'Construction Best Management Practices' and a 'Construction Mitigation Acquisition Program.' It does not, however, mention any mitigation for the wear and tear that will be inflicted on the roads by the 1.2 million truckloads of dirt. I believe the Port must be required to set aside mitigation funds to repair the roads it plans on using and damaging to transport the fill.

"To conclude, it is clear that the Port does not plan to meet its obligation to adequately mitigate impacts on surface transportation. Until it does so, I do not see how the project can continue without severe impacts on our roads. The neighborhoods surrounding the airport suffer from many deleterious impacts caused by the airport. The third runway will add to this list of negative impacts a severely congested surface transportation system that is cracked and crumbling.

Once again, the neighborhoods of my district are being degraded, asked to bear the burden of subsidizing travel and trade for all of Washington.

"Thank you."

MR. DRISCOLL: Thank you.

There is a copy of the draft EIS that should be located on the tables right under the clock. If you've taken those make sure those are put back because those are for the public to review. Pat Pompeo?

MS. POMPEO: My name is Pat Pompeo, 434 Southwest 186th, Seattle, 98166.

One comment I would like to make is that it's more common for us in our neighborhoods now to awaken to the strong aroma of the airport pollution, and it's much more common than it used to be and it's -- makes you want to hold your breath when you go out for your first breath of fresh air in the day. Citizens of the FAR 150 area will be reporting on this whole EIS process to Janet Reno of the Justice Department. Thank you.

MR. DRISCOLL: Thank you. Dan Caldwell?

MR. CALDWELL: You caught me a little off guard, I wasn't expecting to be called yet. My name is Dan Caldwell. My address is 19547 Second Avenue South and that's in Des Moines.

This airport I feel is an amateur operation in that it's a Port operating an airport and that's not within the field. For example, about a week ago the US Maritime Commission levied fines against Japan. If the Port had had a lobbyist there instead of here, they would have brought Vancouver into the operation as through the GAT, Geneva Conference, and it lobbied for that Maritime Commission to include Canada, so we're losing jobs while they're playing around with an airport that can't go.

Miller Creek is being diverted. Miller Creek supplies the Seattle Water Department with water through their aquifer, they divert the creek, they are diverting the aquifer. Des Moines Creek has construction going on right now just down the street. They divert Des Moines Creek, they're affecting the Highline Water Department's water.

Patrick O'Malley from the Tacoma Port says the two airports should merge -- the two ports should merge, Seattle should merge with Tacoma, creating a regional shipping Port. Now this makes sense, but it doesn't have much sense handling an airport. They should just plain get out of the airport business and turn it over to the cities or the county, but they don't belong in the sirport business.

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Going a little further, the Port -- the third runway is one of the biggest fat cats -- fat cat schemes in the state's history. The Port of Seattle does not have the income or fiscal credibility to take on the total cost of the proposed runway. The Port already requires a 34.4 million welfare check from the King County taxpayers just to stay in operation.

Blaming Port planning errors for delay in construction for another five years is only a deadbeat excuse. The Port does not have the money required to build a third runway. The 9.4 million paying passengers using at Seattle-Tacoma produce only 28 million in passenger fees per year. This is barely sufficient to operate the existing runways in an antiquated airport. The airlines are not going to shoulder the expense. Many international flights to the Orient have already moved to Vancouver B.C. Vancouver has more flights than Seattle-Tacoma.

Horizon Airlines is considering moving to Paine Field. Airline economics are tight. If by some fluke the airport is actually built it will probably be the biggest park and ride in the State's history.

(Applause.)

MR. DRISCOLL: Simon Miedema?

MR. MIEDEMA: My name is Simon Miedema. The

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address is 638 South 146th Street.

All my comments are in regard to the SEIS. The SEIS is the biggest coverup for the boondoggling that the EIS started with. The EIS, the cost figures were deliberately lowballed to make them more palatable to the people, and they neglected to include in the cost the cost of taxes and any contingency fund and now they come up with a measly 3 percent contingency fund which -- let me explain. The Bell Street project which they are building now increased 30 percent from 65 million to $85 million and it's still not completed.

Also in this SEIS is an underlying idea that they want to extend -- enlarge the airport because they even have in there to extend the existing runways and a new 12,500-foot runway. In March 18, 1996 at the fieldhouse hearings the ATA, which is the Airline Transportation Association, they were recorded in the paper as saying they were neither for or against the third runway until they penciled in the bottom line.

Now, airlines naturally are concerned about their bottom line. Do you realize -- and this was told to me by one of the Port's who made out the EIS, and he told me that some airlines will take their planes and fly them to Portland overnight rather than pay the high charge of overnighting at Sea-Tac, and this was

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verified to me by an airline pilot who flies in and out of Portland.

Now, 900 homes and businesses would be displaced. Now, figuring that's close to almost 2,000 people would be displaced, and this SEIS is further -- it's credibility is further eroded by a groundless comment by -- a groundless comment by a prominent citizen to say the third runway is the best and most cost effective solution.

I say we've heard this old record once before -- many, many times before, that it's the best and most cost effective runway solution, and I say to those people if you cannot come up with the facts you are just blowing hot air. Thank you.

(Applause.)

MR. DRISCOLL: Rose Clark?

MS. CLARK: My name is Rose Clark. 16856 Des Moines Way South, Burien, 98148.

My first concern is this is a terrible time to have a hearing this time of day in the middle of the commute and an awful place to have it for people to get to easily.

Another concern is the lack of availability of the SEIS, which I do protest. Today it is not in the Des Moines Library. I would like to give some

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information from a book called "Flying Off Course" from the National Resource Defense League. Studies have been conducted at several airports nationally. The airports have been listed along with the industries found there. O'Hare omits -- emits more VOC's, volatile organic compounds, 61 tons more than the all steel plants and 211 tons more nitrous oxide than a corn by-products plant. This raises all sorts of serious questions about the damage to our health due to the air we breathe. With more flights our air will worsen. Will the Port of Seattle set aside money for our health bills and our early death? This is an example, and the reason the Port of Seattle and the PSRC should read this study.

Also of concern are seismic concerns on the west side of the airport between SR 509 and Des Moines Way. Both a hydraulic study and a seismic study should be done before one truckload of dirt is dumped in this seismic area. The means of handling traffic during construction and after the runway is built needs to be addressed. We have already experienced commuter delays due to the trucks during the work that was done last summer in the safety area.

Our roads and our freeways in the local area are at gridlock now. We can only expect worse in the

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future with the way the Port has planned or not planned this part. With cost escalating while the runway is years in the future a detailed financing plan must be developed and made public. Respect for the county taxpayers, all county taxpayers who currently pay millions would demand that it be made public that they will be paying more. The studies are incomplete and I demand that detailed studies of the above-mentioned issues be addressed before approval is given to the third runway project. Thank you.

MR. DRISCOLL: Thank you. Mr. Matthews, are you ready yet?

MR. MATTHEWS: My audience isn't here yet.

MR. DRISCOLL: Margaret Gerdes?

After that, James Bartlemay will be the witness after this one.

MS. GERDES: I'm Margaret Gerdes and I live at 20014 First Place Southwest and that's in Normandy Park.

I feel it's utterly ridiculous to build a third runway. By the time of completion a new airport will be needed. What a waste of taxpayers money. The Port has taken some properties off their tax rolls making it more of a burden to citizens to support schools. The Port has not been truthful with people

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living near the airport and under the flight pattern and noise has not been contained. It's really disgusting to be awakened by airplanes taking off at midnight on to around 1 a.m., then again at 2 a.m. and at 6 a.m. Saturdays one would like to sleep in, but again we are bombarded by noise and it continues most of the morning. It's no joy to do gardening or yard work. I resent my life being intruded on by the Port of Seattle. Thank you. I don't like talking before the public.

MR. DRISCOLL: You're only talking to me today.

(Applause.)

MR. DRISCOLL: James Bartlemay and followed by John Rankin.

MR. BARTLEMAY: My name is Jim Bartlemay and I live at 23510 10th Avenue South in Des Moines. I am also the vice-president of a citizens group of several thousand people that live in the south King County area called CASE, Citizens Against Sea-Tac Expansion, and I come to this meeting today to protest the process, and you've heard some examples of that already in this meeting, but there are some two to three hundred thousand people in the south King County area that are being impacted by this expansion of the Sea-Tac

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Airport, the runway, the terminal, the taxes and whatever, the $3.5 million project. These are people that are children where their schools are impacted, they're working people, they're retired people that are on fixed incomes, in connection with that their property values are being depressed, they're losing value in their property, and I expect I'll lose some $50,000 on my home in the Des Moines area, and that isn't even considered in this supplemental EIS or any EIS that has been printed so far.

But I protest this process not only for those people, but you people published a draft of, you know, upwards of almost 1,000 pages of complicated, technical data, data about wetlands, stream relocation, air pollution, water pollution, a number of these things in a complicated piece of paper and yet you printed 16 copies that you supplied to the public in the libraries. However, the libraries haven't received them. The Des Moines Library, and I checked at noon today, hadn't received a copy. Not one citizen in the Des Moines area has been able to see this draft. You can buy this draft for $120, and even though that wasn't publicized in any of your papers you can get it at King County for $120, but who is going to pay $120? The average citizen isn't going to do that. It's more

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practical to go to the library. And then when you have one public hearing where do you have it? You have it in a main auditorium in the Sea-Tac Airport.

I called the FAA and talked to Dennis and two other members of his staff and said "How do you get there?" And he said, "Geez, I've only been there one time so I'm not real sure, but if you go in the Delta entrance and ask a porter he'll tell you how to get there." I asked him about parking and he didn't know where the main -- he said go to the parking garage. Is it paid for? He wasn't sure, there's a lot of things.

If you're going to have a public hearing on this type of a project that impacts so many people, why don't you have it in the cities that are impacted and not have one meeting of four hours in a main auditorium in an airport? Have two, three, four meetings maybe two hours apiece, but in the local city council buildings and the fieldhouse at Des Moines or the Cove where we've got an auditorium, and these are public places, and I'll volunteer my time and the citizens in CASE to help set up these meetings. 45 days isn't enough time when you don't have the document to review. That ought to be extended at least to 90 days and then maybe you'll get some significant, written comments.

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And I could say a lot more technical stuff that's in that document, but don't believe it, I haven't read it. I have read part of it, but I had to get it through another agency, and I don't think it's a good process at all. You people took a year to write it, you ought to give us some time to review it and get a good public hearing on it. Thank you.

MR. DRISCOLL: Thank you.

(Applause.)

MR. DRISCOLL: John Rankin, and the next witness after Mr. Rankin will be Len Oebser.

MR. RANKIN: Good afternoon. My name is John Rankin, I am the mayor of Normandy Park and the chairman of the Airport Cities Coalition. I don't have prepared remarks today so I'11 just let you know what I think about this and the way the process has gone.

Government today is the last bastion of unbridled self-interest. It exists in many cases to support itself, and if you have any questions about that you have to look no further than this process.

This process, which is a very -- is very artificially contrived to put those people testifying the most ill at ease, to provide the most advantage to the Port in terms of what it allows. The process itself, we shouldn't be so naive as to suspect that

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there's any outcome that is expected from this other than confirmation by the Port that they have had the hearing, the supplemental EIS document has been released, people have had an opportunity to comment on it, and now on to the next step.

While in the meantime they prepare to decimate our communities. Sociologically, economically, educationally, our communities are going to pay a tremendous price for this project, but there is no forum for us to protest it.

Now I'm here because as a citizen it's my job to be involved in the process that the board has set but the process itself is a false. And the most shameful thing about that is that at the end of the day all the people that put together this document, the hired guns, the lawyers, the Port officials, the commissioners and the people that work at the Port get in their cars and they go home to their houses and they turn a blind eye and a deaf ear to our cries to have communities that aren't going to be decimated by this project and have suitable learning environments for our children. There is not a single word in there about what they're going to do for our educational system here.

All over the nation you've got people saying

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education is the number one priority in the nation today. We must teach our children how to read, we must prepare them for the future. The Port is not the Grinch who stole Christmas, this Grinch steals futures, and this process is not designed to help anyone but the Port, so I think that that is the most important thing to realize about this. Those are my comments.

MR. DRISCOLL: Thank you.

(Applause.)

MR. DRISCOLL: Len Oebser, and the next one will be Harvey Rowe after Len.

MR. OEBSER: My name is Len Oebser. I live at 20724 8th Avenue South in Des Moines.

"For the record this testimony is from Karen Keiser, one of the two state representatives in the 33rd Legislative District." I shall read from her statement.

"I regret that I am unable to attend this hearing in person as I have a critical Education Committee meeting in Olympia today. As you know, I represent the communities most impacted by the proposed expansion of Sea-Tac airport.

"I would like to express my concerns with the Draft Supplemental Environmental Impact Statement of the Proposed Master Plan Update for Sea-Tac

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Airport. Throughout the many processes addressing the environmental impacts of this project, one constant theme emerges -- the impacts of a third runway are always minimized and underestimated in an attempt to make this ridiculous proposal appear reasonable.

"It is not a reasonable alternative. It is not even close. And the fact is, most of the data we have today underscores just how exorbitant and destructive this preferred alternative is. Recently we learned that the projected construction costs of building this slab of concrete has increased to $587 million, a conservative estimate by all accounts. I say this because if you have no intentions of helping the humanity you pave over in the process it will still cost you a bundle.

Port Commissioner Paul Schell told the Highline Times last month that perhaps the Port would seek a waiver from the state sales tax to cover the increased costs. In a decade of spending limits, failing school levies and skyrocketing property taxes, I would say that this government agency is the least deserving recipient of a tax break.

"But this sort of reasoning is to be expected when you're dealing with an unreasonable situation. This project is going to impact our

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pocketbooks, our air and water, our schools and our quality of life. And this document fails to address these certainties in an adequate fashion.

"I found this document to be ridden with ridiculous assumptions and projects. When it comes to the impact on our local roads, it notes that because State Route 509 or South Access are not yet completed, the cumulative impacts 'cannot be identified.' The absence of these highways creates more impact on our existing roads not less. To suggest otherwise insults the public. The only reference to mitigation funding is the City of Seatac's parking tax. I am confident these impacts extend well beyond the City of Seatac.

"This document is also flawed by a serious lack of reality through the reams of glitzy charts and graphs. It specifically relies on computer modeling. For example, to date, no conclusive canister testing -- testing the air you and I breathe -- has been completed. Because preliminary modeling predicted that carbon monoxide was likely to exceed what little environmental standards we uphold in relation to this project -- the Port, the State Department of Ecology, the Puget Sound Air Pollution Control Agency and the US Environmental Protection Agency have entered into a Memorandum of Agreement to conduct air measurements in

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the vicinity of Sea-Tac Airport. This means merely the measurement of air pollution on our communities has at least begun.

"Unfortunately, the rest of the track record for our environmental agencies on this issue has been dismal at best. I am mostly disappointed with our own state Department of Ecology. Back in December of 1996, two weeks prior to leaving their respective offices behind, and despite loud objections from several state law makers, outgoing Governor Mike Lowry and outgoing DOE director Mary Riveland decided it would be sufficient to sign off on this project as environmentally sound in the wake of numerous environmental violations by the Port. This decision was also made despite a federal law mandating that the Governor sign off on this project. Accordingly, I was not surprised to find this 'certification' included within the context of this document. But for the record, I feel it is my duty to point out why this is an outrage.

"Under section 509 of the Airport and Airway Improvement Act the Governor must sign -- not an agency department head -- the Governor, must sign off on this project. More specifically, here is what the law actually says.

'No project grant application for a project involving airport location, a major runway extension or runway location may be approved unless the Governor of the state in which such project is to be located certifies in writing to the Secretary that there is reasonable assurance that the project will be located, designed, constructed, and operated so as to comply with applicable air and water quality standards.'

"Please note what I have just cited does not say 'or appropriate state official' as so noted in this document. This document states that 'under delegated authority from the Governor,' the Department of Ecology 'issued a letter certifying that such assurance was provided.' As a state representative, I have asked the incoming Governor and DOE Director to immediately rescind this decision as it is clearly in violation of the federal statute. Furthermore, my research has found no mere agency head has ever signed off on an airport project of this magnitude. None.

"What about noise impacts? What can be said? The illusions in this document would make David Copperfield proud. Only Port consultants can make white elephants disappear. We are talking about 66 dump trucks per hour. Impacts? I predict that the noise from the trucks will be so deafening that for

once we won't hear the jets.

"What will this project do to the water we drink and the bodies of water we fish in? As I speak, my office is reviewing the Department of Ecology's latest decision to clean up fuel contamination of the local aquifer. It has been brought to my attention that the Department of Ecology has yet again failed to enforce regulation under Chapter 173.200., which provides for environmental protection of our groundwater. I think this is alarming and I think it's likely to continue under this proposed expansion.

"The Port says it plans to buy out 70 residential homes located east of Des Moines's Memorial Drive between State Route 509 and State Route 518. I think this figure assumes only a handful of residents and businesses are going to be bothered by the parade of dump trucks needed just to construct this project.

"There are no comprehensive mitigation plans within this document. The analysis fails to address the true impacts on our communities. As a purported environmental impact statement, it flunks every test of reality-based judgment.

"Thank you."

(Applause.)

MR. DRISCOLL: Harvey Rowe?

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MR. ROWE: I'm Harvey Rowe. I live at 8850 9th Avenue Southwest in Seattle.

I have been an international pilot for many years with Pan American World Airways, and I think this third runway is just a big waste of money. You have two parallel runways already and the third is not going to give you a big advantage over what we have already. You cannot crowd planes in much tighter except in fair weather, but the problem is in Seattle we have, occasionally have a little bit of bad weather, a little cloudiness here and there. This is what we have to plan for. We cannot have runways side-by-side all the time. We have to have a certain amount of distance between for safety, and I do mean safety. As a pilot I'm concerned with that.

When this runway -- when this runway would be the most expensive runway in the United States, doesn't that give you some idea maybe it's not cost effective and not worth the taxpayers' dollars being spent on a poor idea?

It appears to me you're trying to create a major 'hub' airport and trying to compete with Dallas and some of these other ports that have many thousands of acres of open land and with little congestion and you are trying to jam all this into a high residential

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area of Sea-Tac. This airport should be a destination airport only and new 'hub' airport built where there's plenty of open land yet. And we have Portland we should be working with and combine the whole area. Portland wants to work with us. There's plenty of land in between. I see no reason why we should jam everything into Sea-Tac. It's only a matter of time before this would be needed and even if it's -- even if this third runway mistake is made.

It seems to me if you're really trying to make Sea-Tac Airport into a major 'hub' airport you will soon be trying to build a fourth and fifth runway as you totally devastate a fine residential area. Your promises with the second runway was that there would be no more runways. Don't you remember, or is it just easier to overlook your promises again and again?

Highway 99 is overcrowded already and can't handle massive increases in traffic already. The entrance to the airport is already one of the most congested I have seen around the world, and to me this is one major thing you have to think of, the people, the traffic, the congestion. Look what happens when we had an accident down the highway here just recently, airports -- or planes were being delayed and passengers couldn't get out. How about the snow, the convenience

of people getting to the airport? These should be very strong considerations and if that's considered Sea-Tac would not get a third runway.

Let's get responsible and plan for another 'hub' airport elsewhere and give the taxpayers their money's worth for a change.

There are three things in aviation to remember for safety of planes, passengers and convenience: That is, one, separation; two, separation; three, separation. I can't emphasize this enough. As a cockpit member I believe in separation.

It's obvious by your actions that you have not flown for years in the cockpit as a pilot as some of us have and experienced the close calls and emergencies that occur only too often. Let's think safety by separation; separation between planes, separation between airports for passenger convenience, auto traffic. Separation for close alternates of airports in case of foggy days, and we do have those foggy days.

Many times I have had to hold over Seattle and then I have had to divert to Portland because there's no close-by airport. Then we had to bus the people all the way from Portland. To me it's unbelievable we're jamming a third runway in when we

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need close-by airports. We do have a number of foggy days and poor weather.

In the meantime I have submitted several letters but these letters seem to be ignored and disregarded completely, and as a member of a flight crew I want to emphasize safety and convenience of everybody.

Why can't the Port of Seattle listen to us pilots that make our living by flying and each flight we put our lives on the line. Safety should be the number one issue. Flying is a three-dimensional problem and there is no place to park and think things over if there's close calls or emergencies, and, believe me, in my time of flying I have had a lot of them. I just don't like close calls. Let's get our money's worth and plan safe and convenient airports for a change. There's only one way to go, that's to have separation, convenient airports to the passengers and planes, and as the planes get heavier and more expensive we've got to concentrate on this.

When I was flying out of New York for a while sometimes we'd load our planes and we might be number 45 for takeoff. We couldn't even start engines for another 20, 30 minutes there, sitting there waiting. Finally we'd get a chance to start engines, then we'd

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be 15 or 20 before takeoff. We'd sit there burning fuel and wait another 25 minutes before we could get airborne. To me this is jamming too many people, cars, planes all at one time. If you have separate airports you don't have this problem. And we've just got to give it some consideration. We've got to have safe airport operation and things that are convenient because right now with a third runway it's not going to give us the effect we want and we're going to be wasting our money.

Thank you.

MR. DRISCOLL: Derek Brown?

MR. BROWN: Derek Brown, 239 Southwest 189th Place.

MR. DRISCOLL: Go ahead.

MR. BROWN: I went to church last Sunday and I missed part of the sermon because a jumbo jet went overhead. When the third runway is put in it will be even harder to hear what's going on not only the sound will get louder more often but the air that we breathe and live off of will get polluted, too.

I certainly do not want to have to breathe out of a scuba tank every time I go outside because of the pollution. So say no to the third runway and save your children's and my future from this fate because

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the future is not yet written.

(Applause.)

MR. DRISCOLL: Arlene Brown? And then Ben Stark will be the next witness.

MS. BROWN: Arlene Brown, 239 Southwest 189th Place, Seattle, 98166. I'm not as well prepared as he was. I haven't written out my comments, but I have scratched out some notes here. I studied SEIS already and I'd like to point out that Exhibits 2-1 and 2-7 indicate that had the Port used the FAA terminal air forecast estimates instead of using their own low numbers we would not be sitting here right now. It is very clear looking at the FAA numbers that we need at least a fourth and possibly a fifth runway. If you use FAA guidelines, that is, when you're at 60 percent capacity you're supposed to start planning. If we had the third runway out there operating right now we're already late for the fourth runway plans.

We should be sitting here and evaluating an alternative that says runway three, four and possibly five and weighing that against alternative sites, that is if we were paying attention to FAA guidelines and paying attention to the terminal air forecasts.

Now, it turns out that the TAF forecasts, that's what I'm referring to, we have never met those,

we have already exceeded the TAF estimates. Historically Sea-Tac has always beat out the growth of the rest of the United States' airports. So why is the Port assuming we are only going to have a two and a half percent growth when the rest of the world is projecting a 3.1 percent growth for the US and a 5 percent growth for the world overall? Especially considering the 5 percent world growth rate is because of the Asian increase in traffic and obviously we are in one of the best positions to take advantage of that increase in traffic. That's one of the reasons we tend to exceed the normal US average.

So the whole thing is based, every single impact in that entire document is based on the wrong estimate of operations, but that's no real surprise to anybody who has been involved with reading the draft environmental impact statement. This has been a ploy, as best as anyone can figure out, in order to hide the real costs. In order to truly expand Sea-Tac, to really be able to accommodate the growth requires paving over all of Burien and all of Normandy Park. That completely eliminates those cities. That also means you have to level hills. Those are not your standard flat places that you can easily expand out.

That gets us to the dirt. People keep

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reporting the wrong amount of dirt and the wrong amount of trucks and the wrong number of costs in the media. Semantic games are going on. It turns out that according to the SEIS the number is 26.4 million cubic yards of fill is needed. People keep leaving out certain projects. Even that number is incomplete. It doesn't address that they want to excavate where the wellhead is and have Seattle water get a legal agreement going with the Port so that the Port can pay for all our water once they contaminate it. That's a letter that's in the SEIS appendix E. It's really interesting reading. It says forget it, your engineering assessment says my water is not going to get contaminated, but it will, that's what it says, and they want money for it.

Other numbers, the number of trucks, the media has been reporting a lower number, but if they look real hard on page 5-4-2 you will find that this has 109 trucks. That's 218 truck trips per hour per day in the good weather, and as Rob Blalock mentioned earlier, that's for more than 16 hours a day if they can get the weather to cooperate.

Regarding the costs, people keep mentioning the costs of the concrete. If you were going to buy an office building would you get the costs for the walkway

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or would you get the costs for the whole building and the parking lot as well as the walkway? I'd want the whole cost if I were the contractor.

You look at the total cost of this project, it's approximately 10 billion, 5 billion for construction plus the cost of money, and then we move on to mitigation, and there's a mitigation study coming out that's going to show billions of dollars in mitigation. So you're not working with the operations -- to summarize, you don't have the right operations, the right emplacements, don't have the right numbers being publicized for the public, so they haven't got the foggiest about the real traffic. That's going to come from Du Pont, Enumclaw, Black Diamond and Maltby are the main sources of fill, with the possible exception that they could come from Maury Island, but they need a strip mine, first. Right now they're allowing strip mining in Des Moines as an exception to the permit. I'm assuming that's going to get challenged legally. I think I'm probably done timewise.

Thank you very much.

MR. DRISCOLL: Thank you. Ben Stark and then that will be followed by Debi Des Marais?

MR. STARK: My name is Ben Stark. I live at

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1310 South 230th Street in Des Moines.

I own three pieces of property in Des Moines which will be impacted by this third runway if it is built. I also own a piece of property in Seatac that is zoned for apartments, directly west of the proposed runway. If it's built it would eliminate on my property alone about 100 apartment -- potential for about a 100-unit apartment. My neighbors and I together on our properties have had it zoned for up to 600 units of apartments. These will not be built, probably, if the runway is built. Maybe we can get them built before the runway. Anyway, I am concerned about housing and the impact on housing in south King County and south Seattle.

I have been in the real estate business all my life, and yet I haven't been able to read a copy of the SEIS, it hasn't been available. I don't see that it makes any sense when thousands and thousands of people live in this area and the SEIS has not been available for them to see. It hasn't been at our library in Des Moines. How can we come in here and comment on it? It's just not possible. I do expect to be able to get ahold of it somehow and read it and send in a written comment, but I would like to request that the comment period being extended for at least an

additional 60 days to May 31st, 1997 at a minimum.

Thank you.

MR. DRISCOLL: Debi Des Marais and then followed by Trina Torgelson.

MS. DES MARAIS: I'm Debbie Des Marais. I'm the president of the CASE organization and our mailing address is 19900 Fourth Southwest in Normandy Park and I'd like to have five minutes because of the organization.

MR. DRISCOLL: That would be fine.

MS. DES MARAIS: All right. Somebody mentioned that this was a 10 billion dollar project. I'd like to talk about the numbers that have been circulated. 455 million dollars is just for the cost of fill and the cost of pavement. To build this runway we need an infrastructure, we need a new terminal to accommodate all the increased passengers, we need expanded cargo facilities, we need relocation of line maintenance facilities, we need new freeways, new roadways, we need improvements to existing recognize roadways, they need to be widened, we need new parking. By the time you get down to it, it's a 4.3 billion dollar project now with another billion added for cost overruns to the entire project, not just the 455 million dollar runway project. That doesn't

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include 4.7 billion worth of mitigation costs and losses to the local cities that will be impacted. It doesn't include any costs for insulating the schools or taking care of the upgrades to the schools and putting in air conditioning like Chicago got when they sued and they won.

It also doesn't include existing losses that people have given up on the value of their properties. Some areas like Normandy Park are averaging $50,000 per home. What that works out to is over 15 billion dollars of existinging losses to the surrounding cities that has not been compensated or mitigated from the first and second runways since they were put in. If we're going to have 600 to 700 thousand operations per year what we need is removal of most of the homes out around the airport for at least a two-mile radius and then put the noise remedy program beyond that on all four sides because that's what Atlanta did when they got 700,000 annual aircraft operations. The SEIS didn't use terminal aircraft numbers but shows an arbitrary lower number for no apparent reason. The forecasts fluctuate for no reason. They go up and they go down, depending on what year. The only way to really -- it seems like is to just wait and see.

We want to be insulated -- the people want to

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be insulated under the new flight tracks and the people that are going to be in the runway protection zone should be removed. The draft EIS said they will remove many of those people in that hazardous area if they tell us they want to be removed. The final EIS said "We didn't hear from anybody, so I don't think we're going to take anybody out." Now SEIS says it will be considered now in the FAR 150 update. Those people have to be removed because it's a federal regulation that they're in a hazardous area. It's where airplane crashes happen.

We want a good, credible, objective noise and air pollution modeling exercise which shows real life contours for all of the air pollution added all together in all the areas around the airport. We want noise modeling that does the same thing, that uses actual monitoring data to validate the modeling. We want to know what are the safety problems with a third runway. We want to know what the 21 percent possible incursion rate on the ground is in the air once Boeing Field has 400,000 to 600,000 annual operations per year, Sea-Tac has 600,000 operations per year and Renton has 200 or more thousand operations per year making our crowded air space in the Puget Sound region the most busiest in the entire world, since O'Hare is

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the busiest now and it has only a million and we'll be up to 1.5.

We want costs of the school insulation to be added to the project costs even if the Port remains unwilling to pay. We want to know how long and how much it will take to clean up all the hazardous waste sites at the airport. We want real mitigation that uses worst case predictions, not the wishful thinking fantasy predictions. We want to know how the third runway will ruin our cities and how it will be paid for and how it will be mitigated.

We want our children to grow up in peace so we want to know how long this fight is going to go on. We want to know how you're going to mitigate airplane pollution. When you get more airplanes you can't mitigate it by reducing the pollution levels arbitrarily each time you add more airplanes, it doesn't make any sense, it's not reality, it's fantasy again.

We want to know why the Port can dump hazardous waste into our streams without getting fined each time they do it. We can't do it, why can they do it? We had 3,600 parts per million of glycol in Miller Creek which is a salmon-bearing creek. Canada has a standard of no more than 100 parts per million that

they are working on developing right now. We're thousands of times over that limit. A worm can't even live in there. We want to know why the Port can leave maybe a thousand buried oil septic tanks in the north parking lot area that are full or half full and not have to drain or remove them. We would, why don't they have to?

I want to know why there are less cars on the road when all of the predictions for vehicle miles traveled and single passenger autos in the future are going to continue to increase so much that they predict that pollution reduction milestones will be completely lost. I want know why those are disappearing, why the air pollution is disappearing, why the noise is disappearing when we can smell it, we can hear it and we know it's all getting worse.

(Applause.)

MR. DRISCOLL: Trina Torgelson?

MS. TORGELSON: Good afternoon, my name is Trina Torgelson and I'm the executive director of Air Washington, a statewide coalition of business, labor and government in support of adequate air capacity at Sea-Tac.

First we're glad that the Port and the FAA have responded in the SEIS to the revised forecast of

increased forecast and operations growth. The revised forecast emphasizes how important this is in our economic Washington. Our message over the last eight years hasn't changed very much. Air capacity is absolutely critical to our economy, and expansion at Sea-Tac is the most environmentally responsible and cost effective solution to the foreseeable future. In fact --

(Boo's from the audience.)

MR. DRISCOLL: Excuse me. At the outset I said I wanted behavior from the audience to be similar to that you would expect if you were in the witness chair and I still expect that so I want the same courtesies you've shown others.

A. In fact, the revised forecasts and rosy economic picture only underscore the need for our region to move ahead with the runway, terminal improvements and additional parking facilities without further delay. We are pleased that the SEIS co-sponsored by the Port and FAA concludes that the impacts of expansion at Sea-Tac can continue to be effectively mitigated. We urge you to move ahead with the improvements to Sea-Tac, the options have been thoroughly studied.

Thank you very much.

MR. DRISCOLL: Kitty Milne?

MS. MILNE: I'm Kitty Milne. I'm a council member from the City of Burien. I reside at 11913-27th Place Southwest, Burien, 98146.

First of all, I'd like to object to the unavailability and sufficient copies of the SEIS before this hearing. I would also like to second the previous comments of all my peers and citizens who have come to protest this outrageous project.

However, I'm not surprised that we're here again today, the truth will be known. It will rise up to the top, you can't keep it down. The truths in the ACC response to the first EIS are proved to be correct. The Port duped our communities in the draft EIS, the final EIS, and is trying to do so in the supplemental EIS. It is time for the Port to stop playing games, accept the truth and get on with finding a responsible solution.

One of the most important truths is that federal funding for airport expansion is drying up even though the Port promised the federal government was not only willing but able to help fund this project. There still is no money today. In fact, President Clinton's proposing that the budget for airport expansion be cut by 30 percent in 1998 and transportation officials say

that their top priority is to fund expansion of smaller, regional airports, which are better able to meet ongoing transportation needs.

The Port continues to have us believe that doubling our air traffic will not have dire consequences to the health, environment and economic well-being of our communities. A recent study by the Washington State Trade and Economic Development done by the City of Burien put preliminary mitigation at over 3.8 billion. Your supplemental EIS doesn't even address this let alone mention schools, which is an extremely important part of our mitigation.

I repeat again, the truth will be heard, and when it is it will seek justice, no, demand justice. We expect to see you all here again. You who turn aside from hearing the truth and wander off into myths and man-made functions, truth and justice will win out, trust me.

MR. DRISCOLL: Shirley Basarab?

MS. BROWN: I am speaking for Burien council member Shirley Basarab. She gave up her position so I would be allowed to finish. First I'd like to mention process --

MR. DRISCOLL: You may introduce yourself again.

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MS. BROWN: Arlene Brown, 239 Southwest 189th Place, Seattle, Washington, 98166.

And first I'd like to start with process. With regard to the expert panel back last spring they basically found that the Port had not complied with the mitigation that they were supposed to, and as you read their technical report, which I did, it was very clear that they had found that the noise modeling was not credible. The SEIS still has not truly addressed the issues that have been raised by the expert panel. They do briefly mention them but they haven't addressed the legal issues. Neither have they addressed the Congressional testimony that went on also last spring. We had an air transportation expert as well as an economist that both testified before Congress and raised many, many issues with regard to the -- basically we're going to have a negative return on investment with this, and that actually this could actually decrease the overall capacity for Sea-Tac because this runway is only 8000 feet from the existing runway, which means it is dependent, it shares the same air space not only with the existing runways but also with Boeing Field.

The SEIS just mentions that this testimony was given, it does not give an adequate summary of

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those. I have excerpts from that meeting and I don't know why those aren't in the appendix in the SEIS but when I submit my formal comments of course I will include those.

I'd also like to comment on the PSRC public forum that is mentioned in the SEIS. It was a public forum, sort of. As soon as the forum was over they took -- the PSRC took their vote and as they voted the members said, well, my city council directed me to vote this way so that's why I'm voting this way. So we never had a chance to speak to the people who were actually voting because they weren't present, they just sent their representatives.

I'd also like to speak with regard to the process of this meeting in the "Forum," which is the newsletter that goes out. It said that this was a tentatively scheduled meeting and to call a particular number to see if it was for sure. As of seven o'clock this morning that number still has no message on it. I don't know if it does now but I certainly know as of 7, and I tried it off and on every few days since I got that newsletter.

Now I'd like to go back to the costs again, because that's really one of the main reasons that I became involved with all this. I'm an aerospace

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manager and engineer and I care deeply about the health of the aerospace industry. I also get to talk with CEO's of airlines that use Sea-Tac so I truly do care. I am not here because of noise, I am here because I care about our health and our industry. The mitigation costs that people have been quoting of 3.3 billion in the Burien mitigation study, I believe when that comes out shortly you'll find that number has jumped up. You will also find that it has a lot of exceptions and qualifiers and that it really only covers a tiny, tiny portion and in no way does it cover all the costs.

No one has even looked at the construction costs much less the mitigation costs. Somebody already alluded to the seismic anomalies. There's two seismic anomalies on the third runway area. That dirt must be removed and it must be replaced. No one knows how much has to be removed. So obviously no one knows how much it's going to cost to remove it and cost to replace it. Likewise, the SEIS and FEIS admit that the land that it is there, the fill, has some contamination in it and it says that the contaminated fill numbers are included in the total number of cubic yards that it's saying is available in the Sea-Tac Airport area.

I could go on and on with regard to different problems. For instance, in the modeling in table D-2

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in the appendix, it comes out with 7 tons less on the nitrogen oxides for the alternative 3 cases as compared to do-nothing. That makes absolutely no sense whatsoever. Alternative 3 clearly has more planes. Even though they've assumed more planes in alternative 1 that can theoretically fly in and out of Sea-Tac, even if you consider that they've used the wrong number compared to the number that they've used for alternative 3 it still makes no sense.

They have -- something has gone wrong in the model and unfortunately they don't give you all the model printouts so you can't quite figure out how on earth they got their numbers, but you can do ratios and see that it clearly goes over the 100 tons that the Clean Air Act threshold is concerned with.

I'd like to go back to capacity, and sorry about skipping around here, because I'm not sure quite how long it takes and how much I can fit in. Back to the terminal air forecast data out of the FAA. The SEIS was directed by the FAA because they found that the Port numbers were not credible. They were way too low. The Port came in and they only increased the operations by a certain amount and the amount was so little, I believe it's about 68,000, but I don't want to take the time to find that number. They didn't go

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up to the terminal air forecast numbers. There's an appendix in the SEIS and when you look at that appendix it evaluates the new airport estimate plus 10 percent, which is a standard thing you do in engineering, you look at the low, look at the high, look at the most likely scenario. Their 10 percent over the new port is still below FAA estimates. That's how low those estimates are. There's no credibility whatsoever and that drives all other costs.

MR. DRISCOLL: One minute.

MS. BROWN: I'd like to -- I'm trying to figure out how can I get through this message. We have all kinds of costs with regard to the trucks. The double haul trucks are really like having four cars when you're dealing with traffic analysis. So when you hear 218 truck trips going on in an hour if you want to figure out what that's really like to you personally, you need to think of that as an extra 1,000 or 800 cars running around on that street in that same hour. This is a huge number. What the SEIS does is it treats the trucks, when it refers to the percentage of traffic on the street, as if it's just, oh, it's just a 3 percent increase, so what? Well, if you can hardly move on the street and it's a 3 percent increase and it's all double-haul trucks it's awful.

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We had a terrible time this summer. We had five haul trucks in a row and at the most there ever was was one car in between. If we continue to haul at the current rate we did this summer for the runway safety area it will take 50 years to bring all the dirt into Sea-Tac. 50 years. Now obviously they can't live with 50 years, but you're not going to do it in the five years in the construction schedule that's in there right now. You can pretend with a model that you've got 70-miles-an-hour designed highways, which is what's in there right now, but in real life that won't work. The real traffic is there and you can't have everybody stay home for two months while the trucks get to the airport.

Thank you very much.

(Applause.)

MR. DRISCOLL: We are going to take about a ten-minute break to let the stenographer's fingers get awake again and then we'll be back.

(Brief recess.)

MR. DRISCOLL: If you would have a seat we can begin again.

Mr. Matthews, are you ready? After Mr. Matthews I will have Clark Dodge step forward.

MR. MATTHEWS: My name is Pierre Matthews and

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I live at 15929 Maple Wild Avenue Southwest, Burien, Washington.

Well, well, well, here we are again, and I'm sure this isn't the last time that we'll be here. Tonight I'm hear to talk about the weather. Specifically the Port's 44 percent solution. I'm sure that most of you here are aware that the Port touts the fact that the main reason, the most critical reason for the third runway is the inclement weather that requires instant landings 44 percent of the time. That really sounds bad, doesn't it, 44 percent. What does that really mean? 44 percent of 24 hours is 11 of the 24 hours. This means that the Port is implying that for an average of 11 hours a day 365 days a year we have scuzzy weather, perhaps like yesterday, for example.

I'm reminded of the scenario of a classic old motion picture with, say, James Cagney and Pat O'Brien where the person flying the plane is steering it like a truck and he's saying over the radio "I'm out of gas," and he's saying "I can't see anything," and the guy on the ground is on the microphone saying "I can hear you, I can hear you, you're right overhead, turn left."

That it is the kind of scenario that the Port seems to imply about the weather around here. Much of the bad weather occurs between the hours of 10 p.m. and

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6 a.m. When the planes are not supposed to be flying anyway, except for the occasional bandit that wakes me up at 2 a.m. or 4 a.m. So the real weather impact is more like 20 percent instead of the meaningless 44 percent. Perhaps this explains why the Sea-Tac Airport has one of the best on-time records for its size in the country. Is there an oxymoron here somewhere? The real reason the Port wants the third runway is to allow them to add up to 175,000 more flights per year. This means an added flight averaging every two minutes, 16 hours a day, 365 days a year.

Think about that. Also these added flights are biased toward the larger jets rather than commuters which would basically double the number of the big jet flights. Yet the Port claims there would be only a slight increase in noise. That's because they're using the whisper jets, that one at 79 decibels instead of 86. There's an old addage that figures don't lie but that liars can sure figure.

Around 1920 Boeing Field was a dirt runway set in the middle of truck farms way south of the city of Seattle. 30 years later in 1950 Boeing Field had one of the best runways in the country, capable of handling B-52 bombers, yet the Boeing Field terminal was judged difficult to get to, had inadequate parking,

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outmoded baggage handling and was dangerous to the surrounding neighbors, so the powers that be at that time decided to build a new airport way out in the sticks between Seattle and Tacoma. Now it's difficult to get to, has inadequate parking and has an outmoded baggage facilities and is dangerous to the surrounding neighborhoods. Adding a third runway at Sea-Tac is analogous to giving a liver transplant to someone who is dying of heart disease and liver cancer.

Supposedly competition is one of the things that makes this country great, whether it is athletics, business, manufacturing, bigger, better, faster, cheaper. Unfortunately there are those who would subvert this competition to maintain a monopoly such as Sea-Tac Airport. Despite what the PSRC says and the Port says there are several ideas where a contemporary, world-class airport could be built for less than what the Port wants to waste on this facility. Unfortunately greed is a big motivator.

Thank you.

MR. DRISCOLL: Clark Dodge and then Lorraine Miller.

MR. DODGE: Thank you. My name is Clark Dodge, I live at 225 Southwest 171st Street, Normandy Park, Washington, 98166.

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I am the immediate past president of the RCAA, the Regional Commission on Airport Affairs, a former city councilman of Normandy Park and a chair and founder of the Miller Creek Management Coalition, which comprises the cities of Normandy Park, Burien, Des Moines, Seatac, along with King County, Port of Seattle, Trout Unlimited and the sewer districts. And I bring this up for a reason.

We know the area that we live in and we know the area that surrounds Sea-Tac Airport. We have studies of the Miller Creek basin, the Miller Creek itself, Des Moines Creek, the water basins, the water tables. The fish that are in the streams, have been in the streams, past and present, and knowledge and there are several things that the SEIS and the EIS didn't cover. They didn't go into areas like this. They looked at, we feel, a limited number of issues. I think what we need here is to look to the future.

These kinds of issues at Sea-Tac makes the airport a very limited player in the future. The issues here aren't covered as to what kind of an airport do we need for the future, how big is it going to be, are we going to cover the freight issues? Are we going to cover melding all of the things together that Sea-Tac never was, really, and never will be

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simply because it is a limited area and limited square miles?

There are so many things that have been said here that I'm trying to hit the important ones. I guess what I feel is that the Port of Seattle right now isn't covering the issues of how are they going to get the traffic in and out of Sea-Tac Airport. I had the opportunity to ride the people mover that Raytheon is building and how it could move traffic, which would cut down on the number of cars, trucks and buses coming in and out of the airport. It's electric, it's nonpolluting. There's nothing in here to cover these kinds of issues.

You add the increased traffic, the increased air traffic. Even though the engines are getting cleaner, you're still -- there are still more of them, and I think what we need here is an airport of the future and not just a short-term bandaid which we're looking at right here. Let's put this money into something that will serve the next 50 years. Sea-Tac is a good airport, but it's still not the airport of the future. So let's look where we're spending the limited amount of money that may or may not be available.

Thank you.

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MR. DRISCOLL: Thank you.

Lorraine Miller?

MS. MILLER: I signed the wrong sheet.

MR. DRISCOLL: Okay. Alvira Carrier?

MEMBER OF THE AUDIENCE: She wanted to give her time to Arlene Brown.

MR. DRISCOLL: Does anyone else want to give Arlene Brown their time?

(Members of the audience raised their hands.)

MR. DRISCOLL: Go ahead, Ms. Brown. Arlene Brown.

MS. BROWN: Arlene Brown, 239 Southwest 189th Place, Seattle, Washington, 98166.

I wanted to touch on several different items. One is education. In Chicago the lawyer, Cara Gonus (ph) has had some recent court rulings where the schools -- the Court has ruled that the schools need to get insulated down to about 45 dB's. They also set the precedent that instead of using the DNL's noise model that they need to look at the noise with respect to the noise that the children see during the school day and that you need to calculate the noise based on that. The way the noise models currently work the airplanes can go all day long over the schools and then it can be

quiet at night and that can all average out to no noise and no insulation. So one of the things that Chicago, in the court ruling there recognized, is that children are only there during the daytime hours and that you need to look at the noise during that time.

The costs that it would cost to noise insulate even the existing schools that are identified in the noise area won't even come close to all the schools that are impacted. For instance, Mar Vista School should get noise insulation if you look at the Chicago court ruling and if you were to apply that here. So the costs are quite large. Of course, that won't solve the problem in the school yards. Right now you can go in the school yards and you cannot hear. And on the hot days since the schools are not air conditioned you also cannot here.

We have a church that has been insulated to the tune of about $1 million and then the parishioners put in about a million, but you still hear the noise, only along with the airplane noise you have this annoying air conditioner-type noise in the background that's extremely annoying. So you have to realize that even when you come up with the money to insulate the schools there might be a very high background level noise that the children will still have to deal with.

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In order to deal with that noise when you look at the statistics on how far away you can be from the teacher what it's really saying is we should be designing our classroom for 10 or 15 students and not above 30 which they are right now. The Highline School District used to be a huge, very successful district and the existing runway has already taken a very big toll on it.

I'd like to swap subjects a little bit here and I'd like to move to the socioeconomic area which was a real -- really neglected in the SEIS. It tends to rely on the final environmental impact statement rather than doing anything new. It doesn't really go in and recognize the significant number of increased operations with regard to the new port estimates and then more importantly the more realistic FAA TAF estimate. If -- on top of that, if you go in there's a theoretical capacity as determined by the FAA once again, and it's NPIAS, is what it's characterized as, and using that it says that the maximum number of operations at the airport is 600,000. It could be as high as 630,000. At no time does it evaluate what is the impact of 600,000 operations.

That's part of the reason there's so many people upset right now over the second runway. They

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pulled the same thing on the second runway. On the second runway the noise mitigation which they drew those boundaries, it was based on a maximum of approximately 260,000 operations even though the theoretical is 460,000 operations. 460,000 operations was never, ever looked at on any impacts. Now here we are doing it again and we have a third runway with a maximum theoretical operation of 600,000 and we have an SEIS that not once evaluates an impact.

If it wasn't for -- there is a few different charts that are in Chapter 2 and they are exhibits and they are very clear, and there's also some text that accompanies those. It explains how the 600,000 was arrived at by the FAA, it also explains that in the Port's own report back in I believe about '82 they also came to the same number. So even the Port agrees with this number, yet the Port has never evaluated any impacts. What's so important about those numbers is then those translate into all the mitigation costs, so those schools that I'm talking about, there's a lot of schools impacted far more than what the list says.

The noise sensitive list, it's kind of interesting, you know, the way you categorize things. The fact that there's a Kinder Care day-care at the end of the runway that has kindergarten there, they don't

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count, they count the official Highline elementary schools in their noise sensitive things, they don't count the private kindergartens and things likes that. There's also an YMCA there with an open pool. There's a whole assortment of pools that are open-air pools that are not inside. All those are impacted by the pollution, by the noise, there's no cost estimates on any of that stuff.

The real estate value, I am still livid, all the way back to the draft environmental impact statement. At that time I supplied the house sale property, all the house sale data for Normandy Park from 1988 through the time period for the draft environmental impact statement. It clearly shows, I gave all those numbers, I also listed all the Puget Sound multiple listing average home prices, I graphed them all together, I pointed out where the publicity for the third runway started and it shows a clear change in the slope of the line that all of the sudden Normandy Park appreciation slowed dramatically and it no longer continued to follow the Puget Sound multiple listing appreciation value. This data goes all the way back to the 1990s.

The Burien mitigation study and the draft environmental impact statement only went back to '93

and they showed that, yes, indeed, there are some losses. However, if you go back further and start at about '88 so you can see the trend of what things were doing, then there was the third runway publicity, that's when things slowed down dramatically. Now we have a similar problem in existing cities. What this means to Normandy Park today, today, is if you take the sales price that we had over in 1996 and compare them, even though our homes are still appreciating, had they continued to appreciate the same as the Puget Sound multiple listings, each home on the average in Normandy Park would be worth approximately 75,000 more today than they were then. That translates to about 1,000 in real estate tax revenue per home. This is lost opportunity cost. It's not a true lost cost in that the homes never got to see that value 'cause they started depreciating in the early '90s and it's been happening ever since.

So, yes, Normandy Park will still stay as nice-priced homes because it's a waterfront area, because had it has nice parks, parks, I might add that are within 10,000 feet of the runway, which means we're in the wildlife attraction FAA regulation issue, but that's something I'll come to some other time. It's a really, beautiful, gorgeous community, but it doesn't

change the fact that our tax revenues are down from what they used to be and we'd be a much better, even better city than what we are had we not the threat of the third runway.

These are numbers, you know, there is precedent from other airports where people got in and got market price from outside the immediate airport area and got true market. We have to realize that there's the risk of lawsuits. Now I know in the past there have been a handful of homes that have tried to take on the Port and they've lost with regard to home values. But they've never taken on the kind of numbers that they're going to be facing, the number of homes and the amount of value and the amount of people with a high income that they're taking on now.

The Normandy Park average income is over about $75,000. It's not your standard city to take on compared to some of the other cities that have been impacted to date, and the third runway, the SEIS clearly shows that the western portion of the noise quarter is growing and it's getting larger and they even admit that.

Now there's some other problems with the noise things, such as all of the sudden now they're assuming they have a whole -- on the runway that they

have -- what are referred to as intersections and they're taking off and stuff from the intersection rather than the end of runway, so on your modeling they're assuming one thing and then they're saying in the text that the airplanes are actually going to take off in a different manner than what the models are modeling. I know that Debi has been doing some of the modeling on the pollution that goes with that, also, and we can't quite figure out how looking at the width on some of the pollution contours, how we can get those, and I'd have to go back and ask about what are the fleet mix assumptions, because it appears we can't seem to get those kinds of numbers unless we make some really unreasonable fleet mix.

Now I know in the FEIS the only way we could get to those numbers was to assume one of the planes was only flying with one engine and was a DC9, and we know those fly with two, and I don't know if some of the similar things have happened in the SEIS because there wasn't quite as much detail. All of the modeling is suspect. The traffic modeling talks about there are more cars with no third runway, and that doesn't make sense. If we supposedly have all these additional passengers we should have some more cars. Instead we've got I think it's about 1,000 less cars as long as

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we have the third runway. How did we get here?

Oh, I have to do a --

MR. DRISCOLL: Do you want to do that in the next segment?

MS. BROWN: Yeah, I'd like that.

MR. DRISCOLL: We'll call you back for an encore. Sophie Frause?

MS. FRAUSE: I gave her my time.

MR. DRISCOLL: Marliza Meltzer?

MS. MELTZER: Can I pass for a few people? I got thrown out of schedule.

MR. DRISCOLL: Okay. Ryan Corvari?

MR. CORVARI: My name is Ryan Corvari. I'm 15, I've been in Normandy Park for 13 of my years, and I live now at 19458 1st Place Southwest, and not more than exactly an hour ago I was playing on a baseball field outside of Mount Rainier that's directly under the flight path and I can tell you I personally could smell the jet fuel. Not only that but while sitting in classrooms you can hear the jet noise over the teacher. It's as if you've gone deaf and you can only see the teacher's lips moving.

MR. DRISCOLL: What school do you go to?

MR. CORVARI: Mount Rainier. The dampening in the schools just is not great enough. We can still

hear the airplanes. Every two minutes there's at least one flight going over. What else? That's basically all I wanted to say. Sorry about that.

MR. DRISCOLL: Okay. Thank you. Let me make sure that I've credited Ms. Brown with all the witnesses who have given her their time. Alice Bilz, you gave your time to Arlene Brown; is that correct?

MS. BILZ: Yes.

MR. DRISCOLL: Alice Romero?

MS. ROMERO: Yes.

MR. DRISCOLL: Audrey Richter?

MS. RICHTER: Yes, but maybe I would take my time. I'll just take one minute.

MR. DRISCOLL: We're going to have a lot of time to spare so there's plenty of time.

Lorraine Miller?

MS. MILLER: Yes.

MR. DRISCOLL: Alvira Carrier?

MS. CARRIER: Yes.

MR. DRISCOLL: Paul Nuss?

MR. NUSS: Yes.

MR. DRISCOLL: Candy Corvari?

MS. CORVARI: Right.

MR. DRISCOLL: Sophie Frause and Wallace Myers.

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Ms. Richter, do you wish to step forward now?

MS. RICHTER: Okay. I'm Audrey Richter. I live at 711 Southwest 187th in Normandy Park, and I just wanted to take one minute. We're about two miles west of the airport. We smell jet fuel at our home now and we are very worried what would happen if another runway would be a half a mile closer to us. I have the signatures of 50 of my neighbors who smell jet fuel, also. I sent these signatures to Jack Block, who was president of the Port Commission before Page Miller took over, and never received an answer. No recognition of the fact that we smell jet fuel. I have four grandchildren living in the two houses next to me, and two of them have asthma, and this is a great concern for us, as any doctor will tell you, how the asthma rates have increased recently because of pollution in the air. And this is our big concern, those of us who live west of the airport, the jet fuel odor that we are presently getting without the third runway.

MR. DRISCOLL: Thank you. I just want to remind everyone that you can submit written comments by March 31st, 1997. They should be submitted to Dennis Ossenkop, Federal Aviation Administration, and his

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address is on the sheet at the desk there, so if you do not testify today or you have not had the opportunity to look at the Supplemental Environmental Impact Statement you can still do so and have it submitted by March 31st, 1997, but make sure if you do so that you get the right address and take one of those fliers.

Marliza Meltzer is now ready?

MS. MELTZER: Yes.

My name is Marliza Meltzer and I live at 1905 South 103rd Street, Seattle, 98168.

Just to start off, there was an article yesterday, I believe, day before, Saturday's paper, something like that in the Highline News about FAA said that they'd had only one complaint ever about fuel dumping, and I can tell you that I have called the Port. Actually I only called them once to complain about fuel dumping and was told that I was wrong, there is no fuel dumping because fuel dumping is illegal and they don't do it, period, and that's -- and I suspect that if I've called about it that other people have as well. In fact, my neighbors were the ones that told me, they have a balcony and they've watched it.

I've been really disappointed about the seeming lack of cooperation. The Port doesn't seem to be willing at all to work with the residents in the

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surrounding communities. You know, the outcry has been tremendous. It's taxpayers' money that pays for a lot of this stuff and it's like you take our money, you slap us in the face. We live here, we were here before -- my neighbors were here before the Port was here and even that aside, assuming the Port is going to overbear us and disregard our pleas by going ahead with the third runway, I don't understand why there's no goodwill, no neighborliness.

The Port, aside from the other obvious things, the school thing, the lack of insulation had been a big deal, and noise and air pollution and all that, but there's a whole lot of other things that this brings about. There will be an increase in transiency, prostitution, crime, traffic. I called the FAA to find out why or if those issues were going to be addressed and I was told that we will do only what Congress tells us we have to do, period.

We are not mitigating those areas and those all affect the communities, everybody, everybody in the whole community. We've got those problems now and they're going to get worse and it's really scary and it's not fair. And I think that the Port should be held accountable for cleaning up whatever messes they make just like I've got to clean up whatever messes I

make, you know? So that's basically it.

There is one more thing. I also had mentioned to the FAA about the black sludge stuff that people have complained about on windowsills and patio furniture and things of that nature, and I mentioned that, too, and I was told that it was checked into and they found that it was simply mold. I can tell you that mold washes off with bleach, mold washes off with disinfectant, and the stuff we got didn't wash off with anything. It had to be sanded off in order to paint. Paint would not adhere to it and it came in from outside.

I was told that it was probably, then, from -- not from the airplanes but from the traffic because there was so much traffic and I says, there you go, whether it's the planes flying over or it's the traffic coming to catch the planes, the source of the problem is the same, it's due to airport traffic, and I know, you know, I fly, too, we all fly, but, gosh, you know, do what the Bay area did, they've got three airports, they've got San Francisco, Oakland, San Jose, kind of in a triangle, people from a lot of areas can get there and it makes a lot of sense, it doesn't throw everything in just one area. That's all.

MR. DRISCOLL: Thank you.

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Is there anyone that I missed other than Ms. Brown that still wants to testify?

A. My name is Shirley Ascerap (ph). I'm on the Burien City Council and I was forced to give up my time so that others could speak. However being given this opportunity, I appreciate it.

I feel that the following information was not adequately addressed in the SEIS. The economic impacts on the schools and the City, the cost of not properly addressing the 3 to 4 billion dollar mitigation costs that we as a community are forced to bear, the south King County residents and their children. When Puget Sound Regional Council chose to endorse the third runway, it was done with a lie. The Port knew at that time that they were not -- they were going to have to do an additional SEIS but did not tell Puget Sound Regional Council. This will not solve the air capacity needs and, in fact, will be obsolete by the time it is finished. Puget Sound Regional Council did not follow it's agreement on either looking at alternatives nor the expert panel's recommendations. The aquifer contamination is not properly addressed in the SEIS.

The SEIS was not available to the public and, in fact, is not yet at the Des Moines Public Library where it is supposed to be available to the public. We

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have given -- been given very, very few days to evaluate a thousand-page document which I feel is totally unreasonable. The third runway will rob our community through partial takings by impacting it with sound and air pollution, making us pay for what the State uses as a regional transportation facility.

The airport estimates have been false in the past, and from what we've heard earlier are, again, not accurate. We have been duped during the second runway, we were duped with the environmental impact statement, and we are again being duped. We ask for true, honest information.

The truck traffic does not properly address or at all address the potential destruction of Southcenter Mall, the City of Burien's business, the City of Normandy Park's business, the City of Auburn's business, because much of the dirt will come from that area, nor the City of Des Moines' businesses. With one truck every second there will be no capacity for our traffic.

The wetlands have not been properly addressed. This public hearing is not open to the public without having to pay for parking, and from what I'm seeing from an outsider, I would suggest that perhaps this airport is being put in merely to maintain

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the power of the five Port Commissioners and prevent it from going out of the county. The air pollution has not measured and is not measuring particulates, which is one of the biggest things that the airport dumps. The dust coming from the construction site will be equivalent to volcanic eruptions. This has not been addressed. The council members at various meetings to both the north and the south have both told me that they are interested in an -- in an international airport of their own.

We are finally being told that, yes, they do dump fuel, it is being admitted, but I think the most important issue of all is the safety issue. Our children are not going to be protected, the air pollution is killing us, the freight will allow things to be imported and exported that we do not want in the area. Parts of airplanes drop from the sky onto our school grounds, but most important is the tremendous influx of people traveling through a single airport will not allow us to protect ourselves from drug imports and other things going in and out of the airport. Not mentioned is the fact that the airport intends to have heavy freight flights.

Thank you.

MR. DRISCOLL: Don Newby?

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MR. NEWBY: My name is Don Newby, I live at 2464 Southwest 150th Street, Burien, Washington, 98166. I'm a member of the Burien City Council. First of all, like President Clinton, I'd like to thank you for inviting me back again.

MR. DRISCOLL: I wasn't here the last time, so...

MR. NEWBY: I understand this is unprecedented in the fact that you go back for a supplemental EIS again.

MEMBER OF THE AUDIENCE: Wait 'til next year.

MR. NEWBY: Yeah, we'll go for an unprecedented third time.

There's a few things I'd like to address with you tonight. First of all is the direct credibility of the organization that we're dealing with, particularly in this supplemental EIS. And what brought us here today was the fact that the priority of a third runway and the capacity requirements in foul weather, and now under this supplemental EIS the priorities are terminals and parking and the delayed construction of a runway. But yet the runway was the pressing need for the last five years, so I'm a little bit dubious of the fact why the priorities have all of the sudden

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changed.

It kind of brings me to the fact, too, of the scope of the Port of Seattle and the fact that if they had not thought of adding a third runway and the auxiliary facilities they were going to need then I kind of challenge the type of project management they're bringing to the party here. Also, if they don't think of sales tax and a few others, contingency fund of only $15 million for a three-plus-billion-dollar project, it concerns me about their management.

Also the fact that in 1992 this runway was proposed to be $229 million. In 1996 it rose to over 400 million dollars, and now we're told with the supplemental EIS we're up to $587 million, and that's for just simply an 8500-foot slab of concrete. They're also very much delinquent in the promises of the second runway. Their insulation program, when you study the statistics of when the commitments were made they did not get involved at all with the insulation project until they made the determination that they wanted the third runway, then they started to designate the insulation project over 10 to 15 years from when the original commitments were made, and you will see charts that accelerate in the mid-'90s the number of

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insulations, but for 15 years previous nothing was done.

Also the fact that after the second runway the cooperation of the school district has been nil. The Highline School District, just for your information, the FAA and the federal government, was one of the top ten school districts in this state 20 years ago. It is now at the bottom of the list in this state and the citizens struggle day in, day out, week in, week out for the children and the education, and this state is very much committed to education, over 50 percent of the state budget goes to education, and we promise every child in this state an education and a good education, and we're not able to deliver on that commitment any more.

Also I'd like to bring to your attention the fact that during the process of clearing the hurdles and the PSRC's vote on this issue information was withheld, information that was available, and I believe it's being recorded with the courts that was available and withheld from the decision-making on the original vote in July from the Puget Sound Regional Council that concerns, number one, the types of operations, the number of operations and so forth.

Also, I believe that the Port has added new

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meaning to Krushchev's statement "We will bury you." They're going to bury us with over 20 million cubic yards of dirt, but yet it's absent as to where this dirt is going to come from, whose roads they're going to travel on, and who they're going to disrupt in an already congested traffic. That's blatant to me. I don't understand how a professional impact statement could ignore that issue alone.

It is also the only place in this nation where that much dirt ever has to be hauled. It also ignores many areas in regards to the affects on the community. Number one, you just heard the health issue of fuel dumping. That to me is unconscionable. I have no problems, I have flown in airplanes many times that had to dump fuel across the Pacific or Atlantic due to engine problems or breaking of antiskid cables, but not over our communities and our homes and our families and our children. It's unconscionable to me. And we have yet to understand, to determine the affects of that health hazard that goes on, but I think the government should at least contribute to the fact to look at the prescription rates around here, the respiratory rates of the people in the flight path. I think you at least owe it to the citizens for that.

Also you don't take into account the hundred

and some odd thousand in increase of operations but no impact on our roads, so I assume those people are never going to leave the 2500 acres here at the Port of Seattle. Also you don't address the fact, and these are all costs to the local communities, health, transportation, the impact of public safety, the cost increase of public safety and, again, mentioned before, the socio and economic effect that occurs with airports. The property values you've heard earlier and you'll continue to hear again, and most of all the education. There's over 17,000 student body in the Highline School District and although some are closer than others all are impacted by this because more resources go to trying to provide the education that's required by us by state law to furnish those who are closest, so it keeps pulling the resources from everybody.

And, again, the Port of Seattle's own noise appointed panel said they had not done enough. Also you overlooked the effect of the environmental at Miller Creek and Salmon Creek, creeks that used to run with salmon for years are being affected, and the Port is going to take ten years of environment and move it to Green River Valley. I assume I'm going to get to charge mileage to go and enjoy my ten acres now.

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I would like you to enter the fact that the impact studies from the City of Burien will be done. It is the first time in this nation that a thorough understanding of impact of a siting of a regional or national facility of significance on or near an urban center will be done and I think it will surprise many people. The people here are not too surprised, we've been paying that cost for years.

Also I'd like to bring to the attention the fact that there doesn't seem to be very many available of this impact study, the SEIS. I understand it's been delivered to a library or two but I would like for a 3 and a half billion dollar project that we could find the printing cost to make a more equitable distribution of this impact statement to more people.

Also I'd like to say that the Port could learn something probably from State Farm whose -- I think their motto is "Since we're neighbors, let's be friends." The Port has never taken an attitude of friends with the local community whatsoever and have been known to stand against everything that we stand for, which is quality of life, education and health. Instead they seem to take and paraphrase the AT&T slogan, "Reach out and take something." They take our land, they take our schools, they take our house

values, and they specifically take our quality of life and with no retribution -- or in return of receiving nothing. So that's what I'd like. I specifically would like to see the SEIS more available to the population.

MR. DRISCOLL: That will be recorded.

MR. NEWBY: And without them having to pay the $120 per copy.

Thank you.

MR. DRISCOLL: Okay. Ms. Brown?

MS. BROWN: Arlene Brown addressing endangered species.

The Sierra Club has made a resolution against the third runway, and that's because there are so many environmental concerns. I'd like to indicate that, for instance, SEIS page 1-11 indicates raptors are not nesting on the west side but it neglects to mention the nesting bald eagles on the east side. Now, elsewhere you can find them if you go off -- that was something that one citizen fought real hard, because in the draft EIS it started out with the eagles at Des Moines Marina aren't flying at the airport so there are no eagles, and needless to say that got a lot of people upset so we finally in the FEIS got them to admit that there's a bald eagle on Angle Lake, they still don't with the

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Normandy Park ones, but at least we got one now nesting.

And this is the kind of thing you go through, and yet when you go and look in the document it might recognize in the FEIS but somehow it misses it in the part of the SEIS. It's just like the glycol that someone was talking about earlier. Even when you find mistakes and you fight your way through and get it corrected it might only get corrected in a piece of the thing. That's just like the 26.4 million cubic yards of dirt, this number that appears in very, very few places, I think only one or two places in the entire SEIS, yet it's such a critical number but it keeps getting forgotten, and the lower number keeps showing up everywhere which isn't the real number, and that's how you figure out how many trucks.

Back to the eagles. According to this it's 274 acres of forest, grassland and wetlands potentially suitable for bald eagle perch and foraging habitat would be permanently lost. That was a quote out of the EIS. We have bald eagles there, they're nesting, it also admits to the hawks, the blue heron, several other things, and yet no endangered species permits are required. There's a hole somewhere. It's just like the Mining Act that I mentioned earlier.

The Mining Act, if you go over a few acres you're supposed to have a strip mining permit if you're going to hurt more than a few acres. We've got hundreds of acres that are being used by endangered and threatened species and we're not going to require a strip mining permit and we're not going to require an endangered species permit. That doesn't make sense. If we were somewhere else maybe you could get away with that but, you know, we have a history which the SEIS glosses over incredibly with regard to legal and -- appeals that are going on.

We have cities that are taxing themselves in order to go to the court over this. This isn't just a few citizens that are objecting to this. We have whole cities. In fact, the cities became cities just to fight the third runway. The only reason Burien exists today is because they announced the third runway was going to start up so Burien became a city to fight it and Burien has taxes going in just like the other cities. Seatac became a city and Federal Way also became a city. Des Moines was the only one that was here when we started this battle for the third runway.

We have a lot of committed citizens to this cause, and, yet, when you read the SEIS that doesn't come through. The SEIS also does not mention Ray

Akers; he has a suit. They found that the flight manual had changed, which normally requires an environmental impact statement when you change the path of the airplanes, and yet one has not been done. And that's been another one of the open issues because it turns out that that impacts, the noise modeling, because the planes aren't really flying where the noise models assume.

There's also some old reports that indicate by using some satellite data that the planes are not actually operating like the models assume. All this kind of stuff, I don't find this in the SEIS. If you read through the Puget Sound Regional Council minutes, and there was a lot of testimony submitted last spring in support of those meetings and you can find, you know, quite a bit of this stuff, so I guess I'm wondering if perhaps the SEIS really needs to go back and review all the PSRC correspondence. It's been extremely confusing trying to figure out who you're supposed to send comments to for different things because it's changed over the course of time.

The draft environmental impact statement, the Corp of Engineers was intricately involved and now they're not any more. The FAA has been the common thread, but during one of the comment periods we sent

our comments in to the Port of Seattle, they didn't go directly to the FAA, which was -- and that was on the FEIS, so it's been very confusing with the changing rolls to people.

I wanted to mention -- different people have mentioned the dirt and the dust, and "we will bury you," I thought that was cute. If you were to take all the dirt -- minus what you're going to need for the soft soil and the contaminated soil, we're not including that yet, just the 26.4 million cubic yards, and you were to stack it on a football field it would be higher than Mount Rainier if you start at sea level. This is a great deal of dirt. And I think talking to the haulers, they say usually you'd use about a $12 per cubic yard cost on something like that. You won't find that number in any kind of the Port estimates, so my question would be, how can you truly justify the low cost per cubic yard in your estimates to date? The rail and barge stuff all has to be worked out. There's no way that that cost estimate has any credibility.

I'd like to point out that Albuquerque, New Mexico had a similar situation, and when they were faced with hauling this kind of dirt, not as much as us, they said absolutely no way and moved immediately

on to looking at other alternatives. What's really interesting reading in their impact statement is that they looked at an 8,500-foot runway but totally dismissed it because there's so few airplanes that can use it. It turns out that's so short that all the big jets can't go on it, and the FEIS and the SEIS both admit that and they list about five different names of big jets that can't use it. But once again, you don't seem to hear that.

People keep thinking it's a full-time runway. We're talking a part-time, short runway for little planes, and what the problem with the SEIS is, it gets real confused between extending an existing runway base 600 feet versus this short 8,500-foot runway. For instance, on page 2-18, item B, it's talking about how wonderful it is because it's going to provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim, blah, blah, blah. The problem is that's really referring to the 600-foot length extension on the existing runway. This statement is totally 100 percent false with respect to the 8,500-foot runway.

What happens is they keep lumping the two together and putting all the advantages on the same

page, and people who are not aerospace-type people read it and think this is the whole -- this is referring to the third runway. It's not, it's referring to the 600-foot extension. I'd like to say that the Port of Seattle does understand the difference, they understand about an 8-foot separation, they understand what an 8,500 foot runway means it's obvious because in the SEIS they mention in the year 2000 they wanted a master plan update, they want us to go through this all over again.

They also mention about eliminating the cargo areas and expanding the airport northwards. What's really interesting is supposedly the rationale of why we were supposed to do the third runway here was because the cargo facilities were already here and we didn't want to move the cargo facilities. Well, now they're talking about in the year 2000 getting rid of them anyway, so it doesn't make sense. It's only presenting the minimum amount of data, it's not full disclosure. There are too many things that are known that aren't going in the SEIS that belong in the SEIS.

On the same day that they voted in the third runway there was a vote saying that they needed an alternative airport. That kind of stuff is not showing up in this SEIS so it's giving a very distorted

picture. It's just like if you look at the scales on the figures you'll notice that, yeah, sure, whenever it's a picture of the airport itself it will show a scale of, you know, 1 inch is 1 mile, that sort of thing. When you go to the haul truck maps that show its way down in Du Pont, I didn't even know where that was, that's way south of the Tacoma, I'd never heard of the place, and you know there's not one of those maps that has a scale on it on the SEIS or in the FEIS. So if you're not familiar with this area, if you're out in Washington, D.C. and doing a quick look you have no idea what kind of miles we're talking about on those haul trucks because it dismisses -- it talks about, oh, we have all these sites and then you start reading and you find out that a whole bunch of the dots on the maps that are supposed to indicate sites, if you read the texts they say those sites are unacceptable. There's only seven of those that are even being considered and one of those seven doesn't even have a permit. It needs a strip mining permit before it can be considered. But even all that you can still say seven because they still have a shot at a strip mining permit.

That's the kind of manipulation of data that goes on through this whole SEIS, and also you have to

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read it from cover to cover because what happens is there will be a piece of data that you need if you're doing pollution and it's off in noise or it's off in construction. Like the pollution, all the construction pollution is in the construction area, none of it is in the pollution, and when you're reading the pollution you can easily overlook it. It's just like there's no landslide problems, but in the FEIS the Miller Creek, the water part talks about the landslides. Well, they responded to my comment on that one in the SEIS and they said, well, they're only landslide scars so we don't have to worry about landslides. Well, if there's scars that doesn't make sense of why it doesn't have a landslide rating essentially since there were some other King County reports and maps that indicated that that was a landslide area.

Which brings us to the retaining wall. The retaining wall is over three times the standard height for a retaining wall, yet there was virtually no discussion of the engineering difficulties, the engineering risks, or whether or not they can even design it. Whether or not you can come up with enough geotechnical materials that you could put into that wall that won't destroy our aquifer at the same time is not discussed.

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You can't just go hold back all that dirt and have the slope that they're look at on that retaining wall because the problem is Highway 509 kind of gets in the way, so we have some risks. If that wall fails we're going to bury Burien. Who is going to pay for that? Is that going to have to be some federal disaster money or is the airport going to pick up the price? Who is going to pay? Just like right now I know one of the persons in the SEIS they wrote in about the floods and all the water that's on that land in the recent flooding that we've had. And there's no answer back, it's just ignored.

The increased flooding already just from the existing safety project appears to have increased the flooding in the areas on the west side of the airport, yet it has been totally dismissed. They're only adding about a few more -- it's maybe a few percent more in terms of flood storage and it's just not enough. They're going off on a 100-year rule and we've had at least five of those in the last five years. It's totally inadequate. So you can go on and on on this thing. It's pick a subject, it doesn't matter, you can pick endangered species, you can pick wetlands, you can pick engineering, construction, feasibility, cost analysis, homes, it's not just noise. If this was just

noise it would make sense, but you have to ask, it's unusual that a project like this has been delayed this long and you have to ask yourself why and why so many people are against it.

MR. DRISCOLL: Thank you. Okay, is there anyone else in the room who wants to testify that has not and I will give them a chance? Is there anyone who has testified who would like to testify with some additional testimony? Yes, ma'am.

MS. CLARK: Thank you, again. I am Rose Clark, 16856 Des Moines Memorial Drive.

Listening to Ms. Brown brought some problems to mind that I had looked at before but we've looked at so many things I had forgotten them. The flooding she mentioned immediately west of the airport, the homes in that area right alongside where the water is are not in the buy-out area. The wetlands are being flooded by the airport, the homes will be flooded by the airport. There is no mention of those homes.

She also mentioned problems with the aquifer. Two problems can occur here with the aquifer with the weight of that dirt. One of those problems can be earthquakes, and this is a hazardous area already. There is scientific proof, I cannot think of the word right off, I think it's isostasy,

i-s-o-s-t-a-s-y, I think, is a problem where the amount of weight that you're putting on an area can cause it to mash down. You're on a seismic plate here. It will cause another area of that plate to rise. When that happens, the earth doesn't stand still, it doesn't stand still under the airport, and it doesn't stand still under Puget Sound.

The other problem here with that fill, if it does not cause earthquakes that have been projected to cause Mount Rainier to erupt, it can cause a squeezing together of the little crevices and all under where the water is, and cause total collapse, and you can have a wonderful thing like the hill where the airport is collapsing, and when it collapses it takes a lot of territory with it.

These are things that are not addressed, and a good geological survey with the help of seismic engineers that I mentioned before would validate this. And for the sake of the whole Puget Sound region, not just the 5 areas that are in the -- five cities around here, the whole Puget Sound is at risk, so they need to address this.

MR. DRISCOLL: Thank you. Is there anyone else who would like to give additional testimony? Okay. Derek.

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MR. BROWN: Derek Brown.

I don't have anything prepared so I might get goofed up, but just bear with me. When I was listening to my mom and also the lady that went after her, it brought back some memories of about like two years ago there was a heavy rain and our basement got flooded and when I was out -- we were dumping stuff out that was all wet, and then I noticed this hole that was on the side of our carport and then it was full of water so then I just took a shovel and dumped it all out and then I came out again and it was full. Then I took our hose and put one end in the hole and the other down a hill so it would be on a slope and I just stood there holding the other end of the hose for like five minutes and the water would keep on coming and coming and coming and coming and it wasn't even still raining. So -- beautiful day, water that kept on coming and coming and coming and coming, and I'm running out of breath before I can continue, but -- and then when I did it the second time, I think it was like two or three months ago, it kept on coming and I ended up running two hoses through there to see if it would get over quicker, but it actually took longer for it to get done and I'm like, what the?

And then so I'm doing it and I was walking

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home and a few days ago, then I walked home and I saw that puddle full again and I'm like, oh, no, and then I walked in and luckily there was just a little crack outside our basement door and it got water. Then I soaked it up with a towel and it stayed dry, luckily, so apparently something didn't get goofed up or hopefully it blocked it, but then if that is the case -- and before when we moved in, it was fine, we went through worse snows, worse hail, worse rain, and nothing happened, and then when my mom kept coming home with stuff about the third runway, as she so often does now, it was just -- and then after a while something clicked in my head and could these be connected? And at first when she didn't have anything on the third runway, because when anything is going on, she's probably into it, so, that's another story, but...

And then she was taking home this stuff and then I'm wondering that I got more in-depth to it and I got hooked on it and after a year later that's when the second flood happened, and I used two hoses and I was just standing there, standing there, and so on. And when I was doing that it just got real boring and it just -- and after that happened I started getting into it. And then when I went to a few meetings, which I have before, I attended a few meetings, and then the

landslide -- then I was told about the landslides, plus the flooding and then when we you know -- and Debi, another person in CASE and -- my mom works with her, we had a meeting, and I attended it.

And Debi brought over her coffee maker and she forgot her coffee maker and we had to bring it over because her husband gets cranky if they don't have coffee in the morning, and we brought it over to her and as we were walking by I could see the -- there were -- it was dark but I could still see clearly because the moon was bright and there wasn't any clouds, and along the side of the road I could see a very clear-cut edged road, and then as we took a bend about halfway up the hill I saw instead of three feet -- in where it started getting straight instead of a clear cut road there started to be dirt on the side, and there was more and there was more and there was more, until it came out to about one-quarter of the street was covered with dirt. And then I looked up and then I saw this hill that progressively got steeper and then I was wondering what was going on, but then it gradually went away, so I thought must have been a truck ran into it and something fell out or something clipped it. But then we were still going along another bend and we're going straight up the hill --

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MR. DRISCOLL: You're bringing the coffee maker back; right?

MR. BROWN: Yeah, the coffee maker is still in the car. And then we saw another bend, and only this time it was further out in the road and I'm like, what is going on here? And when we brought it back mom was talking about a third runway and then that just stayed in my head for about two nights, and then I went in with her when she was typing on the computer about different stuff on the third runway and I said about -- and then she had a title that was "Landslides Happening" and I'm thinking -- I knew it was related to the third runway, because it always is, so...

So then I thought third runway, landslides, Debi and mom both working against the third runway and it seemed like they were each links of a chain and it welded them together and it all fits. So it's like it's all into melding because the third runway is being put in so it's taking away dirt from the area, which is making the ground worse, which is letting the water run through, which is flooding our homes, or at least my home, I know that much, and then -- and later on you'll get to or back to the dirt and the dirt taking away is making the ground soft because there's hollow underneath it. And when there's nothing to support it,

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what do you expect, it falls, gravity works, and the way gravity was pulling was across the road, and so there's dirt halfway across the road.

And we're going back and then we see this car coming back and I thought it was part of the road that had been eaten away, and as we went over I saw this dirt trail lying -- the car has a trail of dirt and I looked down again because there was still some part that had been run over but we hadn't passed it yet and I could see the road through it so the dirt had actually covered the road instead of road being pulled away, so there's dirt underneath it.

MR. DRISCOLL: How do you think she feels? So you want the environmental impact statement to consider the landslide issue, too, is that correct?

MR. BROWN: Along with the flooding.

MR. DRISCOLL: Okay.

MR. BROWN: And as she so mentioned, like, in I think it was third grade that I was -- we were doing landscaping and we made these clay models and I made mine solid out of this clay that I made and other people made a netting and put the clay over it and another person had it hollow, and when they set theirs down -- and after a while the thing just started to crumble and fall. The one with the net kind of just

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fell in between the holes and mine stayed solid, and with this strip mining, I guess that's what it's called, when they're taking the dirt out of the ground, in this case, anyway, when they're taking the dirt out of the ground and they're making a hole, they weren't putting up beams, which would be the netting, so it was like the guy's hollow one that fell. And eventually that might happen or that is happening in landslides in which she so mentioned and may cause an earthquake because the pressures are changing.

MR. DRISCOLL: Okay. Thank you. Let's take a short, ten-minute recess.

(Brief recess.)

MR. DRISCOLL: Okay. It's 7:20 P.M. and I'm going to open the record up again for anybody who still might want to testify if there's anyone in the audience. Anybody want to testify?

MR. CARPENTER: My name is James Carpenter, address is 16463 6th Avenue Southwest, Seattle. This is a location about a mile west of the airport.

And I just picked up this draft Supplemental Environmental Impact Statement as I came in the door about 20 minutes ago, so I won't claim to be an expert on the document. However, I did look here on page 3-4, where new alternatives, new airport alternatives are

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discussed, and I think this is a very important issue over all. The subject here is defined as development of the new airport, either a replacement or a supplementary airport. The thrust of all the previous things I have seen concerning the third runway is that this current airport will be sufficient no matter what is done only for a very limited number of years. And I haven't found it in here but I assume this is still current.

Now glancing through it again I see that the number of years which it will be adequate, no matter what the improvements are, seems to be decreasing every one of these -- here one on page 2-4 which shows that the usage is going up much more rapidly than predicted, which would indicate that whatever this date was when the facility is no longer adequate will be approaching much more rapidly than expected. What are we doing in the meantime? We are putting billions of dollars into this facility which is acknowledged to be inadequate, never will be adequate, and any constraints against continued improvement will become more and more difficult as time goes by, so it seems that the comment that we're going to need another airport sometime is still valid, much more valid than it was, and that invalidates some of the comments on page 3-4.

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You know, number one, there is no sponsor, identified source of funds or an acceptable site for a new airport. There isn't going to be any sponsor unless it is a will on the part of the public officials to develop a new airport rather than spending money here at Sea-Tac. If there's not an acceptable site now, it's not going to be any easier to find an acceptable site 120 years from now. This is the best time to look for this new site and to develop it.

Identified source of funds goes right back to the same thing as the sponsor. If it's desired to do it, it will get done; if it isn't, as long as the official word is not to do it, it won't get done. So I'm saying let's have the will and the desire on the part of all the public bodies to do the right thing, to develop the new airport now, not to continue to develop these massive documents which only prove that we shouldn't be putting money into Sea-Tac.

I won't debate item number 2 concerning the Puget Sound Regional Council process. I think other people have covered that more than adequately. I'm afraid the answer was created before the process was started. The item 3 seems to reiterate number 1, it says there's no sponsor. Of course there isn't a sponsor because the official line is to work on

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Sea-Tac, and number 4, it says if a supplemental airport site could be identified market forces would not enable it to successfully compete with Sea-Tac. Of course it wouldn't. That's why communities have developed new airports, have put them into use, they don't force them to compete with the old airport.

This happened in Dallas, it happened in Denver, so one has to put one's whole resource into development of the airport and its use if a decision is made, so I am urging that this decision be made now and not later. This is the best time to do it.

Thank you.

MR. DRISCOLL: Thank you.

Is there anyone else who wants to testify? Mr. Dodge, did you want to testify again?

MR. DODGE: For the record, my name is Clark Dodge and I'm at 225 Southwest 171st, Normandy Park, 98166, and some testimony that was taken earlier reminded me of a friend of mine who is a builder of custom homes in the greater Puget Sound area was talking to a State appraiser who informed him that his homes built in the Normandy Park area at 450 to 500,000 each, if they were built in the Bellevue-Redmond area would be worth $750,000 plus. And the reason was is that with the airport and this being an industrial area

it devalued his homes, and I just wanted to get that on the record, because the comments that were made earlier, that is an issue. I think the impact on homeowners and the area is very important.

And another issue that several people asked me if I would comment on, being chair of the Miller Creek Management Coalition, we did a walk-through of the Miller Creek basin, we've also planted fish and are looking at restoring wetlands and streams, but at the north of the lake in the immediate area of Lake Blue and the retention pond area you can take a pole of 14 to 20 feet long, and I watched one of the guys do this, and just pushed it down into the area at the north end all the way down to where his hand was in the water with no restriction at all, which means that the peat bog and the peat areas around that are of great concern. And how far are we going to have to go down and how much is going to have to be removed before you get solid enough ground to fill? And it doesn't appear that even that area has been addressed in the amount of dirt that it will take, so I wanted to add those two, for the record.

Thank you.

MR. DRISCOLL: Thank you. Okay. Kevin James?

MR. JAMES: Could I have one minute?

MR. DRISCOLL: Sure. We can go off the record for a while.

(Brief recess.)

MR. DRISCOLL: Mr. James, are you ready?

MR. JAMES: Sure.

MR. DRISCOLL: Okay.

MR. JAMES: My names is Kevin James, and I'm a council member with the City of Burien, 415 Southwest 150th Street, Burien, 98166.

My understanding is we're welcome to provide written comments in addition to this.

MR. DRISCOLL: Right. They have to be in by March 31st, but there's a flier there and the name of the person is on there.

MR. JAMES: Perfect, I'll keep my comments real brief and submit the written ones, also.

MR. DRISCOLL: Okay.

MR. JAMES: While I am encouraged that there was a Supplemental Environmental Impact Statement I feel that it still fails to adequately address the full mitigation of the communities that are impacted by it. While there's no doubt that it's an economic development generator but the benefits and the drawbacks are not evenly distributed, and I did not see

in that document where progress has been made toward identifying the true cost of mitigation as well as the true items of mitigation. There's more here than just noise and that's still not there. I have some concerns about the traffic generation counts that are shown as trips, including the local shuttles and things like that, and that doesn't appear to be an accurate measure of the actual use of the airport as far as where the arriving and departing passengers are actually headed to. That is a more significant identifier than just how many trips due to hotel shuttles and things like that.

In closing I feel that this statement still does not even begin to identify the full impacts to the surrounding communities, and quite honestly doesn't begin to start to explain how you shoehorn in the third runway into a fully-developed urban area.

So thank you for the opportunity.

MR. DRISCOLL: Thank you.

(Brief recess.)

MR. DRISCOLL: Is there anybody else who wants to give final testimony? Okay, hearing none, then, this hearing will be in adjournment.

(Hearing adjourned at 7:55 P.M.)

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C E R T I F I C A T E

I, TONI L. CHRISTY, RPR, do hereby certify that the foregoing proceedings were stenographically reported by me and that this transcript was prepared by me and is a true, complete, and accurate transcription of same to the best of my ability.

Signed this 10th day of March 1997.

Notary Public in and for the State of Washington, residing at Seattle. Commission expires January 21, 2000. CCR CHRISTL408NM

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9TH DISTRICT, WASHINGTON

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March 20, 1997

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Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, WA 98033-4056

Dear Mr. Ossenkop:

I am writing to you to comment on the Port of Seattle/Federal Aviation Administration Draft Supplemental Environmental Impact Statement (SEIS) for the third runway at SeaTac International Airport. There are many problems surrounding the SEIS. As a Representative for the communities affected, I feel it necessary to list some of my concerns. I hope that you will take these into consideration when evaluating the SEIS.

On March 17, 1997, the U.S. Department of Transportation denied a request for a 45-day extension on the comment period on the SEIS. This action concerns me because the communities most affected by potential construction did not have adequate time or access to the SEIS and therefore, did not have the time necessary to prepare comments. Copies of this study were to be released to the public libraries in order to give everyone the opportunity to review the document. Many libraries did not receive the study until the day of the first, and only, public hearing. Only sixteen copies were provided, which did not provide adequate time for the 200,000 potentially affected people to review the SEIS. Furthermore, while I appreciate the decision to have the SEIS available to copy, the $120.00 cost made it impossible for many to unitize this service.

Aside from the inadequate comment time, the most troubling aspect of the SEIS is the lack of depth in the analysis of the impact the project will have on the surrounding communities. The SEIS is based on the supposition that airline traffic would increase whether the third runway was built or not, therefore, the SEIS assumes that the project construction would have no additional impact on the environment and on the surrounding communities. Nothing could be more untrue.

For example, the mining and transport of 26 million cubic yards of dirt to fill the foundation of the runway will put 1,269 additional vehicles on local roads during peak hours. This traffic will significantly affect the lives of area citizens. Another example is that the SEIS neglects to explore the third runway's impact on air and water quality. Specifically, the SEIS fails to fully examine the impact of the run-off from the project into local waterways; many of which contain critical habitat. Furthermore, the SEIS overlooks how affected wetlands will be replaced in accordance with the local regulations.

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In addition to overlooking the impact of construction, the SEIS fails to take growth management into account. Growth management regulations require the Port of Seattle to coordinate plans with local governments and adhere to local land use laws. The new runway would allow the airport to service twice as many passengers. Increased traffic to and from the airport would require additional parking and roadway expansion. The SEIS assumes these efforts would take place, but commitments have not been made.

Overall, the massive impact of a new runway to the surrounding areas should not be ignored. While the SEIS addresses some of the problems, it fails to fully explore the extent the third runway will have on the lives of Washington state residents.

Sincerely,

Adam Smith
Member of Congress

- G-96 -

March 31, 1997

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Mr. Dennis Ossenkop
FAA Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, WA 98055-4056

Comments Regarding the Draft Supplemental Environmental Impact Statement (SEIS)

Referring to comments and their responses in the final EIS was very difficult to follow. The two were printed in entirely different sections and since responses were lumped together, it was almost impossible to know if individual comments were given adequate consideration and treatment. In the final SEIS, please refer to the numbers and letters I use now and in the section where the questions are reprinted, could you also include the responses side-by-side and make a notation in any places in the text of the FSEIS where comments were incorporated into the final analysis and where that can be found. Also, please include in the responses to comments the following consideration:

> "Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response." NEPA §1503.4(5)

1. (a)The FAA should consider alternatives to the expansion which have not been previously considered such as GPS (see NEPA §1503.4(2)). Paine Field is being used by Horizon. (b) Is there any reason why the air transportation in the region cannot be spread throughout the region? (c) Moses Lake, has a modern facility, 350 VFR days per year, one of the longest runways in the country, and over one million square feet of available hangar space, it makes no sense at all that Sea-Tac needs to expand, extend a runway to be 1500 feet shorter than Moses Lake's and add a maintenance facility that will be only a fraction of the size. (d) It is completely unnecessary and public money can be better spent on necessary things such as light rail and transportation links to alternative sites such as Moses Lake.

2. (a)The new FAA TAF should have been used for all the SEIS analyses rather than the lower numbers chosen by the Port of Seattle, especially considering the high number of aircraft operations per year that are possible with three runways plus technology (800,000 +) and possibly three runways without technology. (b) Why did the SeaTac Communities Plan say that 260,000 annual operations was capacity for Sea-Tac? (c) If that figure is now known to be inaccurate, what changed?

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3. (a) Why did the draft EIS make us believe that Sea-Tac could handle 525,000 annual operations when the SEIS now admits that no more than 460,000 is capacity? (b) What is the real actual capacity of Sea-Tac with a third runway? (c) How many total operations can there be with a third runway and technology combined?

4. (a) How can a parking lot and warehouses be built on City of Seattle Water Department Wellhead Protection area?

5. (a) How can the third runway new flight tracks be drawn without any noise insulation plan for the new corridor? (b) What kind of a degree turn will the large aircraft have to make to reach the old flight corridor noise abatement line when taking off from the third runway and at the south end, for instance, approximately what cross street and at what nautical mile will the turn be completed to reach the old corridor? (c) How far is this from the turn at 3,000 feet? (d) If aircraft cannot make it to the old corridor in time or if they will conflict with other aircraft already in the old corridor when taking off from the third runway, will noise mitigation measures be implemented for the new corridor? (e) If so, how far west will this extend? (f) Why has no plan been discussed so far? (g) There will obviously be more noise further west into neighborhoods should the third runway be build. (h) Why hasn't the FAA and/or Port of Seattle done anything to alert the public that the new corridor will not receive noise abatement? (i) Does the Port still maintain that noise is being reduced even though Stage II aircraft operations are still on the rise and the Expert Noise Panel did not agree with this assumption and in fact, indicated that noise will continue to rise?

Section 5-2 Air Quality Summary Section Chapter 1

6. (a) Does the SIP consider all airport area sources such as the 26,000 tons per year of CO from local automobile trips? (b) If not, why not? (c) If so, why does the SIP inventory on page 5-2-4 only seem to include aircraft and airport sources at 5,880 and not the local surface street automobile traffic? (d) Why does the SIP go down in the maintenance plan to 4,442 in the future when there are absolutely no controls for aircraft and airport point sources included in the maintenance plan?. (e) If this scenario includes only airport sources such as aircraft which are a significant contributor to CO in the sources category of EDMS, then why does the SIP go down at all considering that no controls of aircraft emissions are being implemented by or in the SIP and a reduction would reflect mostly automobile improvements for which tons per year of total roadway sources at 20,000 plus are not even reflected in this SIP number?

7. (a) Page 1-9 Summary says that CO AAQS violations will occur but the FAA does not believe they are subject to a general or transportation conformity determination even though this projects impacts can be controlled and are in the jurisdiction of the federal agency or within its control. (b) Why does FAA believe they are exempt from conformity when Clean Air Act NAAQS violations are predicted?

5-1 Surface Traffic Analysis Summary Chapter 1 page 1-8

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8. (a) Why are there 1,000 less vehicles in the future "with project" scenario compared to the "do-nothing"? (b) It doesn't make sense to me that the parking garage expansion at the airport will draw less surface traffic volumes in the future than the do-nothing, especially since in the do-nothing scenario, there may be no new parking expansion at the airport itself and the fewer cars in the with project ignores the trends of more VMT and SPA in the future, not less? (c) Could you explain why the Hotel will not draw additional traffic over the do-nothing in the future? (d) Could you explain why the North Unit Terminal and a significant increase in passengers in the future will draw 1,000 less cars over the do-nothing? (e) Can you explain why 1,000 less cars will go toward 509/South Access in the with-project over the do-nothing considering this road will or may be built regardless of the runway? (f) Can you explain why SASA will not draw 1,000 more cars, not less, if it is built in the with-project scenario considering SASA was supposed to create 9,000 direct and indirect jobs? (g) Could you also explain how 1,000 of the missing cars in 2010 will use the relocated parking at 154th since it cannot be built on the protected City of Seattle Wellfield?

9. (a) The SEIS admits that more people will be exposed to noise in 2010 over 2000. (b)What will be done about this additional noise and square mile area considering the present noise abatement area is based upon year 2000 peak noise?

10. (a) Why does number of people exposed to noise of 65 DNL and greater in 2000 decrease in 2005?

5-4 Construction

11. (a) Hasn't borrow area one been discussed as a business park or recreational area in the past? (b) With increases in the borrow quantities from this site, could the FSEIS outline how much fill might need to be added to the site to construct a business park or ball field and other recreational and business developments and who would be responsible for filling in the holes? (c) What will the area look like once all this fill is excavated? Who will be responsible for beautification? (d) What kind of a berm will be left once borrow 1 is excavated? (e) Will the project require a mining permit? (f) Why or why not? (g) Since borrow area 1 is located in the City of Des Moines and is under the jurisdictional authority of Des Moines for land use designations, how does the Port plan to turn the area into a mine?

12. (a) Which route will trucks use to transport fill to the airport from this area since no streets within the fenced area are now contiguous? (b) If the trucks go down 24th Avenue South, where will they turn to head west toward the runway site? (c) Since the borrow demand on area 1 has increased, what will the hauling be like within the City of Des Moines as compared to other local jurisdictions? (d) During the comment period on the draft EIS, I asked what was meant by the site survey description of the area of borrow #1 as gently sloping toward the west in comparison to the EIS's account of the mounds that could be leveled. I never received a response to this concern. (e) I wonder now whether

the mounds are the entire hill above Wesley? (f) Especially since borrow area #1 demand has been significantly increased and the previous description of the demand would have devastated the area and left 40 foot cuts. (g) How will this type of excavation impact the Des Moines Creek which is to the north and downslope from these cuts? (h) Will there be greater flows and possible flooding? (i) How will these cuts impact Wesley facilities since they are also downhill? (j) Will the Port provide flood insurance?

5-6 Land Use Impacts

13. (a) Will Sea-Tac Occupational Skills Center be relocated since the increase in noise of 4.41 DNL in 2010 is significantly higher than the 1.5 DNL allowed? (b) Will OSC be a noncompatible land use or not? (c) When will this decision be made? (d) If OSC becomes a noncompatible land use, what will be the cost of relocating this facility? (e) Who will pay and how?

(f) I notice that on page 1-13, 14, the Port mentions considering (possibly for purchase) homes in the Approach Transitional Zone during the current FAR 150 Update. The DEIS had one obscure paragraph asking residents living within this zone to respond if they wished to be relocated. (g) The FEIS also had one paragraph explaining that these people did not respond to the draft and therefore probably would not be relocated. (h) I find it appalling that the FAA would use such an unprofessional approach to what should be a federal relocation requirement for the transitional zone, formerly known as the extended clear or safety zone, formerly known as the crash zone. (i)Why should a safety issue be up to the public to interpret and implement? This does not make any sense. (j) If it is a hazardous zone to live in, then the people should be relocated regardless of their own particular desire since their understanding of aviation safety procedures and requirements is limited and the FAA's public notification process was obscure to say the least.

C-98-1

Safety

14. (a) What will be the potential for in the air incursion or incidents if Boeing Field and Renton expand and increase operations along with Sea-Tac?

15. (a) What is meant by a lag in Boeing Field aircraft traffic?

Chapter 2

Purpose and Need

16. Page 2-1 indicates that poor weather "occurs 44% of the year." (a) What does this mean? (b) Is 44% of the year almost half the time? (c) Didn't an expert dispute this large figure? (d) FAA delay figures published last year covering 1995 operations had Sea-Tac rated one of the best airports in the country for on-time performance. (e) How many aircraft are anticipated to not use Sea-Tac due to the 44% bad weather? (f) Since the third runway cannot alleviate poor weather, what will be the constraints on the airport during

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all this poor weather when aircraft operations are significantly higher in the near future? (g) Is it a good idea to put a new, very expensive runway in an area with such a poor weather factor? (h) Moses Lake Airport has 350 VFR days per year. (i) Wouldn't it be a better idea to expand Moses Lake Airport rather than invest more money in Sea-Tac with all the poor weather?

17. (a) Why did the Port chose to use the lower operations numbers rather than FAA TAF? (b)Are the Port figures indicative of worst case as an environmental analysis requires?

18. (a) How will future delay with capacity constraints compare to the delays of crossing two active runways in the with-project scenario?

19. (a) What is the federally imposed rule at JFK that caps peak hour activity? (Page 2-8)

20. (a) Page 2-10 discusses the wake vortex and says the 82.5 operations per hour (41.25 takeoffs and the same in landings) would be reduced by 2% due to a newly enacted rule. (b) Could you explain how one large aircraft takeoff every 22 seconds can occur at O'Hare with this kind of rule in place? (c) How will this affect Sea-Tac if separation is reduced?

Construction

21. (a) Page 5-4-39 BMP for hauling activities lists a large number of mitigation requirements for keeping roadways clear, etc. "...the contractor shall remove all debris cluttering the surfaces of such roadways. Trucks and equipment shall have all accumulated dirt, mud, rocks, and debris removed before accessing the site and when leaving the work area. Loads shall be struck flush and secured to prohibit loss of material. If spillage occurs, such roadways shall be swept clean immediately after such spillage to allow for safe operation of vehicles as determined by the Port of Seattle." This list appears to contain a far greater mitigation plan than that used for the runway safety area this past summer and fall. (b) Since the runway safety area (RSA) project is such a small percentage of the entire third runway project dirt requirements (1.7%) I wonder whether these mitigation efforts will actually be carried through since almost none of these were utilized during the RSA project. Dirt height in the haulers exceeded the top of the beds and were not covered, roads were coated with dust and debris, trucks were not cleaned before entering and departing the construction area, etc. (c) If the small scale project is any indication of reality BMP's, the runway construction will be a mess.

22. (a) How will construction noise, combined with aircraft noise and other noise impacts associated with construction, i.e., digging, dumping, hauling, compacting, washing, spraying, vacuum sweeping, street sweeping, etc., affect the environment? (b) People? (c) Animals?

23. (a) Will sedimentation controls be effective considering the RSA has eroded? (b) How will Des Moines Way, 509 and other major roadways be affected once Miller and Des Moines Creeks are relocated and wetlands removed? (c) I am wondering whether it was the RSA's small amount of dirt in comparison to the 3rd runway need that recently caused Miller Creek to divert from its normal course and damage First Avenue South?

24. (a) Map on page 5-4-43 shows an on-site material source at area five and eight, both of which cannot be utilized according to the FEIS. Borrow area 8 has numerous wetlands and borrow area 5 is the City of Seattle wellhead protection area. (b) Why does the SEIS continue to show these two areas as potential material borrow sources?

25. (a) Will on-site soil have to be cleaned of debris? (b) Why or why not? (c) How much high quality fill must be placed? (d) How much soft soil must be removed before any fill can go into the area? (e) What are the seismic anomalies in the area? (f) How will these be handled in the construction plan? (f) Has any engineering plan been approved for the constructed aquifer? (g) Is this aquifer plan still being considered? (h) What kind of slope will the third runway have? (i) How tall in the highest spot? (j) How will this be retained? If at all?

26. On page 5-4-45 a drainage swale is depicted. (a) Where will this drain lead to? (b) Is this a bioswale or ditch with grass? (c) What is the purpose of this ditch at the bottom of the slope of the new runway safety area? (d) Is it to capture fuel, oil, grease and runoff?

27. (a) What kind of slope will be at the west side of the third runway? (b) What is standard? (c) Height?

V. Transportation Improvement Projects

28. (a) Which projects on page C-1-21 are federally funded, supported and/or approved? (b) Has the International Boulevard Project Phase I, II received Federal Transit Authority or Federal Highway Administration, or ISTEA funding, support or approval? (c) Was there any federal support involved whatsoever in any of the planned roadway improvements on pages C-1-21-C-2-23? (d) Please identify all sources of funding used by City of SeaTac for each roadway imrprovement listed along with total costs referenced on pages C-1-21, 25? (e) How many of these road projects are needed due to POS expansion plans? (f) Has the POS committed or provided any funding to these projects? (g) If so, identify the sources of the POS monies and the dates when approved by the Port of Seattle Commission? (h) Has FAA given any monies to these projects? If so, when and how identified? (i) Were any of these projects included in the regional TIP? (j) If so, when PSRC performed modeling, did they identify any exceedances of the NAAQS for CO and therefore, mitigation? (j) Did the lead agency (SeaTac City, WSDOT, FHWA, FTA, and etc., perform a project and site specific transportation conformity analysis? (k) Why or why not? (l) If so, what were the results? (m) If any project receives approval, support and/or funding from any federal agency (or state agency according to the state conformity rule) for any project that does not conform to

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the transportation or general conformity provisions of the Clean Air Act, what recourse do local jurisdictions or private citizens have to appeal or challenge these projects and the decisions that supported them?

VI. Future Conditions

29. (a) As mentioned previously in my comments on the draft EIS and during the conformity comment period, I made mention of the need to perform a more detailed air quality, surface water, parking, traffic, land use, stream relocation, wetland impact, and etc., analysis for the SASA site. The SEIS lists SASA on page C-1-32 as a "base maintenance facility" which is somewhat in conflict with other sections of the draft, final and SEIS which discuss SASA as a relocation of existing airport maintenance. (a) Please specify what increase in aircraft maintenance activity, if any, will be accommodated by SASA? (b) In the FSEIS, could you outline the commitments to mitigation that ***will be made*** for SASA which were only discussed in a cursory manner in the SASA FEIS? For instance, a hush house is included in the narrative on page C-1-32 of the SEIS. However, the SASA FEIS used the words "could" and "might" when discussing constructing a hush-house. The SASA FEIS made no commitment to constructing such a thing and never thoroughly evaluated the feasibility, cost or timing, among others, of constructing one. (c) Will a hush house be constructed or not? (d) When in relationship to SASA build? (e) Additionally, the SASA FEIS proposed the relocation of Des Moines Creek and a mitigation plan which would study the effects of the process over the course of due time. Again, this analysis was only superficial and no real detailed specific process of this type of mitigation has been presented to the public thus far. The same situation exists for air quality modeling analysis which was not performed in the SASA analysis, the conformity review and analysis, parking and traffic impacts, need for a new IWS, the federally required 4(f) Lands Evaluation, the knowledge of a nearby endangered species habitat, cumulative impacts to wetlands and mitigation plans, etc. (f) When will these items be evaluated? (g) Could FAA issue a SASA Addendum or SEIS or include these missing evaluations and their cumulative impacts in the final Supplemental Environmental Impact Statement for the third runway proposal? (h) Is the SASA FEIS still current enough to be used or should a new draft EIS be issued?

30. (a) I have not seen any detailed analysis of the east runway extension by 600 feet. I assume this 600 feet (to 12,500) will need a 500 foot runway safety area and blast pad extension as the existing 11,900 foot runway required to be up to current specifications. The amount of fill needed for the runway safety area is only one half or less that of the runway extension project. The runway safety area required a mitigated DNS, but should have had an EIS since wetlands were filled, Tyee Golf Course was impacted, local roadways were affected, surface traffic congestion increased significantly, especially during rush hour, haul truck mitigation was inadequate, i.e., trucks were not covered, streets were not cleaned regularly, dust looked like giant explosions from the street, etc. The runway extension should be evaluated in the SEIS and the FSEIS. (b) Why has it not yet been evaluated in any environmental impact statement? (c) When will it be evaluated?

C-99

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(d) What will the evaluation include? (e) For example, will there be a multiple project impact analysis for surface traffic congestion and air quality impacts which considers all project construction, timing and mitigation? (f) If not, why not?

Sincerely,

Debi L. DesMarais

Debi L. DesMarais, President
C.A.S.E.
19900 4th Avenue Southwest
Normandy Park, WA 98166

- G-100 -

35

March 23, 1997

To: Mr. Dennis Ossenkop, FAA

From: Stan Scarvie
204 South 206th Street
Des Moines, WA 98198
824-5235

Subject: Sea-Tac Supplemental Environmental Impact Statement

The Lowering of the FAA Projections is Irresponsible
A couple of years ago, at an open house held by the Port of Seattle at Tyee High School, I had a conversation with Terry Finn from the Port's Public Relations office concerning projected operations. He indicated that all aircraft operation projections have historically been wrong. He indicated that these projections had always been low.

In light of this historical trend of future operations being underestimated, it was totally irresponsible of the Port to lower the FAA projection of 528,200 for 2010. It appears that this is an intentional misrepresentation by the Port of Seattle which is intended to *obstruct* the search for any other airport site until all the suitable airport locations in the region are unavailable. It is apparent that this action has more to do with preservation of the *monopoly* that the Port of Seattle has in aviation in this region than it has to do with solving regional transportation problems.

The Projection for 2000 Indicates a Significant Decrease in Aviation Growth
The actual operations at Sea-Tac grew from 339,500 in 1993 to 395,000 in 1996. This is an increase of 16% during those four years. The projected operations for the four years from 1997 through 2000 is projected to be only 4%, 395,000 to 409,000. With the massive growth of passenger traffic predicted by the Port, how can such a significant decrease in the growth in operations be projected?

In addition, the growth for the first decade of the next century is only 16%. It will take 10 years to have the same percentage of growth as has happened in just 4 years! Is this reasonable, or is the Port manipulating numbers just to make this runway appear feasible when they are fully aware that it is not?

If the Port is "cooking the books" with the intent to mislead the public and other agencies, that would come perilously close to a conspiracy. We have already seen that the agencies involved in this project have no respect for *due process*. However, the consequences of intentionally assembling and disseminating misinformation to deceive the public could have criminal consequences as well as civil penalties for those involved.

Thank you for considering my comments on the SEIS.

Stanley M. Scarvie

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REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 25 1997
ANM-610

JOAN E. COX
11922 30th S. W.
Seattle Washington 98146

March 23, 1997

Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Ave. S.W.
Renton WA 98055-4056

RE: Draft SEIS Hearing

Mr. Ossenkop,

I attended the March 4, 1997 public hearing on the SEIS for the SEATAC third runway expansion. I PROTEST THE HOUR. 4 to 8 p.m. is the rush hour. The area round the airport is seriousl;y congested. THE LOCATION of the auditorium was difficult to find with no directional signs to lead interested parties to it. Parking is exceedingly difficult and expensive. There were no PORT COMMISSIONERS in attendance. If my memory serves me correctly, we the public elected them. Are they not accountable to the electorate?
The hearing examiner was a poor substitute though very courteous.

The SEIS was later than promised. In fact, the sixteen copies were not in local libraries until Feb. 28, just a few days before the hearing. 'For those who were able to obtain a copy, it was DIFFICULT to read and understand. It was very technical and poorly ORGANIZED following no logical format. The 45 day review is INSUFFICIENT TIME when data is not available and the public meeting was inaccessible.

I strongly suggest all of the above facts are ROADBLOCKS designed to circumvent the purpose of a public hearing. ADDITIONAL HEARINGS AT MORE CONVENIENT LOCATIONS IN A VARIETY OF COMMUMITIES IMPACTED BY THE AIRPORT AND AT TIMES OTHER THAN RUSH HOUR SHOULD BE HELD!

Thank you,
Joan E. Cox

cc: Rep. Karen Kaiser, Rep, Rod Blalock, Sen. Julia Patterson
Mr. Mark Stiles, Highline Times, Mr. Ken Reid, A.C.C.

G-101

March 23, 1997

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Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, Wa. 98033-4056

Dear Mr. Ossenkop,

My wife and I have spent hours at the Burien County Library this week trying to read and understand the Draft Supplemental Environmental Impact Statement for the Third Runway project at Sea-Tac Airport. I hope you have received protests about the unfairness of the hearing and comment process. The documents appeared in libraries with too little time for citizens to read and comment orally at the hearing March 4 or respond in writing by March 31. The White Center County Library does not have a copy to this day, and White Center is an area which would be heavily impacted by airport expansion. The Burien Library received their one copy just a week before the hearing at the airport.

Only strongly motivated people found it possible to attend the hearing March 4th. Parking is expensive at the Airport and no one knew ahead of time that parking tickets could be validated. (We parked illegally at Sea-Tac Denny's.) It's hard for us to believe that F.A.A and Port of Seattle officials really want to hear citizen opinions on the S.E.I.S.

The document itself is so disorganized and complicated that an ordinary person gets only an impression of one more wheel of a giant freight train rolling over us. The tables comparing "with project" and "do nothing" often show such similar conclusions that we suspect worst case figures were used for "do nothing" and best case figures were used for "with project". If we didn't know better, we'd get the impression that a 3rd Runway would do little harm to the 170,000 residents of this densely populated airport area and, in fact, would be economically beneficial to us!

The acid test is: would well-informed F.A.A. or Port officials sink their life savings into a home and yard in Burien or Des Moines and send their children to Highline schools?

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Page 2

We need a system of one or more satellite airports to serve the region rather than any more expansion at Sea-Tac. The costs of building a runway over tons of fill dirt are so huge and the short-term benefits to the region so small that a cost-benefit analysis should abort this project.

For one thing, Paine Field should be put into commercial operation increasingly. The number of passengers living North and East of Seattle compared to only 6% in the airport cities (Port of Seattle figures) would certainly point to use of Paine Field. Of course, the Port of Seattle would lose the revenues from an airport outside of King County, but the interests of the Northwest region should be paramount. Only the F.A.A. at this point, has the power to ensure this. Even the Washington State Legislature - like the Puget Sound Regional Council - is a political body whose members have to please their constituents, so it's a NIMBY sort of situation where mainly parochial interests are considered.

M C Nordhaus

M.C. Nordhaus
11974 Marine View Drive, S.W.
Seattle, Wa. 98146

- G-102 -

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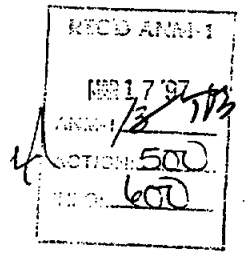
20025 Second Ave. So.
Des Moines, WA 98198
March 7, 1997



Regional Director
Federal Aviation Administration
Northwest Mountain Regional Headquarters
1601 Lind SW
Renton, WA 98055

Subject: SEIS Sea-Tac Airport Master Plan Update

Three major factors point out the need for a reappraisal of the proposed expansion of Seattle-Tacoma Airport.

One, the anticipated passenger growth and the concurrent increased demand for addtional flights requires the expansion of air terminal and parking facilities and construction of a very expensive third runway. This expansion will not meet the needs of the greater Puget Sound metropolitan area within a very few years after completion.

Two, the increased number of passengers will result in increased volume of automobile traffic to and from Seattle-Tacoma Airport and add to the problems of surface traffic congestion thruout the greater Puget Sound area.

Third, the proposed third runway will not be sufficient distance from the other runways to allow simultaneous instrument approaches. At best it will allow an estimated thirty percent increase in arriving aircraft during instrument approach weather.

A much better solution is to make use of Paine Field at Everett to provide a major portion of air service for persons living north of Seattle-Redmond, and to work with the Air Force for joint use of McChord Field for air service to persons in the Tacoma-Olympia area. Other metropolitan areas have been forced to make use of additional airports, for example Los Angeles, San Francisco, New York and Washington D.C.

Use of Paine Field would increase the potential for additional flights arriving during instrument weather by nearly one hundred per cent. Similarly eventual use of McChord Field would provide almost another increase of 70 to 80 percent dependent on the volume of Air Force flights.

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Considering the need for greater flight capacity than the third runway would provide, the negative impact on the surrounding communities from additional noise and air pollution, and the additional road and highway congestion thruout the Puget Sound area from increased use of Seattle-Tacoma Airport, we conclude that our efforts should be redirected to use of other airports in addition to the existing Seattle-Tacoma Airport rather than spending billions on expansion of Seattle-Tacoma Airport.

Your consideration is appreciated.

Fred S. McKnight
Fred S. McKnight

cc: Senator Slade Gorton
Senator Patty Murray
Congressman Adam Smith
State Senator Julia Patterson
State Representative Karen Keiser

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Dear Mr. Dennis Ossenkop

I'm writting you about the Port/FAA SEIS draft.

The SEIS came out late February and did not give people in the communities effected, enough time to review and understand by the March 4 meeting at SeaTac Airport. When you consider the number of communities that will be effected by this project, the public hearing SIT-C was inadequate and the hearing was rushed, Meetings should be rescheduled.

I am a down winder, my wife + I live east of the airport. The air I breath is a concern because we do have to put up with jet exhaust to the point of coughing and taking your breath away. There has not been enough study on the effects to humane lives from the contaminates of jet exhaust.

Thinking of human life brings me to wild life. I often wonder how you move birds, fish, etc when lands 20 miles away and say here it is, doesn't work.

With wild life, clean water for their consumption and ours comes to my mind. The airport SITS right on top of water that

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Supplies This entire area. If The wetlands are moved the water shed is impacted. Changes to water shed not stated.

Construction would be devastating to the surrounding area. The noise, air quality, etc. from Transporting the fill would leave an ever lasting effect on the communities, a mental strain, stress, and a loss. Increase study Area, include: Burien, Des Moines & Normandy Park.

Economic benefits, a majority of the job are in the service sector, can't buy a house on those wages, probably be on public assistance if try to support a family. What's been done to this area in the last 20 yrs. money can't replace. My solution, spread the wealth (that the SEIS implies) around to some of the more depressed areas in the state, like Tenino or Centralia. It would take an awfully brave individual to make a sensible decision like that.

REC'D ANM-610
PLAN, PGM, & CAP
MAR 26 1997
ANM-610

Yours Truly
Ray Overholt
Annette Chomica
4448-S 175th
Seattle WA 98188

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March 24, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, WA 98033-4056

Dear Mr. Ossenkop,

I started out to write some comments about the Supplemental Impact Statement on the 3rd Runway project at Seattle-Tacoma Airport. Since the SEIS is a very overwhelming and disorganized document to read in such a short time, I decided instead to write you a personal letter because I know you are not a faceless bureaucrat but rather, a polite, thoughtful man who looked at our 30 ft. Newport sailboat,"Blue Jeans", in the Duwamish River last summer.

It seems to me that you might be willing to listen to my personal account of what it is like to try to teach in an uninsulated classroom directly under the flight path of jets from Sea-Tac Airport during the last four years of my teaching career from 1990 to 1994. The students and I were interrupted constantly by the roar of jets overhead. A lot of learning time was lost which these children could ill afford. Outside on the playground the littlest ones cringed as the shadow of planes came over them. Even if the buildings were insulated, you couldn't put a bubble over playgrounds and neighborhoods.

The Port of Seattle has never mitigated the effects of the Second Runway built in 1973. They have been unwilling to allow an independent evaluator to estimate the cost of noise insulation for the Highline schools most heavily impacted by jets. The "up to 50 million dollars" offered on a "take it or leave it" basis may be about a third of what is needed to open up, insulate and bring up to code these buildings. The Highline School District was an excellent suburban school district in 1963 when I started teaching there. Now test scores are declining and levies are harder to pass with the erosion of tax base. Families with intelligence and enough money move away and leave poorer, transient residents and the elderly.

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Page 2

There are no political mechanisms in place to force the Port to do anything other than token mitigation for the 3rd runway. The Puget Sound Regional Council told them, mildly, last summer that they ought to do something in the way of mitigation but no consequences were spelled out if they did not. I hope that the F.A.A. is not naive enough to believe that the Port of Seattle will or can come up with the more than 3 billion dollars mitigation money recommended by the recent study commissioned by the Washington State Legislature to make our airport communities whole.

The major thrust of my letter is: if the environmental devastation of a project cannot be adequately mitigated, the project should not be carried forward.

The Puget Sound region needs a system of airports rather than expansion of Seattle-Tacoma Airport in a densely populated area such as this. The human cost, an important part of which is the health and learning of children, is going to be huge if the planned 3rd runway is built. Nothing in the S.E.I.S. contradicts that. Thanks for listening.

Molly Nordhaus

Molly Nordhaus
11974 Marine View Drive, S.W.
Seattle, Wa. 98146

- G-105 -

A. M. Brown
239 SW 189 Place
Seattle, WA 98166
22 March 1997

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ANM-610

To: Federal Aviation Administration (FAA)
NW Mountain Region
1601 Lind Ave SW
Renton WA 98055-4056
Environmental Protection Specialist Dennis Ossenkop, ANM-611

cc: Federal Aviation Administration (FAA)
800 Independence Ave SW
Washington DC 20591
Acting Administrator Barry L. Valentine

Subject : Request for Extension of Sea-Tac Airport SEIS Comment Period

Reference: Draft Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, February 1997.

It is requested that you extend the comment period of the referenced SEIS including the air conformity section until 120 days after the number of copies in the branch libraries is increased to at least three per library. If the number of copies is increased, the libraries will allow them to be checked out instead of limiting their use to two hours during library hours. For those that work full time days, it is extremely difficult to find a time that the documents are available for review. Also, as you know, distribution to library branches was delayed.

It is also requested that you issue a public notice announcing the extension and referencing the multiple corrections that have been issued as of that date (the first one regarding missing key pages D-9 and D-10 as well as the correction that I believe was sent around 17 March 1997).

It is extremely important that the SEIS be reviewed thoroughly. What will over 80,000,000,000 pounds of fill do to the aquifer, creeks, lakes, wetlands, and peat bog, not to mention the adjacent neighborhoods? It's no wonder that Seattle Water Department has taken the position that excavation of borrow site 5 will contaminate our drinking water and have requested a **legal agreement requiring the Port to indemnify "costs** arising from enhanced monitoring activities, spills, contamination, and remediation of groundwater." (SEIS Appendix E).

We didn't think we would need to write letters requesting an extension considering (1) at the Public Hearing testimony it was made very clear that the public needed an extension and (2) groups such as CASE and RCAA were informed that Senator Adam Smith requested an extension shortly after the SEIS was released. Just extending the Air Conformity from March 15 to March 31 is inadequate.

One of my responsibilities at work is to ground airplanes when I believe the structural analysis indicates that it is unsafe to fly. I am not some lunatic that goes around the saying the sky is falling. The engineering in the SEIS is seriously inadequate and I believe some of it borders on being **negligent or fraudulent**. I am convinced that trying to build the Third runway above what is currently 12 Street will be one of the biggest engineering mistakes ever made in the US. Only the Chek Lap Koc airport that is sinking even rates in the same order of magnitude of engineering difficulty. But, at least Chek Lap Koc can accommodate more aircraft and passengers than the **short dependent** runway at Sea-Tac, so at least their project made economic sense.

Sea-Tac needs to be planning a Third and a Fourth runway now if FAA Terminal Air Forecast estimates are realistic and FAA planning guidelines are to be followed. The "logical" location for the Fourth runway is First Avenue, the main road of Burien and Normandy Park that's unstable and has one lane closed until the next dry season! **Why build runways on unstable ground that is hundreds of feet below the existing airport when the airport is "surface transportation limited"** according to the SEIS?

Politics may be able to approve the Third Runway but the inevitable engineering problems, cost overruns and air traffic capacity problems will ultimately become a national **scandal that the aerospace industry can NOT afford**. By extending the SEIS comment period, the environmental agencies can do a more credible analysis of the SEIS and the public will have time to comment constructively with the appropriate substantiating references.

I also recommend the FAA require the Port of Seattle to assess impacts using FAA Terminal Air Forecast (TAF) estimates in a new draft SEIS instead of allowing them to continue using the SEIS "New Port "estimates that are lower than the TAF estimates.

Sincerely,
A. Brown
A. Brown
Pager (206) 654-1533, Home (206) 431-8693

OasExt03.doc

FEBRUARY 26, 1997

KATHLEEN McGINTY
COUNCIL ON ENVIROMENTAL QUALITY
722 JACKSON PL N.W.
WASHINGTON, D.C. 20503

Dear Ms. McGinty,

I am sending you a copy of a letter I wrote to Dennis Ossenkop of the FAA's Northwest Mountain Region, located in Washington State. My concern has to do with the exclusion of a population of people from two Environmental Impact Statements (one EIS, one Supplemental EIS), even though Rainier Valley in Seattle, Washington, is protected by an environmental justice ordinance, E.O. 12898, and even though my community is being negatively impacted by altered flight patterns done without the benefit of an environmental assessment.

For over two years, the FAA has maintained flight patterns were not altered, stating the impact from this 'non-event' is merely a matter of perception. Aside from the simple arrogance of the FAA's assertion, is the troubling awareness of the ease in which a federal agency is allowed to develop policy at the expense of a vulnerable population.

I have contacted Vice President Al Gore, and the Inspector General of the Department of

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Transportation. I have included this correspondence to establish a record of how Environmental Impact Statements are conducted in our area.

Sincerely,
Bethany Woodward
3521 S. Ferdinand
Seattle, WA 98118

cc: Lowell H. Johnson
manager, Airports Division
FAA NW Mountain Region

Elker Moore
US EPA

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Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Avenue Southwest
Renton WA 98055-4056

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 27 1997
ANM-610

Re: Draft Supplemental Environmental Impact Statements Comments

Mr. Ossenkop:

Come on, lets get real- we the people who are the government, are sick and tired of being bulldozed over by a bunch of agencies run by a bunch of airheads. If you are wondering what we are writing about, it's the SEIS and the comment Time period. This statement is a big waste of Taxpayers money Again.

Many important issues are not even mentioned, ie. South Aviation, does not detail the specfic action that would be required to constract a third runway or build new terminals, Conflict of Airspace with Boeing Field, The further destruction of quality of all facets of life around The airport (people, children especially, wild life, plants, our earth, and increasing the size of this destruction area, our creeks, preserving our wetlands, quality of our air):

This document was not even available in time for people to study, and The one and only meeting scheduled at a place and Time making it impossible for the public

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To: attend. This document should be stored on shelves in the fairy Tale department, and you need to lengthen the Comment Period.

Sincerely
Norma Wattum
Bill Wattum

20 March 1997
12301 - 4th Ave. S.
Seattle, WA 98168

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Magnolia Community Club
your community council

3213 WEST WHEELER #136 • SEATTLE, WASHINGTON 98199

March 26, 1997

Mr. D. Ossenkop
FAA Northwest Mountain Region
1601, Lind Avenue S.W.
Renton WA 98055-4056.

Dear Mr. Ossenkop,

The Magnolia Community Club offers the following comments to the Draft Supplemental EIS for the SeaTac 3rd Runway project:

Appendix C-3 (Aircraft noise impacts)
1. We are very concerned about the potential increase in overflights of Magnolia and Discovery Park, including flight tracks within 1 mile of Magnolia. The appendix does not show which tracks would affect Magnolia nor does it show the increase in number of flights that fall in this category. We need to know the expected increase from today's levels, in DNL, SEL and Time-above metrics, over Magnolia with the preferred alternative operations, through 2015.

2. The tables of Comparative Locational Analysis, in the area of King County International Airport (KCIA), do not include the cumulative effect of aviation noise from both SeaTac and KCIA. Based on noise contours for KCIA, prepared by HMMH Inc., new areas of Georgetown and Beacon Hill, including Cleveland High School may well fall inside the 65DNL contour, when combined with the projected SeaTac contours. The problem is further exacerbated by the I-5 freeway noise and the rail corridor noise. This combination effect should be addressed by the Final SEIS.

Appendix C-4 (Surface transportation construction impacts report)
We are concerned about the potential of using Pier 91 as an off-loading location of barged fill dirt for transportation to the SeaTac site as indicated on Exhibit C-4-3 The traffic and noise impact to the neighborhoods of Magnolia and Queen Anne could be significant. We see no reason to truck fill dirt through downtown Seattle when there are numerous barge off-loading piers south of downtown. We recommend deletion of Pier 91, Pier 86 and Pier 69 from the list of potential barge transfer locations.

General
We are concerned that there has been no opportunity for a public meeting on the Draft SEIS in the communities, like Magnolia, that are not adjacent to the airport, yet still significantly affected by the project. There is also concern that we have not been properly informed as to the impact of the project on our community. The draft project plan should include a wide public input, including public meetings and discussion in our community.

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Thank you for the opportunity to review and comment on this Draft SEIS. If you have any questions please feel free to contact me.

Sincerely,

Mike Rees

Mike Rees, Chair, M.C.C. Committee on Aviation Noise.(Ph: 282-1109)

c.c. David Dougherty, President M.C.C.
Larry Phillips, King County Councilmember, 4th District
Georgetown Crime Prevention and Community Council

- G-109 -

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023-FAA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: ECO-088

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1997
ANM-610

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave, S.W.
Renton, Washington 98055-4056

Re: DSEIS for Sea-Tac Master Plan Update

Dear Mr. Ossenkop:

In accordance with our responsibilities under Section 309 of the Clean Air Act (CAA) and the National Environmental Policy Act, the Environmental Protection Agency (EPA) has reviewed the **Draft Supplemental Final Environmental Impact Statement (DSEIS) for Proposed Master Plan Update Development Actions at Seattle-Tacoma (Sea-Tac) International Airport.**

EPA is pleased with the many improvements in the quality of the analysis reflected in the DSEIS. We commend the Federal Aviation Administration (FAA) and the Port of Seattle (POS) for their diligence and responsiveness to the issues and concerns we have raised thus far during the EIS process.

In our letters dated March 18, 1996 and April 19, 1996 to the FAA and POS respectively, we mentioned concerns regarding air traffic noise exposure. We refer you to these letters for more detail about those concerns. We believe that the noise analysis in the DSEIS meets the recommendations set forth in the Federal Interagency Committee on Noise 1992 report (FICON report), an interagency document (EPA, FAA and U.S. Air Force) describing the manner in which noise impacts should be determined in an EIS. Therefore, we have no further comments on noise related impacts from Sea-Tac air traffic. However, for future projects, due to strong public concerns regarding air traffic noise in the Seattle area, we strongly encourage the FAA to revisit the recommendations in the FICON report to look for ways to improve upon the methods of explaining and mitigating air traffic noise impacts.

Based on our review of the air quality conformity analysis in the DSEIS, we have serious reservations with the conclusion that the project conforms to the State Implementation Plan (SIP). The updated draft conformity analysis in the DSEIS provides the basis for the final conformity determination that the FAA will make as part of its decision whether to approve the Airport Layout Plan and any subsequent Federal funding. Should the final conformity

determination significantly differ from the updated draft conformity analysis, it may be necessary for the FAA to allow for additional public comments on that analysis prior to making a decision. In particular, an additional public comment period should be considered if, as discussed in the Conformity Implications section below, the *de minimis* thresholds have been exceeded for carbon monoxide and/or oxides of nitrogen.

The following comments, which are described in greater detail in the enclosure to this letter, discuss our concerns with the emissions inventory and the implications for the conformity determination. EPA utilized the support of Science Applications International Corporation in our review of the conformity analysis.

Emissions Inventory Concerns

The emissions inventory is the basis for any conformity determination. EPA believes that several errors in the emissions inventory bring into question the DSEIS's conclusion that the proposed action fully conforms to the State Implementation Plan. Some of the apparent errors may be explainable in a much more detailed review of model inputs and outputs that form the basis for the emissions inventory. However, due to time constraints and the cost of this type of intensive effort, our comments reflect a more general review of the emissions inventory data in the DSEIS.

G-110-1

The first apparent error is in the use of incorrect MOBILE5A factors to model emissions using the EDMS.

The Emissions and Dispersion Modeling System (EDMS) model is a tool used to calculate all direct and indirect emissions at and around an airport. MOBILE5A is a computer program that estimates emissions factors for motor vehicles (the choice of years in EDMS is limited to 1990, 1995, 2000 or 2010). The EDMS emissions results for the year 2005 found in Figure B, Detailed Operating Emissions Inventory, on page B-9 of the DSEIS used year 2000 MOBILE5A factors for the Do-Nothing scenario, and year 2010 MOBILE5A factors for the Preferred Alternative. In the MOBILE5A model, emission factors decrease in future years as the vehicle fleet is replaced by cleaner vehicles. Since MOBILE5A factors are not consistent for the Do-Nothing and Preferred Alternative scenarios, emissions for the Preferred Alternative are significantly underestimated. If the correct MOBILE5A factors are used (year 2000 for Do-Nothing and Preferred Alternative), CO emissions from the EDMS model exceed the *de minimis* threshold for general conformity in the year 2005.

The second apparent error is found in the calculation of emissions from construction activity during the year 2000, the maximum construction year at the airport.

Non-road vehicle construction emissions were broken into three categories. They include those emissions related to: Earth moving, other construction, and runway material hauling. The "other" construction category should be elaborated upon to include a more detailed description of how these emissions were calculated on an activity-by-activity basis. These "other" construction emissions have not been included in the overall EDMS results in Figure A, Change in Emissions Inventory, on page B-8 of the DSEIS. If these "other" construction emissions are added, it appears that nitrogen oxide (NOx) emissions in the model will exceed the *de minimis* threshold for general conformity in the year 2000.

The third apparent error in the emissions inventory calculations is the underestimation of annual aircraft operation emissions by approximately 9-12% in the years 2000, 2005 and 2010.

The EDMS model is also used to estimate annual aircraft emissions based on the total number of annual aircraft operations. The emissions from aircraft in Figure B on page B-9 appear to be based on 372,988 operations as compared to the 409,000 operations shown on Table C-2-1 on page C-2-4. The emissions should have been calculated from the higher number indicated in the table, but they were not. This error affects emission inventory for both Do-Nothing and Preferred Alternative scenarios, and should be corrected so that more accurate aircraft emissions are presented in the tables.

Traffic Modeling Evaluation

Although time and resource limitations have prevented us from fully evaluating the CAL3QHC modeling runs used to predict ambient impacts of CO at intersections, our initial review of these runs shows that they incorporate the appropriate emissions factors and meteorological inputs. However, we were unable to ascertain whether the congestion levels derived from the Traffix model were accurate. A common theme in the public comments presented in Appendix B, Attachment D is concern regarding the results from the Traffix model. We believe additional information should be provided in the final supplemental EIS that assures that planning assumptions used in the Traffix model are consistent with planning assumptions from the Puget Sound Regional Council, the City of Seatac and other relevant sources. This coordination is an essential step in the overall conformity analysis.

Conformity Implications

The conformity provisions of the CAA mandate that any federal agency proposing a project in a nonattainment or maintenance area for air pollutants must demonstrate that the project conforms to the State Implementation Plan for pollutants of concern. As is noted in the DSEIS, the Sea-Tac International Airport is located in a maintenance area for carbon monoxide and ozone. The conformity provisions state that if the direct and indirect emissions of the Preferred Alternative scenario exceed the direct and indirect emissions of the do-nothing scenario by more than 100 tons per year for either carbon monoxide (CO), volatile organic carbons (VOC's), or NOx, then a more detailed general conformity determination must be made. These 100 tons per year thresholds are also known as the *de minimis* thresholds.

The DSEIS asserts that none of the *de minimis* thresholds have been exceeded. However, as explained above, our review of the emissions inventory indicates that these thresholds have been exceeded in the year 2000 for NOx , and the year 2005 for CO. If a *de minimis* threshold is exceeded for a specific pollutant, then a more detailed analysis for that pollutant must be conducted as described in 40 CFR 93.158. Because each pollutant has different regional or more localized impacts, the type of analysis required differs depending on the pollutant, including the identification of measures to mitigate or offset an expected exceedance. In the case of CO, a modeling analysis of intersections of concern is generally required. In the case of NOx, emissions from the action should be fully offset within the same nonattainment or maintenance area per 40 CFR 93.158 (a)(2).

Conclusion

Overall, the project proponents have done a commendable job of compiling a large amount of data, calculations, and analysis in a comprehensive and thorough manner. A few errors appear to have been made which call into question the validity of the position that the Preferred Alternative would produce air quality impacts that are the same as or less than under Do-Nothing. As a result of these apparent errors in the conformity emissions inventory, our evaluation of the DSEIS indicates that the *de minimis* thresholds for CO and NOx would be exceeded in the years 2005 and 2000, respectively, if the Preferred Alternative is implemented.

If you have further questions regarding our review or regarding the ongoing conformity analysis, please contact me at (206) 553-1234, or Claire Hong and John Bregar of my staff at (206) 553-1813 and (206) 553-1984 respectively. We appreciate your willingness to involve us at this stage in the process.

Sincerely,

Chuck Clarke

Chuck Clarke
Regional Administrator

Enclosure

cc: Doug Brown, Ecology
Paul Carr, Ecology
Barbara Hinkle, Port of Seattle
Mary Vigilante, Synergy Consultants
Dennis McLerran, PSAPCA

Environmental Protection Agency Detailed Comments *Draft Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, February 1997.

General Discussion

The project proponents (the Port of Seattle, the Federal Aviation Administration, and the U.S. Department of Transportation) and their consultants and subconsultants (Landrum & Brown, Inc., Synergy Consultants, Inc, and INCA Engineers, Inc.) have performed extensive documentation and modeling to establish the potential air quality impacts and benefits of the proposed actions associated with the Master Plan Update at Seattle-Tacoma International Airport. Many hours of research, calculation, modeling, and analysis have obviously been expended to create a comprehensive air quality analysis for which all concerned should be commended.

The document preparers took great care to thoroughly address the primary concern expressed by the U.S. EPA, the Washington State Department of Ecology (Ecology), the Puget Sound Air Pollution Control Agency (PSAPCA), the Puget Sound Regional Council (PSRC), concerned organizations, and members of the public, i.e., "What would be the air quality impact associated with the large increase in aircraft operations and vehicle traffic projected by the Master Plan Update?" Prior to addressing this question, the project proponents met with the regulatory agencies to discuss and setup the protocol that would be followed to model the emissions and dispersion impacts produced by the new project-related sources. The result of the discussions led to extensive modeling output from several models, including: the Emissions and Dispersion Modeling System (EDMS), an EPA-approved model developed by the FAA and U.S. Air Force to predict emissions and pollutant dispersion at airports and air bases; the MOBILE5A model, an EPA mobile source emissions program used to determine emission factors for gasoline-fueled and diesel highway motor vehicles; the CAL3QHC model, an EPA-approved model used to predict the concentrations of carbon monoxide (CO) produced by motor vehicle traveling near roadway intersections; and the Traffix model, to determine the traffic forecasts for major roadways.

The comments contained in the sections below represent the major findings resulting from the evaluation of the overall air quality analysis as presented in the document. These comments are divided into two parts: those areas where the document was judged to present acceptable, and in some cases exemplary, analysis; and those areas where there were errors or possibly questionable areas of the analysis which could affect the results.

Commendable Areas of Analysis

Emissions Assessment and Modeling Protocol. The approach used to assess emissions is consistent with EPA guidance on emission inventories, as contained in *Compilation of Air Pollution Emission Factors,* AP-42 (EPA, 1985) and *Procedures for Emission Inventory Preparation* (EPA, 1992). The air quality modeling methodologies are consistent with EPA guidance on air quality modeling, as contained in *Guideline on Air Quality Models (Revised), including Supplements A through D* (EPA, 1994). Further, the protocols were discussed with and agreed to by the EPA, Ecology, PSAPCA, and PSRC prior to implementation.

Meteorological Data and Input Parameters. A selection of input files from each of the air models used (EDMS, MOBILE5A, and CAL3QHC) was examined line-by-line. In general, it was found that the models were correctly set up, and that the choice of input parameters was correct for the situation being modeled (a few exceptions are discussed in the Errors and Questionable Assumptions section below). The choice of meteorological data for screening analysis was 1.0 meter per second wind speed with "E" atmospheric stability conditions (which represents a stable atmosphere with low dispersion of pollution). These conditions typically result in the most conservative (worst-case) air quality impacts. Five years of hourly meteorological data were used for the EDMS refined analysis, as recommended in the *Guideline on Air Quality Models.*

Receptors. Receptor locations chosen to determine the air quality impact of the project in the EDMS and CAL3QHC models appeared to be in appropriate locations and in sufficient density to provide a good estimate of the location and level of maximum impact concentrations.

Sources. With the possible exception of some construction equipment (as noted in the Errors and Questionable Assumptions section below), all direct and indirect emission sources associated with the Master Plan Update seem to have been accounted for in the analysis. The direct sources include aircraft, aircraft ground support equipment, airport-related vehicle traffic on roadways and in parking lots, heating plants, surface coating operations, tank farms, construction equipment, and construction vehicles. Indirect sources are primarily the increased vehicle traffic caused by the growth associated with expansion of airport operations, such as new commercial sites, vendors, and service providers.

Background Concentrations. Background concentrations representing existing ambient pollutant levels contributed by non-airport sources were added to the model results to determine total impact concentrations. In all cases the values used to represent background were reviewed by Ecology. The values appear to be appropriate based on monitoring data available to the FAA during the period of document preparation.

Traffic Conditions. Given the underlying assumption that the level of activity at the airport does not change significantly between the Do-Nothing and the Preferred Alternative, the DSEIS correctly states that the Average Annual Daily Traffic (AADT) does not change significantly between these alternatives. Consequently, the change in traffic forecasts between the Do-Nothing and the Preferred alternative result in traffic increases along some roadways and traffic decreases along other roadways in the study area, but the project area traffic levels are about the same.

In general, the use of the Traffix model was appropriate for this study, and the resulting traffic forecasts for the major roadways appear to be reasonable. A screening-level review of the traffic analysis did not uncover any major flaws that would justify a more detailed review. Based on the limited available information, it can be concluded that the traffic projections for various intersections could vary by ± 10-15% from those presented in the EIS if the assumptions were changed. *Note that changes in traffic projections at intersections would impact the CAL3QHC modeling results for CO hot spots. At this time, we have not determined whether a 10% increase in traffic at some of the intersections would result in exceedances of the CO standard.*

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Errors and Questionable Assumptions

Incorrect MOBILE5A Factors for Year 2005 Preferred Alternative EDMS Modeling. The EDMS model was used to estimate the Do-Nothing and Preferred Alternative emissions contained in Figure B on page B-9 of the Conformity Determination in Appendix B of the DSEIS. The emissions for roadways and parking lots are calculated by the model using a built-in database of MOBILE5A vehicle emission factors. The choice of which MOBILE5A factors to use is determined by the modeler and is limited to the years 1990, 1995, 2000, or 2010. To assess impacts in year 2005, since year 2005 factors are not available directly in the MOBILE5A model, the modeler had to choose whether to use year 2000 or year 2010 factors. (The 2005 factors could be used but only with significant additional work.) An examination of the input files used for the year 2005 modeling runs indicated that the year 2000 MOBILE5A factors had been selected for the year 2005 Do-Nothing runs, while the year 2010 MOBILE5A factors had been selected for the year 2005 Preferred Alternative runs, which is inconsistent. Since year 2005 MOBILE5A factors were not directly available, the year 2000 factors should have been selected for both the Do-Nothing and Preferred Alternative cases. The year 2010 MOBILE5A factors include additional expected emission controls and are therefore much lower than the year 2000 emission factors. *Note: the use of year 2000 factors instead of year 2010 will tend to overestimate the impacts in 2005. Nonetheless, factors from the same year should be used to compare the Do-Nothing and the Preferred Alternative. Moreover, the use of year 2000 factors for two scenarios would be the conservative approach.*

Our evaluation indicates that use of the year 2000 factors instead of 2010 factors would have increased the year 2005 Preferred Alternative emissions of CO from 18,986 tons per year for roadways to 21,707 tons per year, and increased the parking lot emissions from 272 to 290 tons per year. Overall, total year 2005 Preferred Alternative CO emissions would be 23,931 tons per year, an increase of approximately 13 percent. The effect of this increase would be to produce a net increase of 104 tons per year for Preferred Alternative emissions compared to Do-Nothing emissions (instead of the net decrease of 2,635 tons per year currently shown in Figure B on page B-9). This increase combined with the 100 tons per year produced by construction would result in a total increase of CO emissions for year 2005 of 204 tons (see Figure A on page B-8), an amount which is greater than the 100 tons per year *de minimis* threshold for a CO maintenance area.

Emissions from "Other" Construction Activity is Not Included. The Updated Draft Conformity Determination provided in Appendix B of the DSEIS indicates that the year 2000 would be the year of maximum construction emissions. Supporting documentation and other material were obtained from Synergy Consultants, Inc., which provided details on how the construction emissions were calculated. The review indicated that only emissions from equipment operating in the "borrow areas" and emissions from haul trucks operating between the borrow areas and new runway construction sites were included in the calculation of construction emissions for the year 2000. Some calculations of emissions which would be generated by construction equipment operating at "other" construction sites was included in the backup calculations, but not included in the summation shown in Figure A on page B-8 of the Conformity Determination.

Table 2-7 of the DSEIS indicates a long list of terminal and landside activities that could be occurring during the year 2000. Equipment emissions from the construction activities active in the year 2000 should have been included in Figure A. The emissions calculated as "other" could be assumed to represent emissions occurring from these activities. However, a detailed description of how the "other" emissions were calculated on an activity-by-activity basis was not provided, and the emissions appear to be low considering the large number of potential projects listed. At a minimum, including the emissions calculated as "other" would have raised oxides of nitrogen (NOx) emissions from 118 tons per year to 155 tons per year. Similarly, total NOx emissions from construction plus operation should have been raised from 88 tons per year to 125 tons per year, an amount which is greater than the *de minimis* threshold for general conformity. Exceeding the *de minimis* thresholds means that a detailed Conformity Determination would be required to show that the total of direct and indirect emissions from the project are fully offset within the same maintenance area so that there is no net increase in emissions of that pollutant [see 40 CFR 93.158(a)(2)].

Annual Aircraft Operation Emissions Underestimated. Annual emissions from aircraft were estimated using the EDMS model. EDMS bases its calculations on the input of

conditions for the peak hour of activity. Emissions for all other hours of the day are calculated from the peak hour emissions by use of a "temporal factor" (between 0.0 to 1.0) multiplied times the peak hour emissions. Temporal factors are also used to scale emissions according to day of the week and month of the year. The hourly, daily, and monthly temporal factors are input by the model user and must conform to the following equation:

annual activity = peak hour activity x 8,760 hours x average hourly factor x average daily factor x average monthly factor.

The hourly aircraft departure temporal factors are shown in Table C-2-7 on pages C-2-19 and C-2-20 of the DSEIS for the 2000 "Do-Nothing" case and 2000 "Preferred Alternative" case, respectively. The sum of these temporal factors is 9.77 for 24 hours. The hourly average is therefore 9.77 / 24 = 0.407. Likewise, the daily and monthly temporals which were previously provided in Tables D-5 and D-6 of the Final EIS, respectively, sum to 6.53 and 10.51, i.e., a daily average = 6.53 / 7 = 0.933, and a monthly average = 10.51 / 12 = 0.876. The peak hour departures modeled for the year 2000 was 64. As shown below in the application of the above equation, 64 peak hour departures produces a total of 186,494 annual departures (equivalent to 372.988 annual takeoff and landing operations).

annual departures = 64 x 8760 x 0.407 x 0.933 x 0.876 = 186,494
annual takeoff and landings = 2 x 186,494 = 372,988

The total number of takeoff and landing operations which should have been modeled is 409,000, as shown in Table C-2-1 on page C-2-4 of the DSEIS. Since emissions are directly proportional to operations, the aircraft emissions are approximately 9 percent too low ((409,000 -372,988)/409,000 = 0.088).

Similar errors were made for the years 2005 and 2010, resulting in an underestimation of the aircraft emissions by 9 to 12 percent. It should be pointed out that this same error was made in estimating aircraft emissions for both the Do-Nothing and Preferred Alternative alternatives, so correcting this problem is not expected to increase the difference in emissions between the two alternatives. Dispersion modeling would be slightly effected.

Incorrect Peak Hour Departures for Year 2005 Preferred Alternative EDMS Modeling. Table C-2-2 on page C-2-13 of the DSEIS indicates that a total of 64 peak hour departures were modeled for the year 2005 Preferred Alternative case. However, an examination of the model inputs indicates that errors were made in entering the peak hour departures for individual aircraft types and runways. The errors cause the total peak hour departures to sum to a total of only 63.08 rather than 64. The effect of this

error would be to underestimate year 2005 Preferred Alternative aircraft emissions by an additional 1 percent.

Resolution of Questions on the Traffic Analysis. It is our opinion that revisions in the traffic analysis may result in changes in the projected congestion levels at some intersections and in recommendations for roadway improvements. Public comments on traffic projections in this DSEIS, especially for intersections, should be carefully reviewed, in particular, to identify any significant shifts in traffic volumes between different access points to the airport. However, it is unlikely that these details will change the emissions inventory. Shifts in traffic volumes between intersections could, however, have some effect on the CAL3QHC modeling results. The analysis indicates the 8-hour CO standards are already exceeded at some intersections by both the Do-Nothing and Preferred Alternative scenarios and the 1-hour levels are close to the standard at some receptors. In each case of 8-hour standard exceedance the Do-Nothing concentrations are slightly higher than the Preferred Alternative concentrations. Adding another 10 to 15 percent to traffic volumes would exacerbate the current situation and could possibly cause new exceedances of both the 1-hour and 8-hour standards.

CONCLUSIONS

A few errors may have been made which call into question the validity of the some of the conclusions in the document: that the Preferred Alternative case would produce air quality impacts that are the same as or less than under the Do-Nothing scenario. In particular, the year 2005 EDMS dispersion results are suspect and there may be exceedances of the 8-hour CO standard or annual NO_2 standard if the model is rerun using the corrections indicated in the comments above. Further, because the *de minimis* thresholds would actually be exceeded, a detailed Conformity Determination is required which meets all the requirements of 40 CFR 93 Subpart B for determining conformity of CO and NOx emissions.

The revisions to this conformity analysis needs to include more detailed narrative explanation of model results. For example, when significant changes in the emissions inventory occurs between alternatives or years, the analysis should clearly explain the extent to which each modeling factor (such as: emissions rates, AADT, aircraft operations, vehicle speeds, etc.) is causing the change.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

KING COUNTY ▲ KITSAP COUNTY ▲ PIERCE COUNTY ▲ SNOHOMISH COUNTY

March 31, 1997

Mr. Dennis Ossenkop
ANM-611
Federal Aviation Administration
NW Mountain Region, Airports Division
1601 Lind Avenue SW
Renton, WA 98055-4056

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Dear Mr. Ossenkop:

Draft Supplemental Environmental Impact Statement and
Draft Conformity Determination for the Sea-Tac International Airport
Master Plan Update--Air Quality Comments

PSAPCA has reviewed the SDEIS with reference to airport operational forecast updates, plan implementation phasing changes and--most importantly--the draft air quality "de minimis" conformity determination.

On the issue of "de minimis" conformity it was beyond PSAPCA's capabilities to evaluate in full the reasonableness and accuracy of the complicated emission model assumptions and analyses utilized to make the draft determination presented in the SDEIS. However, as you are aware, we recently examined results from a detailed technical SDEIS air quality review conducted by the US Environmental Protection Agency (EPA). These results were first presented and discussed by EPA, PSAPCA, the Port of Seattle, the Federal Aviation Administration, and the Washington State Department of Ecology at an interagency meeting held on March 25, 1997.

The EPA report identifies several errors in the Emissions and Dispersion Modeling System (EDMS) model procedures run for carbon monoxide (MOBILE5A factors) and aircraft emissions (temporal factors), as well as concerns about "other" construction equipment excluded from the EDMS emission calculations. At issue is whether the corrected EDMS model emission totals for the preferred alternative do exceed the de minimis general conformity levels for two criteria pollutants: carbon monoxide (CO) in 2005 and oxides of nitrogen (NOx) in 2000. If so, more detailed conformity determination for both pollutants is required per the federal Clean Air Act.

At the March 25, 1997 meeting the Port acknowledged modeling errors and made a commitment to correct the EDMS calculations for CO and NOx. The Port will combine the corrected emissions from the operations side with refined construction equipment emissions, to determine whether a de minimis finding can still be substantiated.

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Because the results of this reanalysis were not available prior to today's deadline for draft conformity comments, however, and given uncertainty about corrected plan-related emissions vis a vis de minimis levels, PSAPCA cannot support the Port's conformity finding as contained in the DSEIS.

We suggest that the Port complete their emissions re-analyzes as soon as possible and, in the interest of public comment opportunity, present findings as draft in the FEIS, prior to issuance of a Record of Decision.

Thank you for the opportunity to comment. We appreciate the time and professional technical effort that the Port has expended to ensure that the air quality data supporting the Master Plan proposal is accurate and in compliance with the federal Clean Air Act. Please contact me at 206/ 689-4004 or Brian O'Sullivan of my staff at 206/689-4063 if you have further questions.

Sincerely,

Dennis J. McLerran
Air Pollution Control Officer

DJM:ls

cc: Chuck Clarke, Regional Administrator, EPA-Region 10
Tom Fitzsimmons, Director, State Department of Ecology
Michael Feldman, Director of Aviation, Port of Seattle

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STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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March 31, 1997

REC'D ANM-610
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MAR 31 1997
ANM-610

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave, S.W.
Renton, WA 98055-4056

Dear Mr. Ossenkop:

The Department of Ecology has reviewed the draft Supplemental Environmental Impact Statement (SEIS) for the Proposed Master Plan Update Development Actions at SeaTac Airport. This letter comments on the air quality and general conformity aspects of the project. Comments on other environmental concerns are being provided in another letter from Ecology. The Air Quality Program has been coordinating its review and comments with the Environmental Protection Agency (EPA) and Puget Sound Air Pollution Control Agency (PSAPCA). Our intent is to provide the Federal Aviation Administration (FAA) with information to enable a thorough, final conformity analysis and to ensure that the project conforms to the State Implementation Plan (SIP) as required by the Clean Air Act.

As noted in the draft SEIS, the SeaTac Airport is located in a maintenance area for carbon monoxide and ozone. We are concerned about the updated air quality conformity analysis conclusion that the project will not equal or exceed the applicable "de minimis" threshold levels. We also have concerns regarding the surface transportation impacts and construction impacts associated with the fill for the third runway.

Our concern regarding the "de minimis" conclusion is based upon an intensive technical air quality review conducted by the US Environmental Protection Agency (EPA). On March 25, 1997, these draft findings were discussed by EPA and their consultant, PSAPCA, the Port of Seattle and their consultants, the FAA, and Ecology.

The EPA identified errors in the Emissions and Dispersion Modeling System (EDMS) model procedures run for carbon monoxide (MOBILE 5A factors) and aircraft emissions (temporal factors). Additionally, some "other" construction equipment was not included in the EDMS emission calculations. The report indicates that the project would exceed the de minimis conformity thresholds for carbon monoxide and oxides of nitrogen in the years 2005 and 2000 respectively. Some additional analytical work may be needed for carbon monoxide to supplement the local carbon monoxide "hotspot" conformity analysis already in the draft SEIS. Exceeding the de minimis threshold for the oxides of nitrogen standard means that emission offsets may be required to demonstrate conformity.

On the basis of EPA's analysis, and acknowledgments by the Port of Seattle's consultant of modeling errors and a commitment to revise the calculations, Ecology cannot support a de minimis conformity

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finding at this time. We urge the FAA and the Port of Seattle to complete their conformity reanalyses as soon as possible and present the results in the final SEIS. Should the reanalyses differ from the draft SEIS conformity analysis it may be appropriate to provide additional time for public comments on the final conformity analysis.

As noted in the draft SEIS, surface transportation vehicles are the predominant source of air pollution in the airport area. Clearly conveying the traffic activity, such as the shifts in traffic volumes among interactions, is important for ensuring air quality "hot spot" impacts are appropriately analyzed and mitigated. A discussion specifically identifying the major access routes to the existing airport, the major access routes under the master plan including access to the north terminal, and the traffic volumes on those routes both with and without the project would be helpful.

The truck activity associated with the fill for the third runway should be described in better detail so that the impacts upon the community and air quality can be better understood and the most appropriate mitigating measures selected. A description of the number of trucks per hour on the haul routes within the airport environs would be useful. The description should also include the access routes to the airport environs so that the localized and regional impacts are presented together.

Thank you again for the opportunity to comment on this project and your willingness to discuss these issues. Ecology wants to ensure that the project conforms to the SIP, there is appropriate mitigation, and the air quality around the airport is not endangered. If you have any questions, please contact Doug Brown at (206) 649-7082.

Sincerely,

Joseph R. Williams
Program Manager
Air Quality Program

cc: Bonnie Thei, EPA
Dennis McLerran, PSAPCA
Barbara Hinkle, Port of Seattle
Doug Brown, Ecology
Paul Carr, Ecology
Elizabeth Phinney, Ecology

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WASHINGTON STATE DEPARTMENT OF
Natural Resources

JENNIFER M. BELCHER
Commissioner of Public Lands
KALEEN COTTINGHAM
Supervisor

March 31, 1997

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1997
ANM-610

Federal Aviation Administration
ANM-611
Dennis Ossenkop
1601 Lind Avenue SW
Renton, WA. 98055-4056

RE: Supplemental E.I.S. Sea-Tac Expansion - Additional Comments

Dear Mr. Ossenkop:

I have reviewed the Supplemental Environmental Impact Statement (S.E.I.S.) for the proposed SeaTac Airport Expansion and have the following response.

1 G-117 1

1. A Surface Mine Reclamation Permit will not be required for Borrow Sites 1, 2, 3 and 4 because they fit the exclusion in RCW 78.44.31(17).

2. Borrow Sites 5 and 8 will not be mined, therefore a Reclamation Permit will not be required for them either.

3. The proposed wetlands mitigation project located in Auburn is stated to disturb 47 acres. This project will require a Reclamation Permit because it; (a)exceeds the 3 acre threshold for a permit and (b) the material is proposed to be exported from the site.

4. In reviewing the SEIS reclamation plans, it appears reclamation will be accomplished as if it were in accordance with RCW 78.44. The department would be happy to provide limited technical assistance to ensure satisfactory reclamation of these disturbed areas.

SOUTH PUGET SOUND REGION
28329 SE 448TH ST ▮ PO BOX 68 ▮ ENUMCLAW, WA 98022-0068 ▮ FAX: (360) 825-1672 ▮ TTY: (360) 825-6381 ▮ TEL: (360) 825-1631

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Thank you for the opportunity to review the proposed project.

If you have questions I can be reached through the South Puget Sound Region Office at (360) 825-1631.

Sincerely,

Bonnie B. Bunning
Region Manager

Dave Pierce

David S. Pierce
Surface Mine Field Inspector

Regional Transit Authority
821 Second Ave., M.S. 151
Seattle, WA 98104-1598
(206) 684-5776
FAX (206) 684-1234

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March 31, 1997

DRAFT

Mr. Dennis Ossenkop
Environmental Protection Specialist
ANM-611
Federal Aviation Administration
Northwest Mountain Region, Airports Division
1601 Lind Avenue S.W.
Renton, Washington 98055-4056

Subject: Draft SEIS for the Proposed Master Plan Update Development Actions at Seattle Tacoma International Airport

Dear Mr. Ossenkop:

Thank you for the opportunity to review the Draft Supplemental Environmental Impact Statement for the Master Plan Update at Seattle-Tacoma International Airport. The RTA has the following comments to offer:

- The Regional Transit Authority has adopted *Sound Move* -- The Ten Year Regional Transit System Plan for urbanized King, Pierce, and Snohomish counties. Local funding to implement this plan was approved by the region's voters on November 5, 1996.

- The RTA is in the process of adopting an Implementation Guide which will provide the schedule for implementing all facilities and services included in *Sound Move*. Under the draft Implementation Guide, issued on March 27 for public review, the RTA plans to start regional express bus service which would serve Sea-Tac Airport by the end of 1999, with additional routes serving Sea-Tac coming on-line in 2000. The Implementation Guide is scheduled to be adopted in May 1997.

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- The draft Implementation Guide also indicates that the RTA will begin Electric Light Rail service to Sea-Tac Airport in 2006.

- The location of the Electric Light Rail station at Sea-Tac Airport has not been determined yet. That determination will be part of a community decision - making process scheduled to begin later this year. It is the RTA's belief that locating the Sea-Tac Airport Station at the airport terminal will insure efficient, convenient and reliable transportation for the riders who will access the light rail system at that station.

We understand that neither the existence of the RTA nor light rail and regional express bus service to Sea-Tac Airport within the Port's planning horizon could be assumed when work on the Master Plan Update Development Actions began. The RTA is now a funded agency with an adopted 10-year plan which includes regional express bus and light rail transit service to the airport. As such, the RTA can take an integral role in addressing land side issues. In the near term, we are looking forward to working with the Port of Seattle and the City of Sea-Tac in the decision - making process to determine the station location.

Sincerely,

DRAFT

Bob White
Executive Director

bw:vb
LETTER.DOT

Puget Sound Regional Council
PSRC

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March 31, 1997

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1997
ANM-610

Mr. Dennis Ossenkop, Airports Division
Federal Aviation Administration, ANM-611
1601 Land Avenue SW, Suite 540
Renton, WA 98055-4056

Dear Mr. Ossenkop:

- G-119 -

Thank you for the opportunity to comment on the Supplemental Environmental Impact Statement (SEIS) prepared for Seattle-Tacoma International Airport's Master Plan Update. The Council's review of the SEIS follows a regional level analysis related to our responsibility to assist the region in meeting its long-term air transportation needs. The Council recognizes the Master Plan's time horizon is 2010, but much of our interest is in your more limited analysis done for the year 2020.

In reviewing the new information presented in the SEIS, two items relate directly to the regional understanding of air capacity. First, the new forecasts used in the SEIS, which indicate demand at Sea-Tac could be 17% higher than was expected, are similar to those used in the Flight Plan EIS done jointly by the Port of Seattle and the Regional Council. Forecasted operations in the year 2010 have been revised to 474,000, or 6% above the Flight Plan 2010 forecast. When you extrapolated the data to the year 2020 (See Appendix - D), the revised forecast for operations is 532,000, slightly higher than the Flight Plan EIS (525,000 operations are forecasted for the year 2019, one year prior to the Flight Plan).

The second item of direct interest to the Regional Council is the long-term capacity added by the third runway at Sea-Tac. Long-term capacity of Sea-Tac is the key variable in understanding the regional long-term air transportation needs. In a number of locations, the SEIS shows the capacity of Sea-Tac increasing with the addition of the third runway. For example, Exhibit 2-7 "Delay Curve for Future Airfield" shows the increased capacity associated with the third runway and its relationship to delay. Capacity is also clearly addressed under the heading "Airfield Capacity with a Third Parallel Runway" (p.2-25). In this section the SEIS states that with a third runway, "Sea-Tac would reach its theoretical maximum capacity at 600,000 to 630,000 operations...this would likely occur after the year 2030...". In addition to this theoretical upper limit of capacity, please provide a clear statement of the estimated capacity of the expanded Sea-Tac facility if delay remains at the approximate level experienced today.

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In other sections of the document, the explanation of capacity should be clarified. For example, on page 2-1 it is stated that "the need for the third runway would not be affected by accelerated demand because its primary purpose is to address existing airport constraints, to reduce delay, and to improve the reliability of the existing airfield during poor weather", and on page 2-17 the stated purpose of the new runway is to "improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay." We recognize that these statements are true, because until approximately 2010, the added capacity of the new runway is not needed to satisfy demand. Therefore, it is true that its purpose until approximately 2010 is to address delay. But the SEIS should distinguish between the benefits of the third runway before and after 2010.

SPECIFIC COMMENTS

Timing of construction of third runway

Please clarify the logic for deferring the runway project. The SEIS identifies the "revalidated maximum capacity" of the existing airport as 460,000 operations, and states that this capacity will be reached between 2005 and 2010 (p. 1-2). The SEIS should clearly identify potential consequences of delaying the runway until late 2004 or 2005 vis-a-vis capacity.

This SEIS should also discuss the consequences of deferring the runway project on delay, given the new forecasts. For example, one commuter airline recently announced it was considering initiating origin-to-destination service at Paine Field. Can we expect more of this as congestion at Sea-Tac increases? Have these impacts been considered?

Surface Transportation

1. Transportation Demand Management (TDM).

   The Region has adopted a Metropolitan Transportation Plan (MTP) that contains policies and strategies designed to reduce reliance on single occupancy auto travel. The MTP concludes that TDM measures are required if this region is to avoid substantive deterioration in the performance of its transportation system. Sea-Tac International Airport, like other major regional traffic generators, needs to take actions and provide leadership that will help insure that the MTP policies are met.

   During the study period, surface traffic at Sea-Tac is forecast to increase from 72,400 to 113,300 vehicles per day (p. 1-8). The SEIS states that "while the Port of Seattle has not identified specific TDM measures that would be implemented at Sea-Tac, it is anticipated that the Port would aggressively pursue TDM policies to reduce travel demand at the airport"(p. 5-1-8). The SEIS should discuss specific traffic demand strategies.

One TDM measure that requires more attention in the SEIS is the service provided by the Regional Transit Authority (RTA). Table C-1-3, "Passenger Traffic Mode Choice Summary" (p. C-1-7) shows the mode share for RTA as "none" under both the Do-Nothing Alternative and the Preferred Alternative through the year 2010. The most recent RTA Draft Implementation Program (dated 2/12/97) estimates RTA light rail service to Sea-Tac will begin by 2006. In addition, regional express bus service serving Sea-Tac will begin operating in the year 2000. The SEIS should include an analysis of the potential effects the RTA could have on future airport access. The SEIS should discuss this issue in both the master plan time frame (through 2010) and beyond.

Finally, the SEIS should discuss the probable impacts of the City of Sea Tac's proposed Personal Rapid Transit project on airport circulation (draft *PRT Feasibility Project* report was published in January 1997).

2. General Comments on Traffic Counts.

Annual Average Daily Traffic numbers shown in Table 5-1-1 (p. 5-1-10) may not be consistent with the new passenger forecasts. While the new passenger forecasts are 17% higher than in the Master Plan, the total airport traffic figure for 2010 is only 7.75% higher than with the Master Plan forecast. Is this difference totally attributable to the portion of passengers that are transferring from other planes and do not use ground transportation in Seattle?

In addition, several of the new traffic numbers in this SEIS actually go down as result of the new, higher forecasts. These are (1) passenger off-site parking, which declines by 21%; (2) airport employee parking, which declines by 15.7%; and (3) air cargo, which declines by 5.5%. It is unclear why these airport traffic figures decrease.

Finally, Table D-2 (p. D-9) of the SEIS (an addendum Table received by the Regional Council on February 21, 1997) shows total daily airport traffic for year 2000 of 73,910 for the Do-Nothing Alternative using the Master Plan forecasts. But Table 5-1-1 of the SEIS (p. 5-1-10) shows airport traffic to be 86,465. Which number is correct?

Noise.

Please clarify statements concerning noise impacts. On page 1.12 the SEIS states "[noise] impacts in all future years would be less than current exposure..." This statement seems to be inconsistent with statements elsewhere in the document. For example, the second sentence following states that by 2010 residential areas outside the existing Noise Remedy Program boundary would be expected to be exposed to levels in excess of 65 dnl. Also see page 5.3.5, where states that 85 sites would be expected to experience significant increases in aircraft noise within 65 dnl.

Final results from the Noise Panel (under Regional Council Resolution A-93-03) were reported following completion of the Master Plan FEIS. Will actions taken to mitigate existing noise in response to Resolution A-96-02 impact continuing operations at Sea-Tac? The discussion of noise impacts in Section 5-3 does not appear to mention the actions taken in response to Resolution A-96-02.

Miscellaneous.

1. Please clarify your statements about the FAA Terminal Area Forecast (TAF) on page 2-3. You cite the TAF forecast for international passengers as growing at 0.6% per year. The latest FAA Terminal Area Forecasts (FY 1997) showed average annual international passenger growth rates of 6%.

2. One of the important assumptions driving the new forecasts is that air fares will continue to decrease by 1.2% per year (P.2-3). Please explain the rationale for this assumption and the role of ticket prices (relative to other factors) on travel demand.

3. The SEIS appears to contain conflicting statements regarding delay. On one hand, it is stated, "for Sea-Tac, data through August 1996, confirms that Air Traffic Operations Measurement System (ATOMS) measured delay has substantially decreased since 1989 and has stabilized" (p. 2-18). On the other hand, the SEIS states "delay at Sea-Tac in 1993 resulted in nearly 26,000 hours of delay with a cost of $42 million. Activity levels have increased nearly 15% between 1993 and 1995, and as a result, delay and cost have increased" (p. 2-21).

4. Please correct the reference made to adoption of the VISION 2020 Update on page 4.6. The correct adoption date is May 1995.

5. On page 1.8 and again on page 4.7, the SEIS omits from its list of recent appeals and litigation the Port of Seattle's recent law suit and Hearings Board appeal challenging Des Moines Comprehensive Plan.

6. On pages 4.6 and 4.7, regarding the plans of cities in the vicinity of the airport, the comment is repeated several times that "no amendments have occurred (to the local plan) to bring about transportation compatibility with the Airport, as directed by the Updated MTP." Amendments to local plans were not expressly directed by the Updated MTP. However, the thrust of these statements is accurate because state law required the Regional Council to certify that local transportation plans are consistent with the MTP [See, e.g., RCW 47.80.023(3)]. Consistent with this statutory requirement, after the MTP was amended, the Regional Council sent a letter to jurisdictions alerting them to the amendments and to the need to assure that they were consistent with the MTP as amended.

MAR 50 TO 92271600 P.06/06

Thank you again for this opportunity to participate in the environmental review of the Master Plan Update. If you have questions or comments about the material in this letter, please contact me at 464-7134.

Sincerely,

Norman A. Abbott
SEPA Official

cc: Dave Russell, President, Puget Sound Regional Council
Bob Drewel, Vice President, Puget Sound Regional Council
Mary McCumber, Executive Director, Puget Sound Regional Council
Barbara Hinkle, Port of Seattle

March 4, 1997

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Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Avenue Southwest
Renton, WA 98055-4056

MAR 31 1997
ANM-610

Comments Regarding the Transportation and General Conformity Determination for the Sea-Tac Airport Master Plan Update Draft, Final and Draft Supplemental Environmental Impact Statements

Dear Mr. Ossenkop:

1) I do not agree that the FAA is exempted from a General Conformity determination as the FAA asserts in the Draft Supplemental Environmental Impact Statement (SEIS).

2) I also do not concur that if FAA were subject to a general conformity analysis that they would pass the test as FAA also states in the SEIS. According to the FAA, the Clean Air Act (CAA) and Amendments of 1990 require as a prerequisite for the necessity to perform a general conformity analysis, that certain de minimus levels of pollutants be exceeded. These de-minimus levels, FAA believes, are not exceeded in the SEIS analysis and air pollution inventory tons per year.

3) I believe FAA's assertion that they are exempt and their claim of compliance if subject to such a review is based upon flawed data input into the model, a misunderstanding of the intent of the law and a possible predisposition to manipulate the data input to eliminate their responsibility to the public and the Clean Air Act.

4) I also believe that even if FAA were exempted from general conformity by being below de minimus levels, that the predicted exceedances of the NAAQS NO_2 annual standard, 8 hour carbon monoxide standard and the 24 hour and annual PM_{10} standard, (some of which is project related, [foreseeable direct and indirect emissions within the authority of the FAA/Port of Seattle's jurisdiction and/or control[1]], while others cannot be mitigated and none of which considers cumulative impacts) would not allow FAA to fund, support or approve the project.

I would appreciate a response from FAA to not just my direct questions, but also to each of my comments and include information according to the following chapter of NEPA:

[1]See FR Vol. 58, No. 228 page 63221, particularly, see definition of reasonably foreseeable direct, indirect, exclusive and support.

§1503.4(5) "Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response."

NO_2

The draft Environmental Impact Statement (DEIS) aircraft operation numbers used for the EDMS screening analysis are one example of why I believe the numbers have been manipulated to obtain the predetermined results. While the forecast numbers of total number of aircraft operations for existing, 2010 and 2020 were used for the purpose and need section of the DEIS at 384,000 approximately existing condition, 440,000 for 2010 and 525,000 for 2020, the air pollution modeling analysis used 384,564, 408,040 and 443,869[2] respectively. These existing, 2010 and 2020 numbers were used to determine area impacts from future aircraft air pollution contours in the DEIS. These same numbers were also used in the final Environmental Impact Statement (FEIS) and the results were similar to those of the DEIS. The DEIS and FEIS both indicated a NAAQS annual NO_2 exceedance at South 154th Street of 0.08 ppm compared to the standard of 0.053 ppm annual. The FEIS claimed that this single exceedance was in an area restricted to public access and therefore, was not of concern. For the 2010 scenario, a new, similar exceedance appears in the FEIS at South 188th, an area of public right of way, similar to the 154th street area.

The SEIS has increased the numbers of aircraft operations considerably to 445,000 in 2005 and 474,000 in 2010 yet the impacts in the dispersion screening and refined analysis of NO_2 as well as tons per year in the SEIS are almost exactly the same or less than the DEIS and FEIS.

Date/Forecast	Annual Operations	Tons/Year	Inc./Dec. #	TPY dif.
1994 DEIS existing	384,564 annual ops.	1378.30	constant	constant
FEIS existing	384,564	1400.00	no change	+21.7
1994 DEIS 2010	408,040	1524.60	+23,476	+ 124.6
FEIS 2010	408,040	1523.50	no change	- 1.1
SEIS 2005	445,000	1441[3]	+ 36,960	-82.5
SEIS 2010	474,000	1523.60	+ 29,000	+82.6
DEIS 2020	443,869	2006.40[4]	-30,131	+482.8
SEIS 2010 Case 2+10%	521,400	1592.0	+ 77,531	-414.4
SEIS 2020 Case 2+10%	585,200	2182.0	+ 63,800	+590

[2]Draft EIS page D-3 Table D-1
[3]Page 5-2-3 (B) states: "...improvements would reduce Nox by 2%", and given amount in this text when reduced by 2% is actually 1176 tons/year.
[4]Page D-14 Alternative 3 "With Project"

1989 DOE[5]	360,000[6]	2066	- 225,200	-116
1993 Chicago O'Hare[7]	383,362 L/T/O /year	4650	+ 23,362	+2584

I would tend to believe that if you increase the number of yearly polluters, the amount of pollution would also increase. But this is not the case with these three documents. The annual tons per year of NOx has gone up and down arbitrarily regardless of the number of aircraft takeoffs/operations.

For the SEIS 2005 condition at 445,000 annual operations, there are 565 less tons per year of NOx over the DEIS 2020 case although the DEIS used only 1131 less annual operations. If the documents had shown consistency between the numbers evaluated, there would actually be an increase in NOx between the Do-Nothing condition existing and With-Project scenario of over 628.1 tons per year with the addition of 59,305 possible airplane operations if I consider the original numbers and compare to the most recent. However, the SEIS, I believe, has biased the outcome of their analysis and managed to be below de-minimus levels. I do not trust this most current analysis since it is so different from previous and independent analyses done in the past. While there is a significant increase of airplane operations, the increase of NOx in tons per year is insignificant and where the inventory is increased considerably such as the Case 2 + 10%, no dispersion analysis is conducted so we do not know what additional exceedances might occur.

Compare the increase in operations in 2010 between the DEIS 2010 scenario at 408,040 and the SEIS 2010 at 474,000 or an increase of 65,960 annual aircraft operations but one less ton per year of NOx. In the SEIS 2010 Case 2 condition at 521,400 annual operations there is 542.4 less NOx than the 1991 Ecology study even though there are 161,400 more aircraft operations.

I have used the average fleet mix, not the adjusted fleet the consultant uses for increases in peak hour takeoffs, gathered an average number from the most consistent figures in the tables above and increased the NOx incrementally based upon increases in aircraft operations. There is no other way to obtain examples from the data without re-running the model and there is not time to do this in the brief comment period. The new figures are given in the tables as below:

1994 existing [baseline]	384,564 annual operations	1378.30 tons/year NOx
FEIS 2010 [baseline add]	408,040 (23,476 more)	1523.50 + 145.2 tons/year or equal to 0.0062/plane
SEIS 2010 [example 1]	474,000 + 65,960 x .0062	1932.45 + 408.9 TPY
SEIS Case 2 + 10% [example 2]	521,400 + 47,400 x .0062	2226.33 + 293.8 TPY

[5] Department of Ecology Seattle Tacoma International Airport; Air Pollutant Contribution May 91 pg. 16
[6]1992 Flight Plan Project Final EIS 1990 aircraft operations
[7]NRDC Flying Off Course October 1995 page 44 (Attachment #1, selected pages)

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In each case where logic might prevail and the increases in the annual aircraft inventory would equal a constant and reliable increase in expected pollutant inventory, the levels are above de-minimus levels of 100 tons per year. An example is given below:

1378.30 tons/year NOx existing baseline	384,564 annual operations baseline		divided by total planes = .00358 tons/year/plane NOx
existing to 2005 x 60,436 increase in 2005 above existing to 445,000 = 216.36 tons/year incr.	**2005 to 2010** x 89,436 increase in 2010 above existing to 474,000 = 320.18 tons/year NOx incr.		**2010 to 2020** x 111,200 + 10% faster growth from 474,000 to 585,200 = 398.09 NOx tons/year incr.
existing to 2020 =710.50 tons/year incr.	**2000 to 2010** 232.7 tons/year incr.	**2000 to 2020** 630.08 tons/year incr.	**2005 to 2020** 501.2 tons/year incr.

Consider also the statements the DEIS makes regarding NOx:

"According to the USEPA, many of the newer aircraft engines emit significantly lower levels of carbon monoxide (CO) and Volatile Organic Compounds (VOC), while generally producing higher emissions of nitrogen oxides (NOx)."[8]

"Accordingly, the addition of larger jet aircraft with their higher rates of fuel flow could contribute to higher NOx levels."[9]

"However, these same fuel-efficient aircraft also produce increased NOx emissions."[10]

In case the argument might be made that these numbers of aircraft would arrive and depart Sea-Tac with or without a new runway, the DEIS told us that 525,000 annual aircraft operations would occur with or without a runway. The SEIS tells us that no more than 460,000 aircraft per year can arrive or depart Sea-Tac without a new runway. What is the truth?

[8]Draft EIS page D-4 column 1, 2.
[9]Ibid.
[10]Ibid. page D-5 column 1, 3.

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The 1973 SeaTac Communities Plan told us that the maximum capacity of Sea-Tac Airport was 260,000 and hence, the noise remedy boundaries are based upon that figure.

It should therefore be plainly obvious that we are dealing with unreliable data, inconsistent figures and forecasts that are either biased, flawed or just plain wrong.

Please refer to the enclosed (Attachment #2) table of forecasts and the dates those forecasts were made.

Another dramatic illustration of the disparity between figures is in the peak hour screening and refined dispersion analysis for nitrogen dioxide. The tables below represent these problems which are most likely based upon the same inconsistent figures used for the annual inventory above:

1994 Draft EIS	43.9 existing hourly op.	0.08 ppm NO_2 154th St.
1995 Final EIS	63.9 hourly op.	0.051 "
1997 SEIS existing	54.1 hourly op.	0.08 "
1997 SEIS 2000 do-nothing	64 hourly op.	0.09 "
1997 SEIS 2000 with proj.	64 hourly op.	0.05 "
1997 SEIS 2005 do-nothing	64 hourly op.	0.09 "
1997 SEIS 2005 with proj.	64 hourly op.	0.06 "
1997 SEIS 2010 do-nothing	64 hourly op.	0.07 "
1997 SEIS 2010 with proj.	64 hourly op.	0.05 "

One reason the dispersion analysis shows decreased NO_2 impacts even though the airplane numbers departing in the peak hour are increased is due to the fact that the consultant insisted that larger aircraft could not take off at a rate of one per minute due to regulations regarding aircraft spacing in the preferred noise abatement corridor.[11] When a higher number was used in the peak hour, the consultant used a higher number of non-jet operations. In the 2000 scenario where approximately 408,000 annual aircraft operations are considered, the peak hour fleet mix reflects 217,000 annual non-jet aircraft operations. This scenario is untypical of Sea-Tac and will be even more untypical in the future. This number of non-jet operations represents more than half the expected 2000 Sea-Tac aircraft operations and is unrealistic and must be revised.

The consultant failed to note that even the FAA states that one aircraft departure per minute is theoretically possible at Sea-Tac with two runways and they make no qualifications about spacing or types (Attachment #3) and that the Sea-Tac tower personnel have publicly stated in the enclosed article that 75 peak departures occur beginning at 7:00 a.m. in the summer (Attachment #4). The consultant also failed to mention that aircraft departing from the third runway 3 to 4% of the time will have to

[11]SEIS Appendix B Attachment A-11 Response to Comment 28

make a break-neck turn to hit the existing noise abatement corridor before reaching the 5 NM or 3000 foot turn. I must assume that the consultant believes that all aircraft departures in the future from the third runway will use the same old noise abatement route even though the EIS flight tracks for the third runway are independent of the old corridor.

Additionally, the spacing of the third runway is suspicious at 2500 feet from the easternmost runway. The FAA Advisory Circular 5300/13 Change #4 states that for independent departures, the standard separation distance between runways is 2500 feet and that the distance for independent landings is 4300 feet. We already know that this new runway will not allow for dual simultaneous arrivals in poor weather without the addition of advanced technology and equipment such as LDA and GPS. We learned during the DEIS process that the alleged existing 44% bad-weather landing delay figure at Sea-Tac that was used to justify the purpose and need of the third runway is false. We have seen the current FAA statistics which rank Sea-Tac as one of the least delayed airports in the country. The SEIS now gives us an admission that the third runway will increase capacity. Therefore, it is reasonable to conclude that the 2500 feet, being the exact separation needed for dual simultaneous departures, will accommodate dual simultaneous departures in the peak hour which will use independent flight corridors without the addition of further noise abatement procedures.

The FSEIS should re-run the model considering 75 aircraft departures and using the standard fleet mix given in the DEIS Table D-1 with an existing condition dispersion analysis that compares 75 peak departures in the do-nothing condition to a number at least 30% (to 500,000) higher for the new runway which will accommodate dual-simultaneous departures.

Another area of concern is the analysis that moved from the original screening of nitrogen oxides to the refined analysis in the DEIS[12]. The SEIS provided the short term screening rate of NO_2 at the receptor located at 154th Street which corresponds with qualifications with receptor C-7 in the DEIS.[13] The DEIS did not chose the highest receptor from the screening dispersion analysis and the approximate rates of annual refined level of higher original DEIS receptors is given below:

Max concentration NOx	Annual Average by $\mu g/m^3$	Annual Average ppm
C-7 3058.80 = 14226	0.215 = 2.6875	0.08 ppm (SEIS exceedance)
C-6 3315.09	0.23	0.086 ppm annual
M-7 3614.60	0.25[14]	0.095 ppm annual
L-6 3783.65	0.26[15]	0.099 ppm annual

[12]Ibid. A-4 Response to Comment 10
[13]DEIS pages D-17 - [grid] and D-86, 87 dispersion rate by grid point in micrograms per cubic meter.
[14]Ibid.
[15]This rate and the last two are above the California short-term 1 hour standard of 0.25 ppm

B-7 4392.0	0.31	0.115 ppm annual
L-7 6208.55	0.44	0.162 ppm annual

I realize that to obtain the refined dispersion levels of nitrogen dioxide/oxide, that five years of actual weather data was added to the modeling. However, since some of the grid points are actually closer to the pollution sources expected to produce the single exceedance rate that the South 154th Street receptor detected, it is unusual that some of these much higher, more downwind receptors did not experience annual exceedances unless they did, but were ignored in the SEIS as they were in the DEIS. Additionally, I note that the grid on page D-17, "Exhibit D-1" chose receptor A-8 in Riverton Heights neighborhood, which is not the closest receptor to 154th Street, for that refined dispersion analysis. I am assuming that the high receptor which experienced the exceedance of 0.08 ppm is the one as it is described in the final EIS and SEIS as located at South 154th Street which description corresponds more accurately with receptor C-7.

However, if A-8 is the receptor that was chosen for the refined analysis and the originally much higher receptor C-7 was ignored, the rates given in the table above, would actually be as much as three times higher considering A-8 measured a mere 1392.10 compared to L-7 at 6208.55!

All receptors listed in the tables above are in areas of public access. Some are located in Tyee Golf Course, others are near Riverton Heights neighborhood where an elementary school is located near a public park. The South 154th and South 188th Street receptors are along public streets, NOT ON PORT PROPERTY! Also, please note that the NOx dispersion contour hot spots in the FEIS Appendix D page D-17 existing condition are, for the most part, confined to the runway area with some branches reaching over a mile to the east and west and into the Normandy Park community. Page D-18 year 2000 "With Project" has similar branches but are confined to use of the west runway only, with a run-up plot on the east runway. This is unusual because the east runway is the primary takeoff runway for most of the larger aircraft utilizing Sea-Tac.

These contours indicate that the wind direction used in the worst-case condition was primarily from the east or west even though the text on page D-16 would indicate a worst-case wind angle. A worst case would consider closest neighborhoods and elementary schools and if wind angles from 90 degrees are used, the Westside single family residential neighborhood would be the area experiencing the greatest impact, from 225°, Riverton Heights neighborhood and elementary school would be most impacted, from 315°, Angle Lake community and elementary school would be most impacted, and from 135°, Sunset Park baseball field and tennis courts would experience the greatest impact, etc. Ecology's 1991 study of the NOx contours summarized:

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"...the contouring routine produced artifacts because of the low point density in this particular data set; the actual shape of the contours is expected to be much narrower and symmetrical as in the two other cases. In this particular run EDMS predicted a concentration of 19 ppm NO_2 in a receptor location right on 154th street. With the wind blowing directly from the north (1 degrees) the Tyee Golf Course can be getting as much as 12 ppm NO_2 one-hour average during worst-case conditions."[16]

These NO_2 rates above, are nearly one hundred times greater than the highest screening analysis rate detected by the SEIS dispersion modeling at 0.215 ppm South 154th Street even though there were only seven more aircraft used by Ecology in the peak departure hour in comparison to the SEIS (71 compared to 63.9). Ecology used an older version of the EDMS model, but when I reviewed the NOx rates in this 1991 study in comparison to the newer model 944 used by the consultant for the DEIS, I noticed that the NOx rates for the larger aircraft such as the DC-10 and 747, have ***increased*** in the newest version (compare 215.3 kg/hr/engine for DC-10 and 747 1991 Geomode 1 pages A1-6, 8 and referenced from EPA AP 42 Volume II Mobile Sources 1985 with EDMS 944 at 277.78 kg/hr/engine Geomode 1 DC-10 and the 747 at 358.88 kg/hr/engine) rather than decrease, which would be the logical assumption if the dispersion rates are now lower. There is no explaination for this apparent discrepancy.

I believe the SEIS documentation supports existing violations of the NO_2 annual standard. I also believe that the NO_2 exceedance at 188th in 2010 is a direct project related exceedance which would not occur without the addition of the third runway and that the South 154th Street exceedance is a new violation recently discovered and is directly related to increased aircraft operations at Sea-Tac that have recently occurred.

I also believe that there are more exceedances of the NO_2 standard in the project vicinity that have been ignored in the refined dispersion analysis. I also contend that if proper numbers of airplane operations had been used with an appropriate fleet mix throughout the study years and an inventory that more logically reflects Sea-Tac historical mostly jet-fleet mix and increases based upon capacity building, that the exceedances would be higher and more of them. I am also concerned about the number of NO_2 rates listed on page C-2-27 of the SEIS "With Project" for 2005 and 2010 at South 154th and 188th, both east and west at 0.05 ppm which cannot be compared to the standard of 0.053 ppm since the last digit is not printed.

Sea-Tac Airport is the greatest producer of ozone precursors NOx and VOC by acre than any other countywide source[17] and in this situation the following applies:

"(Note that project-specific modeling for ozone is not generally considered an

[16]DOE page 18, 19 (see Figure 17, page A5-10 345° case with contours next to Angle Lake and Seattle Christian Schools)
[17]SEIS Appendix B Attachment A-2 Comment #5

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option since, as a technical matter, ozone models are not sufficiently precise to show such impacts unless the project is a large portion of the total area inventory.)"[18](underlining added)

Fulfilling the intention of the SIP to reduce emissions does not mean to report them and then ignore them. Emission reduction programs at airports have been talked about for two decades and although many strategies are affordable and relatively convenient to implement, little has been accomplished at Sea-Tac although several control measures could have made a tremendous difference to the local air quality by now. Meanwhile private citizens are paying for cleaner cars, I/M programs, public taxes for park-n-ride, light rail, etc. Private citizens are paying the way for the local airport to increase their emissions budgets by reducing ours. People are largely unaware that when our region has an air quality alert in the summer, and we are asked to curtail driving or mowing our lawns, Sea-Tac will continue to operate status-quo even though it takes the pollution levels of either thousands of cars or one million 4-stroke mowers operating at full power for one minute to equal the ozone producing emissions of just one - one minute takeoff of a 747.

Section 176(c) of the Act defines the purpose of conformity to assure that projects will not increase the severity of the number of violations of the NAAQS, contribute to any new violation of any standard in any area, increase the frequency or severity of any existing violation of any standard in any area or delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. The purpose of the SIP is to "ensure emissions reduction progress targets are achieved and air quality attainment and maintenance efforts are not undermined."[19] Maintenance of the ozone standard will be undermined by the project and also by the predicted continued increases of Sea-Tac Airport operations. Some type of control of the existing condition exceedances must be implemented.

The NO_2 violations are an indication that the intent of the Clean Air Act is not being fulfilled. The addition of a new violation at South 188th should be cause for alarm, not merely because the federal standard is being exceeded, but mostly because the criteria air pollution is an immediate public health threat that can cause or contribute to irreparable injury to passers-by, people living nearby, children attending local schools, and the elderly living in nearby nursing homes, etc. The potential for additional project related and future exceedances of the federal standards is inherent to the nature of aircraft engine produced NOx and the subsequent significant impact on ambient air quality for ozone, nitrogen dioxide and HAP.

The FAA should not be allowed to fund, approve or support this project until a mitigation plan to reduce the exceedances of the NAAQS NO_2 standard can be developed that will

[18]FR Vol. 58, No. 228 page 63223
[19]Ibid. page 63215

consider all areas of public access and neighborhoods which are affected in the existing and future conditions.

In addition to the necessity for a general conformity determination, the FAA and Port of Seattle also must consider additional emission inventories that are reasonably foreseeable. Some examples are the SASA facility where engine testing/run-ups will be performed on a 24 hour per day basis. This facility is mentioned in the SEIS, but the SASA FEIS did not model air quality impacts or conduct a conformity determination for the project. The SEIS talks about SASA as though it is a relocation of existing Port routine maintenance facilities. However, there is no complete analysis of what the vacated facilities at the airport will be used for nor any analysis of how much additional aircraft activity to Sea-Tac the SASA facility might draw in the future. Other examples of cumulative impacts required by NEPA §1508.7 and 1508.25 necessary for a thorough general and transportation conformity analysis are:[20]

1) ***509/South Access Freeway (DEIS)***
2) 28th/24th Avenue South Arterial
3) *International Boulevard Phase II (Checklist?)*
4) *SeaTac Aviation Business Park*
5) *Alaska Flight Training Facility*
6) *Hotel (FEIS)*
7) ***Parking, both on airport, part of the NUT and at South 154th Street (piecemeal)***
8) ***Federal Detention Center (Nearly complete)***
9) ***FAA Tower***
10) *Enplane Drive Improvements/Asbestos Removal (DNS)*
11) *Federal Express Expansion (DNS)*
12) *IWS Upgrade (DNS)*
13) ***FAA Localizer Directional Aid Underground Tank Remediation (DNS)***
14) ***SASA (Incomplete FEIS)***
15) Haul Truck NOx

The SEIS maintains it contains a cumulative impacts analysis. However, as in the FEIS, many projects are merely mentioned and the SEIS also notes that some other projects do not have a completed environmental analysis (See Attachment #5). This is true with the 509/South Access Freeway Extension, but not so in the case of SASA, International Boulevard Phase II, the Hotel, Federal Detention Center, Runway Safety Area Improvements (RSA), Enplane Drive Improvements, and others which have a completed checklist, or a final EIS or a partially completed project such as the RSA.

CO

[20]Bolding added to federal projects, italics to those which might be federally funded/supported or on federally acquired/controlled land.

The intersection dispersion analysis continues to show exceedances of the NAAQS for 8 hour carbon monoxide (CO) levels and a project related increase in these emission rates predicted to occur in the future. Additionally, I note that the intersection at South 188th and International Boulevard shows 1,000 less cars in the future build scenario which assumes several things which are probably inaccurate:

1) Assumes that the additional passengers and employee VMT using an expanded airport will not increase although it is inevitable. Or assumes that automobile traffic will decrease in general which is not predicted to occur in the future, in fact, just the opposite, increased SPA use and VMT is assured. Assumes that the parking facility at South 154th Street will be constructed even though it is planned for land belonging to City of Seattle used for a wellfield. Assumes that SASA and SASA Cargo facility, the Hotel, SeaTac Business Park and etc., will not draw additional traffic although the plans for these facilities indicate otherwise.

The FSEIS should also increase the CO tons per year inventory and the dispersion analysis based upon hundreds of additional planes in an 8 hour period in the future, idling and taxiing across two active runways an additional 1700 feet, all of which is uphill, which may offset any emission reduction benefits of the third runway congestion and delay relief. Additionally, it is apparent from the EDMS inventory that the same unusual problem of arbitrary and illogical increases and decreases of both dispersion modeling and tons per year of CO is also inherent in this analysis and should be revised.

PARTICULATE

NEPA § 1502.21 states:

> "When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking."

In the SEIS, the response to my question on the complete lack of particulate data in the EDMS model was "revised to include only that data for which reliable particulate information is known. "The FAA has not updated the particulate data because no reliable data on aircraft particulate emissions is available."[21] This is not an accurate statement. New aircraft engine testing certification has current particulate emissions that do not predate FAA's removal of all particulate data from the EDMS model. Additionally, the consultant did not answer the question this way when I first asked it during the DEIS process. It took two years for me to ask the right question which got the complete answer that I knew must be true in the beginning.

[21]SEIS Appendix B Attachment A-7 Response to Comment 15

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All particulate data for every jet aircraft operation in the L/T/O cycle has been removed from the EDMS standard airport air pollution model.

For a proper particulate inventory and a cumulative analysis which considers the project long-term construction related haul truck particulate matter violations of the NAAQS 24 hour standard along haul-routes identified in the SEIS on page 5-4-15, current particulate measurements for jet aircraft contained in FAEED is available for the consultant. According to the enclosed letter from Dennis Ossenkop (Attachment #6), the model is open to the user to input information such as smoke number. This much needed new analysis should include a cumulative impact analysis which then can be added together to better formulate a mitigation plan for the predicted exceedances of the PM_{10} standard along the haul routes and in the project vicinity. The future particulate inventory should also include an analysis of the new particulate standard and the $PM_{2.5}$ standard, especially in light of the previous Department of Ecology Study, which is now the only available study which included the particulate data in EDMS prior to its removal by FAA, and it states:

> "EDMS revealed localized hot-spots of particulate concentrations in the range of 800 micrograms per cubic meter, particularly in the 170 degree case...Note that 154th Street is located at the hot spot."[22]

The combination of particulates and the exceedance of the Federal NO_2 Standard at this single location should be cause for concern, especially since atmospheric particulate matter is a significant contributor to the problem of regional haze. The hauling and dirt dumping near this location at 154th Street along with significant existing NOx concentrations and VOC emissions could cause exceedances of both the PM_{10} and ozone standard. It is critical that a baseline for existing impacts be established and that FAA use the upcoming monitoring of NOx and particulate by Department of Ecology to establish this baseline for background concentrations which should then be added to the hauling phase both for haul truck particulate, dumping, re-entrained dust, digging and dirt flying off of trucks during transport as well as haul truck NOx added to existing condition of the NO_2 exceedance and publish these rates once available in the FSEIS.

The re-run of the model should also consider 18 mile backup queues of trucks during peak hour periods, since "do not use" and "avoid" as the planned mitigation for congested roadways will not work because these severely congested roads are the ONLY way to the area to be filled!

Referring to page 5-4-15, it appears that the Spokane data used for background is already in excess of the federal standard in many areas of study. I am somewhat confused as to the reason why Spokane data rather than local Duwamish and Kent monitoring data was

[22]May 1991 Department of Ecology Seattle Tacoma International Airport; *Air Pollutant Contribution* page 20

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used. It appears that along some haul routes, particulate matter with the addition of haul trucks will increase by several hundred percent over the do-nothing condition. The SEIS explains that the mitigation **might** and **could** reduce emissions by as much as 80%. I do not know if this mitigation equals 80% of the 200% increase over the federal standard, 80% of the entire 300% or whether the standard is still expected to be exceeded by 20% or not at all. "Might and could" do not sound like a commitment to reduce particulate impacts. It also sounds like an 80% reduction might be wishful thinking, especially since the hauling is not being done in a Spokane environment where burning of crop waste and the dusty atmosphere generally cause elevated particulate levels which would be controlled completely different from haul vehicle and dirt hauling mitigation.

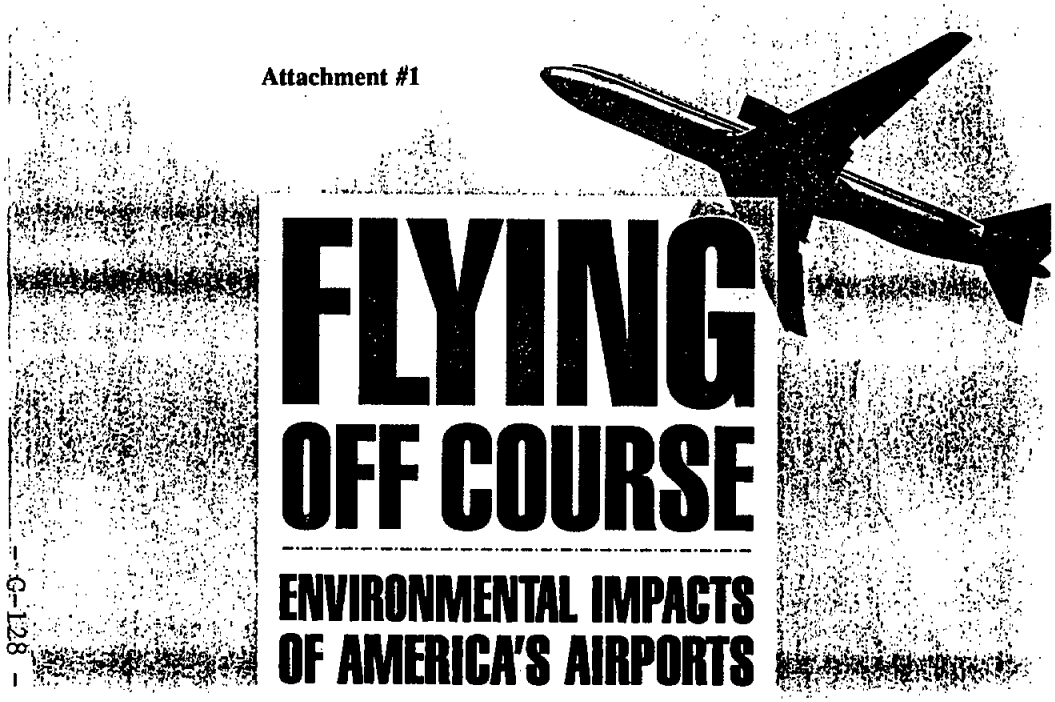
I believe that these particulate levels indicate that the PM_{10} 24 hour and annual standard will be violated during the project. But it is difficult to know if this is a new violation of the federal standard because the arid or dry environment used for background is already too high. However, these rates of particulate represent a worsening of an existing violation (one that does or does not exist in this area) and some type of mitigation plan that uses BMP's that can be tested and approved to be effective prior to the commencement of the project, should be implemented (this may be the biggest dirt moving project in state history, and as such, a mitigation plan should be monitored since this hasn't been done before).

Sincerely,

Debi L. DesMarais
31500 1st Ave S #14-103
Federal Way WA 98003
(206) 529-8407

cc: Congressman Adam Smith
EPA
Senator Patterson
Representatives Keiser, Blalock
DOE
PSAPCA
ACC

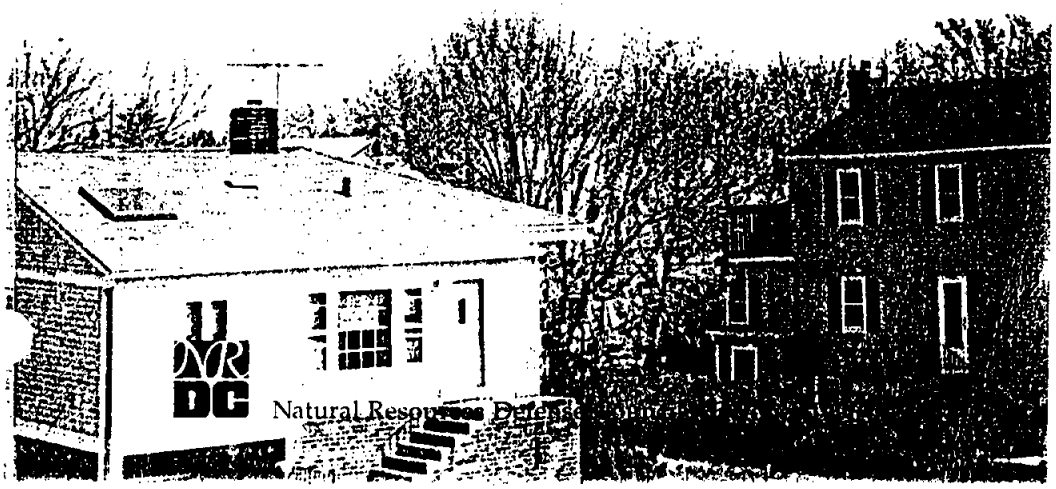
Attachment #1



FLYING OFF COURSE

ENVIRONMENTAL IMPACTS OF AMERICA'S AIRPORTS

- G-128 -



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CHAPTER 2

GROUND-LEVEL AIR EMISSIONS

The issue of noise tends to dominate debates over airport pollution, often to the exclusion of another important topic: ground-level ozone, the primary component of smog. Smog is normally associated with motor vehicles (perhaps the single largest threat to local air quality) and industrial sources such as factories and incinerators. However, air pollution totals from automobiles and many major industries have stabilized or decreased with time while aircraft continue to emit more and more ground-level ozone precursors — volatile organic compounds (VOCs) and nitrogen oxides (NO_x)— with each passing year. Airplanes produced 350 million pounds of these pollutants during their landing and takeoff cycles (LTOs)[63] at United States airports during 1993, more than

Figure 5
New York City's 5 Largest Industrial VOC Sources

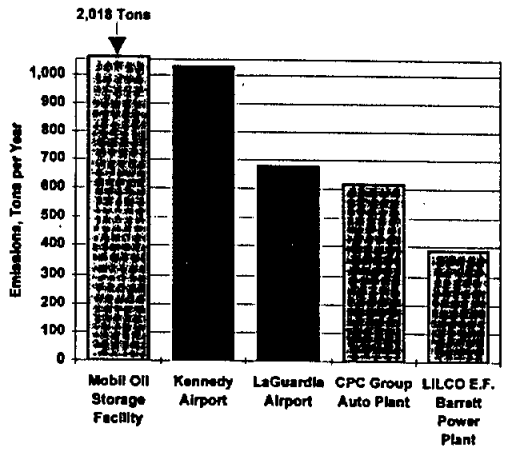
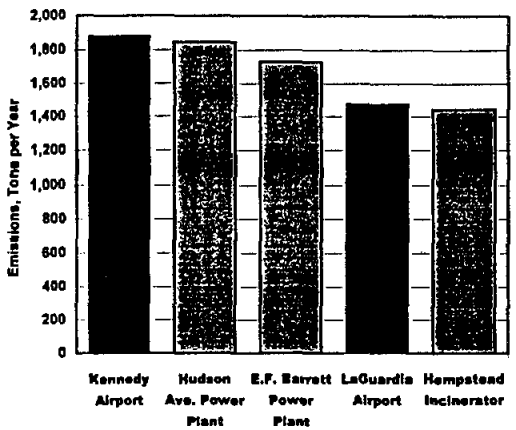


Figure 6
Major NO_x Sources in the New York City Area



Notes:
All sources are located within the New York City Severe Ozone Nonattainment Area.
Airport totals come from 1993. They reflect landing and takeoff cycle emissions from commercial airlines' flights. Emissions from other airport sources such as automobiles, buses, refueling trucks, and boilers were not included.
VOC and NO_x comparisons were made using 1994 emissions data provided by New York State.
Ground-level VOC totals from aircraft may be 10-15% lower than reported, due to fuel conservation measures voluntarily practiced by airlines which also result in emissions reduction.

Sources:
Akira Kondo, FAA, fax communication, 2/22/96
FAA Airport Activity Statistics for Certified Route Carriers, 12 Months Ending December 31, 1993
FAA Aircraft Engine Emissions Database Version 2.0
"Title5.zip" file available from the New York State Department of Environmental Coservation electronic bulletin board entitled DECAIR.

twice their 1970 total.[64] Locally, an airport's arriving and departing planes can create as much, if not more, ground-level VOCs and NO_x as many of its largest industrial neighbors. (See figures 5 and 6.)

Although airports are major emitters of VOCs and NO_x, they are not regulated like other significant air pollution sources. While the Clean Air Act Amendments of 1990 effectively targeted motor vehicles and industrial sources for emissions reductions, it left state and local officials essentially unable to control air pollution from an airport's planes. The number of commercial flights, which burn the most fuel and cause the most pollution per operation, meanwhile grows higher and higher each year. If the relationship between airplanes, airports, and air pollution is not thoroughly reexamined, this increase in flights will undoubtedly lead to a continued increase in uncontrolled, local air pollution.

While the Clean Air Act Amendments of 1990 effectively targeted motor vehicles and industrial sources for emissions reductions, it left state and local officials essentially unable to control air pollution from an airport's planes.

The very young, the elderly, and people with respiratory illnesses are most susceptible to ozone-related respiratory problems, but ozone pollution can affect anyone.

HEALTH EFFECTS OF NO_x AND VOC EMISSIONS

NO_x and VOC emissions combine to form ground-level ozone, a form of pollution that compromises people's ability to breathe. During the summer, when ozone levels are at their highest, between 10% and 20% of all East Coast hospital admissions for respiratory problems may be ozone-related.[65] The very young, the elderly, and people with respiratory illnesses are most susceptible to ozone-related respiratory problems, but ozone pollution can affect anyone (see Table 3 for estimates of people at risk from ozone pollution). Recent studies show that six or seven hours of exposure to "relatively low" ozone concentrations significantly reduces lung function and induces respiratory inflammation in healthy people during periods of moderate exercise; chest pain, coughing, nausea, and pulmonary congestion often accompany this decrease in lung function.[66] The EPA also notes that "although less well established in humans, animal studies have demonstrated that repeated exposure to ozone for months to years can produce permanent structural damage in the lungs and accelerate the rate of lung function decline."[67]

Table 3
Estimates of Populations-at-Risk in Ozone Nonattainment* Areas, October 1991 (1)

Children <13	Elderly 65+	Pediatric Asthma (2)	Adult Asthma	Chronic Bronchitis & Emphysema
29,906,621	17,929,500	2,167,600	4,087,011	8,402,935

* Ozone nonattainment areas violate federal ambient air quality standards for ozone.
(1). At-risk population estimates are based on county-wide populations, but portions of certain counties may be in attainment while others are in nonattainment.
(2). Pediatric asthma is calculated in the population less than 18 years of age.

Source: American Lung Association, Breath in Danger II, New York: 1993. p. 9.

NO_x and VOCs can lead to other health problems. NO_x contributes to the formation of particulate matter. Approximately 64,000 people may die prematurely every year due to heart and lung disease caused by particulate air pollution.[68] Particulate air pollution has also been linked to increased hospital admissions of children with acute respiratory ailments and increased rates of hospitalization for elderly people with heart and lung disease.[69] Certain VOCs, including some of those emitted by jet aircraft, are toxic (see box).

Toxic Air Pollution from Aircraft

A 1993 EPA study suggests that aircraft release significant quantities of toxic volatile organic compounds and particulate matter. The study, conducted in response to community concerns, evaluated cancer risks attributable to all air pollution sources in southwestern Chicago. It indicates that Midway Airport may be a considerable source of toxic compounds such as benzene, 1,3-butadiene, and formaldehyde as well as particulate matter. Midway's arriving and departing planes released far more of these air toxics than other industrial pollution sources within the 16 square mile study area (see following chart). In fact, few of Chicago's factories release as much benzene or formaldehyde as Midway Airport. None of them release 1,3-butadiene, a pollutant produced primarily by mobile sources such as cars, airplanes, and off-road vehicles.[70]

Table 4
Particulate and Toxic Emissions in Southwest Chicago, 1993

Facility Name	Pollutant	Emissions
Midway Airport (Aircraft Emissions)	Formaldehyde	62.9 tons/yr
	Particulate Matter	50.1 tons/yr
	Benzene	9.0 tons/yr
	1,3-Butadiene	7.6 tons/yr
Corn Products	Formaldehyde	0.27 tons/yr
	Benzene	0.002 tons/yr
Grace Specialty Chemicals	Formaldehyde	0.115 tons/yr
Sun Chemical (proposed incinerator)	Benzene	0.001 tons/yr

Source: EPA, Estimation and Evaluation of Cancer Risks Attributable to Air Pollution in Southwest Chicago: Final Summary Report, prepared by ViGYAN Inc., Falls Church VA, April 1993, p. 13.

This study, a starting point for discussion rather than the definitive word on toxic aircraft emissions, suggests that the issue deserves more attention. It ranked aircraft engine emissions fifth on a list of potential hazards by source — behind automobiles but ahead of nearby steel mills, hazardous waste treatment, storage, and disposal facilities, as well as other industrial sources. It concluded that aircraft engines are responsible for 10.5% of the cancer cases in southwest Chicago caused by toxic air pollution, and notes that "It is no surprise that emissions from aircraft engines may have a significant impact on the people living in the study area, especially to people living at receptors [locations] adjacent to the airport."[71] The same conclusion might apply to people living immediately adjacent to airports all over the country, many of which handle considerably more air traffic than Midway. (Midway was the country's 49th busiest airport in terms of commercial flights in 1993.)

However, toxic aircraft emissions are addressed by neither the Toxic Release Inventory (TRI) nor the Clean Air Act Amendments of 1990. The TRI, created under Title III of the 1986 Superfund Amendments and Reauthorization Act,

lets people know which toxic chemicals are being released, used, or transferred in their neighborhoods. Twenty different types of manufacturing facilities, many of which release considerably less benzene, formaldehyde, or 1-3 butadiene than Midway's idling planes, must provide emissions information to the TRI database. While EPA may require airports to report to the TRI in the future, they are currently exempt from its reporting requirements.[72] Similarly, when Congress targeted 179 types of major hazardous air pollution sources in the Clean Air Act Amendments of 1990 — all of which EPA intends to regulate by 2003 — airports and aircraft emissions were absent.[73] There continue to be no restraints placed on airlines and airports for toxic emissions — such as benzene, formaldehyde, 1,3-butadiene — from aircraft engines.

ENVIRONMENTAL EFFECTS OF NO_x AND OZONE POLLUTION

NO_x contributes to other environmental problems besides ground-level ozone formation. NO_x is an important precursor to acid rain and a potentially significant contributor to uncontrollable algal growth — algal blooms — in ecosystems such as the Chesapeake Bay.[74] Algal blooms kill off aquatic life by depriving it of both light and oxygen, a process known as nitrification.

Ozone is even more damaging. It harms crops, native vegetation, and ecosystems more than any other air pollutant,[75] leading to "several billion dollars of agricultural crop yield loss in the United States each year."[76] A partial list of the crops adversely affected by ozone includes corn, soybeans, tomatoes, rye, wheat, beans, potatoes, melons, alfalfa, spinach, onions, and grapes.[77] Ozone also accelerates the aging process in various materials, causing rubber cracking, dye fading, and paint erosion.[78]

REGULATORY FRAMEWORK: THE CLEAN AIR ACT AMENDMENTS OF 1990, CRITERIA POLLUTANTS, AND AIRCRAFT

Due to its many deleterious effects, ozone pollution is targeted by the Clean Air Act Amendments of 1990. The Clean Air Act establishes health-based standards (known as the National Ambient Air Quality Standards or NAAQS) for NO_2 (a specific type of NO_x), ozone, and other pollutants. States that include areas that fail to meet the standards, "nonattainment areas," are required by law to clean up their air according to a statutory timetable.[79] In 1993, 51.3 million Americans lived in 93 different ozone nonattainment areas.[80]

States containing nonattainment areas are required to develop State Implementation Plans (SIPs). SIPs detail the ways in which these states plan to reduce emissions within their nonattainment areas to more healthful levels; emissions must continue to fall until the nonattainment area meets the relevant health standard. Ozone SIPs, which target sources of all sizes, attempt to reduce VOC and NO_x emissions one source at a time. Power plants, gas stations, dry cleaners, and private car owners can all be asked by the state to reduce their emissions as part of a state's ozone SIP.

However, aircraft emissions at even the nation's busiest airports lie outside the reach of the SIP process — a glaring omission considering that 30 of the nation's busiest 50 airports are located in ozone nonattainment areas.[81] The Los Angeles-South Coast Air Basin — the country's worst ozone nonattainment area — contains three of the top 50 airports. Similarly, six of the nation's eight "severe" ozone nonattainment areas contain a top 50 airport; three of them contain more than one (see Table 5).

Table 5
Ozone Nonattainment Areas with Top 50 Airports

Nonattainment Designation	City and Number of Airports If More than One
Extreme	Los Angeles (3)
Severe	Baltimore, Chicago (2), Houston (2), New York (3), Philadelphia, Sacramento
Serious	Atlanta, Boston, San Diego, Washington DC (2)
Moderate	Cincinnati, Cleveland, Dallas (2), Nashville, Phoenix, Pittsburgh, Salt Lake City, St. Louis
Marginal	Portland, Seattle, Tampa

Source: "Ozone and Carbon Monoxide Air Quality Data Update Fact Sheet," available over EPA's Technology Transfer Network (TTN) as part of the Trends94.zip file.

How and Why Airports Slip Through the Cracks

Aircraft emissions are left out of the SIP process for a variety of reasons. First, in order to prevent interstate commerce conflicts, the federal government has kept a firm hold on its jurisdiction over the aviation world. States and municipalities are, for the most part, prevented ("pre-empted" in legal terms) from adopting measures that would reduce aggregate aircraft emissions at the airports within their jurisdictions. Thus, while simple changes in commercial planes' idling/taxiing procedures could lead to substantial VOC emissions reductions, no city, state, or airport can require airlines to change these procedures. The FAA, which currently has no operational guidelines aimed at reducing idle/taxi emissions, has the final say over all such matters.[82]

Secondly, current exhaust standards for aircraft engines do not effectively address aggregate aircraft emissions. Prototypes of individual jet engines must meet smoke, hydrocarbon (HC), and NO_x standards in order to be certified for mass production;[83] if a jet engine has been certified for use in the United States, its prototype met these standards.[84] But, these smoke, HC, and NO_x standards do not enable state and local regulators to tackle the air pollution problems caused by the tens and hundreds of thousands of jets that pass through the nation's busiest airports. They do not address the *aggregate* pollution totals generated by aircraft in real world conditions. States

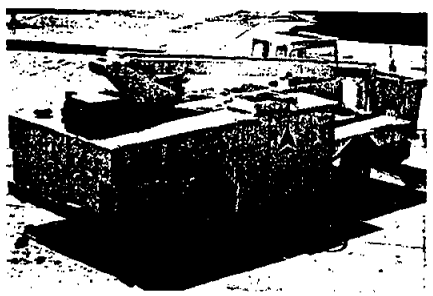
and cities, preempted by the Clean Air Act from establishing their own emissions standards, are therefore prevented from effectively regulating aircraft pollution.[85]

Finally, groups representing airlines and airports have successfully resisted attempts to curb aircraft emissions. In 1994, the EPA suggested restricting the types of planes that land at certain California airports in response to the state's air quality problems. The agency's proposed idea was as follows: allow only the "cleanest" planes, those that cause the least pollution per passenger, into California's worst ozone nonattainment areas. However, the American Association of Airport Executives (AAAE) and Airports Council International-North America (ACI-NA), groups that represent airports, responded that such "clean fleet" rules would violate the Airport Noise and Capacity Act of 1990 (ANCA).[86] They argued that ANCA gives the FAA and Department of Transportation final say over such matters. The EPA, citing "the complex issues involved," eventually dropped the idea (see box on Southern California aircraft emissions).[87]

The Battle Over Southern California's Aircraft Emissions

In February of 1994, the United States Environmental Protection Agency released its proposed air pollution reduction plan (called a "Federal Implementation Plan" or FIP) for California's most polluted areas (the Sacramento, Ventura, and the South Coast air basins). The agency prepared the FIP in response to legal obligations created by court-ordered disapprovals of these areas' State Implementation Plans (SIPs).[88] The proposed FIP contained the following aircraft-related measures:

- **Declining emissions rates targets would be set for emissions sources such as airplanes under the airlines' direct control.** Airlines would be "free to reduce their emissions using the methods that best suited their particular situations."[89]
- These targets would be consistent with the declining caps proposed for industrial sources such as factories and power plants. They would begin in 2001.
- Airlines would pay fees if they exceeded their emissions allotment.
- Intra-airline averaging of emissions and an inter-airline credit and trading system could be established in order to help airlines meet the targets.[90]



The California Federal Implementation Plan (FIP) requires airlines to convert their ground service equipment from diesel fuel to cleaner-burning natural gas or electricity. However, the FIP does not address aircraft emissions.

Once the reduction of aircraft emissions was on the negotiating table, airline and airport officials reacted quickly. They argued that the airlines could comply with declining NO_x caps only by drastically reducing service.[91] The Air Transport Association (ATA), a group that represents the major airlines, added that the implementation of declining emissions caps would, in essence, lead to EPA-mandated use of certain emissions reductions procedures. In its opinion, obligatory use of these methods would lead to "serious safety concerns" and

"most important[ly], interference with a pilot's operational control."[92]

The EPA, airline, and airport industry groups ultimately arrived at a compromise that did not impose emissions limits on either airlines or airports. The airlines will have to convert their ground service equipment from diesel and gasoline to cleaner-burning alternate fuels such as natural gas or electricity; airports will have to provide planes with electricity and climate-controlled air at the gates, thereby allowing pilots to minimize auxiliary power use. (Auxiliary power units are essentially small jet engines that generate electricity and compressed air.[93] The less time they spend in operation, the less fuel the airlines burn and less air pollution they create.)

The emissions benefits expected from these measures are, however, relatively small. At the seven airports studied for the FIP, ground service equipment and auxiliary power units together created only 6% as many ground-level VOCs and 10% as much ground-level NO_x as did commercial aircraft.[94] The fact that airports are being required to reduce their VOC and NO_x emissions reductions is a step in the right direction, but the key issue — aircraft emissions during the landing and takeoff cycle — remains unaddressed.

NRDC'S EMISSIONS INVENTORIES

In order to better understand the relationship between aircraft emissions and local air pollution problems, NRDC calculated the amount of aircraft-generated VOCs and NO_x at nine United States airports. The airports selected for study were Chicago O'Hare (IL), John F. Kennedy International, LaGuardia International, and Westchester County in New York, Newark International (NJ), Bradley International (CT), Jacksonville International (FL), El Paso International (TX), and Fairbanks International (AK).

These airports were selected because they span a wide range in terms of the types and numbers of planes they handle—from the nation's largest international airports to smaller, yet busy, regional airports. For example, John F. Kennedy International Airport (JFK) handled seven times as many commercial flights as Westchester County Airport during 1993. Many of these flights were simply too large to land at an airport like Westchester County. Conversely, Westchester County accommodated 10 times more private flights than JFK during this same year, most of them smaller, propeller-driven, aircraft.[95]

NRDC's calculations include aircrafts' landing and takeoff cycle (LTO) emissions, i.e. only the air pollutants emitted by the major airlines' planes within what the EPA calls the "mixing zone" (see box).[96] The mixing zone is the vertical column of air immediately above the earth's surface. It extends up to approximately 3,000 feet above ground-level, although its exact ceiling depends on local topography and ever-changing weather conditions. Emissions produced at any elevation within this column mix thoroughly with ground-level air; thus, aircraft emissions introduced anywhere within approximately 3,000 feet of the ground affect the quality of the air we breathe.

The Components of a Landing and Takeoff Cycle (LTO)

The time a plane spends in the mixing-zone can be divided into four distinct periods. These periods are

- approach/landing
- taxi-in/taxi-out
- takeoff
- climbout [97]

Taken together, these four periods constitute a landing and takeoff cycle (LTO) — the foundation of ground-level aircraft emissions calculations. The cycle begins when an approaching plane crosses into the mixing-zone and lands. It continues as the plane taxis to its gate or cargo unloading area (taxi-in). When the time arrives for the plane to leave the airport, it taxis out to its runway. The pilot then opens the plane's engines to full throttle (sometimes a little less if its load is light enough) and takes off. Once the plane has gained about 500 feet of elevation, the pilot reduces the engines' power setting and begins climbing up towards cruise elevation (climbout). Climbout, within the context of an LTO, ends when the ascending plane crosses the mixing-zone's ceiling.

NRDC focused on emissions from air carrier (i.e. commercial airline) flights in its inventories for two reasons: (1) the recent rapid growth in air carrier travel and (2) the wealth of information available on air carrier flights. Air carrier emissions were calculated using FAA data and software, aircraft and engine information in *Jane's World Aircraft Recognition Handbook*, and input from the U.S. Environmental Protection Agency (EPA), Utah Department of Environmental Quality (DEQ), and Texas Natural Resources Conservation Committee (TNRCC).[98] Information about the different types of planes and engines in use at these airports was entered into FAA software, entitled *FAA Aircraft Engine Emissions Database Version 2.0* or FAEED, which then calculated the emissions created by each airport's planes as they passed through the mixing-zone. The results of NRDC's air carrier emissions inventories are as follows:

Table 6
Ground-Level Air Carrier Emissions at Nine Airports in 1993*

Airport & State	LTOs/yr	VOCs (tons/yr)	NOx (tons/yr)
Chicago O'Hare (IL)	383,362	1,428	4,650
Newark (NJ)	140,109	914	1,916
LaGuardia (NY)	135,800	677	1,476
John F. Kennedy (NY)	80,337	1,027	1,879
Bradley (CT)	36,506	128	342
El Paso (TX)	29,752	48	258
Jacksonville (FL)	19,838	42	201
Westchester (NY)	9,145	18	42
Fairbanks (AK)	7,075	15	64

* Raw data generated using FAA software and data as well as airport-specific idle/taxi times. Actual VOC totals may be 10-15% lower than reported due to fuel conservation measures voluntarily practiced by airlines which also result in emissions reduction.

Sources:
FAA Aircraft Engine Emissions Database, Version 2.0.
FAA Airport Activity Statistics of Certified Route Air Carriers for calendar year 1993.
Akira Kondo, FAA, fax communication, 2/22/96 (for average airport idle times in 1995; 1993 average airport idle times were unavailable).
EPA, Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources, 1992, p. 198.

Omissions From Inventories

NRDC's emissions inventories do not include emissions from planes belonging to foreign countries or governments because (1) the FAA does not publish flight data for planes that fit this description, and (2) information provided by the International Civil Aviation Organization (ICAO) was not detailed enough for our purposes. However, ICAO reports that there were 26,638 such LTOs at the New York area's three major airports — Kennedy, LaGuardia, and Newark— 9,601 such LTOs at Chicago O'Hare, and 380 such LTOs at Fairbanks International Airport during 1993.[99] These totals were, respectively, 7% of all of the New York City area's 1993 air carrier traffic, 2% of O'Hare's 1993 air carrier traffic, and 5% of Fairbanks' 1993 air carrier traffic. Aircraft emissions at these airports are therefore likely to be higher than our inventories indicate.

NRDC also did not include automobile emissions in its inventories. While cars are significant sources of air pollution at airports (see box), their emissions are already addressed by many emissions control strategies in most states. Unlike airplanes, they do not slip through the regulatory cracks.

Mass Transit at Airports

Planes are hardly the only pollution sources at major airports. An EPA-funded study of seven Southern California airports found that private vehicles traveling within an airport's confines can produce as much, and sometimes more, VOCs and NO_x as arriving and departing planes. At Sacramento Metropolitan Airport, for example, aircraft and private vehicles each produced approximately 108,000 pounds of hydrocarbons (VOC precursors) during 1990.[100] NO_x emissions from private vehicles at John Wayne Airport during that same year were approximately 9% higher than those from arriving and departing airplanes.[101]

Our own survey results suggest a reason for these high totals: low reliance on public transit. Two of the seven California airports in the EPA study, Los Angeles International and Ontario International, responded to our survey. Only 5% of Los Angeles International's passengers and 2% of Ontario International's passengers reach the airport via public transit.

Overall, NRDC obtained some information on how people traveled to and from 23 of the nation's 50 busiest airports. Private and commercial cars — taxis, limousines, or jitney services— accounted for over 90% of the traffic to and from 18 of these 23 airports.

Twenty airports provided us with information on public mass transit use. In only three cases — John F. Kennedy Airport in New York, and Houston's Intercontinental and Hobby airports — did 10% or more of an airport's passengers or employees use mass transit. John F. Kennedy International Airport

NRDC's survey shows that the overwhelming majority of airline passengers reach the airport in their own car. Higher reliance on mass transit would reduce airport-related smog.

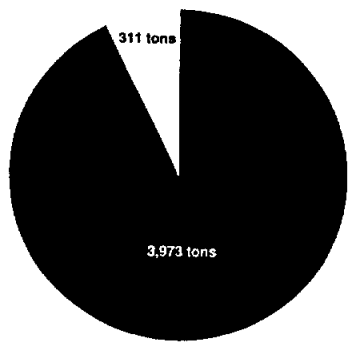
reported that 14% of its passengers reach the airport via public transit, the highest total of any airport in the top 50.

Mass transit is therefore one of the most effective, and under-utilized, means of reducing airport-related smog. City and airport officials should work to establish viable mass transit links to and from airports, providing passengers with reasons to leave their cars at home.

Results and Analysis

Our calculations and data provided by the states of Illinois, Utah, and Connecticut show that an airport's arriving and departing air carrier flights produce comparatively large quantities of ground-level VOCs and NO_x (see Table 7). VOC emissions, products of incomplete combustion, occur primarily during the idle/taxi phase (see Figure 7). Air carrier flights create a situation in which airports might as well contain smokestacks emitting VOCs—93% of the LTO cycle VOC emissions from air carrier flights occur during the idle/taxi phase.

Figure 7
Ground-Level VOC Emissions at Inventoried Airports



Graph includes emissions from air carrier flights only.
Source: NRDC's emissions inventories

Conversely, the majority of the air carriers' ground-level NO_x emissions are generated by approaching and departing planes. Since NO_x is a by-product of high-temperature combustion, jet planes produce nearly all of their NO_x while their engines are running hot (while they are in the air). The extent to which these NO_x emissions affect ground-level air quality depends largely on the mixing-zone's ceiling, which, in turn, is affected by local topography and weather

patterns. Arriving and departing planes will have more of an impact on surface air quality if this ceiling is at 4,000 rather than 2,000 feet — if all the pollution planes introduce within 4,000 rather than 2,000 feet of the earth's surface mixes thoroughly with ground-level air. Our models assume a mixing-zone ceiling of 3,000 feet above ground-level.[102]

Table 7
1993 VOC and NO_x Emissions in 3 States: Airports[a] and Comparable Sources

State	Pollutant	Emissions Source	Rank in State[b]	Tons/yr
IL	VOC	Deere & Co. (Harvester Plant)	17	1,471
IL	**VOC**	**Chicago O'Hare Airport**	**—**	**1,428**
IL	VOC	All Steel, Inc.	18	1,367
IL	NO_x	Granite Steel Company	21	4,819
IL	**NO_x**	**Chicago O'Hare Airport**	**—**	**4,650**
IL	NO_x	CPC Int'l (corn products)	22	4,439
UT	VOC	Geneva Steel	6	590
UT	**VOC**	**Salt Lake City Int'l Airport**	**—**	**485**
UT	VOC	Magnesium Corp. of America	7	438
UT	NO_x	Questar Pipeline Company	8	1,152
UT	**NO_x**	**Salt Lake City Int'l Airport**	**—**	**955**
UT	NO_x	Chevron USA Salt Lake Refinery	9	743
CT	VOC	Quality Rolling (metal painting company) [c]	10	129
CT	**VOC**	**Bradley Int'l Airport**	**—**	**128**
CT	VOC	Northeast Petroleum (storage facilities) [c]	11	112
CT	NO_x	AES Thames (coal-burning power plant) [c]	17	370
CT	**NO_x**	**Bradley Int'l Airport**	**—**	**342**
CT	NO_x	Dexter (paper mill) [c]	18	290

Notes:
(a) Airport totals reflect LTO cycle emissions from air carrier flights. NRDC calculated the emissions for O'Hare and Bradley airports. The state of Utah provided the emissions data for Salt Lake City International Airport. Ground-level VOC totals from aircraft may be 10-15% lower than reported due to fuel conservation measures voluntarily practiced by airlines which also result in emissions reduction.
(b) Ranking is based on stationary source emissions inventories provided by the states of Illinois, Utah, and Connecticut.
(c) Refers to 1994 rather than 1993 data.

Sources:
1993emit.dbf file provided by Chris Higgins, Illinois Department of Environmental Conservation.
Marie McLaws, Utah Department of Environmental Quality, fax communication, 7/20/95.
1993 Utah Air Emissions Inventory.
"Emissions Inventories" binders for the state of Connecticut, printed on 7/18/95.

THE FREE-RIDER ISSUE: A QUESTION OF FAIRNESS

In recent years, airports and airlines have taken steps that have resulted in some emissions reductions from aircraft and airport vehicles. For example, planes at Dallas/Fort Worth and Houston Intercontinental airports are fueled directly from storage tank pipelines rather than from tanker trucks, thereby reducing the evaporative VOC emissions that accompany the transfer of fuel.[103] Many airports are in the process of replacing their diesel-powered shuttle buses with buses powered by cleaner-burning alternative fuels like natural gas or electricity. Airports all over the country are also providing planes with power and climate-controlled air right at the gates, minimizing the length of time planes need to run their own generators (auxiliary power units or APUs), ultimately saving fuel and reducing pollution. In their efforts to comply with the Aviation Noise and Capacity Act of 1990, airlines have been phasing out their older, noisier Stage 2 aircraft in favor of newer, quieter Stage 3 aircraft. Since Stage 3 engines are, for the most part, cleaner-burning than the Stage 2 engines they replace, VOC emissions *per seat* are decreasing.[104]

NRDC's inventories and emissions data furnished by state governments illustrate the extent to which airports, and the airlines that serve them, are getting a free ride on the backs of other industrial polluters.

Nevertheless, NRDC's inventories and emissions data furnished by state governments illustrate the extent to which airports, and the airlines that serve them, are getting a free ride on the backs of other industrial polluters. Stationary industrial sources that emit considerably less ground-level VOCs and NO_x than major airports' air carrier planes face emissions reductions requirements that neither airports nor airlines face. If an industrial source located in an ozone nonattainment area produces more than 10, 25, 50, or 100 tons of VOCs per year, it is obliged to reduce its annual VOC emissions until the area reaches attainment.[105] (These totals respectively correspond to extreme, severe, serious, and moderate ozone nonattainment areas.) By way of comparison, a major airport's *idling and taxiing planes* can emit hundreds of tons of VOCs annually. NO_x reduction requirements for ozone nonattainment areas vary from state to state. However, even the least stringent compulsory reduction measures apply to industrial sources producing 100 or more tons of NO_x per year — hundreds, and in many cases, thousands of tons less than an airports' arriving and departing planes.[106]

Of the airports listed below in Table 8 — all of them located in ozone nonattainment areas, and all of which would be required to cut their emissions if they were factories rather than airports — none are legally obliged to reduce the pollution caused by their arriving and departing aircraft.[107] These aircraft emissions simply slip through the cracks, leading to some rather absurd situations. For example, Chicago factories that produce one-fiftieth as much VOCs as O'Hare's idling and taxiing planes must strive to lower their VOC emissions. O'Hare, on the other hand, can legally emit limitless amounts of VOCs so long as they come from aircraft engines. Similarly, New York's SIP targets the boiler in one of John F. Kennedy Airport's terminals for emissions reductions because it produces 292 tons of NO_x per year[108] — one-sixth the amount of NO_x produced by Kennedy's arriving, departing, and taxiing planes in 1993.

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Table 8
Air Carrier Emissions* at Airports in Nonattainment Areas

Airport	Type of Nonattainment Area	Idle/taxi phase VOCs (tons/yr)	LTO Cycle NO_x (tons/year)
Chicago O'Hare (IL)	severe	1,302	985
John F. Kennedy (NY)	severe	4,650	1,879
Newark Int'l (NJ)	severe	858	1,916
LaGuardia Int'l (NY)	severe	620	1,476
Bradley Int'l (CT)	serious	114	342

*Actual VOC emissions from idling and taxiing aircraft may to 10-15% less than reported due to fuel conservation measures voluntarily practiced by the airlines which also result in emissions reduction.

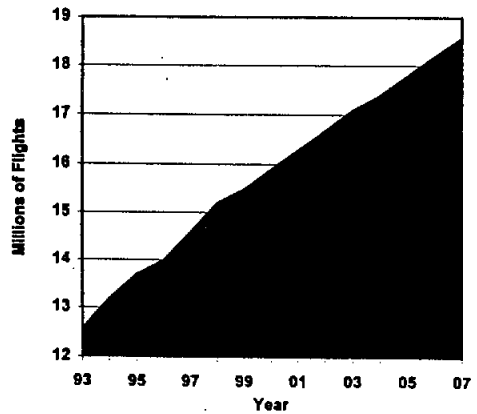
Sources:
FAA Aircraft Engine Emissions Database, Version 2.0.
FAA Airport Activity Statistics of Certified Route Air Carriers for calendar year 1993.
Akira Kondo, FAA, fax communication, 2/22/96 (for average airport idle times in 1995; 1993 average airport idle times were unavailable).
EPA, Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources, 1992, p. 198.

The Future of the Free-Rider Issue

With smokestack polluters under increasing public pressure and legal obligations to reduce their emissions, and air traffic estimated to continue its annual growth well into the next decade, the airports' free-rider problem is likely to get worse. The FAA expects there to be 4.9 million more air carrier operations (landings or takeoffs) in 2007 than there were in 1995. (See Figure 8).

State and local regulators will find themselves compelled to place further restrictions on other industries if the emissions from these additional flights are left uncontrolled. According to an EPA-sponsored study, 1990 air traffic at five commercial airports in California's South Coast air basin accounted for 0.3 and 1.1% of the area's total VOC and NO_x emissions respectively.[109] Flights to and from these five airports could produce 3.9 and 4.4 percent of the area's allowable NO_x and VOC emissions respectively in 2010 — all of which would, under the current regulatory scheme, be untouchable.[110] Concrete evidence of the growing free-rider problem is already available from New York State. Air carrier flights at New York's John F. Kennedy's produced 1,027 tons of ground-level VOCs and 1,879 tons of ground-level NO_x during 1993. In 1990, an industrial source that produced these totals would have been the state's seventh and twenty-eighth largest stationary VOC and NO_x sources respectively. An industrial source that produced these same totals in 1994 would have moved up both of these lists; it would have been the state's third largest stationary VOC source and twenty-third largest stationary NO_x source.[111] In other words, as the state succeeds in curbing emissions from industrial sources, its airports' relative contributions grow higher and higher.

Figure 8
Air Carrier Flights, Actual and Forecasted



Source: FAA Aviation Forecasts: Fiscal Years 1996-2007, Office of Policy and Plans, March 1996, table 33.

REDUCED ENGINE IDLING AND TAXIING AS A MEANS TO CUT VOC EMISSIONS

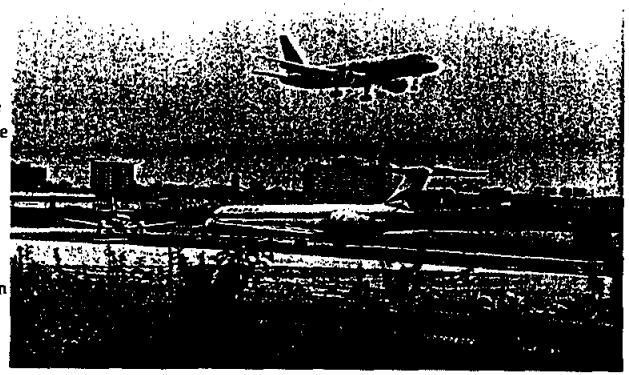
Airports' annual VOC totals could be reduced significantly if all the major airlines would voluntarily adopt a procedure that is in their own interest: idle and taxi using the fewest number of engines possible. This practice, in addition to reducing VOC emissions (toxics included), would save the airlines money.

"Reduced engine idling/taxiing," also commonly known as single-engine taxiing, is not a complicated procedure; pilots simply maneuver their planes around airport runways without all of their engines running. Jet planes need to have all of their engines in operation for two to three minutes before takeoff and one to three minutes after landing;[112] they are otherwise capable of maneuvering about an airport's taxiways and runways on one or two engines. Two-engine planes can idle/taxi on a single engine; three-engine planes can idle/taxi on one or two engines; four-engine planes need to have two engines running in order to idle and taxi. Pilots can therefore shut down one-third, one-half, or two-thirds of their engines for most of the idle/taxi period.

Opportunities for reduced-engine idling/taxiing vary from day to day. Pilots must consider a variety of ever-changing factors — wind and runway conditions, the load of the plane — before deciding to idle and taxi on one or two engines. This decision is, appropriately, ultimately a matter of pilot discretion.

Opportunities for reduced-engine idling and taxiing also vary from airport to airport. In 1995, air carrier flights at 223 U. S. airports idled and taxied for an

average of 13.7 minutes before takeoff and 5.4 minutes after landing.[113] Reduced engine idling would have been possible for as many as 16.1 of these 19.1 minutes. Average taxi/idle times at the airports NRDC selected for study varied widely, the extremes being represented by JFK and El Paso International airports. In 1995, JFK's flights idled/taxied for an average of 32.3 minutes whereas El Paso's flights averaged only 10.8 minutes of idle/taxi time. In either case, the taxi/idle period presents an opportunity for easily-achieved fuel savings and VOC emissions reductions.



Increased, voluntary use of reduced-engine idling and taxiing would cut airport VOC emissions and reduce many airlines' fuel costs.

Nevertheless, discussions with pilots and fleet managers revealed that the major airlines hold widely varying opinions on reduced engine/idling and taxiing. Delta encourages the practice on all of its planes to the fullest extent possible whereas United's two- engine planes rarely idle/taxi on one engine.[114] America West discourages its Boeing 757 pilots from employing the practice and its Boeing 737 pilots practice reduced engine idling and taxiing on an ad hoc basis.[115] The EPA's FIP calculations assumed that 20% of the air carrier traffic in California's South-Coast and Sacramento Air Basins employed reduced- engine idling/taxiing procedures.[116] However, this study was based on 1990 flight data and, due to its economic benefits, the practice has probably become more popular since then.[117]

Economic Benefits of Reduced Engine Idling/Taxiing

Idling and taxiing using the fewest number of engines possible could help airlines lower their fuel costs. However, there is no industry-wide consensus on the practice. Single- and reduced-engine idling/taxiing has been a standard operating procedure at Delta since 1981.[118] Delta may have saved as much as $5.9 million in fuel costs during 1995 solely on the flights to and from its hub—Atlanta—because of this program. America West, on the other hand, does not encourage the practice. In fact, its Boeing 757 pilots are specifically discouraged from minimizing engine use while idling and taxiing. The airline may consequently have missed an opportunity to save $1.2 million in fuel costs on its 1995 Phoenix and Las Vegas flights.[119] (Phoenix and Las Vegas are America West's two major hubs.)

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Emission Benefits of Reduced Engine Idling/Taxiing: A Case Study at Newark Airport

In order to illustrate the emissions advantages of reduced engine idling/taxiing, NRDC created a comparative model [120] (see Table 9). We assumed that all of the airlines which flew into Newark International Airport during 1993 followed Delta's example. Delta's flights idle and taxi on the minimum number of engines necessary.[121] Furthermore, they wait until the last possible moment to fire up their remaining engines before takeoff and, conversely, shut engines down as soon as possible after landing.[122]

Table 9
Potential Emissions Reductions at Newark International Airport, 1993

	VOCs (tons/yr)	NO_x (tons/yr)
Baseline Idle/Taxi Emissions [a]	857.53	295.88
Delta Scenario, Idle/Taxi Emissions [b]	537.90	182.54
Added Auxiliary Power Unit (APU) Emissions [c]	0.36	9.66
Potential Net Reduction (tons/yr)	318.27	103.68
Potential Net Reduction (tons/day)	0.87	0.28

Notes:

(a) The baseline scenario assumes than no airline practices reduced-engine idling and taxiing.

(b) The "Delta Scenario" assumes that all airlines follow Delta's lead in employing reduced engine idling/taxiing procedures. Unlike pilots at other airlines, Delta's pilots idle and taxi on the minimum number of engines whenever they can. Depending on weather conditions, as well as aircraft and engine models involved, Delta pilots will idle and taxi on either one or two engines until 2-3 minutes before takeoff. (Engines must warm up for a minimum of 5 minutes if they have been off for more than 2 hours.) Similarly, they will shut down all but one engine 1-3 minutes after landing.

The assumptions about two- and three-engine flights contained within the "Delta Scenario" are based on conversations with Delta pilots and managers. The assumptions about four-engine flights are based on a conversation with Rich Wilcox, Senior Environmental Scientist, EPA. These assumptions are as follows:

Two-engine planes and 727s: Fifteen percent of all two-engine and Boeing 727 flights were assumed to have all engines running during the idle and taxi period. The remaining 85% of the flights were assumed to have all engines running for only 2.5 minutes before takeoff and 2 minutes after landing; otherwise they were assumed to have idled and taxied on one engine.

Three-engine planes other than 727s: With the exception of Boeing 727s, 25% percent of three-engine planes were assumed to have all engines running during the idle and taxi period. The remaining 75% were assumed to have all idled and taxied on two engines until 2.5 minutes before takeoff, and to have shut down all but one engine 2 minutes after landing.

Four-engine planes: Fifteen percent of four-engine planes were assumed to have all of their engines running during the idle and taxi period. The remaining 85% of the flights were assumed to have all engines running for only 2.5 minutes before takeoff and 2 minutes after landing; otherwise they were assumed to have idled and taxied on two engines.

(c) Additional Auxiliary Power Units (APU) emissions: Delta pilots turn on their in order to help light the cabin at night. They would not need to have their APUs running if they had all of their engines running during the idle/taxi period. Half of all flights were assumed to have their APUs running while idling and taxiing.

Sources:
FAA, Airport Activity Statistics of Certified Route Air Carriers for 1993.
FAA, Aircraft Engine Emissions Database, Version 2.0.
EPA, Procedures for Emissions Inventory Preparation Volume IV: Mobile Sources, 1992.

Akira Kondo, FAA, fax transmission, 2/22/96.
Carter Chapman, Program Manager for Delta's MD88 and MD90 Fleets, telephone communication, 6/26/96.
Phil Kelley, Delta 737 Fleet Manager, telephone communication, 2/1/96.
Don Martin, Project Manager, Performance and Measurement-OCC, Delta Airlines, telephone communication, 6/4/96.
Roy Tucker, Program Manager for Delta's MD11 Fleet, telephone communication, 6/28/96.
Rich Wilcox, Senior Environmental Scientist, EPA, telephone communication, 11/13/95.

By way of comparison, the state of New Jersey expects all of the transportation control measures included in its SIP to result in a 1.4 ton per day VOC reduction by 1996. The creation of park-and-ride lots, one-way tolls, high-occupancy vehicle lanes, and selected highway capacity improvements— all of which come out of the state's budget, and require changes in individual lifestyles as well as years of construction projects— are among the transportation control measures New Jersey is currently implementing.[123] Meanwhile, the airlines are not being asked to cut their VOC emissions even though they could save themselves money in the process. A voluntarily implemented Delta-style idle and taxi program for all of Newark's flights could yield three-fifths of the transportation control measures' emissions reductions at no public cost, and with likely operating savings for the airlines.

NO_x Emissions

The problem of aircraft NO_x emissions is not so easily addressed. Reduced engine idling would substantially reduce the amount of NO_x air carrier flights produce while on the ground, but these flights generate the overwhelming majority of their LTO-cycle NO_x while approaching and leaving the airport. Increased voluntary implementation of NO_x emissions reduction measures (using less than full power on takeoff, minimizing use of reverse thrust upon landing) would barely reduce the amount of ground-level NO_x produced by jet travel.

Barring the obvious solutions— flying less often, traveling by train or bus rather than airplane— ground-level aircraft NO_x emissions cannot be significantly reduced without the combination of technological breakthroughs and tougher NO_x standards. On the technology front, NASA is currently working with major jet engine manufacturers to develop an engine that produces 70% less NO_x than today's average jet engine. NASA expects the technology for these engines to be available by 2000, but it could be decades before such engines actually appear on airplanes.[124] In terms of standards, the International Civil Aviation Organization (ICAO), the body responsible for establishing international NO_x standards for jet engines, is currently considering tightening its NO_x standards by an additional 16%.[125] The U.S. delegation to

ICAO has staked out a minority position by not supporting this measure. Whereas European nations already support tougher international NO_x standards, the U.S. is calling for further study of the issue.[126]

CONCLUSIONS AND RECOMMENDATIONS

Airports are significant sources of ground-level VOC and NO_x emissions. Arriving and departing planes can produce as much ground-level NO_x as nearby power plants; idling planes generate VOC emissions rivaling those blowing from nearby smokestacks. Nevertheless, the aviation industry is being given a free ride. Neither airports nor the airlines are held accountable for the aggregate impacts of their ground-level aircraft emissions. NRDC recommends the following:

1. Treat airport-generated emissions in the same manner as emissions from other large sources and include them in state air pollution plans. Although airplane emissions at airports are comparable to those from industrial sources, they escape inclusion in State Implementation Plans (or SIPs), the EPA's principal means of achieving cleaner air in nonattainment areas. State and local regulators remain virtually powerless to address this problem. As states scramble to meet mandatory emissions reductions deadlines, other major industrial sources are forced to compensate for this omission. Allowing states to include control strategies for ground-level aircraft emissions in their SIPs would help them meet air quality goals.

2. Minimize aircraft engine use while idling and taxiing. VOC emissions (both toxic and non-toxic) at airports would be significantly reduced if all airlines instructed their pilots to shut down as many engines as possible during the idle and taxi period. This simple procedure would decrease emissions, as well as fuel costs. The FAA should issue an Advisory Circular on reduced-engine idling and taxiing, encouraging airlines to employ the practice as often as possible.

3. Adopt more stringent NO_x standards. Ground-level NO_x emissions from aircraft can be curbed by tightening engine emissions standards. The UN-affiliated International Civil Aviation Organization (ICAO) tightened NO_x standards by 20% on January 1, 1996 and is currently considering tightening the standard an additional 16%. The European Union is supporting the tighter NO_x standard. However, the new standard is unlikely to be approved without U.S. support, which has, to date, been withheld. The United States needs to join its European counterparts in actively supporting the additional tightening of this standard. Regardless of ICAO's ultimate decision, the United States should adopt the proposed standard as its own.

4. Conduct further study and require additional reporting of toxic aircraft emissions. The EPA should carry out a thorough investigation and risk assessment of toxic aircraft emissions on a nationwide basis. If findings similar to its southwest Chicago study are reached elsewhere, then airports should be placed on the agency's list of major hazardous pollution sources. Meanwhile, airports should have to report their toxic emissions to the Toxic Release Inventory (TRI). They should not be exempt from reporting requirements that similarly-sized hazardous air pollution sources must obey.

5. Investigate differential landing fees. Until local authorities can implement SIP control strategies for aircraft, they can address the problem of aircraft pollution indirectly. Airports can establish a revenue-neutral set of differential landing fees in order to encourage airlines to use their least-polluting planes. This approach could help reduce airport pollution with no net cost to airline passengers.

6. Discourage auxiliary power unit use. Jets parked at airport gates often use generators (auxiliary power units or APUs) to power their electrical and climate control systems. Both emissions and fuel consumption could be reduced if planes shut off their APUs and relied on airport-provided power and air to the fullest extent possible. Southern California's airports are already electrifying their gates; airports in other nonattainment areas should follow their lead.

7. Convert airport vehicle fleets and ground service equipment to alternative fuels. Converting ground service equipment from gasoline or diesel to alternative fuels like natural gas or electricity leads to emissions reductions. Alternative-fuels programs already exist at many airports. Los Angeles International Airport (LAX), for example, operates 14 liquid natural gas (LNG) buses, and is ordering more. Massport, the agency that runs Boston's Logan Airport, is converting its vehicles from diesel to natural gas and electric power and encouraging the airlines that serve Logan to do the same. Centrally fueled and maintained airport-based fleets are excellent niches for alternative fuel vehicles, and states and airports should require or create incentives for their conversion.

8. Encourage mass transit. Private vehicles traveling on airport grounds can produce as much VOC and NO_x as an airport's planes. Our survey shows that the overwhelming majority of airline passengers reach the airport in their own cars. Airport emissions totals could be considerably reduced if these people left their cars at home; mass transit use to and from airports should be promoted and developed at every opportunity.

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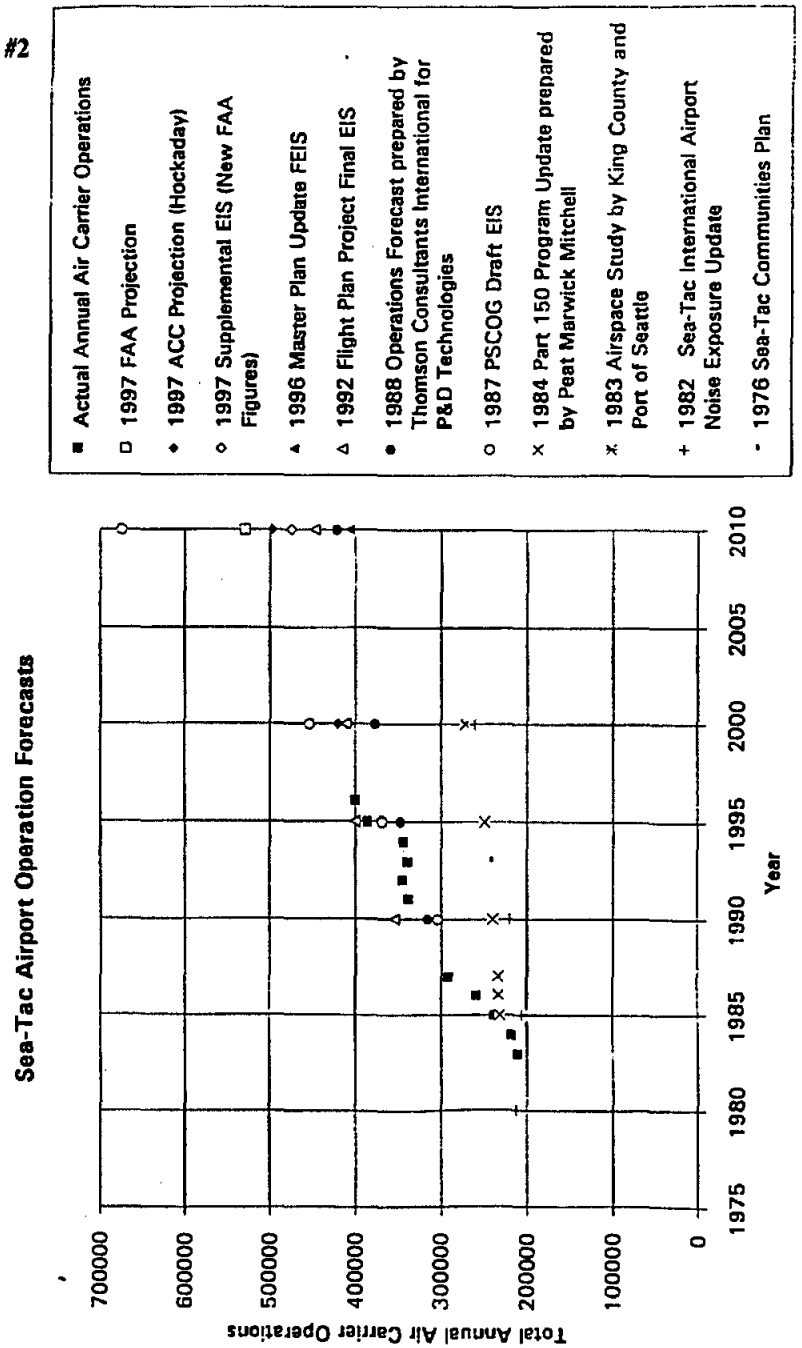
Attachment #2



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September 24, 1996

Attachment #5

Mr. Chuck Clark, Regional Administrator
U.S. EPA Region X
1200 Sixth Avenue
Seattle, WA 98101

Dear Mr. Clark:

I have received a copy of the letter from Mr. Lowell Johnson of FAA dated July 15, 1996 and, as I have again spent the time to look through the final EIS, have the following comments regarding his assertion that FAA has conducted a cumulative impact analysis. For your convenience, I have cited the appropriate sections referred to in the above referenced letter and given the exact analysis presented in the final document itself:

Chapter IV *Consequences*
Section 1- "Noise" "However, until specific project plans are completed for these developments, the total cumulative impacts can not be identified." [IV.1-13-]
Section 2- "Land Use" No cumulative analysis
Section 3- "Historic" "However, until project specific plans are developed for these developments, the cumulative impacts can not be identified." [IV.3-4-]
Section 4- "DOT 4(f) Lands" "However, until specific project plans are completed for these developments, the total cumulative impacts can not be identified." [IV.4-8-]
Section 5- "Farmland" "As no prime or unique farmland exist in the immediate airport area, no cumulative direct impacts would be expected." [IV.5-2-]
Section 6- "Social Impacts" "However, until specific project plans are completed for these developments, the total cumulative impacts can not be identified." [IV.6-7-]
Section 7- "Human Health" No cumulative analysis
Section 8- "Socio-Economic" "At this time, the long-term and combined impact from the construction and operation of a number of facilities planned for the Sea-Tac Airport vicinity cannot be fully assessed or quantified with any degree of precision." [IV.8-12-]
Section 9- "Air Quality" No cumulative analysis
Section 10- "Water Quality" No cumulative analysis
Section 11- "Wetlands" "Loss of this amount of wetland area, however, should be viewed as one of many contributing to cumulative effects on natural resources in the Puget Sound Region." [IV.11-5-]
Section 12- "Floodplains" "Adverse impacts on floodplains or flooding in the Des Moines basin would potentially result from development of other proposed projects in the vicinity..." [IV.12-4-]
Section 13-14- "Coastal & Rivers" "Within the Airport vicinity, Angle Lake is the only waterbody under the jurisdiction of a local Shoreline Master Program, and it would not be affected by any of the Master Plan Update alternatives." [IV.13-1-]
Section 15- "Surface Transportation" "However, until specific projects are proposed for these developments, the total cumulative impacts can not be identified." [IV.15-7-]

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Section 16- "Plants & Animals" "Even with successful implementation of proposed mitigation, construction and operation of the proposed Master Plan Update and other planned development in the area could contribute to cumulative impacts on fish and aquatic resources." [IV.16-13-]
Section 17- "Endangered Species" "Bald eagles and peregrine falcons are not likely to use regularly forage or perch in such highly developed areas." [IV.17-3-]
Section 18- "Services/Utilities" "However, until specific project plans are completed for these developments, the total cumulative impacts can not be identified." [IV.18-7-]
Section 19- "Earth" "Many proposed projects, such as the Regional Transit Project, would require use of substantial fill, which, together with the Sea-Tac Master Plan Update airport improvements, would increase the borrow demand within the Regon." [IV.19-18-]

The FAA letter also referenced Chapter II, but I did not find any cumulative analysis or reference to one in that chapter. Does FAA believe that a list of other projects such as that contained in their letter constitutes a cumulative analysis? I am concerned that the ROD will contain only a list of area projects. And I do not believe that the words; "cannot be identified" satisfy the intent of NEPA, especially when some of the projects in the list the FAA has supplied are Port of Seattle proposals. The SASA base is missing from the list however, and this is a significant oversight. The final EIS for SASA is an FAA/Port of Seattle co-lead agency project subject to the general conformity provisions of the CAA. The SASA document did not contain a detailed air quality impact analysis. The Master Plan identifies a number of carriers who will be relocated for maintenance to the SASA area with a phased build-out planned for this facility. I believe it is imperative that the FAA be required to now complete the necessary air quality analysis before approval of the Master Plan since SASA with 9,000 employees and several relocated carriers with expanded maintenance will use the facilities.

I would appreciate a response to my concerns as soon as possible.

Sincerely,

Copy

Debi L. DesMarais
31500 1st Ave S #14-103
Federal Way, WA 98003
(206) 529-8407
c: ACC
Port of Seattle

51

Attachment #6

U.S. Department of Transportation
Federal Aviation Administration

Northwest Mountain Region
Colorado, Idaho, Montana
Oregon, Utah, Washington
Wyoming

1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

December 13, 1995

Mrs. Debi L. DesMarais
24322 22nd Ave. S.
Des Moines, WA 98198

Dear Mrs. DesMarais:

This is in response to your letter of November 13, 1995. I will address your questions in the order asked.

1. This is the type of question that should have been asked as part of your comments on the draft EIS. I believe it would be improper to answer this question since the draft EIS comment period has long since closed. Addressing this type of question, at this time, would be viewed by many as preferential treatment or selectively re-opening the comment period.

2. through 5: Are general technical questions about EDMS. The following answers have been provided by the Office of Environment and Energy in our Washington, D. C. Headquarters office:

Have the emission rates contained within the model been approved by EPA? If not, were previous rates approved? When? Is the EDMS model approved by EPA?

On July 20, 1993, the Environmental Protection Agency (EPA) formally accepted EDMS as a "Preferred Guideline" model for use at civil airports and military air bases. The emission rates contained within EDMS come from EPA's AP-42 Compilation of Air Pollutant Emission Factors and the FAA Engine Emission Database (FAEED).

If the emission rates come from manufacturers specifications, who exempted aircraft engine manufacturers from estimating particulate matter (smoke number)? If FAA exempted, do manufacturers estimates exist? Are they available for viewing?

The particulate matter (PM-10) come from EPA's AP-42 database. The aircraft engine manufacturers are required to estimate smoke number for certification purposes. For further information, please contact Richard Wilcox at EPA, Ann Arbor, Michigan.

Does FAA update emission data periodically with newer aircraft engine emission rates? If so, can those rates be substantiated with appropriate documentation?

The FAA updates aircraft emission data as information becomes available. The EDMS model is flexible in allowing users to add new aircraft emission data into the database and to override defaults for more detailed or site specific values.

"Expect Excellence"

Since there is such disparity between the 1985 EPA AP-42 engine emission rates and today FAA EDMS rates, can the reduction in CO and HC by approximately 2/3 be substantiated?

The emission rate in EPA's AP-42 and EDMS are very close. We are in the process of updating the EDMS database to incorporate data from the recent update of the AP-42 database. If Ms DeMarais can specify how she used the EDMS model to calculate the emission rate, then we would be willing to look at the cause of any disparities.

A further contact for EDMS questions is Ms Diana Liang at 202-267-3494.

Sincerely,

Dennis Ossenkop
Environmental Protection Specialist

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Sea-Tac to hail bigger 'cab'

Taller, roomier control tower planned by 2002

By Chris Geana
Journal Business Reporter

SEATAC — The Federal Aviation Administration wants to build a new air traffic control tower at Seattle-Tacoma International Airport to increase safety and efficiency at the Northwest's busiest commercial air travel hub.

The FAA says the new tower, which will cost $16 million to $18 million and be completed in mid-2002, will be taller, roomier, and better situated relative to Sea-Tac's two main runways.

The Port of Seattle, which operates Sea-Tac, has completed an evaluation of 20 potential sites. It settled on one near the Airborne Freight Building in the "North Terminal Area" three-fourths to one mile north of the present tower.

FAA Air Traffic Manager Tom Davidson pointed out the need for more room to visitors Tuesday to the tower "cab" — the glass-enclosed top floor of the tower. From the cab, 127 feet above the pavement, air traffic controllers guide airliners, shuffling landings and takeoffs, directing like traffic cops the planes taxiing between runways and boarding gates.

"Sea-Tac is blessed with the latest of everything," Davidson said — the latest air surveillance radar, electronic aids for reduced visibility operations — it's one of nine airports in the U.S. that has the latest model of a radar that tracks airplanes moving on the ground.

"But all this equipment takes space." He motioned to the banks of lights and switches, radar and computer screens that take up every inch of counter space. "If you can find a place to put one more thing here, point it out to me."

That more equipment is coming is, to Davidson, a foregone conclusion — with or without a third runway planned for Sea-Tac. "I'm trying to look 40 years into the future and allow for what we'll need then," he said.

Attachment #4

Gary Kissel/Journal

Paul Hadler, air traffic control specialist, directs the arrival and departure of jetliners at Seattle-Tacoma International Airport.

Walkaround room is just as important, Davidson said, since tower controllers are responsible for everything that moves on the flight side of the terminal. Business was slow Tuesday at 2 p.m., and a crew of four staffed the tower cab: local controller Paul Hadler, ground controller Rick Morris, Bud Pangan delivering clearances and flight data, and supervisor Brook Shumway.

But three times a day, the pace picks up:

- In the 20 minutes around 7 a.m. every day, 59 flights depart. In summer, 75 planes leave during the morning rush.
- Around 4:30 p.m., flights that left the East earlier in the day arrive in Seattle's holding patterns.
- From 10 to 11:30 p.m., the last rush of late East Coast flights arrives.

During those peaks, Davidson said, the tower crew can easily double. Assistants are called in and a gate hold controller is added to keep planes at their gates rather than burning up fuel on a gridlocked taxiway.

"And I'm seeing the peaks not growing, but filling in between. I need space for three more positions, and if I can get four, I'll take it."

Within the life span of the new tower, Davidson said, the FAA may have to have a local controller for each of Sea-Tac's parallel main runways. There will have to be two controllers giving flight crews their Air Traffic Control clearances. The gate hold controller's position will get more important as fuel costs rise.

And the growth of technology goes without saying. In the radar approach controllers' room one flight down from the cab, a computer shows a map of the U.S. superimposed with color-coded images

See SEA-TAC, B4

Specifically, the settleme

Sea-Tac

Continued from B1

of every airplane headed for Seattle. Three blips hovered over the map of Wisconsin as visitors watched it Tuesday. "We would have liked to h[illegible] of t[illegible] the c[illegible] iew to[illegible] in the [illegible] Serrill

Davidson said, "but there just wasn't room."

Jim Serrill, manager of technical services for the port, said the present tower was constructed in 1975 and is approaching the end of its 25-year service life.

He hasn't seen final plans for a

said, but he's been told it will be 251 feet tall — just less than twice the height of the present tower.

The FAA will pick up the tab for design and construction of the new tower, but the port will pay a share in site preparation and "architectural enhancements," according to a recent memo to port commissioners.

C-141

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Attachment #3

US Department of Transportation
Federal Aviation Administration

Seattle Airports District Office
[illegible] Avenue S.W.
Renton, WA 98055-4056

April 24, 1992

Ms. Minnie O. Brasher
846 South 136th
Seattle, Washington 98168

Dear Ms. Brasher:

This responds to your letter dated April 2 regarding the capacity of Seattle-Tacoma International Airport if a dependent third runway is built. The hourly airport capacity of the existing airport during clear weather conditions is 56 to 60 arrivals, as you have stated I am assuming that this number is based on actual operation of the airport

The theoretical maximum hourly capacity of the existing airport is 100 operations (takeoffs and landings) during clear weather conditions. In Phase II of the Puget Sound Air Transportation Committee report, the theoretical hourly capacity of Sea-Tac with a dependent runway during clear weather is 141 operations. At this time, we believe that this is a reasonable estimate.

Sincerely,

Sarah P. Dalton

Sarah P. Dalton
Planner, Puget Sound

35V

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March 31, 1997

Mr. Dennis Ossenkop
Northwest Region FAA
1601 Lind Avenue SW
Renton, WA 98055

Dear Mr. Ossenkop:

Attachment #1

These questions and comments are to be included along with the other comments I made and previously submitted to FAA with reference to the draft Air Quality Conformity Determination. These comments are not meant to replace the previous comments but are to be considered a supplement to those comments. Please include all my submittals into the Record of Decision.

1 G-142 1

Questions and Comments Regarding the draft Transportation and General Conformity Determination for the Sea-Tac Airport Master Plan Update Draft, Final and Draft Supplemental Environmental Impact Statements

Please refer to my numbers when responding to my questions and please indicate by page number or reference in the FSEIS responses to comments section where any questions and/or comments warranted any change and where that can be found in the text or no change in the analysis.

1. How can the project be exempted from a conformity review when there are existing and future modeled exceedances of the CO, NO_2 and PM_{10} standards?

2. Why didn't FAA model ozone, especially since Sea-Tac Airport is the greatest producer by acre of ozone precursors in the county?

3. Why do the numbers for annual inventory in tons per year of pollutants vary so much between documents? Why do the numbers go up and down arbitrarily without any relationship to number or type of polluters?

4. Why is it that when I average the pollution from the standard fleet mix and then increase the number in the fleet as the SEIS predicts is the future case, I derive more pollution but the SEIS shows less?

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5. Why is there such a difference (over 2500 tons) between the NRDC's report on inventory in tons per year for nitrogen oxides at O'Hare with relatively the same number of annual aircraft operations as Sea-Tac's and the SEIS estimates?

6. Why does this same illogical scenario occur with the 1991 Department of Ecology study, especially when nitrogen oxides is now increased in the newest EDMS 944 model over the 1991 version used by Ecology?

7. Why does the consultant make such unusual adjustments to the fleet mix that are untypical of Sea-Tac operations when peak hour operations are increased? Why does the consultant insist that aircraft spacing demands a lower level of peak hour operations when this situation does not constrain other airports such as O'Hare which has one jet departure every 22 seconds with new technology and scattered departure corridors?

8. When I increase nitrogen oxides incrementally based upon logical increases in aircraft operations, why do I get levels that are above de-minimus but the SEIS does not?

9. Why does the draft and final EIS state nitrogen oxides will increase in the future, but the inventory does not go up by levels that seem to make sense?

10. Why are levels of annual nitrogen oxides so similar in the SEIS to the draft EIS when aircraft operations are significantly increased?

11. Will there ever be dual-simultaneous departures from the first and third runways? If so, will a new air pollution analysis be conducted which considers this scenario?

12. Which receptor in the draft EIS was the one that had the exceedance of the NO_2 standard? Where does this correspond for the SEIS? How far from A-8 is the new receptor which has the same level of NO_2? Were there any higher receptors than South 154th Street or South 188th Street in the draft or final EIS screening dispersion analysis? Refined analysis?

13. Why are the FEIS dispersion contours confined to a second runway plot?

14. If other wind directions are used in the dispersion analysis in a worst case scenario, would the "westside" neighborhood adjacent to the airport west fence be impacted by air pollution? Why or why not? Tyee Golf Course? Riverton Heights neighborhood?

15. Why is there such a difference (over 100 times greater, 28 ppm compared to 0.215) between Ecology's 1991 EDMS peak hour screening analysis of nitrogen dioxide in comparison to the SEIS? Please justify this discrepancy. If the model has been improved, please discuss the improvements and how and/or why these improvements would change the analysis to this degree especially considering NOx has increased in the newer version?

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16. Do de-minimus level requirements for conformity analysis change depending on the severity of historical exceedances of any particular standard? Nonattainment status? Maintenance status?

17. Will there be any exceedances of the new ozone or particulate standards with or without the project?

18. Are there any federal regulations covering the emission of HAP in a gaseous or particulate form? Any of these that apply to the conformity review? Are any of these types of pollutants present in the emissions from aircraft? What about PAH? PNA? PAN? Particulate that contain nitrite, sulfite or other hazardous or toxic pollutants? Why has there been no thorough analysis of the risk to nearby residents from emissions at Sea-Tac?

19. Will or can FAA assure the nearby residents that they will not experience ill health effects from any air pollution and/or emission(s) associated with future Sea-Tac Airport aircraft operations? If so, what is the degree of certainty? If not, how many will be affected and where?

20. When will a cumulative and multiple project air quality impact analysis be conducted? Why has it not been conducted so far? Would FAA be within de-minimus levels if all sources and projects expected to increase in the future are considered as an aggregate whole? How would mitigation offset any of these increases? What types of mitigation might be proposed which could significantly reduce emissions?

21. Why does FAA assume that air pollution will decrease in the future when all estimates indicate new exceedances of the federal CO standard by 2010 due to increased population, VMT and single passenger automobile use?

22. When will jet aircraft produced particulate data be estimated in the EDMS model run? The FAA has admitted that the data has been removed, but that the model defaults of zero are open to the user. Why didn't the consultant input data from FAEED?

23. Will FAA add all the potential operational and project related dust, particulate, NOx and other emissions together in the FSEIS?

24. Will FAA use better baseline data for background levels of particulate in the FSEIS?

25. Will FAA reevaluate the project draft air quality conformity determination considering the following issues:

a. New violation of the standard for particulate during hauling
b. Worsening of an existing violation of the NO_2 standard once cumulative impacts are assessed and logical assumptions are input into the model.

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c. Delaying achievement of interim milestones in ozone standard maintenance due to continued increase in NOx and VOC inventory at Sea-Tac Airport in the future build scenario.
d. Worsening of CO exceedances in the intersections at Sea-Tac.
e. Lack of mitigation commitment or plan.
f. New violation of the NO_2 standard at 188th.

26. Does the SIP include all airport related inventories including the automobile impacts in nearby intersections? Cumulative? Will total and cumulative inventories affect the conformity analysis?

27. Why does the SIP allow Sea-Tac emissions to increase when all other regional sources must be reduced?

28. Why does the SIP inventory not include the 20,000+ tons per year from automobile impacts in the intersections near Sea-Tac?

29. Would the project conform to an applicable SIP if all airport related/generated pollution were added together as a cumulative whole?

Sincerely,

Debi L. DesMarais
CASE
19900 4th Avenue SW
Normandy Park WA 98166
(206) 824-3120

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Rec'd
3/31/97

A. M. Brown
239 SW 189 Place
Seattle, WA 98166
28 March 1997

To: Federal Aviation Administration (FAA)
NW Mountain Region
1601 Lind Ave SW
Renton WA 98055-4056
Environmental Protection Specialist Dennis Ossenkop, ANM-611

Subject : Comments on Sea-Tac Airport SEIS due 31 March 1997

Enclosed are comments on the subject SEIS. They should be considered as a supplement to all my comments previously submitted. Please note, I do not consider many of my prior comments adequately addressed in the FEIS or SEIS. In my comments on the DEIS, I provided data suggesting that the estimates were too low. The "New Port" estimate is still too low.

Please include the questions or revision requests, their number (AB x), and the enclosed rationale in the Record of Decision. This will make it more obvious to the reader when the questions are taken out of context, ignored or only partially answered. The SEIS response should reference the question number.

Also, in accordance information in accordance with the following chapter in NEPA:

> 1503.4 (5) "Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicates those circumstances which would trigger agency reappraisal or further response".

Due to the short comment period, despite the major revisions, I was unable to organize my comments into an easy to follow document as I did for the DEIS.

Sincerely,
A Brown
A. Brown
Pager (206)654-1533 (Also can be contacted through CASE or RCAA office)
Enclosure : Note - References for SEIS comments are listed in Appendix A

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A. Brown SEIS Comments -Questions dispersed throughout this enclosure

Global Comments

Question AB 1 : Why aren't alternatives outside of Sea-Tac being considered now that FAA TAF forecasts indicate the Third runway does not provide adequate capacity but will cost more than building an average US airport (construction, infrastucture, mitigation and funding costs)?

Question AB 2 : Why were the impacts for alternative 1 based on operations above the theoretical maximum?

Question AB 3 : Why weren't the impacts for alternative 3 calculated using the theoretical maximum of operations and enplanements?

Question AB 4 : Why weren't the impacts for alternative 3 calculated using the FAA TAF estimates ?

Question AB 5 : Considering the uncertainties around the estimates, why wasn't a sensitivity analysis done comparing New Port estimates, FAA TAF estimates, and theoretical maximums?

Question AB 6: What are the impacts using FAA TAF estimates, 10 % over FAA TAF estimates, and theoretical maximums?

Question AB 7 : How do fleet mix assumptions change impacts to assessments based on New Port estimates, FAA TAF estimates, and theoretical maximums?

Question AB 8 : Realizing the SEIS was required by the Washington DC FAA office because they felt the FEIS estimates were too low, isn't issuing a SEIS that only adds 68,200 operations and ignores the FAA TAF estimates inconsistent with Washington DC FAA's intent?

Question AB 9 : Isn't assuming only a 2.5 % growth for Sea-Tac airport too conservative considering (1) Sea-Tac's large growth to date, (2) continuing growth of industry and population in the area and (3) its proximity to popular foreign travel routes?

Question AB 10 : Isn't excluding Boeing Field impacts inconsistent with the cumulative impacts approach required by environmental regulations?

Question AB 11: What are impacts if Boeing Field current and projected growth are included?

Question AB 12 : Aren't their exceedences or larger exceedences in pollutants such as nitrogen oxides if Boeing Field is considered?

Question AB 13 : Considering the mix zone for Boeing Field and Sea-Tac overlap and the nitrogen oxides from the newer aircraft are worse than the old ones, what are the real expected pollution levels?

Question AB 14: How much larger would the noise mitigation boundaries be if Boeing Field noise and Sea-Tac noise for ALL aircraft operations including foreign carriers were considered?

Question AB 15: What are the approximate additional mitigation costs if all reasonably probable cumulative impacts are considered along with all the supporting infrastructure needed to make a Third runway practical ? This includes pollution from Boeing Field operations, SASA, tower, parking lots, road repairs, road construction etc.

Question AB 16: Are their any precedents for ignoring the higher TAF estimates but then later in the same SEIS stating that ANOTHER Master Plan update will be need around the year 2000 because of the fast growth?

Question AB 17 : What is the rationale for ignoring the higher TAF estimates but then later in the same SEIS stating that ANOTHER Master Plan update will be needed around the year 2000 because of the fast growth?

Question AB 18 ; What is the rationale for assuming Sea-Tac will grow slower than the US average?

Question AB 19 : Have you assumed slower growth for Sea-Tac because the Third runway is inadequate from a capacity standpoint?

Question AB 20: Have you assumed slower growth for Sea-Tac because of the Third runway's unprecedented high TOTAL cost, particularly if supporting infrastructure costs are considered?

Question AB 21: Why do the traffic models predict no impact from double haul trucks on roads and highways that people dread going on NOW because they are so congested?

Question AB 22: Would the modeling results be different if only one edition of the Highway manuals had been used instead of mixing different versions?

Question AB 23: Isn't Sea-Tac's location and geographical constraints incompatible with significant growth?

Question AB 24: page 2-2 Why was year 2010 Alternative 1 estimated to be 474,000 operations (New Port estimate) rather than the 460,000 theoretical maximum operations listed on page 2-7?

Revision AB 25 : All Alternative 1 year 2010 impacts including but not limited to noise, pollution, and surface transportation should be recalculated using the NPIAS 460,000 in the SEIS.

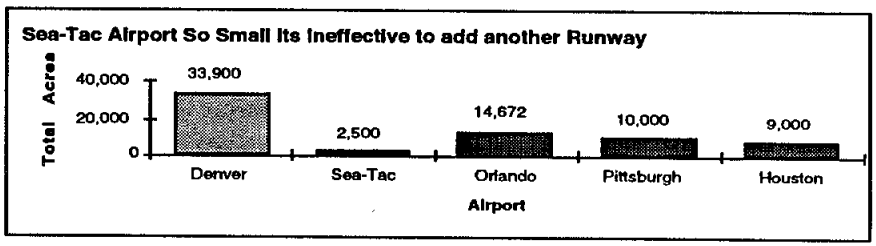
Comments and Rationale Primarily related to pervious Questions

Airport Location and Size Incompatible with Significant Growth

Port Columbus is obtaining 240 acres to build a new 10,250-foot third runway (ref. (p)). Compare that to Sea-Tac basically taking several blocks of a residential street with houses lining one side of it.

When other small U.S. airports don't have room to expand because of heavily populated areas, they use another airport or technology to increase their capacity. For example, Charlotte with 5,000 acres and San Francisco with 5,400 acres opted for Localizer Directional Aid technology instead of additional runways. It is the airports with large acreage that can afford to add runways or those with large buffer zones. Comparing airport sizes, runway lengths and capacities, using data in the FEIS (ref. (d), page R-201), it becomes obvious that even with the proposed land acquisition, Sea-Tac's proposed expansion is too small to be cost-effective and safe. See figure below.

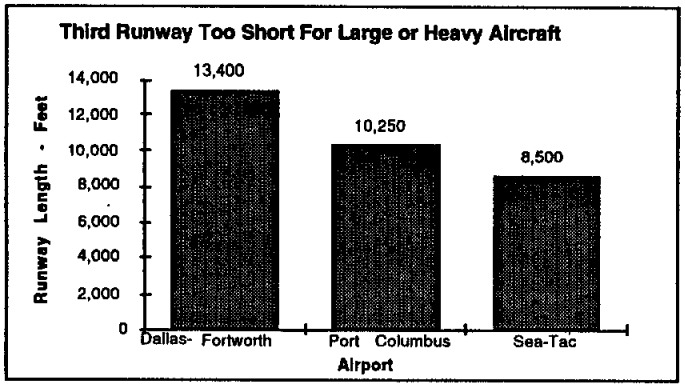
Figure 1 Airport Size Comparison



Runway Length Incompatible with Significant

The proposed runway is too short to handle fully loaded cargo planes. The FEIS states the 8,500 foot runway is too short for B-747, DC-10, MD-11, L-1011 or B-767 (Ref. (d), page R-126). Compare the proposed Third Runway short length to other new U.S. runways. The other airports have considered the new, larger airplanes that will be in use by the time the Third runway is built as well as the existing large passenger and cargo jets. *The industry preferred runway length is about 40 % longer than Sea-Tac's proposed part time arrival runway length of 8,500 feet !!*

Table 2 Proposed Runway Too Short for Large Jets



Using the 1997 FAA TAF (Terminal Air Forecast) estimate and NPIAS standards in SEIS Exhibit 2-7, the Sea-Tac airport with the Third runway will

1) Exceed practical capacity before it opens
2) Be severely congested by 2010
3) Be able to support only an additional 68,200 operations after 2010 before it reaches its theoretical maximum capacity of a mere 600,000 operations.

SEIS Exhibit 2-2 clearly shows that Sea-Tac operations per year have been consistently UNDERESTIMATED for over a decade using the FAA estimates.

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Yet the SEIS chooses to ignore the 1997 FAA TAF estimate and use even lower numbers (474,000 for 2005). Even SEIS Appendix D that evaluated Case 3, a 10 % increase over the SEIS estimates, is BELOW the 1997 TAF estimate for 2010.

Using the SEIS (Port of Seattle) estimates Sea-Tac won't reach the TAF 2010 levels until approximately 2020! Considering the Washington FAA office required the SEIS be prepared because of the low Port estimates in the FEIS, does it really make sense to ignore the TAF levels? The 1994 FEIS estimates for year 2000 were surpassed in 1995. The 1982 projections for year 2000 were surpassed in 1986 so extremely low estimates have plagued this airport for decades (Ref. Sea-Tac Noise Exposure Update June 1982, Table G-1).

Question AB 26: Considering elsewhere in the SEIS it indicates that Sea-Tac airport is growing so fast it will need another Master Plan Update around year 2000 (SEIS pg. 2-14), how can the SEIS agencies justify not comparing the following for 2000 through at least 2020:

1) New Port's estimates (current SEIS)
2) 1997 TAF estimates
3) Upper bound of 600,000 operations for years 2010 and 2020
4) "Do-Nothing" alternative constrained to its theoretical maximum of 460,000 operations

The sensitivity analysis for the four scenarios listed above should include airport operations, pollution, surface transportation, and noise, etc. because

1) Using FAA TAF estimates capacity appears inadequate
2) Using FAA TAF estimates, Alternative 3 violates the Clean Air Act
3) SEIS indicates surface transportation could be a limiting factor
4) Appendix D identifies a much larger area of housing will be impacted by noise which then influences mitigation costs

The 1997 TAF projections are conservative. Historically, as SEIS Exhibit 2-1 shows, the TAF UNDERESTIMATES Sea-Tac growth. It is extremely misleading to use the New Port projections for noise, air or traffic estimates. The new Port estimates are still unrealistically low and point to the poor quality of the SEIS. See also data A. Brown DEIS comments and growth projections (ref. (c)).

Appendix D provides some comparison information for different levels of operation but appears to be seriously flawed. For example, SEIS Table D-2 predicts 7 less tons of nitrogen dioxides for Alternative 3/Case 1 even though it has 72,000 more operations than the "Do-Nothing" alternative for the same time period. If this is due to fleet mix considerations, a fleet mix sensitivity analysis of those is also needed. It is unlikely that Sea-Tac will be able to continue sending its jets like MD-80's to Boeing Field for the duration of the planning period.

Using the numbers in SEIS Table D-2 to calculate nitrogen oxides for TAF estimated operations in 2005, it appears the Clean Air Act "trigger" of 100 tons additional nitrogen dioxides may be reached by 2005 and that by 2010 over 200 tons of additional nitrogen oxides will occur annually with Alternative 3. These violations occur even if the connecting road, whose absence in Alternative 1 so significantly biased the SEIS surface traffic pollution calculations in favor of Alternative 3, is still absent. Note, this just addresses nitrogen dioxides, when other pollutants are added to the equation, the violations occur even sooner.

The air pollution assessment is illogical that " any of the "With Project" alternatives would result in pollutant concentrations equal to or less than would occur in the Do-nothing." (SEIS 1-9)

Using 1997 TAF FAA with the Third runway Sea-Tac airport will already be "Severely congested per NPIAS by 2010 and per Exhibit 2-7 be theoretically capable of LESS than 600,000 operations (SEIS Exhibit 2-7)

If the SEIS "New Port" estimates are as underestimated as the original FEIS estimates , Sea-Tac will reach theoretical maximum capacity of a mere 600,000 operations long before the SEIS predicts.

Why if the technology conference on September 25,1996 (SEIS pg. 1-5) concluded that there is 2500 foot spacing requirement between runways attributed to wake vortex conditions is a Third runway that is only **800 feet** from one of the present runways being recommended? It **reduces the capacity of**

the existing runway as well as Boeing air field. (pg. 3.2 2500 west of 16L/34R)

Question AB 27: Haven't the benefits of the Third Runway been overestimated?

Dependent Air Space and Taxiing The transportation expert when testifying before a Congressional hearing indicated that the Third runway may actually increase schedule delays under certain circumstances (ref.(i)). Because it is dependent, it will decrease capacity of the existing Sea-Tac runways and reduces Boeing Field capacity (ref. (lll)).

Peak Season Corresponds to Less than 3% Poor Weather The FEIS claims the benefit from the Third Runway is that it decreases arrival delays in poor weather. However, peak season coincides with less than 3 % poor weather (ref. (i)).

According to the FEIS R10-14, page R-124,
"..the possibility of a peak hour of airport activity and worse case meteorology occurring at the same time is rare if not highly improbable."

Question AB 28: Were the weather corrections made to the models so the number of summer's will now equal the number of winter's? If not, why weren't the corrections made?
Comment : See Congressional testimony

Another Runway Doesn't solve the ATC problem

Air capacity is a world wide problem. Europe has already faced up to the reality that infinite expansion of airports is not cost-effective and other alternatives are being implemented. The Port needs to consider the Air Transport Authority's March 20,1996 statement (ref. (rr)):

"The key lies with the air traffic control system, not our airports. System delays are overwhelmingly the result of inefficient ATC capacity"

Sea-Tac's load factor is less than 30 passengers per aircraft. The airport is recognized both nationally and internationally for its timeliness. Building a short runway that costs more than building a new airport is NOT a practical short term fix.

Question **AB 29: Isn't the Third Runway project and related infrastructure, on a per passenger or per pound of cargo basis, more expensive** than any other airport project in the world? Chek Lap Koc (Hong Kong) cost 21 billion but expects 35 million passengers. This total island/airport/bridge/town/railway cost amortizes to $ 600 per passenger over the first year.
Denver spent $ 3.2 billion to construct an airport with 5 runways that resulted in 530,839 operations (ref. (n) and FEIS Table R-12). If you amortized this over just one year then it's equivalent to $ 6028 per operation.

If you use the Denver's $ 4.9 Billion figure (ref. n) which includes all costs of money, rental car facilities, etc., then the equivalent Sea-Tac figure exceeds the partial cost of $ 3.3 billion in Tech Report 8. The $ 3.5 billion doesn't include toxic and hazardous clean ups, excavation or replacement of soft soil at Sea-Tac, loss of Federal HUD housing (or noise mitigation to avoid losing HUD funding, etc.). The $3.3 billion has since grown in the SEIS but it still leaves out many costs.
People are driving out of their way to use Colorado Springs airport because it's cheaper than the new Denver airport (ref. (l)). How much business will Sea-Tac lose if we help pay for the Third runway with enplanement fees? How much do our taxes go up if we don't pass the costs of the new part time runway onto the airlines? Even bonds cost money ultimately. Ask Denver about their junk bonds if you doubt this (ref. (o)). Or, ask United Airlines if they want us to spend as much on a part time arrival runway as was spent on the new Denver Airport. United pays $ 35 million to operate out of Stapleton. They pay "$ 195 million to operate at the new airport -- after realizing a $ 15 million savings from efficiencies. " (ref. (p))

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Don't let Denver's high cost scare us away from a new airport. Denver spent $7.5 million in art and $ 232 million on their baggage handling system (ref. o). A well-planned airport can cost much less than Denver's new one **IF we set aside the land NOW.**

Question AB 30: Isn't Mirabel in Montreal a good deal compared to the proposed Sea-Tac expansion? They spent about a billion in Canadian dollars but at least they have cargo traffic even though the passenger traffic didn't materialize. Can you blame the passengers for not using it? There is no highway connecting Dorval to Mirabel and "the high speed rail from downtown never got on track" (ref. (q)). Mirabel airport also has over 35 times more acres than Sea-Tac so it has growth capacity.

The Third Runway is incredibly expensive compared to other projects no matter what cost number you use:
- $ 500 million (some construction cost),
- $ 1.5 billion (related construction),
- $ 3.3 billion (includes some cost of money and operating expenses but still doesn't include all construction costs), or
- a higher cost figure than $ 3.3 billion that includes the costs that government documentation says have not been computed yet such as soft soil excavation, toxic clean up, litigation costs, etc.

A state government funded Burien mitigation study (ref. (mmm)) with a very limited scope, has already identified at least another $ 3.3 billion in costs.

If all costs are considered, rather than just those the Port of Seattle and FAA acknowledge today, the real price tag probably exceeds $10 billion dollars for construction of the runway and associated infrastructure plus the cost of mitigation.
Question AB 31: Which runway is SEIS page 2-18 referring to?
pg. 2-18 item B "Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim" ... Base on the projected demand, the runway extension would be needed after 2010. "

Which runway? Are there plans to extend the Third runway since its too short for most large jets? If so, that impact needs to be assessed now, not in another Master Plan Update around 2000.

Revision **AB 32: Aircraft pollution calculations are underestimated and need to be revised**

The calculations of the aircraft need to be redone using a realistic fleet mix, all aircraft engines being used in flight, and a REALISTIC landing/takeoff cycle time (L/T/O). To assume only 11 minutes for an entire L/T/O cycle as the FEIS does is unconservative (ref. (d) Table R-10). If this number was true there would be no discussion about building a part time runway that ultimately will cost more than the new five runway Denver airport. Considering it will have dependent flight paths with two airports and requires taxing in and out across two active runways, 11 minutes is a gross understatement. Eleven minutes is much shorter than prior Sea-Tac studies. At least 20 minutes should be used for the pollution calculations and the DC-10 calculations should assume two engines are used in flight.

No particulate is estimated in the EDMS 944 model. Particulates are significant and should be calculated.

The number and placement of receptors in the modeling is inadequate.

Since the release of the FEIS, a 14 foot slope for the Third runway has been proposed. Pollution calculations need to be redone to account for the different engine characteristics and the impact to taxiing also needs to be evaluated.

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Groundwater and Flooding Inadequately Addressed

Revision AB 33: The SEIS needs to be revised to more accurately address the groundwater issues and risks that were understated in the FEIS (ref. (d))

The response to comments in FEIS (ref. (d)) indicated a significant risk to the Highline aquifer but did not offer any real mitigation. Isn't it a fact that Highline's aquifer which supplies 20% of Seattle's drinking water is already contaminated with jet fuel? Residents complain that even "contained" jet fuel leaks correlate with increased incidence in diarrhea. The construction of the Third runway and moving of creek beds virtually guarantees an even higher pollutant level. Isn't a permanent water source other than Highline's aquifer needed for the area or are we all to buy bottled water for the rest of our lives ?

See the Seattle Water Department letter reproduced in the Appendix E of the SEIS.

Revision AB 34: The amount of retention capability needs to be increased due to the high frequency of "100 year floods".

Question AB 35: Why have the DEIS, FEIS and SEIS consistently downplayed the critical water problems and risks?

The recent construction at the airport increased the area of impervious surface which caused 1996 flooding in areas that historically have not had not had flooding problems. Flood maps have been revised and mortgage holders notified that they now must carry flood insurance. The 1996 FEIS (ref. (d)) seriously underestimates flooding impacts. The area has had several "100 year" floods in recent years.

The SeaTac city appeal outlines the lack of 100 year flood capacity of the current Miller creek Reba detention facility despite King County and Port of Seattle agreements to comply.

Question AB 36: What are the increased impacts considering only 10% of the homes are cold climate (more insulation in cold climate homes)?
Question AB 37: Was the "cold climate" assumption used in setting noise mitigation boundaries or strategies?
Question AB 38: Was the "cold climate" assumption used in estimating loss in property values?
Question AB 39: What is the estimate in loss in property values considering we do not live in cold climate homes and property descriptions, even for property well outside the general study area, are now required to list "airport noise" on them?
Rationale for above questions
The DEIS and FEIS both assumed we live in cold climate homes when evaluating the socio-economic aspects. The FEIS response admits that only 10% of the homes fall in this category so there can be an additional 15 dB of noise exposure while inside.

Revision AB 40: SEIS pg. 1-12 neglects to list the Kindercare kindergarten as one of the schools impacted."

Revision AB 41: SEIS pg. 1-13 needs to be revise to indicate that the $50, 000 million is inadequate to provide adequate insulation

Revision AB 42: The noise model needs to be revised to correlate better with actual noise measurements
Rationale : Noise panel report cast grave doubts regarding the accuracy of the model. Boeing Field noise should be added into the noise model if it isn't already. This is particularly important since some noisy Sea-Tac flights were switched to Boeing Field. Also, Boeing Field is also undergoing a Master Plan Update to increase operations which will increase noise.
Each version of the noise model has reduced the contours yet the public is adamant the noise is getting louder and more frequent. Actual measurements support the public's claims that noise is increasing. Some noise issues include:

(1) Existing Noise Contours too Small
April 15, 1996, aviation easement contradicts the 1996 noise contour models (ref. (x)). It indicates that the noise contour model lines should be at least 5

G-150

DNL larger. There are whole neighborhoods even closer than that home to the airport. Therefore, there are still many people living in high DNL contours that the Expert Noise Panel was told had been removed (ref. (e)). This removal was sited by the panel as being why the noise mitigation was impressive, however, this removal hasn't actually happened.

(2) Predicted Noise Contours too Small
The current projections are even more unrealistic than the current noise contours. Actual noise measurement data shows that the existing contours are too small. See references (y), (aa) and Expert Panel report (ref. (e)) as well as the panel's supporting data. Noise contour maps need to consider All air traffic, including Boeing Field, when calculating noise exposure.

(3) Mitigation Boundaries Too Small
Noise boundary analysis appears to assume we live in cold climate homes but we don't according to the FEIS. Therefore, more homes should be eligible for noise insulation and/or buy-out (ref. (d) and (z)).
Actual noise monitoring, by the Port as well as RCAA, indicates that the noise contours are incorrect. See references (y), (z), (aa), and Expert Panel report (ref. (e)) as well as the panel's supporting data.
It appears that the noise model has not been updated to handle the different type of noise patterns caused by Stage 3 aircraft. Vibrations from Stage 3 have not been addressed. Also, according to the FEIS the noise model doesn't consider the increased noise from the reflections from the new buildings, walls and pavement around the airport.

(4) "Significant" Number of Homes Insulated Misleading
Area residents, deprived of their rights under the Federal Relocation Assistance Act when the second runway was added, have been forced by economic circumstances to live in areas that other airports would have paid to remove them from. Sea-Tac airport has more people living in areas that should have been condemned so we have more homes needing insulation. Also, the geographical location, i.e., close proximity to cities without the advantages of over the water flight paths, creates far more homes, daycares, hospitals, businesses, etc., in high noise and air pollution areas than most, if not all, other U.S. major cities. The FAA in other regions wanted a "residential

no-build zone" inside the 60 dB DNL boundary (ref. (ll)), compare that to Sea-Tac with homes and schools adjacent to the airport both before and after the Third Runway.

(5) Ramifications from Flight Path Changes and Noncompliance with Routes

The noise measurement data has been compromised by both unintentional and perhaps intentional flight path changes. Numerous flight path violations are a matter of record. In additional, changes to a Flight Manual suggest flight paths were also intentionally changed. A court may need to determine if the change in the Flight Manual should have required an Environmental Impact Statement in accordance with 1992 U.S. Court of Appeals, SCCF vs. FAA . See Mr. R. Akers correspondence including, but not limited to reference (bb), his court case. See also reference (y), and Reference (aa). These route changes have extremely serious ramifications with regard to availability of Federal funding for three low income housing developments which, based on actual noise measurements, appear to no longer be eligible for federal money (ref. (w)) and ref. (y)). The Hud housing impact is the subject of Aker's FEIS appeal (ref. (ooo)). See also the Mitre report (ref. (xxx))!

(6) Ramifications from Fleet Mix Changes Uncertain

Realistic current and future fleet mix is needed to predict noise contours. Changes in Alaska Airlines operations to Boeing Field impacted recent noise measurement data. Impact of the new larger airplanes, still on the drawing board, do not appear to be fully considered in the projected noise contour maps.

Revision AB 43: Does the noise model adequately take into account the side noise from hush kits on aircraft such as MD 80's
Comment: Noise from hush kitted planes is particularly loud in the Normandy Park area which is outside the current noise contours.

Question AB 44: Is their any data that suggests that aircraft are still not operating in accordance with the assumptions in the noise and pollution models.

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Comment : Mitre report (reference (xxx)) indicates **"... most airlines were using procedures which differed significantly from those assumed by then then-current Number 7 INM data base."**

Revision AB 45: The impact of vibrations on landslide hazards is inadequately addressed.
During the recent flooding weren't the flight paths altered for some aircraft because they were contributing to landslide hazards. Considering the quality of the soil in the area under the flight paths, won't this hinder using the airport at full capacity?
Question AB 46: How can you have a landmark scar without their being a landslide hazard?

Wildlife Attraction Guideline

Question AB 47: Is the Third runway inconsistent with the FAA wildlife attraction rule?
Question AB 48: Is the 600 foot runway extension inconsistent with the FAA wildlife attraction rule?
Question AB 49: Why doesn't the EIS apply the FAA "wildlife attractions' rules consistently?
Rationale : The FAA has indicated that "wildlife attractions' within 10,000 ft of the edge of any active runway is not recommended (SEIS pg. 1-11). Page 5-5-13 used the "wildlife attractions' rationale to explain why the wetlands mitigation would be in another basin. But, using that same rationale, the Third runway and the other runway extension shouldn't be allowed considering the following are examples of items within 10,000 feet:
(1) bald eagle nest on Angle Lake just 3907 feet from airport (see FEIS)
(2) bald eagle nest in Normandy Park.
(3) Normandy Park Park (hiking trails in forest)
(4) Burien Park
(5) Marine View Drive Park (hiking trails in forest and along water)
(6) Puget Sound
(7) Many Lakes (Lora (visited by an otter annually, Arrow, Bow, Tub, Angle, and possibly Arbor Lake depending on which map in the SEIS is scaled accurately)
(8) Miller creek with active salmon run and Des Moines Creek

Note, the SEIS interpretation of the wildlife rule is different than the verbal interpretation the FAA gave A. Brown in 1994. They told her it only applied to things like garbage landfills and the fact that we have wetlands, bald eagles and a strip of restaurants adjacent to the airport was irrelevant. They noted that bald eagles do not present the bird strike hazard that geese do because of where and how they fly.
The FAA should clarify and then apply this guideline consistently in the SEIS.

Endangered and Threatened Species

Revision AB 50: The SEIS needs to be revised to accurately report the impacted endangered and threatened species on <u>each</u> page that mentions them.
Question AB 51: Why are the political ramifications and possible schedule slides resulting from destruction of the environment used by rare species understated in the SEIS?
Question AB 52: Why are the possible schedule slides resulting from successful breeding of bald eagles not mentioned in the SEIS?

Rationale : The area is one of the "Top 200" that World Wildlife Fund (Reference (www)) has decided to focus on. The Sierra Club has passed a resolution against the Third Runway.

SEIS Pg. 1-11 indicates raptors are not nesting on the west side but neglects to mention the nesting bald eagles on the east side. This needs to be revised to add "bald eagles are nesting in the east side of the airport less than 3907 feet from the airport and the project will reduce their foraging area by at least 274 acres". Note, 0.74 miles in the FEIS on page IV 17-1 equals 3907 feet. Reporting this distance as a fraction of miles increases the probability that a reader may not realize how close the nest is, so I suggest this number be reported using feet instead.

Revision AB 53 : The impact on salmon and other fish needs to be addressed in more detail.
The impacts to salmon and other fish were not adequately addressed. Studies such as the DNA ones in reference (mm) are needed (see also

references (nn) and (oo)), particularly considering the fuel incident mentioned in the DEIS that killed all the fish in Miller Creek.

Wetlands

Question AB 54 : Does the 274 acres in the following statement include all projects in the SEIS such as SASA or does it refer just to the Third runway?

> 'As a result of the proposed new parallel runway construction, approximately 274 acres of forest, grasssland and wetlands potentially suitable for bald eagle perch and foraging habitat would be permanently lost" (FEIS IV17-3)

If it just refers to the Third runway, what is the total number of acres impacted by all the airport related improvements in the airport area, even if outside the small study area but still in the same basin? How many areas are impacted at the off-site fill locations?

Hazardous Clean Up

Question AB 55: What are the cost estimates associated with hazardous materials clean up?
Revision AB 56: Exhibit IV-2.1-1, Hazardous Substances Risk Sites in FEIS should be updated in SEIS. This should also indicate probable sites for asbestos, lead paint, and underground oil tanks of property that previously had buildings. Note, also, that some Port estimates of the number of oil tanks that were reported in local newspapers appear very low considering the number of buildings impacted and the popularity of oil heat at the time the buildings were erected.

Comments: In the DEIS this was dismissed as insignificant but additional hazards have been identified since that time. Considering the ongoing delays with the North SeaTac project regarding asbestos, oil, and dust violations (ref. (hhh), (ww) and (fff)), hazardous clean up costs and schedule delays need to be considered. Known problems include asbestos, oil tanks, gasoline stations and sludge farms (ref. (d) and (ww)).

Fill and Construction

Question AB 57 : Will the land that 154/156 St. is suppose to be relocated to, hold up the weight of vehicles or is it so soft it will require excavation?
Question AB 58: How much soft or contaminated soil must be excavated for (1) the existing Master Plan Update (2) the other planned projects including those the SEIS mentions that are not part of the existing Master Plan?

Question AB 59: What are the risks that the oil tanks, left in the ground when houses were abandoned, now have contaminated soils around them that must be removed?

Question AB 60: Is it assumed fill will come from the Des Moines Creek Campus even though the project's been canceled?
Rationale : Table 2-7 indicates "Development of Des Moines Creek Campus" This project was canceled. The FEIS assumed fill dirt would be obtained from this location.

Question AB 61: How much must the retaining wall slope design be compromised to avoid impacting Highway 509?

Question AB 62: What is the steepest slope that will be used in the retaining wall design?

Question AB 63: Will standard practices be used or is a special unique design needed for the retaining wall?

Question AB 64: Why were sketches at the low points of the retaining wall included in the SEIS rather than the tallest section?

Question AB 65: Considering the proximity of the retaining wall to the aquifer, our drinking water supply, what are the risks of the retaining wall construction materials contaminating the groundwater or Puget Sound?

Question AB 66: Considering the proximity of the retaining wall to the existing soft soils, what are the risks of the retaining wall construction materials retaining their integrity over time even assuming the existing soft soils are removed?

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Question AB 67: Considering some soil is so soft, the Miller Creek Restoration team was able to sink a 20 foot stick into the creek bed as easily as a straw in a milk shake, what are the risks of excavating those areas and what are the uncertainties with the amount of soil that must be excavated?

Question AB 68: Is it possible that it may not be feasible to excavate all the soft soils and the runway will need to be built on top of soft soils?
Question AB 69 : How much engineering data is their to support the premise that construction projects can be accomplished in such a way that the soil is stable and the retaining wall will remain intact in an earthquake? Please site specific references.
Question AB 70: If the retaining wall fails due to earthquakes, landslides, or inadequate design, what is the estimate for loss of life and property damage?
Question AB 71: What are the underlying engineering assumptions being used that support the impervious surfaces will be stable?
Question AB 72: What are the underlying engineering assumptions being used to support that the retaining wall will be stable?
Question AB 73: What are the underlying engineering assumptions that lead to the assumption that the rest of the airport won't start shifting as a result of the over 80,000,000,000 pounds of fill being placed on what is now wetlands and an aquifer?

Rationale : Considering a lane on First Avenue is closed because it is no longer stable, what is the life of a retaining wall without the proper slope.
Considering the retaining wall design should include an additional strength calculation factor added for earthquakes, be able to accommodate a fluctuating water table, and is three times the normal height of retaining walls in some locations, how can standard practices be applicable?
Significant civil engineering challenges are being treated as "standard practice" such as the earth retaining wall about 3 times the standard height.
A design is needed to determine costs and feasibility. The design should accommodate a minimum of an additional 10% lateral pressure (ref. (rrr)) to account for the earthquake sensitivity in the area (rated 4 on a scale that only goes to 5)

The "soft" soil in the airport area needs to be removed yet the amount hasn't even been determined yet according to the FEIS (ref. d). It is not part of the 26.4 million cubic yards.

The contaminated soil in the airport area needs to be removed yet the amount hasn't even been determined yet. It is not part of the 26.4 million cubic yards. Not only has the unknown quantity of contaminated soil been ignored, the Port has even forgotten about the soil that is known to be contaminated such as that in the proposed Snow Equipment Storage Shed area (ref. (ggg) from Port contradicts FEIS ref. (d) page IV 21-2).

No matter how simple the construction sounds in the SEIS, politics can't change the fact that the land needed to make the expansion of the airport in reality is really a combination of wetlands and covered over peat bogs that cover the area's aquifer (our drinking water supply). Can the "land" ever stabilize?

Question AB 74: What are the densities and type of fill needed for the Master Plan Update Projects and other necessary projects?

Question AB 75: What will be the impact to the construction schedule, fill costs and fill availability if the Department of Natural Resources reverses their position in the SEIS and consequently decides to enforce RCW 78.44 rather than taking exception to it?

Rationale : Excerpt from March 1997 letter to WA Dept. of Natural Resources
Attention:
Region Manager: Ms. Bonnie Bunning
Commissioner of Public Lands : Ms. Jennifer Belcher

Subject : Permits for Mining in Sea-Tac Airport Area

This is regarding your letter dated March 20,1996 issued by Ms. Bunning and David Pierce, that is reproduced in the Sea-Tac Airport's Supplemental Environmental Impact Statement.

What is your rationale for taking exception to Washington State Surface Mining Act (RCW 78.44)? Your letter states " A Surface Mine Reclamation Permit is not required for borrow sites located within the Port of Seattle Ownership" even though the sites are not "adjacent or contiguous".

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Potential borrow sites 1,2, and 3 are not only are so far south of the airport that neighborhoods and major public streets like S 188th and S 200th separate them from the airport, they are even located in a different city. These proposed borrow sites act as a noise buffer, pollution buffer, and are a habitat for endangered and threatened species. These functions can not be performed if the intended strip mining occurs.

Site 4 has similar issues as 1,2, and 3 but some of it extends into the SeaTac city limits (it's immediately north of S 200th).

Site 5, which is across a public street and on the other side of the highway from the airport, is located within the federal and state mandated wellhead protection area and is over the aquifer. Its purpose is to provide drinking water. It is not intended to be a parking lot , after being excavated, as the SEIS suggests. I urge you to read the Seattle Water Departments letter in the SEIS on page E-6.

Area 8 is across a public street from the main airport area and consists of wetlands.

Using your "exception" as currently worded, the excavating of the proposed wetlands mitigation area in Auburn, which is mentioned in the SEIS, could also be allowed.

Please provide specific examples where you have applied or tried to apply this "exception" in the past. Was its legality ever challenged ? If so, please provide a brief summary of the outcome and the case number.

Surface Traffic

Revision AB 76 : Considering the traffic jams, pollution, schedule delays, and accidents associated with Permit PWD0115-96 (ref.(gg)) that hauled dirt to the south Runway Safety Area in 1996, the SEIS needs to be revised to admit to the significant problems that could be in the critical path of the project's schedule.
Revision AB 77: Construction traffic models need to be rerun with realistic speeds and lane closures.
Revision AB 78: The surface traffic models are so inaccurate that they misleading with regard to pollution, construction feasibility, construction schedule etc. and need to be revised.
Question AB 79: Have the proposed road improvements considered that by improving one section of the road, congestion shifts to another portion of the road or another road?
Revision AB 80 :How can the FEIS and SEIS be sure safety won't be impacted?

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Question AB 81 : How many cubic yards of fill were the double haul trucks for Permit PWD0115-96 (ref. (gg)) able to haul on the average?
Question AB 82: Using this amount hauled by permit PWD0115-96 (ref. (gg)) does the 1,200,000 haul truck figure in the SEIS need to be increased?
Question AB 83: If the loads are covered can they carry as much as they did for permit PWD0115-96 (ref. (gg)) ?

Rationale :

(1) Traffic Hazards Dismissed or Underestimated

How many accidents will there be as unsuspecting drivers suddenly see what looks like an explosion near-by? When the dirt associated with permit PWD0115-96 (ref. (gg)) at the south end of the airport is dumped, it creates a huge sudden thick dust storm. While driving down S 188 St., it is extremely distracting since your initial reaction is to assume there has been an explosion due to the incredible size and density of the dust.

The FEIS (ref. (d)) says that you can put over 3000 trucks per day on the roads around Sea-Tac, even ones with unusually high accident rates, and not impact safety (ref. (d)). That defies logic if you are familiar with the particular roads.

The FEIS response R-28 that "increased truck traffic on any leg does not impose any increased traffic risk" contradicts the Dept. of Transportation conversations with A. Brown the summer 1995. The conversations resulted in Department of Transportation providing the SR 509/SR 518 interchange data because they said it was the area's most hazardous traffic location. It is no surprise that a double haul truck "jack knifed " at that location on September 18, 1996. Now that there are many haul trucks taking that route, the community has additional concerns based on data. It is much more difficult to merge onto north bound SR 509 using the 160 St. entrance when the haul trucks are present. A. Brown already knows someone involved in an accident on 188th that blames the recent construction hazards. In addition, there was also a fatal accident there recently involving a car and truck (it was early evening so haul trucks may not have been present) (ref. jj). The August 1996 forty vehicle pile-up on Interstate - 5 that resulted in at least one **dead child** had a jack-knifed double haul truck at the front (ref. (jjj)). Was it traveling to Sea-Tac airport?

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The commute was not only longer , but also more HAZARDOUS, as a direct result of hauling a TINY FRACTION of the amount that will be needed for the Third runway !!!!!!!!!!!!

The FEIS (ref. d)) also says you won't impact safety on roads that have yet to be defined, in cities yet to be selected. How can the FEIS be sure safety won't be impacted? This is not a "standard practice" hauling job. Over a million double haul trucks is difficult to conceive. Considering SeaTac PWD0115-96 (ref. (gg)) usually has 5 double haul trucks in a row, with one car in between each, even though it "only" requires hauling less than 2% of the dirt in 1/4 the time than the Third Runway, what will things be like if the Third Runway construction begins?

If you ratio the amount of dirt to the number of months needed for the current permit work and assume the same rate for the Third runway,
It would take over 50 years to haul
the 26.4 million cubic yards of dirt !!!

To avoid taking about 50 years, the traffic jams from the Third Runway and associated additional pollution will have to be much worse than the summer of 1996 south end airport construction traffic congestion and construction pollution.

(2) Traffic Congestion Inadequately Addressed

The thousands of double haul truck trips a day will severely impact transportation. SeaTac permit PWD0115-96 (ref. (gg) for double haul trucks currently traveling to the south Sea-Tac airport construction site are traveling about 15 mph below the speed limit and come to a full stop to turn on the roads around Sea-Tac. The FEIS (ref. (d)) transportation assessment does not address the 3 or more years of traffic jams. Permit PWD0115-96 (ref. (gg)) is for less than 2% of the dirt required for the Third Runway project but increased commute time by about 2 hours per week for those using S 188 St. The current construction site had speed limit signs that are 10 mph below the street's customary speed limit and signs that read **"Be Prepared to Stop".** Neither the reduced speed or full stops were considered in the FEIS traffic analysis.

These traffic and pollution concerns are shared by many as illustrated by the multiple complaints being phoned into Bruce Rayburn, SeaTac Public Works Representative, the local newspaper publishing complaints (ref. (hh)), and the Highline school district has said the construction is "expected to cause delays when students return to school in September" (ref. (ii)). See appendix for letter that accompanied a petition sent to SeaTac Public Works.

The number of just double haul trucks is about equivalent to all the vehicles that travel over a busy section of Interstate-5 in about a week's time (based on data from FEIS page R-153 (ref. (d)).

The traffic assessment is illogical . It assumes more traffic with Alternative 1 than New Port alternative 3 (114,000 vs. 113,300 SEIS pg. 1-8). Yet it says additional 95PM peak hour trips in 2010 with Alternative 3.

SEIS Section 5-4 references the FEIS Appendix J. It assumed 70 miles per hour highway design speeds, all lanes open, and level terrain for some highways. Were these same assumptions used in the SEIS traffic analysis? The current speed limit on SR518 is still 60 mph. On I-90, a likely truck haul route, which has raised the speed limit for cars to 70 mph, retained the 60 mph limit for trucks. Traffic models with these high densities of trucks need to use the lower of the following speeds (1) truck speed limits or (2) actual vehicle speeds consistent with realistic LOS conditions. Are the traffic models models overly optimistic? See other related comments herein, particularly page AB 33.

Seattle is tied as the sixth worst traffic congestion in the US and is rated as the fourth highest congestion tax (cost of wasted fuel and time while in traffic).

Is road construction underway?

Question AB 84: Is any of the clearing of brush, preparations to build roads or actual building of roads that has been going on at the airport, related to trying to provide roads for haul trucks?

Question AB 85: Would the road construction activity at and around the airport be as high if the Third Runway proposal was killed?

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Comments : There appears to have been significant activity related to roads in and around the airport in recent years, particularly along side Des Moines Memorial Drive and S 188th.

Transport Across Public Streets of "On-Site" Fill

Question AB 86: How will the fill get across S 200th, a public street?

Question AB 87: How will the fill get across S 188th, a public street?

Question AB 88: If the runway area bridge over S188th is used for haul trucks, will it reduce the use of the runway?

Rationale : On-site fill is assumed to not impact public roads in the DEIS, FEIS and SEIS. Will bridges or conveyer belts be built over the public roads?

Question AB 89 : Why isn't construction pollution adequately addressed? The complete impact of thousands of truck trips per day plus all the associated construction equipment and traffic for YEARS needs to be fully addressed. These calculations need to be done using the actual pollution levels and then adding the trucks/equipment using pollution parameters (emissions in grams per mile) consistent with the age of the trucks and a realistic speed (typically a maximum of 15 mph below the speed limit except on highway exit ramps). Cumulative impacts from other projects in the area need to be included in the calculations.

Haul truck pollution in the DEIS was estimated far below the current federal standard emission indices for new trucks manufactured in the U.S. Realistically, doubling the particulate levels presented in the DEIS would still be too low, but when added to construction dust, would exceed the PM_{10} short term standard every day.

Question AB 90: Why isn't the cumulative particulate pollution adequately addressed in the FEIS or SEIS?

Question AB 91 : What is the impact on the children swimming in the outdoor YMCA pool or on the play toys outside Kindercare, both a short walk from the airport's dust storm construction site, the south Runway Safety Area?

Question AB 92 : What will be the impact on the children swimming in the outdoor YMCA pool or on the play toys outside Kindercare, both a short distance from the proposed Third runway site?
Question AB 93: Considering this current construction is nothing compared to the Third Runway construction (about 2%), how can the FEIS and SEIS treat the pollution subject as so trivial?

Permit PWD0115-96 (ref. (gg)) for double haul trucks currently traveling to the south Sea-Tac airport construction site has resulted in a dust storm that made it difficult to breathe, particularly on the "Smog Alert" days (July 1996). The accumulation of dust and dirt on vehicles that drive by there a few times appears worse than a year in a standard urban environment. This is causing wear and tear on property as well as an increased use of water for cleaning. Impacts from significant projects such as this must be considered in conjunction with those in the FEIS (ref. (d)) and probable new projects mentioned in the SEIS.

The National Resources Department Council Urban Environmental Program report in the words of their Senior Attorney Richard Kassel is " the latest in an overwhelming and ever-growing body of evidence that particulate pollution contributes to **ill health and early death**" (references (uu), data in ref. (vvv)) (bolding added for emphasis).

Question AB 94: What are the impacts if the employee parking lot N of SR 518 can't be constructed?
N of SR. 518 for employee parking lot (SEIS pg. 3-15) requires filling 1 acre of wet lands (3-13) and requires excavation of Borrow site 5 (pg. 5-5-7) which has hydrocarbon contamination per FEIS. Also, the Seattle Water Departments' wants a legal indemnity agreement because it will contaminate the drinking water supply for the area (SEIS Appendix E)

SEIS Chapter 4 : Affected Environment Issues

Revision AB 95 : Page 4-4 Aviation Subcommittee hearings. This section should reference an appendix with the complete testimony of Michaelis and Hockaday. Considering there is a question whether the Third Runway will even

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increase capacity under poor weather conditions, rebuttal of their testimony is needed.

Revision AB 96 : Pg. 4-7 Need to add the Ray Akers appeal regarding HUD noise violations and also mention the issue of the Flight Manual changes that occurred without the authorization of an FEIS

Chapter 5 : Environmental Consequences

Revision AB 97a: Page 5-1 needs to be revised. The Third runway does not permit unrestricted departure weights or accommodate 99% of the aircraft. Rather, the 600 foot extension of the existing runway provides these benefits.

Note, the Albuquerque airport dismissed an alternative to build a runway of the same length, i.e. 8,500 because of its inability to support Type V aircraft. (ref. ttt).
Revision AB 97b: The SEIS needs to be rewritten to differentiate the impacts and benefits from the 600 foot extension versus the short Third runway.
Revision AB 98 : The second Page 5-1 should be labeled 5-2
Revision AB 99 : The data for 425,000 operations for year (2003 and 2013) and delay costs ($146M and $132M) on the second page 5-1 do not match page 5-5-7 and 5-6-16. One of these pages need to be corrected.
Question AB 100:What are the delay losses if the FAA TAF estimates are correct for 2005 through 2020?
Question AB 101: Isn't the Third Runway a poor investment considering it is going to cost the surrounding cities much more than $3.3 billion identified to date in the Burien Study plus has a project cost that exceeds $3.3 billion but it is projected to save only $136 million in 2003 and $454 million annually by 2019. Even if the Third runway was operational right now, using FAA guidelines that at 60% Annual Service Levels (ref. (ttt)) alternative planning for a fourth runway or use of alternative airport(s) should have begun years ago. Waiting until the year 2000 for another Master Plan Update is contrary to FAA planning guidelines *(60% of 600,000 max. operations with Third runway = 360,000 operations). According to FAA guidelines construction at 80% capacity construction should start. That's about the year 2005 using FAA TAF estimates and 2010 using the Port's estimate IF the Third runway was already in use.*

Question AB 102 : Page 5-5 Delete or clarify "minimizes aircraft push-back and taxiing conflicts as flights enter and exit the terminal". As discussed in the FEIS the Third runway increases the incursion rate by 21% using the "low " FEIS capacity so the accident risk is presumably even higher with the new increased capacity numbers.

Question AB 103: Page 5-2-6 Change item 2 to indicate that Alternative 3 creates and/or worsens exceedences of the Nitrogen dioxide ambient air quality standard (AAQS). This is true even using the low New Port estimate of operations but even worse if the FAA TAF estimates are correct.. See page 5-2-5 that refers to 0.08 ppm at the S 154 receptor which exceeds the 0.053 ppm annual AAQS Note, also that the public routinely park and picnic along side S154 to watch the airplanes land and take-off . Either "No Parking" signs or signs warning of the health hazard are needed in all areas with exceedences as part of a mitigation strategy.

Question AB 104: Page 5-2-6, Were the nitrogen oxides and ozone modeled assuming 40F as the annual temperature as some of the other air pollution was in the FEIS? If so, what are the values for the hot summer temperatures in July-August if typical summer temperatures are used in the model?
Question AB 105: How many days exceed the annual AAQS for nitrogen oxides and ozone if seasonal high temperatures are used in lieu of 40F?

Question AB 106 :Page 5-2-11 Need to change that Alternative 3 exceeds the applicable de minimus threshold rates when:
1) using the FAA TAF operations estimates
2) using the NPIAS defined theoretical capacity for Alternative 3 compared to the "Do-Nothing" alternative (630,000 versus 460,000 operations respectively)

Note, if the model has not been run using the high summer temperatures and summer air traffic peak operations then it needs to be run to determine if that condition also has exceedences. Also, it should be noted that the SEIS calculations assumed Alternative 1 had 14,000 annual operations above the theoretical maximum so there is a larger difference between Alternative 1 and 3 than stated in the SEIS.

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Question AB 107: Exhibit 5-2-4 : The receptor locations do not adequately reflect (1) the significant number of intersection take-offs that are planned , (2) the data from either end of the new proposed runway or (3) the new end of 34R runway. Additional receptors are needed in the model.

Question AB 108: Has the destruction from strip mining been considered in the pollution model?
In order to reduce wildlife hazards the removal of some trees is being considered. This will increase the pollution, particularly nitrogen oxides. The amount of vegetation to be removed needs to be coordinated with the air pollution agencies, particularly if the model uses data from the actual monitoring program that has been arranged under the Memorandum of Agreement.

Question AB 109: How do the assumptions regarding % usage of runways impact the pollution calculations?
(pg. 5-3-4 Third runway By 2005 20% approaches and 4% departures but in 2010 states 44% approaches)

Question AB 110: Have you taken into account the actual noise of some stage 3 is louder than stage 2's?
Comment: SEIS pg. 5-3-5 "even with the new parallel runway, the noise exposure pattern of each future alternative would be between 42% and 46 % smaller than the noise exposure pattern of the existing condition" .
This does not take into account hush kits are just "rule beaters' Often aircraft such as MD-80's exceed the side noise allowance by making less take-off noise so their total noise allotment complies. Therefore, they are actually louder to those on the sides than some stage 2 aircraft.

Revision AB 111: Page 5-4-2 The pollution and construction traffic modeling need to account for hauling in excess of 16 hours per day and 109 one-way truck trips per hour in the good summer weather referred to on Page 5-4-2. Impacts during peak conditions need to be assessed.

Revision AB 112 : Page 5-4-42, Eliminate dots for sites on Exhibit 5-4-1, Off-Site Material Sources that have been eliminated based on Table 5-5-3
Rationale: Exhibit gives false impression that numerous sites are available when only seven sites are still under consideration.

Revision AB 113 : Page 5-4-42 Add a scale to Exhibit 5-4-1, Off-Site Material Sources
Rationale: The FEIS and SEIS omit scales whenever it would indicate to the reader the long distances that need to be traveled with thousands of double haul trucks daily

Revision AB 114: Page 5-4-44 Add a scale to Exhibit 5-4-3., Potential Barge Transfer Locations
Rationale: The FEIS and SEIS omit scales whenever it would indicate to the reader the long distances that need to be traveled with thousands of double haul trucks daily

Revision AB 115 : Increase flood plain storage on SEIS Page 5-5-20
Rationale :10,000 cubic yards of floodplain storage and floodway conveyance is inadequate based on increased frequency and severity of flooding that the Burien/Normandy Park area has experienced that coincided with airport and Boeing related construction on both sides of S154 St. as well as the south runway safety area.

Question AB 116: Were the Alternative 1 noise impacts calculated based on 474,000 operations (New Port estimate) rather than the 460,000 theoretical maximum? Rationale: Page 5-6-4 notes that there will be more residences, parks, churches and schools impacted with 65 DNL or greater noise with Alternative 3 than with the Alternative 1.

Question AB 117 : What is the difference in noise of the theoretical maximums of 460,000 for Alternative 1 and 630,000 for Alternative 3 are used?

Question AB 118: Why isn't the inadequacy of mitigation funding noted?
Rationale : Pg. 5-5-6- $50 million can not possibly even complete the noise mitigation required for the second runway, which is still incomplete after 20

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years, much less provide any meaningful mitigation for the Third runway if noise is to be kept to 45 dBs in the classroom and the noise calculations are done on the school day rather than averaging quiet nights in with noisy days.

Question AB 119 : Why wasn't the FEIS induced socio-economic section rewritten to reflect we do not live in cold climate homes and therefore, we are impacted more than the FEIS assumed (see SEIS pg. 5-71)?
Rationale : In the FEIS response to comments the FEIS says that only 10% of the homes are cold climate yet the FEIS assumes they were cold climate and therefore, insulated. Noise impacts on temperate climate homes are greater than cold climate by about 15 dB, thus greatly increasing the area impacted as well as severity.

SEIS Appendix C-1 Surface Traffic

Revision AB 120 : Table C-1-1 Need to add construction for year 2000 for alternative 3

Question AB 121: Why do Tables C-1-3, C-1-7, C1-9, C-1-13 and C-1-15 assume Alternative 1 and 3 are the same when Alternative 1 has considerable less operations?

Rationale:

Table C-1-3 incorrectly assumes the same number of passengers in 2005 and 2010 for both alternatives. Do Nothing has less than the "preferred"

Table C-1-7 incorrectly assumes the same amount of employee traffic in 2005 and 2010 for both alternatives. Do Nothing has less than the "preferred"

Table C-1-9 incorrectly assumes the same amount cargo traffic in 2005 and 2010 for both alternatives. Do Nothing has less than the "preferred"

Table C-1-13 incorrectly assumes the same amount of general aviation traffic in 2005 and 2010 for both alternatives. Do Nothing has less than the "preferred"

Table C-1-15 incorrectly assumes the same amount of maintenance facility traffic in 2005 and 2010 for both alternatives. Do Nothing has less than the "preferred"

Example: Page C-1-17 refers to South 200th between International Boulevard/SR 99 and Interstate -5 as a "four lane, east-west principal arterial roadway". It should be noted that the speed limit is only 25 mph on S 200th because it is lined by closely situated single family residences. The road improvements on page C-1-23 for year 2000 on Military Road South, S 200th and I-5 will not ease the congestion on S 200th . This also applies to page C-1-51 for year 2010. See Question AB 79.

See also other areas herein that are related to this subject

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Revision

~~*Question*~~ AB 122: Revise taxes

Note: SEIS Appendix D -Impacts through 2020 (2010 if use FAA TAF numbers) Table D-2 , Page D-10 needs the lost taxes revised to include lost real estate taxes in the impacted cities and any other tax issues in the Burien Mitigation study. Normandy Park house sales data was submitted as part of the DEIS comments but ignored because it was considered to be outside the study area. Considering as a direct result of the threat of a Third Runway, the average sale price has already dropped $75,000 the data indicates that the study area is much too small and the impacts much larger than estimated in the SEIS or even the Burien mitigation study. The loss in sales price ultimately translates into lost real estate revenue. See also socio-economic comments enclosed.

Revision AB 123: Table D-2 , Page D-10 needs the amount of Earth to be revised to be equal to 26.4 million cubic yards or a flag note needs to be added explaining that 23 excludes the 15% for settling.

Revision AB 124: The connecting road should be either be in both or neither pollution surface transportation analyses.

Question AB 125: How can 30 to 40 double haul trucks be insignificant to a congested road like Auburn Way North (SEIS pg. 5-5-18)?

Question AB 126: How technically and economically feasible is using Borrow site 5 for the new North parking lot as proposed in the SEIS when Borrow Site 5 was eliminated for consideration for the Third runway?

Rationale for question : FEIS Page IV 19-17 in the FEIS indicates that the 1.1 million cubic yards or 1.75 depending on cut geometry includes "petroleum hydrocarbon-contaminated fill in these estimates". The SEIS indicates because of cost considerations, it will no longer be used for the Third runway project but the SEIS elsewhere indicates it will be used for the parking lot.

Question AB 127 : Why is "using best practices" or "standard practices" acceptable answers throughout the EISs for mitigation associated with construction, excavation, and hauling tasks are that are orders of magnitude more difficult than what is customary ?

Question AB 128: What are the probabilities of being able to obtain the maximum quantity of on-site fill indicated in the SEIS considering topography,

peat bogs, aquifer, water levels, seismic anomalies, contamination, incomplete soil surveys, debris from buy-outs, etc.

Question AB 129 :What accounted for the increase in Borrow site 1 fill estimates?
Question AB 130: Does the SEIS, unlike the FEIS, assume excavation in the low lying areas where there is a "likely occurrence of shallow groundwater (ref. FEIS page IV 19-17)?

Question AB 131: How many on-site fill square miles previously had homes or businesses that may have had in-ground oil tanks ? How many of these square miles are known to be contamination free?

Question AB 132 : Is it true that this project will use all of the local areas fill for the next 10 years if no new strip mining permits are issued and no on-site fill is used?
Question AB 133 : What percent of the presently permitted sites within 10 miles of the airport will be available for non-airport related projects assuming no on-site fill is used?
Question AB 134: What percent of the presently permitted sites within 20 miles of the airport will be available for non-airport related projects assuming no on-site fill is used?
Question AB 135 : What percent of the presently permitted sites within 30 miles of the airport will be available for non-airport related projects assuming no on-site fill is used?
Question AB 136: What is the realistic schedule for new strip mining permits?
Question AB 137: What is the total likely estimate of required fill including replacement of contaminated soil, soft soils, and adjustment for shrink/swell?
Question AB 138: What is the worst case total estimate of required fill including replacement of contaminated soil, soft soils and adjustment for shrink/swell?
Rationale : The adjusted fill requirements are 26.4 million cubic yards (SEIS C-4-5) excluding replacement of soft soils and contaminated soils so the total requirement exceeds 26.4 million cubic yards. The critical path for construction is the fill availability. If inadequate fill is available the construction schedule could slide several years or even more if haul costs exceed original estimates.

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Question AB 139 : Why does Table C-4-3 show 66 peak hour trucks when elsewhere in the SEIS it discusses 109 one-way truck trips in the summer months?

Question AB 140 :How many cubic yards did the 1996-1997 runway safety area trucks carry?
Question AB 141: Will the trucks really carry 22 cubic yards or do they typically carry 17.5 cubic yards?
Rationale : Using numbers in a newspaper article the 1996-1997 runway safety area was only able to transport 17.5 cubic yards of fill instead of the 22 assumed in the SEIS.

Question AB 142: When on-site fill needs to be replaced, such as when its removed from the SASA site but eventually needs to be replaced to finish SASA, the replacement fill needs to also be identified. Has the 26.4 million cubic yards been adjusted upwards to include the eventual replacement fill?

Question AB 143 : What are the socio-economic, economic and environmental impacts if all cities surrounding the Sea-Tac airport are considered?
Question AB 144: Why don't the property devaluation estimates in the EISs pass a sanity check?
Question AB 145: Are some property values low because the Port bought out average to high income families and then rented the same property to low income families so that over time the neighborhood degraded?
Rationale: The study area needs to be enlarged to include all cities being devastated economically and environmentally by the proposed Master Plan Update. The increase in noise contours, increased flooding, and loss in potential real estate revenue justifies the increase in study area. As shown in the table below the threat of the Third Runway has depressed appreciation so much that the average loss in 1996 tax revenue is $1028 per house in Normandy Park. Normandy Park sales data was submitted as comments to the DEIS (1988 thru 1994) and ignored. The DEIS answered the question with SeaTac city numbers.

Table RE-1 : Normandy Park Depreciation Slowed by Third Runway Publicity

Year	Puget Sound Multiple Listing Average House Price /1/	Normandy Park Average House Price /2/
1988	$104,414	$178,416
1989	$129,932	$210,312
1990	$155,003	$241,858
1991	$156,012	$235,034
1992	$157,429	$240,699
1993	$163,822	$237,919
1994	$171,522	$240,419
1995	$173,345	$238,429
a) 1996 actual	$179,163	$252,568
b) 1996 if Normandy Park had continued to appreciate at same rate as Puget Multiple Listing rate		$ 328,338
Loss in Value due to decreased Appreciation between 1988 and 1996 (line c = line b - line a)		**$75,770 loss per house**
1996 Tax revenue lost per house		**$1028 per house lost in 1996 tax revenue**

/1/ Includes Snohomish and King County plus the northern portion of King County

/2/ Excludes waterfront homes

Question AB 146 : Considering property outside the general study area is now required to list "airport noise" on the legal real estate property descriptions, how can the SEIS justify the small study area?
Rationale : Listing "aircraft noise" on property descriptions will drive real estate values even lower. See Normandy Park calculations prior to this new reporting requirement.

Other

Question AB :147 Why is the selection of measurement units biased in favor of the Third runway?
Rationale : The EISs tend to use whatever measurement units are least likely to raise a red flag to a reader opposed to the Third runway. This editor's trick used in reporting bald eagle distances in fractions of miles rather than as 3907 feet, pollution calculations (tons versus grams) and surface transportation data in the EISs.

Revision AB 148 : Pg. 2-24 sentence Obstacles exist.... "
Need to add law suits and appeals, particularly considering the court date is set for January 1998. Also time to obtain permitting for strip mining should not be underestimated despite the Department of Natural Resources letter in Appendix E. Do you really believe the City of Des Moines is going to allow an exception to RCW 78.44 without taking it to court?

Revision AB 149: SEIS pg. 3-9 needs to be revised
Regarding the "consensus" of the region is that a supplemental airport is not viable (SEIS page 3-9) . The only consensus I am aware of is that in most circles it is considered "political suicide" to defy the Third runway and opposing it will result in threats against your business and possible transfer from your job if you are in a position to influence the outcome. Considering THREE unincorporated areas of King County became cities so that as a body of five cities they could sue the Port is hardly a indicative of a consensus. The area now has a new county movement and will become a new county unless the legislature changes the law to make it virtually impossible to do so.

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Question AB 150: Considering the Port's track record at estimating operations, enplanements and implementing mitigation, what justification can you provide to lend any credibility to the SEIS and other supporting documents?
Rationale : The Expert Arbitration Board findings cast grave doubt on the Port's noise modeling, willingness to fulfill legally binding mitigation responsibilities, etc.

Health

Question AB 151: Why wasn't statistically significant health data addressed adequately?
The high incidents of diseases, particularly rare ones, around Sea-Tac airport are not given serious consideration in FEIS (ref. (d)) or SEIS. Likewise, the ongoing high infant mortality rates in South King County contrast dramatically with the 61% decline in deaths for Seattle from 1988 to 1994 (refs. (qq) and (kkk)) and is not considered in the 1996 FEIS. Also see separate list of health references.
This proposed Sea-Tac expansion has heightened the awareness of some citizens of the significant pollution risks. Can the taxpayers really afford the lawsuits that will advertise that the "current airport operations are likely responsible for formaldehyde levels 23 times the WDOE's Acceptable Source Impact Level ..." (ref. (ee)) ?
Ethylene glycol deicer is being released untreated into our water. Some children wade in that contaminated water !!! The FEIS (ref. (d)) will be corrected to reflect the ethylene glycol contamination when the Record of Decision is issued but agencies such as the Seattle Water Department have not been notified of this important critical change?
See also pollution comments herein.

Safety

Question AB 152: What are the probabilities of in-air collisions, on-the-ground incursions risks considering the operations of the other airports as well as Sea-Tac's using 1) the New Port estimate and 2) 2010 TAF estimate, 3) 630,000 operations and Alternative 1 2010 ?
Comment : FEIS indicates 21% increase incursion rate.

Question AB 153: What are the increased risks airplane parts falling on neighborhoods using theoretical maximum operations for alternatives 1 and 3.

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Question AB 154: What are the increased risks of airplane parts falling on neighborhoods using theoretical maximum operations for alternatives 3 compared to 260,000 operations for alternative 1 (the number of operations the existing noise boundary and prior mitigation agreements are based on)

Rationale: Considering the increase operations in the SEIS, what are the accident probabilities now (air-collisions, bird strike, etc.) ? According to page 5-5-16 approximately 20 bird strike incidents happen per year. By adding a Third runway that is only 800 feet from the adjacent runway creates a greater hazard. As you know, a petition was submitted by pilots indicating that even at the lower number of operations they considered the Third runway to be too dangerous. FEIS (ref. (d)) states in one place the Third Runway will be safer but page R-43 states there is a 21 % increase in on-the ground incursion rate. How can it be safer to taxi across two active runways?

The air space would also be shared with another airport, Boeing Field. Excerpts from a petition signed by commercial airline pilots follow:

"... Our association, A.L.P.A., has not endorsed the proposed 3rd runway because of its marginal safety"

Because Sea-Tac does not have a buffer zone between it and neighborhoods, any accident has the potential of not only killing those in the airplane but residents. We have numerous children in the area already traumatized by aircraft parts falling on school grounds while they were outside playing. Some have testified at various Third runway related hearings.

Alternatives

Question AB 155: Considering the increase in costs and sliding schedule for the proposed Third runway, why hasn't the search for other alternatives been resumed in accordance with WAC's cited in Table 2 of reference (c), namely WAC 197-11-070 (1), WAC 197-11-060 (4) c& d , WAC 197-11-030 item g, WAC 197-11-440 (5) b and WAC 197-11-786.

Question AB 156: Why wasn't Tenino Washington considered as an alternative site?
Rationale: Using the 1997 FAA TAF estimates and data in the SEIS, the Third runway provides inadequate capacity even when its brand new. It also violates the Clean Air Act, destroys over 10 acres of wetlands, disrupts over 274 acres of bald eagle/ blue heron foraging areas, and requires a more difficult civil engineering feat than the hauling/filling/compacting proposed for the Alburquerque New Mexico airport's proposed runway that they deemed "virtually impossible" to implement (refs. (sss) and (ttt)).
Considering it will ultimately cost billions more then the New Denver International airport but provide very little growth capability, the search for alternatives that was so abruptly halted needs to be resumed.

A new Environmental Impact Statement is needed to address alternatives because the SEIS indicates the only way Sea-Tac can support predicted FAA TAF growth is to add at least two additional runways by 2005. Using FAA planning guidelines, this planning is already behind schedule. Since the addition of a fourth runway will require the annihilation of two hilly cities, namely Normandy Park and Burien, the cost would be astronomical. Even if the civil engineering challenges could be met and the endangered species ignored, the buying out of multi-million dollar homes makes this option cost-prohibitive.

SEIS pg. 3-2, 3-4 and 3-9 PSRC EB-94-01 regarding alternative sites did not consider Tenino even though Oregon has expressed interest in helping to fund an airport at that site which is close to a deep harbor, Interstate -5 and the rail line.

Question AB 157: How could Sea-Tac add more runways cost-efficiently?

Regulation Compliance Risks*Question* AB 158: What are the likely construction schedule slides due to compliance issues?
Question AB 159: What are the risks, that Sea-Tac, like some airports in Europe, will need to close or curtail operations during times of high pollution?
Rationale
a) Schedule slides should be required to mitigate construction pollution each time a new receptor location violates the Clean Air Act

b) Schedule slides should occur during smog alerts such as those experienced July 1996
c) Schedule slides should be required to comply with the Endangered Species Act each time the bald eagles have eggs in their nests

Procedures

Question AB 160: Considering the significant number of procedures that were violated or are in the questionable category, what is a reasonable estimate for resolution of all related court cases and appeals?

Rationale : Some of the questionable procedures include:
1) Failure to Follow Administrative Notification Procedures
As outlined by Cutler & Stanfield (ref. (j)), the Federal Land managers were NOT provided an opportunity to review the air pollution documentation as required by the Clean Air Act.
As outlined by the Ravenna Bryannt comments (ref. (y)) several government bodies were not coordinated with as required by the HUD regulations and the Executive Order.

(2) Certificate of Compliance Issued Prematurely by Wrong Governmental Agency
Washington DOE issued the Certificate of Compliance (ref. (bbb)) but regulations (ref. (ccc)) require the Governor to do so. Under certain circumstances the Governor may delegate that responsibility to the EPA, not the DOE. The DOE did not even participate in the multi-year evaluation process but only became involved for the six months following the release of the FEIS (references (ddd) and (eee)). The FAA still has not issued the Record of Decision because of the magnitude of errors in the FEIS (ref. (d)). For example, the air traffic assumptions were so low in the FEIS they've been surpassed and ~~are being~~ were redone. The Port promised to correct the FEIS to admit to the release of untreated ethylene glycol but who knows to look for the change?
Question AB 161 : How many corrections were made in the FEIS and SEIS that should impact pollution compliance issues?
Question AB 162 : How do we identify the changes that were made in the FEIS and SEIS that impact pollution assessments?

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(3) Unreasonable Appeal Procedures
The Port's NEW appeal process, Resolution 3211, dated 8 February 1996 is unrealistic and appears to be designed to preclude high quality appeals. It appears to be an obstruction of justice. To allow only 15 CALENDAR days to appeal a major controversial item such as the Third runway is unethical and should be illegal. A. Brown began requesting copies of the appeal process at least one week prior to the August 8 public notice, yet did not receive a copy until 12 August 1996, with a mere nine days left to respond. Had the call not been made until the day of the public notice, the time to respond would have been even less than nine days, including weekends.

The time period should have been extended and a submittal of revised comments permitted without additional charge.

The appeal charge of $300 is also high considering (1) it is not a judicial appeal and (2) the short time to appeal. There was only a little over a week to arrange funding for the appeal during prime vacation season. This made it very difficult, if not impossible, for some community groups to arrange a meeting to authorize funding an appeal.

(4) Key Comments Missing From PSRC Correspondence Packages
A critical Environmental Protection Agency (EPA) letter to the Federal Aviation Authority (FAA) (ref. (w)) was not in any of the PSRC correspondence packages A. Brown obtained directly from the PSRC . The letter states the "Draft conformity analysis does not support your conclusion that the project conforms to the State Implementation Plan". Unless overturned, this means that the **Third Runway is ineligible for any Federal funding.**
Cutler and Stanfield request for an SEIS (ref. (j)) which was hand delivered to PSRC 6 June 1996 was also missing from the PSRC Correspondence packages as of 11 July 1996. It was referenced in "Response to Requests For Supplemental Environmental Review". The Cutler and Stanfield correspondence explains the ramifications of not meeting the Clean Air Act. Neither of these crucial comments (ref. (j) and (w)) were available in all the PSRC correspondence packages mailed out at the time of the PSRC General

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Assembly vote, raising the question of the vote's validity if it wasn't just A. Brown's packages that were incomplete. The dates of the packages are continuous beginning with a package dated "April 3 through April 15, 1996" and ending with package dated "July 10-11, 1996".

(5) Useless Public Hearings
The 27 June 1996 morning public testimony was useless considering that as certain individuals voted on that afternoon of the PSRC Executive meeting, they referred to meetings held on PRIOR days that had already decided their vote (ref. (v)). For example, most of the Tacoma City Council members voted, without ever hearing the public testimony, For the Third Runway, at a separate meeting. Their representative then honored that prior direction when voting at the Executive Board meeting. See reference (aa) for additional comments on the procedures used at other meetings and reference (c) for comments regarding Open Houses. *I am sincerely convinced that anyone, except those with an interest in obtaining short term construction work, would be vehemently against the DEPENDENT, PART TIME Third Runway if they understood the total cost, tiny capacity increase, risks, and compared those factors to other alternatives , i.e., new air traffic technology , choosing a different airport to expand, multi airport system, reliever airport such as Moses Lake for cargo maintenance, or banking land for a supplemental airport.*

Other hearings such as the SEIS and DEIS ones involved speaking into a microphone with your back to the audience with no Port or FAA officials present, just a mediator.

(6) Inadequate Technical Review by Cooperating Agency
Some technical experts responsible for commenting on the Draft EIS (ref. (b)) had inadequate time to review it thoroughly because it took so long to reach their desk (routed through managers then eventually to the technical expert) (ref. (c)). Also, for many of the topics, it requires reading the entire Environmental Impact Statement to obtain all the relevant data. It did not reference related sections. Note, NEPA requires a clear and concise 300 pages.

(7) Illegibility of Comments Published in 1996 FEIS (ref. (d))

Comments were reduced to fit two pages onto one page. This made the size of the print too small to read in some cases and difficult to read in almost all cases. It was unreasonable to expect anyone to try to read and respond to the comments on the DEIS ((ref. (c)).

(8) Inadequate traceability of response to comments

In the FEIS (ref. (d)) and SEIS it is only sometimes possible to trace an answer back to the commentor which violates WAC 197-11-550. It is impossible for some to determine if their question was accidentally overlooked, intentionally ignored because it was unsubstantive, inadvertently misinterpreted ,or answered somewhere in the over 5,500 pages of the FEIS but they haven't happened upon it.

(9) Inadequate traceability of comments for Supplemental Review

In the "Response to Requests for Supplemental Review" (ref. (dd)) it is not always possible to trace an answer back to the commentor. It is impossible for some to determine if their question was accidentally overlooked, intentionally ignored because it was unsubstantive, or inadvertently misinterpreted so although the PSRC considers it answered, the commentor does not.

For example, some unanswered questions from reference (s) are:

How can the FEIS rely on "best or standard commercial practices" or "standard procedure" as a substantive answer when the engineering and environmental aspects of the task are far more difficult then "standard or best commercial practices"?

Considering reinforced earth walls typically have a maximum height of 50 to 60 feet, how will the over 100 feet heights be handled? Will the 160 feet area need an earth wall? (FEIS R-11-2)

How much soft /low grade soil must be excavated?

Where will all the fill come from? Can permits to mine and haul it be obtained in a timely manner?

How can you have over 3000 haul trucks a day without decreasing safety, particularly considering current accident rates on those roads? Considering most routes haven't been defined how can safety be adequately addressed? (FEIS R12-28)

The study boundary is much too small from both environmental and economic aspects and needs to be expanded. Normandy Park is being hurt more than any other city but was not evaluated in the FEIS. For example, Brown's seven years of house sale data was ignored but clearly shows a significant decline (ref. (c)).

What is the real air capacity increase if consider the weather during peak season?

What is the pollution impact from the aircraft if all their engines are running and realistic landing/take-off cycle times are used?

(10) Inaccurate answers in Response to Requests for Supplemental Review

For example, in the "Response to Requests for Supplemental Review" (ref. (dd)), it states on page 10 that "The over-statement of pollutant levels occurred by using worst case weather conditions..." yet the FEIS states that it did not. The FEIS R10-2, page R-112 explains that the reason the FEIS shows less pollution than previous studies is because the FEIS uses "actual historic meteorological conditions". The pollution is not overstated. If this was the same wrong weather data that the poor weather estimate came from used in delay calculations, i.e., the 10 summers but 11 winters (ref. (i)), the O_3 and NO_2 pollution is even more underestimated than the original question suggested. Combine this the ridiculously short 11 minute take-off and landing cycle time used in the calculations, there is even less credibility in the pollution numbers.

(11) Misinterpretation of Final Noise Decision; (Ref. (e))

The PSRC has misinterpreted the "Final Noise Decision on Noise Issues". At the December 1994 Expert Panel Public Testimony meeting (ref. (t)), the Arbitration Board went to great lengths to explain they were only addressing second runway mitigation and would take no comments on the Third runway. If they changed this position, then the public comment sessions were incomplete and need to be redone.

The Noise decision indicates that noise has definitely increased according to actual measurements, questions the validity of noise contour maps, and suggests that although it might be feasible to mitigate noise from the second runway, it's probably unrealistic to believe the Port would mitigate noise from a Third runway in a timely or meaningful manner.

(12) Invitation to Question Constitutionality of Government Agencies

See reference (ff) for some points related to this issue

(13) Steps after DEIS Confusing

After the DEIS comments were submitted to the FAA, comments sometimes went to the Port and sometimes went to the FAA depending on what part which document you were commenting on. With the added complication of adding the Third runway into the MTP plan, it would be a miracle if all the comments really got to the right agency each time. Also, some people are probably under the mistaken impression that what they submitted to the Expert Panel or the PSRC is included automatically in the EIS process.

(14) Inaccessibility of EIS's

The FEIS cost $350 and only one copy was available at the local branch library. It could not be loaned out because it was the only copy. Likewise, there is only one copy of the SEIS at the local library, and even that arrived late.

(15) Inaccessibility of Key references in SEIS

Key items such as the Miller Creek plan are not in the SEIS.

(16) Alleged Flight Path Changes without EIS

The Flight Path appeal by Akers regarding Manual changes flight path without the required EIS needs to be addressed in SEIS.

(17) SEIS Public Hearing Notice

The Port's "Forum" newsletter indicated the SEIS Public Hearing was tentative and to call a phone number to confirm. The number was not updated as of 7AM the day of the hearing to say that the hearing was scheduled. I assume the automated phone line was never updated with the hearing information. The Forum newsletter that confirmed that the hearing arrived in my mailbox AFTER the hearing had already started.
The Forum newsletter did NOT indicate that parking would be validated nor did the automated phone line message. It is very expensive to park at the airport so some people were unable to afford attending the meeting.

A copy of the SEIS still was not at the Des Moines library as of the hearing date.

SEPA and NEPA Regulations

Question AB 163 : Is the National Environmental Policy Act (NEPA) applicable to this SEIS?

Question AB 164 : If NEPA is applicable, please provide justification for the departures from NEPA. See Appendix B.

Question AB 165 : How do you justify non-compliance with the regulations or rationalize compliance with the SEPA regulations listed in the following table ? Please address each specific WAC paragraph cited.

Enclosed is a partial summary of SEPA regulatory issues. The majority of Table B1 covers items specifically addressed in comments to 1995 DEIS (references (c) and (s)). Some key items added to this table since June 1995 include:
(1) LDA technology
(2) GPS technology
(3) Final Noise Decision on Noise Issues
(4) Kludt litigation
(5) Flight Path Change without an EIS (Akers)
(6) Executive Order Appeal (Akers)
(7) PSRC process
(8) Port process

After reading the SEIS, even if the SEIS comments on the item such as technology, the answer appears inadequate or incomplete.

Table B1 Regulatory Compliance Issues Partial Summary

Issue	SEPA Regulation
FULLY address other REASONABLE alternative sites	WAC 197-11-070 (1) WAC 197-11-060 (4) c& d WAC 197-11-030 item g WAC 197-11-440 (5) b WAC 197-11-786
The "weighing and balancing" with respect to economics and the logistics of the additional off-site fill now required for Sea-Tac must be compared to the other Alternative sites.	WAC 197-11-448 (1) first sentence
Fully address Demand Management alternative	WAC 197-11-786
Address probable impact from 4th & 5th runways	WAC 197-11-060 (4) c, d
Address impact of "reserving for some future time" the implementation of this project	WAC 197-11-440 (5) viii
Add cost-benefit analysis. Considering cost estimate tripled over several months and will be the most expensive US runway, and has a limited capacity (too short for cargo planes in warm weather)	WAC 173-806-125 WAC 197-11-726 WAC 197-11-055 (6) WAC 197-11-600 (4) c)ii
Need to address LDA technology similar to that used in San Francisco without a Third Runway	WAC 197-11-070 (1) WAC 197-11-060 WAC 197-11-030 item g WAC 197-11-440 (5) b WAC 197-11-786

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Table B1 Regulatory Compliance Issues Partial Summary

Issue	SEPA Regulation
Need to address technology combined with some form of demand management (Note (ref. {dd)) clearly states "unconstrained demand " is assumed in the 1996 FEIS)	WAC 197-11-060
Need to address LDA technology similar to that used in San Francisco with a third runway closer to the existing runway alleviating the need for over 24 million cubic yards of fill and acres of wetland construction	WAC 197-11-070 (1) WAC 197-11-060 WAC 197-11-030 item g WAC 197-11-440 (5) b WAC 197-11-786
Need to address GPS technology scheduled for FY 2001 implementation with a third runway closer to the existing runway alleviating the need for over 24 million cubic yards of fill and acres of wetland construction	WAC 197-11-070 (1) WAC 197-11-060 WAC 197-11-030 item g WAC 197-11-440 (5) b WAC 197-11-786
Need to address GPS technology scheduled for implementation FY 2001 without a Third Runway	WAC 197-11-070 (1) WAC 197-11-060 WAC 197-11-030 item g WAC 197-11-440 (5) b WAC 197-11-786

Table B1 Regulatory Compliance Issues Partial Summary

Issue	SEPA Regulation
Address Property devaluation of ALL significantly impacted locations - Burien, **Normandy Park, Des Moines**, SeaTac, **Tukwila** Significant litigation should be addressed such as Kludt and Akers Flight Path charges	WAC 197-11-600 (b) i, and (d), ii WAC 197-11-440
PSRC members received direction to vote "For the Third Runway" prior to public testimony/hearings	
Address the ACTUAL transportation plans for the about 1,000,000 haul loads of fill. Is it possible to be economically practical? Barges are NOT fully addressed in DEIS.	WAC 197-11-660 (2) WAC 191-11-440 (6) c, iv
Acquire missing critical data such as erosion, landslide & earthquake hazards, air toxins, ground water movement/quality, etc.	WAC 197-11-080 (1) WAC 197-11-660 WAC 197-11-444 (c),iv WAC 197-11-600 (b), ii and (d), ii

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Table B1 Regulatory Compliance Issues Partial Summary

Issue	SEPA Regulation
Investigate noise projections, Noise contour maps not substantiated by noise measurements.	WAC 197-11-600 (b) ii, (d) ii
Address impact on existing "brown-out" problems related to electric utilities	WAC 197-11-600 (b), ii and (d), ii
Address pollution and safety impacts of aircraft crashes	WAC 197-11-794 WAC 197-11-600 (b), ii and (d), ii
Address air toxin levels in Chapter V, item 4. Data suggests it already exceeds annual safety levels and will not be mitigated	WAC 197-11-080 (1)
Revise misleading calculations such as carbon monoxide levels	WAC 197-11-080 (1)
Add SPECIFIC, FEASIBLE mitigation measures	WAC 173-806-100 (c) WAC 197-11-660
Proposed mitigation measures UNREASONABLE (feasible ones could double construction schedule and some aren't feasible)	WAC 197-11-660 (1) f ii
Fully address mitigation using the "appropriate technology". No mention of new technology like infrared hangers for deicing[1] and concrete barriers for running off runways[2].	WAC 197-11-768

Table B1 Regulatory Compliance Issues Partial Summary

Issue	SEPA Regulation
Provide mitigation schedule and bonds considering the decades old mitigation agreements still have not been fulfilled (pollution and noise related)	See King County Rules in addition to SEPA rules
FULLY address monitoring of environmental impacts	WAC 197-11-660
Publicly retract published misleading information - see Forum	WAC 197-806-130
Revise conclusions not supported by data for which the data is readily available from court house records, government documents, and libraries.	WAC 197-11-080 (1)
Revise ES Summary to reflect the data in the report such as Chapter V disturbance-sensitive species perishing (see Biological Appendix K)	WAC 197-11-440 (6)
Address other related documents such as the Arbitration Panel data and reports including the **Final** Noise Decision on Noise Issues (ref. (e)). Do not quote things out of context.	WAC 197-11-055 (6) WAC 197-11-402 (6)
Identify all those impacts which will not be fully evaluated further because regulations governing "on-site" construction are significantly different. Evaluate, conduct tests, and assess these before EIS approval. Example: Excavation and repositioning of contaminated fill that then can contaminate creeks leading into Puget Sound.	WAC 197-11-660 (2)b
Determine if the term "on-site" is appropriately used for sites that are geographically separated by public roads. Identify differences in policies and regulations for on-site compared to off-site.	WAC 197-11-660

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Table B1 Regulatory Compliance Issues Partial Summary

Issue	SEPA Regulation
Determine the correct Lead and Cooperating agency relationships. SEPA requires DOE to be Lead agency when over 1,000,000 gallons of fuel are involved. Not all agencies provided adequate review of DEIS because they each thought another agency had prime responsibility for that section and they wanted to avoid duplication.	WAC 197-11-938 (10) Note, WAC 197-11-942 does not apply to items listed under 197-11-938.
Consider a NEPA. Current EIS contains too many fallacies to use it to justify the Third Runway.	WAC 197-11-610
Include a single map identifying all the environmental sensitive area issues	WAC 197-11-908
Fully address pollution from aircraft crashes and major fuel spills	WAC 197-11-794 (2)
More fully address aircraft parts falling onto school grounds now that even more schools are in the "fall-out" zone	WAC 197-11-794 (2)
EITHER DENY THE PROPOSAL or require a SEIS to identify feasible, technically adequate, and economically practicable mitigation measures. Present DEIS/FEIS mitigation measures are TECHNICALLY INADEQUATE such as the water pollution control methods, not all Significant Unavoidable Impacts have been addressed such as the homeless endangered species and (3) inadequate information regarding fill source locations which will certainly create a "Significant Adverse Impact". Significant Adverse Impacts needs to address loss of eligibility for low income housing The SEIS needs to address Alternative Sites, technology and assess current traffic at other local airports such as Bellingham, WA Traceability to questions inadequate and answers unsubstantive	WAC 197-11-600 (4)d ii WAC 197-11-660 WAC 197-11-330 WAC 173-806-100 (c) WAC 11-440 (6) c iv See Alternative Site rules first Table B1 entry WAC 197-11-550

Table B1 Regulatory Compliance Issues Partial Summary

Issue	SEPA Regulation
If FAA Record of Decision intends to increase capacity numbers above the "New Port" estimate, issue another SEIS to recalculate pollution and increase on-the-ground taxi time, etc.	
If FAA Record of Decision intends to change the location of the runway so it is below the FEIS location (14 feet below proposed), instead issue another SEIS to recalculate pollution and increase on-the-ground taxi time, etc. . Curent SEIS does not appear to consider this.	
Suggest REASONABLE and feasible mitigation measures. Example: Can over 3000 trucks per day really avoid rush hour near businesses and an airport that are open 24 hours a day ? If it is hauled in at the same rate as the current south airport construction rate which is creating havoc, it will take about **50 years**.	WAC 191-11-440 (6) b,i and (6) b ,iv WAC 197-11-660
Address "Economic Practicability" of mitigation measures. Note, some required mitigation for the 2nd runway completed in 1973 is still incomplete.	WAC 11-440 (6) c iv WAC 197-11-660 (2)

[1] Aviation Week, "FAA Tests Infrared Deicers", May 1,1995, pg. 38

[2] Aviation Week, 1995

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Summary

1) The basic premise that the Third Runway is the only solution may have been valid at the start of this evaluation process, but is no longer valid now
2) The procedures used by the Port and the PSRC are being challenged in the courts as well as through the EIS appeal processes
3) The data presented in the FEIS is being challenged in the courts as well as through the FEIS appeal process
4) The Third runway on 12 St. is so expensive that the airline carriers will not support it unless "free" FAA funding is available
5) Clean Air Act, Clean Water Act and Endangered Species Act will be violated if the Third runway is approved. It is not economically feasible to mitigate this incredibly difficult civil engineering project. The Port can't even afford the 1970's second runway mitigation that has yet to be accomplished.
6) Filling in a valley where people and endangered species live to make the world's most expensive runway in a heavily populated residential area on top of the aquifer makes no engineering sense. If the Port had jurisdiction outside King County would they still want this runway?

If you take the time to study all the references they do NOT support a Third Runway from an environmental, engineering or economic point of view. As time goes on, more and more data keeps accumulating that supports my original comments to the Draft EIS (references c, f, i, j, r).

Bottom Line

We want a man's size 13 shoe,
We are PAYING for a man's size 13 shoe,
We're getting a baby bootie.

It just doesn't fit

Recommendations

1) Immediately discontinue efforts to approve a Third Runway at Sea-Tac because of the **exorbitant** economic and environmental costs. If this can't be done at this time, the Government Accounting Office should conduct an audit.

2) Identify and implement a **meaningful mitigation** plan for the existing Sea-Tac airport configuration recognizing the impact technology and a demand management plan will have on air traffic.

3) Aggressively pursue **realistic alternatives** as well as a combination of alternatives, i.e., rail and other airport sites combined with technology improvements at Sea-Tac International Airport

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Appendix A

Dirt Petition Letter

Acronyms

References and Bibliography

Health Bibliography

C.A.S.E.

Citizens Against Sea-Tac Expansion

3 October 1996

font size reduced for incorporation into SESIS comments

To: Director of Public Works
City of Sea-Tac Public Works Dept.
17900 International Blvd.
Sea-Tac, WA 98188

Dear Mr. Bruce Rayburn,

Subject : Current and Planned Haul Truck Mitigation in Sea-Tac Airport Area

References :

(a) "Number of Dirt Trucks Will Increase, Third Runway", by V. Nordstrom, Highline News, 10 August 1996

(b) Puget Sound Air Pollution Control Agency, Notice of Violation, Registration No P371603874-75, Reg. I, Section 9.15 (a), 2001 S128 St., North Sea-Tac Park Project

(c) Engineer's Personal Assessment of the Sea-Tac Airport Master Plan Update Draft Environmental Impact Statement (DEIS) - Proposed Third Runway, The United States' Most Expensive, Limited Capacity Runway, incorporated into FEIS response appendix.

(d) Sea-Tac Airport Master Plan Update Final Environmental Impact Statement (FEIS), 1996

(g) City of Sea-Tac Public Works Permit PWD0115-96, Parcel 282304-9016, Issued 6/20/96, Expiration 12/17/96, Contractor Segale, Signed by Bruce Rayburn

Both the air pollution and traffic controls in the Sea-Tac airport safety project permit (ref. (g)) appear inadequate when driving on S 188th, SR 509 and SR 518. Considering the volume of fill for that permit is **only about 2 %** of that needed for the Master Plan project covered in the Final Environmental Impact Statement (reference (d)) much more mitigation is needed to minimize future hazards.

Recognizing the problems the current "insignificant" project has caused (see the enclosed petition), it is difficult to imagine the problems if the Third Runway is built in the short time scheduled by using thousands of haul truck trips per day.

This letter addresses measures we recommend be **mandatory to MINIMIZE loss of life and property. Over 75,000,000,000 pounds[1] of fill requires more mitigation than routine projects !**

[1] 24.6 million cubic yards per FEIS (ref. (d)) excludes the soft soil and contaminated soil that needs to be removed and replaced

Proposed Mandatory Permit Requirements

(1) Each haul truck should be required to participate in a "How am I driving?" program (e.g. 1-800-827-SAFE). These programs post a sign on the back of each truck. It lists in large letters a short truck identification number and a phone number to report traffic violations.
Rationale: Since hauling began for the referenced permit (ref. (g)) there has been a significant increase in citizens' complaints regarding haul trucks (ref. (a)). Both RCAA and CASE receive phone calls requesting whom to contact to complain. It has become a standard topic of discussion at meetings and typically includes the following allegations:

(a) *running red lights at SR 518 and SR 509 interchange (going south)*
(b) traveling outside the white lines
(c) excessive speed on SR 509 and SR 518
(d) inability to merge onto SR 509 due to fast moving trucks
(e) reduced visibility because trucks travel in a line of four (4) or five (5)
(f) fill flying onto cars behind the trucks
(g) huge clouds of dust distract drivers because it appears to be an explosion when it's actually just from dumping

Not all trucks are airport bound so by using an identifying number it can ensure the correct companies are contacted about alleged driving violations. Alleged traffic violations are in areas <u>not</u> visible by the uniformed officers required by *permit PWD0115-96.*

(2) Additional uniformed officer coverage is needed to patrol the areas identified under the Safe driving program as high risks. This patrol coverage should be a condition of the permit and paid by the haul truck contractor.
Rationale: Considering thousands of haul trucks will be coming from all over Puget Sound and converging on Sea-Tac daily, the high risk areas likely will extend well beyond the immediate airport area. The August 1996 forty-two (42) car pile-up on I-5 included at least four trucks. The newspaper and television coverage showed a double-haul truck jack knifed across I-5 near the beginning.

(3) Additional uniformed officer coverage is needed at the SR 509 and SR 518 interchange. This should be a condition of the permit and paid by the truck contractor.
Rationale: The Dept. of Transportation statistics indicate this is the most dangerous intersection in the area. This concern was raised in comments on the Draft Environmental Impact Statement (ref. (c)) but the Final Environmental Impact Statement response R-28 was *"increased truck traffic on any leg does not impose any increased traffic risk"*. There has already been at least one significant haul truck accident on 18 September 1996 at the intersection of SR 509 and SR 518. Also, the SR 509 and SR 518 interchange appears to be generating the most negative comments from residents (see item (1)).

(4) Haul truck operating hours need to be reduced
Permit PWD0115-96 rush hour limitations need to be extended at least to 8:30 AM. Additional limitations may be needed as a result of the traffic analysis requested in item (5).
Rationale: Permit PWD0115-96 has already significantly increased commute times and caused an increase in pollution due to slower traffic. This is particularly significant considering the carbon monoxide levels that already exceed approved levels. Note, the construction area posted speed limit is 10 miles per hour less than the standard speed limit, signs warn you to be prepared to stop (it takes the trucks so long to turn it requires the cars to stop), and one lane is closed to facilitate the trucks turning. This results in a traffic situation that was NOT included in the FEIS traffic analysis (ref. (d)).

(5) The number of trucks entering the Sea-Tac per hour needs to controlled to avoid creating any additional Loss F conditions and to minimize the impact on those intersections already at Loss F (see King County Road Adequacy Standards). Traffic analyses need to be redone using the reduced speed limits, full stops for traffic behind double haul trucks as they turn and to account for lane closures used to facilitate the turning of the double haul trucks. Because this project far exceeds any standard practice haul project, the entire haul job must be considered rather than each individual contractor's number of trucks.
Rationale: The intent of King County Road Adequacy Standards is to avoid additional Loss F locations. The traffic controls used for Permit PWD0115-96 (See rationale as item (4)) are <u>not</u> reflected in Final Environmental Impact

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Statement. Even more extensive traffic controls will be needed for the Third runway project. It is much larger both in total number of trucks and number of trucks per day than PWD0115-96. It's extremely unlikely that the current construction schedule can be met if King County Road Adequacy Standards or the Clean Air Act is enforced.

(6) Either the loads need to be covered and/or reduced so that NO dirt is above the rail. Also moisture content prior to dumping needs to be controlled
Rationale: Current regulations are totally inadequate considering the pollution levels in the area and that the quantity of haul dirt that needs to be brought into the area for the Third Runway far exceeds standard practice. Even assuming the loads are covered, the moisture content of the fill needs to be closely controlled to avoid a repetition of this summer's exploding dust storms.
The Puget Sound Air Pollution Control Agency issued a Notice of Violation 29 July 1996 regarding fugitive dust at North Sea-Tac Park (ref. (b)). This is just north of the dumping under Permit PWD0115-96.

(6) Haul Contractor shall pay adequate share of road repairs
Rationale : Hauling trucks are a leading contributor to road damage. This project requires thousands of trips per day of haul trucks that will require road repairs. King County Road Adequacy Standards permit pro-rata payments but if it's not set up in advance the cities may need to sue to obtain the repair costs.

Your timely response to this request would be appreciated. Technical questions regarding this request may be directed to A. Brown of C.A.S.E.

Sincerely,

Debi DesMarais (signatures on original)
C.A.S.E. President
19900 4th Ave SW
Seattle, WA 98166
(206) 824-3120

J. Bartleymay
C.A.S.E Vice President

cc: ACC
Dept. of Transportation
Environmental Protection Agency
Federal Aviation Administration
King County Police
Port of Seattle
Puget Sound Air Pollution Control Agency

Enclosure : Petition

Haul Trucks Pollution and Traffic Controls Petition - To be Enclosed with CASE letter

Considering the **increased pollution and traffic control problems** created by Permit PWD0115-96, much more **meaningful and significant mitigation measures need to be imposed on future haul truck permits traveling in the Sea-Tac airport area.** The amount of fill Permit PWD0115-96 currently hauls to the south end of the Sea-Tac airport represents **only about 2 %** of the fill needed for the proposed Third Runway project.

signatures on file

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Acronyms

ACC	Airport Communities Coalition
CASE	Citizens Against Sea-Tac Expansion
DEIS	Draft Environmental Impact Statement
DOE	Dept. of Ecology
FEIS	Final Environmental Impact Statement
EPA	Environmental Protection Agency
HOK	1996 Burien Study funded by WA
KC	King County
LDA	Localizer directional aid technology
GAO	Government Accounting Office
GPS	Global Positioning Satellite technology
NEPA	National Environmental Policy Act
NPIAS	National Plan for Integrated Airports System
PSAPCA	Puget Sound Air Pollution Control Agency
PSRC	Puget Sound Regional Council
Port	Port of Seattle
RCAA	Regional Commission on Airport Affairs
Sea-Tac	Seattle-Tacoma International Airport
SeaTac	SeaTac, city adjacent to Sea-Tac airport
SEIS	Supplemental Environmental Impact Statement
SEPA	State Environmental Protection Act
SIP	State Implementation Plan ... Air Quality
TAF	Terminal Air Forecast
WA	State of Washington

References and Bibliography
See also Health Bibliography that follows

(a) Supplement to the State Implementation Plan for Washington State, Plan for Attaining and Maintaining National Ambient Air Quality Standards for Ozone in Central Puget Sound, January 1993, Amendments June 1994

(b) Sea-Tac Airport Master Plan Update Draft Environmental Impact Statement (DEIS), 1995

(c) Engineer's Personal Assessment of the Sea-Tac Airport Master Plan Update Draft Environmental Impact Statement (DEIS) - Proposed Third Runway, The United States' Most Expensive, Limited Capacity Runway, incorporated into FEIS response appendix.

(d) Sea-Tac Airport Master Plan Update Final Environmental Impact Statement (FEIS), 1996

(e) "State of WA Puget Sound Regional Council **Final** Noise Decision on Noise Issues", dated 27 March 1996 (bolded by author to emphasize legal title)

(f) Comments on the Draft General Conformity for the Sea-Tac Airport Runway and Associated Development Projects, A. M. Brown dated April 30 1996

(g) Technical Report #8 prepared by P&D Aviation for Port of Seattle.

(h) Testimony at the Congressional Aviation Subcommittee Hearing by nationally known economist Dr. Lynn O. Michaelis, held March 18, 1996

(i) Testimony at the Congressional Aviation Subcommittee Hearing by air transportation expert, Dr. Stephen Hockaday, held March 18, 1996

(j) Study submitted to FAA by Envirometrics, Dr. Ruby, Smith Engineering & Management, Cutler & Stanfield, dated 6 June 1996

(k) Implementation of an LDA/DME Approach to Runway 16R in lieu of a Third Runway at Sea-Tac, prepared by G. Bogan & Associates, Inc. dated 26 June 1995 (presumably submitted as comment to Draft EIS)

(l) Letter To PSRC President Doug Sutherland, From Pork Patrol, Al Furney, Chair, dated 12 June 1996 - in June 3-19,1996 PSRC correspondence package

(m) "City, State Forces Wrangle over Third Chicago Airport, Aviation Week & Space Technology, 8 April 1996

(n) GAO/RCED-95-35BR (Government Accounting Office)

(o) "Finally ! It's Here (Denver International Airport Opens), Newsweek, 6 March 1995

(p) "Denver International Airport - Economic aspects", Travel Weekly, 2 February 1995 v54, n9, p4

(q) "Montreal Airport never got quite off the ground" Times 15 April 1996 - in PSRC Correspondence package dated June 21-26,1996

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(r) Comments regarding adding the part time dependent runway to the MTP. To D. Sutherland PSRC, From A. Brown, dated 15 June 1996 - in PSRC Correspondence package 3-19 June 1996. Special Note the cover letter enclosed a copy of 25 pages of comments dated 11 June, 1996. These comments were hand delivered to the PSRC with the CASE comments on June 11,1996 so the July 19,1996v date is incorrect with respect to the pages labeled 1/25 and so on.

(s) "Comments on Public Comment Meeting June 27,1996 - Topic : Proposed Addendum to the 1995 Metropolitan Transportation Plan (MTP) to include the Third Runway", To D. Sutherland & PSRC Executive Board, From A. Brown, dated 7 July 1996 - in PSRC Correspondence package July 10-11, 1996 (enclosure 3 in this Port Appeal letter of August 1996)

(t) Expert Noise Arbitration Panel Hearing December 1994

(u) FAA Hearing June 1995

(v) PSRC Executive Boarding Meeting and Public Testimony, June 1996

(w) Letter (Supplement to FEIS Comments, "Draft conformity analysis does not support your conclusion that the project conforms to the State Implementation Plan"), To D. Ossenkop of FAA , cc Hinkel of Port, From U.S. Environmental Protection Agency, dated 6 June 1996

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Note: This is only a partial list of references. Typically, the same information appears in multiple locations. All correspondence to the FAA, Port of Seattle, PSRC, Corp. of Engineers, Dept. of Ecology, Environmental Protection Agency, Expert Noise Panel, PSAPCA, and Dept. of Transportation on current airport operations as well as the Third runway are applicable.

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Appendix B: NEPA Regulatory Issues Summary

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

CITATION OF REGULATIONS WHICH APPLY TO VIOLATIONS AND POTENTIAL VIOLATIONS OF THE ACT IN THE DOCUMENTATION PROVIDED BY THE FAA/PORT OF SEATTLE AS CO-LEAD AGENCIES IN A NEPA/SEPA PROCESS FOR THE THIRD RUNWAY DEVELOPMENT MASTER PLAN UPDATE (FEIS) AND RELATED PROJECT SASA BASE (NEPA will be italicized)

§1500.1 Purpose
Section 102(2) contains "action-forcing" provisions to make sure that federal agencies act according to the letter and spirit of the Act.

§1500.2 Policy
(b) Environmental impact statements shall be concise, clear and to the point, and shall be supported by evidence that agencies have made the necessary environmental analysis. (underlining added)

Many of the statements in the EIS were supported by phone conversations. Others were not substantiated. Although documentation was requested by myself and many others who commented on the draft EIS, no additional technical or supporting data, that I could find, was supplied in the final EIS.

(e) Use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment.

§1501.2(c) Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources as provided by section 102(2)(E) of the Act.

In 1993, a resident of Centralia presented an area of 37 to 50,000 acres of available, largely vacant land in Tenino to then King County Executive Gary Locke and the PSRC for consideration as a new airport site and this site was never pursued, evaluated or explored as an alternative to Sea-Tac expansion. At that time, there were 300 homes on the land. The Port of Seattle has publicly stated that there is a need to pursue, site and develop another airport prior to or shortly after the year 2020. Viable alternatives have not been pursued or evaluated.

Flight Plan nor the FEIS identified reasonable alternatives to the proposal. Existing technology such as LDA used at San Francisco (700') in an airport layout with less runway separation than existing Sea-Tac (800') according to expert testimony can eliminate the need for an additional bad weather landing runway 2500' from the existing west runway (16R34L) (1700' from the existing

west runway 16L34R). Future technology GPS (2001) and GDSB can eliminate bad weather landing constraints at Sea-Tac and can completely alleviate the need for a third runway.

The Port of Moses Lake has 350 VFR days per year in comparison to Sea-Tac 44% bad weather delays. Moses Lake is approved for a Foreign Trade Zone whereby cargo from the Pacific Rim and elsewhere now utilizing Sea-Tac could be alternately destined alleviating the pressure on Sea-Tac.

Port of Moses Lake is equipped to handle maintenance of aircraft. WAC 173-60-050(d) provides that maintenance facilities be located away from populated centers whenever possible. Moses Lake has over 1,000,000 sq. ft. of hangar space available to handle maintenance where Sea-Tac would have to incur a great public expense to site, build, and quiet such a facility. The proposed SASA site is near neighborhoods, businesses and a mobile home park. An extended land bridge with a tunnel would have to be built to accommodate planes moving across 188th.

I G-180 I

The NEPA (FAA)/SEPA (Port of Seattle) Final EIS for SASA contains a letter from the Department of Interior stating that no endangered species have been identified near the project (SASA) site. However, the letter also indicates that:

"Should a species become officially listed or proposed before completion of the project, the FAA will be required to reevaluate its responsibilities under the Act."

A Bald Eagle nest has been recently listed located at the northeast corner of Angle Lake, only a few city blocks away from the proposed SASA site. The FAA, according to the DOI, must now reevaluate the project and under NEPA, consider other alternatives.

Moses Lake, multiple airport use recommended by Flight Plan, technology, Tenino are all viable alternatives to the proposed action which have not thoroughly been evaluated or considered. The use of Moses Lake as a reliever airport for cargo and a maintenance base would eliminate the commitment of resources such as the loss of Des Moines Creek Basin wetlands and salmon bearing creek to name only one of many avoidable adverse environmental impacts.

ß1500.4 Reducing paperwork. Agencies shall reduce excessive paperwork by:
(a) Reducing the length of environmental impact statements (1502.2(c)), by means such as setting appropriate page limits

(b) Preparing analytic rather than encyclopedic environmental impact statements

Much of the content of the draft and final EIS consisted of repetitive narrative that might have appropriately been replaced with substantive data and credible scientific analysis.

ß1503.4(a) An agency preparing a final environmental impact statement shall assess and consider comments both individually and collectively, and shall respond by one or more of the means listed below, stating its response in the final statement. Possible responses are to:
(2) Develop and evaluate alternatives not previously given serious consideration by the agency
(3) Supplement, improve or modify its analysis
(4) Make factual corrections
(5) Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response.

The documents were confusing, maybe purposefully so, it was not clear if comments were adequately addressed and important information that was extremely difficult to find or know it was there was scattered throughout the massive document.

Considerable time and space was spent on detailed statements of purpose and need that were never substantiated. The entire purpose of the document and the project itself was based upon a bad weather delay assumption that was easily dispelled as faulty not only by consultants working for the ACC but also by the project co-lead agency, the FAA itself, reporting statistics of national delay with Sea-Tac in the nation's top ten of best on-time performers. The assumption of bad weather delay along with the premise of utilizing Sea-Tac Airport with billions of dollars worth of improvements including a third runway at the same capacity with or without the runway, with or without the delays which don't exist, should have logically dispelled the entire purpose of the runway in everyone's mind. This did not happen but should have happened.

Regarding the need for an addendum to the existing document, an SEIS or an entire new EIS, NEPA ß1502.25.(4)(c) states:
An agency shall revise the determinations made under paragraphs (a) and (b) of this section if substantial changes are made later in the proposed action, or if significant new circumstances or information arise which bear on the proposal or its impacts.

Although the PSRC rejected requests for a supplemental EIS, the FAA, under NEPA, is compelled to consider all information presented to them regarding conformity, environmental justice and any other "new" or "substantive" information that may have been provided during the comment and review period(s) warranting an SEIS.

ß1502.4(a) Proposals or parts of proposals which are related to each other closely enough to be, in effect a single course of action shall be evaluated in a single impact statement.

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This regulation should be applicable to any joint project proposal from the FAA/Port of Seattle under NEPA such as the SASA base and the current removal of soils and localizer relocation. However, I consider that many projects that have been proposed by the Port itself under SEPA as either a final EIS or a DNS are also part of the overall development plans of the Port to renovate the airport, appearing to the public as part of the Master Plan and should have been analyzed in a single document, especially considering the potential for cumulative and multiple project impacts of the following:

1) The Hotel (1994 final EIS)
2) North SeaTac Park (20+ year old EIS where significant new information is available)
3) North SeaTac Park Detention/Retention Pond Project (1995 DNS)
4) Federal Detention Center (final EIS 1992?)
6) Enplane Drives/Asbestos Project (1995 DNS)
7) RSA (1995/96 DNS 16R)
8) CTI (1995 EIS)
9) South Access (1995/96 draft EIS WSDOT)
10) 28th/24th Arterial (1993 SeaTac City EIS)
11) Phase I/Phase II International Blvd. (1994? EIS (contains erroneous air quality data and conformity analysis which should be revised based upon Master Plan FEIS data)
12) North Fuel Rack (1996 DNS)
13) Northwest Fuel Tank Remediation (?)
14) Federal Express expansion (includes relocation of employee parking lot A & B to north of SR 518. Federal Express expansion was not included in the Master Plan, but the parking facility was. However, the parking facility was dropped from development plans due to the large acreage of wetlands located at the proposed site. If Federal Express expands now, what will be the new location of the employee parking in the future?)
15) Others

§1506.1(2)(c) While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major Federal action covered by the program which may significantly affect the quality of the human environment unless such action:

(1) Is justified independently of the program:

(2) Is itself accompanied by an adequate environmental impact statement; and

(3) Will not prejudice the ultimate decision on the program. Interim action prejudices the ultimate decision on the program when it tends to determine subsequent development or limit alternatives.

Since I view the many projects listed above as part of the Master Plan or closely enough related to the overall development program, I also view the projects that have begun under designations of nonsignificance and separate EIS documents as a violation of this chapter of NEPA. However, since they have been singled out by the lead agencies as independent of the overall development they have no cumulative impact analysis and the projects which

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have a designation of nonsignificance, which might be significant if added to other past, present and future actions irregardless of significance, have not been analyzed for their adverse multiple consequences to the human/natural/built environment. Therefore, most responsible agencies and officials which have purview over significant impacts in one EIS are potentially unaware of the total and cumulative impacts of reality, not paperwork, that is occurring today at Sea-Tac Airport and environs.

§1508.25 ***Scope*** *(2) Cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement. (3) Similar actions, which when viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography. An agency may wish to analyze these actions in the same impact statement. It should do so when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single statement.*

(b) Alternatives, which include: (1) No action alternative (2) Mitigation measures (not in the proposed action). (c) Impacts, which may be; (1) Direct; (2) indirect; (3) cumulative.

It is my contention that the SR509/South Access Federal Highway Administration and WSDOT co-lead agency proposal should include the 28th/24th arterial project, the enplane drive improvements and any other connecting roadwork planned for the general area, their impacts and commitments to mitigation. These three are in the same geographical area, will coincide in timing, are roadways which will interconnect; i.e., state route, local arterial and airport drives, together in a more efficient manner, but at the same time creating the potential to significantly add traffic loads, thereby, exacerbating potential NAAQS CO violations. The cumulative effects of these projects should be analyzed together, in fact, these roadworks, in my opinion, are well suited for just this reevaluation in the spirit and intent of this particular NEPA chapter. Maybe the Port of Seattle should be responsible for this cumulative analysis since the primary purpose of generating additional vehicle carrying capacity of these roads is to accommodate airport related future automobile and cargo traffic increases. Whoever might be responsible is irrelevant, it needs to be done and according to NEPA, it should be done before approval of the two major federal actions. Once the reevaluation is complete, and should this area remain in nonattainment (maintenance) this project must then meet conformity requirements to be elligible for federal funding, approval and support, i.e., ISTEA, other federal agency funds.

§1505.2 ROD(c) State whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not. A monitoring and enforcement program shall be adopted and summarized where applicable for any mitigation.
§1505.3 Implementation: Agencies may provide for monitoring to assure that their decisions are carried out and should do so in important cases. Mitigation

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(ß1505.2(c)) and other conditions established in the environmental impact statement or during its review and committed as part of the decision shall be implemented by the lead agency or other appropriate consenting agency. The lead agency shall: (b) Condition funding of actions on mitigation. (c) Upon request, inform cooperating or commenting agencies on progress in carrying out mitigation measures which they have proposed and which were adopted by the agency making the decision. (d) Upon request, make available to the public the results of relevant monitoring.

There are problems here. 1) All real impacts have either not been identified, have not been acknowledged by the lead agency, or remain less than thoroughly evaluated, and in some cases, not at all; i.e., noise in Normandy Park and Rainier Valley has not been acknowledged even though it exists. 2) The mitigation plans, i.e., wetland mitigation, is in violation of normal federal, state and local law. 3) There are adverse impacts that **cannot** be mitigated, i.e., air quality impacts from jet aircraft takeoffs. (no technology yet exists to retrofit jet engines with scrubbers) 4) Thorough analysis of the fuel contamination of soils, groundwater and aquifers and costs for remediation have not been evaluated.

Federal requirements for certification; 49 CFR ß47101, et. seq (formerly known as the Airport and Airway Improvement Act Section 509):

"(B) only if the chief executive officer of the State in which the project will be located certifies in writing to the Secretary that there is reasonable assurance that the project will be located, designed and constructed, and operated in compliance with applicable air and water quality standards except that the Administrator of the Environmental Protection Agency shall make the certification instead of the chief executive officer if-

(i) the State has not approved any applicable State or local standards; and
(ii) the Administrator has prescribed applicable standards and

(C) if the application is found to have a significant adverse effect on natural resources, including fish and wildlife, natural, scenic, and recreation assets, water and air quality, or another factor affecting the environment, only after finding that no possible and prudent alternative to the project exists and that every reasonable step has been taken to minimize the adverse effect."

Rather than the Chief Executive Officer (Governor), Ecology conditionally certified the project and rather than sending it to the Secretary of Transportation it was sent to the Regional FAA. Besides the fact that the deferral and signator were contrary to federal law, the conditional nature of the certification is more like a mitigation plan than a compliance guarantee.

Prepared by: D. L. DesMarais, 31500 1st Ave S #14-103, Federal Way WA 98003
Permission to enclose was obtained from author. These comments should be considered as a supplement to all their comments previously submitted.
Also, in accordance information in accordance with the following chapter in NEPA: 1503.4 (5) "Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicates those circumstances which would trigger agency reappraisal or further response".

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SEIS/ Federal Register Docket No.

Henry J. Frause
411 S.W. 186th
Normandy Park, WA., 98166-3959

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1997
ANM-610___

To: Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, WA. 98033-4056

CC: RCAA; ACC; and CASE

Ref.: (1) Telecon Between Mr. Henry J. Frause and Mr.Dennis Ossenkop on March 24, 1997, RE. The Separation Of Comments Related To The FAA From Those Related To The Port.
(2) Federal Register No. 970055[1], Documented Feb. 14, 1997, p. 6969, From Mr. Ossenkop.

Subject: Telephone Confirmation; and A Response to the Supplemental Draft SEIS Including It's Final Rule Compliance.

Dear Mr. Ossenkop,

INTRODUCTION

May I , first of all, thank you sincerely for answering my questions per the Ref. (1) Telecon. I hope my ideas will support your request. I've read articles suggesting that Sea-Tac Airport is to become the pilot program for other airports. . If that idea persists, then the basic FEIS Engineering and any supplemental modifications to the basic must be submitted to the Federal Register and identified by Docket No. _____.. I know we disagreed about this procedure, but I wish to present my point of view. Having worked at Boeing as a Technical Writer and Editor for 37 year, I feel that amount of document exposure qualifies me sufficiently.

Design and Procedures Manuals are necessary requirements for any kind of manufacturing and/or construction activities. In our discussion on Monday, I asked a question about the separation of comments related to the FAA from those belonging to the PORT.. It seems to me that Engineering concepts are different from the "HOW-To" processes; consequently, comments ought to be treated separately.

CONCEPTIONAL TRANSPOSITIONS

From Public/Private to Municipal/Corporation.

I'm addressing the term Municipal/Corporation because it seems to be identifing a modus operendi that is basically changing our way of life. Mitigated transpositions submitted by Private Corporations are driven by Economic Development dollars extracted from Municipalities by eliminating overlapping duplications of Home-Rule Ordinances.

Local Government Law redefines the word PUBLIC (which originally identified people) to the word Municipality which now is a collective word that idenifies people as a homogenized group, such as, a city, town, or district. The word PRIVATE has been changed to mean Businesses, Contractors, Corporations, etc. Thus, Public/Private is now identified under the

collective noun--Municipal/Corporation. The term PUBLIC still retains its authorative arm of Constitutional Law even though it is referred to as a Municipality. There's a reason for that.

When the (PUBLIC) Municipal side of the equation is married to the Corporational side (PRIVATE) the mixture of Constitutional Law with Corporational By-Laws" becomes a concept closely resembling a conflict of interest; and, this marriage then is the underlying cause that is eroding our freedoms and rights away--(both yours and mine).

FIAT CONTROL

You may have been wondering why I was setting up a scenerio based on the concept of PUBLIC/PRIVATE. Well, the word "Partnership" was the catalist. I've been having an awful time trying to justify why a person of your caliber and background as a responsible elected Public Official (heading up the Federal Agency in the Puget Sound Area) would purger himself and become a closely associated member of a Minority Corporation.

When I proposed the idea of shuffling my comments into two separate batches, you told me that a separation was not necessary because the FAA/PORT was essentially a joint partnership, responsible for the details that will finally define the construction procedures of the Port Master Plan and all of the follow-on changes. The flaw in that procedure allows a "Final Rule" Summary to be extended indefinitely without ever reaching a conclusion. And , of course, you know that a summary is required in order to obtain a Federal Docket Number; and a Federal Docket number cannot be assigned without a Final Rule Summary accompanying the request.

You were right! The Draft SEIS Fact Sheet states that, "The FAA and the PORT are joint lead agencies for the purpose of the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS)".

From an academic point of view, the above plan would have to represent the following: Any problem related to NEPA would be processed by the FAA. Problems related to SEPA would be handled by the PORT. The equation, then, expresses the marriages shown below:

(a)	PUBLIC	PRIVATE	
(b)	NEPA (FAA)	SEPA (PORT)	Political
(c)	Municipal	Corporation	← Marriages
(d)	Laws	By-Laws	
(e)	Majority Rules	Minority Follows	

Because the DSEIS fact sheet does not provide a separate detailed Functional Procedures Manual or Document, (showing a Road Map to identify the processes linked to the Administrative Policies and Paper Activities buried in the partnership mixture of Constitutional Laws with Corporational By-Laws), it is impossible to determine which of the lead agencies is the absolute controller. If the procedure follows the equation noted above, the FAA Official control's the track all the way to the Federal Bank. If the Constitutional Law has been amended by some "exception to the rule" that was never disclosed, then I'm sure I don't have to proceed any further with the consequences of this illustration.

The FAA/PORT partnership may have altered or changed or intends to change the policies and requirements of the FAR Part 150 Rules and Regulations. If the control of any EIS inputs are assigned to the EPA, then that event establishes another marriage to the FAA/PORT

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agency, and now we enter the field of polygamy. Why do I make that statement? Because I was told, " ...that a Federal Docket No. was unnecessary because the EIS is now being controlled by the EPA". I'm sure that the Seattle Partnership does not have control to override the Federal Government's way of life without congressional action.

Another example of Justice Dillon's Municipal Partnership Decision is further replicated in the first paragraph of the subject DSEIS. Allow me to extract it from the context:...

> "This Supplemental Environmental Impact Statement (EIS) is a combined National Environmental Policy Act and Washington State Environmental Policy Act (SEPA) document."
> Doesn't this statement sound as if the word "Combined" signifies a marriage of the ACT to the DOCUMENT?

Comment: The NEPA Act is a Federal Statute; while SEPA (also a Statute) is identified as a State Document. Act over Doc is like Oranges over Lemons. A partnership at the Federal Level would be identified and expressed as FEDERAL over STATE. Any Resolution that the Port of Seattle (a Separately Constituted, Private, Immune, Municipal/Corporation) or the PSRC creates cannot override a Federal Statute, regardless of how much power was allocated and turned over to the Port by the State Legislature.

To my way of thinking, an alert Federal Official should have become cognizant of the fact that something highly irregular was occuring and should have notified his consituents immediately in order to prevent the spread of this vicious virus.

The FAA/PORT marriage has been the cause of a lot of confusion and distrust. The Political Policies ruling each side of the Designated Term PUBLIC/PRIVATE is allowing the participants an opportunity to dip into Federal Grant Monies free from any accountability. That kind of practice must stop.

I'm affraid that the disease has already converted the Port of Seattle into a Limited Monarchy costing the citizens of the Port 's ten jurisdictions a huge sum of hidden taxes. In my opinion, I feel that the Sea-Tac Airport Syndrome is actually focusing its strategies on destroying our Nation. I will not change my pledge...

"I PLEDGE ALLEGIANCE TO THE FLAG AND TO THE REPUBLIC FOR WHICH IT STANDS..." You'll never hear me recite this pledge as follows:

"I PLEDGE ALLEGIANCE TO THE PORT OF SEATTLE AND TO THE DICTATORSHIP FOR WHICH IT STANDS..." Never will I say that!

A FEW MORE COMMENTS AND ANALYSES

I wish to offer my congratulations to you for the format presentation of page1. It reflects a strong character of professionalism. Governmental and Corporational Seals are often used to reflect a high degree of authority, but my instincts informs me that such impressions

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SEIS/ Federal Register Docket No.

are sometimes employed to deflect any in-depth analysis of its content.

People will be submitting their comments concerning this SEIS who will simply ignore the first paragraph. It presents a blast of references governing the SEIS; and I know that the information presented therewith is completely over their heads; AND, even if those documents are absolutely on target, and AVAILABLE for review, respondents might not be compelled to varify the sincerity of the facts presented.

The first sentence of the second paragraph makes a statement which counteracts the intent of the partnership. The sentence reads in part that, "The Port of Seattle, operator..." How come your half of the partnership was omitted? Aren't you proud of your marriage? The courts would rule in your favor. Your activities are much stronger than the Port's. If that statement is wrong, then I request a complete detailed resume as to what is the ongoing policy!

Another item that is lacking in this Document is the Procedures governing zoning laws. There ought to be about forty or fifty pages of rhetoric devoted to the conflicting, overlapping mitigation items of Municipal territories of each of the ten cities. Also, even though Liceneses, Permits and other Approvals were mentioned in the fact sheet, I saw no remark or discussion that pointed to the fact that a permit is required before your partnership can approve its project. The permit and the Agency responsible for furnishing it must be identified. The completed runway must be Certified by the Governor--signifing that the entire project complies with the State's Laws. Lastly, the disposition and record of EIS or airworthiness projects must be addressed as a procedural policy followed by a Final Rule Summary.

I-G-184-1

Projects must be identified, traceable, and controlled at the Federal Registery Office. Regulations generated at all airports in the United States would be unable to follow a system of scattered control--especially if they were to be filed within the structure of Local Agencies in this State. Absolute accountability will be foremost to control the staggering amount of dollars that will be expended for the 3rd runway project.

I've become uneasy that the Docket No. you gave me might not be correct. I'm submitting an example of how a Docket Number I have in my possession is recorded.

Ex. reads [Docket No. 93-CE-54-AD; Amendment 39-9665; AD 96-12-22]
Your No. is EIS 970055, dated Feb.14, 1997, p. 6969. They don't look alike.

I've activated a tracer operation at the Federal Register Office to check the authenticy of this No. I would not want to submit two copies of this letter to the Chief Counsel in Wash. DC. until I'm sure. Thank you for your indulgence in reading my comments.

Yours truly,

Henry J. Frause

Henry J. Frause

1. Document 44554, specifies that Written comments must be mailed or delivered in duplicate, to the FAA Office of the Chief Counsel, ATTN: Rules Docket No._____ , 800 Independence Avenue S.W. Washington, D.C. 20591. Comments must be marked Docket No._____

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Minnie O. Brasher
Seattle, Washington 98168
846 So. 136th

March 27, 1997

ANM-610_____

Mr. Dennis Ossenkop
FAA - Northwest Mountain Region
1601 Lind Avenue SW
Renton, Washington 98005

Subject: Comments on Supplemental Draft Environmental Impact Statement for Sea-Tac Airport:

The DSEIS does not specify mitigation as a site specific project. It leaves the mitigation up to permitting agencies. This does not allow for environmental review or for cost analysis of the project.

The mitigation of Miller Creek and Des Moines Creek appear to cause far more lasting environmental damage impacts than a do nothing option. The DSEIS does not relate any consequences to the creeks for the mitigation outlined.

The DSEIS ignores the cumulated impacts of the complete Master Plan. It is impossible to review the cost benefit and the environmental impacts for the project as presented.

The DSEIS in using the Port's opted lower range figures for prediction of passengers and operations at Sea-Tac Airport instead of the higher range figures of the FAA is indicative of the EIS and SDEIS as a whole in stating the environmental impacts for this project. FAA should know best.

The environmental impacts from this project on the Highline Acquirer will be an insurmountable cost to this region. This impact alone should stop this project. This SDEIS and the FEIS did not even attempt to account for the environmental impacts to the Highline Aquifer.

Minnie O. Brasher

Minnie O. Brasher

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RCAA
Regional Commission on Airport Affairs
19900 4th Ave SW
Normandy Park, WA 98166
(206) 824-3120
FAX (206) 824-3451

March 31, 1997

Mr. Dennis Ossenkop, ANM-611
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, WA 98055-4056

Dear Mr. Ossenkop:

Enclosed please find the Regional Commission on Airport Affairs' comments on the draft Supplemental Environmental Impact Statement for the proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (Volumes I-II).

Our organization looks forward to the responses. We would appreciate receiving a complete copy of the final Supplemental Environmental Impact Statement including all responses to all submitted comments.

Sincerely,

Len Oebser
President

Encl. NASA Conference report dated December 1996
Port of Seattle letter dated 7 March 1997
Newspaper article dated 8 February 1997
Magazine article dated 3 June 1996
Final Decision on Noise Issues 27 March 1996

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PREFACE TO COMMENTS

The Regional Commission on Airport Affairs (RCAA), a Washington corporation, is a non-governmental, citizen's organization, whose mission is to achieve a long-term integrated plan for air and surface transportation to meet the competitive needs of Washington state, and to achieve immediate and permanent reduction in noise and other adverse environmental impacts from commercial aircraft in the Puget Sound Region.

RCAA is governed by its Board of Directors, with input from numerous volunteers and from endorsing and supporting organizations in Pierce and King Counties. Its work is primarily performed by its volunteers. RCAA was created to be, and is, a coordinating and 'umbrella' organization for citizen groups, institutions, organizations public and private, and individuals who support its mission statement.

Since its founding, RCAA has closely followed and actively participated, to the extent permitted, in such processes as the Port-PSRC Flight Plan study, the work of the State Air Transportation Commission, the work of the State High-Speed Rail Commission, the Expert Arbitration Panel review ordered by PSRC, and the present environmental review for the site specific third-runway proposal. Representatives of the organization have spoken and testified at numerous public hearings, have submitted their own studies and critiques, have encouraged others in similar activities. RCAA has commissioned expert studies of particular issues and has submitted those studies to appropriate official bodies involved in airport and transportation issues.

RCAA submitted extensive scoping comments at the start of the present environmental review and participated in the one occasion afforded for public input during the scoping process. RCAA's preparation and submission of the following comments on the Draft Supplemental Environmental Impact Statement for the Sea-Tac International Airport Master Plan Update is part of its ongoing concern with transportation issues and the adverse impacts of commercial aviation activities.

Introduction to comments of RCAA on the draft Supplemental EIS for Master Plan Update

A note on method: With stated exceptions, the abbreviations used in these comments are the same as those used in the draft Supplemental Environmental Impact Statement. Exceptions: 'POS' is sometimes used to mean 'Port of Seattle'; 'dSEIS" is used to refer to the draft Supplemental Environmental Impact Statement (the subject of these comments); 'fSEIS' is used to refer to the final Supplemental Environmental Impact Statement to be issued in due course.

Our comments are numbered sequentially within each of the following categories, each of which includes discussion of related mitigation issues:

1. Construction Impacts (see dSEIS sec. 5-4)
2. Air Quality (see dSEIS sec. 5-2)
3. Noise (see dSEIS sec. 5-3)
4. Wetland and Water Quality Impacts (see dSEIS sec. 5-5)
5. Social and Socio-economic Impacts (see dSEIS sec. 5-7)
6. Alternatives (see dSEIS sec. 1-3, Chap. 3)
7. Other Comments
   - (A) Planning Horizons
   - (B) Surface Traffic
   - (C) Cost
   - (D) Methodological Concerns
   - (E) Miscellaneous
8. Request for Extension of Time to Provide Additional Comments

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General Comments: We noted in our General Comments to the original draft EIS that the environmental consequences of the project are grossly understated, & that mitigation measures are utterly inadequate. Passage of time, and independent studies by disinterested experts (the Burien Impact Study team, for example), have only strengthened those conclusions.

Like its predecessors the DEIS and the FEIS, on almost every topic examined in which serious impacts on the surrounding communities are involved, the dSEIS does not meet minimum standards for accuracy, faimess, completeness, or technical competence. Major conclusions are stated as bald matters of fact, without citation to authorities. Important past & pending studies are omitted, and not even referenced. Permit applications submitted by the Port, and relevant reports and plans prepared by, or for, the Port are not mentioned. Documents are incorporated by reference under circumstances such that almost no readers could possibly become familiar with those documents (which, by the way, is a practice that we believe to be unlawful).

Concerns raised by us in our original scoping comments, and again in our comments to the DEIS, continue to be ignored. A clear example is our repeated request that projections not be expressed in terms of one absolute figure, but that ranges be presented, with analysis of probabilities. Yet throughout the dSEIS the reader finds projections expressed as single numbers when it is patently obvious that no reasonable person would stand behind such rigid projections. Issuing projections in the dSEIS without explaining their level of uncertainty is both unprofessional and misleading.

Finally, we believe it is vitally important that the Final SEIS detail the commitments which the Port/FAA has provided to local cities, communities and residents to mitigate the impacts of the options proposed in the dSEIS. The mitigation promised by the Port of Seattle associated with its 2nd Sea-Tac runway expansion was not provided as promised. The impacts of this unmitigated damage have not been forgotten in these communities. We therefore believe that, prior to proceeding with discussions of any of the alternatives described in the Draft SEIS, the Port of Seattle/FAA should enter into binding agreements with local municipalities which dictate specific terms of how the impacts of the proposed actions will be compensated, and the mechanisms and means through which these programs will be accomplished in the affected communities and cities.

RCAA COMMENTS ON DRAFT SUPPLEMENTAL IMPACT STATEMENT

PART 1: CONSTRUCTION IMPACTS

1-1. Truck Trips -- How Many? The discussion of truck trips for hauling fill material, found at p. 1-10 of the Summary, is unclear. Will the number of hauls and length of day during which loads are hauled be reduced? or not? The summary in the fSEIS should be clearer.

1-2. Truck Trips -- How Many? P. 5-4-4, first unnumbered paragraph, second sentence, refers to '109 hourly truck trips on all roads'. Compare to footnote 1, p. 5-4-1, which seems to refer to 109 trips per day. Is it contemplated that there might be as many as 109 truck trips per day or 109 truck trips per hour? (The per-hour interpretation of-these ambiguities is strengthened by the reference to 1109 one-way peak hour truck trips' in the last full paragraph at p. 5-4-7.)

1-3. Truck Trips -- How Many? A table or graph might usefully be inserted in section 5-6 (A), showing anticipated numbers of trips per day for representative dates during the 5-year fill-haul period.

1-4. Truck Trips -- How Many? A table or graph might usefully be inserted in section 5-6 (A), showing anticipated numbers of trips per hour at the same dates used in constructing the table for trips per day suggested in the immediately preceding comment.

1-5. Truck Trips -- How Many? At p. 5-4-1, do the numbers in footnote 1 refer to daily trips? If so, the note needs to state that clearly.

1-6. Truck Trips -- Is It Trucks Only? The discussion of fill-hauling in the Summary, at p. 1-10, is couched in terms of truck trips. Is it not intended to use truck-trailer combinations for fill-hauling, & is not the discussion of numbers of trips, hours of operations, number of years needed for fill-hauling, all predicated on using truck trailer combinations?

(d) What is the level of increased Cancer Risk to the population associated with the Alternatives discussed in the SEIS. Provide the study which was done to assess the increased level of cancer risks due to chemical and air pollution impacts from Sea-Tac airport.

2-3. Air Quality -- Health consequences. We note that there is no discussion in the Air Quality section of the SEIS of the health consequences of aerial fuel dumping associated with Sea-Tac operations. It is well known that such dumping is a common phenomenon, especially over Beacon Hill and Rainier Valley in Seattle. The SEIS admits fuel dumping events occur from aircraft operating at Sea-Tac. The March 1, 1997 edition of the *Highline News* reports that the FAA recorded an incident of fuel dumping which occurred on July 8, 1996.

(a) Do the preparers disagree with the foregoing statements, & if so, in what particulars & on what factual basis (citing available documentation)?

(b) What is the projected amount of future fuel dumping associated with Sea-Tac operations?

(c) What are the anticipated health consequences from future fuel dumping associated with Sea-Tac operations?

(d) What literature has been reviewed in this regard?

(e) What (alternative) mitigation measures are proposed?

2-4. Air Quality -- Will Aircraft Emissions Increase throughout the Planning Period? It appears from the last sentence of sec. 5-2 1 (p.5-2-2), and from Exhibit 5-2-3, p. 5-2-4, that the preparers of the dSEIS expect aircraft emissions of carbon monoxide, ozone, and hydrocarbons to increase every year to the year 2010, even though emissions of these substances from all sources in the so-called Region will decrease. Is this a correct understanding? If not, what is being forecast in this regard?

1-7. Noise from Fill-Hauling. The Summary (p. 1-10) is silent as to any noise impacts from the fill-hauling operations. Surely some noise impacts are expected? The fSEIS should discuss this matter in the Summary.

1-8. Truck Trip Scheduling. Why will the fill-haul work peak at any particular year, and why the year 2000? (See sec. 5-4 (A), p. 5-4-2, second numbered item under first bullet point.)

1-9. Tables Need Work. The table numbering in section 5-4 needs to be changed in the fSEIS, to include numbering of the unnumbered table now appearing on p. 5-4-3, which should be Table 5-4-1, & then renumbering all further tables in the order in which they appear. It is confusing, & inappropriate, to have Tables 5-4-6 & 5-4-7 appear before Table 5-4-1, especially when no page numbers are provided when the tables are discussed in the text.

1-10. Construction Noise Impacts -- Need for Mapping. The noise subsection, 5-4 (D), of the Construction Impacts section, does not present a comprehensible picture of the noise impacts to be received by properties adjacent and near to truck routes, nor does it present a comprehensible picture of the present and projected land uses along the haul routes. The fSEIS should present clear, detailed, and understandable maps, with 60 and 65 LDN noise contours -- existing and projected -- for each haul route. The present discussion does not permit policy-makers or citizens to reach any intelligent decisions on possible measures to mitigate noise by route selection or alteration, by restraints on hours of use, or otherwise, for one cannot tell what noise will be received by whom, when or where.

1-11. Other Construction Impacts -- Need for Mapping. Other construction impacts, such as general traffic congestion, dust (see subsection (E)), ground vibration, and restricted access to and from private property, should also be displayed in map format in the fSEIS. It would be best if the same base maps were used for all presentations of impacts, to facilitate comparability and assessment of cumulative impacts.

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1-12. Combined Construction Impacts -- Better Identification of Impacted Areas. The mapping suggested in the two immediately preceding comments would perhaps serve as a useful way in which to identify more clearly those locations that might experience excessive detrimental impacts. The present text discussion at subsection (F) would be much more useful with accurate mapping, and with text discussion that could develop from study of such maps.

1-13. Construction Noise Impact -- Truck Noise Combined with Aircraft Noise. Is it accurate to assume, as does the first bullet point, p. 5-4-14, that there is no impact from truck noise if there is pre-existent aircraft noise? Isn't noise cumulative?

1-14. Construction Noise Impact -- Night-time noise & traffic.
(a) Apparently it is planned to run the fill-hauling vehicles well into the evening hours, and again early in the morning. We suggest that this will not do; further thought needs to be given to restricting the hours for major hauling work that would impact residential & health-care properties.

(b) The fSEIS should present clear schedules, including proposed daily hours of operation, for the fill-hauling activity on the various routes under consideration, to permit all concerned to understand the full impacts of this massive activity.

1-15. Construction Noise Impact -- Air Quality. The proposed, soon-to-be-adopted US EPA standard for airborne particulate matter between 2 and 10 microns in diameter should be addressed in subsection 5-4 (7).

1-16. Construction Impacts -- Lack of Quantification in Discussion of Social Impacts. All of the discussion in subsection 5-4 (F) should quantified.

1-17. Construction Impacts -- Mitigation measures inadequate. As to subsection (J), p. 5-4-19, we suggest that acquisition of some properties will not mitigate impacts on other properties, and a complete mitigation program needs to be developed in cooperation with the relevant municipalities, neighborhood & local-business groups, schools, and residents and other occupants.

PART 2: AIR QUALITY

2-1. Air Quality -- Health Consequences. The dSEIS is silent as to air and water pollution by particulate matter emitted from aircraft operations related to Sea-Tac.

(a) How much, and what types of, particulate matter is expected to be emitted as the result of aircraft operations related to Sea-Tac, at each measuring date (including year 2020)?

(b) What literature has been reviewed in this regard? Cite it.

(c) What are the anticipated health consequences from such pollution?

(d) The dSEIS is silent as to the proposed change by the US EPA of its standards for particulate matter, which, as the preparers of the dSEIS surely know, will bring particulate matter in the size range of 2.5 microns within EPA's standards. What will the consequences be for Sea-Tac airport and its environs when the new PM standard comes into effect?

(e) The dSEIS is silent as to the proposed change by the USEPA of its standards for ozone, which, as the preparers of the dSEIS surely know, will tighten the ozone standards considerably. What will the consequences be for Sea-Tac and its environs when the new ozone standard comes into effect?

2-2. Air Quality -- Health Consequences. We note that there is not a word in the Air Quality section of the dSEIS about the health consequences of the air pollution to be anticipated from Sea-Tac operations in the future.

(a) What are the anticipated health consequences from Sea-Tac pollution (including exhaust from aircraft using the facility)?

b) What literature has been reviewed in this regard? Cite it.

(c) What are the (alternative) mitigation measures proposed?

2-5. Air Quality -- Chief Executive's certificate. See sec. 5-2 7, p. 5-2-12.

(a) Does the statute (49 USC 47106(c)(1)(B) provide, as this section implies, that the chief executive officer of a State may delegate his or her authority to make the statutory certificate? If so, cite and quote the exact language.

(b) Did the letter of 20 December 1996 referred to p. 5-2-12 state that the director of the Department of Ecology was acting for the Governor (Washington's chief executive officer), under the provisions of the above-cited Federal statute. Quote the exact language.

(c) What state-law authority permits the Governor to delegate authority under the cited Federal statute? Cite and quote.

2-6. Air Quality -- Projections. Other commenters have advised us that the figures for NOx emissions in the DEIS, FEIS, and dSEIS seem to bear no clear relationship to the numbers of operations projected, the known emission characteristics of the fleet mix, or other relevant factors. It seems that despite ever-increasing levels of operations in fact and projected in the future, NOx emissions do not rise proportionately. Comment and explain. Kindly set out the various NOx predictions put forward at various stages of this environmental-review process (preferably in tabular or graphic form), and explain the assumptions underlying the various projects.

2-7. Air Quality -- Particulate Emissions. Are particulate emissions from Sea-Tac aircraft operations considered in the discussion of air-quality issues associated with third-runway construction, or, have those emissions been removed from the relevant models?

2-8. Air Quality – Conformity provisions. We do not believe that the project will be in compliance with the general conformity provisions of the Clean Air Act for the following four reasons:

1. The project *de minimus* levels would be violated if proper input had been used in the modeling of impacts.

2. The SEIS indicates several locations where pollutant concentrations will exceed the National Ambient Air Quality Standards for NO2, CO and PM10.

3. The intent of the SIP is to reduce emissions and achieve attainment and maintenance of the standards. This project increases emissions of CO and ozone precursors without any control measures to reduce airport related emissions which could jeopardize the maintenance status of the area. The potential for a new violation of the PM10 standard from construction activities and exceedances of the new ozone and PM2.5 standard would also violate the Clean Air Act and general conformity regulations.

4. All predicted exceedances of the federal standards are within areas of public access and represent ambient locations and therefore, must be mitigated.

The fSEIS should discuss compliance with conformity regulations and mitigation.

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PART 3: NOISE

3-1. Is the Port Serious About Noise and Noise Mitigation?

(a) On page 5-3-2 the dSEIS states: "On the basis of scientific surveys and analysis, the FAA has established 65 DNL as the critical level for the determination of noise impacts." Authorities cited in support of this claim are "Federal Aviation Administration Part 150 and the Federal Interagency Committee on Noise" (FICON). The FICON document referred to fails to establish or cite authorities establishing 65 DNL as the threshold for health effects caused due to noise.(p.2-4). 14 CFR part 150 contains no provisions establishing noise levels of 65 DNL as a threshold for determining health effects caused due to noise. The Noise Expert Panel's Final Decision similarly challenges the dSEIS's bald assertion that 65 dB DNL is the threshold for determining impacts on populations exposed to noise. In their Final Decision on Noise Issues" issued March 27, 1996 the Panel wrote: "The Port cites the 1992 FICON Report . . . since that FICON Report was issued, a considerable body of medical literature has been developed, documenting the adverse effects of exposure to noise levels in the 65 to 75 dB range, including psychological distress, loss of concentration and reading comprehension, and other physiological effects." (p.20) The fSEIS should cite the "scientific surveys and analysis" which the dSEIS purports establish 65 dB DNL as the critical level for determination of populations affected by noise?

(b) In our DEIS comments (COMMENT IV-1-7) we asked for a comprehensive search of the scientific literature which cited all references, documentation, and the scientific basis explaining the DNL 65 establishes the threshold of impacts. No response was provided. We repeat our earlier comment and request a response in the fSEIS.

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As we noted in our earlier comments, in a recent rulemaking, [1] the FAA apparently endorsed the EPA's position that it should "modify the definition of (the noise study area) so as to eliminate the perception that the area within the DNL 65 dB contour is the sole area to be considered for noise impacts, while retaining the flexibility of extending beyond the DNL 65 dB contour."

(c) Additionally, we provided in our earlier comments on the Draft EIS a copy of the results of a search of scientific, medical and technical literature on the health effects of airport noise. The results of this literature search turned up over 400 separate citations of publications of potential interest to investigators studying this issue. Since our search additional information has come to light. We request that the fSEIS review our previous DEIS comments as well as recent literature concerning aircraft noise and request that it cite all references, documentation, and the scientific basis explaining its assertion that DNL 65 establishes the threshold of aircraft noise impacts.

(d) How much of its own money does the Port of Seattle (POS) plan to spend for noise mitigation? It seems from p.1-14 that the insulation programs are restricted to activates financed by FAA per Part 150 studies. Please do not include funds received from other governmental bodies in the response.

(e) For what noise-mitigation activities will the Port of Seattle's (POS) own money be spent (if any of the Port's money will be so spent)?

(f) What is the timetable for implementation of the noise insulation program. Include a table showing the amounts in dollars which will be allocated year by year for noise remedy programs through the year 2020.

(g) Include a copy of the interlocal agreements signed by local cities, including Burien, Des Moines, Federal Way, Tukwila, Normandy Park, and SeaTac and local school districts, including the Highline School District, which contain funding commitments for noise programs, which will be executed prior to authorization of the 3rd runway.

[1] Letter from Richard E. Sanderson, Director, Office of Federal Activities, U.S. Environmental Protection Agency to Office of the Chief Counsel, Federal Aviation Administration (Jan. 1, 1989)

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3-2. More Maps Needed. SEL contour maps should be prepared & included in the fSEIS, comparable to the 65 DNL maps (Exhibits 5-3-1 *& seq.*) depicting the 100 dB, 90 dB, and 80 dB SEL noise contours for existing conditions as well as all proposed options

3-3. Estimated Population Impacted by Noise.

(a) The assertion in 5-6 1 (B), and in the associated tables (Tables 5-6-1 through 5-6-3), that with increased airside activity under the preferred alternative (100,000 operations per annum, is it not?) there will only be another 1280 people adversely affected (*i.e.*, within 65 LDN contours). This assertion is not supported by factual studies or comprehensible explanations. Please provide both.

(b) If activity increases of 20 or 25 percent don't budge the 65 LDN contour by more than a minor fluctuation (probably within the margin of observational error), the logical conclusion is that the LDN metric is structured and computed in such a way as to suppress recognition of actual noise impacts. If that is a wrong explanation, provide the correct one, if there is one.

3-4. Latest INM Noise-Modeling Program Should Have Been Used. The DNL noise contours were developed on the basis of the FAA's INM Version 4.11 noise modeling program. This version of the INM does not represent the best available methodology for modeling noise impacts. Version 5.0 of the INM program has been available for years. Version 5.1 of the INM was released prior to the announcement that a dSEIS would be issued.

We find it appalling that the noise analysis for a proposed project whose cost and impacts amount to over $7 billion dollars, is being assessed by a consultant paid nearly $5 million dollars, apparenlty too cheap to purchase the latest revision of the INM noise modeling program, costing some $250 dollars. Because the following comments reveal that the noise analysis in the dSEIS is fatally contaminated with faulty assumptions and will need to be redone, the revised analysis in the fSEIS should utilize the current version of the INM. We note that the latest version of the INM (5.1) is capable of directly using INM version 4.11 files, and files from earlier INM versions can be used with minor changes.

3-5. Modeling Assumptions Should Have Been Stated.

(a) The dSEIS failed to include the modeling assumptions used in producing the noise contour maps in the noise analysis. The Port/FAA have been previously criticized for failing to produce the data assumptions used to produce noise exposure maps. In their "Final Decision on Noise Issues" issued March 27, 1996 the-PSRC Expert Panel wrote: "despite the Panel's specific request, the Port failed to supply detailed information on the assumptions and adjustments it used when it applied the INM to compute changes in (i) DNL contours and (ii) the population adversely affected by noise . . . ". [p.15] The following data assumptions used in generating the INM noise contours and analysis are examples of what should have been included in the dSEIS and should be provided in the fSEIS:

1. The definition of the approach and departure flight tracks.
2. Verification of the selected flight tracks with actual operation conditions,
   correlation with radar data, etc.
3. Assignment of flight track segments
4. Identification of Aircraft types
5. Maximum gross takeoff weight
6. Maximum gross landing weight

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7. Static thrust, and operational thrust levels
8. Noise curve selected for specific aircraft types
9. Flight profile of each aircraft modeled
10. Identification FAA approval for non-standard (including NDAP) INM profiles use in model
11. Annual number of operations of each particular type of aircraft.
12. The type of engine associated with each type of aircraft modeled.
13. Data assumptions used for modeling taxiway noise
14. Data assumptions used for modeling run-up noise
15. Source data used to estimate affected populations
16. Source data for base map including topographical data

(b) We note that the absence of the modeling assumptions makes it impossible for the reader to analyze the reliability of the resultant noise analysis. We noted this in our scoping comments, and repeated this requirement later in our comments on the draft EIS, that inclusion of the data assumptions associated with analyses contained in the EIS documents was a mandatory requirement to enable the public to make informed comments. This information was not provided in the final EIS and again has not been included in this document. Please provide it in the FSEIS.

(c) Our ability to make informed comments on the noise analysis in the dSEIS has been further impaired by our inability to obtain the information from the author of the SEIS through request made under Washington State's Open Public Records Act. Attached as an Exhibit to these Comments is a copy of a letter dated 7 March 1997 from Port of Seattle Planning Program Manager Diane Summerhays, stating the information which provides the basis for the modeling assumptions in the dSEIS NEMs is not available from the Port of Seattle, a preposterous assumption since the SEIS is a joint Port of Seattle/FAA publication.

3-6. NEM for 1996 Should Be Included. A noise exposure map (NEM) for the year 1996 rather than 1994 should have been included in the fSEIS to allow a comparison between most recent noise exposure conditions as compared to the noise exposure predictions made for the years 2000, 2005, and 2010, &c. The total number of aviation operations in 1996 (395,000) exceeded the year 1994 operations (345,052) by 44,957 operations. We note that the 1996 noise exposure map produced during the recent Part 150 Update assumed predicted rather than actual number of flight operations, &c, for 1996 and therefore would not suit as a reliable reference. A noise contour map showing actual noise exposure conditions at Sea-Tac for 1996 is required to made a reliable comparison. Please provide it in response to this comment.

3-7. NEM's Depicting Seasonal Variations of Air Traffic Should Have Been Provided in the dSEIS The INM User's Guide states "*It may be useful or necessary to perform supplemental analysis for different times of the year or other time periods. For Example, a supplemental analysis may be necessary for the spring season as comparad with fall and winter, if significant changes in fleet mix, flight operations, or flight tracks are anticipated.*" (INM Version 5.1 User's Guide, p.2-2) Sea-Tac airport experiences significant shifts in flight operations and flight tracks through the year. The 1991 Part 150 Update reported that in 1990, Sea-Tac airport was in South flow conditions 69% of the year and in North flow conditions 31% of the year. (p.24) During the Months of January through June and October through December SeaTac airport was in South flow conditions 76% of the time. During the months of October and November Sea-Tac was in South flow over 92% of the time. NEM's depicting seasonal noise exposure should have been developed in the dSEIS and should be included in the fSEIS. Please provide them in response to this comment.

3-8. 65 dB Noise Level Mischaracterized. On p. C-3-8, the dSEIS states that 65 dB is a relatively low environmental noise level". In their "Final Decision on Noise Issues" issued March 27,1996 the Noise Expert Panel found "a considerable body of medical literature has been developed, documenting the adverse effects of exposure to noise levels in the 65 to 75 dB range, including psychological distress, loss of concentration and reading comprehension, and other physiological effects." Panel Order, p. 20. Cite the authority for the assertion in the dSEIS or remove it from the final SEIS.

3-9. Correlation of Noise Exposure Map Contours with Port Remote Noise Monitoring System Data. The Port of Seattle maintains 11 separate remote noise monitoring system (RMS) stations in areas surrounding Sea-Tac airport. These stations measure DNL (Day-Night average noise level) as well as time above (TA) noise metrics, single event level (SEL) as well as other metrics. Remote NMS data recorded for the year 1996 should have been presented in the dSEIS and correlated to the 1996 NEM for the base year study. The compared noise levels should include the DNL, and time above (TA) as well as the single event level (SEL) metrics recorded at each of the eleven (11) RMS stations. A table should be included comparing the respective DNL, TA and SEL metrics from the RMS system with the level predicted in the INM model.

An error analysis showing the statistical correlation between the predicted INM contours and the noise measurements recorded through the Port's Remote RMS should also have been included in fSEIS noise analysis. Provide this comparison and analysis in the fSEIS.

3-10. The INM Predictions of SEL are Invalid. The INM was not designed for single-noise event prediction., but rather for estimating long-term average input data. The FAA's INM User's guide states that comparisons between measured data and INM calculations must be considered when modeling SEL noise levels with the INM. (Integrated Noise Model (INM) Version 5.1 User's Guide, p.2-3) The dSEIS contains no comparison between actual actually measured SEL noise levels and SEL noise levels predicted using the INM noise modeling program for the base year. The fSEIS should provide this and an alternate methodology for predicting single event noise impacts for future years and include contour maps depicting future year SEL noise conditions.

3-11. Questionable INM Input Assumptions Concerning Utilization of Runway

(a) The flight track for jet departures in Table C-3-16 indicates that the utilization of runway 16X for departures of heavy aircraft (exceeding 300,000 lbs.) under north flow conditions is estimated to be 1% for each of three (3) departure flights tracks (HT11, HT17, and HT33) and that the noise impacts of the third runway are based on the assumption that it would be utilized by operating departing flights along only one flight track which would constitute only 13% of the airports operations. Please reconcile the proposed utilization of these runways with the cost-benefit analysis which should also be provided in the fSEIS. Indicate in the comments the section number where the cost-benefit analysis assuming this runway utilization can be found.

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(b) Under south flow conditions the dSEIS assumes use for runway 16X (third runway under north flow conditions) is 1% for each of three new flight tracks under both day-time and night-time operations. The utilization of the third runway under south flow conditions is 13% for one individual flight track under south flow conditions. Please reconcile the proposed utilization of these runways with the cost-benefit analysis which should also be provided in the fSEIS. Indicate in the comment the section number. where the cost-benefit analysis assuming this runway utilization can be found.

(c) The allocation of usage of the third runway under south flow conditions shows one flight track (TOI) accommodating 2% of the operations of the 3rd runway of heavy aircraft (exceeding 300,000 lbs.) along only one flight track whose operations would 3% of the airports operations. Table C-3-16 makes similar presumptions for other aircraft types. Evaluation of noise impacts for jet aircraft weights less than 300,000 lbs. are based upon the assumption that the third runway would be utilized by aircraft operating with use of three separate flight tracks (JTII, JT15, and JT 33), each of which would utilize only 1% of Sea-Tac Airport's flight operations. Under south flow conditions the dSEIS bases its noise prediction on the assumption the third runway would be utilized by jet aircraft (weighing less than 300,000 lbs.) operating with use of one flight track, whose operations would constitute only 2% of Sea-Tac Airport's operations. The noise analysis for the new runway for the year 2010 also estimates that the noise impacts based on the assumption that the third runway would be used by propeller aircraft less than 1% of the time along three flight tracks under north flow conditions (PT11, PT13, and PT 15), while the noise assessment is based on projections that aircraft operations of approximately 2% of Sea-Tac's operations would occur under south flow conditions. Please reconcile the proposed utilization of these runways with the cost-benefit analysis provided in the fSEIS. Indicate in the FEIS comments the section where the cost-benefit analysis assuming this runway utilization can be found.

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3-12 Prefatory note on sections 3-13 - 3-25. Specific concerns about the assumptions being made in the INM which have not yet been reported for public review and comment, and are requested to be provided in the fSEIS are as follows:

3-13. Estimates of Affected Population. During the Puget Sound Regional Council's Expert Panel Hearings last year Dr. Sanford Fidell noted that "adjustments on the order of 2 dB made by the Port to reconcile differences between measured and predicted SEL values "could easily lead to errors as great as thousands of people in estimates of populations exposed to similar noise levels in different time periods." (Testimony Presented by Dr. Sanford Fidell to the Expert Arbitration Panel on Noise and Demand/System Management on Phase II Noise Issues, p.2).

(a) Provide documentation from U.S. Census Bureau records including the census tract information used to estimate the total population affected by noise levels of 55 dB, 60 dB, 65 dB, 70 dB, and 75 dB DNL.

(b) Provide a description of the analysis used to predict the impacted population in various noise exposure zones (55-60 dB, 60-65 dB, 65-70 dB, 70-75 dB, 75+ dB, &c.) in the fSEIS. Include the analysis used to determine the margin of error of the estimation of the impacted populations with confidence intervals and sensitivity tests to support the statistical reliability of the dSEIS data.

3-14. Ground Noise. Previous Sea-Tac noise exposure maps (NEMs) have not included the impacts of ground noise from Sea-Tac airport. Recent versions of the INM (Versions 3.9 and later) are capable of integrating runup noise and taxiway noise into the NEMs. Aircraft runup noise and taxiway noise parameters were not included in the input files used to generate the Year 1990 and 1996 noise exposure maps (NEMs) produced in Sea-Tac's last (1991) Part 150 Update. The 1991 study did find that DNL noise levels at remote monitoring stations RMS 5 (S.171st & 10th Avenue S.) and RMS 10 (S.192nd & 11th Avenue S.) located immediately West of Sea-Tac read higher than predicted by the 1990 NEM by 3.1 and 1.7 decibels, respectively.

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A professional engineer conducted an independent study which measured Sea-Tac's 65 dB DNL noise contour as far as 4,000 feet west of the location shown on the Port's 1990 NEM.(Sea-Tac Noise Study prepared for RCAA by Errol Nelson PE, January 1993 previous submitted by the RCAA). The SEIS should publish the data assumptions used to model runup noise and taxiway noise in the INM noise exposure maps published in the fSEIS.

3-15. Assumptions about Future Noise Levels Erroneous. Section 6 (p. 5-3-7) makes two absurd assumptions. First, that "Future impacts will be less than the current noise exposure regardless of which Master Plan Update alternative is pursued", and second, "The 'With Project' alternatives would result in slightly greater noise exposure in comparison to the Do-nothing Alternative. Justify these assumptions or correct them.

3-16. Noise Barriers. Strategies to reduce noise impacts on surrounding communities utilizing noise barriers should be considered in the fSEIS. We note the FAA recently approved plans for the construction of a noise berm on the western edge of airport property in Paine Field's Part 150 Master Plan and Noise Study Update issued October 1996. The noise berm is being provided to "protect residences just west of Paine Field Boulevard from experiencing higher aircraft noise than they presently experience. Similarly, the construction of a noise berm on the West side of Sea-Tac Airport would shield residents in the West area of the City of SeaTac, and residents of Burien and Normandy Park from harmful and annoying noise caused by runups, takeoffs, and landings. Indicate what written financial commitments the Port of Seattle has made in conjunction with the construction of noise berms for attenuation of aircraft noise from Sea-Tac airport. Include documentation evidencing the Port's financial commitment in the final SEIS. Provide maps showing proposed berms. Provide drawings showing typical berm construction, as planned.

3.17. Levels of Annual Operations Used in Future-Year NEMS. Total number of operations projected for future-year periods are problematic in the dSEIS. Currently, there exist at least a dozen projections of air traffic activity at Sea-Tac for the year 2000. Forecasts of the total number of Sea-Tac airport air carrier operations in the year 2000 have ranged from 260,810 operations per year to 452,800 operations per year, a variation of 191,990 operation per year. The latest Terminal Area Forecast for Sea-Tac airport developed by the Federal Aviation Administration should be utilized in developing the future-year noise exposure maps in the SEIS.

3-18. Verify Aircraft Flight Profiles Used in the INM. A 1981 FAA study ("A Comparison of FAA Integrated Noise Model Flight Profiles with Profiles Observed at Seattle-Tacoma Airport", George W. Flathers, December 1981, Report No. FAA-EE82-10) determined that aircraft flight profiles at Sea-Tac were not consistent with the profiles used in the current version of the INM noise modeling program. This study noted that the departure profiles used in the INM "were constructed under the assumption that, for all aircraft types, airlines employed the FAA noise abatement departure profile as outlined in AC 91-53. However, the observed data for the low-bypass-ratio engined aircraft in the study (DC-9, B-737, B-727) suggested that for these three types of aircraft, this may not be the case."

The 1991 Part 150 study assumed that Stage 2 aircraft followed the FAA's suggested Noise Abatement Departure Profile (AC 91-53) which calls for thrust reduction after takeoff upon reaching 1000 feet elevation. (Noise Exposure Map Update: 1991 prepared by the Port of Seattle April 1992, p.54) However, no substantiation that these procedures were being followed by the airlines serving Sea-Tac was provided in the update.

We further note that the FAA now requires approval of Noise Abatement Departure Profiles (NADP) in the INM model. The INM User's Guide specifically states: "INM 5.1 does not contain pre-approved NADP's . . .". (p.2-2) No documentation was provided in the dSEIS indicating the FAA has approved NADP flight profiles for use in the INM.

Evidence including tower orders, adoption of standard or NADP operations for departures by the scheduled air carriers, radar data, etc. should be provided to corroborate that operational assumptions used to predict noise exposure in the NEMs are actually being followed by aircraft at Sea-Tac. The fSEIS should contain this documentation. Additionally, publish NEM's which show alternative noise contours assuming (1) the use of NADP in the INM model and (2) assuming standard departure procedures. Publish documentation provided by FAA approving the use of NADP flight profiles in the NEMs.

3-19. Verify Fleet Mix Assumptions. Careful consideration must also be given to the parameters used in the INM noise model used to estimate fleet mix. The 1996 NEM produced in the recent Sea-Tac Airport Part 150 update assumed Stage 2 aircraft operations constituted 14.73% of Sea-Tac's total flight operations. According to the Port of Seattle's Noise Abatement office the percentage of Stage 2 jet operations during 1996 exceeded this level. The fSEIS should provide the assumptions underlying its predictions of future aircraft fleet mixes.

3-20. Verify Aircraft / Engine Types Used in the INM. Careful verification of aircraft types and engine models selected for use in the model should be made by the consultant. The INM noise modeling program allows the user to select a noise curve for each type used in the INM to match a specific aircraft/engine configuration. Noise levels produced by the same type of aircraft vary considerably depending on engine type. For example, a model 737-300 equipped with JT8D-15QN engine is 5.6 dB louder on takeoff than the same model aircraft equipped with JT8D-7QN engines (Estimated Airplane Noise Levels in A-Weighted Decibels, AC No. 36-3F published by FAA, August 10, 1990, p.23).

Noise levels on departure vary by as much as 10.2 dB comparing a Stage 2 727 outfitted with JT8D-17RQN engines compared to a 727 equipped with model JT8D9FCD engines. Accumulation and propagation of error through the INM noise model should be limited by verification of aircraft type and engine parameters. The fSEIS should provide .documentation that verifies that the engine configuration assumed comports with the specific aircraft type designating in the INM used in generating noise exposure maps for Sea-Tac.

3.21. Verify Statistical Reliability of INM Data. During their recent (1996) investigation into the Port of Seattle's Noise Exposure Maps (NEMS) the Expert Arbitration Panel requested that the Port (i) present information on confidence intervals to support the statistical reliability of its data, (ii) provide documentation of the assumptions and adjustments it made when developing the INM contours, (iii) show the assumptions used for estimating impacted populations, and (iv) produce sensitivity tests to evaluate the effects of these assumptions. The Port did not comply with these requests (p.14). The above information is similarly missing in the analysis in the dSEIS. Provide this analysis in the fSEIS.

3.22. Include Noise Contributions from Other Area Airports in NEM's. The Noise Exposure Maps should integrate the noise level contribution from other area airports, particularly Boeing Field, located approximately six (6) miles north of Sea-Tac. The DNL values of noise generated from Sea-Tac should be added to the DNL noise levels produced from Boeing Field to produce and accurate and realistic assessment of the combined noise impacts of these two airports upon the citizens in the south Seattle, south King County areas. (See p. 6-3 of INM User's Guide.)

3.23. Base Map. Version 5.1 of the INM is capable of generating noise contours on U.S Coast and Geodetic Survey (U.S.G.S.) maps which model the topographical feature of land surrounding the airport facility being modeled. The fSEIS should present NEMs that incorporate the topographical features of U.S.G.S. maps into the noise model and calculate DNL, TA, and other metrics each of the locations modeled.

3-24. Noise Abatement Departure Profile. The Noise Expert Panel also recommended that the Port/FAA evaluate the utilization of noise abatement departure corridors to minimize aircraft noise impacts and "*Evaluate, with FAA and community input, the potential net benefits of a noise abatement departure profile employing a steeper angle of climb, coupled with an expanded residential acquisition and insulation program if, as a result of a steeper departure profile, the 75 dB DNL contour expands in the immediate vicinity of the airport while areas farther out receive benefits.*"

Provide an analysis of the effects on noise exposure of the population in the 60 dB DNL and above noise affected population through adoption of noise abatement departure profile employing a steeper angle of climb. Include revised noise contour maps for the future year *2000, 2010,* and 2020 showing the locations of the 60 dB, 65 dB, 70 dB, and 75 dB DNL as well as the 70 dB, 80 dB, and 90 dB SEL noise contours surrounding Sea-Tac airport based upon the level of operations projected in the SEIS using the noise abatement departure profiles recommended by the Noise Expert Panel.

3-25. Preferential Runway for Noise Abatement. The Noise Expert Panel also recommended that the Port/FAA evaluate the utilization of a preferential runway during periods of low activity:

e. Evaluate, with FAA and community input, the potential net benefits of preferential runway use during "low activity" periods (would more use of the east runway, for example, result in reduced overall population noise exposure?) --coupled with an expanded residential insulation and acquisition program, as needed.

Include in the SEIS an analysis of the potential changes in noise impacts which would result through the preferential use of runways during low activity period to achieve a reduction in noise impacts.

3.26. Part 161. Recent policy shifts by the FAA have indicated increased flexibility by the FAA in implementing enhanced noise reduction programs at airports adopting enhanced noise restrictions under Part 161 regulations. Recently in connection with its approval of a Part 150 Noise Compatibility Program for Pease International Airport in New Hampshire, the FAA approved funding for a Part 161 study as an element of the airport's Part 150 program (Airport Noise Report, April 15, 1996). Citizens and local municipalities surrounding Sea-Tac airport have suggested that the Port of Seattle engage in a Part 161 study in conjunction with a Part 150 Update Study currently underway at Sea-Tac. (See also ACC testimony before Noise Expert Panel dated Feb. 16, 1996.)

In November 1995 the King County Council adopted Resolution No. 9709 which funded a Part 161 program to establish current and future noise restrictions at Boeing Field. The final SEIS should comment on the impact future Part 150 and Part 161 programs will have upon future development at Sea-Tac Airport.

3-27. Social Surveys. In its Final Decision on Noise Issues issued March 26, 1996 the Expert Panel recommended that social surveys be utilized to evaluate community attitudes concerning the impacts of airport noise upon citizens. The Panel recommended "*That the Port and the organizations representing the affected communities jointly sponsor social surveys at regular intervals to assess the effectiveness of future noise abatement and mitigation measures in terms of perceived noise impacts.*

We concur with the view expressed by the Port's noise consultants in the 1993 AIRTRAC Final Report (p. 3-33): 'The way to avoid incorrect predictions of community response to a ... [noise reduction] action is to ask the community directly how it feels about a particular airport action,and the proposed mitigation program connected to it." Explain why the Port/FAA have not conducted the social surveys recommended by the Expert Panel as part of its review of environmental and social impacts.

- G-198 -

3-28. School Sound Insulation. The Expert Panel recommended:

"That, with respect to the Noise Remedy Program, the Port take the following actions:

a. Begin a rapid, full-scale program of school insulation as soon as the impasse with the Highline School District is resolved, with the maximum feasible commitment of re-sources and the earliest possible completion schedule."

Include a copy of the written financial commitment the Port of Seattle has made in conjunction with the insulation of schools in the Highline School District.

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3-29. Public Buildings Sound Insulation. The Expert Panel recommended:

"That, with respect to the Noise Remedy Program, the Port take the following actions:

b. Complete the "sensitive-use" public buildings insulation pilot studies and fund the full program envisioned in the Noise Mediation Agreement, as well as a program for insulation of multi-family dwellings, with an aggressive schedule to allow completion as soon as possible. The Port Commission is on record as committed to these programs."

Indicate what written financial commitments the Port of Seattle has made in conjunction with the insulation of public buildings. Include in the fSEIS documentation evidencing the Port's financial commitment.

3-30. Expand Residential Acquisition Program. It is significant to point out that the boundaries of the Port of Seattle's present noise remedy program still remain based upon the Port of Seattle's earlier **1982** estimate that only 260,810 operation per year would occur at Sea-Tac in the year 2000. The annual operations at Sea-Tac currently outstrip the year 2000 operation prediction by approximately 136,000 operations per year. The Expert Panel noted that the expected reduction in total population exposed to noise levels of 65 dB DNL and above has not occurred as predicted. The Panel recommended:

"c. Evaluate the possibility of an expanded residential acquisition program offering more of the most severely impacted people the buy-out option, even if no additional Federal money is made available for this purpose. While relocation is not desired by all (nor easy for anyone), the environs of a major airport are plainly not the best location for residential neighborhoods."

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The fSEIS should indicate what steps the Port plans for expansion of its residential noise remedy program eligibility area to mitigate the impacts of residents. Indicate what written financial commitments the Port of Seattle has made in conjunction with the expansion of the Port of Seattle's noise insulation program. Include documentation evidencing the Port's financial commitment in the final SEIS.

3-31. The fSEIS appears to assume the majority of housing construction in this region is cold weather construction. It is not. Homes here, for example, do not have the insulation, storm and or thermal windows and other cold weather construction techniques found in other cold-weather areas of the country or the air conditioning found in warm climates. The SEIS should reflect the temperate climate construction used in this area.

G-199-1

3-32 Cold-weather construction: only 10%? In some places in the dSEIS the drafters appear to assume that cold weather construction is either brick or masonry construction. At others, it states that 10% of the housing is masonry or brick.

(1) If it is only 10%, not the majority of the housing, the figures should be reworked and it is not clear in the dSEIS if they were.

(2) The fSEIS should distinguish masonry from brick, as the dSEIS fails to do—what percentage of each. There are *very few* stone masonry houses in this region of the country. Furthermore, the dSEIS does not distinguish brick construction from brick veneer, which is essentially wood construction and should be so treated. The SEIS should correct this error.

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PART 4: WETLANDS & WATER QUALITY IMPACTS

4-1. Miller Creek Relocation.

(a) How does the Port propose to effect a plan to relocate and re-channelize Miller Creek, as well as to increase the rate of flow in Miller Creek, given that it is under an existing court order (consented to by the Port, as well as King County), forbidding it to undertake such actions? We previously provided copies of these settlement agreements (*Kludt et al. v. King County and the Port of Seattle, King County Superior Court, Case No. 762259*) which prohibits the re-channelization of Miller Creek and the increase in flow in Miller Creek, to the authors of the dSEIS. Nevertheless, this action is now apparently contemplated in the dSEIS. A previous response to our DEIS concerns about proposed plans to alter Miller Creek from the Port/FAA cited a completely unrelated matter before the State's Pollution Control Hearings Board. We again invite the commenters to provide a fSEIS which acknowledges the existence of the settlement agreements with the Port and King County which exerts local pre-emption of planning activities in the Miller Creek Basin. We look forward to comments responding to this matter in the fSEIS. Does the Port/FAA acknowledge the previously mentioned settlement agreements as pre-empting Port/FAA control over planning in the Miller Creek Basin?

(b) Has the Port advised the U.S. Army Corps of Engineers of the court ordered settlement agreement referred to in (a)?

4-2. JARPA & §404 Application.

(a) The texts of the applications, as well as the Miller Creek Relocation Plan, Wetlands Relocation Plan, and accompanying drawings and other documents referred to in Section 5-5 1, p. 5-5-1, should have been part of the dSEIS and should be included in the fSEIS. Please provide them in response to this comment.

(b) How as a practical matter do the proponents expect the general public to comment on this subsection when the most important documents (the applications) are available only in two remote locations? Non-availability of these documents prohibits the review of impacts or the proposals made in the application for the Corps of Engineers Wetlands permits and impairs the public's ability to make informed comments on the SEIS.

4-3. Use of out-of-basin wetlands replacements. We are aware that other commenters have commented, and intend to further comment, on the inappropriateness of substituting wetlands in one basin for those damaged in another, which is proposed here. We join in such comments, and ask for a full explanation of the legality (if any) and practicality of the proposal. The fSEIS should specifically address, city by city, the local codes that require wetland mitigation to be within the same drainage basin, as well as any other relevant legislation or regulations.

G-200-1

4-4. Sea-Tac International Airport Storm Drainage Plan Ignored. While we have been unable as of this writing to secure a copy of the document, we are well aware that on behalf of the Port, the firm HDR Engineering, Inc., has issued a multi-volume final draft report, dated February 1997, entitled "Sea-Tac International Airport Storm Drainage System Comprehensive Plan".

(a) Do the preparers deny the existence of this report?

(b) Why was this report not referred to in the dSEIS?

(c) What is the relationship between the Plan set out in the referenced document and the December 1996 Miller Creek Relocation Plan, prepared by Parametrix, Inc., for Landrum & Brown, a consultant to the Port? Set out in detail and in format permitting easy comparison the actions proposed, the adverse impacts thereof, & the proposed mitigations of such actions, as proposed in the two different documents & in the dSEIS.

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4-5. Underlying Aquifers. Why is the dSEIS silent on the subject of impacts on aquifers known to underlie Airport property? This subject should be covered in the fSEIS.

4-6. Des Moines Creek.

(a) We do not find -- the lack of an index is a real handicap here -- any mention of impacts on Des Moines Creek in Section 5-5 or elsewhere in the dSEIS. If Des Moines Creek was mentioned, the response, we are confident, will point out the location of such mention.

(b) On the conclusion that the dSEIS ignores Des Moines Creek, we ask that the fSEIS explain why, in light of the fact that the Port has told the U.S. Army Corps of Engineers in Attachment B to its Section 404 application dated 18 December 1996 that "[i]mpacts to Des Moines Creek will occur in later phases of construction activity", these impacts were not discussed in subsection 5-5 1, or anywhere else in section 5-5.

(c) What are the projected impacts to Des Moines Creek, when will they happen, what are the consequences of the impacts, and what are the proposed mitigation measures (including the costs thereof)?

(d) As mentioned above any mitigation plans should be sequenced such that the mitigation is in place prior to the action for which the mitigation is required.

4-7. Impact on Fish Populations.

(a) While two goals are stated (p. 5-3-20, Goals 2, 5) in regard to enhancing fish populations in one of the creeks to be impacted by the project, nothing is said as to whether, or to what degree, either goal will be met. The fSEIS should show how each of the goals, including fish-enhancement goals, will be met for Miller Creek if relocation were to occur.

(b) The dSEIS is silent as to impact on fish populations in streams in the affected area. The fSEIS should cover this topic.

4-8. Useful Life. The dSEIS says that the useful life of the runway will be approximately 5 years. (The revised completion date for the 3rd runway is the yeas 2005. According to EXHIBIT 2-7 on page 2-25 of the dSEIS, Sea-Tac airport with a 3rd runway will reach its "[p]ractical capacity per NPIAS" in the year 2000. The same chart in the SEIS shows that according to FAA terminal area forecasts (TAF'S) Sea-Tac airport equipped with a 3rd runway would be classified as "Severely Congested per NPIAS" by the year 2010. Please explain what the total amount of costs of this project will be, including capital costs, mitigation costs, as well as accrued financing and amortization costs. What is the cost per year of the new runway's useful life? Provide an analysis which derives the rate of return on investment for this project?

4.9 Lost Opportunity Costs. The fSEIS should discuss the lost opportunity costs to the region of spending public money on the 3rd runway project as opposed to spending it on alternatives.

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PART 5: SOCIAL, SOCIO-ECONOMIC, & LAND-USE IMPACTS

5-1. Noise and Land Use. We comment again, in connection with Subsection 5-6 1, that the 65 LDN metric is no fair measure of adverse airport noise impacts on land use. The Expert Arbitration Panel, the US EPA, the Natural Resources Defense Council, and many commenters in this long process all have pointed out various weaknesses of the LDN metric. We call, once again, for the use of more reasonable metrics.

Single-event noise levels are studiously ignored in the discussion here commented on, yet everyone knows -even government environmental specialists -- that, more than anything else, it is the single noise event (be it from aircraft, motor vehicles, gunfire, human voices) that disturbs people in their everyday lives. We challenge the SEIS preparers to find anyone disturbed by a year-long average of aircraft noise.

It may be that the FAA is cheerfully content to remain the prisoner of its own misconceptions on this matter, but the Port of Seattle, which is NOT bound to limit its good deeds to the cramped style of FAA, should now rise to the occasion and use more appropriate noise metrics. If there are any good reasons (a) to disregard the criticisms of the 65 LDN metric or (b) to stick with that metric criticisms notwithstanding, what are those reasons?

5-2. Noise and Land Use.

(a) The fSEIS should present noise contour maps on the basis of 55 LDN contours as suggested by US EPA.

(b) Single-event noise levels should also be presented in a comparable mapping format showing 100 dB, 90 dB, and 80 dB SEL noise contours.

(c) Tables showing 55 LDN & SEL measurements should be presented, comparable to Tables 5-6-1 through 5-6-3.

(d) The numbers of single-family homes, duplex/triplex homes, apartment houses, places of religious activity, schools, nursing homes, hospitals, &c., should be reported in terms of the other metrics suggested in this and the immediately prior comment. (c)

5-3. Social Impact Discussion Grossly Deficient. Subsection 5-7 2, Social Impacts, is grossly deficient, to the point that some observers would think that it is a deliberate insult to the adversely affected communities.

(a) The subsection correctly recognizes that social impacts include residential and business displacement, disruption of existing communities, disruption of planned development. P. 5-7-1. After setting out the number of single-family properties, apartments, and businesses to be acquired, there is not a single word about the consequences. Why not?

(b) Is it the intention of the dSEIS preparers to refuse to discuss the subject of residential displacement?

(c) Is it the intention of the dSEIS preparers to refuse to discuss the subject of business displacement ?

(d) Is it the intention of the dSEIS preparers to refuse to discuss the subject of disruption of existing communities?

(e) Is it the intention of the dSEIS preparers to refuse to discuss the subject of disruption of planned development?

(f) Each of the matters referred to in comments 5-3 (a) - (e) should be discussed in detail in the fSEIS.

5-4. Social Impacts: Pending Study Ignored; Depression of Property Values Ignored.

(a) In addition to failure to discuss the very impacts that it recognizes, the dSEIS subsection 5-7 2, Social Impacts, fails to take into account the State-

funded impact study now being conducted by the HOK study team, a draft of which was released last Fall. Why was this study ignored? Why were no responses to the issues raised reported in the dSEIS?

(b) Will the fSEIS take into account the final, published version of the HOK study? If not, why not?

(c) The HOK study describes in detail a major adverse socioeconomic impact that is not discussed in the subsection being discussed: depression of property values. Did the preparers fail to discuss this subject because they believe that there is no depression of property values resulting from airport-related noise? If not, why was this subject not discussed in dSEIS?

(d) If the preparers agree that property-value depression is a real impact, do the preparers have an estimate of the dollar amount of the property-value depression resulting from Sea-Tac-related noise? What is that dollar amount and how was it computed?

5-5. Induced Socio-economic Impacts: Pending Study Ignored; Loss of Tax Revenues from Real-property Taxes.

(a) We regard the notion of separating "Social Impacts" from "Induced Socio-Economic Impacts" as nonsensical, and request that in the fSEIS the discussion of the two identical topics be combined.

(b) The dSEIS fails to take into account the above-mentioned draft HOK study, which sets out, even in its preliminary, draft form, enormous losses of revenues to municipalities in the vicinity of the Airport as the result of airport-related noise. Why?

(c) The HOK study gives much higher numbers for these tax-losses than does the dSEIS. The dSEIS provides no explanation of its tax revenue-loss figures, whereas the draft HOK study sets outs its methodology & results in detail. How did the preparers of the dSEIS arrive at their numbers?

(d) Explain & justify the differences between the dSEIS tax-loss numbers and the tax-loss numbers in the HOK study.

(e) Provide comprehensive evaluations, based on valid, cited authorities, as to any offsetting revenue gains that the preparers expect the affected municipalities to receive as the result of expanded Airport activity.

(f) What mitigation is proposed with regard to lost real-property tax revenues? Provide a copy of the real-property tax mitigation plan in the fSEIS.

(g) The fSEIS should comment in detail on the conclusions of the HOK team that gains from Airport activity and losses therefrom do not fall proportionately on the populations, individuals, or municipalities involved. Chapter 1 of the draft study shows that the neighboring communities derive little of the benefits and most of the negatives. This is a major conclusion, new information in this environmental review process, and deserves the fullest examination in the fSEIS, including much more extensive mitigation measures than have been proposed to date.

5-6. Induced Socio-economic Impacts: Pending Study Ignored; Demographic Changes.

(a) The dSEIS does not discuss impacts on community demographic profiles from Sea-Tac expansion. The above-mentioned HOK study indicates significant impacts from changes in demographic profiles. Why is the dSEIS silent on this matter? The fSEIS needs to examine this problem in detail, & to recommend relevant & sufficient mitigation measures.

(b) Changes in demographic make-up of affected communities are shown in the draft HOK study to result in widespread changes in employment patterns. These changes seemingly are not recognized in the dSEIS nor does the dSEIS take into account in its optimistic view of the economic impact expansion on nearby communities the depression of average income, the increase in socially-dependent individuals and households, the loss of existing businesses, and the consequent diminution of sales-tax & related revenues for the nearby communities. This subject (i) needs to be addressed in the fSEIS, & (ii) appropriate mitigation measures need to be suggested therein.

(c) Impacts from demographic changes are shown in the draft study, albeit not in great detail, to have a damaging impact on the local public-school district. This subject (i) needs to be addressed in the fSEIS, & (ii) appropriate mitigation measures need to be suggested therein.

5-7. Inappropriate Shifting of Social Burdens. Massive Airport development is shown in the HOK study to result in billions of dollars of social burdens. Careful studies of such matters as origins of local residents using the Airport for travel purposes, and location of persons employed at the Airport or in direct association with Airport activities, such as those already done by the HOK team, strongly indicate that the benefits of the Airport are enjoyed by persons and communities, for the most part, well removed from the facility. The burdens, including loss of property values, diminution of real property tax revenues, loss of businesses, destruction of residential and business communities, increased social-welfare burdens, and the like, are directed upon the neighboring communities. The Airport & its employees & users gain; the local communities & their residents lose. Fundamental fairness would seem to dictate that the Airport itself should be the vehicle by which society at large accumulates, and redistributes, the funds & other assets needed to redress this balance (in much the same way that insurance serves the social purpose of evening out the unequal burden of risk-of-loss from societally approved transportation facilities such as highways). The fSEIS needs to address, in a global manner, how this unequal sharing of benefits and burdens is to be remedied.

5-8. Inappropriate Shifting of Social Burdens -- Executive Order 12898. One effort to prevent inappropriate shifting of social burdens is Executive Order 12898, the Executive Order on Environmental Justice. The dSEIS is silent about how the dSEIS addresses impacts associated with this order, its requirements, and the disparate impacts of Sea-Tac activities that may fall within the reach of the order. The proponents/preparers are well aware of concerns expressed in many different ways about disparate impacts of Sea-Tac activities on populations specially protected by the Order, and it would be burdensome to include here the many letters, newspaper articles, and other documents reflecting those concerns & their expression. Many have been previously submitted to the Port of Seattle, by local residents, elected members of the King County Council, the city of Seattle, and local representatives of the State Legislature.

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We call particular attention to the state environmental policy act (SEPA) administrative appeal of the FEIS approval filed by Ray Akers & the information found therein concerning the impacts upon his neighborhood in the Rainier Valley area which the dFEIS has chosen to ignore. The fSEIS is obliged by law to deal with the E.O. 12898 issues in detail, with accuracy. We note with alarm that the residents of South Seattle have not been informed of the impacts which their community would be subjected to due to the Port/FAA's disregard of proper public notice and advertisement of the dSEIS. (We have elaborated on the Port/FAA failure to provide proper notice concerning this action in Part 8 of our comments.)

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PART 6: ALTERNATIVES

6-1. Use of Other Modes of Transportation As an Alternative to Project. See sec. III.1 (A) (p. 3-1). As was argued in RCAA Comment II-44 (h) to the DEIS, when 'edge' conditions are reached in airport capacity, any measure that diverts air traffic has a disproportionately beneficial, and cost-effective, impact. See also RCAA Comment II-46, II-55(b)(1).

(a) The responses to the cited comments failed to address the 'edge' effect arguments, which leads to the conclusion that they are unanswerable, since no reason for ignoring them was offered.

(b) The proponents should take the opportunity of this SEIS process to evaluate the beneficial impacts from the seemingly marginal improvements that could be experienced when Sea-Tac surpasses the 380,000 to 400,000 annual operations level, and begins to suffer markedly increased delay (*cf.* dSEIS Exhibit 2-7, p. 2-26).

(c) The fSEIS should report more fully on the big change of heart as to future rail development in this State experienced by the Department of Transportation immediately after the Expert Arbitration Panel's ruling on rail alternatives. It will be recalled that the DOT told the Panel that faster rail was utterly impractical. Then, after the Expert Panel's Dec. 8, 1996 Order was issued in reliance on the Department of Transportation's utterly negative evaluation, WSDOT turned out a big publicity blitz, seeking support for its program, seemingly developed overnight, for short-term implementation of faster rail and issued its study. Witness the Jan. 4, 1996 *Seattle Times* article reporting WSDOT's release of its *Options for Passenger Rail in the Pacific Northwest Rail Corridor* study. The rail alternative should be re-examined in light of the now-positive evaluations of the Department and its previous reliance that a 3rd Sea-Tac runway would be available to provide additional capacity by the year 2000.

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In its *Final Order on Phase II Demand/System Management Issues* issued December 8, 1995 the Expert Panel wrote: "We are confident that "high-speed" rail would produce a very substantial diversion of travelers from air to rail transportation in the Portland-Seattle-Vancouver corridor. (p.5)

(d) The dSEIS assumes the relative attractiveness of air service from Sea-Tac will remain as it is today and has taken no account of the effect that a decision not to build a 3rd runway would have on other transportation options, including rail and the use of other airports. The fSEIS should discuss this in detail.

The fSEIS discussion should include comment on and resolve conflicts between the data presented in the fSEIS and representations made by the Port of Seattle to the PSRC Expert Panel regarding the Panel's *Final Decision concerning Demand Management Issues.* For example, i, the Port told the expert panel that the Port had "identified need to have the proposed new runway operational by soon after the year 2000." (*Rebuttal of System Management Submittals,* November 6,1995, pg. 2)

The Port also verbally reassured the Panel that it would have the runway in operation shortly after the year 2000. However, in a recent article published in the *Tacoma News Tribune* (February 8,1997 "3rd Runway Unlikely to Fly Before 2005"), ," Mary Vigilante, "an FAA consultant who prepared the third runway project's supplemental environmental impact statement" was quoted stating, "There's not enough money to do it all at once". The fSEIS should explain in detail the impact the anticipated minimum five (5) year in availability of a 3rd Sea-Tac runway would have on the other alternatives, including demand management, use of other airports, rail, & etc. The fSEIS should include a similar analysis for a using a ten and a fifteen year delay.

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Explain in the fSEIS how the introduction of the following alternatives to Sea-Tac expansion would affect the need for a third runway:

1. Implementation of rail service on the Vancouver, BC-Seattle-Portland, Oregon corridor.
2. Implementation of commercial air carrier service at Paine Field
3. Implementation of commercial air carrier service at other regional airports including Bellingham International, Vancouver, BC, Portland, Oregon, Moses Lake, Washington, Renton, WA, and other regional airports.
4. Development of Category E and F, and G traffic congestion conditions on the major arterials serving the Puget Sound area including Interstate 5, Interstate 405, Interstate 167, Interstate 18, Interstate 520, and other major surface and intermodal transportation routes.

(e). The fSEIS should comment on the effects which legal challenges prohibiting Sea-Tac expansion will have upon proposed expansion of Sea-Tac airport including the options outlined in the dSEIS . What effects will the adoption of transportation alternatives, including alternate regional airports, rail transportation, and other external factors have on Sea-Tac airport's traffic levels given implementation of the Master Plan "Do-Nothing Option?

Project the effects of utilization of these alternatives on Sea-Tac air traffic levels and associated environmental impacts through the year 2020
(f) As to the telecommunications alternative, the fSEIS should cite authorities for its bald assertions that telecommunications are still in the Dark Ages. Perhaps the authors of these materials have not yet heard of the Internet? A 9 per cent. reduction in air travel in & out of Sea-Tac will be much more significant than the dSEIS material admits, when the airport begin to experience 'edge' conditions. Provide an analysis of the savings in dollars, including annual totals, of the 9% reduction in air travel associated with the use of new telecommunications technologies.

6-2. Other Airports. See sec. III.1 (B).

(a) The non-appearance (in the eyes of the POS and FAA) of a 'sponsor' for a new airport does not rule out another airport as an alternative. The assertion at p. 3-4, Part III (B) 1. is a non sequitur. Otherwise, this whole exercise is a sham, for the proponent of any project need simply announce that it will not sponsor any alternative other than the preferred one, therefore there are no alternatives, end of discussion. Cite the legal authority for the proposition stated in the cited paragraph.

(b) Surely it is not beyond the ability of the Government of the United States of America to encourage sponsorship of worthwhile alternatives, should they be identified. Or, the United States can become the sponsor -- not the first time that projects thought to be worthwhile were done under that sponsorship!

(c) In fact, as we all know, there are known sponsors for airports capable of meeting the State's needs in the next century, & they should be named in the fSEIS & their proposals treated seriously. See RCAA DEIS Comment II-48, studiously ignored in the official responses. These sponsors have been ignored in the past, as all know, because the proponents of the Sea-Tac expansion (the same people who are doing this environmental review) have the idea that the solution to future air-capacity problems has to lie in an unsuitable location, and cannot be sought elsewhere. See following comment.

(d) The artificial limitation of the examination of alternatives to the Central Puget Sound sub region is pretextual, a mere ploy to avoid discussing real alternative sites. Why not frankly say that the study of alternative locations has to be limited for political reasons to areas controlled by the principal advocate, the Port of Seattle, and admit that there is no interest in any solution that the Port does not control?

(e) The remarks in paragraph 4 of the cited section are, typically, mere bald assertions, unsupported by facts, reason, theory, or authority. The fSEIS needs to provide at least a semblance of support, particularly in view of the facts that (i) the dSEIS itself states that the 10-million-enplanement per annum threshold has been passed, and (ii) operators are already moving from Sea-Tac elsewhere (King County International Airport, Paine Field). What the dSEIS says cannot occur is underway. Explain that. What are the future implications?

(f) We note in particular current moves by the scheduled commercial airlines to establish air carrier service at Paine Field. (See *Seattle Times* Feb. 11, 1997, p.B5) Paine Field's recently completed Part 150 Master Plan and Noise Study Update forecasts significant levels of National and Regional air carrier service. Forecasts for regional service with Paine Field served by regional air carriers only, range from 81,000 to 135,000 operations per year in 2004, prior to completion of the proposed 3rd runway. Forecasts for national service with Paine Field served by both national and regional air carriers range from 464,000 to 776,000 annual operations in the year 2004. (See Attachment - Page B-9 from Master Plan Study)

For the dSEIS to ignore the impact of diversion of Sea-Tac's commercial passengers to Paine Field of only a fraction of the above traffic levels constitutes an error and omission best characterized as gross negligence. The fSEIS should assess the impacts upon Sea-Tac's projected operations given the scenario of rapidly expanding commercial aviation growth at Paine Field

(g) We additionally note recent regional growth in commercial operations caused due to the addition of Vancouver, B.C.'s International Airport's 3rd runway as well as shifts to Vancouver airport due to the recent "Open Skies" treaty established between the United States and Canada. We also note the growth in commercial service at Bellingham international airport. (United Airlines "Shuttle") as well as the recent announcement that Horizon airlines is expending $20 million dollars to expand commuter operations from Portland International Airport in Portland, Oregon. The fSEIS should comment upon how development at each of these airports will influence commercial aviation growth at Sea-Tac.

6-3. Demand Management. See dSEIS p. 3-5.

(a) The discussion here misrepresents the findings of the Expert Panel. The fSEIS should not do so, but should report that the Panel found that demand management would not work because (1) the Port refused to put demand management into play and (2) the Panel and PSRC had no power to force the Port to adopt demand-management measures. (Another example of exclusion of alternatives by refusal to sponsor them.) In its *Final Order on Phase II Demand/System Management Issues* issued December 8, 1995 the Expert Panel wrote: "We nevertheless continue to have questions about the complex and dynamic delay and capacity problems that are seen by the POS as justifying the construction of the new runway.". The Panel noted "[t]he Panel does not believe that it has been charged with the generalized responsibility for determining whether there is a need to build the proposed third runway." (p.3)

(b) We question whether applicable environmental-review statutes and regulations permit exclusion of alternatives just because there is a failure of will, or perhaps an excess of 'won't', on the part of the sponsor and/or environmental-reviewer. The fSEIS needs to discuss the question whether an otherwise-viable alternative can, legally, be excluded by the whim of the proponent of an action.

6-4. Localizer Directional Aide (LDA) Technology

The dSEIS erroneously stated that implementation of Localizer Direction Aide (LDA) technology at Sea-Tac would allow landing approaches only under visual flight rule (VFR) weather conditions. In our previously submitted study (*Implementation of and LDA/DME Approach to Runway 16R in Lieu of a Third Runway at Sea-Tac*, June 1995) RCAA demonstrated that LDA approaches under instrument flight rule (IFR) weather conditions have been adopted at many airports and recommended that these procedures be implemented at Sea-Tac in lieu of a 3rd runway. The study found that implementation of LDA at Sea-Tac "would accomodate 98% of the DEIS year 2020 hourly forecast, within the acceptable delay parameters outlined [in the DEIS]" (Executive Summary)

In its *Final Order on Phase II Demand/System Management Issues* issued December 8, 1995 the Expert Panel wrote: "Improvements in Technology, including LDA, can be expected to enhance the effective capacity of the airfield at Sea-Tac". Provide an analysis in the fSEIS of the cost savings in landing delays to the airlines associated with implementation of LDA technology at Sea-Tac airport as recommended by the Expert Panel in their *Final Order on Phase II Demand/System Management Issues.*

6-5. Global Positioning Satellite (GPS) Technology.

(a) In a previously submitted May 1995 report to the Committee on Transportation and Infrastructure of the House of Representatives titled *Comprehensive FAA Plan for Global Positioning System is Needed* the General Accounting Office stated that "FAA expects that the augmented GPS will be able to support runway approaches and landings in all weather conditions". (Report GAO/RCED-95-26, p.5, emphasis added) This 1995 report also noted FAA's change to the year 2000 as the milestone for the feasibility determination of GPS augmentation for supporting Category II/III precision approaches. (p.23) Explain why the dSEIS did not consider that implementation of GPS technology years prior to the completion date for a 3rd Sea-Tac "bad weather" runway, which would very likely obviate the need for the runway.

(b) In a recent (December 1996) report titled *Proceedings of the NASA Workshop on Flight Deck Centered Parallel Runway Approaches in Instrument Meteorological Conditions* progress concerning utilization of derivations of GPS technology is revealed. The report discloses that parallel approaches to runways separated closer than the 2,500 foot discussed in the DFEIS are now being considered for use in conjunction with this new navigational technology. (p.81) This report provides a graphic showing parallel landing approaches under IFR meteorological conditions are being studied with runway separations less than 2,500 feet. A United Airlines pilot discussed investigation into utilizing the technology for conducting paired IFR approaches to San Francisco airport's two runways which are spaced 750 feet apart. (p.104) Sea-Tac airport's existing runways are spaced 50 feet further apart (800 feet) than San Francisco's. A copy of this report is attached. Explain in the FSEIS why the dSEIS did not contemplate options including new runways more closely separated than 2500 feet.

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(c) Innovations in GPS technology have not been lost in the public media. The enclosed article published in the June 5, 1996 edition of *Aviation Week and Space Technology* reports a concept called "Traffic Conditional Approach" has been proposed "that could permit dual IFR approach streams leading to very closely spaced parallel runways." Explain in the fSEIS how implementation of this traffic conditional approach technology would or would not obviate the need for a third Sea-Tac runway.

(d) Finally, as reported in our Fall 1996 newsletter Alaska Airlines, one of Sea-Tac airport's major carriers is now in the process of implementing GPS navigational technology in its 737-300 fleet aircraft. (The RCAA Fall Newsletter is available on our website. The URL is http://www.rcaanews.org/rcaa .) Explain in the fSEIS how implementation of GPS technology would or would not obviate the need for a third Sea-Tac runway.

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(e) The fSEIS should indicate how implementation of GPS technology will affect each of the alternatives discussed in the fSEIS, during the years 2005, 2010, 2015, and 2020. The fSEIS should also provide a discussion of the impact of implementation of GPS technology allowing "poor weather" IFR approaches at Sea-Tac upon the stated "purpose and need" for the 3rd Sea-Tac runway, the need for a "bad-weather" runway.

6-6. Blended Alternative. See discussion at dSEIS p. 3-6.

(a) The discussion here is fatally flawed by the mistaken notion that each alternative standing alone must be able to satisfy the need for the proposed project. The discussion should address the combination of non-project alternatives, including those referred to in earlier comments -- rail, medium-speed rail, use of other nearby airports, teleconferencing & related technologies, LDA, GPS, increased efficiencies (especially with regard to the below-60-seat airlines, consuming 38 to 40 percent. of the operations capacity). Provide a matrix which describes the estimated effect on future Sea-Tac air traffic operations by year, through the year 2020, in five year increments. Analyze the effects on Sea-Tac traffic and delay costs assuming the following factors:

1. Assume medium and high-speed rail diverts existing Sea-Tac traffic levels in the following ranges: 5-10%, 10-15%, 15-20%, 20-25%.

2. Assume implementation of LDA technology which obviates the need for IFR approaches at Sea-Tac in the following ranges: 90-100%, 80-90%, 70-80%, 60-70%

3. Assume FAA issues feasibility determination for implementation of GPS technology which obviates the need for all IFR approaches at Sea-Tac in the year 2000.

4. Assume new innovations in telecommunications technologies divert existing Sea-Tac traffic levels in the following ranges: 5-10%, 10-15%, 15-20%, 20-25%.

5. Assume utilization of alternate regional commercial airports divert existing Sea-Tac traffic levels in the following ranges: 20-30%, 30-40%, 40-50%, 50-60%, 60-70%

(b) The delay discussion on p. 3-7 needs detailed cross-references to wherever it is in the FEIS that delay matters were discussed in depth (including comments and responses thereto).

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PART 7: OTHER COMMENTS

The comments in this Part are organized as follows:
A. Planning Horizon
B. Surface Traffic
C. Cost
D. Methodological Concerns

PART 7(A) -- Planning Horizon Issues

7(A)-I. Planning Horizon Should Be At Least Year 2020.

(a) The planning horizon for environmental impacts should extend at least to the prior planning horizon originally established in the Master Plan Update for this entire exercise, the year 2020. See dSEIS p. 5-1. It seems absurd to plan to put a facility in operation in the year 2005 or 2006 and then refuse to look at impacts taking place beyond the year 2010. It defies human understanding to suppose that there would be no impacts five or six years after the third runway's expected coming into use.

(b) Do the SEIS preparers assert that there will be no adverse impacts from the proposed actions after the year 2010?

(c) Is it not the fact that the post-2010 years are ignored because preliminary studies show that the impacts will be progressively more severe, and the proponents of the project do not wish the public to know about those impacts? If not, give a valid explanation consistent with prior use of 2020 as the planning horizon in this environmental-review process.

(d) State the planning horizons used in PSRC transportation planning processes, including aviation planning. If there are differences between the PSRC planning horizons (i.e. PSRC's Vision 2020) and those used by the SEIS preparers, explain them & provide justifications for deviating from the PSRC methods and time table.

7(A)-2. If Planning Cannot Be Done More Than 14 Years in the Future, Can Any Rational Planning Be Done in This Exercise? The putative reason for not doing the work beyond year 2010 --high volatility of travel demand -- is an excellent reason for not engaging in air-traffic forecasting as well, and therefore for not doing this project.

(a) Can rational planning be done in light of the constraints suggested by the dSEIS (p. 5-1)?

(b) Is the economy to be burdened with a 2 or 3 billion dollar project with over 4 billion dollars of adverse impacts on the basis of projections that do not include consideration of future events that are reasonably foreseeable, although perhaps not in exact arithmetical terms? Or does reasonable foreseability only apply to measuring the harm done by the project, not the alleged benefits?

PART 7 (B) -- Surface Transportation Issues

7(B)-I. Map Problems.

(a) Ex. 5-1-1 (simplified local highway map) should indicate whether it is current or includes proposed but as-yet-unbuilt roadways. Perhaps both are needed.

(b) The hexagons with numbers, described as percent distribution of airport traffic, do not convey much meaning, and need at least a text explanation and a suitable cross-reference thereto in the table itself.

7(B)-2. Mitigation Issues.

(a) Construction. (This matter relates to Part I of these Comments, Construction Impacts.) The HOK study, referred to in earlier comments, indicates that extraordinary wear and tear will occur to local roadways as the result of the colossal number of fill hauling trips.

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No mitigation is proposed in the dSEIS to the State, County, or affected cities for an exercise that apparently will be destructive. The fSEIS should examine the roadway mitigation problem & other mitigation issues and make realistic proposals.

(b) Long Term. Who is to bear the cost of fixing traffic messes that will occur long-term as the result of Sea-Tac expansion? Is this another burden to be thrown off on the local people and their local governments, all for the benefit of Airport users who pay little to no taxes to the local governments, and who mostly reside elsewhere?

(c) The long-term mitigation problem is particularly poignant in the case of air cargo. The Port of Seattle operates at a yearly loss of over $35 million, which is made good by real-property taxes. While it is claimed that none of this loss comes from aviation activities, we have seen nothing to rebut the contention that this is at best a mere accounting convention. Air cargo, like marine cargo, passes through here on its way to & from remote destinations. Operating losses and unmitigated adverse impacts amount to subsidies given by the taxpayers and local residents to business activities in other States and in foreign countries, given as the dSEIS suggests (The FAA being co-author of the dSEIS) by our tax-exempt Port district. If this is being done at federal initiative, the federal government should pick up its fair share of the mitigation bill (in the billions, over-all); if this is only done for the convenience of the Port and its customers, then the Port should be the vehicle for redress of adverse impacts. The fSEIS needs to sort this all out, for surface traffic impacts, for all other impacts as well.

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PART 7(C) -- Cost

7(C)-I. Are the Cost Estimates Reliable? Meaningful? It is conceded at p. 5-4-1, referring especially to third-runway work, that detailed design & construction plans have not been prepared.

(a) How reliable are the construction time lines suggested in either the FEIS or the dSEIS?

(b) How reliable are the cost estimates suggested in either the FEIS or the dSEIS? We note that only several weeks ago the Port announced the estimated cost of just the 3rd runway alone jumped by $132 million dollars.

(c) It appears that no engineers have been involved in this work (none are identified in the list of preparers of the dSEIS), and neither the FEIS nor the dSEIS examines the work that will need to be done to construct the third runway. (i) Is this huge earth-fill work practical? We are aware that the 1994 EIS for improvements at the Albuquerque Municipal Airport concluded that an runway extension with up to 150 vertical feet of fill required -- closely comparable to the Preferred Alternative for Sea-Tac -- was impractical. (ii) Will the fill sustain the stresses to be placed on it by the aircraft that are expected to use it? Provide a copy of the geo-technical report prepared by a registered professional engineer which substantiates this.

(d) Cite the relevant studies that support your response to this comment, and quote relevant portions that indicate that this work can be done. Identify the individual engineers and engineering firms who have done the work on the third runway to date.

7(C)-2. Cost-Benefit Ratio. Where are the cost-benefit studies required for this dSEIS? If they exist, including them with the fSEIS. Alternatively, indicate locations where they may be obtained or perused.

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7(C)-3. Cost-Benefit Ratio. Perhaps the reason why it has been decided to shorten the planning horizon to the year 2010 is to avoid the problem discussed in this comment: the third runway will outlive its utility in a very few short years after it opens for business, and the number of those years shrinks as the new traffic forecasts are made. What sense does it make to spend all these billions of dollars for this short-term fix, when the forecasts indicate that the need for an alternative REGIONAL (not Seattle-Tacoma local) solution will be upon not more than six years after and more likely before the opening date for the proposed 3rd runway? The fSEIS should discuss this problem in fullest detail.

7(C)-4. What Will Happen When Capacity Limits Are Reached? Given the onrush of traffic and the likelihood that even if the third runway is built Sea-Tac will be far beyond capacity in a few years, what is proposed for the next action to alleviate the capacity crunch? Is the fourth runway now a 'gleam in anyones eye'? Or is it expected that technological improvements will permit another capacity increase at Sea-Tac?

7(C)-5. Future Aircraft. What actions are being considered to cope with the advanced aircraft of the future now under study, such as the so-called 'China Clipper', super-jumbo subsonic jets, and others?

7(C)-6. Rationale for Scheduling-Change. Why do Port staff now recommend that the third runway be operational by 2005 instead of the original target date of 2000. See dSEIS, p. 2-21. What was reexamined, to what effect, and where are the results of the reexamination published?

7(C)-7. Financing Concerns. Careful reading and re-reading of Part 3 A, second unnumbered paragraph of first bullet point, p. 2-21, together with the first sentence on p. 2-24, leads us to conclude that the operative reason for the staff suggestion in this dSEIS to reverse the order of construction of the third runway and associated groundside projects --non-runway projects first -- is the unavailability of financing for the third runway during the time frame posited by the Master Plan Update and its FEIS. Is this a correct reading? If not, what is the correct reading, & why is the order of construction of the two major components proposed to be changed?

7(C)-8. Contingency Planning. There should be discussion in the fSEIS of contingencies that may arise from further delay in various phases of the over-all expansion project. In particular, the fSEIS should look carefully at the contingency that funding for the third runway will still not be available at the now-planned start date. Would it be rational to construct the landside facilities if third runway financing will not be available (whether at the time hoped for, or at all)?

PART 7(D) - Methodological Concerns

7(D)-I. Incorporation of Applications by Reference.

(a) It is inappropriate to incorporate documents by reference (p. 5-5-2) without providing them for review.

(b) Do the preparers of this SEIS expect that the Port Commissioners will troop down from Seattle to the Port's Engineering Office at the Airport, or the FAA's shop in Renton, to-read these documents?

(c) Do the preparers think that it is practical for all the interested agencies, cities, special districts, community groups, individual citizens, and so on to review documents only available in the FAA's or Port's offices, with only one copy per office available for review?

7(D)-2. Incorporation of FEIS Appendix R by Reference. In the Air Quality section of the dSEIS, there is a general reference to air quality information appearing in Appendix R, the appendix to the FEIS setting out the official responses to comments on the DEIS. The dSEIS text then says that Appendix R is incorporated by reference.

(a) The Appendix should not be included by a general reference. Rather, reference should be made to particular responses that deal with the particular issue under discussion in the dSEIS or fSEIS. The air-quality section of the dSEIS should be revised accordingly in the fSEIS.

(b) This is a particularly aggravating practice in the instance of Appendix R for two reasons: (i) the rather scattered nature of the information in the Appendix; (ii) the Appendix was, unaccountably, not furnished to numerous commenters.

7(D)-3. Incorporation by Reference -- Another Instance. Exactly what parts of the FEIS are 'incorporated by reference' in the second full paragraph on p. 5-1? Give page numbers. Better yet, set out the material.

7(D)-4. Cumulative Impacts. See sec. 5-3 5 "Cumulative Impacts", p. 5-3-7.

(a) The projects or developments referred to here should be specifically identified, one by one, and the present state of planning of each should be set forth.

(b) Is it not true that ranges of possible impacts from these various projects can be forecast and considered?

7(D)-5. Cumulative Impacts. Subsection 5-6 1 (D) p. 5-6-5, suffers from the same defects as other discussions of cumulative impacts in the dSEIS.

(a) Surely the other pending projects in the Airport area are well known to the preparers. Is this not so?

(b) Surely the statutes and regulations require the preparers at least to make a colorable effort to gauge the impacts of other known projects. Is this not so?

(c) The fSEIS should touch on known pending projects and at least give reasonable ranges of potential, cumulative impacts.

7(D)-6. Still No Index. Where is the index? Why do the Port and FAA refuse to provide indices to these environmental documents? Alphabetizing the table of contents (as was done for the FEIS) is not an index, for such a construct does not tell the reader where discussion of various topics can be found --the very purpose of an index. This is particularly disabling when trying to find discussion of such important matters as noise impacts, air quality, & water quality, where much important discussion occurs in the form of comments and responses, for which there is no index or other guide provided. We asked for an index in our scoping comments, we asked for an index in our DEIS comments, we ask again. By the way, there are perfectly adequate computer word-processing programs that will construct a fair-to-good first draft index at, so to speak, the push of a button. The results of that would be a lot better than the nothing that has been provided to date.

PART 8: Request for Extension of Time to Provide Additional Comments

8(A) Late Arrival of dSEIS Documents in Local Libraries - The dSEIS is almost 1,000 pages long, It is technically difficult and time consuming for the public to read and understand. Copies of the document have not been available to members of the public most affected by the proposed action. Most local libraries did not receive copies until the last week of February. The copy of the dSEIS at the Burien library is date stamped "Received Feb 25, 1997", one week prior to the public hearing.

The Des Moines library whose patrons include residents of one of the areas which would be most impacted by the project did not have a copy of the dSEIS available to the public as of noon on March 4, the day of the public hearing. Only 16 copies of the dSEIS have been provided at public libraries, one per library. The dSEIS at each library is available for reference only. The FAA/Port presumes 16 copies of the document are sufficient to notify over 200,000 citizens of the proposed action's environmental impacts.

8(B) Cost of dSEIS Documents Copies of the dSEIS cost $60 dollars each, exorbitantly priced for even citizens of moderate means, not to mention low income residents who would be most impacted by the proposed action.

8(C) Lack of Availability of dSEIS Documents It took the Port and the FAA a year to write the draft supplemental EIS. The public should have many more copies available at reasonable cost, at least 90 days for review and comment, and at least two more local public meetings to review the proposal in order to provide meaningful public comment concerning the impacts on our communities.

8(D) Unavailability of Documents Referenced in dSEIS Documents which concern elements of the proposed action which have the most significant impacts to the area were not even included in the SEIS. For example; the *Wetlands Mitigation Plan* and *Miller Creek Relocation Plan*. A check with the reference librarian at the Burien Library on March 5 determined neither of these documents have been logged into King County's Library Catalog System and also that neither document is available at the Burien Library for public review and comment. A check with the Des Moines library on March 6 similarly determined that neither the Port's *Wetland Relocation Plan* or the *Miller Creek Relocation Plan* documents were available for public review at the Des Moines library.

8(E) Problems with March 4 Public Hearing A public hearing at SEA-TAC airport on a weekday (March 4) during rush hour was the worst possible location/time/etc. to solicit meaningful public comment for this SEIS. Many citizens were deterred by Sea-Tac airport's exorbitant parking fees. The public notice of the hearing did not indicate whether free parking would be provided for low income residents who wished to testify at the public hearing.

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8(F) Request for Additional Public Hearings and Extension of Public Comment Period To remedy the improper conduct of this SEIS public comment process we strongly recommend at least two evening meetings in the local cities of Burien, Des Moines, Tukwila, Sea-Tac, Federal Way, Normandy Park, as well as communities in the Rainier Valley, Columbia City, Beacon Hill, Mercer Island, Magnolia, Capitol Hill and other affected areas, etc. should be scheduled and held to study the dSEIS. The present public comment period should be extended. After the public meetings are held a minimum 90 day public comment period should be allowed to permit members of the public to review the proposed action and make informed comments upon the proposal.

- G-214 -

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Attachments which should be referenced in transmittlal letter:

December 1996 report titled *Proceedings of the NASA Workshop on Flight Deck Centered Parallel Runway Approaches in Instrument Meteorological Conditions*

Letter dated 7 March 1997 from Port of Seattle Planning Program Manager Diane Summerhays, stating the information which provides the basis for the modeling assumptions in the dSEIS NEMs is not available from the Port of Seattle

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NASA Conference Publication 10191

Proceedings of the NASA Workshop on Flight Deck Centered Parallel Runway Approaches in Instrument Meteorological Conditions

Edited by
Marvin C. Waller and Charles H. Scanlon
Langley Research Center • Hampton, Virginia

- G-215 -

Proceedings of a workshop sponsored by the
National Aeronautics and Space Administration,
Washington, D.C., and held at
NASA Langley Research Center,
Hampton, Virginia
October 29, 1996

December 1996

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Foreword

Many U.S. airports depend on parallel runway operations to achieve capacity necessary for day to day operations. In the current airspace system, Instrument Meteorological Conditions (IMC) reduce the capacity of parallel runway approach operations spaced closer than 4300 ft. apart, or 3400 ft. where Precision Runway Monitoring (PRM) is applicable. The lost capacity costs the airline industry hundreds of millions of dollars each year. Its impact on other businesses and personal inconveniences to travelers is significantly costly but difficult to quantify.

A Government and Industry Workshop on Flight-Deck-Centered Parallel Runway Approaches in IMC was conducted October 29, 1996 at the NASA Langley Research Center, Pearl I. Young Theater. This document contains the slides and records of proceedings at the workshop. The purpose of the workshop was to disclose, to the national airspace community, the status of ongoing NASA Research and Development (R&D) to address the closely spaced parallel runway problem in instrument meteorological conditions and to seek advice and input on the direction of future work to assure an optimized research approach. This research is entitled Airborne Information for Lateral Spacing (AILS).

The workshop highlighted results of focused NASA R&D to develop a practical solution to IMC approaches to closely spaced parallel runways. NASA simulation studies have shown promising results for parallel approaches spaced as close as 1700 ft. apart. Implementation in the field will require capabilities such as will be provided by Automatic Dependent Surveillance-Broadcast (ADS-B) and local Differential Global Positioning Systems (DGPS). The intent of this R&D is to provide a concept that will complement the capabilities developed in the FAA's PRM program, to safely accomplish even closer parallel runway approaches. The technology envisioned includes enhancements to current Traffic Alert and Collision Avoidance System (TCAS) technology and navigation capabilities in the flight deck to enable airborne crews to assume responsibility for lateral path compliance and separation during closely spaced parallel approaches.

To date, NASA has completed three simulation studies and has scheduled initial flight testing to further develop and evaluate related technologies during fiscal year 1997. These studies and plans where discussed by Marvin Waller of Langley, Trent Thrush of Ames, and Charles Scanlon of Langley.

The workshop also included a discussion by Rocky Stone of United Airlines (UAL) of plans to explore the use of dependent parallel approaches described as "paired approaches." This concept was first investigated at NASA Langley in 1994 and discussed in a presentation to RTCA SC-147 in June 1995 (Ref. RTCA Paper No. 346-95/SC147-634, July 14, 1995), as a "Staggered Pair Concept." The adaptation by United Airlines has added cooperating pairs of company airplanes to address the delay

dilemma at the San Francisco International Airport (SFO) where the parallel runway separation is 750 feet. Rocky Stone is leading the effort at UAL.

In a presentation describing work closely related to AILS, Gene Wong, FAA AND-450, presented a discussion of the status of the FAA PRM Program that has been successful in enabling close parallel runway operations down to 3400 feet lateral runway spacing. Also, David Hinton of NASA Langley discussed NASA's plans to investigate the implications of wake vortices on closely spaced parallel runway operations in IMC.

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Contents

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NASA AILS Research Executive Summary

Airborne Information for Lateral Spacing is an effort within the Reduced Spacing Operations (RSO) element of the Terminal Area Productivity (TAP) Program at NASA. The TAP program is led by Robert Jacobsen at NASA Ames and the RSO element is led by Brad Perry at Langley.

The objective of the AILS research being conducted at the Langley Research Center and at the Ames Research Center is to enable approaches to closely spaced parallel runways in IMC with a capacity similar to that obtained in VMC. This research is examining options to enable airborne crew responsibility for aircraft separation during closely spaced parallel approaches. The initial focus of the NASA work has been on independent parallel approaches with intentions of investigating dependent concepts as time and resources permit.

Langley and Ames have planned a number of studies to address the problem, with Langley leading in this activity. A concept design team has been assembled to address the problem. The team at Langley has designed an initial concept after concluding that the problem of flying parallel approaches has two major components. The first is to provide accurate navigation for aircraft on the closely spaced parallel approach paths and to provide alerts to help keep intrusions from occurring. The second is to provide adequate protection for aircraft should one aircraft deviate from its assigned airspace in a manner that threatens another aircraft on a parallel approach path. The research at Ames has focused on providing TCAS like display guidance during collision avoidance maneuvers. The AILS work to date has addressed parallel pairs as opposed to parallel triplets or quadruplets, since it presents a simpler, yet real problem with significant payoff potentials.

Figure 1 illustrates technology that could potentially be used to implement the concept. DGPS provides the basis for the accurate navigation required to perform the approach, while ADS-B, currently under development, will enable aircraft to broadcast their position and other state information such as position, track, and rate of turn. Other aircraft will receive the transmitted information and maintain an accurate fix on aircraft operating on a parallel approach. In addition, the transmitted state information will provide an indication of whether the traffic is turning away from its course or headed back to its nominal path.

As mentioned above, this concept focuses on two aspects of the problem. One aspect is to provide accurate navigation to keep aircraft in their own assigned airspace along the approach paths and keep aircraft from threatening others. Langley engineers are investigating whether the conventional localizer path can be replaced with capabilities such as DGPS to provide parallel approaches where there is less potential for path overlap. Langley is currently exploring use of what is referred to as a "rocketship" shaped lateral path approach profile. The two dot localizer deviation profile resembles a rocketship in its plan view and was suggested by Charles Scanlon of the concept design team. In the area of "localizer capture," the two dot deviation is 2000 ft. on either side of the extended runway centerline. Also, as is normal for parallel runway operations, the approach paths are separated by 1000 ft. altitude during localizer capture. At about 12 miles from the runway threshold, the path width begins to taper down to 400 ft. on either side of the extended runway centerline at 10 nautical miles. After the 400 ft. half-width area is entered, the higher aircraft starts to descend and altitude separation is given up. The 400 ft. half width of the path is held from that point to a location near middle marker where a conventional localizer angular beam shape and width are captured (using DGPS to emulate the conventional localizer signal).

An alerting feature has also been incorporated in the concept to prevent aircraft from straying from their airspace. Should an airplane deviate one dot or more from its nominal path, a caution or level two (SAE ARP-450D) alert is issued to the deviating aircraft with displayed information presented in amber alphanumeric and symbolic formats in the primary flight display and in the navigation display, to warn the flight deck crew to maintain a tighter path adherence. Should an aircraft deviate two dots or more from the prescribed path, a level three alert is issued (using red colors for the displayed information), requiring a break-off maneuver in the direction away from the parallel traffic. In the version of the Langley concept implemented for the second phase of testing, depending of the severity situation, level two or level three alerts are also used to prevent one aircraft from threatening another with excessive bank angles or tracks. The current Langley concept requires use of a single, identical break-off maneuver for all parallel approach deviations. The aircraft required to break off the approach must execute an emergency escape maneuver consisting of a turning climb to a heading 45 degrees away from the nominal runway heading, in the direction away from the parallel approach traffic. A heading bug is automatically set to the (45 degree) escape heading when the alerting algorithms are armed in the approach sequence.

The second aspect of the Langley version of the AILS concept addresses procedures to avoid collisions and near misses in the event one aircraft strays from its airspace and approaches the path of another in a threatening manner. An onboard alerting algorithm will use state information from traffic on the parallel runway, transmitted by the ADS-B link, to detect threatening aircraft and provide an onboard alert to the flight deck crew. The alert is again presented in the primary flight display and the navigation display. A caution is presented in amber as the alerting system first detects the threat as it starts to evolve. As the danger becomes more imminent based on the computations associated with the alerting algorithms, a red (level three) alert is issued in the flight deck of the protected aircraft. The (amber) caution alert and the (red) warning alert in the configurations under study at Langley are accompanied by specially designed displays of the threatening airplane's path to allow the flight deck crew to quickly assess the nature and severity of the threat. In the concept, the red alert, a level three, requires the flight deck crew to execute the emergency escape maneuver as described above. Again this is an immediate, accelerating, climbing turn away from the approaching traffic and parallel runway to a heading of 45 degrees from the nominal approach heading. The version of the concept under study at Langley displays information in the primary flight display and in the navigation display. A computer

controlled voice message complements the displayed information with a "Turn, Climb. Turn, Climb. Turn, Climb" aural advisory when the level three alert is activated.

The concept design team at Langley completed a fixed base simulation test of the initial concept in May 1996. In the test, sixteen pilots each flew 56 parallel approaches, with about one third of the cases presenting collision or near miss threats. The test subjects were line pilots from a number of airlines and air-freight companies. They were trained for the task as they are trained and tested for, e.g., rejected takeoffs (RTO's), and category II approaches. The reaction time of the pilots in executing the turning maneuver and the closest approach were key parameters measured in these tests. Parallel approaches spaced 3400 and 2500 feet apart were examined in the initial study. The test findings show that, under the conditions tested, all of the pilot reaction times were well under the two seconds targeted by the NASA design team, and that no trials resulted in violations of the 500 ft. minimal separations used for defining near misses in the parallel runway approach environment. The mean miss distance measured was in access of 1900 ft., with the closest encounter of 1183 ft.

A second phase of testing was completed in July 1996 at Langley. The follow-up tests included new alerting algorithms and modifications to the displays based on observations and pilot comments from earlier tests. Runway lateral spacing was reduced to 1700 ft. and 1200 ft. Eight two-member airline crews were tested in the second phase. The results were very promising for the 1700 ft. runway separation, with no encounters closer than the targeted 500 ft. miss criteria. The 1200 ft. case resulted in one encounter closer than the 500 ft. two dimensional near missed criterion used and is regarded as questionable by the design team, when the current experimental AILS technology is used.

The study at NASA Ames Research Center was completed in August 1996 and explored application of TCAS concepts to the closely spaced parallel runway approach problem. This study showed that a display based on the TCAS formats, but enhanced with a higher resolution navigation display and specially designed alerting algorithms, resulted in better performance than the TCAS implementation using a conventional navigation display format. The performance with the enhanced display features and alerting algorithms resulted in no near misses and good pilot evaluations. The study at Ames investigated an autopilot coupled approach, in contrast with the manual mode used in the Langley studies, and addressed the 4300 ft. and 2500 ft. runway spacing cases.

In interpreting these results it is important to realize that they show the feasibility of the AILS concept in initial testing in a research simulator environment and that a large amount of additional testing and validation is required before a concept of this nature could be implemented in the national airspace system. Among the issues that must be resolved is the effects of wake vortex considerations.

For additional information, contact Brad Perry 757-864-8257, Marvin Waller 757-864-2025, or Charles Scanlon 757-864-2034.

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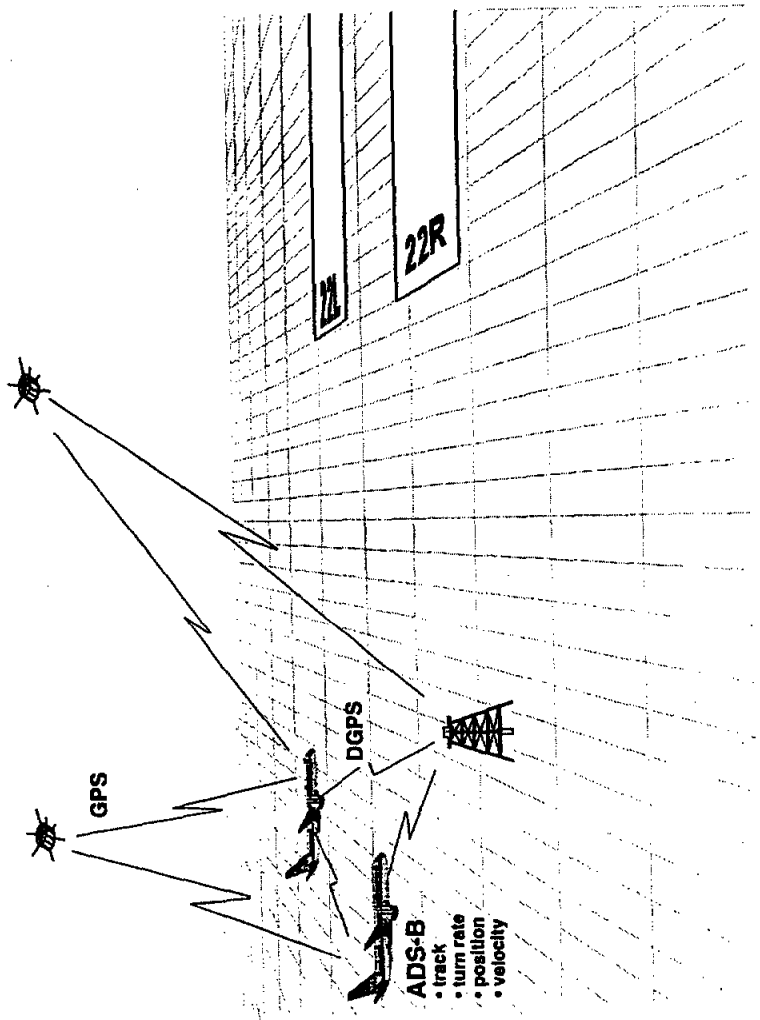

FIGURE 1.- PARALLEL RUNWAY OPERATIONS CONCEPT

Terminal Area Productivity

Advanced Subsonic Technology

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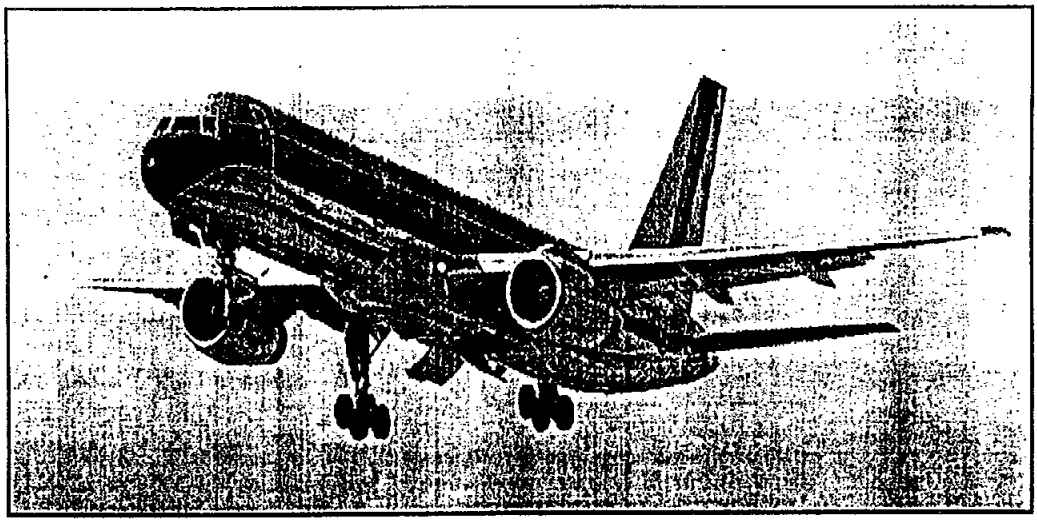

Robert Jacobsen
AST Level II Manager
Ames Research Center

Terminal Area Productivity

Advanced Subsonic Technology

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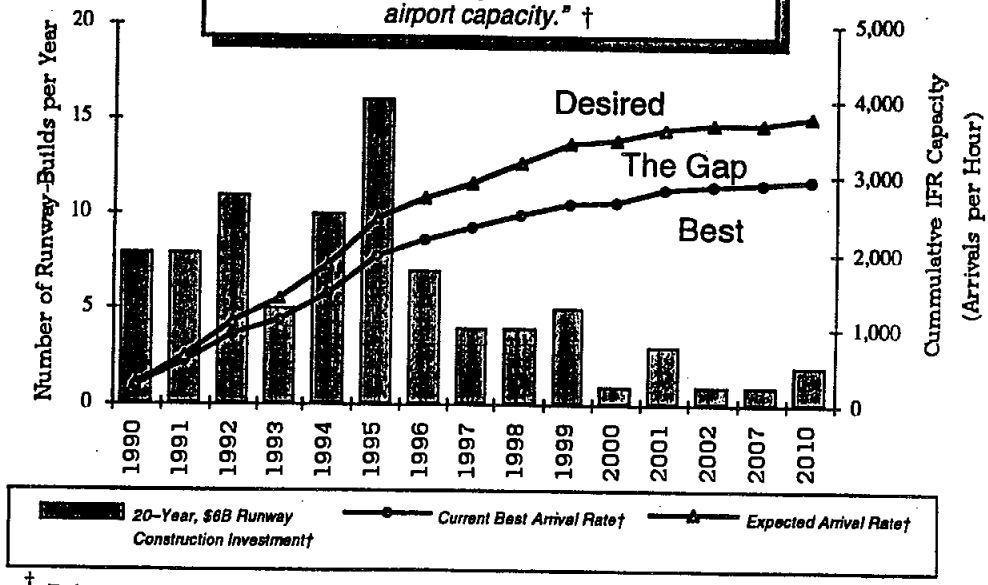
Challenge - The Capacity Gap

"Sixty-six of the top 100 airports have proposed new runways or runway extensions to increase airport capacity." †



† Reference: "1990-91 Aviation System Capacity Plan" DOT/FAA/SC-90-1, September 1990

Terminal Area Productivity

Advanced Subsonic Technology

Achieve safe clear-weather airport capacity in instrument-weather conditions

Objectives:

With the U.S. airline and Aircraft Industries, the Airport Owners/Operators, and the FAA:

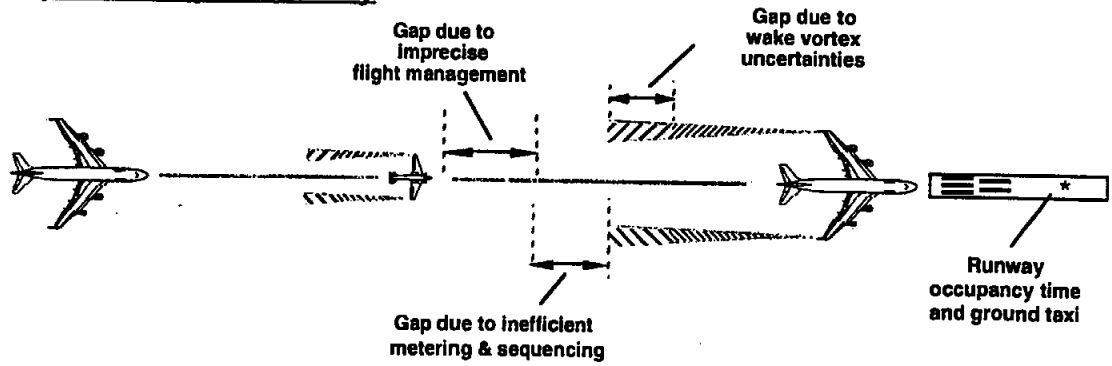
- Increase current non-visual operations for single runway throughput 12-15%
- Reduce lateral spacing below 3400 feet for independent operations on parallel runways
- Demonstrate equivalent instrument/clear weather runway occupancy time
- Meet FAA guidelines for safety

Terminal Area Productivity

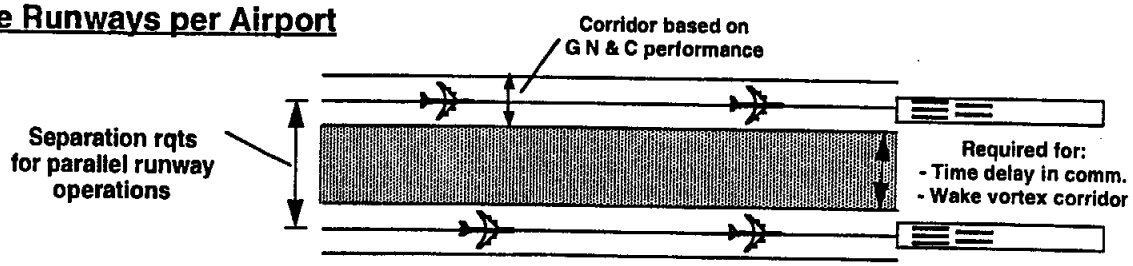
Advanced Subsonic Technology

Technical Approach

More Operations per Runway



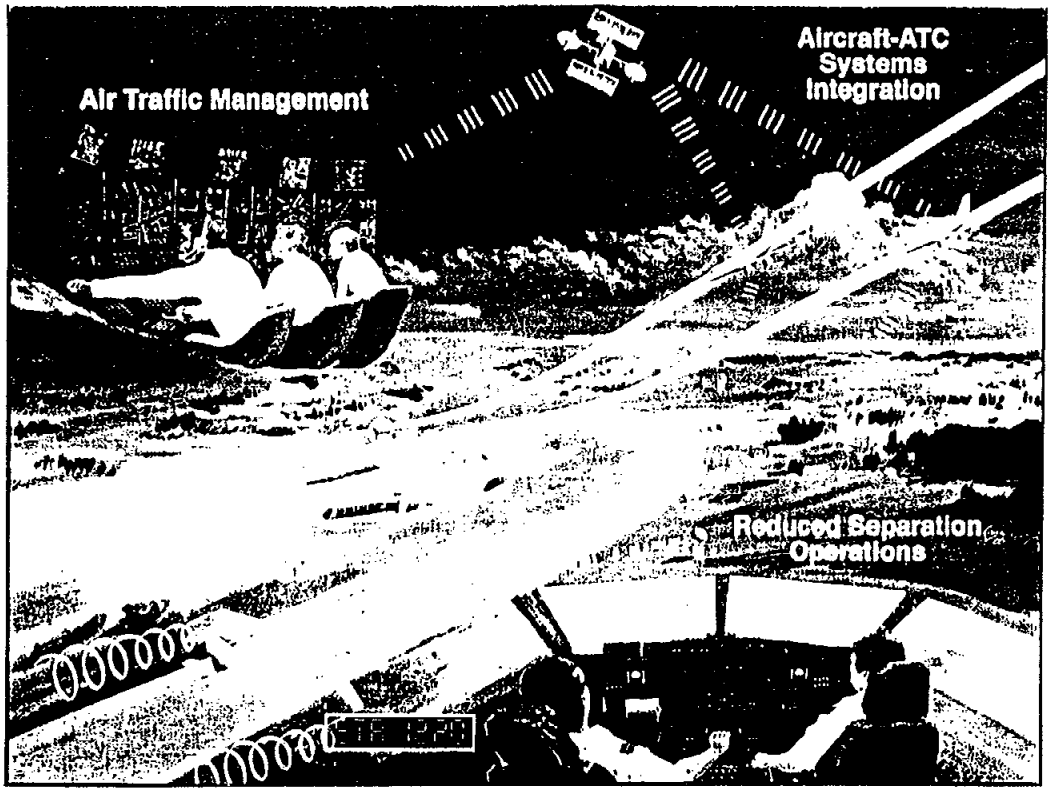
More Runways per Airport



Terminal Area Productivity

Advanced Subsonic Technology

Program Elements



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Terminal Area Productivity

Advanced Subsonic Technology

Program Deliverables

- **Systems for minimally constrained aircraft spacing**
  - Aircraft Vortex Spacing System (AVOSS)
  - Dynamic Spacing
  - Dynamic Routing
  - FMS/CTAS Integration
- **Blunder detection and guidance systems for reduced runway spacing**
  - Airborne Information for Lateral Spacing (AILS) system
- **Sensor/display/G & C technology to permit expeditious airport surface operations in Cat III conditions**
  - Dynamic Runway Occupancy Measurement (DROM) system
  - Roll Out and Turn Off (ROTO) system
  - Taxi Navigation and Situational Awareness (T-NASA) system
- **Integrated technology validation to accomplish clear-weather capacity in instrument-weather conditions**
  - Cost-benefit analyses
  - Procedure and Safety Substantiation (PSS)
  - Integrated technology demonstrations

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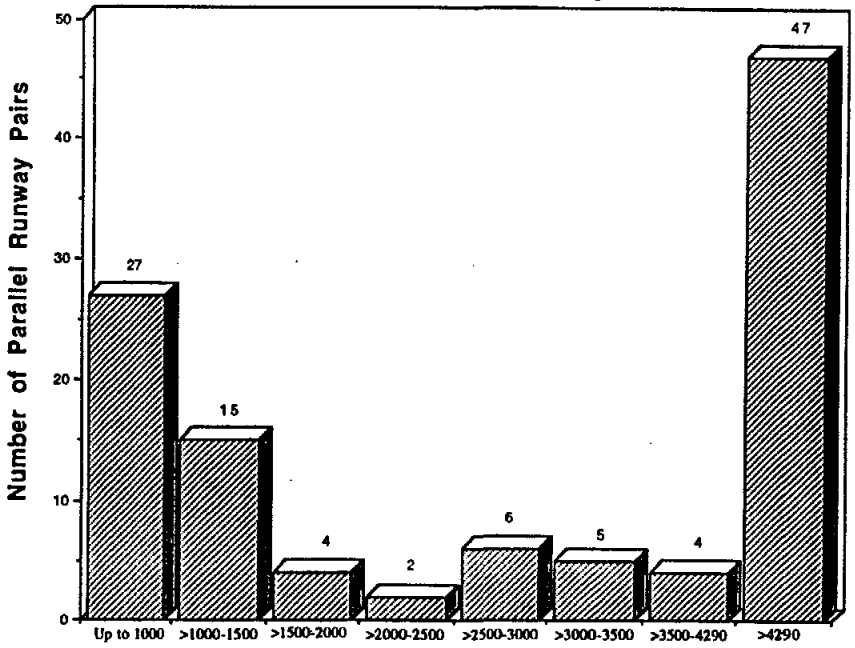
Terminal Area Productivity

Advanced Subsonic Technology

Parallel Runway Pairs in the Top 100 U.S. Airports



(Ref. 1995 Aviation Capacity Enhancement Plan; data from 67 of 71 airports with parallel runways.)

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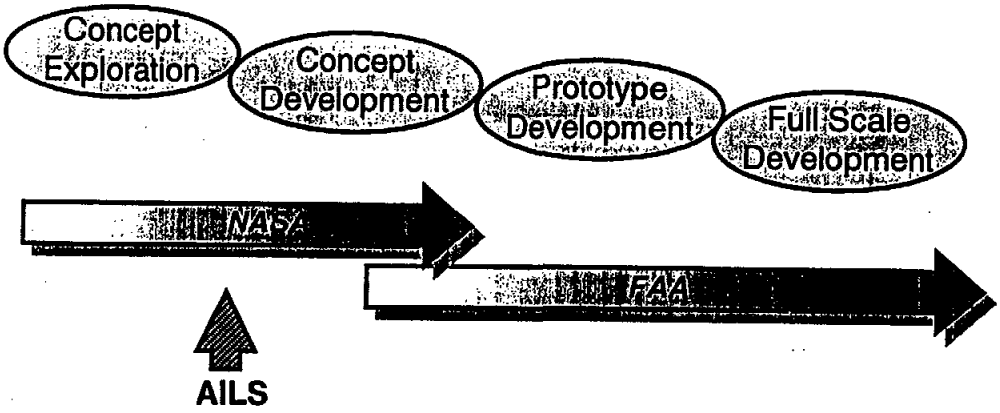
Terminal Area Productivity

Advanced Subsonic Technology

Airspace Technology Development Model



Risk Assessment

- Technological Risk - Low
- Implementation Risk - Depends on Industry Leadership
  - > Roles & Responsibilities
  - > Fleet Equipage

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RSO and AILS Program Description and Overview

Presentation to the

NASA Workshop on Flight-Deck-Centered Parallel Runway Approaches in IMC

NASA Langley Research Center

October 29, 1996

R. Brad Perry
Manager, Reduced Spacing Operations
NASA Langley Research Center

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Reduced Spacing Operations

Terminal Area Productivity

Reduced Spacing Operations (RSO) Research Areas

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- FMS/Center TRACON Automation System (CTAS)
  - NASA research to integrate FMS and CTAS capabilities
- Aircraft Vortex Spacing System (AVOSS)
  - NASA research to develop a dynamical aircraft wake vortex spacing capability for CTAS
- Airborne Information for Lateral Spacing (AILS)
  - NASA research to develop a flight deck-centered solution to IMC approaches to closely spaced parallel runways

Reduced Spacing Operations

Terminal Area Productivity

FMS/Center/TRACON Automation System (CTAS) Integration

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- CTAS and FMS perform some similar functions
  - Calculate flight trajectories based on airplane performance
- CTAS and FMS have different objectives
  - FMS strives to minimize aircraft operating cost
  - CTAS strives to provide safe and efficient scheduling and separation of all aircraft
- Integration of FMS with CTAS has the potential to enhance both systems

Reduced Spacing Operations

Terminal Area Productivity

Aircraft Vortex Spacing System (AVOSS) Concept

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- Separate aircraft from encounters with wake vortices of an operationally unacceptable strength
- Define protected corridor from outer marker to runway and predict time for vortex to clear corridor ("Transport Time")
- Define operationally unacceptable wake strength and predict time to decay ("Decay Time")
- Combine "Transport Time" and "Decay Time" into "Residence Time" and provide to ATC automation
- Monitor safety and provide predictor feedback with a wake vortex detection subsystem

Reduced Spacing Operations

Terminal Area Productivity

Airborne Information for Lateral Spacing

- AILS research goal of applying modern technology to develop procedures, tools, etc. to enable independent approaches to parallel runways with spacings less than the current 3400' Precision Runway Monitoring (PRM) spacing
- AILS research assumptions include:
  - Flight crews responsible for aircraft separation as with visual approaches
  - Information exchange between aircraft at least once per second (e.g., ADS-B)
  - Precise approach navigation (e.g., DGPS)
  - Worst case intrusion scenario of a 30 degree intercept
  - Alerting algorithms and timely evasive maneuvering to avoid intruder aircraft

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TAP/Reduced Spacing Operations

Reduced Spacing Operations

Terminal Area Productivity

Industry/User Interest in AILS

- Seattle-Tacoma International capacity enhancement planning for a new parallel runway at 2500' or 1800' lateral spacing
- Boston Logan International loss of capacity in IMC with existing parallel runway lateral spacing
- Two major avionics companies have identified significant technical feasibility and market potential
- United Airlines interest in improving IMC capacity at San Francisco International
- Ongoing interaction and support from FAA/Precision Runway Monitoring (PRM) Program

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TAP/Reduced Spacing Operations

Reduced Spacing Operations

Terminal Area Productivity

AILS Simulation Studies Overview

- Three NASA simulation studies to date (Two Langley and one Ames)
- Two different simulation fidelities used
  - Langley studies used the Transport System Research Vehicle (TSRV) simulator
  - Ames used desk-top simulator
- Different cockpit displays (PFD and ND) used by Langley and Ames
- Aircraft control mode varied
  - Langley studies manual (hand flown)
  - Ames study auto-coupled

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Reduced Spacing Operations

Terminal Area Productivity

AILS Simulation Studies Overview (continued)

- Approach navigation varied
  - Langley used DGPS
  - Ames used ILS
- Different alerting algorithms used in each study
- Different alerting displays used in each study
- Evasive guidance commands varied
  - Two studies used evasive guidance (different versions)
  - One study used none

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AILS Simulation Studies Overview (continued)

- Evasive maneuvering in all three studies was manually flown
  - Langley used a trained, consistent evasive maneuver
  - Ames evasive maneuver varied with encounter configuration
- Test subject utilization varied
  - Two studies used single test subjects as the pilot flying
  - One study used a two member test subject crew
- All three studies used current EFIS-qualified airline pilots as test subjects

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Upcoming AILS Simulation Study and Flight Demonstration Schedule

- Follow-on simulation experiment(s) as applicable
- Nov 1996: Integrated required navigation performance test using single NASA aircraft
- Nov 1998: Conflict detection and resolution test using two NASA aircraft
- 1999: Integrated AILS Terminal Area Productivity (TAP) flight demonstration (Two Aircraft)

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Some Major Issues to Resolve in Implementing AILS Operationally

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- Datalink (e.g., ADS-B) availability
- Enhanced aircraft navigation availability (e.g., DGPS)
- Airline fleet equipage
- Airborne/ground roles and responsibilities
- AILS certification and operational readiness
- Others??

FLIGHT DECK CENTERED CLOSE PARALLEL RUNWAY APPROACHES: 3400 and 2500 FT

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Marvin Waller and Charles Scanlon

October 1996

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AILS CONCEPT TEAM

Marvin Waller	NASA LaRC
Charles Scanlon, Ph.D.	NASA LaRC
Brad Perry	NASA LaRC
Leonard Credeur	NASA LaRC
Terry Abbott	NASA LARC
Trent Thrush	NASA ARC
Kevin Corker, Ph.D.	NASA ARC
William Rodgers	Lockeed-Martin
William Capron	Lockeed-Martin
John Barry	Lockeed-Martin
David Simmons, Capt.	Lockeed-Martin
Richard Gifford, Capt.	Lockeed-Martin
Gary Lohr	JIL Corp.
Steve Koczo	Rockwell-Collins
Scott Chamberlin	Rockwell-Collins
James Kuchar, Ph.D.	MIT
Brenda Carpenter	MIT
Amy Pritchett	MIT

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OUTLINE

APPROACH

ASSUMPTIONS

CONCEPT

EXPERIMENT OBJECTIVES

EXPERIMENT DESIGN

RESULTS

CONCLUSIONS

APPROACH

(3400 and 2500 FT RWY SPACING STUDY)

- LaRC TEAM DESIGNED INITIAL CONCEPT FOR CLOSELY SPACED PARALLEL APPROACHES USING FLIGHT DECK CENTERED TECHNOLOGY
- TEST THE DESIGN IN A STUDY IN THE TSRV FIXED BASED FACILITY
- COMPARE PERFORMANCE WITH TWO FLIGHT DECK DISPLAY PRESENTATIONS
  - MINIMAL MODIFICATIONS TO CURRENT GLASS FLIGHT DECKS, 10 NM DISPLAY RANGE IN ND
  - DESIGN TEAM CONFIGURATION, 2 NM DISPLAY RANGE

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ASSUMPTIONS

- RESPONSIBILITY FOR SEPARATION WILL BE HANDED OFF TO THE FLIGHT DECK AS IN VMC
- ATC WILL BE AVAILABLE TO ASSUME CONTROL AFTER RESOLUTION OF AN INTRUSION
- ACCURATE SENSING TECHNOLOGY WILL PROVIDE NEEDED MEASUREMENTS FOR NAVIGATION AND DISPLAYS
- NON-AUTOPILOT MODE (ATTITUDE CONTROL WHEEL STEERING)
- 1000 FT. VERTICAL SEPARATION ON INTERCEPTING THE LOCALIZER
- GLASS FLIGHT DECK (SOFTWARE MODIFICATIONS)
- ON BOARD ALERTING ALGORITHMS OPERATIONAL

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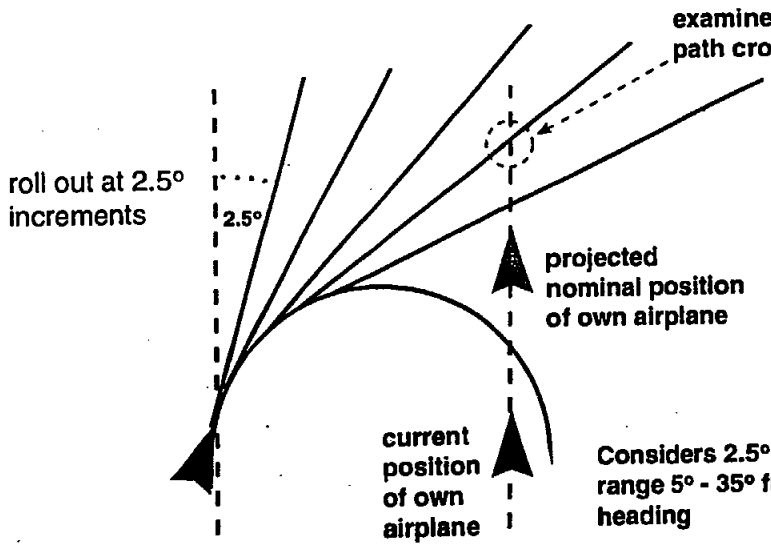
SEGMENTED ALERTING CRITERION

(BASED ON ROCKWELL- COLLINS CONTRACTED DEVELOPMENT)



D2 = 2000 FT
TAU2 = 30 SEC

D3 = 1000 FT
TAU3 = 15.5 SEC

Considers 2.5° increments in the range 5° - 35° from the runway heading

Level two alert if at projected crossing at time ≤ TAU2, separation less than ≤ D2

Level three alert if at projected crossing at time ≤ TAU3, separation ≤ D3.

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CONCEPT DESIGN

APPLY FLIGHT DECK CENTERED TECHNOLOGY TO ASSIST THE FLIGHT CREW IN

- ACCURATE NAVIGATION DURING CLOSELY SPACED PARALLEL APPROACHES
- AVOIDING CLOSER THAN 500 FT. ENCOUNTERS IN THE EVENT OF AN INTRUSION INCIDENT

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FLIGHT DECK PROCEDURES
TO ASSIST PILOTS IN ACCURATE NAVIGATION

- PILOT FLYING CAPTURES THE LOCALIZER AND GLIDESLOPE AND MAINTAINS THE FLIGHT WITHIN ONE DOT OF LOCALIZER DEVIATION

- ONE DOT LOCALIZER DEVIATION TRIGGERS AN ALERT WITH AMBER DISPLAY COLOR CHANGES (LEVEL TWO)

- TWO DOTS LOCALIZER DEVIATION TRIGGERS AN ALERT WITH RED DISPLAY COLORS, AURALS AND REQUIREMENT TO EXECUTE AN EMERGENCY TURN AND CLIMB PROCEDURE (LEVEL THREE)

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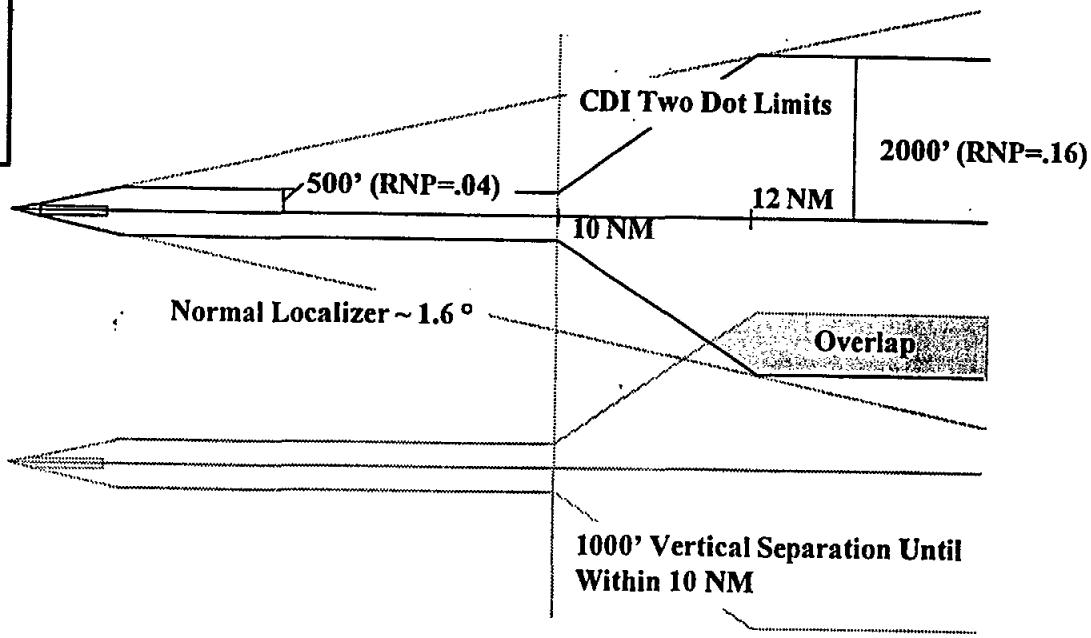
Required Navigation

"Rocket Ship"



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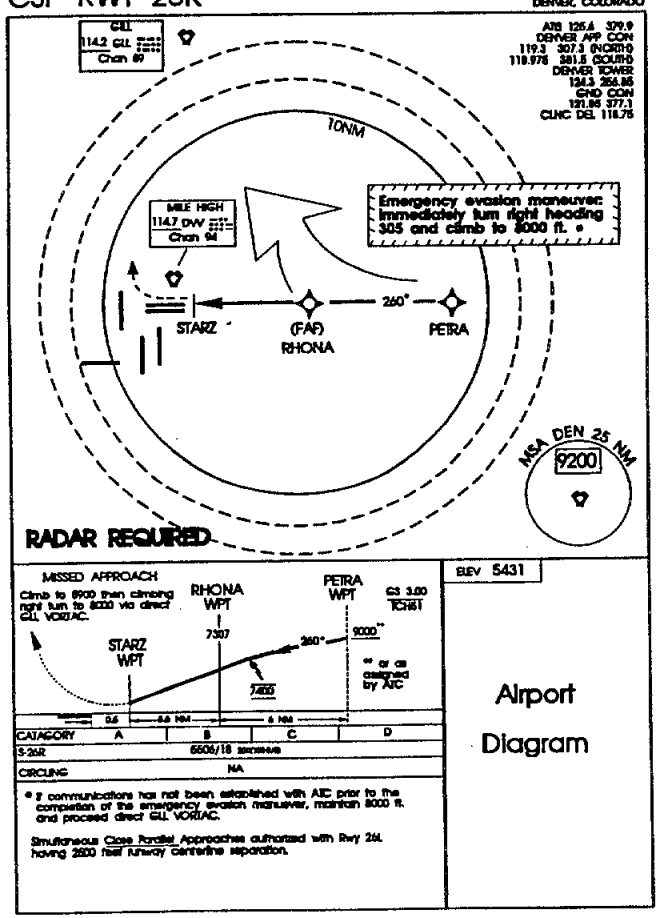
CSP RWY 26R

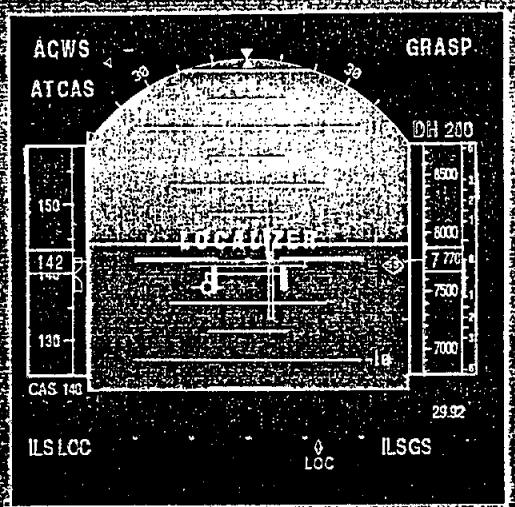
DENVER INTL (DEN)
DENVER, COLORADO

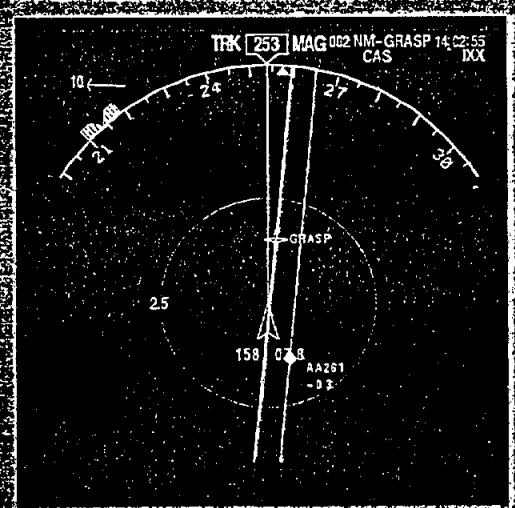


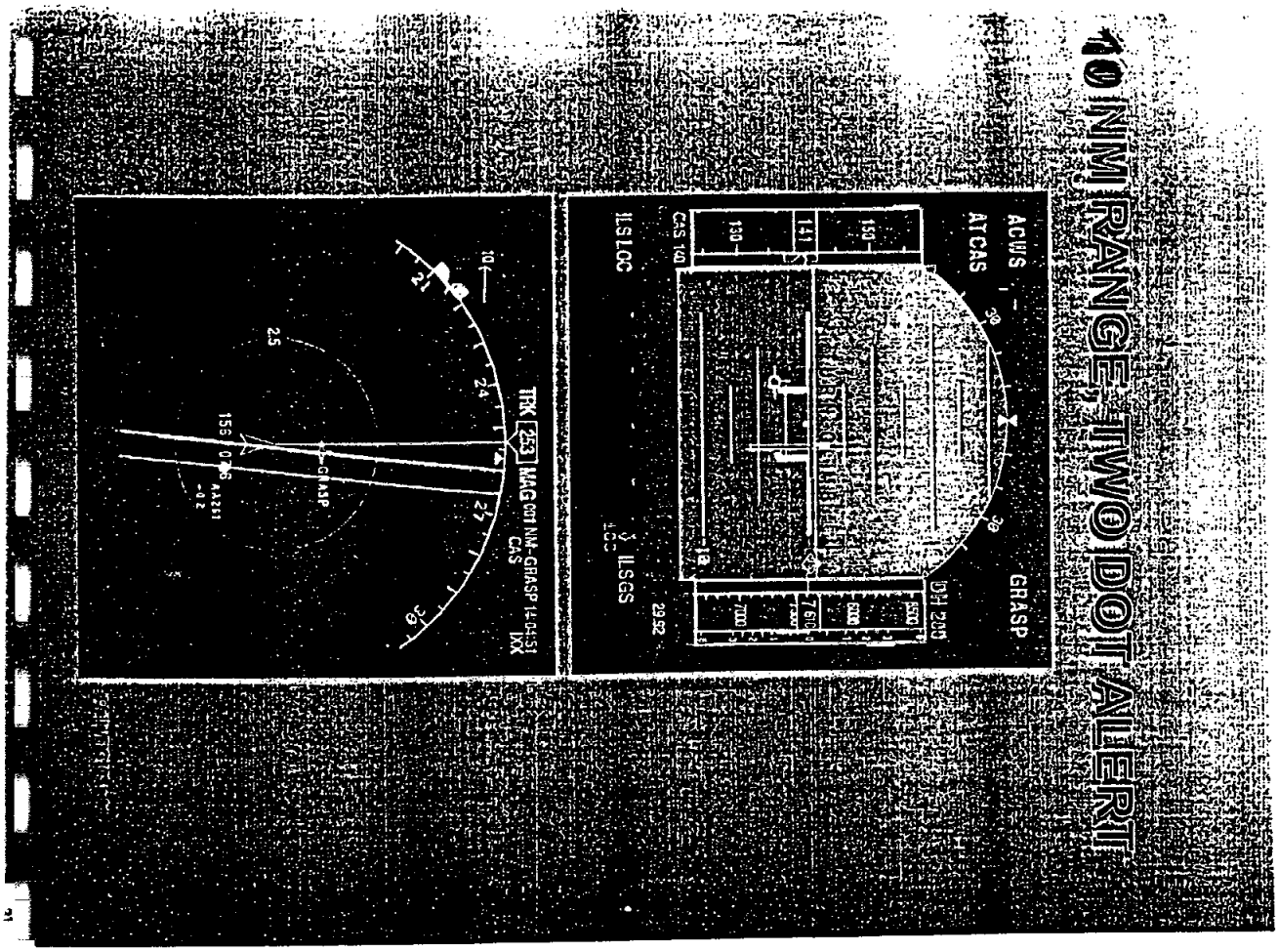
CSP RWY 26R

DENVER INTL (DEN)
DENVER, COLORADO

10 NM RANGE, LOCALIZER ALERT







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FLIGHT DECK PROCEDURES
IN THE EVENT OF AN INTRUDER ALERT

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- EXECUTE AN IMMEDIATE CLIMBING, ACCELERATING TURN AWAY FROM THE TRAFFIC TO A HEADING 45 DEGREES FROM THE RUNWAY HEADING (AS PUBLISHED ON THE APPROACH PLATE), LEVEL THREE ALERT

- CONTACT ATC AS USUAL ON DEVIATING FROM CLEARANCE

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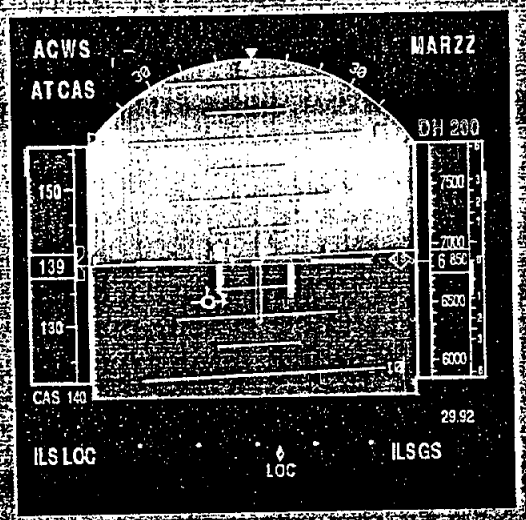
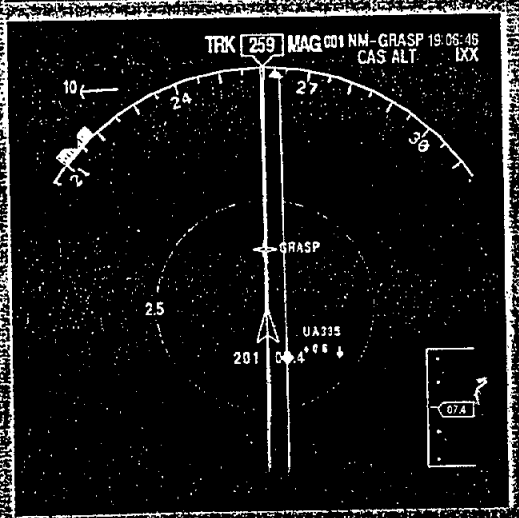
10 NM RANGE, NO ALERTS





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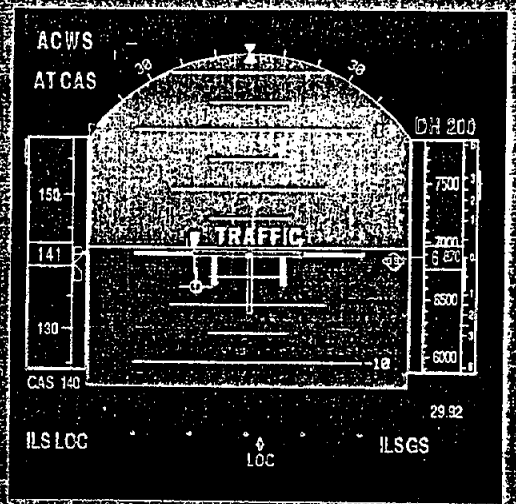
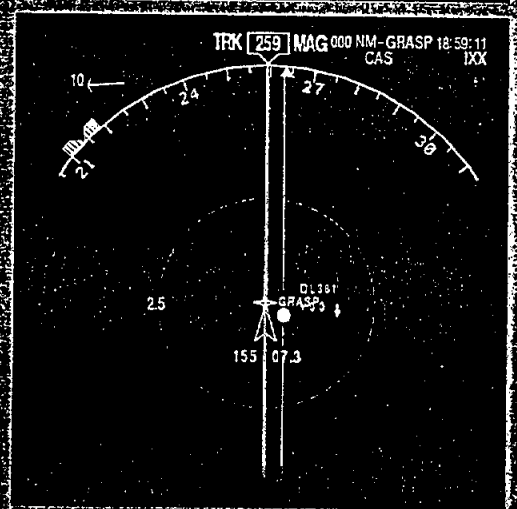
10 NM RANGE, TRAFFIC ALERT





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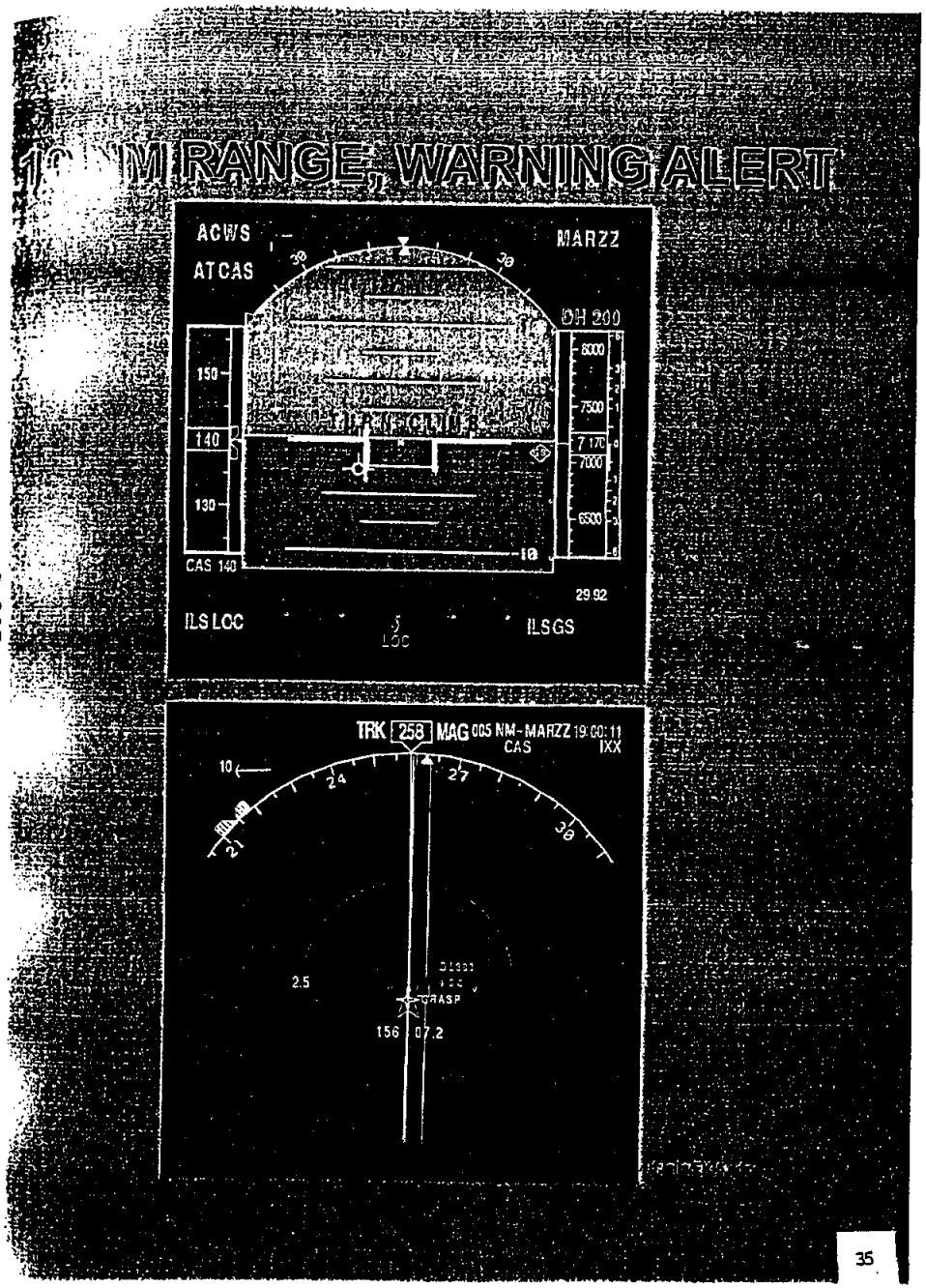
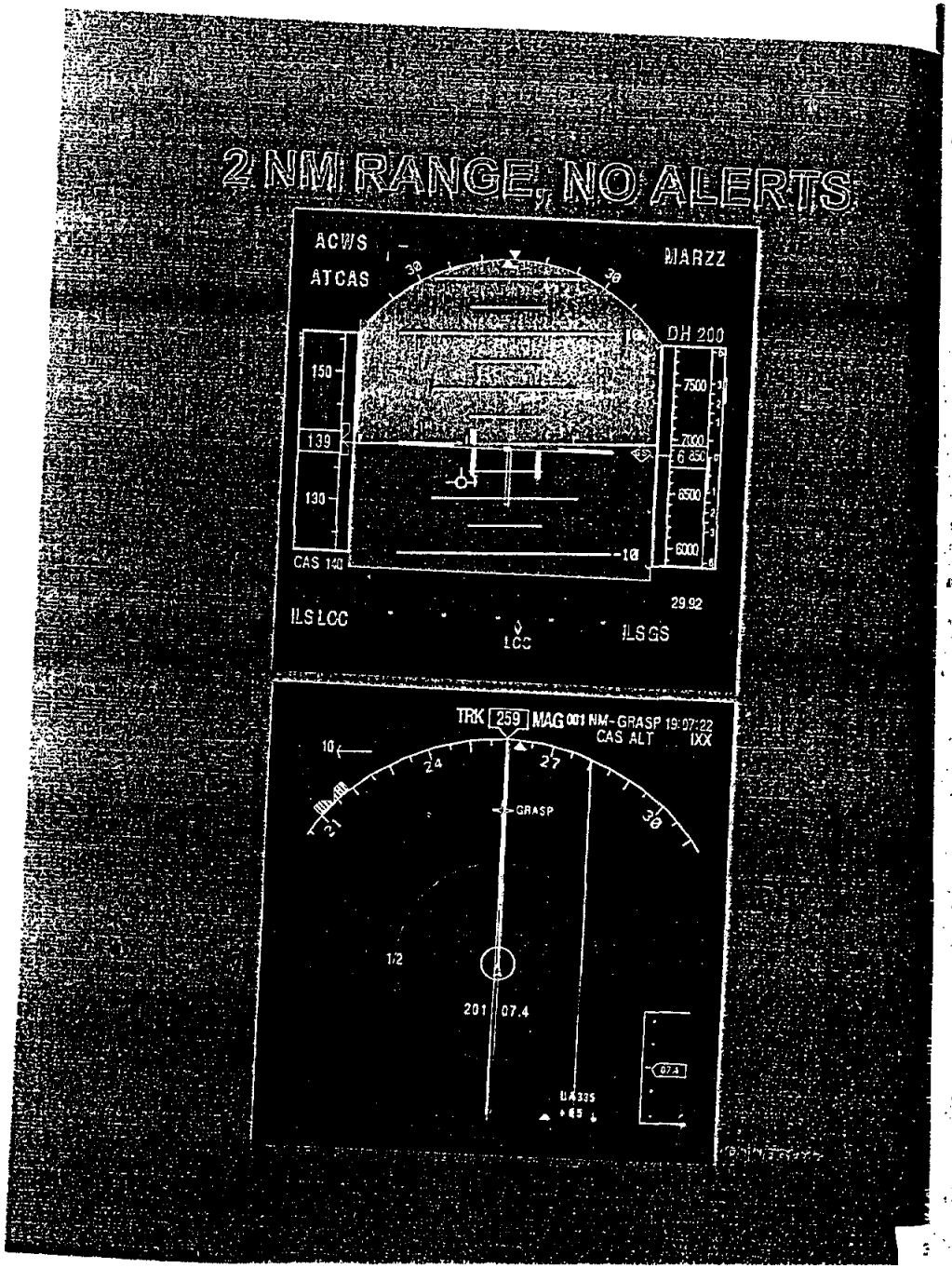

1 NM RANGE, WARNING ALERT
ACWS
ATCAS
MARZZ
DH 200
150
140
130
CAS 140
29.92
ILS LOC
LOC
ILS GS
TRK 258 MAG 005 NM - MARZZ 19:00:11
CAS
IXX
GRASP
156 07.2
2.5
35


2 NM RANGE, NO ALERTS
ACWS
ATCAS
MARZZ
DH 200
150
139
130
CAS 140
29.92
ILS LOC
LOC
ILS GS
TRK 259 MAG 001 NM - GRASP 19:07:22
CAS ALT
IXX
GRASP
1/2
201 07.4

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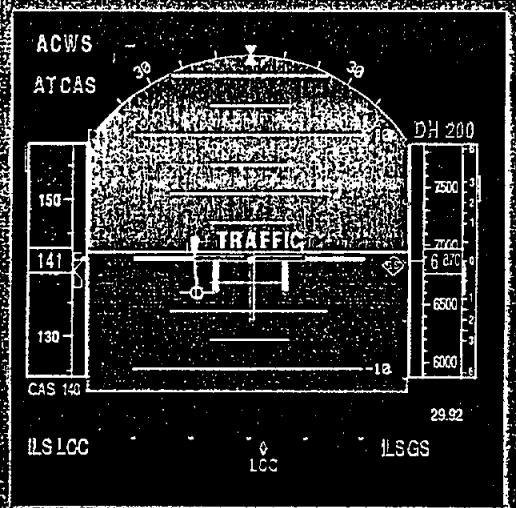
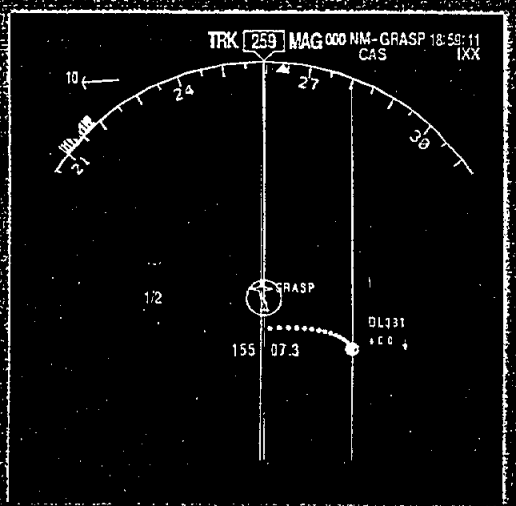
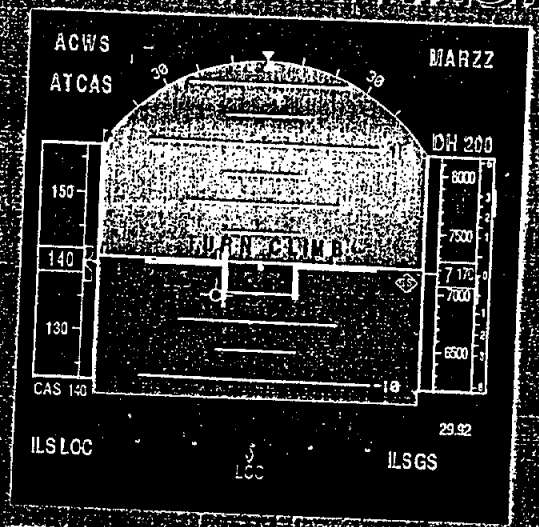
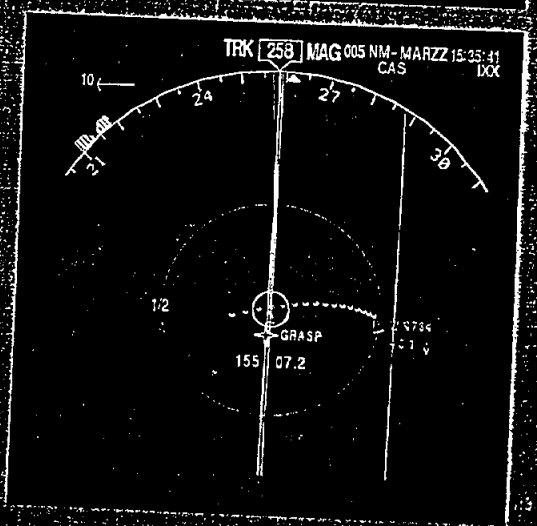
2 NM RANGE, TRAFFIC ALERT





2 NM RANGE, WARNING ALERT





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EXPERIMENT OBJECTIVE

EVALUATE, IN SIMULATION, AN EXPERIMENTAL CONCEPT FOR CONDUCTING PARALLEL RUNWAY OPERATIONS IN IMC. THE CONCEPT INCLUDES

- INFORMATION PROCESSING
- DISPLAYS
- PROCEDURES

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TEST MATRIX

- RUNWAY SPACINGS
  - 3400 FT.
  - 2500 FT.
- TWO DISPLAY LEVELS
  - MODIFIED CONVENTIONAL (10 NM RANGE)
  - DISIGN TEAM ENHANCED (2 NM RANGE)
- TWO INTRUDER SPEEDS
  - INTRUDER 30 KNOT FASTER
  - INTRUDER 30 KNOTS SLOWER
- SEVEN SCENARIOS
  - FIVE WITH 30° HEADING DEVIATION
  - ONE NORMAL
  - ONE WITH PARALLEL TRAFFIC BREAKOFF

TEST VARIABLES

- INDEPENDENT VARIABLES
  - DISPLAYS 2 LEVELS
  - RUNWAY SPACINGS 2 LEVELS
  - RELATIVE SPEED OF AIRCRAFT 2 LEVELS
  - SCENARIOS 7 LEVELS

16 LINE AND MANAGEMENT PILOTS

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(56 RUNS / PILOT, IN 2 TEST DAYS, 6 RUNS /HR.)

DEPENDENT VARIABLES
- PILOT REACTION TIME
- CLOSEST APPROACH DISTANCE
- PILOTS EVALUATIONS
- PILOT SCANNING BEHAVIOR

SIMULATED AIRSPACE

- DENVER INTERNATIONAL AIRPORT (DIA)

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- CHANGE EXISTING RUNWAY 26 TO 26L, ADD RUNWAY 26R AT TWO DIFFERENT SPACINGS, WITH IDENTICAL DIMENSIONS, EVEN THRESHOLDS (NOT STAGGERED)

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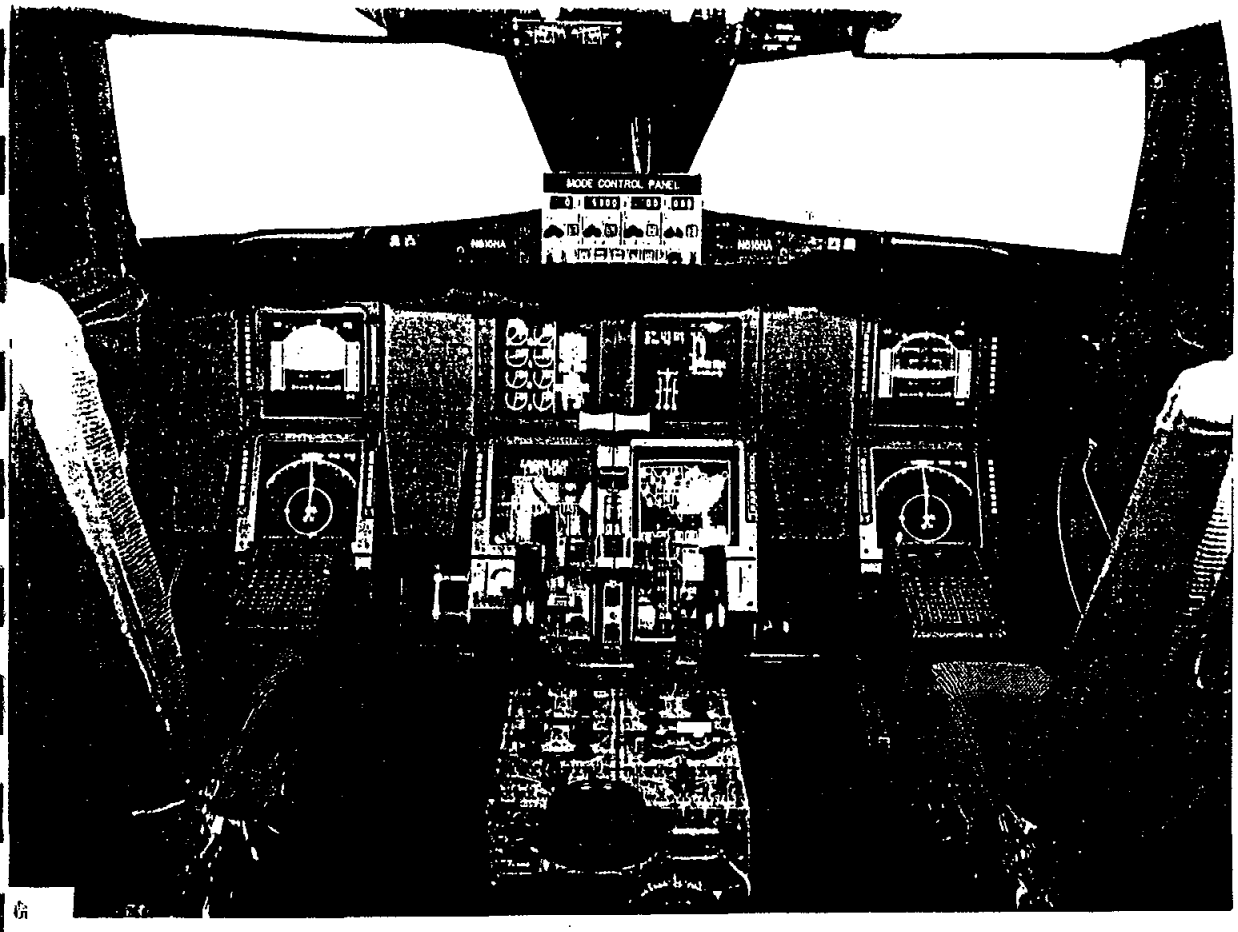
- LOCALIZER INTERCEPT ALTITUDES SEPARATED BY 1000 FT. AT 7400 AND 8400 FT



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PILOTS' EVALUATION

- This is definitely a realistic process and an execellent start
- The pilots generally preferred the 2 NM display capability
- They felt that the task can be accomplished adequately with the 10 NM map scale
- Recommended that the escape heading be displayed in the PFD
- Recommended providing escape guidance in the PFD. Most recommended using the FD command bars
- Felt that the pilot flying would use the ND display in a minimal manner, while a PNF would pay heavy attention to the traffic display

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PILOT REACTION TIME

(From level three alert until 50% lateral side stick deflection)

	Count	Mean	Std	Max	Min
10 Miles					
Average	192	0.70	0.19	1.31	0.03
2500 ft.	96	0.71	0.19	1.28	0.19
3400 ft.	96	0.69	0.20	1.31	0.03
2 Miles					
Average	192	0.73	0.25	1.78	0.03
2500 ft.	96	0.73	0.22	1.44	0.41
3400 ft.	96	0.72	0.28	1.78	0.03

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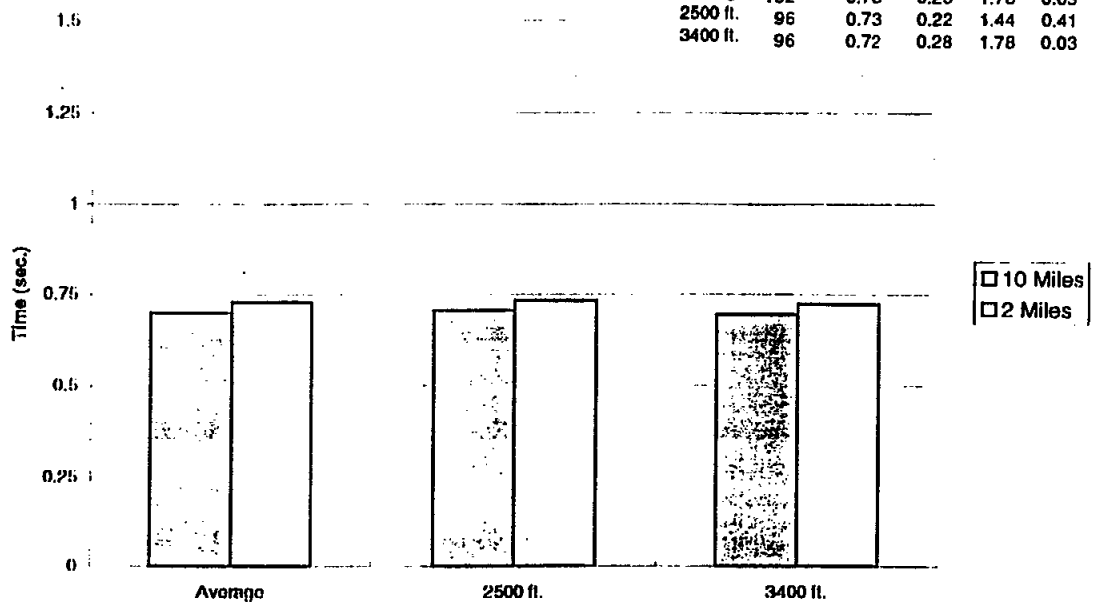

Minimum Separation From Time of Alert to End

	Count	Mean	Std	Max	Min
10 Miles					
Average	192	1953	274	2395	1183
2500 ft.	96	1921	293	2395	1183
3400 ft.	96	1986	251	2355	1319
2 Miles					
Average	192	1939	258	2437	1242
2500 ft.	96	1927	268	2437	1242
3400 ft.	96	1960	248	2298	1276

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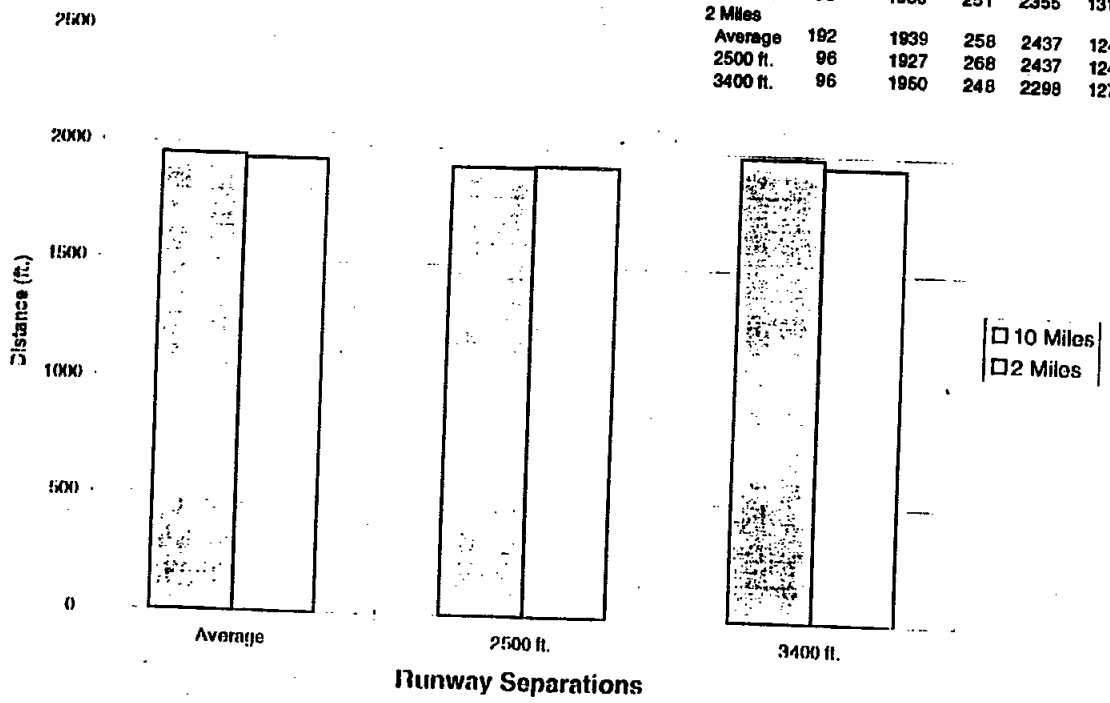
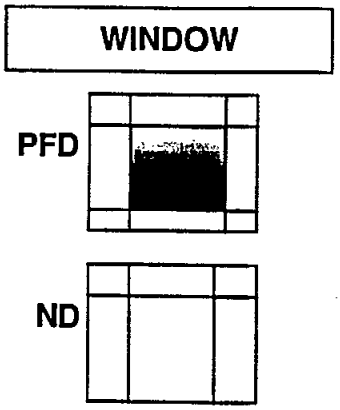


LOOK POINT DATA



CENTER OF PFD
(ATTITUDE/COMMAND BARS)

	DWLSEC	DWLPCT	NO-FIX.	PCT-FIX	DUR-FIX
MEAN 10 NM	224.48	11.13	64.56	8.63	12.82
MEAN 2 NM	218.96	10.44	71.63	7.66	10.96
t-VALUE (2 TAIL)	0.77	-1.45	-2.84	2.37	3.04
SIGNIFICANCE	0.437	0.147	.005	.018	.003

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CONCLUSIONS

- THE CONCEPT APPEARS TO BE PROMISING FOR APPROACHES TO RUNWAYS SEPARATED 3400 FT AND 2500 FT.
- PILOT REACTION TIME WAS LESS THAN THE TARGETED 2 SECOND MAXIMUM VALUE.
- THE MEAN VALUE OF THE CLOSEST APPROACH WAS APPROXIMATELY 1950 FT. WITH A SD OF 270 FT.
- THE CLOSEST APPROACH FOR ALL RUNS WAS 1183 FEET.
- THE PILOTS LIKED THE PROCESS AND OFFERED NO RESERVATIONS ABOUT FLYING IT.
- SOME RECOMMENDATIONS FOR DISPLAY MODIFICATIONS WERE MADE.

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Airborne Information for Lateral Spacing: NASA Flight-Deck-Centered Workshop Review

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TT-10/29/96 Pg 01

Overview

- Objectives
- Previous Research
- Assumptions
- Approach
- Measures
- Results
- Conclusions

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Objectives

- Investigate airborne alerting/collision-avoidance systems (CAS) that could enable pilots to conduct simultaneous approaches to closely-spaced (< 3400 ft) parallel runways in Instrument Meteorological Conditions (IMC)
- Investigate the performance differences between a current airborne alerting/CAS based on 2D (vertical) guidance for conflict resolution against an alternative alerting system utilizing 3D (vertical & lateral) guidance
- Investigate whether additional display information and extensions are beneficial in enabling pilots to conduct simultaneous approaches to closely-spaced parallel rwys
- Investigate whether pilots prefer additional display information and extensions to current displays

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Previous Research

- Traffic alerts and guidance commands are required for conflict resolution. Without alerts and collision avoidance commands, pilots had significantly more incidents with low aircraft separation and executed significantly more unnecessary avoidance maneuvers.
- The collision avoidance commands were not always followed. Guidance commands were satisfied in only about 60% of the maneuvers flown by the pilots.
- More informative displays of the intruders current state did not always produce better aircraft separation. This may be related to pilot's lower rate of conformance to the automatic commands with the displays, which in turn was correlated with lower performance.

- Amy Pritchett, MIT Aero Systems Lab, P-Rwy Ops Studies

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Assumptions

- Navigation Improvements: Current ILS augmented with ADS-B. Heading, ground speed, bank angle, and accurate position data exchanged between aircraft.
- Standard Alerting Levels and Traffic Symbology:
  - *Stage-1*: Amber-caution / Traffic Alert (TA)
  - *Stage-2*: Red-warning / Resolution Advisory (RA)

  Standard traffic symbology: Other-traffic, proximate-traffic, TA-traffic, and RA-traffic on ND-Map.
- Auto-coupled Approach Procedure: Auto-flight (AF) system/standard modes, dual-cue flight-director active.
- Worst-Case Blunder Scenario: Single encounter resulting in a 30° interception. Multiple aircraft not presented.
- Conflict Resolution Commands Provided: RA Guidance.

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Assumptions (cont'd)

- Escape maneuver flown manually: Auto-pilot disconnected, collision avoidance syst (CAS) guidance supersedes active flight-director guidance from AFS.
- No Collision Avoidance / AF System Integration: Current design where AFS modes, defaults and transitions are independent of airborne CAS.
- Modified Missed Approach Procedures: Subject aircraft continues on runway heading course or returns to runway heading course after successful conflict resolution.
- Part-Task Research Platform Suitable: Medium fidelity simulation, generic Glass Cockpit (EFIS) environment with integrated scenario generation and data-collection.
- Minimum Training Desirable: approx 2 hour duration.

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Experiment Design

- 20 Subjects
- Scenarios presented in Display/Alerting System sets. Within each set, Rwy Sep and Blunder Type were varied. One additional NO-blunder scenario was added to each set, resulting in 20 separate scenarios for each subject

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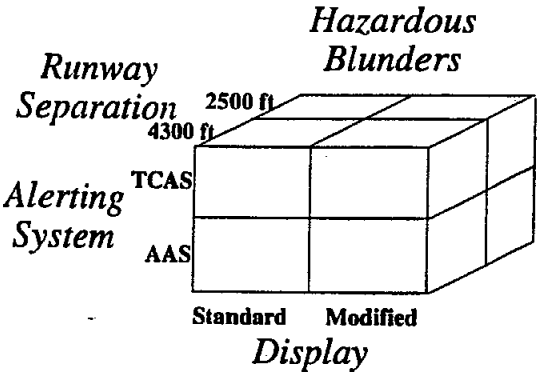

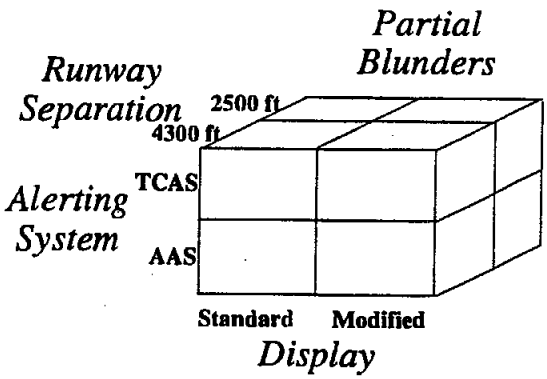

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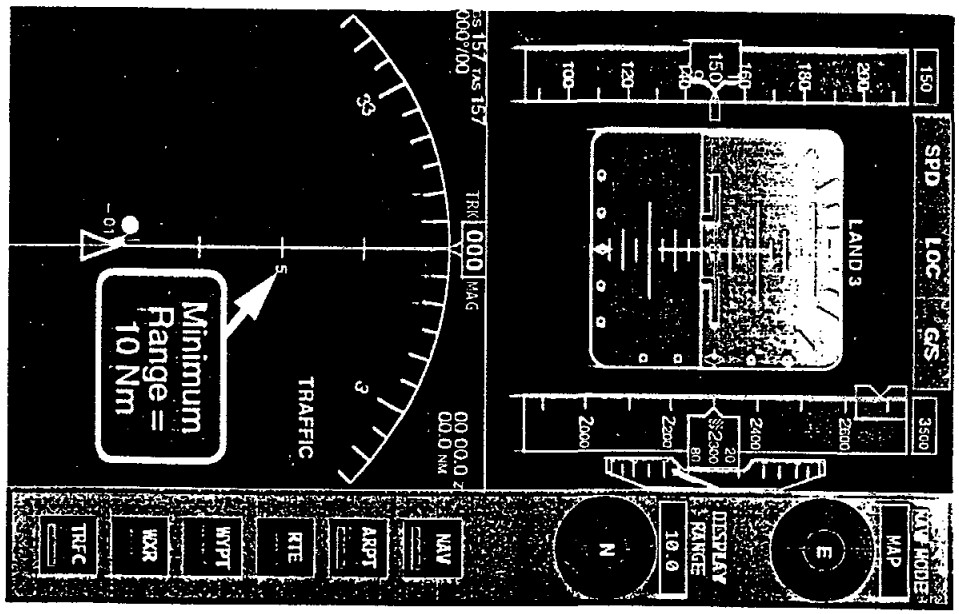

Traffic Alert, Standard Display Condition

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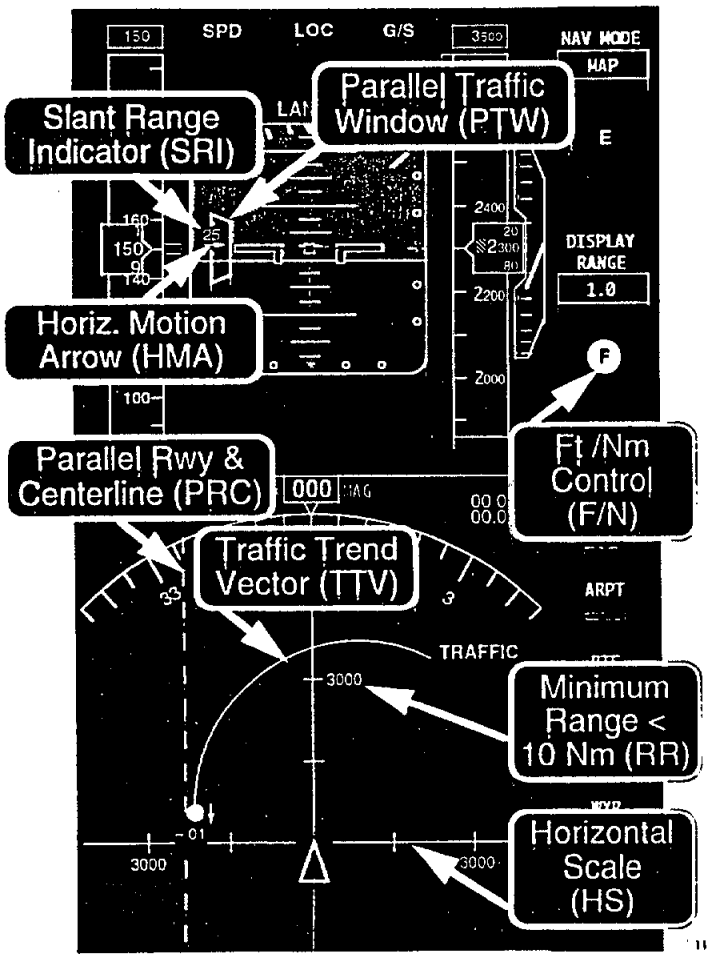
Traffic Alert, Modified Display Condition



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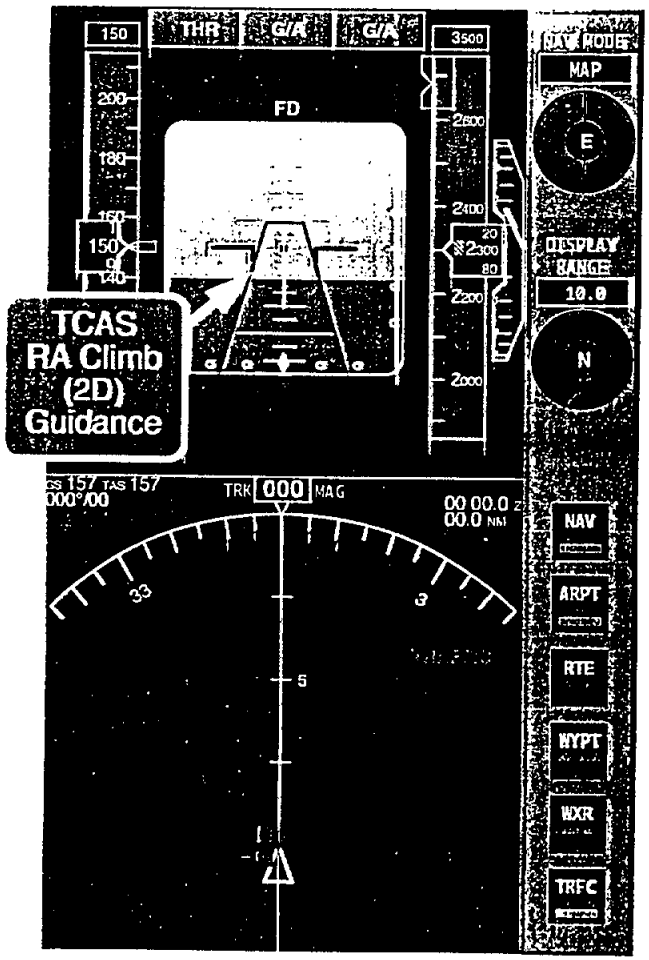
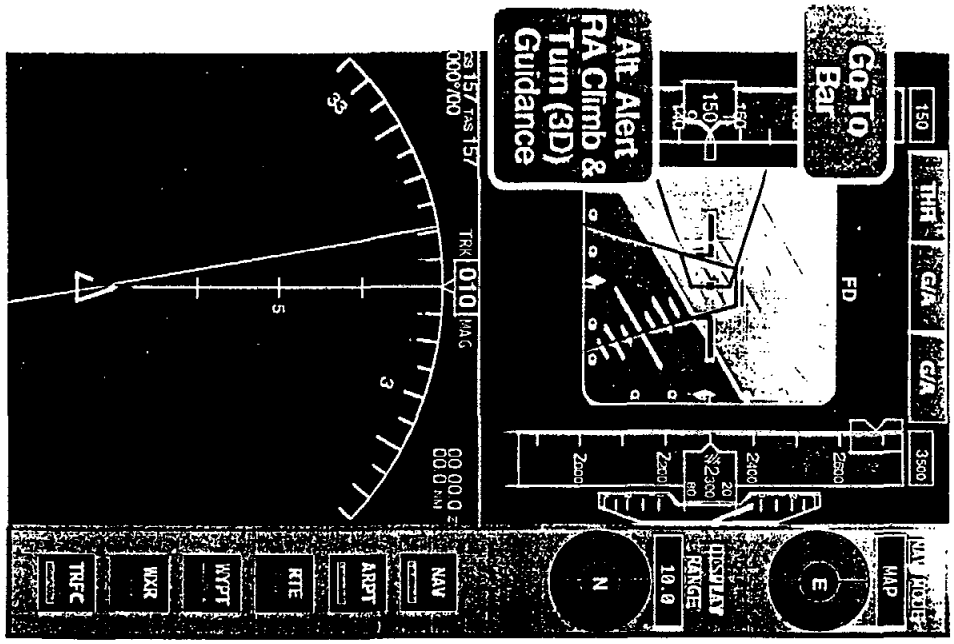
Resolution Advisory, TCAS Alerting System, Standard Display Condition





Resolution Advisory, Alternate Alerting System, Standard Display Condition

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Approach (cont'd)

Subjects

- All from a single, major air-carrier providing uniformity of procedures and training. Each pilot received all independent variables (within subjects design)

	Captain	First Officer	
737-300/500	2	3	25%
757/767	6	2	40%
747-400	5	2	35%
	65%	35%	

Mean Total Flight Hrs: 13,665 Mean # of RA's: 4.4

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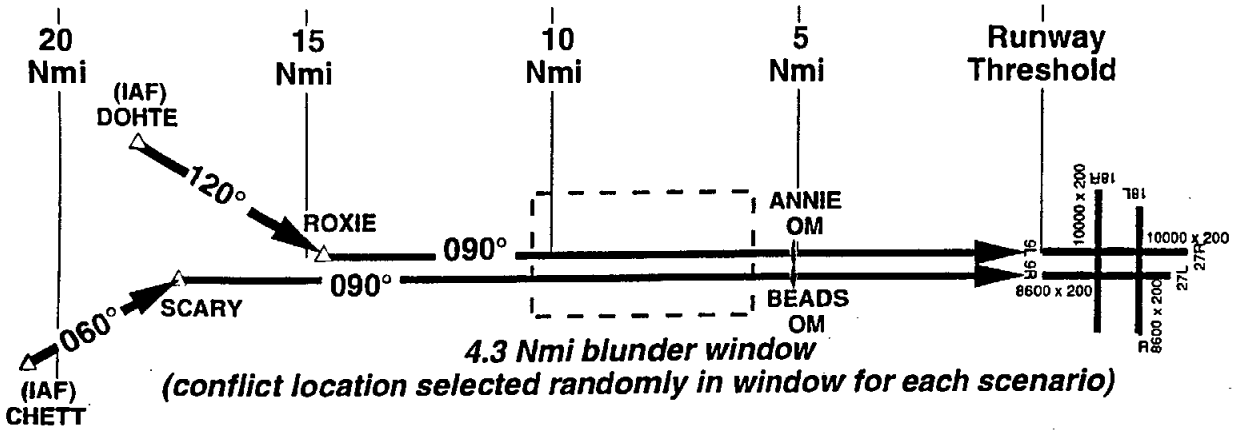
Scenario Geometry



- Four fictitious airports, each with sets of paired runways separated by 4300 ft and 2500 ft.
- Runway stagger provided three geometry conditions

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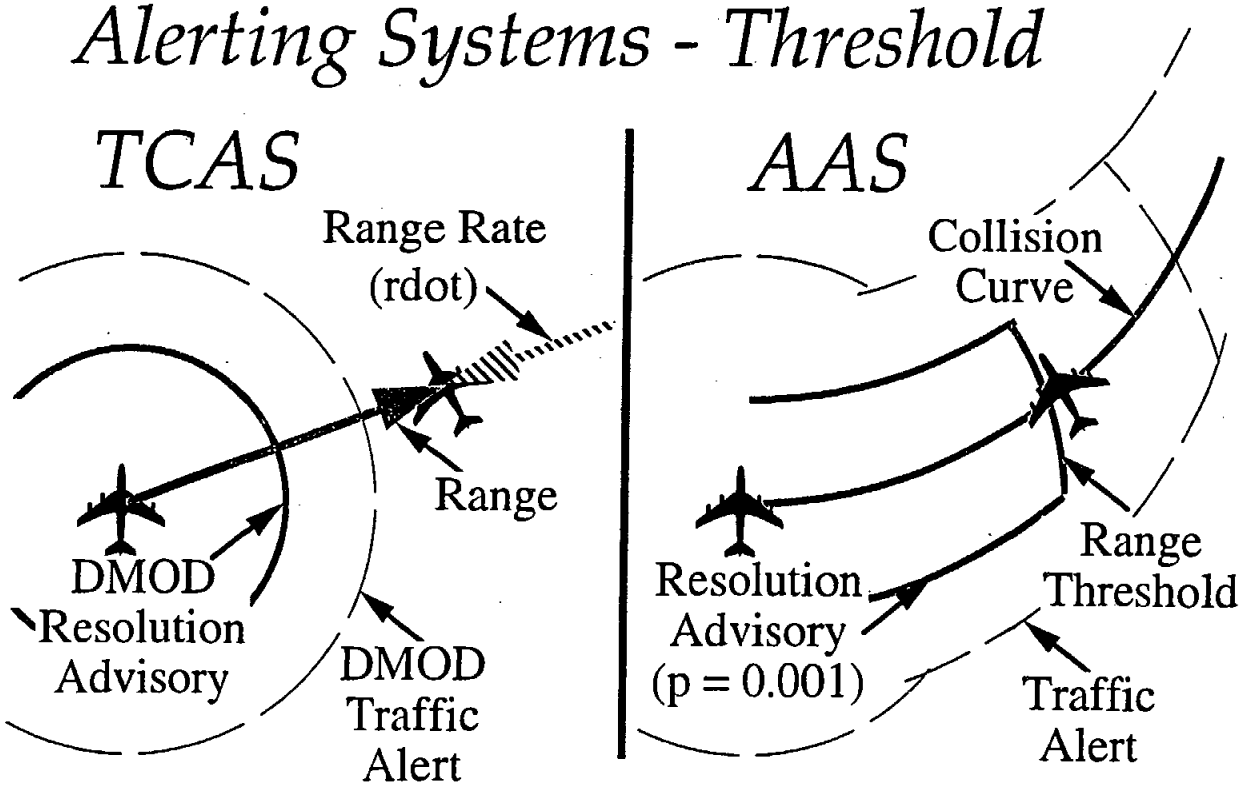
Alerting Systems - Threshold



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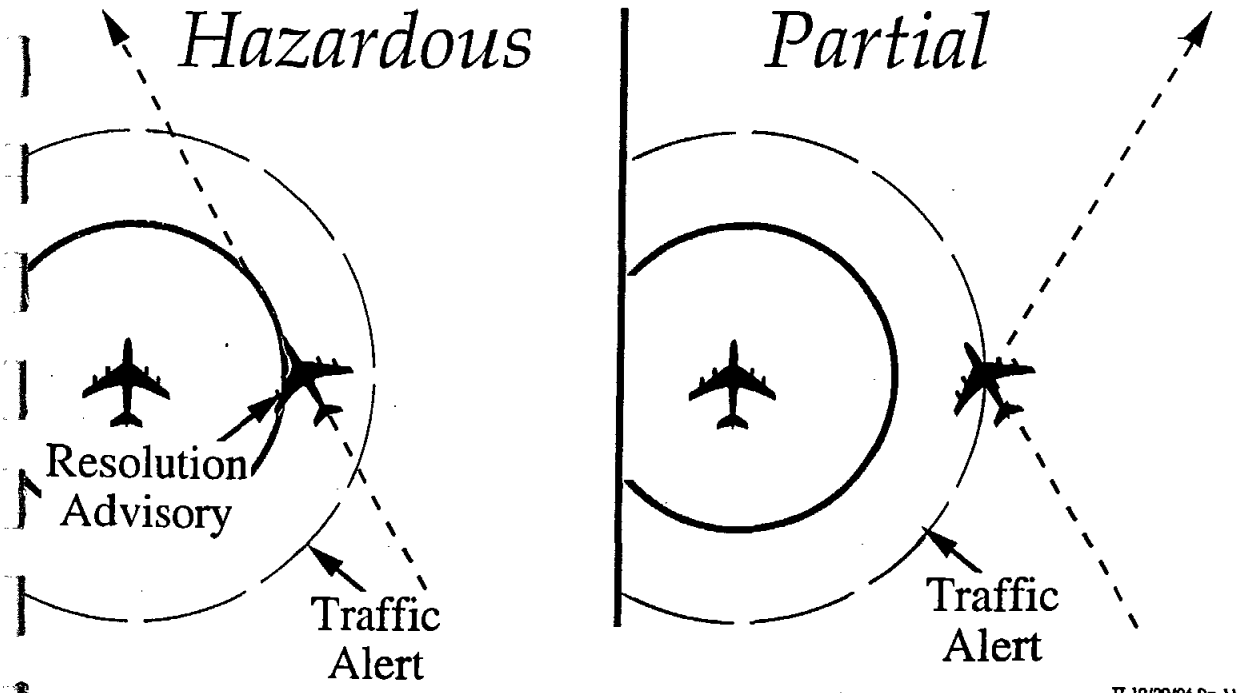
Blunder Type



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Measures

- Closest Point of Approach (Slant $Range_{CPA}$):
  alerting system/pilot effectiveness to maximize range
- Closure Distance Metric (Slant $Range_{RA}$ - $SRange_{CPA}$):
  alerting system/pilot effectiveness to minimize closure
- System Reaction Time to Conformance:
  time to initially satisfy conflict resolution requirements
- Conformance:
  properly satisfy system guidance commands
- Pilot False Alarm / Early Evasion:
  avoidance maneuver is performed without/before an RA
- Subjective Measures
  pilot ratings regarding display/element comparisons

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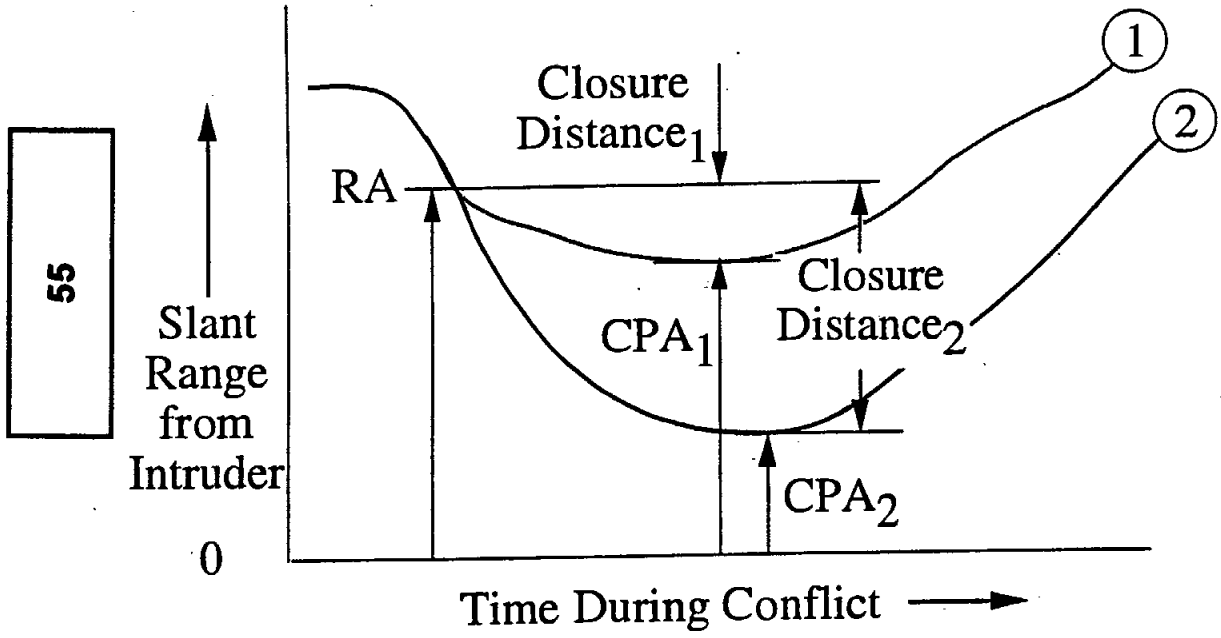
CPA and Closure Distance



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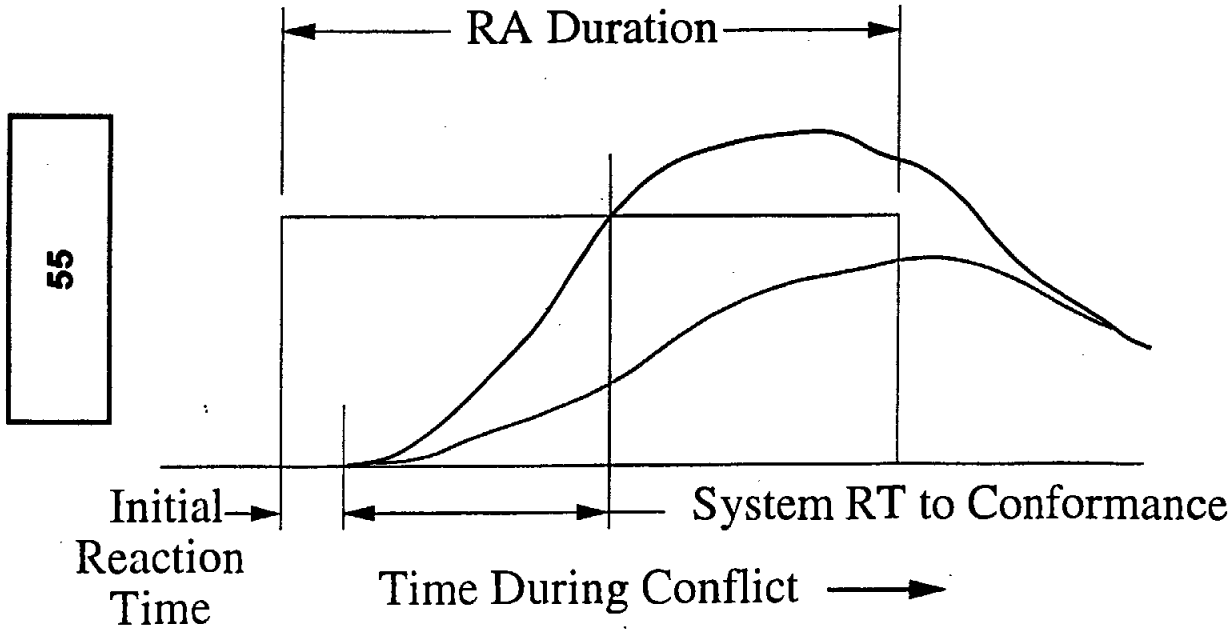
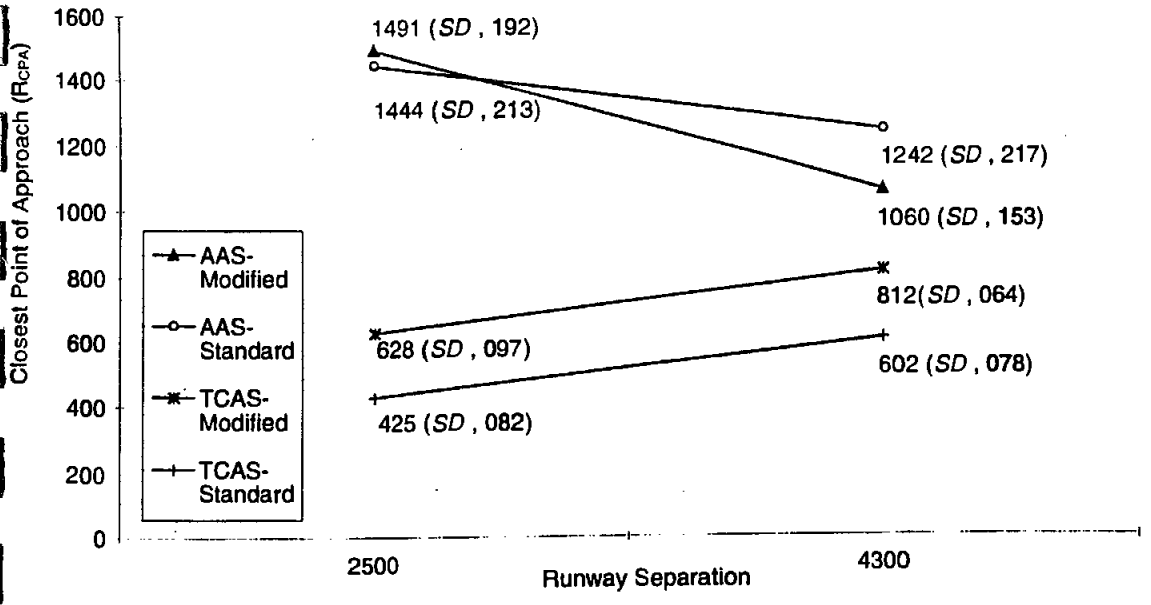
Measures (cont'd)

Conformance & Reaction Time



Closest Point of Approach



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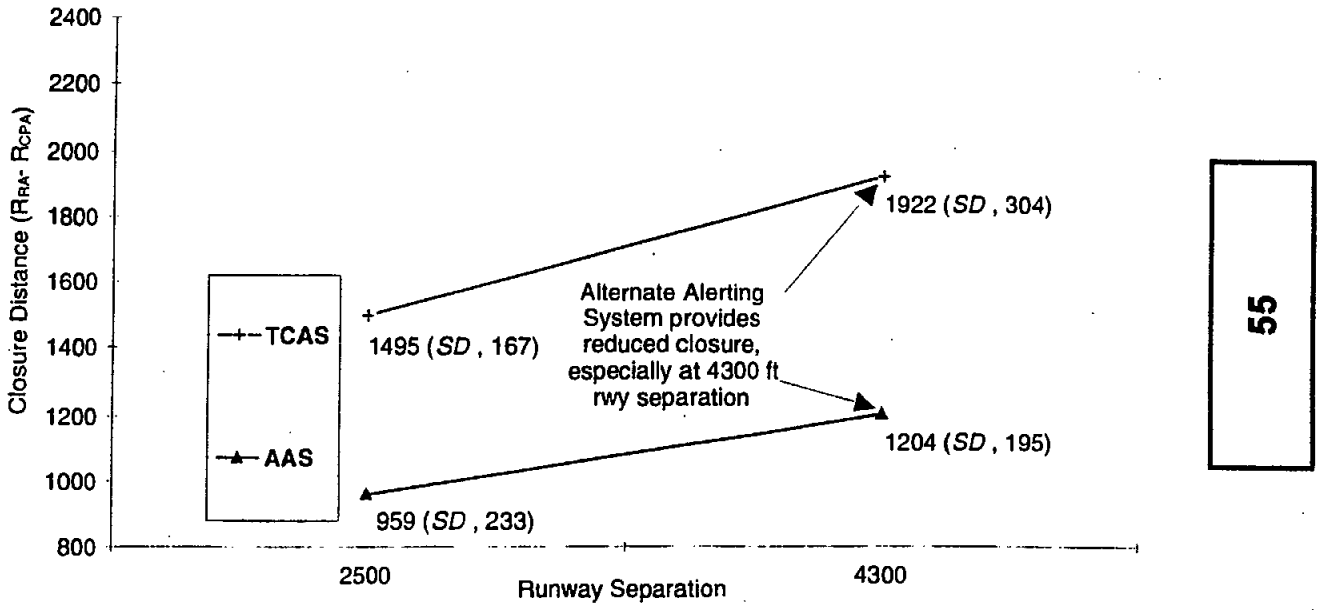
Closure Distance Metric (1)



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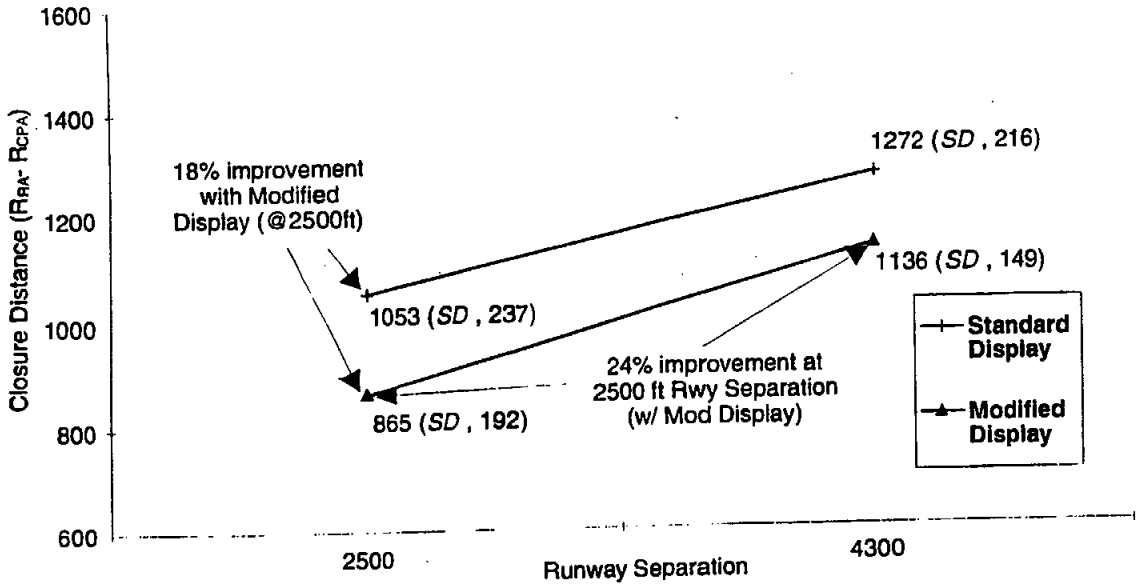
Closure Distance Metric (2)



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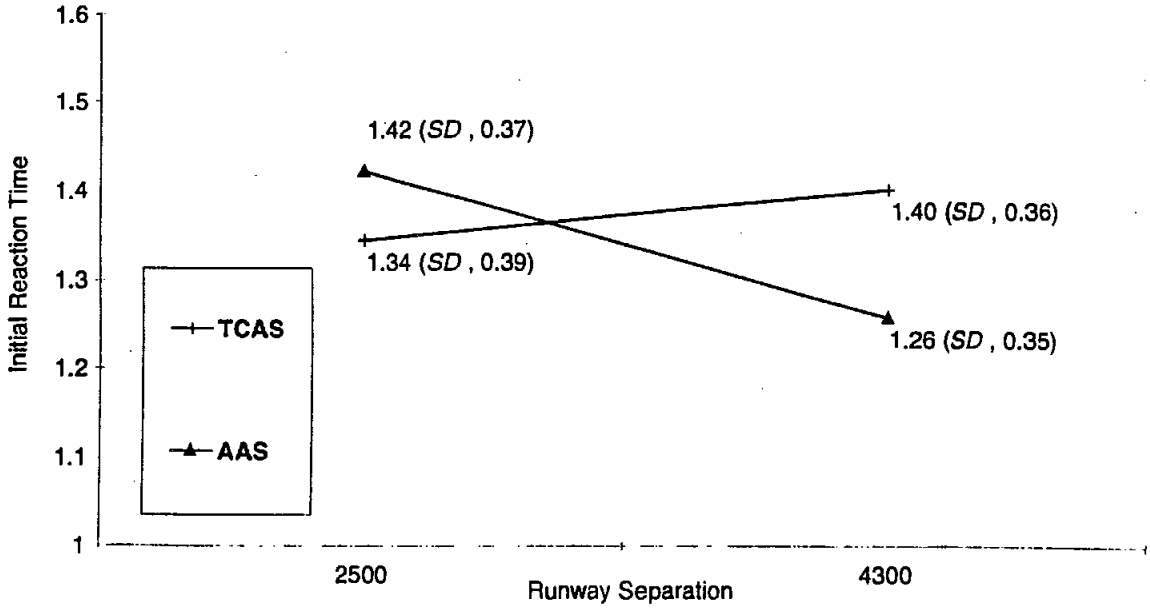
Initial Pilot Reaction Time



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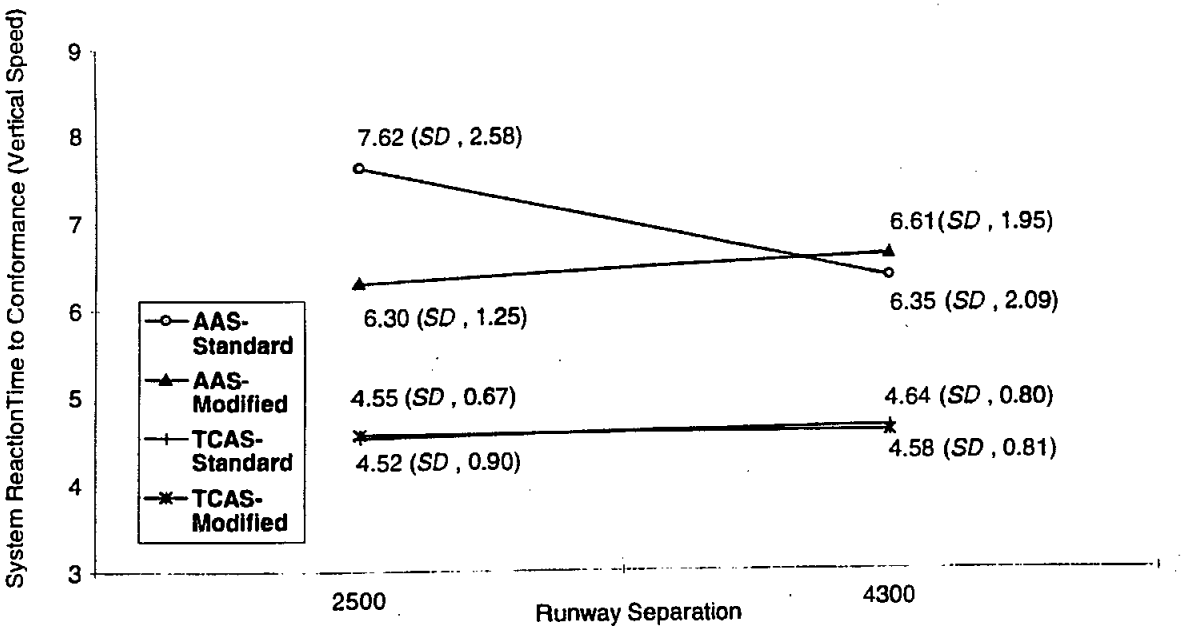
System RT to Conformance (VSP)



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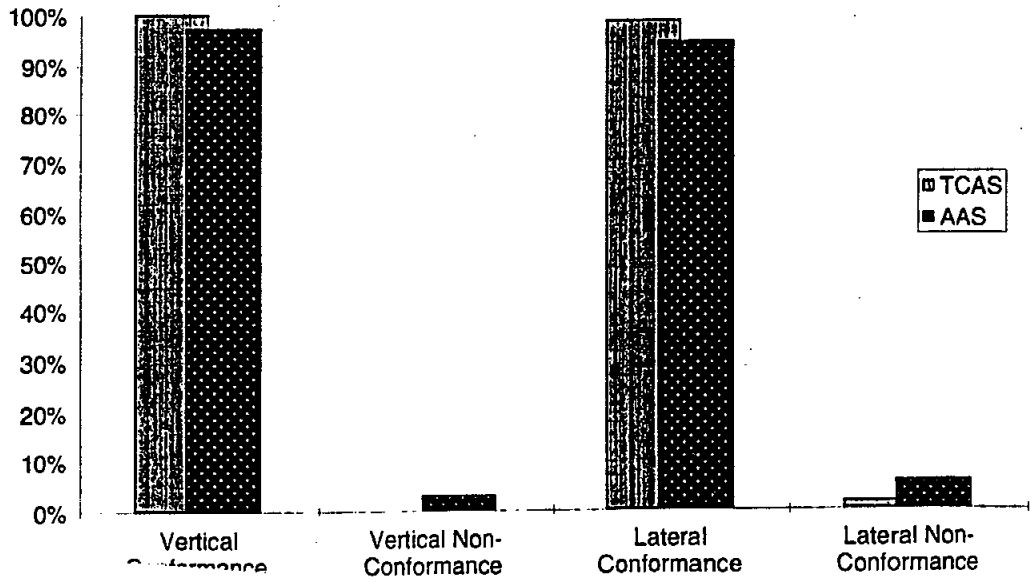
Conformance



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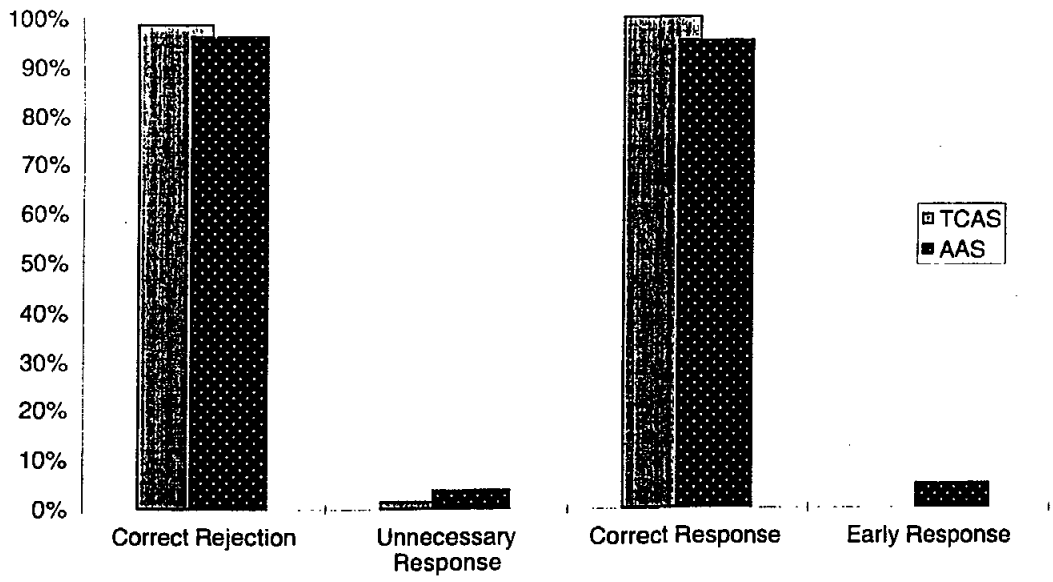
Pilot False Alarm / Early Evasion



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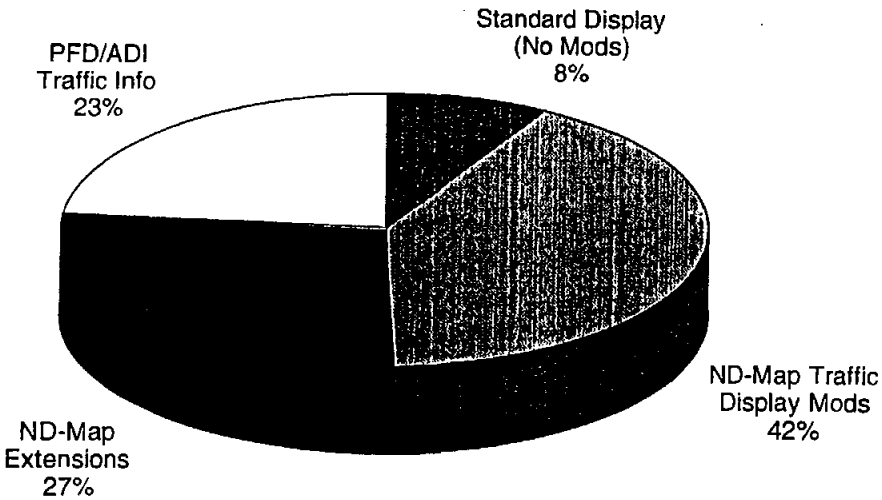
Subjective Measures (1)

- Which display combination was <u>more useful</u> in conducting approaches to closely-spaced runways?



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Subjective Measures (2)

- Which PFD/ADI traffic display information was more useful in conducting approaches to closely-spaced runways?

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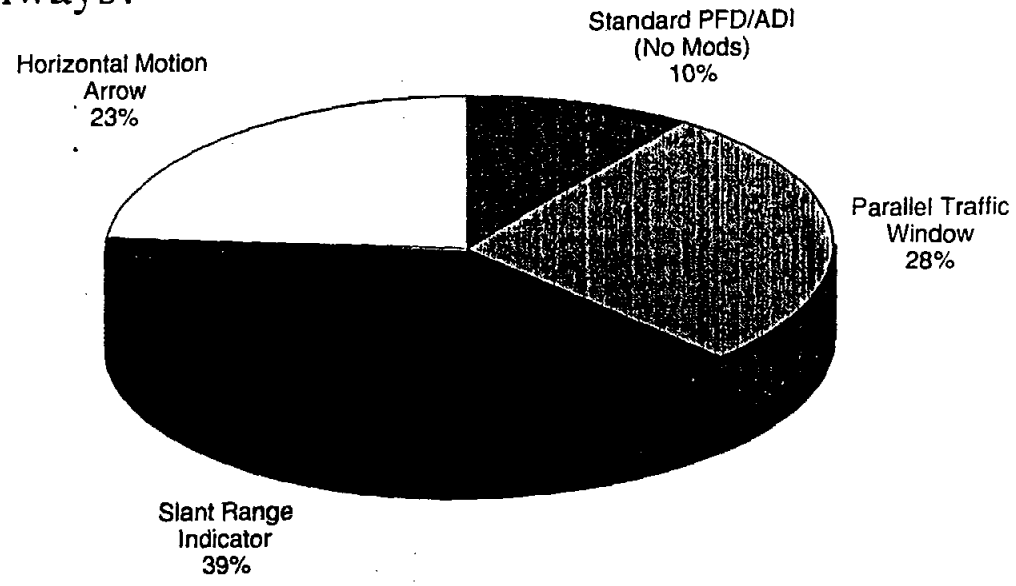

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Subjective Measures (3)

- Which ND-Map traffic display information was more useful in conducting approaches to closely-spaced runways?

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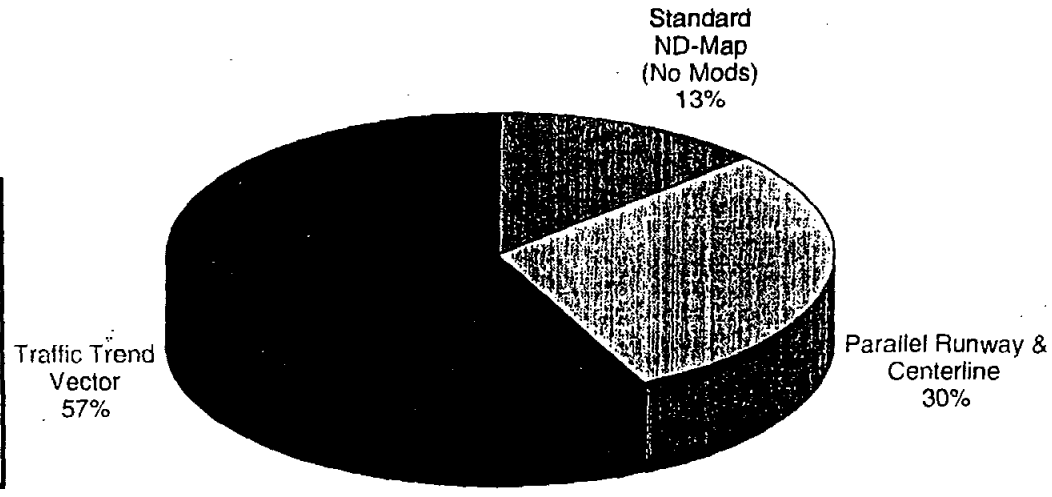
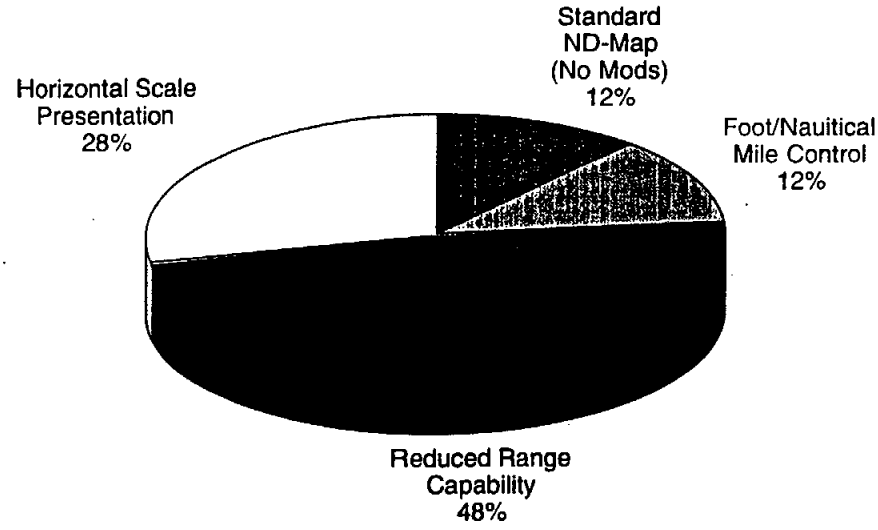


Subjective Measures (4)

- Which ND-Map display extension was <u>more useful</u> in conducting approaches to closely-spaced runways?



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TT-10/29/96 Pg 25

Conclusions

- AAS provided greater aircraft separation than TCAS.
- For AAS, the Modified Displays provided greater aircraft separation than the Standard Displays.
- It took pilots longer to satisfy the vertical commands for AAS than for TCAS. Time to satisfy the lateral commands was about the same as vertical for AAS.
- When using TCAS, guidance conformance was satisfied in nearly 99% of the maneuvers flown by the pilots.
- When using AAS, guidance conformance, and the number of false alarms / early evasions, were only slightly worse than when using TCAS.
- Pilots preferred the Modified Displays, especially the Traffic Trend Vector and Reduced Range capability.

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Flight Deck Centered Independent Closely Spaced Parallel Runway Operations in Instrument Meterological Conditions, Phase II

Charles Scanlon and Marvin Waller
NASA Langley Research Center
October 1996

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Program Goal

Apply modern technology to develop procedures, tools, etc. that will enhance safety enough to enable independent approaches to parallel runways with runway spacing less than the current certified 3400' spacing.

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Assumptions

- Information between aircraft will be exchanged at least once per second (ADS-B)
- Precise navigation information like DGPS is used
- The worst case intrusion is a 30° interception
- A near miss is defined as an encounter with spacing less than 500'
- For analysis purposes, the intruder and evader will be considered to be at the same altitude

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Approach

- Use the TSRV Simulator, an all glass cockpit operating with B737-100 flight characteristics
- Use two person test crews to get some measurement on crew procedures and acceptability
- Use alerts to help keep aircraft in their own airspace and keep from threatening aircraft on the parallel approach
- Use alerts and procedures to avoid a near miss in the event of an intrusion

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Approach (Continued)

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- Hand flown approaches with Flight Director and Auto Throttle
- TCAS used up to the 10 NM to threshold point, then AILS algorithms begin working
- Intruder scenarios hand flown with turbulence
- Test runs flown with turbulence and 10 kt direct crosswind

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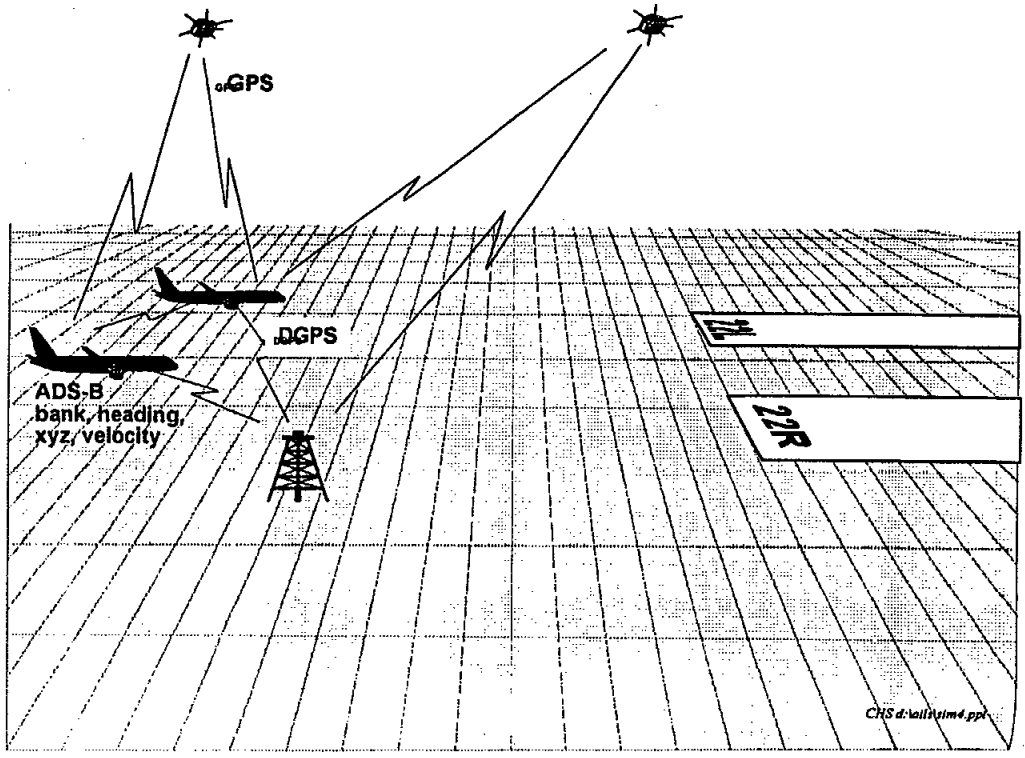
PARALLEL RUNWAY OPERATIONS CONCEPT



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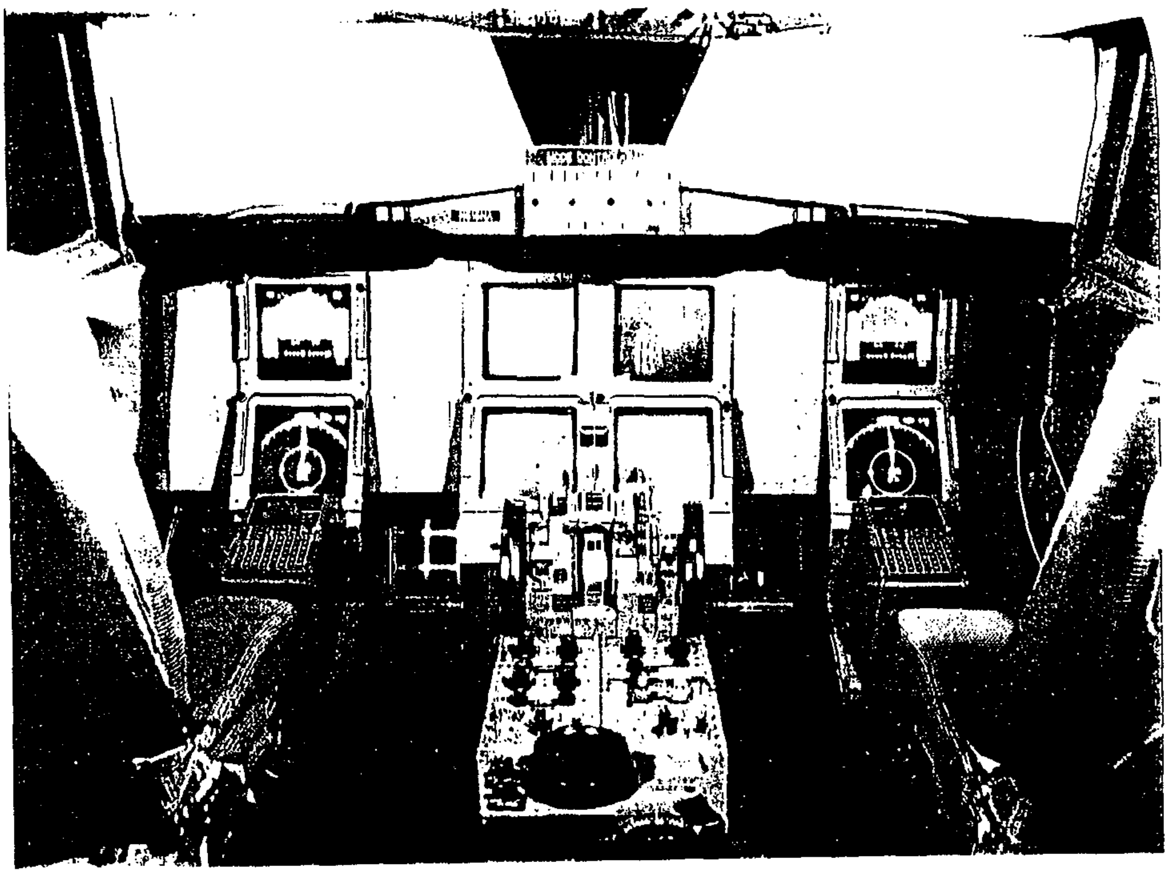

NASA Langley Research Center TSRV Simulator

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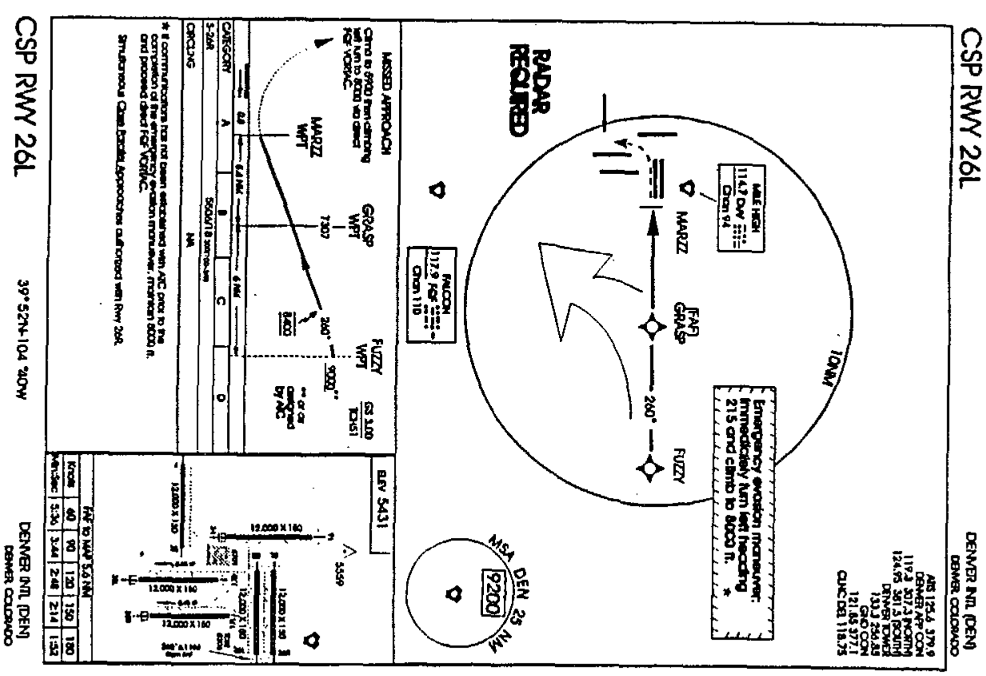

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Phase II: Procedures and Alerts

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- Each aircraft is required to stay within its assigned airspace and maintain a non-threatening attitude/track.
- In the event of an intrusion, an emergency escape climbing turn is mandatory.

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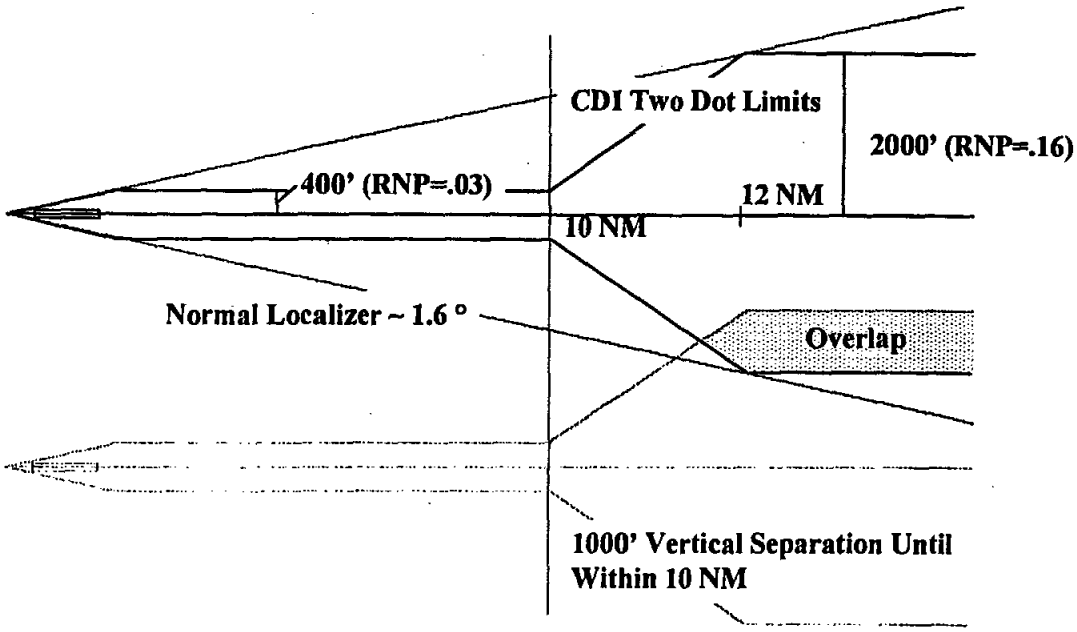
Phase II: Required Navigation

"Rocket Ship"



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The "Rocket Ship" Localizer
C. H. Scanlon

The normal Localizer of an Instrument Landing System (ILS) forms an angular beam with vertex at the localizer transmitter, usually 1000' beyond the far end of the runway and centered on the runway threshold. "The width varies between 3°-6°, tailored to provide 700 ft [width] at the [runway] threshold (full scale limited)", Airman's Information Manual, Section 1-10. In order to use a precision guidance system like Differential Global Positioning System (DGPS) to emulate an ILS, that precison guidance has to be programmed to the angular geometry of a normal ILS localizer.

In the "Rocket Ship" (RS) geometry, the precision guidance Localizer is programmed to be linear for most of the approach. Using the runway centerline as the RS centerline, the RS is programmed to be ±2000 ft wide from the 12 nautical mile point, as measured from the runway threshold, to infinity and ±400 ft from the 10 nautical mile point to the approximate Middle Marker (where the ±400 ft width matches a normal ILS Localizer geometry). The RS geometry gradually tapers from the ±2000 ft width at 12 nautical miles to the ±400 ft wide at the 10 nautical mile point. Inside the approximate Middle Marker location, the RS is programmed to be angular like a normal ILS Localizer.

Normally, aircraft would be "vectored" onto the approach outside the 12 nautical mile point so that the aircraft capture of the Localizer would take place in the wide (±2000 ft) part of the RS. Glide Slope capture normally occurs inside the 10 nautical mile point, within the narrow part of the RS. The RS Glide Slope (GS) is programmed to be angular, just like a normal ILS GS.

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Phase II: AILS Alerts

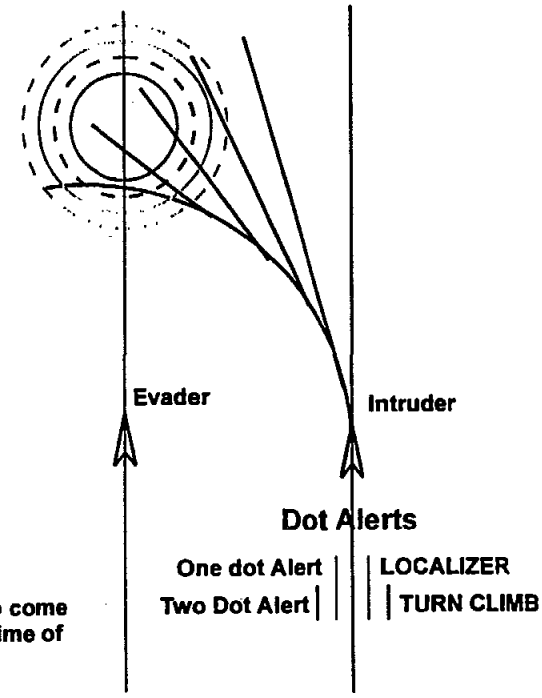
Intruder/Evader Alerts

	Runway Spacing 1200 ft	1700 ft
R1 =	1000	1400 ft
R2 =	1000	1300 ft
R3 =	600	700 ft
R4 =	500	500 ft

T1 =	13	16 sec
T2 =	12	15 sec
T3 =	10	12 sec
T4 =	9	11 sec

Alert 1=Intruder TRACK
Alert 2=Evader TRAFFIC
Alert 3=Inturder TURN CLIMB
Alert 4=Evader TURN CLIMB

If it is possible for the intruder to come within Ri of the evader within a time of Ti, then set Alert I.



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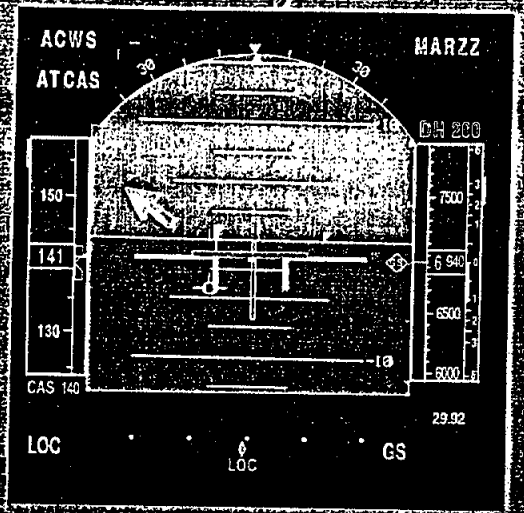
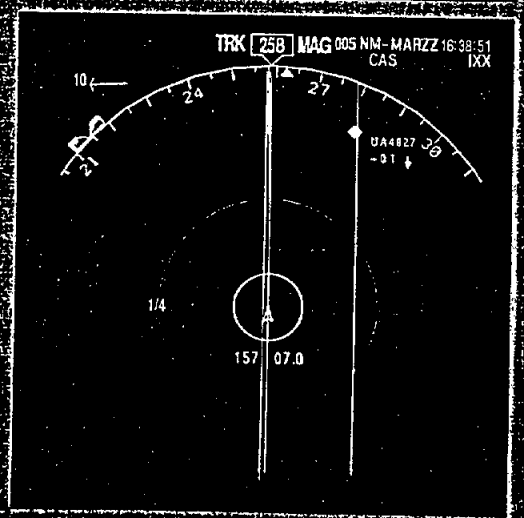
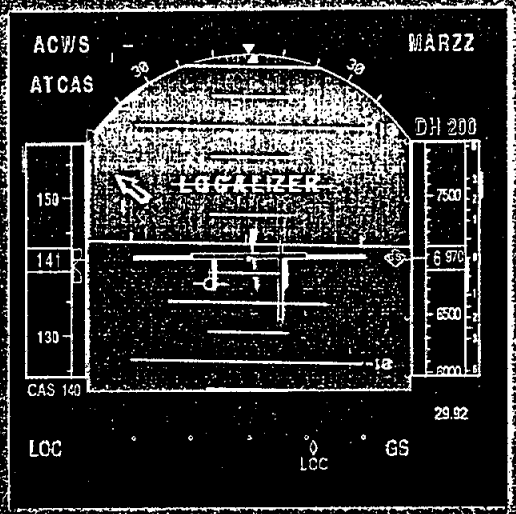
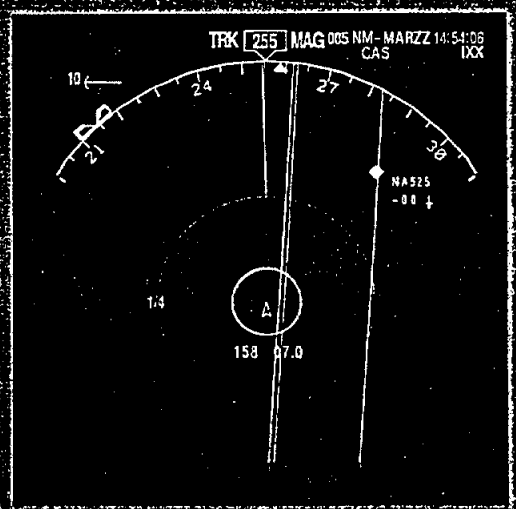
1 NM RANGE, NO ALERTS

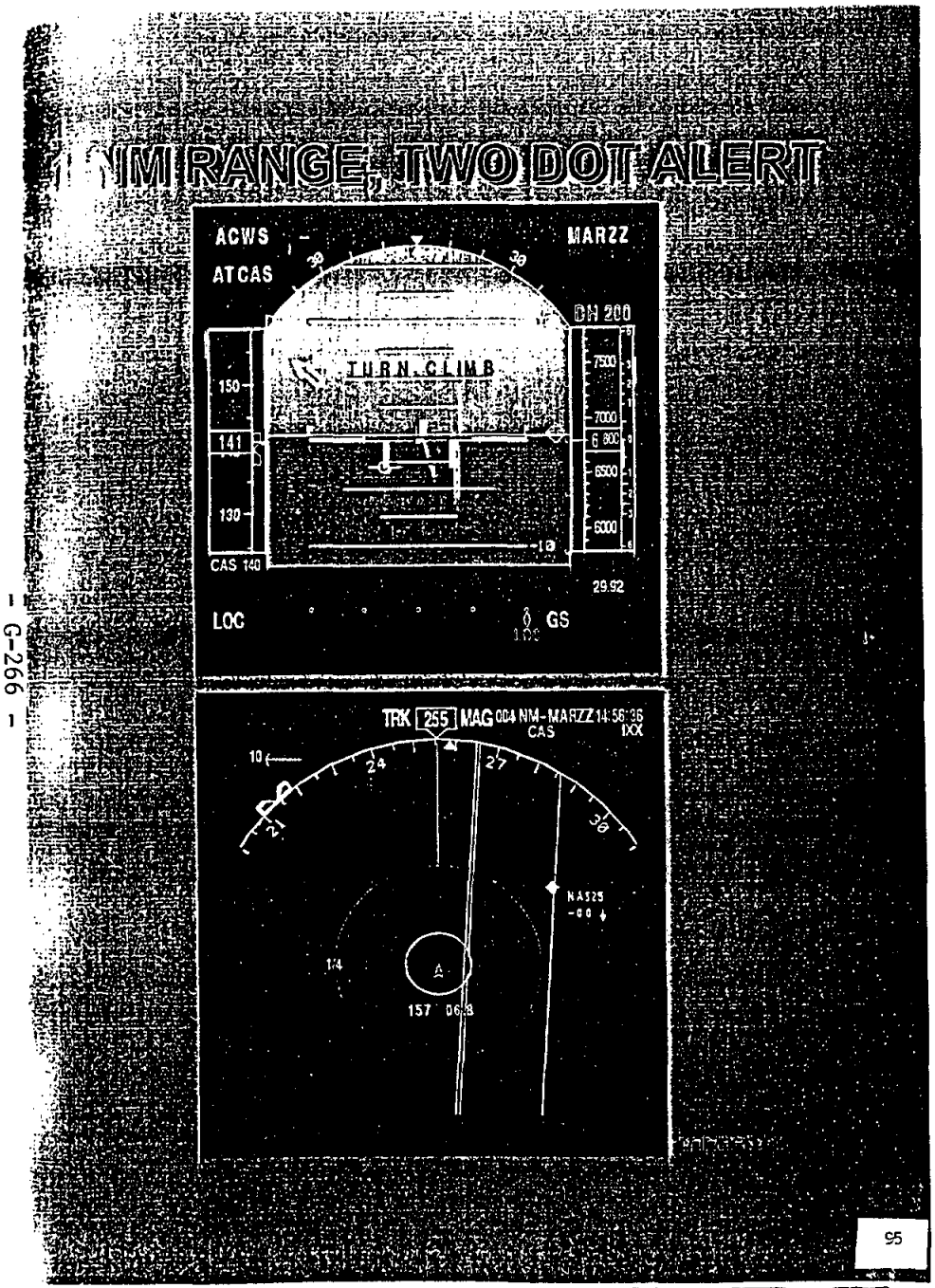


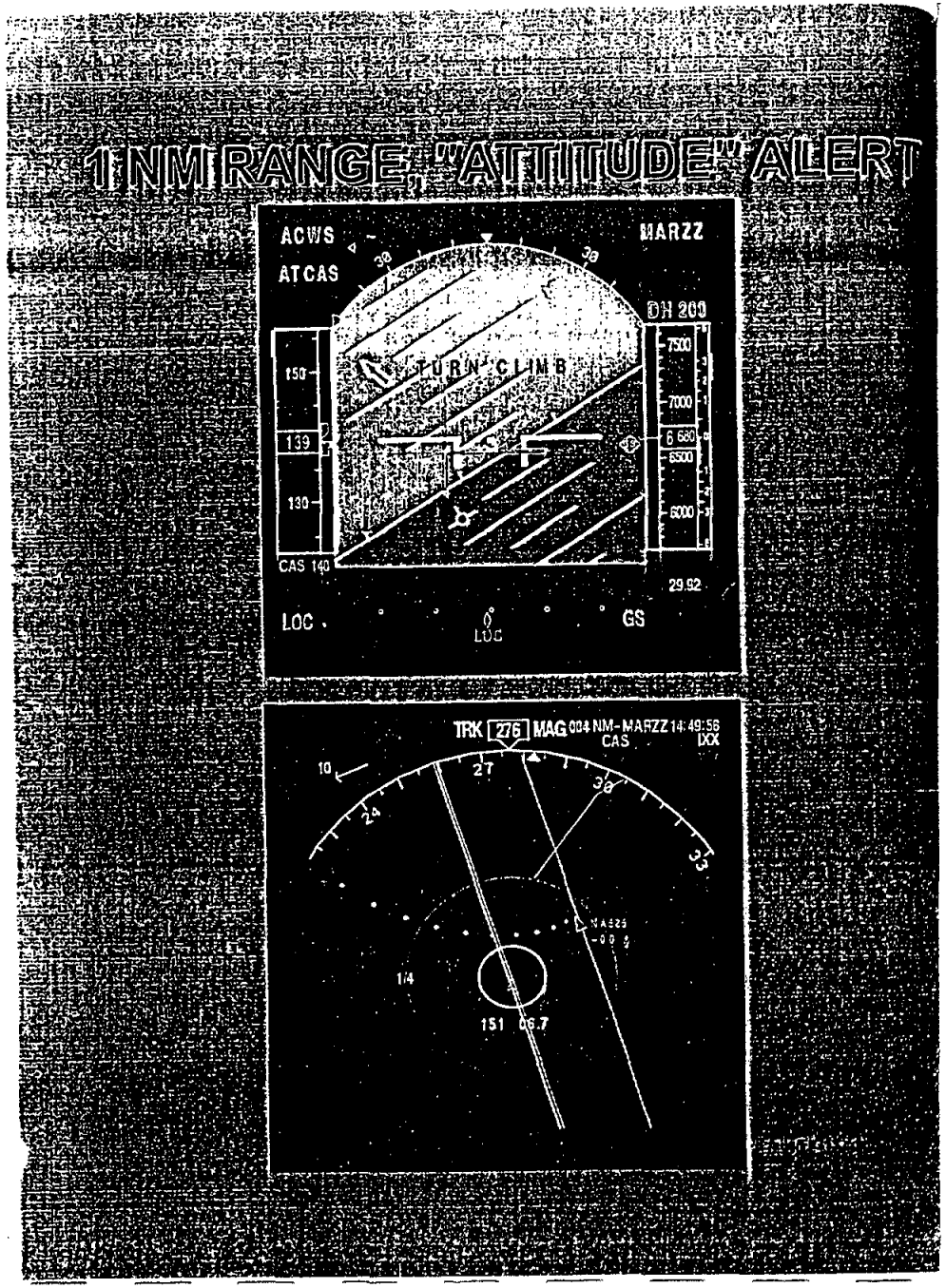


1 NM RANGE, ONE DOT ALERT

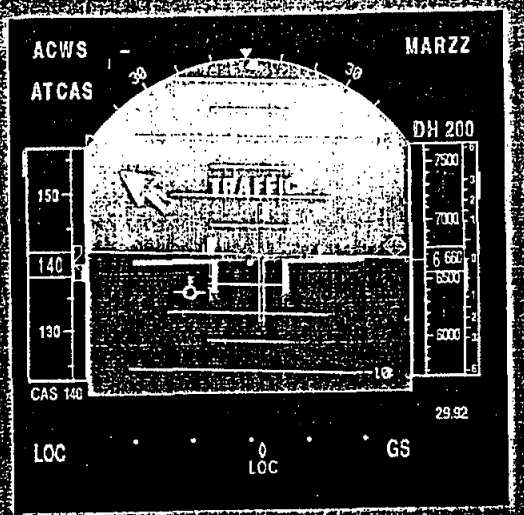


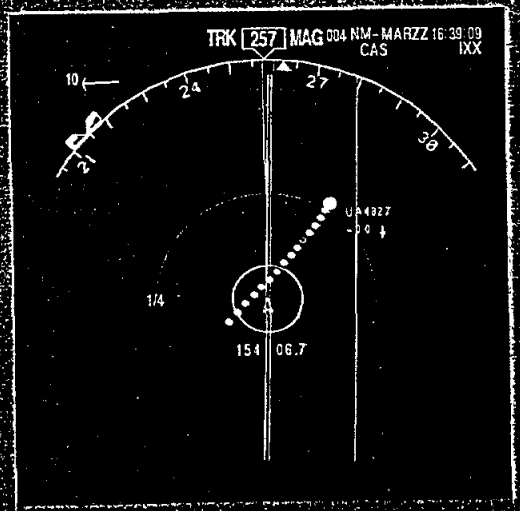



1 NM RANGE, TWO DOT ALERT
ACWS
ATCAS
MARZZ
DH 200
TURN CLIMB
150
141
130
CAS 140
29.92
LOC
GS
TRK 255 MAG 004 NM-MARZZ 14:56:36
CAS
IXX
10
21
24
27
30
NA525
-00
1/4
157

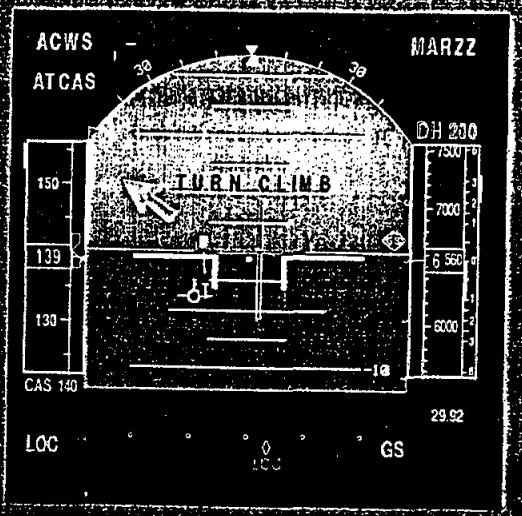

1 NM RANGE, "ATTITUDE" ALERT
ACWS
ATCAS
MARZZ
DH 200
TURN CLIMB
150
139
130
CAS 140
29.92
LOC
GS
TRK 276 MAG 004 NM-MARZZ 14:49:56
CAS
IXX
10
24
27
30
33
NA525
-00
1/4
151

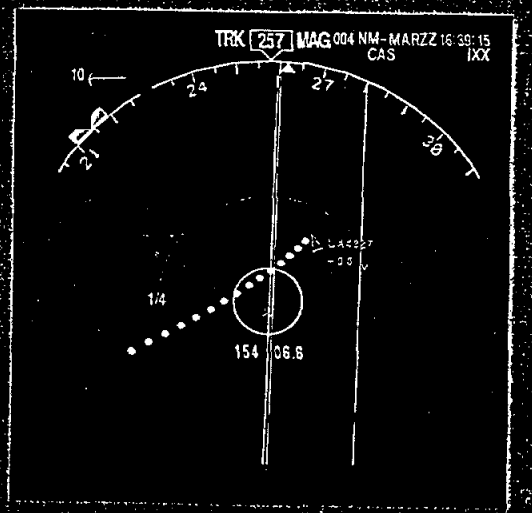
1 NM RANGE, TRAFFIC ALERT





1 NM RANGE, WARNING ALERT





Phase II: Simulation Test Outline

- Eight two pilot test crews
- One day test per crew with 28 runs
- 1700' and 1200' spacings

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Phase II: Simulation Test Matrix

- Primary Experimental Variables
  - Two runway spacings (1700' and 1200')
  - Seven scenarios
- Secondary Experimental Variables
  - Two Relative Speeds
  - Two Approach Altitudes
  - Two Runway Orientations
  - Four Sync Points

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Phase II: Ordering of Runs

- Each crew member flys all combinations of the primary variables (2*7=14) randomly chosen.
- The secondary variables were distributed among the runs so as to make each run unique. This distribution was counterbalanced to the extent possible.
- Crew members alternate pilot flying and pilot not flying.

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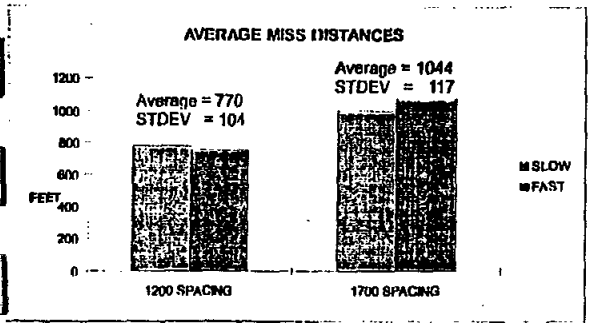
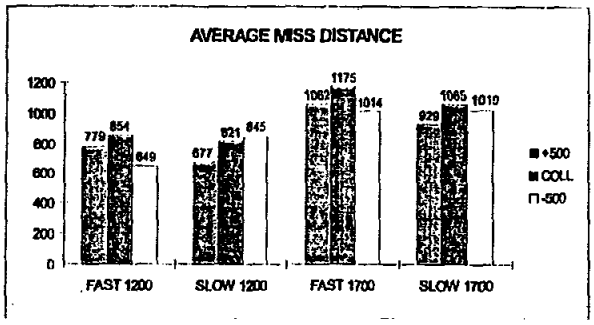
Preliminary Data





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Reaction Time:
Average = 0.82 sec
STDEV = 0.49

Near Misses:
1700' = 0
1200' = 1*

Pilot opinion on "...would you fly...with spacings of:"
1700 ft: Yes: 15 No: 0
1200 ft: Yes: 14 No: 2

***Actual 3D miss distance was > 500'**

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Paired Approach Concept

Rocky Stone
United Airlines

NASA Langley
Parallel Runway Workshop
10/29/96

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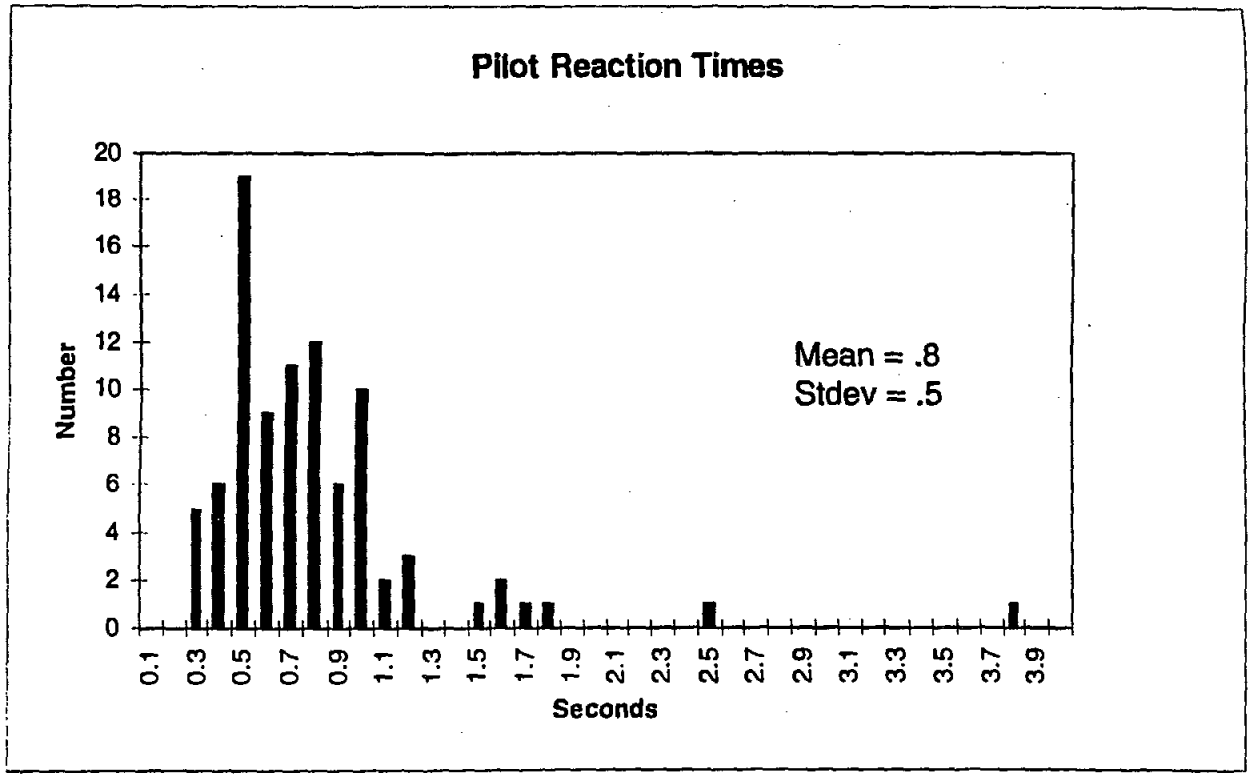

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Objective

- Enable Multiple Arrival Streams in IMC to Airports With Closely Spaced Parallel Runways
  - Increase Capacity
  - Safer Approaches in VMC

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Airline Objectives

- Increase Capacity
- Minimize Delays
- Reduce Costs

Operational Concepts

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- Independent Approaches
  - AILS Project
- Dependent Approaches
  - Paired Approach Concept

Why Dependent Approaches?

- Independent Approaches Can Not Provide Sufficient Capacity Benefits At:
  - SFO
  - SEA
  - EWR
  - STL

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Paired Approach

- Concept Similar to AILS Work In Progress, With Added Longitudinal Dependency
  - Provides Benefits for Airports with Parallel Runways Too Close for Independent Approaches
  - Significant Impact on Future Runway Architecture Decisions

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Paired Approach - Key Features

- Electronic Flight Rules - Pilots Assume Separation Responsibility
  - 2 Independent Modes of Surveillance
  - Proper Displays, Procedures, Training

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Paired Approach - Key Features

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- Traffic Sequenced to Approximately Correct Spacing on Final With 1,000 Feet Altitude Separation
- Trailing Aircraft Adjusts Spacing Before Reaching Final Approach Fix
- No Station Keeping Tasks After Final Approach Fix

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Paired Approach - Key Features

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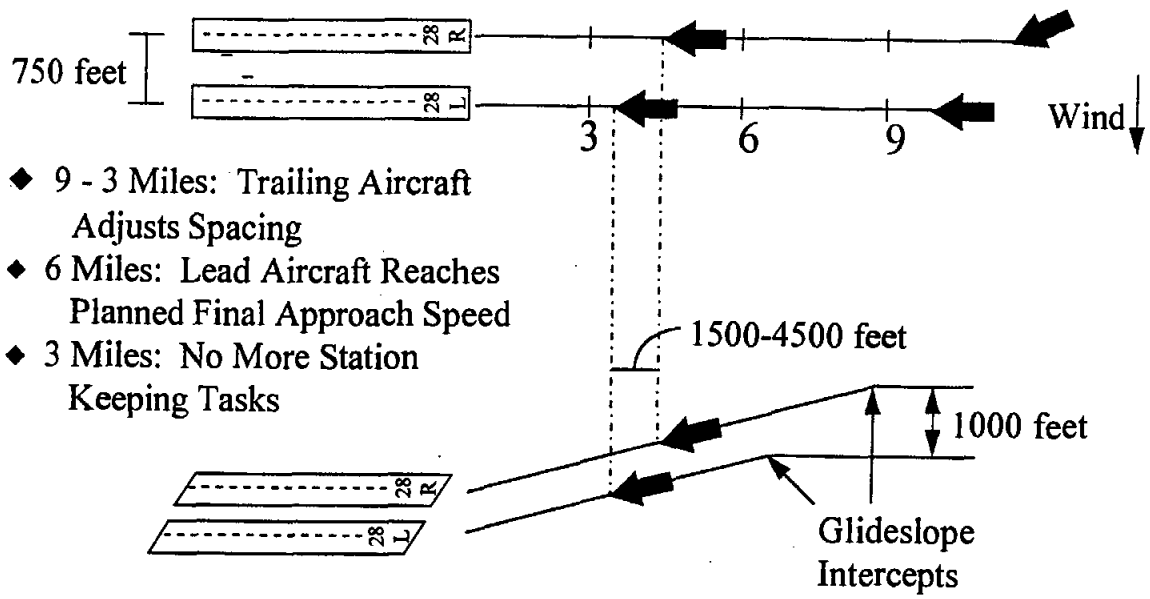
- Trailing Aircraft Escape Maneuver
  - Spacing Out of Window
  - Blunder
- Dual IMC Go-Around Procedure
  - Trailing Aircraft May Continue If VMC and Lead Aircraft In Sight

Paired Approach - SFO Example



- 9 - 3 Miles: Trailing Aircraft Adjusts Spacing
- 6 Miles: Lead Aircraft Reaches Planned Final Approach Speed
- 3 Miles: No More Station Keeping Tasks

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Technology Needs

- Two Independent Modes of Surveillance
  - Passive ADS-B Reception
  - Active TCAS Interrogations

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Interface Requirements

- Designation of "Paired Approach RW28L - Lead" or "Paired Approach RW28R - Trail"
- Designation of "Paired" Traffic
- Entry of Planned Final Approach Speed
  - Cross Linked to "Paired" Traffic

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Cockpit Display Requirements

- Traffic Display With:
  - 1 or 2 nm Minimum Display Range
  - Flight ID
  - Graphical Indication of Range/Closure
  - Alphanumeric Range/Closure
  - Traffic Vector
  - Relative Closure Vector
  - Desired Relative Position at Final Approach Fix

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Flight Director Requirements

- Target Airspeed
  - Lead Aircraft - Specified Deceleration Rate to Achieve Final Approach Speed by 6 nm
  - Trailing Aircraft - Computed Speed to Reach Desired Relative Position at Final Approach Fix

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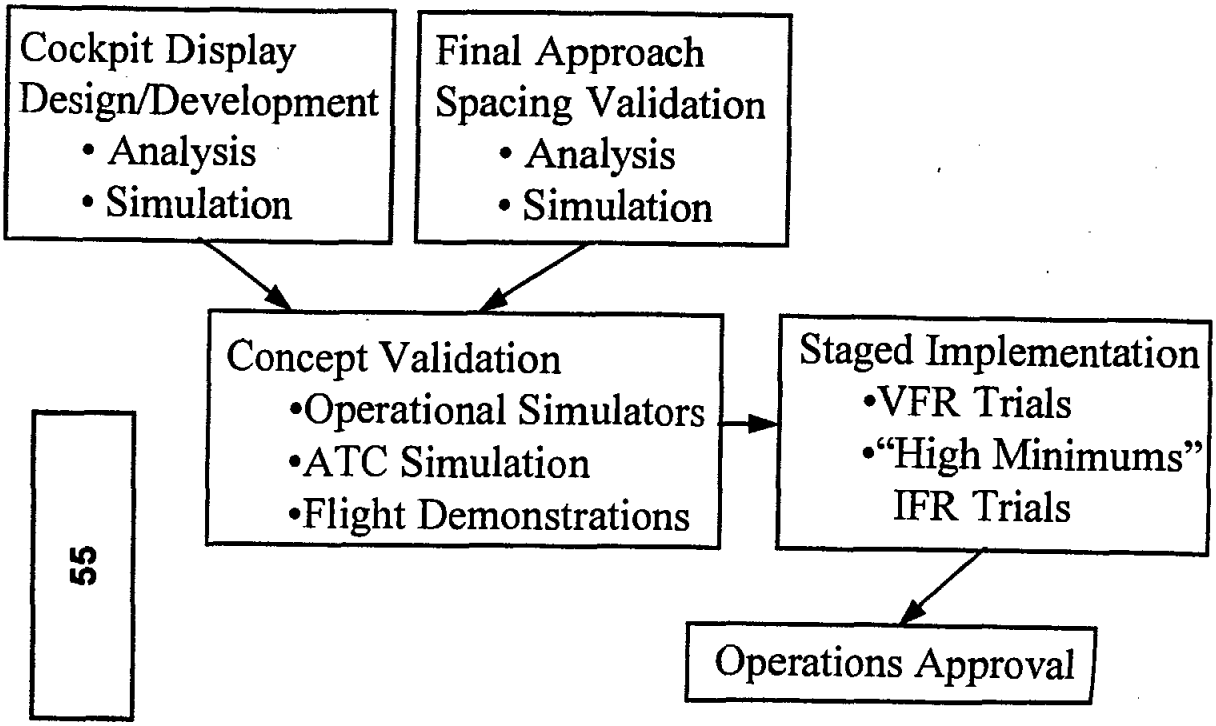
Implementation Milestones



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Next Steps

- Expand Analysis/Simulation of Dependent Approaches
- Continue Development of Independent Parallel Approaches

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Paired Approach Concept

Increasing IFR Capacity to Closely Spaced Parallel Runways.

Rocky Stone, United Airlines

This application envisions using active Traffic Alert and Collision Avoidance System (TCAS) interrogations and passive Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance to maintain a dual runway approach capability to airports with closely spaced parallel runways that would otherwise revert to a single runway approach capability during low ceiling and visibility weather conditions.

It is proposed that two independent methods of surveillance be used since separation between the aircraft will be assured by electronic means, not visual contact. This will be an approach conducted under "Electronic Flight Rules (EFR)".

The goal is to develop a procedure that increases arrival capacity and also improves the level of safety over that associated with closely spaced visual approaches in use today.

Detailed Application Description:

Each runway pair where this procedure is to be utilized needs to be surveyed to determine what spacing criteria is appropriate for the specific runway pair. For this example, runways 28L and 28R at San Francisco are used. These runways are spaced 750 feet apart. Both runways have ILS approaches. In this example, it is assumed that parallel GPS approaches are used, so that the divergence of the ILS localizer beam is not a factor.

A desired longitudinal aircraft spacing needs to be defined for this runway pair. A minimum spacing of 0.25 nm is desired to provide adequate time for the trailing aircraft to perform an escape maneuver, in the event the lead aircraft blunders into its flight path. A maximum spacing of 0.75 nm is desired for two reasons. First is to avoid wake turbulence in the worst case no wind scenario. It is assumed that if there is a crosswind, the trailing aircraft is always placed on the upwind side, to assist in avoiding wake turbulence. The second reason for the 0.75 nm spacing is to ensure that the aircraft land as a "pair" so that departing aircraft can leave from a crossing runway between arriving aircraft pairs.

Once the final approach spacing requirement is established, then how do aircraft get to that point in relation to another aircraft? It is proposed that the ground be responsible for assigning aircraft pairs and vectoring the aircraft onto final approach with 1,000 feet altitude separation into the approximately correct longitudinal spacing. The Converging Runway Display Aid (CRDA) now in use by the FAA could be reprogrammed to assist controllers in precisely vectoring aircraft into the approximately correct position on final approach. The lead aircraft is always vectored onto the approach on the downwind side of the trailing aircraft.

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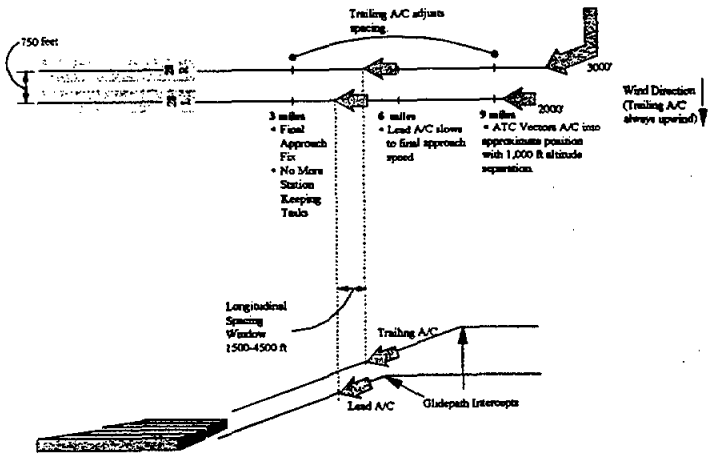
PAIRED APPROACH

SFO Example



Aircraft pairs need to be identified and assigned early enough for the aircraft to exchange an addressed data link message. The lead aircraft needs to enter its planned final approach speed so that it can be cross-linked to the trailing aircraft.

The lead aircraft's planned final approach speed is required by the trailing aircraft, so that it can position itself to remain within the longitudinal spacing window while on final approach. All station keeping maneuvering needs to be completed before reaching the final approach fix. The trailing aircraft needs to notify ATC if its planned final approach speed is not compatible with the "paired" lead aircraft.

Once cleared for the approach, the trailing aircraft becomes responsible for separation with the lead aircraft on final approach. Before reaching the final approach point, the trailing aircraft adjusts spacing so that will remain within the 0.25 to 0.75 nm window the entire time while on final approach. For example, if the trailing aircraft is planning to fly final faster than the lead aircraft, it would set-up spacing to be near the 0.75 miles in trail when passing the final approach fix, as it would be drifting closer to the lead aircraft during the final approach segment. Conversely, if the trailing aircraft is planning to fly final slower than the lead aircraft, it would set-up to be near 0.25 miles in trail when passing the final approach fix, as it would be drifting further back during the final approach segment.

To minimize the impact on pilot workload, there is no station keeping task while on final approach. If the spacing moves out of the 0.25 to 0.75 nm acceptable range, the trailing aircraft executes an escape maneuver.

Since there is a potential of both aircraft going around with less than normal instrument flight rule (IFR) spacing, go-around/escape maneuver procedures need to be designed to maintain separation. If the lead aircraft executes a go-around, it needs to send an addressed air-to-air data link message to the trailing aircraft. This message should be automatically and immediately sent when the pilot initiates a go-around. It is proposed that the lead aircraft be limited to 2,000 feet per minute climb when initiating a go-around. This will allow the trailing aircraft to execute a maximum rate of climb go-around, to always remain above the flight path of the lead aircraft. The trailing aircraft go-around procedure and/or escape maneuver is specified to level off 1,000 feet above the lead aircraft's go-around altitude, so that ATC can resume normal IFR separation. If in VMC, and the lead aircraft is in sight, the trailing aircraft may continue the approach if the lead aircraft executes a go-around.

Air Traffic Control (ATC) responsibilities:

1. Pair up properly equipped and qualified aircraft. Advise aircraft of their "partners" early enough for the trailing aircraft to obtain a data link message from the lead aircraft containing their planned final approach speed.

2. Provide sequencing to the runway. Place the lead aircraft on the downwind approach from the trailing aircraft. Vector the trailing aircraft within 0.25 and 0.75 miles in-trail of the lead aircraft, with the trailing aircraft 1,000 feet above the lead aircraft.

3. After clearing the aircraft for a paired approach, separation responsibility transfers to the trailing aircraft. ATC maintains separation responsibility for both aircraft with any other traffic.

Lead Aircraft - Pilot Responsibilities:

1. Enter planned final approach speed, so it can be data linked to the trailing aircraft for planning purposes.

2. When cleared for the approach, maintain 170 KIAS until reaching the designated slow down point. Decelerate to planned final approach speed (or slightly higher if necessary) at a defined deceleration rate.

3. If a go-around is necessary, fly the published go-around procedure with a maximum 2,000 feet per minute climb rate.

Trailing Aircraft - Pilot Responsibilities:

1. Advise ATC if the final approach speed of the lead aircraft is incompatible with being able to perform this procedure.

2. After vectored into position and cleared by ATC, use speed as necessary to adjust the spacing so that after the final approach point, spacing will be maintained by the anticipated drift due to differences in final approach speeds.

3. Execute an escape maneuver if the lead aircraft blunders into trailing aircraft flight path.

4. Execute an escape maneuver if the spacing on final approach moves out of the established range.

5. Execute a maximum rate of climb go-around if the lead aircraft executes a go-around.

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AILS Single Aircraft Flight Test of November 1996

Charles Scanlon
NASA Langley Research Center

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NASA Langley Research Center Boeing-737

Basic Objective

Validate precision navigation, attitude, and track data obtained in simulations.

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Flight Test Questions

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- Can the "Rocket Ship" approach geometry be easily hand flown in adverse wind conditions?
- In adverse wind conditions, would the alert algorithm be too sensitive? (i.e. set off too many false alerts.)
- Do the flight characteristics of the airplane closely match the characteristics of the simulator during the emergency escape maneauver?

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B737 Modifications

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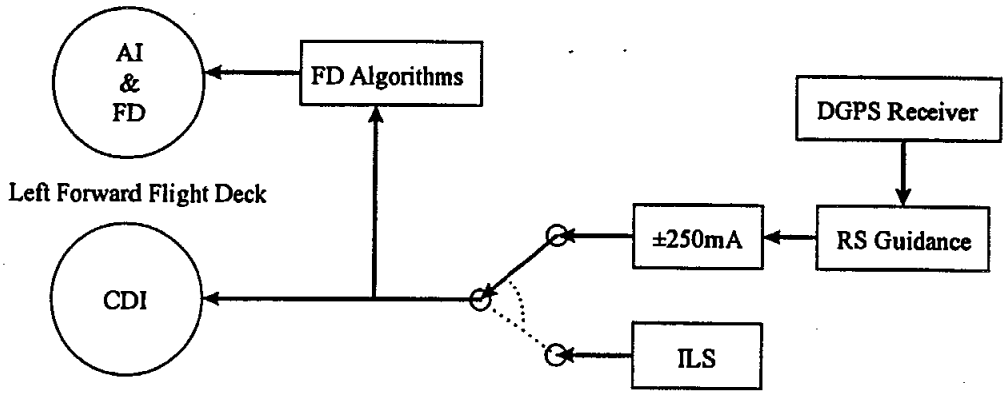

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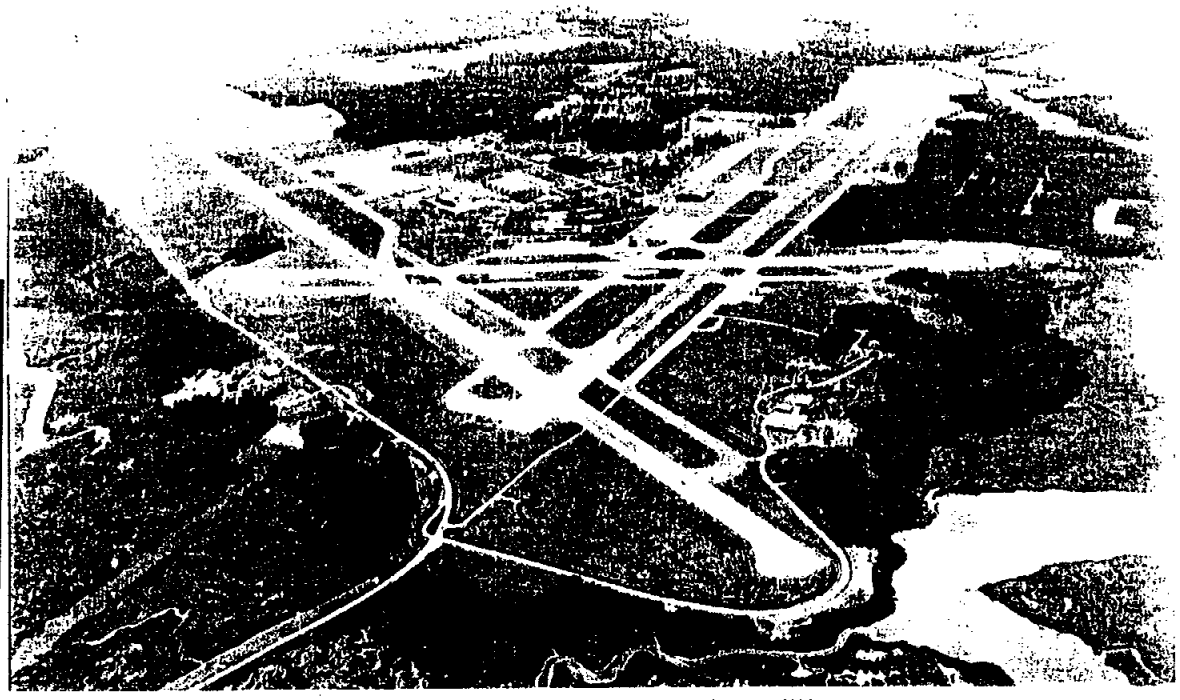

NASA Wallops Flight Facility

Test Matrix

- Two Windy Days (15kt+)
- Approaches to all six runways at Wallops
- Six "Emergency Escapes" at 6000' AGL

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AILS Two Aircraft Flight Test of Fall, 1998

Charles Scanlon
NASA Langley Research Center

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Objective

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Validate AILS simulation data in actual flight conditions using two aircraft, one as the "Evader" flown by an outside guest pilot and the second as the "Intruder" flown by a NASA test pilot.

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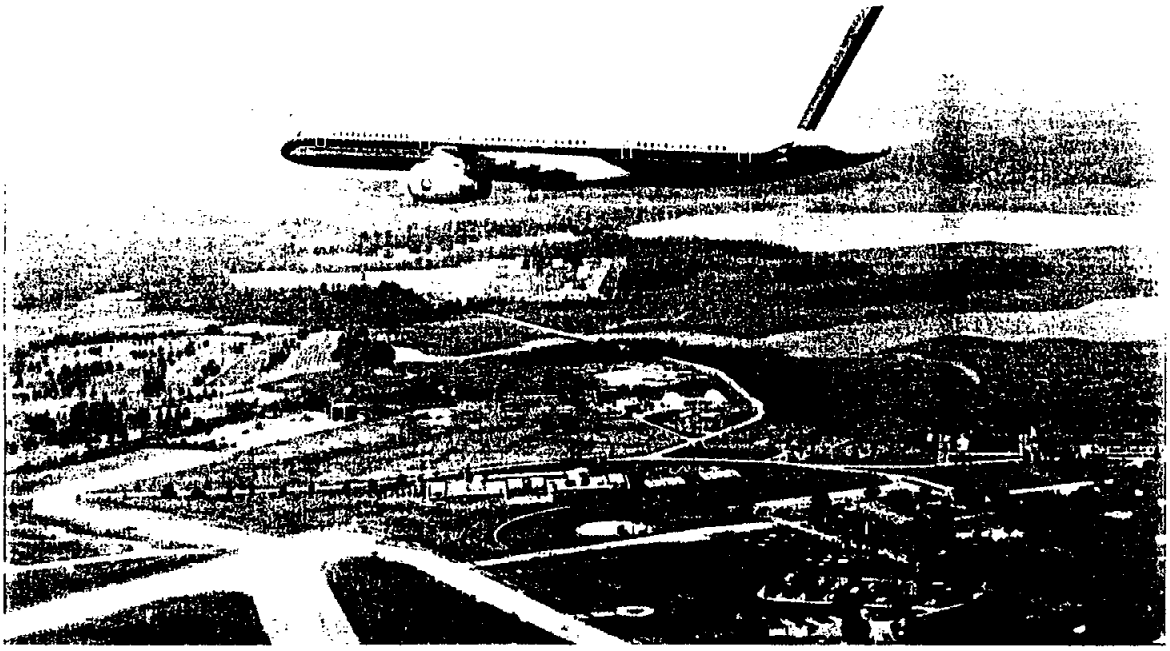
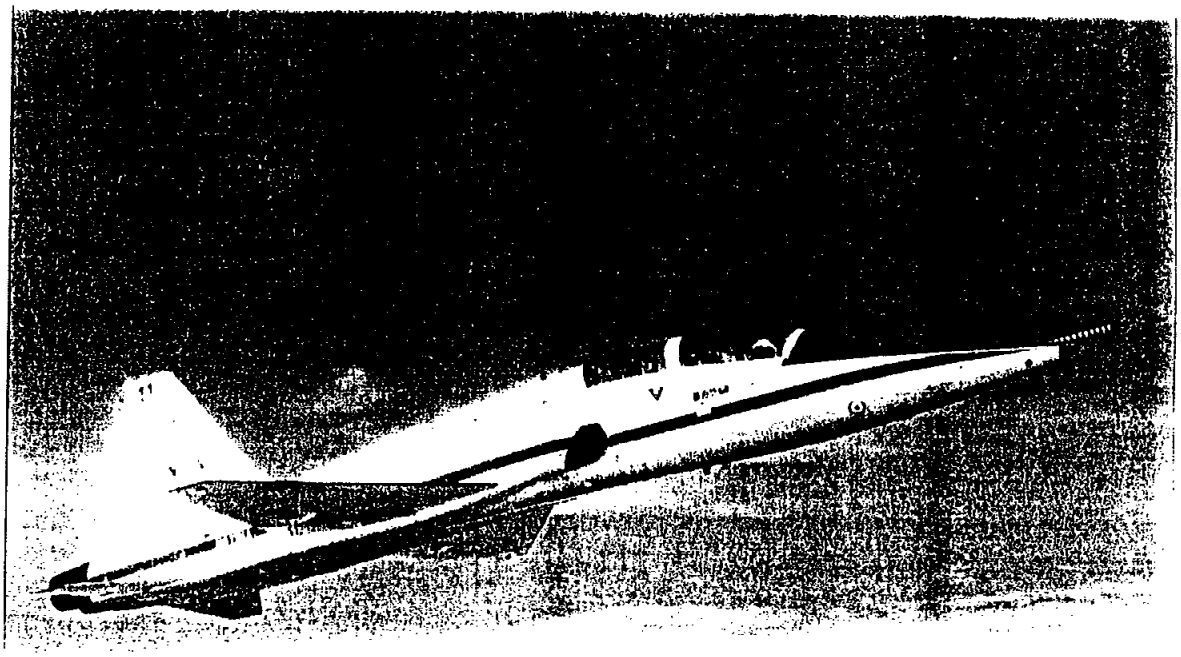


NASA Langley Research Center Boeing-757



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NASA Langley Research Center *T-38*

Aircraft Modifications

(B757 & "Intruder")

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- AILS displays and alerts programmed in the B757
- ADS-B system installed in B757 for reception of packets from "Intruder"
- ADS-B system installed in "Intruder" for transmission of packets.

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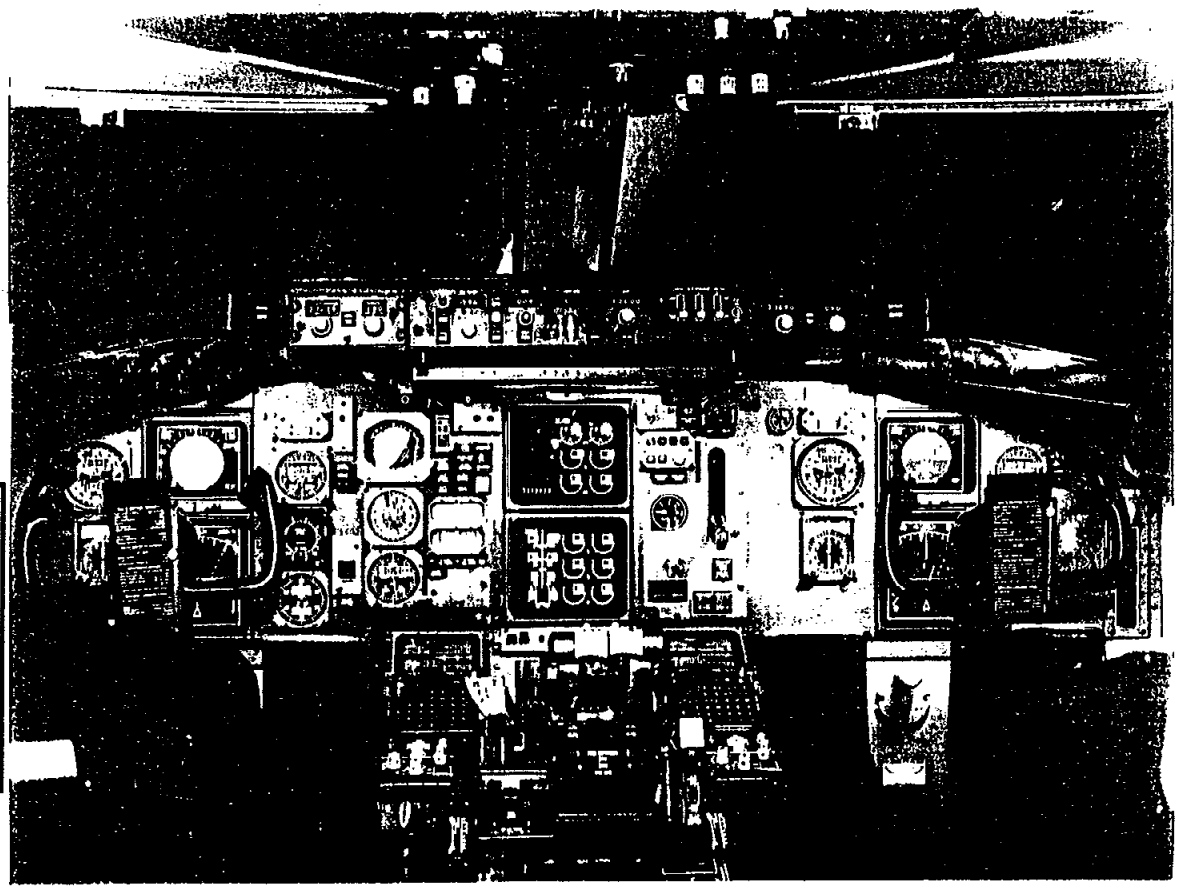

NASA B-757 Cockpit

Plan of Test

Program aircraft and simulator with AILS alerts and pilot interface

Approaches to imaginary parallel runways 5000' above NASA Wallops will be programmed

Eight outside airline subject pilots will be trained in the simulator in the morning and inflight test approaches will be conducted in the afternoon (in VMC)

The "Intruder" aircraft will be an aerobatic NASA aircraft flown by NASA test pilots

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Overview of Precision Runway Monitor (PRM) Program

Gene A. Wong
PRM Product Lead, AND-450

October 29, 1996

High-Update Surveillance System

Characteristics:

Surveillance accuracy higher than current airport surveillance radars

- Azimuth accuracy of 1 milliradian (60' @ 10 miles)

Update rate of approximately once per second

High resolution color ATC display with automated alerts for aircraft deviation

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PRM available now;low-cost alternatives in future

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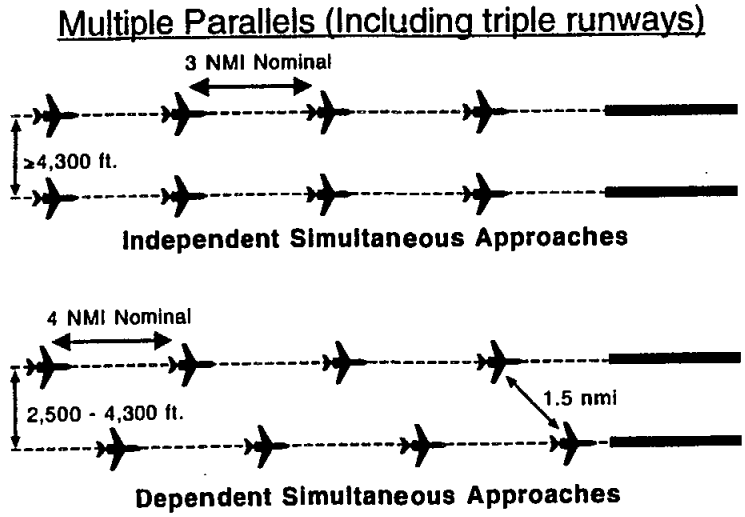
System Objective

Provide the capability to conduct simultaneous independent instrument approaches to parallel runways spaced less than 4300 feet apart.



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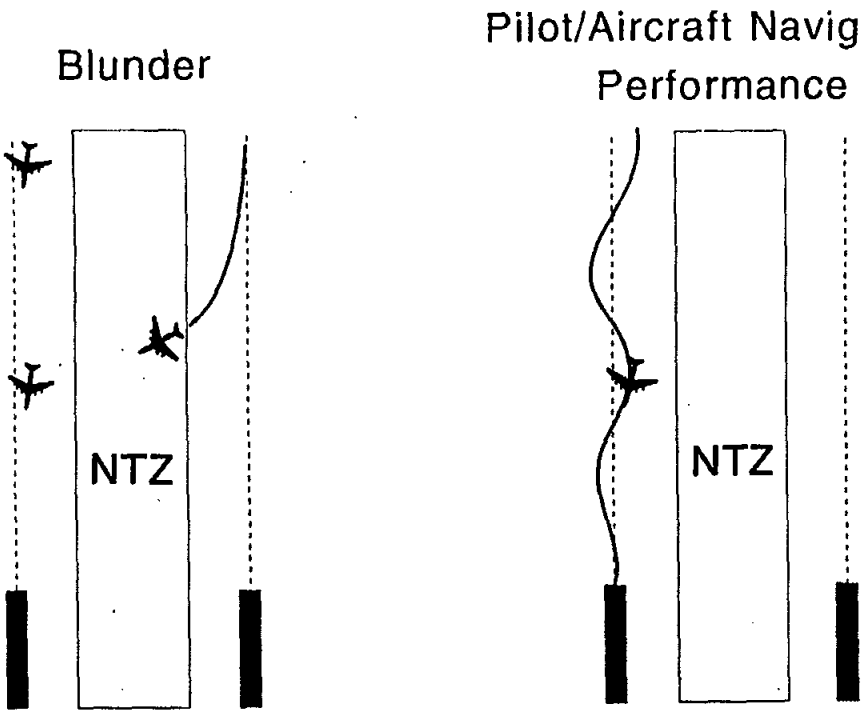
Independent approaches can yield up to 40% more landings than dependent approaches in high-density traffic and IMC

14

Factors Affecting Closely Spaced Parallel Approaches



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Methodology for Procedure Development

Human-in-the-loop realtime simulation using:

- Controllers and line pilots
- ATC displays
- Certified flight simulators remotely connected to FAATC

Collision risk model and safety analysis

Data collection

Operational evaluation by FAA Technical Work group

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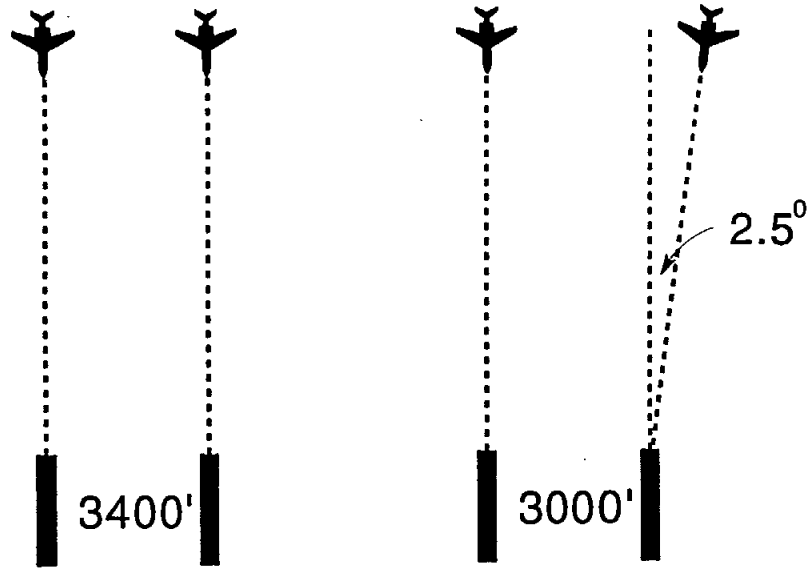
Approved/Recommended Procedures based on High-Update Surveillance System

Dual:



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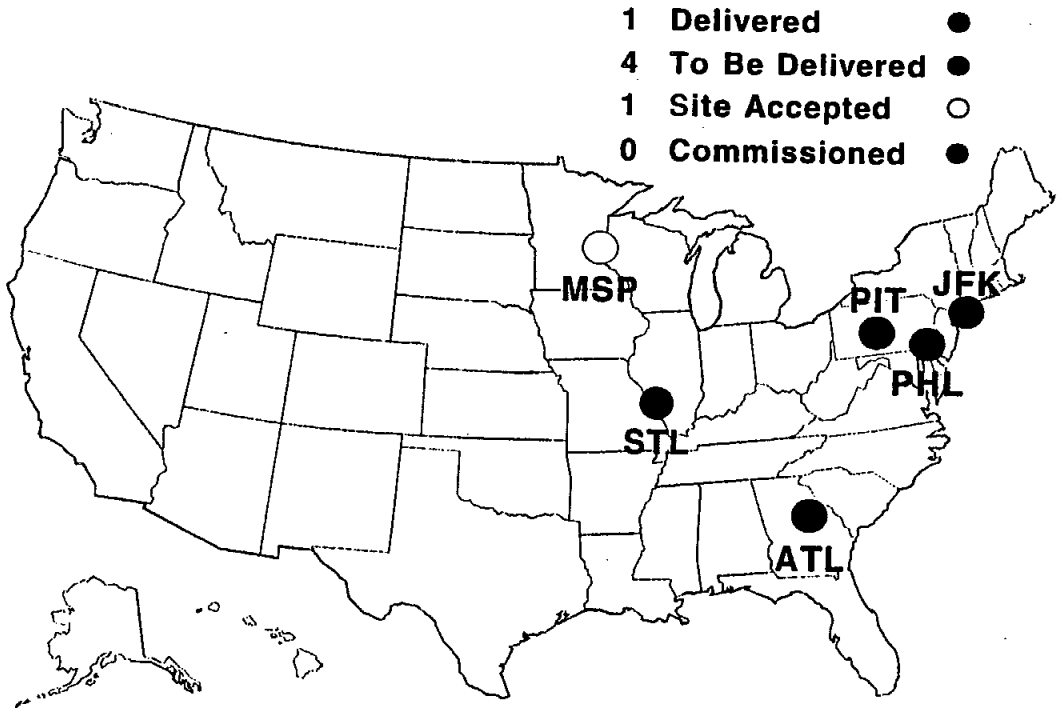
Triple: ATL/PIT procedure for simultaneous ILS approaches recommended

Page 6

PRM Status



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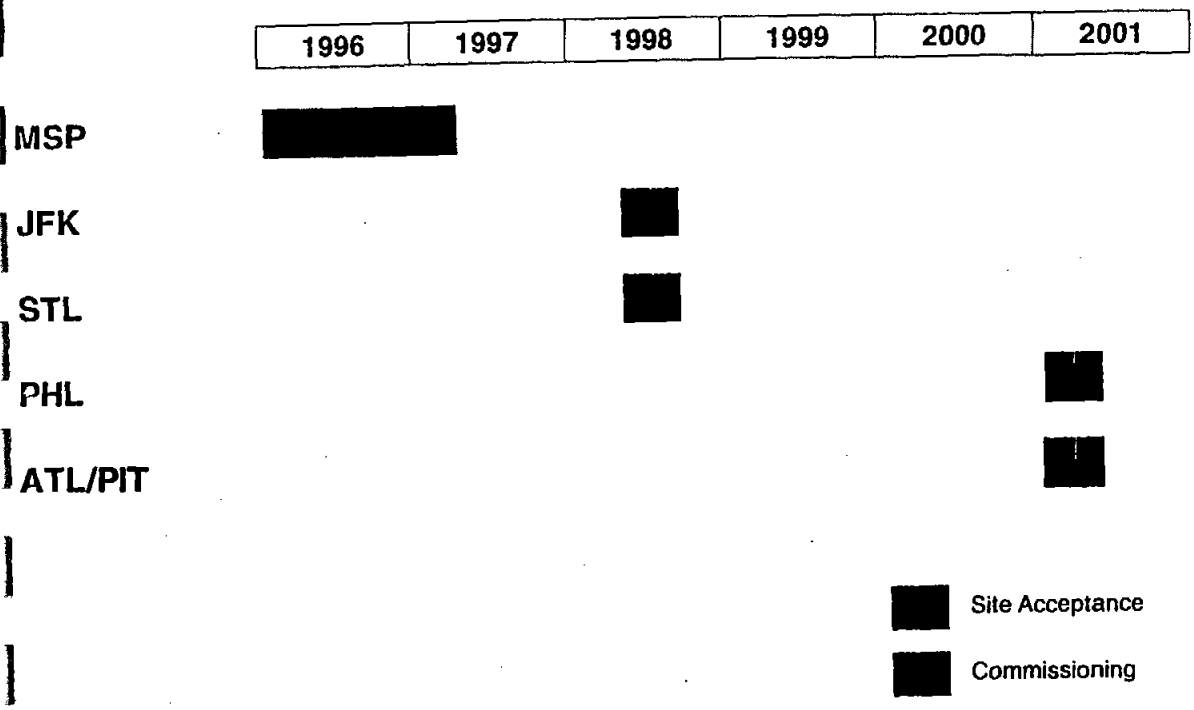
Final Sensor Delivery to ATL or PIT

Page 7

PRM Commissioning/Installations



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Page 8

PRM Issues

Pilot Issues reduced to 1: Pilot Training

-Consensus: Awareness and procedure training via video tape and written material is necessary to improve breakout performance

- Whether additional hands-on flight simulator training is needed for breakouts

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Resolution of Local Issues

JFK - Airspace

STL - "Flyability" of modified procedure

Page 9

Potential Future Low-Cost, Ground-Based Technologies

Multilateration based on a network of low-cost receivers/transmitters (R/Ts) for deriving aircraft positions

- Atlanta demo in late 1996

Automatic Dependent Surveillance/GPS downlinking positions to ground ATC computers (STARS) for monitoring

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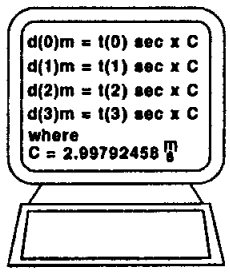
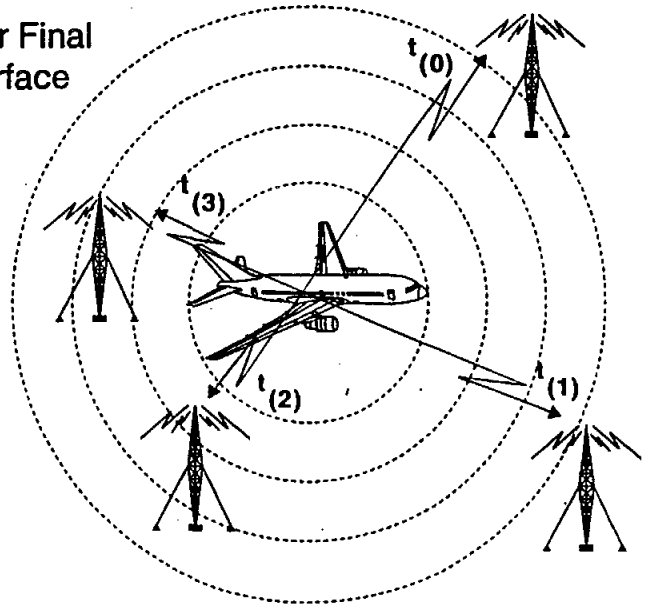
Potential Technology - Multilateration

- Uses four or more ground R/Ts to determine aircraft position
- Works with ATCRB transponders and Mode S
- Substantially lower cost than PRM
- Seamless surveillance for Final Approach and Airport Surface





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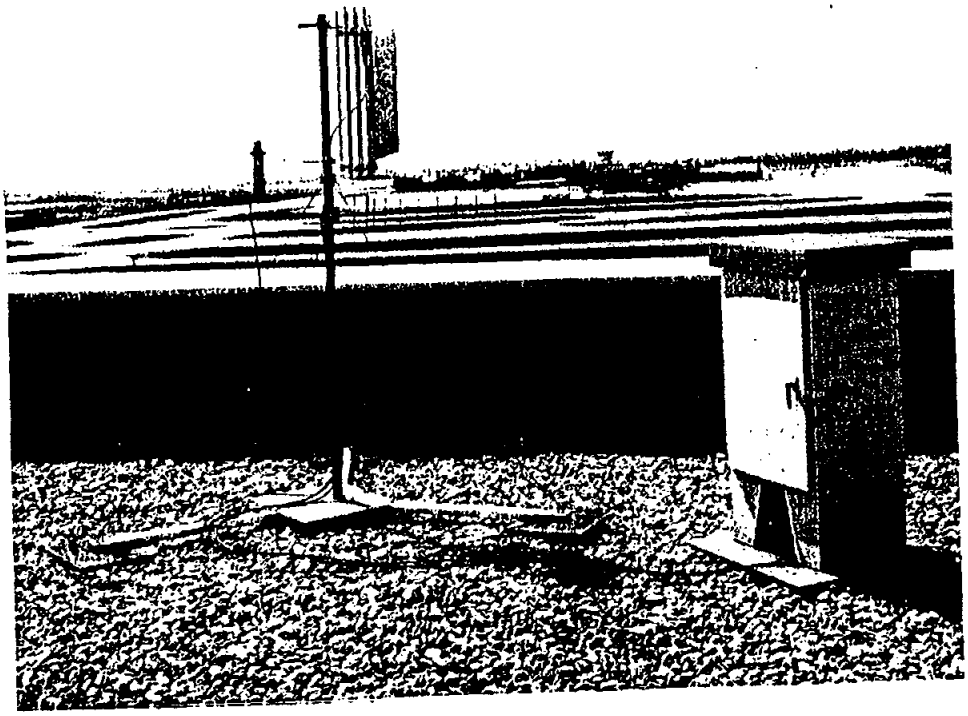
Potential Technology - Multilateration (Cont.)



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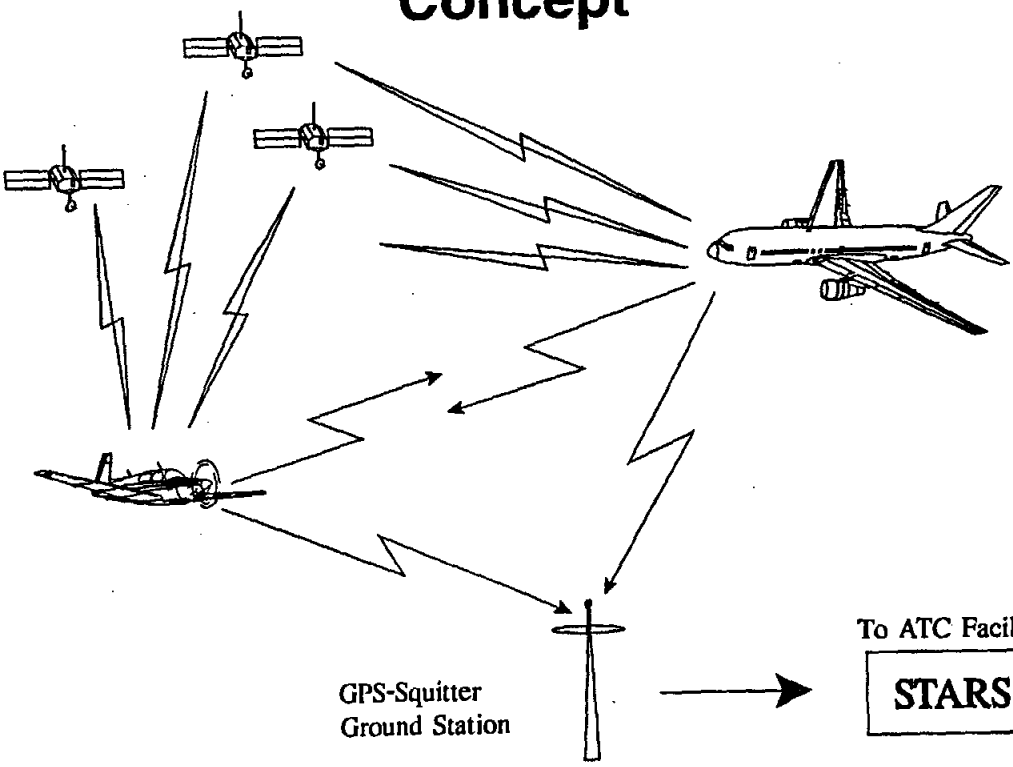
Automatic Dependent Surveillance/GPS Concept



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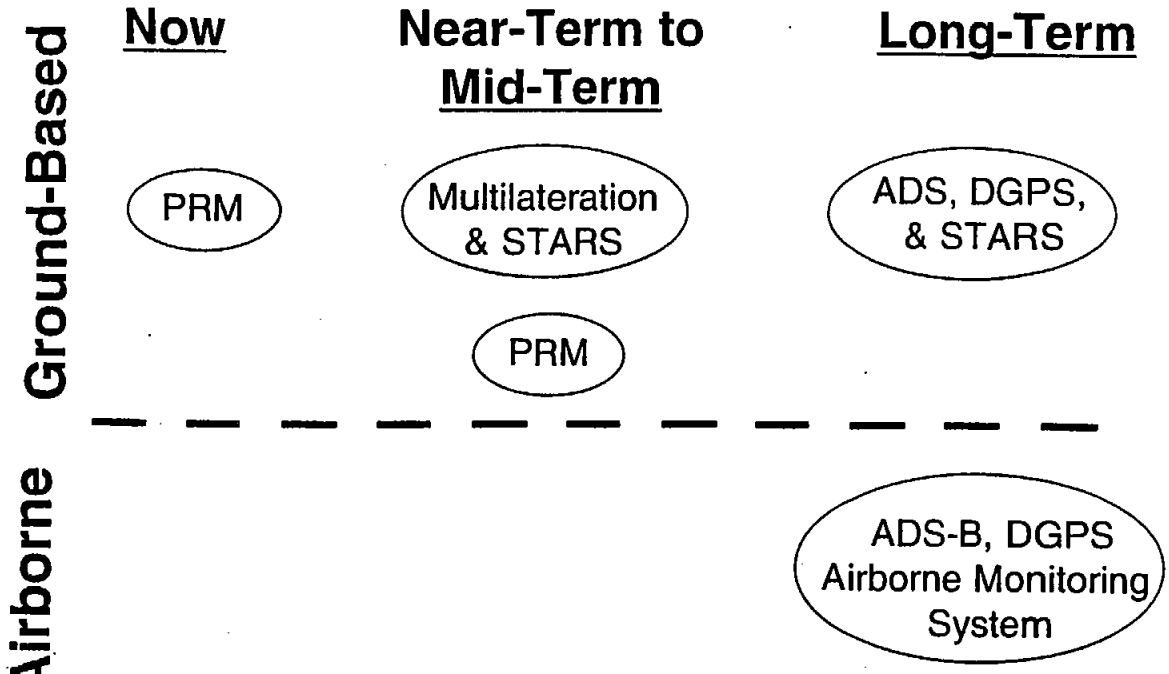
Vision of System Evolution



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Page 14

ADS-B Standards

Rocky Stone
United Airlines

NASA Langley
Parallel Runway Workshop
10/29/96

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RTCA SC-186 Activity

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- Minimum Aviation System Performance Standards (MASPS)
- Generic Requirements, Not Specific to a Transmission Medium

ADS-B MASPS (Cont.)

- Operational Requirements Based on Projected Applications:
  - Free Flight (Conflict Probe)
  - Surveillance for Closely Space Parallel Approaches
  - Station Keeping (Enroute and Terminal Area)
  - In-Trail Climb/Descent

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RTCA SC-186 Activity

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- Minimum Operational Performance Specifications (MOPS)
  - 1090MHz Extended Squitter ADS-B System
  - Cockpit Display of Traffic Information

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Wake Vortex Systems Application to AILS

David A. Hinton

AILS Workshop

October 29, 1996

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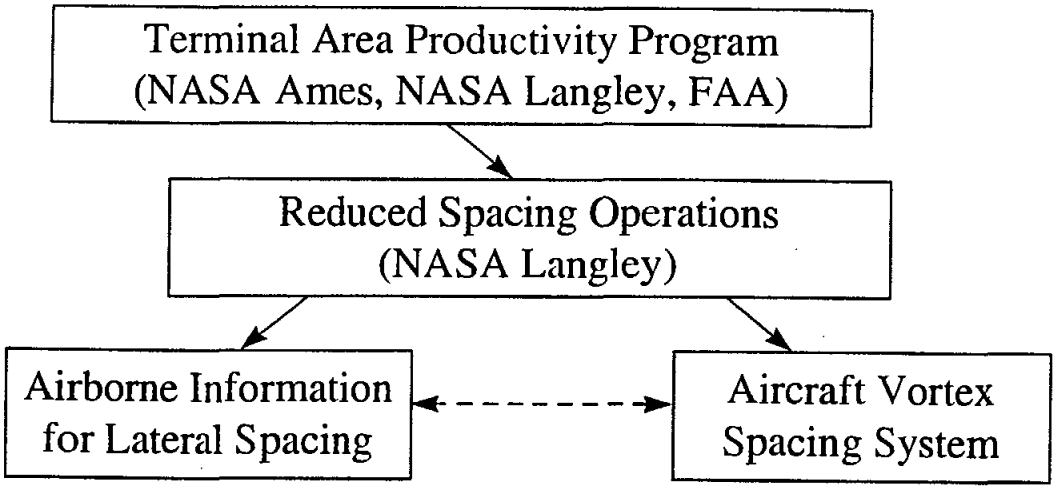
(757) 864-2040

Wake Vortex Systems Support of AILS

AILS development involves wake vortex considerations - which the AVOSS element can address.



Aircraft Vortex Spacing System Goal

Provide dynamical aircraft wake vortex spacing criteria to automated ATC systems at capacity limited facilities with required lead time and stability for use in establishing aircraft arrival scheduling. Support TAP goal of improving instrument operations capacity to current visual operations level.

AVOSS System Concept

- Separate aircraft from encounters with wake vortices of an operationally unacceptable strength.

- Define protected corridor from outer marker to runway and predict time for vortex to clear. ("Transport Time")
- Define operationally unacceptable wake strength and predict time to decay. ("Decay Time")
- Combine and provide to ATC automation. ("Residence Time")
- Monitor safety and provide predictor feedback with wake vortex detection subsystem.

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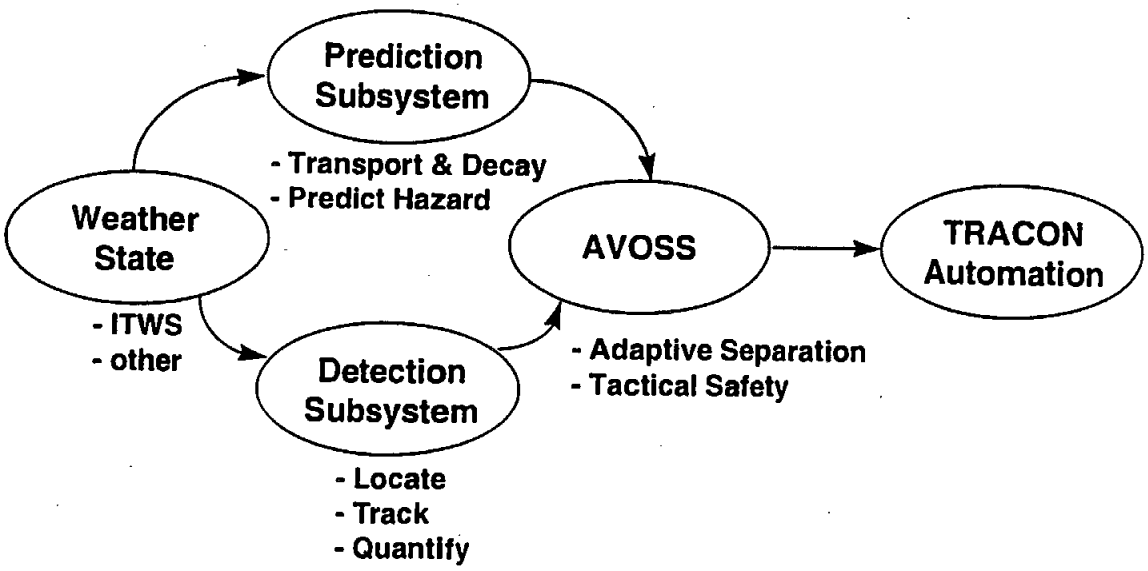
Aircraft Vortex Spacing System Architecture



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Available AVOSS Program Tools

- Enhanced weather systems:
  - Profile winds in the entire approach corridor.
  - Nowcasting.
  - Integrated Terminal Weather System (ITWS) coordination.
- Validated numeric wake simulation tools:
  - Meteorological framework.
  - Validation against field data.
  - Follows technical approach applied to highly successful Wind Shear program.

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AVOSS Program Tools

- Wake Vortex Sensor Development:
  - MIT Lincoln CW lidar with automated wake acquisition and tracking capability.
  - NASA pulsed lidar development.
  - Other technologies under investigation.
- Program integration:
  - ATC procedural aspects.
  - Controller Human Factors (@NASA Ames).
  - Field demonstration infrastructure.

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AVOSS Plans/Schedule

- Initial field studies and numeric wake simulation 2-D version completed.
- 3-D numeric wake and planetary boundary layer simulation in development.
- Wake sensitivity studies and initial AVOSS prototype design underway. Includes atmospheric profiling capability and weather/lidar/prediction system integration.
- Dallas-Fort Worth Int'l Airport being instrumented for the AVOSS prototype tests. Includes dedicated weather sensors, ITWS tie-in, ATC radar data tie-in, and wake sensors data link.
- AVOSS testing and development to follow incremental stages through year 2000 TAP demonstration.

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Potential AVOSS/AILS Coordination

- Wake considerations in blunder situation.
  - Implications for alerting criteria.
- Wake considerations in normal operations.
  - Map possible lateral drift distances vs. wake strength.
  - Identify subset of atmospheric profiles that can transport a hazardous wake to a parallel approach, at different path separations.
  - Provide AVOSS weather system outputs to support TRACON decision processes.

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Summary

- AVOSS development effort brings skills and infrastructure to address wake concerns for AILS.
- At first stages of dialogue, coordination, and issues identification.

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Transcript of the Wrap-up Session

This section presents minutes of the discussions during the wrap-up session of the workshop. The manuscript was prepared from a taped recording. In some cases there was difficulty in understanding the audio recordings or the name of the speaker may have not been recorded. Every effort has been made to capture the statements of the speakers as accurately as possible. We apologize for any statements that may have been misinterpreted. We have indicated some of the unclear recording segments with "...".

Brad Perry (Moderator - NASA Langley Research Center, RSO Manager)
In our last session, this is to be a wrap-up session involving all of the speakers who have presented today. Additionally, I'd like to introduce Leonard Credeur. Leonard is the Deputy Manager for RSO. As such, he has keen insight into many of the technical aspects of the key areas that have to be addressed in implementing an AILS application. I would like to have Leonard join the other speakers.

This is intended to be an open format. This will provide an opportunity for you to ask those questions we just didn't have time for during the day. We can also talk about some of the fundamental issues to be solved.

Remember, I had a chart this morning that listed several of the key issue areas that have to be addressed in implementing an AILS-type technology. Bob Jacobsen showed a chart in his presentation defining the role of both NASA, as well as the FAA, and others in implementing the technology. The key point of his chart was that we are somewhere between concept exploration and concept demonstration now. Obviously, there are many other steps that have to occur to get to operational reality. You'll recall that I had yet another chart in my presentation where I talked about some of the keen interest that has been shown in AILS to date. There are airports with existing problems. There are airports planning new construction which can benefit from this kind of technology. But, overall, for this technology to come together properly, it is going to take all the right partnerships working to make it happen. Specifically, the technology capability has got to be there. We are going to continue working the NASA research to that end. It will require avionics manufacturers to build the equipment, it's going to require airlines to buy the equipment. As Rocky Stone pointed out, they're only going to buy the equipment if it's cost effective. It's going to be used at specific airports. Obviously, the airframers – Boeing, McDonnell-Douglas, and other major players -- will be involved at an appropriate point. A crucial role will be up to the FAA to pave the way through the certification and operational status process that's required.

We'd like to explore everyone's thoughts between now and about five o'clock. To that end let's go ahead and start. We have a roving microphone. Please ask your questions over the microphone. We are going to be recording the questions as well as the responses to these questions.

To that end, I'd like to open the questioning from the floor.

Jack Wojciech (FAA, Office of System Safety)
We had heard earlier, and I've been reading, and I know from some of my background that approximately 50 to 60 percent of the TCAS RA's are not being followed and I am concerned a little bit that if we're in this tighter situation, and we have a similar reluctance (Someone had mentioned every second represents one hundred twenty-five feet). In your part task you are getting responses. In some cases they may not respond. The same things, the same stress are not a part of the AILS, or this type system. But I do believe we need to have a kind of a backup for that or it needs to be considered in the risk assessment. That was my question.

Perry: Okay, who would like to take that.

Trent Thrush: I'm not sure where you get your statistics and whether it has to do with traffic in visual conditions or in IMC conditions. I think that would have a big dependency. Maybe one of the reasons that pilots don't follow some RA's is that they see the traffic.

Wojciech: You say the conditions aren't present and I appreciate what you are saying. But there is still the need to understand the human factors involved. How would company policy play into that go around through something that people don't want to do? Of course they will do it if they know that it is safe, critical and vital, but I just think we need to be sure. We're in a little different ball game as we tighten up. Clearly it needs to be more evolutionary, just to understand that process. Even if we can do 1500 feet, we should never start at 1500 feet.

Credeur:
I think also, I agree with you that before this is operationally acceptable there probably is a lot of risk assessment that has to be done and I don't think we are there yet. Some more studies obviously have to be done, as well as some modeling and risk assessment kind of work.

Rocky Stone:
I absolutely agree with that. And I kind of look at it as the analogy that I think Charlie Scanlon brought up. This is something like an N1 cut. Where as TCAS RA's, I think the average airline crew averages one every other month or something like that. And they can, I hate to say this, they can become mundane or routine. Especially if you get that one every other month up in the same place and you know what's causing it. Where as, this hopefully will be at most a once in a life time situation although I don't have any V1 cut data at the top of my head, I can tell you just from our recent past experience, Charlie, that in real life we don't handle them very well. And that definitely has to go into the safety model.

Perry: Good point.

David Jacobs (North West Airlines)
I guess, on the FAA's question, that kind of pre-supposes the fact that we have simulator training for wind shear avoidance, we have simulator training for stall avoidance, so we probably ought to consider simulator training for this type of avoidance too. If we are going to talk about a once in a while type of event that's going to require immediate action, I don't think watching a video is going to be the answer. On that point. On the second point, we talked about earlier that PRM was introduced at Minneapolis. Our A320 group in particular had some concerns because their particular airplane, in the auto-coupled mode, does not come out of the auto-coupled mode to do this turning maneuver as quickly as the old Jurassic DC-9 that I fly where you hit a button and you're home free. So there is not a lot to turn off. But, going a little bit further with that discussion, the time to react is also based on not just the pilot but the airplane, and that can change. There is a variety of times in there that you can throw in there. And you don't want to equate that so much to like an RTO event that has a whole bunch of different factors related to it. It's an event you don't want to do and you want to shed responsibility or things that would cause you to do that RTO as you get closer to your V1 speed. In other words, at 80 knots a yellow light might cause you to do an RTO, but as you get close to V1 it had better be a red fire light or you're going to go. Because of the problems that were brought up that we usually don't do that very well and, if we're balanced field, we stand a great risk, depending on a lot of other factors, of not being able to stop the airplane. With regards to this maneuver, you've got pilot reaction time at the end of a 5-day leg on a red eye, in the middle of the night, a heavy aircraft on a turn back versus a light aircraft. The aircraft response gets into this equation too. So I think the important factor as Charlie and I talked about is what's the miss distance at the end of this whole maneuver.

And if your miss distance continues to be satisfactory, for where ever you want to put it at, then you are solving the reaction time with all of its factors. The miss distances are getting too close, then you can start breaking it down, I think to discuss, what's causing that. Is it because the pilots are slow to react and only see it once in a while? Is it the aircraft, or all of these other factors?

Perry: Comments.

Scanlon: That's a very interesting discussion. Especially the disconnect that a lot of us have been worrying about. And that's something that we definitely have to look into. If it is disconnect of the auto-throttle, ...that ... has added to some of the reactions times that the FAA has measured in their PRM ..., that's certainly something I intend to look into in much more detail as soon as I can. So, thanks for the comment. That was very good. The bottom line is the miss distance; I agree with that. The reaction time, we may have over stressed that a little bit. But I guess we were getting such different response times than what has been measured in the past. I wanted to make sure everybody understood exactly what they were and how we got them. And why we got such good numbers there. Thank you very much.

Richard Licata (Emery Airlines):
I fly a pre-Jurassic DC-8. And if you can get the aircraft to react in 5 seconds, you're good. All that aside, I just want to comment on the technology. I think this has to continue, because I think the most dangerous situation (is to) "follow that traffic". I don't know who he is. I can't positively identify who that airplane is. Yet I have to see and be seen. And I have to be able to maintain some kind of separation. If one fellow is on left base leg and I'm on right base leg and he says follow that airplane to the airport, I'm not good enough. I don't know I've got three miles or two miles. When I start reading the logo, I think I am getting a little close. So, I believe this has to go on. I believe you guys are right on track with this. I think TCAS is ancient. I think this is the way it should be done. I like to see the traffic myself in the cockpit. And your display was wonderful. You showed me where the airplane was. And at least I can do that. So I believe we have to do it just like this. I think TCAS has to go, and I think ADS-B has to be at least the initial answer to it so that I have a display of who's around me. And eventually, FANS 12 will be here. And we can go all the way back to the Wright Brothers. This is the way we started this in the first place. You don't have to look outside the cockpit. You look inside the cockpit and see the same thing. So Thank you. I appreciate it.

Brad Perry:
I'll just make a brief comment here. We've had a number of visitors come to Langley within the last year or so and some of these individuals are very distinguished. They took a look at what we are doing with our AILS research and they said, you know, this is better information than pilots have in today's VFR environment. I think Rocky (Stone) built on this in what you were talking about. The fact that if someone is closing on you, how soon do you pick it up with the unaided eye looking out of the window. And particularly in today's approach environment having to do the visual search because it's not on the instrument panel in front of you. Do you have to turn and look significantly aft of your position and that's a horrendous cross check if you have to do that sort of thing. So, it's significantly about the business of putting the right information in front of the pilots for this critical phase of flight. And there are many decisions yet to be made, but obviously giving the pilot what he or she needs when they need it is part of the central success story here. To keep it simple, we don't want a technology display in the cockpit beyond what is necessary for safety and operational enhancements as we have been talking about today. There in lies the challenge. Doing it as successfully, optimally as we can.

Trent Thrush:
I'll speak for myself, but at least for our approach, we are not looking at replacing TCAS. We're looking at enhancing the capabilities of TCAS, maybe within the next generation of TCAS's.

But, some of the comments I got from the pilot subjects in my study were a real appreciation for TCAS. Knowing more about what's out there and having experienced that TCAS has benefited them. So, there is a great trust built in TCAS from experience and also their training. If we can leverage that in so way for newer technologies, I think that would benefit us.

Brad Perry:
Yeah, In a global sense it's what do we do to complement or further enhance what's already out there. The fact that TCAS was not designed nor implemented for the specific terminal area problems that we're addressing here gives rise to the need to look further at what does make most applicable sense.

Ralph Nicosia-Rusin (FAA/New England/Airports):
First, I think the technology is very exciting. Just the whole concept of gathering data out of the cockpit and putting it into the surveillance system whether or not it ends up being pilots separating themselves or something integrated with the controller environment, it all seems to be a major enhancement to the surveillance of aircraft. Also, I think the pilot-based systems do speed up the response times with very convincing demonstration in simulation. The one concern I have with that is that you are perhaps over investing that data base in the cockpit. I guess there is a need to look at equipment failure, ... what type of standard operation procedures you will develop in response to equipment failures, and how aircraft monitor each other for the performance of their equipment. The question I had is or the suggestion I also had is regarding approaches. (I'm) fighting hard to develop capacity to airports like Logan and very happy to have independent parallel approaches. (I would) be just as happy to make improvements with dependent parallels. I would suggest that you might look at that especially as an intermediate step to provide you that additional margin of safety you might get. We might even be looking at perhaps 1-mile diagonal separations between the two streams. Probably brings you down to minimum runway occupancy times to both of those runways and still gives you very safe distance if you do have a blunder. So, I suggest that is another area you might look into. Thank you.

Perry:
Okay. One of the challenges with spacing airplanes is how can you best do that with today's ATC tools. Said another way, what accuracy can you achieve in paired or staggered spacing with the capability that's out there today. What's going to be available in the future. Obviously, CTAS is looking to implement an active FAST, (Final Approach Spacing Tool) capability which will greatly enhance the capability overall to pair up airplanes and to do so much more precisely than can be done today in the manual ATC environment. All that has to be taken into account appropriately.

Perry: Further comment on that from the panel?

Scanlon: Can we ask a question?

Perry: Sure

Scanlon: Is there anyone from NATCA here or one of the controller unions? I would really like your comment from a group like that as to what they have seen and are we so far off base that NACTA would never accept any such thing or just general comments would be nice to hear.

William Johannes (Technology Representative, NATCA)
It's very interesting. There are improvements that can be made. Off the top of my head, if you are talking about 1200 feet, 1700 feet separation, I think you are dreaming. I don't think the equipment that we have to work with will support that. And, the road we are headed down with the SR and other things, we are not going to have that capability to support it. But, we are always open to new technology. As far as TCAS is concerned, and I like to address the gentleman who flies the DC-8, TCAS isn't going to go away. I can tell you that. We support the use of TCAS. We

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believe it improves safety in the system. There are some bugs in it, but its come a long way in the last 5 years. Right Rocky (Stone). A few gentle pushes.

But I think you are going down a track to improve what we have to work with. But I would suggest you learn to crawl before you try to take big leaps down to the third of a mile separation and do this.

Ran Gazit (Stanford University)
I have two comments. First of all, the studies that were made at Langley assumed that GPS is used for both navigation and guidance through the approach and for the surveillance through ADS-B. And that means that if an aircraft is blundering due to some GPS failure ... it also would not be able to tell that it is blundering. So there is some integrity issue that you should look at. And another comment is that all the simulations ... involved a human in the loop. And although I understand the importance of that, it seems that this limits the number of simulations that you can make and therefore the statistical significance of the results which were presented here is poor. And if you like to look at the acceptance of the ideas which were presented here, you should look at the false alarm rates of those systems. In order to do that you need to make more simulations, probably in the form of a Monte Carlo simulation. So the results that were presented here can be used to tune in models of human reaction into those Monte Carlo simulations in order to get more statistical significance results regarding the false alarm rates.

Perry: Comments on the statistical basis and significance of our research.

Scanlon: Of course the false alarm rate is very important and that is something we do want to look at. Monte Carlo simulations, we have Rockwell Collins for example has run statistical studies for us and so has MIT. We started out down that approach, but you are right, we sure need more varied type approaches looking into the different scenarios rather than just the few we have used so far. As far as monitoring the equipment when you have equipment failures or when the differential GPS is off, we really haven't even looked into that. I guess we view that more as an industry type thing than what we should be doing. Maybe we should be into that, I don't know.

Rocky Stone:
With the GPS accuracy and the differential GPS, or when it fails, I think that in SC-186 we are very sensitive to that issue because we realize we are combining a navigation and a surveillance function into what traditionally has been two independent functions. And because of that, we have defined, we used to call it, actual navigation performance. We now call it (the) position uncertainty factor. But essentially, what we are saying is that GPS and DGPS can have errors, but ... we can within the GPS box detect those errors. And if necessary, coast or have another navigation source for the ADS-B position report. And when that happens, the ADS-B box has to be smart enough to say, I now have a much higher position uncertainty. And, if that kind of a failure mode would happen, during for instance, a paired approach, that would be time for the paired (approach) to be over and the escape maneuver to begin.

Trent Thrush:
Concerning the false alarm rate data of the system itself, I turn you toward Jim Kurchar as I mentioned before, and some of the reports and studies that he has already done. He has compared the false alarm rate of the system to the false alarm rate of TCAS. I think he is already kind of going in those directions, so far as the alert work that he has been doing.

Brad Perry:
Okay

Frank Cheshire (American Airlines, DFW)
Comment to question - We had a prototype CTAS at DFW in the TRACON for a period of time. The good news is in an advisory capacity it worked well; the controllers liked it. The bad news is when the prototype probation period was over, they took it out. The controllers did not like that.

Brad Perry:
Well that communicates significantly the fact that the enhancement provided by CTAS was in fact good. That is one of the basic measures of anything when you take it away - do you hurt? And you're saying that they did hurt.

Frank Cheshire:
My understanding was they had used it to good advantage in improving the runway loading balance at DFW. My request is, I suspect my boss sent me here because I'm the lowest common denominator in our office, and I'm going to have to be able to explain the charts that are in the proceedings and I would request that the rocketship include a detailed description of what each phase of the profile represents, what technology it is based on, and where there are transitions from one to another. The first time it appears in the proceedings if you would please.

Brad Perry:
Okay, we'll take that as an action and Charlie and Marvin will be working together to do that. That's a very good suggestion. I think that is required for the proceedings to be more stand alone overtime, with respect to the basis of the research, and understanding what we really did. The rocketship for our study was very crucial.

Comments:

Robert Jacobsen (TAP Program Manger, NASA ARC)
Just let me make a comment regarding CTAS at DFW - it isn't gone. I believe what you're referring to is a specific test program that was run where it became active for a day long period or 8 hour period and yes there were very good results, but the development work continues and at this point the FAA is committed, and I think they have plans ... if I'm not mistaken for implementation in eight airports around the country in the next 2 years or so, one of which is Dallas. It has been received very well. I just want to make a comment to follow up on something that you mentioned and embrace our NATCA representative that is here. We recognized the importance of the air traffic controller in the process of the airspace system and the procedures that are used. We want to encourage their participation in all the development activities that we have in all of our airspace system programs. I think our experience in CTAS has borne that out. Until we really got involved with the controllers and had them become part of the development process, you can take all the engineers you want and you're not going to solve the problem. They play a very key role in being part of the solution in CTAS and we want to make sure that that happens in other technologies as well. I think the AILS work has great potential, obviously huge pay back for those (situations) where it is applicable. We need the controllers to be part of the solution to that problem, but there is a big roles and responsibilities issue that needs to be addressed.

Jim Serrill (SeaTac International Airport)
We may be one of those airports where AILS is applicable. As I listen to the AILS discussions and look at the technology, it appears that we're solving only one dimension of the constraint and that's the lateral separation. The pilot looks out the window sees another airplane out there and in visual conditions judges whether there is closure. AILS does that during instrument conditions. The second constraint is wake turbulence and right now under visual conditions you run airplanes side by side and get 800 feet separation. You run them side by side and you're making parallel approaches based on the fact of using procedural avoidance of wake turbulence. That's based on the airplane in front of you being at or below you. Is there not a way within the AILS to add an

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altitude parameter to that and some algorithm that based on the position says where that airplane can or cannot be and if the preceding airplane is above you that that then triggers a missed approach.

Charles Scanlon
I'm sure we'll want Dave Hinton to also comment on this. As a pilot I was very surprised at some of the research that they've come up with. For example: In measuring the wing tip vortices in Memphis, I was surprised to see one example where the wind tip vortex apparently descended slightly, hit a slight wind shear and went back up. It just blew my mind to think of a wind tip vortex going up and going above that airplane in front of me is the wrong thing to do. So I'm not so sure anymore that just flying above the other airplane is the solution after seeing actual wing tip vortices that go up. So that's the reason why we've asked the AVOSS (wake vortex research) people to help us. It may be that under certain atmospheric conditions, you just simply can't run closely spaced parallel runways. You may have to shut it down to one and only one. And if you had an answer, yes it is safe, (or) no it's not ..., you could shut it down or leave it up. That might be one of the solutions. At any rate, we're just now beginning to look at that problem.

(Unclear question from audience) Will that also ... under visual conditions?

Scanlon: Yes, very definitely.

Brad Perry:
Absolutely, as part of our wake vortex research we certainly will have a more complete and comprehensive understanding of wake vortex behavior under a wide variety of weather conditions. Today as most of you know, the Aeronautical Information Manual has some rather imperial rules-of-thumb to follow for safe distance and separation from wake vortices. These have worked very well for the most part, however, as Charlie mentioned we're gathering data now that shows that wake vortices don't always descend. Sometimes they descend, stop descending, and then descend some more. And it is through this much more complete understanding that I think we'll have capability to ultimately fly even more safely than we do today. And that's a safety dividend from the TAP and RSO efforts in addition to what we're doing to primarily to enhance capacity.

Dave Hinton (NASA Langley)
The wake vortex development effort that we're participating in will be able, when it comes to maturity, to be able to predict how the wakes are going to behave in the atmosphere, how far they will drift and how quickly they will decay. How that actually gets implemented in the AILS is going to be something that we'll have to work out together. It may be procedural or it may require some vertical dimension which Charlie you would have to comment on what the capability of your system is. I can't do that. We will be able to determine, given atmospheric conditions, (whether) wake is going to be a consideration for the (parallel) approaches.

Frank Hansen:
I too would like to tell the gentleman from Air Traffic Control that there are some of us who feel that this is probably going to evolve into a combination of systems and we personally believe that there is a role for the air traffic controller, particularly, in the monitoring phase. In fact, I think we would welcome that, at least through a transitioning period and probably forever. Jim and I flew the simulator yesterday and I haven't flown for several years in an airliner, and I've never flown a side stick controller or that horizon. And outside of being kind of sloppy, I did manage ..., in a matter of seconds, to initiate a go around. I think we're over emphasizing that whole problem that we have there. I think back about 30 years of check piloting, when I taught literally hundreds of guys about 100 foot decision heights with big airplanes where you came down and you trained in 100 feet, which isn't very much left to go, ... (that) you punched the button and you went around.

So I think it is a relatively simple procedure that Charlie is pushing there that all you got to do is push the toggle button and turn 45 degrees and it's a piece of cake.
I think we're putting too much emphasis on it. It is something we need to address and we should continue to. Now, kind of the same thing on the vortex turbulence in the fact that we know that we have hundreds, maybe thousands of airplanes every day. All you have to do is to go to LA or anything that lands wing tip to wind tip grounded visually. They're not falling out of the sky, they're not crashing or anything. We know that it causes turbulence and I think you've got to look at the record. Go out and run some tests if you want to look at these airports. Any of us who have flown into Washington National, O'Hare, LaGaurdia know that these places are wing tip to wind tip lots of times. So granted we have some big problems, but I don't think we need to make them bigger than they are. I think Charlie is right on this missed approach procedure. I don't think a missed approach is any big deal one way or another. I would like to commend the fellows here. This is wonderful to see this kind of work. I have copies of our SeaTac position because we're like a lot of other places where we proposed 1800 feet because if we went to 2500 feet, we would literally go over the cliff. And that takes 23 million yards of dirt and probably 300 million dollars. This is a big problem. Bill Cotton from United said we're never going to fill San Francisco Bay. So we've got to be realistic about where we are and what we're trying to do. I think we can do it all and with the help of these guys very successfully.

Paul Miller (Safety, Chairman - UPS Independent Pilot Association)

One of the questions that I have is that when TCAS was first started, it kind of started with congressional mandate which led to an FAA regulation and was further amplified with a second regulation which brought the TCAS requirements to ten-seat airplanes. And somewhere in that mix the address the two or three hundred airplanes that UPS has, the three or four hundred airplanes that Fed Ex has, we're just left out of the mix. So the United airplanes, the American airplanes, they're flying in and out of Philadelphia, DFW, and San Francisco. I'm in a 74, 3 miles behind you at flaps 25 trying to get to the runway as fast as you, basically looking out the window to make sure that I'm keeping 3 miles because I don't have TCAS. I can do that at night pretty good, but then again I'm only 48 and my eyes are pretty good. But somewhere down the line, when I get the requirements to wear glasses, I'm going to be looking out there and seeing the lights of Philadelphia and say... "Looks like 3 miles". And when I take that ride with the FAA guy, he's going to have a block that says V1 cut, but he's not going to have a block that says "Can see 3 miles". Yet, there is a procedure that says "Fly 3 miles". So what we have here is a big disconnect. We have an FAA failure to put a regulation into effect that would require the TCAS and AILS and all other technology, yet you've got FAA integrating these airplanes right into the mix without any differential, including the Jurassic DC 8's. And that's why he was talking about visual because that's the only piece of instrument he has. So you really do have a problem. And as you know, our pilot association petitioned the FAA for a TCAS requirement, ...I'm sure it will be a long lead time before anything takes place. So this is an issue that should be addressed as well as the technology. You have to have the requirement to institute it. Without the requirement, it will not be instituted.

Brad Perry:
Comments on that?

Unclear tape segment ... comment made.

Paul Miller (Independent Pilot's Association):
I didn't really mean to start any discussion about whether or not freighters should have TCAS and I really didn't mean to imply that I think that TCAS shouldn't happen. ... So, I believe that all aircraft should have TCAS. They all should have TCAS that they will use, can use, and that they can afford. I believe that the technology for what we call TCAS today is just ridiculously expensive for what you're getting. You're getting no bang for the buck at all.

I believe that if you give me a cockpit display and some way of telling me to turn to avoid this guy and give me some better tools than what TCAS has to offer,
I want to see it in a 172. It needs to be in all the airplanes. And Since GPS will be in all the airplanes and there is no doubt in my mind that the United States Government is going to save billions of dollars once GPS is in all the airplanes. There's a major incentive. And once GPS is there it's a real short distance to ADS...(recording not clear). In any event, I just didn't want anybody to misunderstand me, that I was against TCAS. I think TCAS is wonderful, but I think TCAS as we know it today just is not getting it done. It's not good enough. And it is limited to the big boys who have big bucks. They are the only ones who can afford to put it in. If we can't get it in the Twin Beaches, historically it's the twin Beaches, those aircraft that have caused mid air collisions. I mean, when is the last time two airliners got together. I think it was Las Vegas somewhere over the Grand Canyon. It was a Constellation and a DC-7. So, TCAS isn't going to help a lot if we put it in one kind of airplane, TCAS has to be in all airplanes. And I think that GPS, ADS, FANS-12, if you will, technology is where we have to go. And we have to go fast. ...(We are getting to into the)... AILS business because it's going to save bucks, therefore its going to be pushed. AILS to me is just a stepping stone toward an intelligent TCAS. I don't care about parallel approaches. It doesn't mean anything to me. I care about the other traffic that's around the airport when ATC tells me you are cleared for a visual. Ten miles visual scares the XXXX out of me. I don't know who is out there. The controller says, do you have the airport. And I say yeah. He nods off to sleep. He's done. His responsibility is finished. Now I have to do it. And that spooks me.

Rocky Stone (UAL):
I want to respond a little bit to that. One of the things we are trying to do in SC-186 is be very sensitive to that (as) we want to design an ADS-B system. We want to make specifications for an ADS-B system that will be affordable for every user. And that means the Cesna 140 owner, the Piper Tripacer, and in fact, we are putting provisions in our MASPS (type of RTCS standards document) for parachuters to carry ADS-B units so that we can tell when they are coming through our flight path, I guess. The point is we want to make a system that has the potential of being very inexpensive and yet that has the reliability and the continuity and availability of the signal to be very reliable, and to be something that the pilot will use and trust in. And that's why, and I appreciate the freighter and the fact that you guys are not under the TCAS mandate, I think there are good things and bad things to be said about that. And in fact, you may have lucked out by waiting for the next step in this technological evolution. You may get most of the benefits for and order of magnitude, ... less price than those of us that have TCAS.

Robert Jacobsen:
I just wanted to make one comment on that, not to get into the TCAS argument one way or the other, except to... But it brings to mind one thing that in our development of any further technology in this area, is that we have to bare in mind that there is a mix in the fleet. So we have to address, from a procedures standpoint, what is going to happen.
And this is another area where air traffic control has to involved with us in the development of these procedures because not everybody is going to buy. And consequently we are going to have air traffic, if we follow the scenario that was presented today, we are going to have some folks out there determining their own separation, but yet we are going to have a system where ATC is going to have to determine separation for other aircraft. How is all of that going to work? It's a big procedures and human factors issue. And so we have that to address if we are taking this thing forward as well.

Leonard Credeur:
I had one sort of story that I preach here. If you would indulge me for just a minute. You know, in this whole issue, I think a couple of people talked about this. In terms of AILS, there are kind of two approaches to look at this thing. One approach is to look at it from the standpoint of the

studies that have been done so far. Looking at separations and looking at response times, and seeing how far we keep airplanes separated from each other. That's sort of the approach of PRM, absolutely assuring separation. Just for philosophical discussion, we have another point of view. That is, if you were to take two airplanes 700 feet apart, coming in on a visual approach, and do a blunder, it would be interesting to see what the response time might be under that circumstance. And think about the relative safety of a situation like that versus perhaps some electronic lead information, coupled with an alerting system. Because, you know, I'm not a pilot myself so that maybe this is off base here but I think in talking to pilots, as they come in on a visual approach and they do a lot of things. Part of the scan problem is to occasionally look over there and see what the other airplane is doing. But they are also doing a lot of things in the cockpit. And what can happen is that the other airplane, between when you look out there and do you internal scan, a lot of things could happen. If you did experiments there, it would be interesting to look at it from that approach. There are really two kinds of ways to look at this thing. I'm just throwing that out for thought.

Lou Taylor (Honeywell):
A real quick question, I think you have been dancing around it, but there is a lot of analog aircraft out there. The demonstrations you did are very impressive, but they are all FMS EFIS. Will the DC-9's, 737's, 727's ... Do you have any thoughts on how to implement this in a non-FMS non-EFIS aircraft?

Charles Scanlon:
That a very good question. Of course the work we have been doing is showing sufficiency. With these tools we are getting good positive results and the question is do you have to have those tools or not. In other words, if you take the round dial airplane with possibly a glass TCAS display, and audio and get the same results. The answer is of course, we don't know. We haven't done that. However, in the first tests we did use the non-zoom-in capability versus the zoom-in capability. In other words, on that 10 NM range you got almost no information at all about whether the other airplane was moving in or not moving in. And it turns out there is statistically no difference in the miss distance, the bottom line. So, about all they had was the turn climb and the flashing on the primary flight display. So, it may be you could implement something in a round dial airplane and get it going. We don't know the answer to that. We have not shown...(recording not clear)...necessary. Just that we do have sufficiency for at least the results we have for the miss distances. But that's a very good point. Thank you.

Anon:
The PRM and AILS are supposed to be complementary systems. Are PRM descending escape maneuvers still part of the PRM equation?

Gene Wong: I believe it is. Let me explain it this way. It is going to be the last resort as far as the air traffic control system is concerned. We recognize a descending breakout is not really a natural maneuver for pilots because they have been taught to do the breakout, to apply power, pull up and turn. So, in our procedure development for the controllers (Rudy please join in to help me out. Rudy is our representative from air traffic.) We would try to minimize that escape maneuver, but the air traffic system retains that option, as a last resort option. There might be some special geometry that you may need to do the descending breakout. For example, the intruder aircraft is descending, and maybe one way to escape is to do a descending breakout for the evading aircraft. The air traffic controller would know all of the particular circumstances underlying that particular encounter. So, that would remain one of the ATC techniques. But my understanding is that it is not an optimum technique.

My friend that says that a missed approach is a routine procedure, it sort of takes it out the routine when that one time in a thousand you get that one time you get a descent and every pilot will hit

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the TOGO switch, you have the throttles going forward to go-around power, now you have to descend.
You're setting yourself up for some real interesting evolution, especially with a dirty airplane that's light ... I think that's an equation for disaster.

Perry:
Okay, we have time for one last question

Clark Dodge (Regional Commission Airport Affairs, Sea-Tac)
One of the things that I'd like to throw into this equation is a little political aspect. I'm the President of the Regional Commission Airport Affairs. We are trying to look at ways that airports across the country including Sea-Tac can benefit by the work that's been done here. I think it's time now for all of us to get together and maybe form a coalition between the technology standpoint and the political, financial. Everything we can do to help NASA in what they been working on. There are a lot of gentlemen up here that have presented various aspects of what we can do. Those of us that are sitting in this room also have something to add to this. Brad is graciously offering to be a clearing point for a lot of this and I think now is the time, all across the country airports and airport owners/operators, aircraft owners/operators, the airlines to really get together and say what do we need, and how we get there, and how can we get there quickly. Because if we keep postponing this and study on the study on the study, pretty soon the technology we are working on right now will have already have passed us up, and we won't have accomplished anything. The same thing will happen for the next evolution.
So my challenge to you is let's work together and Dr. Scanlon, I appreciate your help on this matter. I was very impressed with what I saw. And don't quit. Let's keep going. Thank you.

Perry: Thank you. Comments on that.

Perry: OK. I appreciate those comments Clark. We certainly want to move forward. There is a role for each of us to play and I think as we work together, we will surprise even ourselves at what we can do. NASA is in the conceptual research end of this and many other parties are required to make this real and operational. But, speaking with the NASA hat on, it is personally exciting when we see our research being noticed and being as applicable as AILS is in today's time frame. I think one of the best things that could happen from a NASA perspective is when industry takes advantage and moves out with our research to move it forward, through all the many hoops that need to be successfully navigated to make it operationally real. And, it is through working together that I think we can realize that. I share your comment about taking advantage of the technology before it passes us by. There's a challenge there. It's a challenge for each of us. We have to assume the correct roles and I think through working together we can be very successfully. Further comments on that?

Charles Scanlon:
I certainly would like to agree that a group of people like for example a SEATAC, avionics manufacturer, an airline could really form (I don't know if anybody is familiar with AGATE or not), but such a group as that could really, I believe, make a difference in actual implementation of technology. And so, I would certainly encourage, and I'm sure everybody up here (in the panel) would be more than willing to help with any such group that were formed. I welcome that comment and I hope anybody interested would contact Brad Perry for that.

Brad Perry:
Let's wrap this up, and in so doing let me say how much I appreciate all of you being with us today as we talked about an exciting area of research and development. I think there is clear potential here as many of us have shared. It is in part using a lot of things that already are there. Using them in a different way to do something different that hasn't been done before. That is truly exciting.

Appendix A

Airborne Information for Lateral Spacing

Workshop Agenda
October 29, 1996

Welcome, Workshop Plans and Overview		(30 min.)	8:30 - 9:00
Moderator	Brad Perry		RSO Program Manager
Welcome	Charles Blankenship		Dir. AST Program
Workshop Plans	Brad Perry		RSO Program Manager
TAP Overview	Robert Jacobsen		TAP Program Manager
RSO and AILS Program description and overview	Brad Perry	(20 min.)	9:00-9:20
NASA Research Preliminary Reports:			
LaRC 3400' and 2500' Study: Marvin Waller		(40 min.)	9:20-10:00
BREAK 15 min.			
ARC 4300' and 2500' Study: Trent Thrush		(40 min.)	10:15-10:55
LaRC 1700' and 1200' Study: Charles Scanlon		(40 min.)	10:55-11:35
Paired Approach Concept - UAL:	Rocky Stone	(30 min.)	11:35-12:05
NASA Flight Tests Plans	Charles Scanlon	(25 min.)	12:05-12:30

LUNCH Break and Demonstrations

PRM status	Gene Wong, FAA AND-450	(30 min.)	2:00 - 2:30
Supporting Technology		(30 min.)	2:30 - 3:00
RTCA SC 186 update (ADS-B)	Rocky Stone, Chair		
Wake Vortex Issues	David Hinton LaRC		

BREAK 15 min.

Wrap up: Participant Discussion and Input Session		(45 min.)	3:15 - 4:00

Demonstrations at the TSRV Simulator 4:30 - 7:00

imulator demonstrations will be conducted during the lunch break and at the end of the meeting. There a sign-up sheet at the registration desk.

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List of Attendees

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Appendix B

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Compilation of the Workshop Evaluation Forms

Note: In the replies to each question the numbers refer to a particular responder. For example, all of the responses numbered "5." were responses from the same participant. Twenty six (26) forms were submitted.

Regarding the workshop -

Was it informative?

1. yes
2. yes, more time should be devoted to Q&A to challenge and discuss the ideas presented.
3. yes
4. yes
5. very
6. yes
7. yes
8. yes
9. very much so!
10. yes - very
11. yes
12. yes
13. Check mark presumably meant yes.
14. yes
15. yes
16. yes
17. yes
18. yes, very
19. yes
20. yes
21. yes
22. yes
23. very informative
24. yes
25. yes
26. yes

Did it accomplish what you expected?

1. more
2. yes
3. not sure
4. yes/no
5. yes
6. not very issue oriented
7. yes
8. yes
9. yes
10. yes
11. yes

12. yes
13. yes
14. to learn about AILS
15. yes
16. yes
17. It was different than expected.
18. (left blank)
19. Generally yes
20. yes
21. yes
22. yes
23. yes
24. yes
25. yes
26. yes

Why or Why not?

1. The program is further along than I envisioned.
2. It gave us a chance to have input with people who are conducting tests and models.
3. Didn't know what to expect
4. I would like to see the exact equipment requirements.
5. Understanding of new programs/technology.
6. Hard to tell what to do next after problems were identified.
7. We are trying to keep up with or get ahead of the rapidly change environment.
8. my objective was to learn more about RSO and AILS and I was definitely exposed to a great deal of input.
9. Gave a clear overview of the program, its objectives and current status and plans.
10. great overview
11. Good overall status presentation, good way to meet people working on these programs and get POC's.
12. Good overview of program and met people. The panel discussion was great. Simulators were informative.
13. (left blank)
14. (left blank)
15. Information on experiment
16. (left blank)
17. R and D of the concept has a long way to go to cover the issues and considerations that need to be addressed to be ready for "prototype" operational evaluation.
18. Very informative
19. (left blank)
20. (left blank)
21. Good presentations - Simulation was very informative.
22. Good overview
23. Topics well presented, professional manner and indicated thorough scientific methodology to achieve desired objectives.
24. Very good
25. NASA provided an excellent overview of their AILS research efforts that strongly suggest that substantial benefits can be derived by the flight-deck centered approach monitoring/alerting. There seemed to be considerable interest by industry members to pursue these technologies.

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26. Very good enthusiasm and participation.

<u>Regarding NASA's AILS Program -</u>

Does it address the problem?

1. yes-but may not be only answer
2. yes - but
3. yes
4. yes
5. yes/no
6. no
7. yes
8. not yet
9. Only partially
10. yes
11. yes
12. Not for me to say - we aren't an airline or airport.
13. a good start! Needs to be an ongoing crosstalk between aviation interests.
14. (left blank)
15. yes
16. (left blank)
17. As far as it goes; the unanswered questions pose additional problems until adequately addressed.
18. Good beginning
19. yes
20. yes
21. possibly
22. yes
23. I believe it does
24. yes
25. yes
26. yes

Why or Why not?

1. There seems to be many potential problems that have not been address that could effect the problem.
2. Windshear (lateral), weather problems such as on adjacent
3. Gives cockpit control of traffic.
4. As long as the FAA allows this ADS-B in place of TCAS
5. Problem should be tied to cost benefit more clearly.
6. Traffic mix/fall back integrity
7. Trying to make a more efficient system.
8. Good outline - needs some holes filled.
9. Problem is fundamentally not technological but operational and institutional.
10. (left blank)
11. addresses problems that are concern for pilots, airports, airlines and FAA.
12. (left blank)
13. (left blank)
14. (left blank)
15. (illegible)
16. (left blank)
17. (left blank)
18. (left blank)
19. From pilots point of view.
20. (left blank)
21. (left blank)

22. (left blank)
23. (left blank)
24. The concern re parallel rwys is justified
25. A flight-deck centered approach makes the most sense, allowing fast response times.
26. Addresses specific aspects.

Suggestions for future direction

1. (left blank)
2. Thunderstorm or a storm moving across the localizer, needs to be brought toward the forefront of models and algorithms.
3. It should be used in lieu of TCAS
4. A projected timeline for completion
5. Compare safety versus cost.
6. (left blank)
7. Get traffic controllers involved
8. continued analysis and additional testing
9. Need to perform FMECA or blunder assumption and verify/establish data (surveillance) dependencies.
10. When AILS is beyond its concept stage, my Division would appreciate an overview of airborne equipment maintenance.
11. Should also look at parallel runway landings (staggered approaches)
12. (left blank)
13. Have another workshop when flight testing etc. warrant an industry update.
14. Need to look at relating false alert alarms that result in evasive maneuvers to reduction in capacity - meaningful quantitative work there. We have done a number of system studies at draper involving the development and quantitative evaluation of system FMEA's (Failure Mode and Effects Analysis). We would welcome the opportunity to pursue such and analysis for ADS-B/GPS system availability.
15. Integrate activity with FAA ATC organization.
16. (left blank)
17. (left blank)
18. ATC - Flight crew, equipment interface continue to keep aviation interests informed. Continue workshops.
19. Fly actual approaches - validate assumptions. Legal questions - control responsibilities.
20. Closer coordination with ground solutions, analysis of event probabilities in real world, analysis of effects of false alarms, analysis of evasions on ATC operations, other aircraft.
21. Need to examine local airport environment-obstructions to M.A. etc. Also risk assessment for safety with equipment outages - Aircraft need to monitor and tell pilot when other aircraft are not operating. Mixed environment to accommodate aircraft without proper equipment.
22. More on concept demos
23. Try to structure programs to distinguish between R&D and application knowledge.
24. Consider angular offset approach paths to provide more separation en route to the final approach fix.
25. (Left blank)
26. Would like some kind of necessary and sufficient aspects presented.

Interest in future AILS Program participation -

Are you or your company interested in participating with NASA in its future AILS Program?

1. yes
2. yes
3. yes
4. yes
5. yes
6. (left blank)

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7. yes
8. yes
9. yes
10. It appears that it will be some time before the instructions for continued airworthiness will begin to be developed. AFS-300 (Acft. Maint. Div.) most certainly would like to participate with whoever will administer that process. (P.S. What is the impact of the proposed enhanced vision approach aids to AILS).
11. yes
12. yes
13. yes
14. yes
15. yes
16. yes
17. I am, my company *probably is but I can't make that commitment.*
18. yes
19. yes
20. yes
21. (left blank)
22. yes
23. yes
24. yes
25. Yes, we have enjoyed and learned from our partnership with NASA on AILS and look forward to continued participation with NASA to validate and enhance AILS and to contribute to implementation of a marketable system.
26. yes

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A Government and Industry workshop on Flight-Deck-Centered Parallel Runway Approaches in Instrument Meteorological Conditions (IMC) was conducted October 29, 1996 at the NASA Langley Research Center. This document contains the slides and records of the proceedings of the workshop. The purpose of the workshop was to disclose to the National airspace community the status of ongoing NASA R&D to address the closely spaced parallel runway problem in IMC and to seek advice and input on direction of future work to assure an optimized research approach. The workshop also included a description of a Paired Approach Concept which is being studied at United Airlines for application at the San Francisco International Airport.

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Port of Seattle

March 7, 1997

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Dear Mr. Furney:

I am responding to your letter to Isabel Safora, dated March 4, 1997, requesting access to public records. The Port of Seattle does not have the information you are requesting. However, I can recommend that you contact Dennis Ossenkopp at the Federal Aviation Administration (FAA), who can be reached at 227-2611, or at the following address:

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1601 Lind Avenue SW
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Renton, WA 98055-4056

Should you have any further questions, please call me at 433-5216.

Sincerely,

Diane Summerhays

Diane Summerhays
Planning Program Manager

c: Isabel Safora, Legal Department, Port of Seattle
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3rd runway unlikely to fly before 2005

2/4/97

Officials now say that other Sea-Tac projects must come first

By Sean Griffin
The News Tribune

Traffic at Sea-Tac Airport is growing so rapidly that completion of a controversial third runway is unlikely to occur until 2005 – five years later than Port of Seattle officials originally hoped.

Instead, other construction priorities such as more parking and better roads into and out of the airport need to come first, port and Federal Aviation Administration officials said Friday.

"There's not enough money to do it all at once," said Mary Vigilante, an FAA consultant who prepared the third-runway project's supplemental environmental impact statement released Friday.

The FAA and the port re-assessed the project's impact after the FAA last year predicted up to 17 percent more passengers would travel through Sea-Tac than previously anticipated.

Last year, there were 396,000 takeoffs and landings at Sea-Tac – 16,000 more than airport planners were predicting for the turn of the century just three years ago.

New forecasts predict a total of 409,000 takeoffs and landings by the year 2000.

The increased numbers mean that many of the airport improvement projects slated to begin after 2000, such as parking and terminal expansions, will have to begin sooner than originally planned, said Gina Marie Lindsey, aviation director for the Port of Seattle, which operates the airport.

"We must make sure all of our facilities are ready to handle the kind of growth being projected," she said.

Friday's report said any additional environmental impacts of the runway project can be mitigated, although Vigilante said another 460 homes will need sound insulation to

Please see **Runway, back page**

Runway

TNT 2/8/97

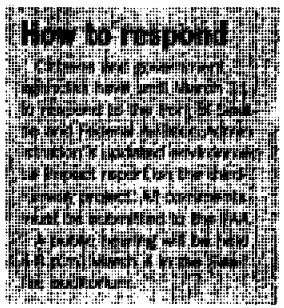
Continued from A1

offset jet noise. That's in addition to about 10,000 homes that have previously been tabbed for insulation over the past 20 years.

Port officials say the breadth of the noise problem should shrink as a new aircraft noise-pollution deadline arrives Dec. 31, 1999. The rules will force all older, noisy planes that land at U.S. airports to have new engines or mufflers installed or be taken out of service.

Vigilante said that as those remaining planes are retired or modified, The number of residents affected by noise will drop by two-thirds after 1999.

Because of increasing traffic, the numbers in the high-noise area will begin to creep up again late in the next decade.



Supporters say the runway is needed to allow two streams of planes to land in poor weather. Conditions limit landings to a single runway 40 percent of the time.

They also say the expansion is needed if the economic development of the region is to continue.

The runway faces opposition from residents in Des Moines, Normandy Park and Burien who feel the brunt of the noise from the 400,000 takeoffs and landings each year.

Opponents were quick to claim a moment of victory – first by helping force the revision of the environmental analysis, then by its findings.

"The (report) acknowledges that we were right from the get-go," said Peter Kirsch, a Washington, D.C., attorney for a coalition of neighboring communities opposing the runway. "So we really have to go back and re-examine all the other statements the port has made that they may have to recant."

The coalition has sued in King County Superior Court to stop the $455 million runway project. The suit could go to trial in about a year.

They argue that a third runway at Sea-Tac won't be sufficient to handle air traffic growth. They say the port and the Puget Sound Regional Council should search instead for a site to build a new airport.

Meantime, President Clinton's proposed 1998 budget also clouds the project. It calls for spending $1 billion on airport improvement funding – 30 percent cut.

U.S. Sen. Slade Gorton (R-Bellevue) attacked the president's proposal on Friday, saying the budget "would jeopardize our ability to secure funding for the much-needed third runway."

The Associated Press contributed to this report.

ENABLING FREE FLIGHT

Free Flight Could Stall Without Key Data Link

BRUCE D. NORDWALL/WASHINGTON

Air traffic controllers will need the information from ADS-B to ensure flight safety for free flight

Several enabling technologies are needed before free flight can be implemented in a workable air traffic management system. Aviation Week & Space Technology examines how the U.S. and Europe are coming to grips with some of the technical challenges. European research organizations have been working on new systems for years. See p. 30.

The FAA and airlines in the U.S. are strongly behind the concept of "Free Flight" but the idea will go nowhere unless certain key technologies are fielded including a new type of automatic data link network.

The conclusion at a recent RTCA symposium is that Automatic Dependent Surveillance-Broadcast (ADS-B) is clearly essential to the development of free flight. It would also pay dividends in flight safety and ground control of aircraft.

But funding is not entirely certain for this key enabling technology and the lack of financial support could stall progress. J. Roger Fleming, senior vice president for the Air Transport Assn., said, "The FAA's funding for 1998 looks bleak and the users are not going to be happy." Most parts of the FAA budget are tight, "but there is currently zero money for data link. And if there is no data link, there will be no free flight," he said.

The air traffic control system will need the additional information provided by ADS-B to ensure safety as separation is decreased to accommodate increasing numbers of aircraft. Airports will gain the benefits of a surveillance system to monitor aircraft on the ground; controllers will also be able to track airborne targets in areas without radar coverage. General aviation may benefit from a cheap alternative to traffic alert and collision avoidance systems (TCAS).

According to Rocky Stone, TCAS program manager for United Airlines, the term ADS-B is self-descriptive: the system is Automatic—with no pilot initiation required; Dependent—on input from another navigation source, most likely GPS; uses a Surveillance system—to monitor aircraft positions; and Broadcasts positions—with data link messages not just addressed to specific recipients, but available for all who receive them.

With ADS-B transmitting an aircraft's absolute GPS position as often as needed, controllers will have a much more accurate location than from the range and bearing from a radar return. The rapid update rate can be adjusted to every ½ sec. to meet controllers' needs. Current position updates are 12 sec. en route using long-range radars and 4.8 sec. for terminal radars, according to Ron Morgan, acting deputy director of FAA's air traffic services.

ADS-B is becoming a hot topic in Europe as well. The European Commission's Atlas IIA project is defining concepts for the long-term future air traffic management systems (called the European Unified ATM System, EUATMS). Among the recommendations is one that an ADS-B dependent surveillance network should be pursued. Further, the integrity, availability and capacity of such a system needs to be verified and a suitable set of frequencies for Europe needs to be allocated.

An operational GPS visionary—Capt. William B. Cotton, manager of air traffic and flight systems for United Airlines—said ADS-B will be an unprecedented tool for tactical separation of aircraft, both for controllers on the ground and between aircraft. Even without GPS augmentation, ADS-B will pinpoint the location of an aircraft for controllers within an area the size of a 747. With differential-GPS, provided by a system such as the FAA's wide area augmentation system (WAAS), the precision of aircraft location will be narrowed to an even smaller area. In addition to 4-D aircraft position the message could include the velocity vector. Changes in the vector would give controllers an early indication of an aircraft's intent.

While that level of accuracy is not needed for en route navigation, it offers new

uses that could entice airlines to invest—such as the ability to reduce separation during instrument approaches in IFR conditions down to VFR separation standards. Pairs of ADS-B equipped aircraft could make approaches under instrument conditions at VFR rates, saving time and fuel compared with non-equipped airlines.

Cotton proposes a concept called "Traffic Conditional Approach," using ADS-B, that could permit dual IFR approach streams leading to very closely spaced parallel runways, which would be impossible today. One candidate for the concept would be San Francisco International Airport, which has two pairs of parallel runways crossing near their mid-points. Each pair of runways is separated by only 750 ft., which is far less than the spacing required for parallel ILS approaches. However, during VFR conditions pilots are permitted to shoot ILS approaches to both runways, maintaining separation through visual contact. ADS-B could give that capability during IFR conditions.

> "ADS-B will be an unprecedented tool for tactical separation of aircraft, both for controllers on the ground and between aircraft"

ADS-B equipped aircraft would be worked in pairs with the lead aircraft making an ILS or GPS straight-in approach. The trailing aircraft would fly a GPS approach, converging to a three-mile straight-in point. ADS-B information from the lead aircraft would allow the trailing aircraft to stay within a "window," ½ to ¾ miles behind the lead. Within that window, a blunder by either aircraft would not result in a collision, and normal tracking of the approach course would avoid wake turbulence, Cotton said. The window also accommodates dissimilar final approach speeds, avoiding true formation flight. He concedes that a good deal of simulation and flight test development is needed to prove such a concept, but argues that the benefits could be substantial to any air carrier that performed a majority of operations at such an airport.

DOMESTIC AIR TRAFFIC control does not need the architecture of a full Future Air Navigation System (FANS), according to Cotton. But ADS-B is essential to free flight in much the same way that the transponder was to the National Airspace System Plan in the 1960s. In that plan, transponders augmented the existing radar system, correlating a radar return with a specific aircraft, and adding surveillance in areas outside of radar coverage. ADS-B will similarly extend the surveillance capability for controllers and alert pilots to other aircraft in their area.

FANS and free flight are not synonymous. FANS is an architecture, while free flight is an operational concept that will use the FANS architecture. And ADS-B will contribute to a number of the steps along the way from the current ATC to the future air traffic management system.

United is one of the early carriers to equip its aircraft with the FANS-1 package, which combines GPS and satellite data links to ATC with the aim of saving flight time and fuel on its Pacific routes (*AWST* Sept. 4, 1995, p. 28). "United is making a pot-full of money with FANS," said Dick Taylor, who chaired the RTCA Task Force 3 that reported on Free Flight Implementation.

Still unresolved is the issue of what radios and frequencies to use for the ADS-B data link. A leading contender is a technique that could be readily introduced using the Mode-S transponder from TCAS, since it is now installed on more than 6,000 commercial aircraft in the U.S. Each would broadcast its location in L-band over a Mode-S squitter at roughly one-sec. intervals (*AWST* Apr. 18, 1994, p. 53).

Other competing techniques would use a variety of time-division multiple-access (TDMA) techniques, one using Mode-S, and the Swedish self-organizing TDMA, over VHF. General aviation would prefer a VHF data link, preferably reusing the VOR spectrum, Steven J. Brown, senior vice president of Aircraft Owners and Pilots Assn. said. Another link under development, D8PSK, is targeting the general aviation market (*AWST* Mar. 18, p. 44). The Defense Dept., with 15,425 aircraft—nearly 10,000 jets and props that operate in positive control airspace—has no military requirement for Mode-S, Frank Colson, executive director of the Defense Dept.'s policy board on federal aviation, said.

ADS-B could be mandated, or encouraged by extending benefits to suitably equipped aircraft. Cotton advocates the latter, but Colson termed that approach "extortion through exclusion," effectively saying: "You don't have to equip your aircraft, just don't fly in the airspace." A Defense Dept. concern about either approach is cost. Colson said it would take $1 billion and five to seven years to put "one of anything" on all their aircraft.

ADS-B could provide some but not all of the capability of TCAS, which has the advantage of active interrogation and vertical maneuver guidance. ADS-B should be seen as a complementary system, which could augment TCAS surveillance and provide some miss-distance filtering and a basis for horizontal avoidance maneuvers, said Frank Cheshire, technical pilot for American Airlines. TCAS does not have sufficient accuracy to distinguish aircraft on taxiways from adjacent runways, but augmented ADS-B does. ●

Europe Tests Core Of New ATM System

JOHN D. MORROCCO/BOURNEMOUTH, ENGLAND

European air traffic control and research organizations have developed and tested the core elements of a new integrated air traffic management (ATM) system for the 21st century.

Program officials have finished their analysis of the initial demonstrations, completed late last year. They said the results validated several new technologies and computer-assisted tools that were acceptable to controllers and aircrews, and integration into a complete air/ground system was demonstrated.

The effort, dubbed the Program for Harmonized Air Traffic Management Research in Eurocontrol (PHARE), is being sponsored by Eurocontrol and national ATC authorities in the U.K., France, Germany and the Netherlands. Italy, which joined Eurocontrol in January and is an observer on the PHARE program, has shown an interest in becoming a full member of the project. Canada and the U.S. FAA are associate members.

Funding for the 10-year effort is set at 80 million pounds ($123 million). Euro-

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EXPERT ARBITRATION PANEL'S REVIEW OF NOISE AND DEMAND/SYSTEM MANAGEMENT ISSUES AT SEA-TAC INTERNATIONAL AIRPORT

Puget Sound Regional Council

PSRC

March 27, 1996

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STATE OF WASHINGTON
PUGET SOUND REGIONAL COUNCIL

In the Matter of:

Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport

FINAL DECISION ON NOISE ISSUES

March 27, 1996

This is the Final Decision on Noise Issues by the Expert Arbitration Panel on Noise and Demand/System Management Issues (the "Panel"). After making a thorough and independent evaluation of all of the evidence and arguments that have been presented to us with respect to the reduction in noise impacts required by Resolution A-93-03 as a condition for the Puget Sound Regional Council's approval of a third runway at Sea-Tac International Airport, a majority of the Panel, consisting of Professor William Bowlby and Ms. Martha Langelan, has reached the following conclusion:

> Although the Port of Seattle has scheduled, pursued, and achieved an impressive array of noise abatement and mitigation programs, the Port has not shown a reduction in real on-the-ground noise impacts sufficient to satisfy the noise reduction condition imposed by Resolution A-93-03.

Mr. Scott P. Lewis, Chair of the Panel, would find that the Port has satisfied the requirements of the Resolution, and dissents from this Decision.

We offer below a statement of the background and history of the Panel's consideration of Noise Issues under Puget Sound Regional Council ("PSRC") Resolution A-93-03, a summary of the basis of the majority's decision, recommendations about future efforts that could be taken to reduce the burden of aircraft-generated noise on the communities surrounding the Airport, a statement of the dissent, and some closing comments. In the majority's findings and conclusions, we have assessed the Port's compliance with the Noise Mediation Agreement (including the reliability of the Noise Validation Method), evaluated the effectiveness of the Port's noise abatement and mitigation efforts with respect to on-the-ground noise impacts, and addressed the nature of the "meaningful" and "reasonable" reductions in "real noise impacts" required by Resolution A-93-03.

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BACKGROUND
(BY THE PANEL)

The Panel was appointed in June 1994 by the Secretary of the Washington State Department of Transportation ("WSDOT"). The appointment of the Panel followed the adoption of Resolution A-93-03 by the Puget Sound Regional Council, the PSRC's promulgation of "Implementation Steps" for the Panel, and the execution of a Memorandum of Understanding ("MOU") among the PSRC, the Federal Aviation Administration ("FAA"), the Port of Seattle ("Port" or "POS") and the WSDOT.

The Resolution, which appears to us to be unique, provides that "the region should pursue vigorously a major supplemental airport and a third runway at Sea-Tac" and that the third runway "shall be authorized by April 1, 1996:

a. Unless shown through an environmental assessment, which shall include financial and market feasibility studies, that a supplemental site is feasible and can eliminate the need for the third runway; and

b. After demand management and system management programs are pursued and achieved, or determined to be infeasible, based on independent evaluation; and

c. When noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation, and based on measurement of real noise impacts."

In October 1994, the Executive Board of the PSRC determined that within the meaning of the Resolution there was no "feasible" site for a major supplemental airport that could eliminate the need for the third runway. See Resolution EB-94-01. It was the Panel's responsibility to make "independent evaluations" to determine whether the demand/system management and noise conditions of the Resolution had been satisfied and, hence, whether the PSRC should authorize construction of the third runway.

After conducting several rounds of hearings on Demand/System Management Issues, the Panel concluded in December 1995 that within the narrow meaning of the Resolution, the demand and system management programs that had been presented to the Panel (including "high-speed" rail, congestion pricing and gate controls) were not "feasible" and, therefore, that this condition of the Resolution had been satisfied. We stress, however, that we did *not* find "high speed" rail (or interim improvements in existing rail service), congestion pricing or gate controls to be infeasible in the sense that they could not be realized or were unworthy of pursuit. In fact, based upon the extensive evidence that was offered to us, it is apparent to the Panel that a coherent, intermodal, cost-effective and environmentally sensitive regional plan for accommodating the rapidly growing need for transportation infrastructure in the Pacific Northwest would include interim improvements of the existing rail service in anticipation of the construction of a high speed rail system in the Portland-Seattle-Vancouver corridor, and the introduction of regulatory measures at the Airport designed to improve the efficiency of use of scarce airport capacity. The Panel's consideration of

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Demand/System Management Issues is laid out in three separate orders: the February 24, 1995 Preliminary Order on Demand/System Management Issues; the July 27,-1995 Final Phase I Order on Demand/System Management Issues; and the December 8, 1995 Final Order on Phase II Demand/System Management Issues.

As a result of these two determinations, the only remaining condition for PSRC authorization of the third runway project has been the noise impact reduction condition established by the Resolution.

Throughout our consideration of Noise Issues, the Port, the Airport Communities Coalition ("ACC") and the Regional Commission on Airport Affairs ("RCAA") have participated actively. They offered the Panel volumes of evidence and distinguished expert testimony on the difficult questions posed by the Resolution. We received thousands of pages of noise measurements, analysis and interpretation, and many informative statements of position from the Port, the ACC and the RCAA, as well as from the FAA, the Airport Noise Group, the Pork Patrol, Air Washington and many individual members of the public. The lead witnesses for the Port were Dianne Summerhays, from the Port's staff, and Paul Dunholter, a noise expert with Mestre Greve Associates. The Port has, from time to time, called upon other members of its staff and outside experts to support its position. The ACC has offered the expert testimony of Sanford Fidell of Bolt Beranek and Newman Systems and Technologies, and the RCAA has offered expert testimony by Alice Suter.

We held our first round of hearings on Noise Issues in August 1994, and on September 22, 1994 the Panel issued a "Procedural Order." We summarized the Resolution, the Implementation Steps and the MOU in the Procedural Order, and then acknowledged "that questions have been raised" about the scope of the Panel's inquiry on Noise Issues. As a result, we announced that we would consider Noise Issues in two phases. In Phase I, the Panel would address three distinct questions:

- Has the Panel been asked to determine whether the goals of the Noise Budget and the Nighttime Limitations Program, if achieved, would produce a significant reduction in real noise impacts on-the-ground?

- If so, would achievement of the noise reduction performance objectives of the Noise Budget and Nighttime Limitations Program produce a significant reduction in real noise impacts on-the-ground?

- Is the Noise Validation Methodology proposed by the Port a reliable method for determining, on the basis of measurements of actual on-the-ground noise using the existing noise monitoring system at Sea-Tac, whether the noise reduction performance objectives of the Noise Budget and Nighttime Limitations Program have been achieved?

If the Panel determined, in its Phase I decision, that the Noise Validation Methodology proposed by the Port is a reliable method for determining whether appropriate noise reduction performance objectives have been met, the Panel would turn in Phase II of its deliberations to the question of whether the Port had demonstrated that it had achieved the noise reduction required by the Resolution. We noted in the September 1994 Procedural Order that the Port has the burden of showing the Panel that it has satisfied the noise reduction performance objectives imposed by the

Resolution. Our Procedural Order was accompanied by extensive requests for information from th Port, the FAA and the public.

We returned to Seattle in December 1994 for two days of hearings, including an extende evening session near the Airport devoted to testimony from residents of the affected communitie: We then issued our January 9, 1995 Order on Phase I Noise Issues. In our January 1995 Order, w summarized what we consider to be our responsibility under the Resolution with respect to th reduction in noise impacts that must be shown before the PSRC should approve construction of third runway at the Airport. We held that to meet its burden under the Resolution, as we interpre it, "the Port must offer us reliable evidence, based upon actual measurements of on-the-groun noise, that by 1996 there has been an objectively measurable, meaningful reduction in aircraft nois impacts in the affected communities surrounding the Airport." As we said then, "the POS mus establish that through whatever means, it has reduced the impact of on-the-ground noise in a wa that residents of the affected communities could appreciate."

We noted, however, that because the Resolution contemplates that objective measurements of on-the-ground noise should be used, the Port would not be required to conduct surveys o residents in the affected communities to ascertain their subjective perceptions of Airport noise, even though such survey results could provide useful information to the Port, the public and this Panel. We recognized that the Resolution does not require the Port to reduce Airport noise to levels "acceptable" to the residents of the surrounding communities, but rather requires only that the Port achieve a significant reduction in the real noise impacts. We observed that "[b]usy jet airports, such as Sea-Tac, are inherently noisy, and it is unrealistic to expect that nearby communities would ever find the noise impacts generated by such airports to be 'acceptable.'"

Finally, both during the December 1994 hearings and in our January 1995 Noise Order, we cautioned the public that "the consequences — particularly the noise impacts — that might occur if a third runway were built at the Airport" were outside our jurisdiction. As we put it then, "this Panel cannot and will not undertake a review of the potential environmental consequences of building the third runway. Our responsibility, with respect to the Noise Issues, is limited to determining whether the POS has scheduled, pursued and achieved a meaningful reduction in real noise impacts at the *existing* Airport."

In anticipation of later hearings, in our January 1995 Noise Order we determined (a) that a showing that the Port had performed its obligations under the Noise Mediation Agreement was necessary, but not sufficient, to show compliance with the Resolution; (b) that the Noise Validation Method then proposed by the Port was not a valid method of establishing the required reduction in noise impacts, and (c) that 1993 should be used as the "base year" for purposes of the measuring whether the reduction in noise impacts required by the Resolution has been achieved (because nothing in the Resolution spoke to reductions in noise impacts that had already been achieved), but that the significance of the 1993-1996 data would "be best understood in the context of as much earlier data as the Port can make available to us."

We said that we would address three sets of subsidiary questions before resolving whether the Port had met its burden: "(a) what measures of noise impacts should be used (that is, what noise 'metrics' should be selected), (b) where should the measurements of noise be made, and (c) how much reduction in noise, by these measures, must be achieved, and over what time period?" We recognized that of these, the articulation of the required reduction in noise impacts presents "the

most difficult question." We did not presuppose that we could provide a satisfactory answer to this question without the benefit of input from the Port and the community. So, in our January 1995 Noise Order, we asked the Port to "show us (i) that it has articulated an appropriate standard for judging whether the reduction in noise impacts is sufficient, and (ii) that by that standard, the Port has achieved the required reduction."

Our January 1995 Noise Order led to a useful discussion of noise metrics that could be used to supplement the information provided by DNL and precipitated the collection of on-the-ground noise measurements by the Port at six supplemental monitoring sites, farther out from the Airport, that better represented significant portions of the affected population. In addition, the ACC subsequently submitted new information. Taking up the Panel's suggestion about the potential usefulness of survey data, the ACC commissioned Dr. Fidell to conduct a social survey to determine whether residents of the affected communities had perceived an improvement in their noise environment. Dr. Fidell conducted a telephone survey of over 1,400 residents in six neighborhoods affected by Sea-Tac-related noise.

When we reconvened in May 1995, the Port did not provide us, as we had asked that it should, with any workable standard that we could use to assess whether the reduction in noise impacts is adequate to demonstrate compliance with the Resolution. We were, as a result, unable to complete "Phase I" of the hearings on Noise Issues with a clear understanding of how the Port or the community advocates thought we should interpret the voluminous measurements of "on-the-ground" noise or the information about noise mitigation efforts that we had asked the Port to provide to us. To accommodate the Port's schedule, we called for a preliminary round of hearings on "Phase II" Noise Issues in November 1995 that was focused upon the question of what standard the Panel should use to make its decision and how the accumulating information about noise levels and mitigation efforts should be interpreted for purposes of resolving whether the Port had satisfied its burden under the Resolution. Following those hearings, we issued, on December 18, 1995, our Preliminary Order on Phase II Noise Issues.

We noted in our December 1995 Noise Order that these hearings had led to a resolution of the first two questions we had posed for Phase II: There was no significant dispute about what noise measures should be compiled or where the measurements of noise should be made. The most difficult, third question, however, remained controversial: "How much reduction in noise, by these measures, must be achieved, and over what time period?" The Panel was unwilling to accept the standard proposed by the Port or the standard proposed by the ACC. We noted that the selection of either of those competing standards for judging compliance with the Resolution would itself determine the outcome of these proceedings.

We felt strongly that it would be premature to decide then whether the Port had met its obligation under the Resolution and said that we would not make that determination until we had reviewed all the data to be offered to us early this year on reductions in noise impacts from 1993 through 1995 and on reductions in noise impacts following the 1990 Noise Mediation Agreement and leading up to the enactment of the Resolution in 1993.

In anticipation of a final round of hearings in February 1996, we provided some guidelines for what the Port should show in its "Compliance Report." We acknowledged that, as both the Port and the ACC had recognized during the course of the hearings, ultimately the Panel would have to rely upon our "best professional judgment ... to determine whether, taken as a whole, the pattern

of change in noise impacts is sufficient, in our judgment, to meet the requirements of th Resolution." We realized that the PSRC General Assembly, in adopting Resolution A-93-03, wa seeking an impartial, objective assessment of a complex technical question. We said that, while w have always understood that our decision would have a "social or political character," we have fel strongly that "our exercise of judgment should reflect the best insights we can gain from establishe scientific sources about the significance of changes in various noise metrics as indicators of change in the impact of noise on the people in the communities surrounding the Airport."

We asked the Port, and the community advocates, to address the following essential issue in written Position Statements:

- What reductions in on-the-ground noise impacts are shown by the various measurements and evidence compiled by the Port?
- How should the Panel interpret the significance of the reductions in noise impacts shown by the Port?
- Why should the Panel find that the noise reduction condition established by the PSRC's Resolution has been satisfied?

The Port responded to our December 1995 Noise Order by compiling and distributing a vast array of noise measurements and related information about its noise abatement and noise mitigation efforts. In its Position Statement, which was supported by the expert testimony of Paul Dunholter, the Port argued that the Panel should find that it had satisfied the requirements of the Resolution because, based upon the measurements of noise and modeling assumptions used by the Port, thousands of people no longer live in areas judged by the FAA to be incompatible with residential use; thousands of people are no longer "highly annoyed" by aircraft noise; high and medium speech interference has been reduced; the potential for awakenings resulting from loud aircraft events has been reduced; and thousands of homes have been relocated or insulated. In fact, the Port urged the Panel to conclude that its standard had been met "without a detailed review of the data" because noise "must have been" reduced because noisy planes have been greatly reduced overall and virtually eliminated at night; because the insulation of homes and schools has been "aggressively pursued and achieved;" and because people outside the Port have said that its noise programs have been successful.

The ACC submitted an opposing Position Statement, based upon the expert testimony of Dr. Fidell, that made three principal assertions: (i) that the estimates of population benefits used by the Port were not reliable because the tools used to derive them were not sufficiently precise to accurately predict benefits from small changes in noise levels; (ii) that, in any event, the reductions in noise relied upon by the Port were not "significant" in the sense that they could be appreciated as reductions in noise impacts for the affected populations; and (iii) that the Port could have scheduled, pursued and achieved a "meaningful" reduction in noise impacts if it had not rested upon the Noise Mediation Agreement. The RCAA also submitted an opposing Position Statement, and many members of the public wrote to the Panel to express their view that the Port had not reduced the impact of airport noise on their communities. Air Washington submitted a statement in support of the Port.

FINDINGS AND CONCLUSIONS
(BY THE MAJORITY)

Because this has been a lengthy and complex proceeding, we believe it may be useful to set forth our reasoning and the technical bases for our conclusions. Our findings and conclusions follow the general structural framework of the Port's argument.

In brief, the Port contends (a) that the overall noise level at the Airport has shown a consistent downward trend since 1989/1990, and has continued to decline (albeit at a lesser rate) since 1993; (b) that it has complied with the 1990 Noise Mediation Agreement with respect to both noise abatement and noise mitigation programs; (c) that the appropriate base year for comparative purposes should be 1989/1990 (or, alternatively, 1992), rather than 1993, the year Resolution A-93-03 was adopted; (d) that by a variety of noise metrics, the Port has shown reductions in the actual, measured, on-the-ground A-weighted sound levels produced by the Airport since 1989/1990, 1992 and 1993; (e) that those reductions translate, through a modeling and estimation process, into reductions in speech interference, sleep disruption, number of people "highly annoyed" by airport noise, and other "real noise impacts" on the ground; and (f) that the change in "noise impacts" can be translated, in turn, into reliable estimates of thousands of people who have received non-trivial benefits from the noise reductions. Proceeding from that logic, the Port proposed the following standard for our decision:

> Compliance with Resolution A-93-03 will be found if the entire record of reductions, taken as a whole, shows a pattern of reductions for several thousand people, counting for each measure only people for whom the reduction is neither inappreciable nor meaningless. The determination will focus on the reduction in noise impacts from 1993, but will not ignore improvements achieved before Resolution A-93-03 was enacted.

At the Panel's request, the Port measured changes in noise with two metrics in addition to DNL (Day/Night Average Sound Level), an overall measure of daily A-weighted sound levels, which weights nighttime noise more heavily than daytime noise and is commonly used in the industry to assess the total level of airport noise. They are SEL (Sound Exposure Level), a standard measure of the level and duration of single noise events, e.g., an aircraft flyover, and TA (Time Above), a standard measure of the total time in seconds, minutes, or hours that aircraft noise exceeds a 65, 75, or 85 dB level in a 24-hour period. Together with changes in the number and distribution of aircraft operations, these metrics provide a more complete picture of changes in the airport noise environment than is given by DNL alone. The Port also reported the progress of its noise mitigation (building insulation) programs.

The Port has presented its noise data and conducted its analysis on the basis of the actual number of operations at Sea-Tac Airport and the specific fleet mix of aircraft serving the Airport during the relevant time period. Air carriers account for almost 60 percent of operations at the Airport (e.g., 54.0 percent in 1989/1990, and 58.5 percent in 1995), while commuter airlines represent about 40 percent (42.6 percent in 1989/1990, and 38.7 percent in 1995). Air carrier operations have

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been increasing, and total operations at Sea-Tac Airport have fluctuated over the past eight yea as follows:

TOTAL AIRCRAFT OPERATIONS, SEA-TAC AIRPORT, CY 1988-1995 (IN THOUSANDS)

CALENDAR YEAR	1988	1989	89/90*	1990	1991	1992	1993	1994	1995
TOTAL OPERATIONS	316	335	354	355	339	346	339	353	387
AIR CARRIER OPERATIONS	177	182	191	193	187	196	200	212	226

* Operations for combined 1989/1990 base "year," per Port Compliance Report.
Source: Sea-Tac International Airport, Traffic and Operations Report.

In some cases, the Panel's request for time-series data on the various noise metrics required the Por to back-calculate certain airport data. For example, the Port calculated DNL values for earlie periods using the fleet mix at the time and the aircraft SEL data measured in 1995 at the 1 permanent Remote Monitoring Station ("RMS") sites and the six supplemental monitoring sites.

The Panel's task under Resolution A-93-03 is to evaluate the results of, first, the Port's noise abatement efforts (the impact of reductions in aircraft noise), and second, the Port's noise mitigation programs (the impact of building insulation). The Resolution itself speaks to overall reduction of "real noise impacts," and the Port has presented a substantial body of information on its efforts with respect to both noise abatement and mitigation. Accordingly, we have taken both aspects of noise control -- abatement and mitigation -- into account in our assessment of the reduction of noise impacts.

We address the threshold points first, including the direction of change in noise levels since 1993, the Port's compliance with the Noise Mediation Agreement, and the issue of the base year; turn next to our evaluation of the results of the Port's actions with respect to (i) noise abatement and (ii) noise mitigation; discuss the concept of "meaningful" and "reasonable" reductions in noise; then summarize our findings with respect to the overall reduction in noise impacts the Port has "scheduled, pursued, and achieved."

I. OVERALL DIRECTION OF CHANGE

As a result of the abatement and mitigation programs instituted by the Port under the 1990 Noise Mediation Agreement, the general direction of aircraft noise levels (measured objectively by noise monitors) has been downward since the PSRC General Assembly enacted Resolution A-93-03 in April 1993. The amount of change may be small, but it is not zero. When we rendered our January 1995 Noise Order, however, the Panel determined that the Port had the burden of showing that the reductions in noise impacts were "significant" or "meaningful;" we held that some reductions, while desirable and beneficial, might be too small to be sufficient to satisfy the Resolution. Accordingly, we find that the noise reduction condition of Resolution A-93-03 is not satisfied by the mere existence of a slight downward trend in DNL and SEL since 1993.

II. COMPLIANCE WITH THE NOISE MEDIATION AGREEMENT

Throughout this proceeding, the Port has relied on the 1990 Noise Mediation Agreement ("NMA" or "Agreement") as the cornerstone of its noise abatement and mitigation programs. The Agreement was the culmination of a long public process and includes many important components (principally the Noise Budget, the Nighttime Limitations Program and the Noise Remedy Program). It was, in 1990, an important milestone in the use of Stage 2 aircraft restrictions to reduce the adverse environmental impacts of airport operations. The Port was aware, however, that substantial numbers of residents were unsatisfied with the noise mediation process and the results it produced; many were extremely upset when, hard on the heels of the Agreement, the FAA's adoption of the Four Post Plan also introduced a major realignment of flight tracks (and resulting noise impacts). In addition, there has been vigorous opposition to the prospect of a third runway in the face of promises that many citizens apparently believe were made when the second runway was built. In light of that ongoing history of vocal opposition and concern about airport noise, the enactment of Resolution A-93-03 in April 1993 should have served notice to the Port that it would not only be held accountable for meeting its programmatic obligations under the Noise Mediation Agreement, but would also have to show that its noise programs were, in fact, producing results in the form of meaningful, measurable, on-the-ground reductions in noise *impacts*. Pursuant to the Resolution, the Panel's January 1995 Noise Order stated that compliance with the Port's obligations under the Agreement was a necessary, but not sufficient, element of satisfying Resolution A-93-03.

We have reviewed the Noise Mediation Agreement in detail, to ascertain whether the Port is currently satisfying the noise abatement and mitigation commitments it made under the Noise Budget, the Nighttime Limitations Program, the Noise Remedy Program, and the other elements of the Agreement.

With respect to the Noise Budget, given a measured reduction in DNL of 3.4 dB at the eleven permanent monitoring sites as of the end of 1995, we can be confident that the goals of the Budget have thus far been met. The 3.4 dB reduction realized by 1995 is already 1.8 dB better than the stated goal for 1996 and is only 1.0 dB under the goal for 2001. According to the Port, the complexity of the Noise Budget calculations apparently also encouraged certain airlines to opt for the simpler phased Stage 3 conversion option, which we believe to be a plus.

In connection with the Noise Budget, the PSRC Executive Board's Implementation Steps also requested the Panel to review the validity of the Port's Noise Validation Method ("NVM"), which is used to translate measured DNL into the ANEL metric used in the Noise Budget. We find that the NVM is a sufficiently reliable method for purposes of determining, on the basis of measurements of actual on-the-ground noise, whether the Port has met the *current* noise reduction objectives (expressed in the ANEL metric) of the Noise Budget, but we reach that finding only because the 1995/1996 goal for reduction in ANEL has been exceeded by more than a decibel. We are not convinced that the ANEL goal for the year 2001 will be achieved, because of the growth in the number of aircraft operations; the change in DNL by 2001 may be considerably smaller, thus necessitating greater accuracy in the conversion to ANEL. We find that the Port's Noise Validation Method would only be a reliable method for determining whether the future ANEL goals have been met if it is revised to incorporate the input from the six supplemental monitoring sites, as indicated

in our January 9, 1995 Noise Order, and any additional monitoring sites the Port may establish, wit a full accounting for statistical uncertainty in the measured data at all sites.

With respect to the Nighttime Limitation Program, the aircraft operation data compiled b the Port show that its current goals have been met. We note that the number of exemptions is sma and the number of variances issued has dropped substantially over the past few years. The Port' expressed attitude about continuing to minimize Stage 2 nighttime operations is encouraging.

Most of the elements in the Ground Noise Control Program have also been accomplishec Powerbacks have been prohibited and are not occurring. The need for use of auxiliary power unit has been reduced. The Port is on record that it will pursue a "hush house" if an additiona maintenance base is developed at the Airport. We did not hear, however, about actions to reduc reverse-thrust noise upon aircraft landing, as stipulated in the Noise Mediation Agreement.

We find that the improvements to the Duwamish/Elliott Bay Corridor Noise Abatemen Procedures anticipated in the Noise Mediation Agreement have not been fully developed o implemented, especially with regard to periods of "low activity" as called for in the Agreement. W also note that the current nighttime departure corridors over Elliott Bay/Puget Sound have a lov compliance rate.

The Noise Management System component has been implemented. There is some question about the status of the program to Control Noise from Most Annoying Operations, which is intended to "control or eliminate particular single event operations that occur on a continuing basis and that are the object of community complaints." That program has three elements: (i) improvement of the Port's Aircraft Noise Hotline procedures to crosscheck noise complaints; (ii) use of the Noise Management System, and/or assistance from the FAA, to identify the specific operation or event that prompted the complaints; and (iii) a commitment that the Port will contact the airline or the FAA "to make the parties aware of the specific noise concern and to attempt to reach a solution." From the record before us, it appears that the Port is carrying out that commitment with respect to initial departure only; in addition, it is not clear how cooperative the airlines and the FAA have been in taking action to adjust or discontinue the operations/events that provoke complaints, or how effective the program has been in actually controlling or eliminating such operations and events.

Turning to the NMA's Noise Remedy/Mitigation Program, our review indicates that, with the exception of the insulation of public buildings (most notably public schools in the Highline School District), most of the Port's essential milestones have been reached thus far, and additional mitigation has been scheduled and pursued, as described below.

The planned Acquisition/Relocation Program, a major element of the Noise Remedy Program, was largely completed by 1993; the Port purchased the last few properties by 1995, accomplishing a total buy-out of some 1,400 properties in the most severely noise impacted areas.

Prior to the NMA, the Port was insulating 175 houses a year. At that rate, it would have taken more than 50 years (to the year 2040) to complete the insulation of the 10,000 homes now deemed eligible for insulation treatment. The Residential Insulation Program adopted as part of the NMA called for the Port to insulate 350 houses per year; at that rate it would still have taken about 27 years to complete the needed work. In mid-1993, the Port greatly accelerated the

residential program, and it is now proceeding rapidly (at a rate of about 110 homes per month). By December 1995, the Port had insulated 3,647 houses.

The Audit Procedures for the insulation program have been implemented. The Cost Share Program has been replaced by the standardized insulation program, as approved in the 1993 Part 150 Update. However, the Mobile Home Program has seen little activity, and we have not been told of the existence of the report on possible mitigation actions for mobile homes called for in the Agreement. For reasons that are not entirely clear, there has also been relatively little activity with respect to the Transaction Assistance Program. We are not convinced that the Port is pursuing this program as effectively as it could.

Our chief concern with the Noise Remedy Program involves the insulation of sensitive-use public buildings, including the public schools (where progress has been delayed due to an impasse with the Highline Public School District). In addition, the Noise Mediation Agreement envisioned an insulation program that would cover a broad range of public buildings; it called for the Port to "[e]xpand [the] existing program to provide insulation for additional types of public buildings (e.g., auditoriums, private schools, churches, day care centers, libraries, etc.)." At present, this component is limited to insulation of classrooms at Highline Community College, now underway, and pilot projects at two churches, one private school, one condominium and one convalescent home. For reasons that are more fully discussed below (in the section of the Decision dealing with noise mitigation actions), we find that the Port's compliance with this portion of the Noise Remedy Program is incomplete.

Although the insulation of sensitive-use public buildings is a critical aspect of noise mitigation and we have very serious concerns about the lack of progress in this area, we have concluded, on the basis of the Port's successful efforts to meet or exceed the requirements of most of the other abatement and mitigation measures stipulated in the Agreement, that the Port is in substantial compliance with the Noise Mediation Agreement. Accordingly, we find that, on balance, the Port has met its burden under the Resolution to show that it is satisfying its basic obligations under the Agreement. We note that this finding does not necessarily imply that the programs pursued under the Agreement have been effective in reducing "real noise impacts."

III. Appropriate Base Year

For the reasons stated in our January 1995 Noise Order and reiterated during the hearings in May 1995, the Panel found that it was appropriate to use 1993 as the base year for purposes of the noise reduction condition imposed by Resolution A-93-03. The Resolution does not by its terms establish a base year, and in the absence of *any* expression in the Resolution that the General Assembly itself meant to look to the past for reductions in noise impacts, it would be highly irregular to interpret the Resolution to establish a retrospective test. The Panel said, however, that we would consider improvements in noise impacts achieved before the Resolution was enacted in assessing the significance of the reductions scheduled, pursued and achieved since 1993.

The Port has consistently maintained that 1989/1990 — the "year" immediately preceding the Noise Mediation Agreement — should be used as the base year for purposes of comparison. We have not accepted this position. In its February 1996 Position Statement, however, the Port offered for the first time a new argument that even if the Panel was correct when we concluded in January 1995 that the Resolution should be interpreted to require a meaningful reduction in noise impacts

after it was enacted, the Panel should have used 1992, rather than 1993, as the base year becat the Resolution was passed in April 1993. By taking 1993 as the base year, the Port claimed, t Panel gave it no credit for improvements realized during 1993.

The Port contends that the consequences of the Panel's interpretation were magnified by t coincidence of a significant but transitory reduction in operations at the Airport and a resulting dr in airport-generated noise during 1993 -- a distortion which was then compounded, the Port argu by a sizable increase in operations at the Airport in 1995. As a result of these aberrations, the Pc maintains, the use of 1993 as the base year for comparison with 1995 made it very difficult to sh a significant change in noise impacts. Accordingly, while reserving its claim that 1989/1990 is t proper base year, the Port urged the Panel to consider the reductions in noise impacts achieved sin 1992, rather than 1993. The ACC responded that the Port's argument came too late, that the Pc should have offered April-to-April, rather than calendar year, estimates (to reflect exactly the timi of enactment of the Resolution), and that in any event, the changes in noise impacts since 19 relied upon by the Port are not sufficient to satisfy the requirements of the Resolution.

We have examined the Port's new argument carefully. We find that, although total Airpo operations declined in 1993, air carrier operations did not -- and air carrier operations are th driving force behind the noise generated at Sea-Tac. The air carriers account for the majority of th Airport's operations, and the aircraft they use are noisier than commuter aircraft: 2 dB to 12 d (SEL) louder on arrival, and up to 23 dB (SEL) louder on departure. Air carrier operations hav declined in only one of the past seven years: 1991, not 1993. Decreases in air carrier operation do affect airport noise, but no such decrease affected the Sea-Tac Airport noise levels in 1993. I addition, the sharp increase in carrier operations in the first few months of 1995 (instigated by th introduction of Southwest Airlines' new service) subsequently settled back to levels more consistent with the long-term rate of growth.

However, the Port's persistent objections to the selection of a 1993 base year (which were echoed by some members of the PSRC's Executive Board), and our own serious concerns about the potential distortions that could be introduced by the selection of short-term intervals for examination, have led us to review Airport noise levels over the entire ten-year period from 1986 to 1995, using data provided by the Port.* These data show that the 1989/1990 base period preferred by the Port was the single loudest "year" in the past ten years, as measured by the Port's 11 permanent remote monitoring station (RMS) sites and reported in the 1991 Noise Mediation Committee Technical Report and the 1996 Port Compliance Report. Consequently, selecting 1989/1990 as the base period would exaggerate the long-term effects of noise abatement on the neighboring communities.

During that ten-year interval, the sound level changes at the Airport, as reported by the Port, show a reduction in aircraft DNL of 0.9 dB since 1993, 2.3 dB since 1992, 3.4 dB since 1989/1990, and 2.8 dB since 1986. The overall change since 1986 (-2.8 dB DNL) masks some substantial fluctuations in the actual rate of change; there was no reduction in average DNL at the 11 permanent RMS sites in the five-year period between 1986 and 1991, for example, and there was very little change from 1993 to 1995.

* Data on aircraft DNL in 1987 was not available to the Panel.

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To avoid biasing our analysis by overstating or understating the trend in noise changes over time, we have decided to take a comprehensive approach. We do not wish to permit the selection of a base year -- a choice that is inevitably arbitrary in some respects -- to prejudice the outcome of this proceeding, and we have therefore examined the results of the Port's noise abatement and mitigation programs over all three periods: since 1993, since 1992, and since 1989/1990.

As this Panel stated in the January 1995 Noise Order, "We are convinced that the Resolution was intended to condition the approval of the third runway upon a showing that the noise impacts of the existing Airport have been reduced in a significant way." Accordingly, we have carefully evaluated all of the evidence presented to us, for each base-year period, in order to determine whether the Port has, in fact, successfully "scheduled, pursued, and achieved" a meaningful and perceptible reduction in real, on-the-ground noise impacts for the people in the communities surrounding the Airport. We present our detailed evaluation below, reporting the specific results of our analytical work for the benefit of the PSRC, the Port, the communities affected by airport noise, and other interested parties.

IV. Effectiveness Of Noise Abatement Programs

The Port argues that its noise data showing reductions in actual, measured, on-the-ground A-weighted sound levels are accurate; that the measured reductions can reliably be converted, through modeling and estimation, into reductions in numbers of people "highly annoyed" by airport noise, speech interference, sleep disruption, incompatible land use, etc.; and that the change in "noise impacts" can be then converted into credible estimates that several thousand people have received non-trivial benefits from the noise reductions, thus demonstrating that the Port has successfully met the requirements of the Resolution.

The ACC has urged that the Panel reject the Port's claim to have achieved a significant or meaningful reduction in noise impacts since 1993 for two related reasons: (i) the analytic tools used to derive the Port's estimates have not been shown to be accurate in measuring changes in noise impacts from small changes in noise levels; and (ii) the reported reductions in measured noise levels and impacts have been too small to be appreciated by the residents of the communities surrounding the Airport.

Reliability of Estimates

The Port presents various estimates of the changes in noise impacts associated with the measured and computed changes in DNL, SEL, and TA since 1993, 1992, and 1989/1990, in terms of numbers of people experiencing annoyance, speech interference, sleep disturbance, and other on-the-ground noise impacts. These estimates are subject to several layers of potential measurement and estimation error: (i) in the initial calculation of the changes in aircraft DNL based on measured SEL data from the permanent and supplemental monitoring sites; (ii) in the application of the revised dose-response Schultz Curve recommended by FICON ("FICON Curve") to estimate noise impacts; and (iii) in the adjustment and application of the Integrated Noise Model ("INM") to estimate DNL contours and the numbers of people benefitted by reductions in noise impacts.

The Panel acknowledged, when we requested the Port to expand its monitoring sites, to supplement its DNL analysis with the additional SEL and TA metrics, and to document its estimates of changes in on-the-ground noise impacts, that the process would "inevitably require the Port to

back-calculate or otherwise estimate some of the required inputs" and that this "would introduce some imprecision into the exercise."

We did not, however, excuse the Port from the burden of addressing the extent and impac of that imprecision. We expected the Port (i) to present information on confidence intervals to support the statistical reliability of its data, (ii) to document the assumptions and adjustments i made when it applied the FICON Curve and the INM to estimate changes in DNL contours numbers of people benefitted, and other noise impacts, and (iii) to perform sensitivity tests, where appropriate, to evaluate the effects of those assumptions. In the December 18, 1995 letter tha accompanied our Preliminary Order on Phase II Noise Issues, for example, we asked the Port to "clearly and completely document every assumption and adjustment it has made in calibrating the INM as used in its Compliance Report." We repeatedly requested confidence intervals and sensitivity tests in the course of the hearings. The Port did not supply that information.

In response to the Panel's questions at the February 1996 hearing, the Port presented some partial details on the confidence intervals for its 0.9 dB reduction in aircraft DNL since 1993. The Port stated that, for the DNL measurements at the permanent RMS sites, the 95 percent confidence intervals were plus or minus 0.2 to 0.4 dB. At the supplemental monitoring sites, the intervals were much wider: "in the neighborhood of" plus or minus 1.5 dB, according to the Port's noise consultant. In other words, the actual change in aircraft DNL since 1993 (per the Port's permanent monitoring sites only) may be as large as -1.3 dB or as small as -0.5 dB; and the change in aircraft DNL at the supplemental sites is not known.

This risk of DNL measurement error is a function of several factors: the possibility of very small inaccuracies in the measurement system calibration over time; the more important fact that noise impacts can vary considerably with slight changes in topography and distance from the noise source; the accuracy with which the system can separate aircraft noise from other sources; and, for the supplemental monitoring sites, the use of data from sample weeks rather than 365 days of measurements to compute measured DNL at the sites.

The principal analytical tools the Port used to translate its measured DNL reductions into on-the-ground noise impacts were the FICON Curve and the Integrated Noise Model.

The FICON Curve, based on the noise dose-response relationships reported from many surveys, is an accepted "model," or method, of estimating noise impacts on populations from changes in measured noise levels (DNL). In making use of the FICON Curve, however, the Port did not take account of the margin of error inherent in the curve. The surveys on which the FICON Curve is based are subject to two kinds of measurement error: error in the physical measurement of the noise (i.e., whether the instruments registered the same levels of noise experienced by the population), and error in the survey reports. Green and Fidell address these issues in an article accompanying the widely accepted 1991 update of the original Schultz Curve by Fidell, Barber and Schultz.* Green and Fidell estimate that the measurement error in the noise variable is 1 to 3 dB, and that the measurement error in the survey reports translates into a 4 dB range in the noise

* D. Green and S. Fidell, *Variability in the Criterion for Reporting Annoyance in Community Noise Surveys*, J. Accoust. Soc. Am 89 [1], January 1991; and S. Fidell, D. S. Barber, and T. Schultz, *Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise*, J. Accoust. Soc. Am 89 [1], January 1991.

variable. They estimate that these errors, together, amount to approximately 5 dB. In other words, DNL differences of less than 5 dB fall within the FICON Curve's margin of error and therefore cannot be used to make reliable estimates of differences in the percentage of the population which is "highly annoyed" by aircraft noise impacts.

Neither the -0.9 dB DNL change reported at Sea-Tac since 1993, nor the -2.3 dB or -3.4 dB DNL changes since 1992 and 1989/1990, approaches the 5 dB margin of error in the FICON Curve. Thus, the estimates of the population effects which the Port derived from the FICON Curve are not statistically reliable. The model is simply not sensitive enough to produce dependable estimates of reductions in noise impacts from such small changes in DNL.

Another way to understand this point is to examine the 95 percent confidence interval around the FICON Curve, which Fidell, Barber and Schultz (1991) calculate. Although the width of the confidence interval varies along the Curve, at the mid-range of the FICON Curve, for a given DNL, the 95 percent confidence interval is nearly 20 percentage points wide. For example, at a DNL of 70 dB on the FICON Curve, we can be 95 percent certain only that the percentage of the population "highly annoyed" by aircraft noise is somewhere between 15 and 35 percent.

The Integrated Noise Model is a complex, FAA-approved computer model used to calculate the land areas impacted by aircraft noise (DNL contours in square miles), and the corresponding numbers of people affected by aircraft noise within various DNL contours. The INM is a standard analytical tool, but the outputs of the INM depend on the specific values the analyst assigns to the input variables. Despite the Panel's specific request, the Port failed to supply detailed information on the assumptions and adjustments it used when it applied the INM to compute changes in (i) DNL contours and (ii) the population adversely affected by noise, from the measured SEL data for each aircraft type. It was not enough for the Port to present, for the first time, at the final hearings in February 1996, tables comparing measured and modeled DNL differences at each monitoring site, with no analysis of the potential effects of these differences on the population estimates and noise impact reductions the Port had derived. Without clear documentation of all the adjustments the Port made to its INM input files, it is very difficult to assess the reliability of the Port's estimates of reduced noise impacts and corresponding population benefits.

Noise analysts frequently must make assumptions in running the INM computer program or otherwise estimating the impacts of noise exposure on an affected population. In such cases, one can use sensitivity tests, in turn, to evaluate how much a change (or a measurement error) in a key input value or assumption might affect the outcome. The Port presented no reports on the results of any sensitivity tests it may have conducted. In short, we do not know what assumptions the Port used in this application of the INM, or how much difference it might have made if the Port had decided to use a slightly different set of assumptions to compute its estimated changes in noise impacts and benefits.

These various types of measurement and estimation error can cascade through the modelling and estimation process, compounding the uncertainty of the final results. Small changes in estimated noise impacts may be a product of the degree of error incorporated in the modelling process, rather than any actual change in on-the-ground noise impacts. Absent the kind of information that would permit us to independently assess the reliability of the Port's estimates, we are left with the possibility that the noise impact results the Port is estimating may very well be smaller than the cumulative measurement error in the Port's methodology.

Our concern about the propagation of error in the Port's analysis does not reflect ormative judgment that the Port made a mistake or did something wrong in its analysis (other tha its failure to document the uncertainty in its data and the effects of that uncertainty on its results Rather, our concern reflects (i) the fact that analytic tools like the FICON Curve cannot provic robust estimates of the population impacts of the small reductions in DNL that were measured b the Port, and, more specifically, (ii) the fact that the Port did not specify the confidence interva on its data, the INM inputs, assumptions, and adjustments it made, or the sensitivity test results th would allow us to place reasonable confidence in the Port's conclusions about noise impacts.

The Port argues, with some force, that the Panel should at least accept the approximat magnitude of the results it has derived, even if we reject the appearance of precision as unjustifie The Port claims that in order to control for the risk of error, it has systematically biased i assumptions and adjustments to minimize the apparent reduction in noise levels, and associate noise impacts, over time. This claim, however, is difficult to accept without a complete descriptio of the actual assumptions and adjustments the Port made. More persuasively, the Port emphasize that the direction and pattern of changes in noise levels and noise impacts that it has estimated ar consistent with the relatively reliable measurements taken at the Port's permanent monitoring site and with common understanding of the two underlying phenomena that have caused the mos significant changes in the Airport's noise environment in recent years: the dramatic reduction o Stage 2 aircraft operations, especially at night, during the years 1989/1990 to 1995, and the markec growth in Stage 3 aircraft operations since 1993.

The Port points out that one would expect, in these circumstances, to see a continuous reduction in DNL over those years; a reduction in the loudest aircraft events, measured by SEL, with a corresponding reduction in average SEL and Time Above 85 dB; and, beginning in 1994, an increase in Time Above 65 dB caused by the increase in flight operations (now running at more than 1,000 flights per day, up 14 percent from 1993). Since this is exactly the pattern that emerges from the Port's noise measurements (and back-calculations), the Port argues that its analysis of noise benefits "makes sense" and should be credited by the Panel. While these arguments have some intuitive appeal, they were ultimately not convincing, in light of our detailed analysis of the Port's noise metrics and estimated population benefits.

We have examined with great care each of the Port's specific arguments about on-the-ground noise impacts and its calculations as to numbers of people benefitted by noise reductions. Wherever possible, we have reviewed and analyzed the underlying data. In general, we find that the underlying data show no serious internal inconsistencies across the various noise metrics; for purposes of analysis, therefore, we accept the Port's DNL, SEL, and Time Above data as generally (if not precisely) reflective of the actual changes in fleet mix and pattern of operations at the Airport. The critical question is what those data actually demonstrate, in terms of meaningful or significant reductions in real, on-the-ground noise impacts.

The Port urges us to accept its interpretation of the data with regard to noise impacts. The ACC and the RCAA urge us to reject that interpretation. We have conducted an independent evaluation, as Resolution A-93-03 explicitly requires. We present, below, our analysis and findings with respect to each of the major types of "noise impacts" addressed in the Port's Compliance Report.

Percentage Highly Annoyed

Noise impacts are often evaluated in terms of changes in the number and percentage of people "highly annoyed" by a given noise source. In its Compliance Report, the Port estimated that some 28,000 people were "highly annoyed" by Sea-Tac Airport noise in 1989/1990, out of a total population of 250,000 to 300,000 people within the 55 dB DNL contour at the time. The Port asserted that the reductions in aircraft DNL at Sea-Tac have produced a 11 percent decrease since 1993 -- and a 33 percent decrease since 1989/1990 -- in the overall number of people "highly annoyed" by aircraft noise: 2,100 fewer since 1993, and 9,900 fewer since 1989/1990, by the Port's estimates.

At the end of the final day of the February 1996 hearing, in response to the Panel's questions about the basis for those statements, the Port supplied the following table to substantiate its estimates of fewer people "highly annoyed:"

PORT ESTIMATES: PERCENTAGE OF PEOPLE HIGHLY ANNOYED

DNL CONTOUR BAND	1989/90	1993	1995
75 dB and above	45	36	34
70-75 dB	29	22	20
65-70 dB	17	12	11
60-65 dB	9	6	6
55-60 dB	5	3	3
OVERALL PERCENT HIGHLY ANNOYED	9	7	6

(Note: The overall percentage highly annoyed reflects a weighted average of the number of people affected by airport noise in each DNL contour band; there are very few people in the 75 dB DNL contour, but many in the 55, 60 and 65 dB contours. 1992 is not included because the Port supplied no estimates on percent highly annoyed in 1992.)

We were then able to trace the logic behind the claim. The Port had placed its reported changes in aircraft DNL on the FICON Curve, calculated a corresponding overall percentage of people "highly annoyed" in 1989/1990, 1993, and 1995 -- 9, 7, and 6 percent, respectively, of the population within the 55-dB-and-above DNL contour -- then multiplied those percentages by its INM population estimates and compared the results with the original estimate of 28,000 people "highly annoyed" in 1989/1990, in order to arrive at its figure of 9,900 fewer people "highly annoyed" in 1995.

That would have been a positive benefit, if we could reasonably conclude that it had actually occurred. Unfortunately, the entire calculation was based on very small movements along the FICON Curve: a shift of -0.9 dB DNL since 1993, and -3.4 dB DNL since 1989/1990, along a curve that does not accurately predict changes in annoyance for DNL changes of less than 5 dB. There is a very large potential for error when one uses the FICON Curve to estimate the percentage of "people benefitted" from very small reductions in DNL; as noted earlier, the 95 percent confidence interval is about 20 percentage points wide. Because the percentage changes the Port computed in its table -- the shifts from 9 to 7 to 6 percent of the overall population -- have no solid basis, one cannot conclude that there has been any change at all since 1993 in the actual number or percentage of people "highly annoyed" by aircraft noise, or more than an insignificant change since 1989/1990.

Consequently, we cannot find that the Port has demonstrated any significant "noise impact" benefit on the basis of its "highly annoyed" population analysis. Contrary to the Port's assertions in the Compliance Report, the actual data are, instead, consistent with the findings of the ACC's 199 social survey that the majority of residents do not perceive a reduction in annoyance due to aircraft noise impacts.

The ACC social survey results, covering six communities in the vicinity of the Airport indicated that (i) people in the Sea-Tac area are generally more tolerant of aircraft noise than people elsewhere in the country where such surveys have been done, and (ii) an average of 30 percent of the respondents were more annoyed by aircraft noise over the past two years (February 1993 to February 1995), while an average of 9 percent were less annoyed. The Port criticized the survey technique (which asked respondents to remember a noise situation two years prior and to compare it to the current time period) and offered expert testimony by Dr. Ward discounting the reliability of memory. On review, we find the survey a useful device, conducted by a leading expert on such surveys. Because the technique differed from the usual methodology of asking respondents to describe the then-current situation at two different times and then independently comparing the answers (no such prior survey was available for the Sea-Tac area), we accept the survey's results on the change in annoyance as illustrative rather than definitive. We note that the ACC's survey results are consistent with the relationship between DNL and Percentage Highly Annoyed expressed in the FICON Curve for noise impacts.

Loudest Aircraft: SEL Analysis

The Port also presents data on individual aircraft noise events in terms of Sound Exposure Levels (SEL). There *has been a reduction in the highest-noise-level aircraft events*, as measured by the Port's SEL data and the aircraft operational data for the changing fleet mix at the Airport.

From 1993 to 1995, the total number of Stage 2 flight operations at Sea-Tac declined from 132 per day to 93. Moreover, by 1995 the majority of the remaining Stage 2 planes were F28s, which are measurably quieter (by 5-7 dB SEL) than the Stage 2 Boeing 727s that dominated the noise profile in 1990 and were still the dominant Stage 2 aircraft in 1993. At night, the average number of Stage 2 operations dropped from 20 in 1993 to 9 in 1995; only a handful remained by the end of 1995 (due to the October 1995 deadline in the Nighttime Limitations Program).

In recent years, however, the change in average SEL has been small. We find that the overall fleet-wide average SEL reduction of 2.0 dB since 1993 is too small to produce a meaningful change in on-the-ground noise impacts, especially when coupled with more flight operations. Further, any assessment of the reliability of that figure is complicated, in part, by the range of variation in measured SEL values over various aircraft types and even within individual aircraft categories. We also find that there was relatively little reduction in the number of peak aircraft noise events with a SEL over 95 dB (averaged over the 11 RMS sites) from 1993 to 1995.

Moreover, the Port's data show an *increase* since 1993 in aircraft noise events with an average SEL over 85 dB at the 11 RMS sites (with only a slight decrease at the supplemental sites). There has also been an increase in the number of aircraft events with an average SEL over 75 dB at both sets of sites. The Port did not supply 1992 average SEL data for the Panel's analysis.

Since 1989/1990, there has been an overall 4.5 dB reduction in average SEL for individual aircraft events. That change, which reflects the early phase-out of Stage 2 aircraft at Sea-Tac, would appear to be "significant" and "appreciable," in the sense that people should be able to notice a difference of that magnitude and perceive some benefit. The extent to which residents actually do perceive a difference of 4.5 dB SEL in the average level of individual aircraft events over the course of a six-year period may be tempered, however, by the unreliability of memory (as the Port noted in its criticism of the social survey), and by the countervailing effects of an increase in the number of daily aircraft operations over the same period.

Federal regulations require the phase-out of all Stage 2 operations by 2001. The Port produced earlier benefits for the Puget Sound Region by accelerating the phase-out of Stage 2 aircraft in the early 1990s; 86 percent of the fleet was Stage 3 by 1995. In effect, residents obtained the benefits of the drop in peak SEL (aircraft events above 95 dB) sooner than they otherwise would have, as Sea-Tac outpaced the national phase-out of Stage 2 aircraft. While that early improvement was certainly beneficial, we find that the gains the Port achieved (reflected in reductions in average SEL) are now being eroded by the growth in operations, as the following evaluation of the Time Above (TA) data indicates.

Speech and Activity Interference: Analysis of Time Above

One of the most useful and illuminating ways to assess changes in noise impacts is the Time Above (TA) metric. The Port uses this measure to estimate changes in speech and activity interference (and corresponding numbers of people benefitted) from data on the changes in daytime TA 85, 75 and 65 dB outdoors, and changes in daytime TA 60 dB and 45 dB indoors. While the TA metric is measured directly from the Port's RMS and supplemental monitoring sites, the Port's estimates of the number of people benefitted must be viewed with the same cautions raised previously about the accuracy of the INM-estimated population data.

Because the Port provided no Time Above data for 1992, our analysis is limited to the 1993-1995 and 1989/1990-1995 time periods. Except where noted below, the Port presented data on TA "per day" based on a 15-hour daytime "day."

We evaluated the significance of the reported reductions in Time Above in terms of minutes per day, as well as percent change. For example, in the 1993-1995 time period, the large percentage reductions in daytime TA 85 that the Port cites in its Compliance Report actually represent decreases of less than two minutes per day in noise exposure above 85 dB, while the small percentage increases shown in TA 65 amount to as much as an additional 44 minutes per day of noise exposure above 65 dB.

When we examined the longer 1989/1990-1995 interval, we found a similar pattern. The average daytime Time Above 85 dB at the reported monitoring sites fell from about five and a half minutes a day in 1989/1990, to just under two minutes a day in 1995. The average Time Above 65 dB remained much the same: 2 hours and 53 minutes in 1989/1990, compared to 2 hours and 38 minutes six years later.

It is difficult to conclude that such small reductions in average TA 85 constitute a meaningful reduction in "real noise impacts." How much weight should one give to the decreases in Time Above 85, in evaluating population exposure to aircraft noise? Removing a large share of the loudest

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aircraft noise does make a difference in on-the-ground noise impacts. But recent increases in Time Above 65 dB are now partially offsetting the reduction in the peak aircraft noise (TA 85). If one takes the "equal energy principle" at face value -- a ten to one noise-energy tradeoff for a 10 dB difference, one hundred to one for a 20 dB difference, etc. -- then as of 1995, with respect to operations at Sea-Tac, the decreases in TA 85 still outweigh the increases in TA 65, implying an overall net benefit (as the small but continuing reduction in DNL suggests). We view that tradeoff with some circumspection, however, especially as TA 65 grows further into the "several hours per day" range. At that point, the real-world relationship between aircraft noise levels and number of operations comes into play. The pattern of aircraft noise at a site in the community has fewer very loud peaks but becomes far more continuous, and a steady stream of aircraft noise above 65 dB has noise impacts of its own.

For the three RMS sites where the Port presented 24-hour (rather than daytime) measured TA data from the Port's noise monitoring system -- RMS sites 5, 10, and 11 -- the Time Above 65 dB in 1995 was 5 hours per day at RMS 5; 3 hours and 51 minutes per day at RMS 10; and 9 hours and 49 minutes per day at RMS 11. At all three sites, Time Above 65 dB is now higher than it was in 1993, and at RMS 11, TA 65 is also higher than it was in 1989/1990.

Moreover, at one site -- RMS 11 -- *TA 85 was also higher in 1995* than it was in 1993. The increase in TA 85 from 9.5 to 10.4 minutes per day at RMS 11 indicates an *increase* in the loudest aircraft events, perhaps as a result of increased aircraft ground noise.

Our examination of the TA data suggests that the Port may have already obtained most of the net benefit it can expect from the reductions in TA 85 produced by its current noise abatement programs. It appears to the majority of the Panel that the Airport may have reached a plateau in net noise reduction, or will do so shortly, because TA 65 is now increasing steadily, and the earlier downward trend in TA 75 has apparently bottomed out as well. With the rising number of flight operations, the number of minutes (or hours) of Time Above both 65 dB and 75 dB is likely to rise in future years, soon overtaking the real benefits of the Port's reductions in TA 85.

We note that Time Above 65 dB — not to mention 75 dB — does more than merely cause "low levels" of speech interference; it disrupts a wide variety of everyday activities (relaxation, thinking, reading, learning, and listening) and is correlated with increased levels of stress, tension, and annoyance. The Port cites the 1992 FICON Report discounting such effects; however, since that FICON Report was issued, a considerable body of medical literature has been developed, documenting the adverse effects of exposure to noise levels in the 65 to 75 dB range, including psychological distress, loss of concentration and reading comprehension, and other physiological effects. In short, increases in outdoor TA 65 can produce serious on-the-ground noise impacts.

We also evaluated the Port's estimates of indoor speech and activity effects based on changes in interior TA 45 in single-family residences. The Port's data support a finding of substantial improvement in interior TA 45 for insulated buildings with the windows shut, but that is primarily a function of the insulation, not a result of improvements in the outdoor TA. (The data results do demonstrate the significance of achieving an average A-weighted sound level reduction of 7 dB for insulated houses, with windows closed.) For the open-window case, however, it appears that interior TA 45 -- a benchmark for the threshold of speech interference -- has increased, based on the trends in the outdoor TA 75 and TA 65. The Port did not specifically show the interior, open-window TA 45 dB data.

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Changes in classroom speech and activity interference were assessed using interior TA 60 and TA 45. In examining the underlying data, we find that the large percentage improvements the Port shows in "medium level" speech interference from 1993 to 1995 amount to actual reductions of just two to three minutes per day. The data also show almost no improvement in the amount of time above the 45 dB threshold for speech interference. Most important, our analysis revealed the striking fact that for the four schools the Port cites, even with the windows closed, the interior noise levels are above the threshold for speech interference (45 dB) for an hour to an hour and a half per day.

Once again, marked improvement is shown when insulation is added. When the Port adjusts its estimates to reflect a 5 dB reduction in A-weighted sound level due to insulation, the number of classroom hours above that threshold noise level of 45 dB are cut in half — still disruptive to the learning process, but much better. These results underscore the critical need for school insulation, because a continued increase in aircraft operations in the future will only increase the number of minutes (or hours) over the threshold for speech interference.

Nighttime Noise Improvements

The Port also presented data and analysis on the change in the potential for sleep disturbance. We note that because the method of analysis is new and untested, the Port's results should be viewed with caution, especially in light of the concerns outlined above about the reliability of the Port's INM-estimated population benefits. The method does seem plausible in its approach and its use of the USAF curve on probability of awakenings.

The reported 1.9 dB reduction in the average SEL of nighttime events since 1993 is not a meaningful indication of changes in real, on-the ground noise impacts, and the reliability of that figure is complicated by the range of variation in the measured SEL data across and within aircraft categories. The reported decreases in nighttime L_{eq} in recent years are small as well: -0.9 dB since 1993, -1.9 dB since 1992, and -3.6 dB since 1989/1990. It appears to the majority of the Panel that the small size of the reductions may be due to a combination of three factors: (i) the increase in the number of nighttime flight operations; (ii) the fact that the wide-body Stage 3 aircraft, with the exception of the Boeing 767, have the highest A-weighted sound levels on arrival -- greater than a Stage 2 Boeing 727; and (iii) the fact that, on departure, the wide-bodies and the hushkitted/re-engined 727s and DC8s are within 3 to 6 dB (SEL) of the Stage 2 Boeing 727. Although there are now far fewer Stage 2 flights at night, the total number of nighttime flight operations is not declining. The Port's data show an average of 133 flights per night in 1989/1990, 120 per night in 1993, and 138 per night in 1995 (data on 1992 nighttime operations were not reported).

The Port's analysis shows a modest decrease in the overall potential for awakenings since 1993, which is attributed mostly to the home-insulation program (discussed later in this Decision). With the windows closed, insulation does work. Our analysis of the data, however, shows an increase in the number of potential awakenings for the open-window case, which suggests that the increase in total nighttime operations is overriding the decrease in average aircraft SEL produced by the nighttime Stage 2 phase-out.

Moreover, we are concerned about the Port's decision to use a 5 percent open-windows assumption in its analysis (i.e., the Port estimated the overall rate of nighttime awakenings on the assumption that residents keep their windows closed 95 percent of the time). We are not sure of

the factual basis for that assumption, or the extent to which it may have affected the Port's results No sensitivity analysis was presented, although we would expect that the difference in noise exposure with open v. closed windows has an important bearing on the rate of nighttime awakenings.

The effectiveness of the Port's nighttime noise abatement programs is being undermined to some degree by poor aircraft compliance rates on the North Flow Noise Abatement Departure Corridors. We commend the Port for its actions in implementing these Corridors; it is clear that such flight track procedures can have a significant impact on population noise exposure. But they produce results only if they are enforced. While compliance with the nighttime Corridor procedures is fairly high on initial departure, we find that the compliance rates are unacceptably poor outside the immediate vicinity of the Airport. In December 1995, for example, significant numbers of aircraft failed to comply with the North Flow Corridors at night: 29 percent on the Elliott Bay Departure, 25 percent on the Puget Sound Departure North, and 27 percent on the Puget Sound Departure South. For the third quarter of 1995, the failure rates for those three Departure Corridors were 21 percent, 19 percent, and 40 percent, respectively. By comparison, the noncompliance rates for the nighttime South Flow Puget Sound Arrival Corridor were 1.4 percent in December 1995 and 0.6 percent in the third quarter of 1995.

Primary responsibility for this problem rests with the FAA, which has operating authority over the more distant sections of the Corridors. In light of the specific language in Resolution A-93-03 requesting the FAA to do more to reduce the noise impacts associated with the Four Post Plan, we find it troubling that the FAA would hinder the Port's noise reduction efforts by failing to enforce the *existing* abatement departure procedures. The Port and the residents of the Region deserve better.

We are also concerned that Alaska Airlines has shifted its two nighttime Stage 2 cargo arrivals and departures to Boeing Field ("King County International Airport" or "KCIA") in order to sidestep, rather than comply with, the Port's nighttime limitations on Stage 2 flights — a move which, we recognize, is outside the Port's jurisdiction (but perhaps not outside its influence). Taking advantage of the fact that KCIA is an unregulated general aviation airport, not subject to the controls that govern commercial airports, the carrier continues to operate these flights. These *very* loud aircraft events have generated many complaints, and this action by Alaska Airlines weakens the effectiveness of the Port's Nighttime Limitation Program.

In light of the small reductions in nighttime SEL and L_{eq}, the *greater* likelihood of awakenings in recent years in the open-window case, and the factors undermining the Port's efforts to reduce nighttime noise exposure, we do not find that the Port has made a convincing case that there is a significant overall reduction in sleep disruption due to aircraft noise.

Airline decisions to shift Stage 2 aircraft operations out of the nighttime period to the "shoulders" of that period -- that is, 8-10 p.m. and 7-8 a.m. -- also have implications with respect to noise impacts (the Port has acknowledged the likelihood of such shifts in the timing of Stage 2 operations). The 8-10 p.m. interval covers the bedtime hour for many children and the period of evening relaxation and early bedtime for many adults. The Apogee survey of people near Dallas/Ft. Worth Airport (which the RCAA supplied for the Panel's review) showed high levels of annoyance with aircraft noise before 10:00 p.m., due to interference with normal evening activities.

Noise Contour Analysis

Another series of measures presented by the Port relates to the "change in DNL land use and population impact." The Port asserts that the population within the high noise contour (75 dB DNL) has now dropped from 3,100 to nearly zero. From the information we have seen, it is not clear that such a reduction actually occurred in the stated 1993-1995 time frame (for example, the 1993 DNL contour map shows virtually no residential land use within the 75 dB zone). Nevertheless, the ability to say that no one is residing inside a DNL contour of 75 dB is an important marker for an abatement program; in keeping with our decision to include earlier time periods, we give the Port full credit for this accomplishment, no matter when it occurred.

Similarly, sizable reductions in the number of people inside the 65 and 55 dB DNL contours are important. The Port states that 8,000 fewer people are inside the 65 dB DNL contour since 1993, and that the population inside the 55 dB DNL noise contour is 19,000 lower since 1993, an 8 percent reduction. Both of these estimates carry with them an unknown but potentially large degree of uncertainty due to the undocumented differences between the modeled and measured DNL levels the Port used in its DNL contour calibration process in the Integrated Noise Model. As we previously explained, we are concerned about the effects of propagating errors in translating noise measurements to noise models to population benefits. Given the size (-0.9 dB) of the 1993-1995 change in DNL and the uncertainty of any appreciable change in noise impacts at that level, it is not clear that the Port's estimated changes in the 65 and 55 dB DNL contours reflect anything more than a marginal shift in levels for houses on the border of the respective contours. If, as the other measures we have examined suggest, the DNL contours have moved only marginally (or not at all) since 1993, the changes are not meaningful, and the estimates of 8,000 and 19,000 people benefitted are laden with uncertainty.

The Port also calculates the change in population exposed to indoor noise levels in excess of 45 dB DNL, reporting data for both open- and closed-window conditions, and closed-window data for both insulated and uninsulated houses. We find that the population noise exposure change resulting from the insulation program is real and undebatable in the closed-window case: These people experienced an average of about 7.9 dB reduction in interior DNL (uninsulated, 1993, compared to insulated, 1995). There is no question about the significance of a change of that magnitude (although the benefits accrue only to the residents of insulated houses, and then only when they are indoors with the windows closed).

With respect to the Port's overall indoor-population-exposure estimates, however, we have the same concerns as we did with the results for the 55 and 65 dB DNL contour analyses: the propagation of error in the population projections due to uncertainties in the underlying data and in the estimation process, coupled with a very small change in mean DNL, as discussed below. Since the Port provided no information that would permit us to judge the accuracy of its population estimates, we cannot give full weight to the Port's reported results.

Summary: DNL Reductions

The DNL metrics provide a very useful -- and widely accepted -- way to characterize overall changes in airport noise. As a summary measure based on the average noise levels of hundreds of thousands of flight operations over time, the annual DNL values incorporate, but mask, the particular variations in sound exposure and noise impacts that are illuminated by the various other

measures discussed above. Total and aircraft DNL metrics are the principal tools used to summari: the overall changes in environmental sound levels associated with airport operations; total DN reflects the changes in noise around the Airport from all noise sources, while aircraft DNL tracl the changes in noise attributed to aircraft operations.

We find that the reported reductions of 0.9 dB and 0.6 dB in aircraft and total DN respectively, since 1993 -- even if they were accepted as statistically reliable -- are too small to justi any finding that there is likely to have been a meaningful or appreciable reduction in speec interference, sleep disruption, the number of people or percentage of the population "high annoyed" by aircraft noise, land use effects, or other noise impacts. The principal analytical to used to calculate such population effects from DNL exposure levels -- the FICON Curve -- permi no conclusions about population benefits on the basis of such a small shift in measured DNL level If one accepts 1993 as the legally-mandated base period for comparison, the 0.9 dB reduction i aircraft DNL is clearly too small to produce even a reliably measurable -- let alone "meaningful" reduction in on-the-ground noise impacts.

Likewise, we find that the use of 1992, rather than 1993, as the base year would not alter ou conclusion that the Port has not shown a significant or meaningful reduction in noise impacts sinc the Resolution was enacted. Given the small size of the change being measured (-2.3 dB in aircrat DNL, -1.8 dB in total DNL), uncertainty remains a concern. Moreover, we are unconvinced tha a sound level reduction as small as 2.3 dB in DNL, over a four-year period, can reasonably b expected to produce an appreciable reduction in the on-the-ground noise impacts experienced b the population surrounding a busy airport with rapidly growing operations.

Over the past ten years as a whole (1986-1995), there has been a change of only -2.8 dB in aircraft DNL as measured by the Port's RMS sites. For the reasons addressed above in our discussion of the "base year" issue, we believe the ten-year change in aircraft DNL provides the most unbiased measure of actual DNL reductions at the Airport. The *maximum* change in aircraft DNL that the Port can show, for any base "year" within that ten-year time frame, is the -3.4 dB change in aircraft DNL from the single worst year (1989/1990) to date.

The scientific literature does not establish any specific figure as a definitive DNL threshold for measuring meaningful airport noise reductions. There is debate about how important a 3.0 dB change in aircraft DNL really is. While a -3.0 dB change in DNL will shift noise contours, and thus, by some measures of effectiveness, give an appearance of importance, it reflects a change in sound levels that is not much more than barely perceptible -- and certainly not "appreciable." In terms of generating real, on-the-ground noise impact reductions that people in their yards or houses would appreciate, a -3.0 dB change in DNL would not generally be considered "significant;" it would not be considered a goal for highway or rail noise abatement programs, for example.

Consequently, if we were to use the more representative -2.8 dB change in aircraft DNL -- the cumulative improvement the Port has actually achieved over the past ten years -- we would conclude that the Port has not demonstrated a sufficient reduction in real noise impacts to meet the requirements of Resolution A-93-03.

Based on our experience, the scientific literature, and our best professional judgment, the majority of the Panel also finds that the maximum reduction the Port has shown (-3.4 dB in aircraft DNL, averaged over the 17 monitoring sites) -- although it is certainly a laudable achievement for

any airport with more than 300,000 operations a year -- is below the threshold of "meaningfulness" in terms of producing a real, appreciable, "on-the-ground" reduction in airport noise impacts for an affected population -- especially when that DNL change occurs in conjunction with an increase in operations that now produces a rising trend in Time Above 65 dB. In short, even over the six-year period the Port has urged the Panel to consider, the majority of the Panel is not convinced that the Port's noise abatement efforts have produced a sufficient reduction in real, on-the-ground noise impacts to satisfy the noise condition of Resolution A-93-03.

This finding will no doubt be controversial. The literature does not precisely define what constitutes a meaningful reduction in DNL, largely because there are so many acoustical and non-acoustical variables that can affect people's responses. (An increase in aircraft operations is one such variable that has been of concern to us here.) Addressing aircraft noise abatement, A. Harris commented indirectly on the meaningfulness of different amounts of noise reduction when he noted, "How effective a noise abatement tool is a displaced [landing] threshold? Not very -- a 4,000 foot displacement is required to obtain *a reduction of 5 dB*.... Even the 3,019 foot displaced runway... produces *only a 3.2 dB reduction* in landing noise...." (A. S. Harris, "Relative Effectiveness of Options for Reduction of Aircraft Noise Exposure around Airports," *INTER-NOISE '80 Proceedings*, p. 814, emphasis added). Both the FAA and the Wyle insulation program report for Sea-Tac note that at least a 5 dB reduction in interior noise is needed, to be noticeable. Should a 5 dB decrease in outdoor noise be viewed any differently? In highway traffic noise analyses, most State Departments of Transportation consider a 10-15 dB increase in "worst hour equivalent sound level" a substantial increase, with a 5 dB increase being noticeable (trends in DNL track trends in "worst hour equivalent sound level" to a large degree); when they consider highway traffic noise abatement, they aim for a "substantial reduction" that is at least 5 dB and typically 7 to 10 dB.

FICON illustrates the debate on the subject, quoting a conversation with W. Galloway at one point ("... in a community noise environment, the majority of a group of persons exposed to a 3 dB change in DNL as a result of a change in aircraft noise exposure would characterize the change as 'clearly noticeable'" [p.3-15]) -- but FICON then goes on to say: "Although a 3 dB change may not represent a significant impact on human health or welfare, particularly below DNL 55 dB, a change of this magnitude is considered as an indicator of the need for additional analysis" (p.3-16). The FAA has established no criterion for airport noise decreases or analysis of the community effects of small reductions in aircraft noise.

The recently issued Federal Transit Administration manual, *Transit Noise and Vibration Impact Assessment* (FTA, April 1995), cites the conclusion "by EPA and others" that a 5 dB increase in DNL is the minimum required for a "change in community response." It also notes that a two percentage-point increase in people "highly annoyed" (e.g., from 10 percent to 12 percent) is the minimum measurable change in community reaction, and that the goal of abatement efforts should be to "gain substantial reduction... not simply to reduce the predicted levels to just below the severe impact threshold" (p. 6-34). Typical rail transit noise mitigation strategies seek reductions of DNL 5 dB or greater.

Some members of the acoustical community suggest that there may be a real difference in the appropriate standard to be used to evaluate the significance of noise decreases, as opposed to noise increases. It is possible that there is a quality of "downward insensitivity" associated with small reductions in already-high noise levels -- that is, people may be more sensitive to increases than to decreases, and once sound exposure levels are high enough to create annoyance and interfere with

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routine activities, it may take more than a marginal decrease in noise to "unstick" that perception and produce an appreciable reduction in noise impacts.

As noted above in our SEL and TA analysis, the evidence at Sea-Tac also suggests that the additional DNL improvements which the Port anticipates from its current noise abatement programs are likely to be overtaken by the effects on DNL of the continuing increase in operations. For that reason, we are not confident that the abatement programs the Port has "scheduled and pursued" to date will generate even small reductions in future DNL -- or produce noticeable reductions in future on-the-ground noise impacts.

V. Effectiveness of Noise Mitigation Programs

However, noise abatement is not the only tool in the Port's toolkit. Noise mitigation measures can also generate important and meaningful benefits in terms of a reduction in noise impacts. We turn now to our findings and conclusions about the significance of the benefits attributable to noise mitigation.

Under the Noise Mediation Agreement, the Port made Noise Remedy Program commitments in four major areas: residential acquisition and relocation; a transaction assistance/special purchase program; residential noise insulation; and sensitive-use public building noise insulation.

The Acquisition/Relocation Program has been completed as planned, with the buy-out of some 1400 properties in the worst noise-impacted areas. The buy-out was essentially completed prior to enactment of Resolution A-93-03; with the purchase of the last few properties in 1995, the Port has declared the acquisition program closed. A buy-out of this size is a major accomplishment for any airport, and unquestionably constitutes a meaningful noise reduction benefit to the families who have been successfully relocated. (However, the buy-out has also had some negative economic and social repercussions for the adjacent neighborhoods. The comments in the 1993 AIRTRAC *Final Report: Mitigating the Environmental and Social Impacts of Air Transportation in Washington* (p. 3-35) regarding "...'dead zones' of boarded up houses and ill-maintained streets that frighten residents...." suggest the need for additional action to mitigate the effects of the buy-out.)

With respect to the Transaction Assistance Program, we note that, while it is ostensibly available to 3,000 homeowners, only 254 — fewer than 10 percent of those eligible — have applied to the Port for assistance to date. The low utilization rate invites the suggestion that the program is not structured in a way that homeowners find useful or equitable, or that such assistance is not widely needed, or that the Port has been less aggressive than it might be in making this assistance easily available.

The Port has done an impressive job of residential noise mitigation since 1993. The Residential Insulation Program was accelerated during 1993, shortly after adoption of Resolution A-93-03, and it is now proceeding rapidly (at a rate of about 110 homes per month). As of December 1995, the Port had insulated 3,647 homes, including 2,888 completed since the end of 1992. The interior noise reductions achieved — an average of 7 dB in the most seriously impacted homes, resulting in interior DNL levels of 45 dB or less in post-modification audits — clearly appear to be both noticeable and meaningful for the people affected, as one would expect from the magnitude of the reductions and as evidenced by the positive reactions of the owners of insulated homes in the worst-impacted areas. The benefits are not in question; they are partial -- indoor, closed-window relief only -- but they are directly measurable. We conclude that the indoor, closed-window noise impact benefits are significant for most, and perhaps all, of the 8,570 people residing in the homes insulated to date.

The Port has defined 10,000 homes (with approximately 23,500 residents) as eligible for noise insulation, and has made a commitment to complete its full residential insulation program before beginning construction of a third runway. However, the Port's Compliance Report shows 14,000 "housing units" within the 65 dB DNL contour in 1995, and more than 17,000 within that contour in 1993. As noted above, with a DNL change as small as -0.9 dB, we are not convinced that the DNL contours have changed more than marginally since 1993. If the 65 dB DNL contour is not decreasing in size, expansion of the residential insulation program may become necessary, since the Port expected a decrease in the contour when it defined the present insulation eligibility criteria. We also note that Port Resolution 3125 places certain requirements on the Port staff with regard to residential insulation prior to construction of the proposed new runway and prior to its opening.

Turning to the longer periods of evaluation which the Port has advocated, we observe that, had the Port accelerated its Residential Insulation Program just 18 months sooner — in January 1992, rather than in mid-1993 — it could have insulated an additional 2,000 homes by December 1995: 50 percent more than it did, in fact, complete by the end of 1995. Had the Port accelerated the program three years sooner, in mid-1990, an additional 4,000 homes could have been insulated by now. Doing so would have more than doubled the number of homes insulated by December 1995, from 3,647 to approximately 7,600. The number of people benefitting from that reduction in indoor sound levels would have also more than doubled, from 8,570 to about 18,000. Instead of a Residential Insulation Program about one-third completed, the Port would have presented this Panel with an important mitigation program that was approximately 75 percent completed. We also note that the residents of those homes would have received the benefits sooner and would be enjoying them today.

We give the Port a great deal of credit for "scheduling and pursuing" the residential insulation program vigorously since 1993, but *when* the insulation is achieved does make a difference in how the benefits are weighed. By the Port's own standard, the fact that it chose to apply substantial resources to this program in mid-1993, rather than in 1990 or 1992, represents a missed opportunity to provide demonstrated, meaningful, and continuing noise reduction benefits to several thousand people. Taken alone, this increase would not satisfy the Resolution (substantial progress is needed on public buildings and multi-family dwellings as well), but it will be an essential source of future noise benefits.

The "Sensitive-Use" Public Buildings Insulation Program, another key component of the 1990 NMA Noise Remedy Program, has been partially scheduled, is being pursued, and has had some achievements. Here, the Port cites its progress on various pilot projects: two churches (2,080 people), the SeaTac Convalescent Center (515 residents), the Soundridge Condominium project (134 people), and one private school. The Port has also begun insulation work at Highline Community College. We note that the NMA did not call for insulation of multi-family dwellings, and we commend the Port for this important addition.

The pilot programs are behind schedule, however. The two churches and the convalescent home are not currently scheduled for completion until mid to late 1996. While the Compliance Report lists the completion date as April 1996, the 1993 Part 150 Update set mid-1995 as the

expected time of completion. We also note that the Port has overstated the current benefits of th community college project, by counting every person at the college (4,000 people) as receivin benefits even though the Port has completed only 22 rooms in four out of 17 college buildings.

The 1990 Noise Mediation Agreement specifically envisioned an insulation program thi would include many types of public buildings: "auditoriums, private schools, churches, day-car centers, libraries, etc." The Agreement also called for field and feasibility studies for public buildin bordering the 65 dB DNL contour. The Port has not reported appreciable progress in these area

In addition to 23 schools, Table 1-7 of the Port's Compliance Report lists 15 hospitals or re homes, 10 churches, and 2 libraries within the 65 dB DNL contour in 1993. The NMA did not ca for the two-step approach the Port is currently using to implement the Public Buildings Insulatio Program (pilot projects, followed at some point by a full program); that approach resulted from th 1993 Part 150 Update. While we respect the Part 150 process, we are not sure that pilot studie were necessary, especially for private schools. Different types of buildings do have their ow peculiarities with respect to noise insulation work, but there would seem to be enough experienc in the field of sound insulation for the Port to have proceeded into a full program. It appears tha the larger issue holding up progress on insulation of sensitive-use public buildings and multi-famil housing units may be the cost. As of the Panel's February 1996 hearing, Port staff said that they ha developed a proposed budget, but funding was still "an issue."

Because insulation of public buildings and multi-family dwellings can reduce indoor DNI substantially, it offers the promise of meaningful, long-term indoor noise relief to a potentially very large number of people in the vicinity of the Airport. The pilot projects are important, but, absent a timetable for the full program and a funding commitment from the Port, we cannot conclude that this component of the Port's Noise Remedy Program is being effectively "scheduled and pursued" per Resolution A-93-03.

Finally, throughout this proceeding, we have repeatedly expressed our concern about the delays in school insulation. We find it difficult to conclude that there has been a "meaningful" reduction in on-the-ground noise impacts as long as the majority of classrooms in the airport vicinity remain uninsulated and heavily impacted by aircraft noise. The record provides ample evidence of speech interference in local schools, and with the continuing increase in the number of daytime flight operations, classroom disruption can only increase. We recognize that responsibility for the failure to move forward with school insulation projects rests primarily with the Highline School District; the Port has made its commitment to funding school insulation projects clear. The factors cited by the School District — general rehabilitation costs, lack of funds, and policy questions concerning noise insulation for older, inadequate school facilities — are legitimate issues, but do not excuse years of inaction on this critical aspect of noise mitigation.

On balance, we strongly commend the Port for its efforts in the buy-out and residential insulation programs, but find that the Port's mitigation programs have had a limited effect in reducing real on-the-ground noise impacts. For the population directly benefitted, relocation and residential insulation have provided real reductions in noise exposure (at least indoors, with the windows closed), but the number of people benefitted remains relatively small, compared to the number of people affected in the Region. In our view, both the Noise Mediation Agreement and Resolution A-93-03 clearly contemplated a broader reach of noise mitigation effects -- especially with

regard to reducing noise impacts in schools and other sensitive-use buildings -- than the Port has scheduled, pursued, and achieved to date.

VI. "Meaningful and Reasonable" Reductions in Noise Impacts

In our January 1995 Noise Order, the Panel stated, "To meet its burden under the Resolution... the *[Port] must offer us reliable evidence*, based on actual measurements of on-the-ground noise, that by 1996 there has been an objectively measurable, meaningful reduction in aircraft noise impacts in the affected communities surrounding the Airport." We expressed our belief that the PSRC General Assembly, in enacting the Resolution, "intended to condition approval of the third runway upon a showing that the noise impacts of the existing Airport have been reduced in a significant way." And we set the parameters of this proceeding by stating that neither an "unreasonable" (i.e., unreachable or infeasible) nor a "meaningless" (i.e., inappreciable or trivial) reduction in noise was contemplated by the Resolution.

At the simplest level, we intended that particular wording to send a balanced, dual message, signaling the Port that this Panel would not be persuaded by insignificant changes in noise levels or noise impacts, and simultaneously signaling the community that we would not impose an unrealistic standard of noise reduction (for example, requiring a 10 dB DNL reduction). Our choice of wording echoed the language used by various members of the PSRC Executive Board in the legislative debate surrounding Resolution A-93-03, and reflected the extensive discussion at the Panel's August 1994 hearing. With our respected colleague's dissent, however, that language has taken on added weight in this proceeding.

Meaningful Reductions in Noise

In view of the plain language of Resolution A-93-03, we cannot accept our colleague's interpretation of the PSRC General Assembly's intent. That resolution, the governing document in this proceeding, sets a specific test that must be met before the PSRC will approve the third runway: Based on "independent evaluation" and on the "*measurement* of real noise impacts," are "noise reduction performance objectives" being scheduled, pursued and achieved? In our view, it speaks to the purpose of the Port's noise programs -- the objectives and the results. The Resolution does not ask whether the Port is performing its programs, but whether those programs are producing meaningful results in terms of the public impact of airport noise. The fundamental goal of all of the Port's noise abatement and mitigation programs, from the Stage 2 aircraft phase-out to the noise insulation at Highline Community College, is to reduce exposure to airport noise in a meaningful way -- the "real noise impacts" stated in Resolution A-93-03. The PSRC General Assembly and the Executive Board did not require the services of a panel of outside experts merely to read noise meters at the Airport, or to conduct an administrative audit to determine whether the Port was implementing the noise programs it had promised the residents of the Region.

The Resolution explicitly requires the "measurement of real noise impacts" -- not measurement of A-weighted sound levels, DNL, or SEL values, but measurement of noise *impacts* on *real people and real* communities. In essence, the Resolution compels the Port to document the effectiveness of its programs: the real, on-the-ground results it is achieving as it works to reduce noise impacts.

We take the Resolution's wording at face value. The use of the term "measuremer required the Port to use a combination of measured noise data and established scientific metho to document its noise reduction results in terms of "noise impacts." The phrase "real noise impact: in turn, implies a standard based on meaningful results -- a scientifically sound, persuasive showi that the reductions in public exposure to airport noise (i) are actually occurring and (ii) are sufficie to reach at least a threshold of significance, in terms of producing documented, appreciable, a noticeable effects for the affected communities. And the requirement for "independent evaluatio meant that the Port had to demonstrate to an independent body -- the Expert Panel -- that it w in fact accomplishing meaningful results from the noise abatement and mitigation programs it h "scheduled, pursued, and achieved."

At the Panel's initial August 1994 hearing, PSRC Counsel stated that the PSRC Executi Board intended its "Implementation Steps" to be consistent with the Resolution. Accordingly, w believe the Implementations Steps also call for results, i.e., "a reduction in measurable on-the-groun noise" not merely in terms of a measurable change in aircraft SEL or airport DNL, but in the for of a measurable, appreciable, meaningful change in the public impact of airport noise. Counsel fc the PSRC explicitly confirmed this interpretation, when the Panel asked, in August 1994, "Is an measurable reduction enough to satisfy the requirements of the governing instruments? Or, are w to examine the question of whether the measured reduction in on-the-ground noise represents a rea noise impact within the meaning of the Resolution?" PSRC Counsel replied, "The latter."

In the Panel's December 1995 Noise Order, we emphasized that our judgment "should reflec the best insights we can gain from established scientific sources about the significance of changes i various noise metrics as indicators of changes in the impact of noise on the people in the communities surrounding the Airport." That has been our approach throughout this proceeding, as the hearing record indicates.

In light of the enormous importance of this issue for the Puget Sound Region, we believe that Resolution A-93-03 requires an impartial and scientifically accurate judgment on the substantive question before us: the effectiveness of the Port's programs in producing a meaningful change in public exposure to airport noise. That is the judgment we have presented in this Decision.

Reasonable Reductions in Noise

In reaching our findings, we have also considered the issue of "reasonableness." At a fundamental level, we do not believe that the General Assembly was "unreasonable" in expecting the Port to demonstrate that its noise programs were actually producing a meaningful reduction in "real noise impacts" for the communities surrounding the existing Airport, before launching a major airport expansion. We believe that meaningful, appreciable improvements for the population exposed to Airport noise -- real results in terms of on-the-ground noise impacts on real communities -- are achievable at Sea-Tac.

More specifically, we examined two broad interpretations of the concept of "reasonableness" in this context: reasonableness of effort, and reasonableness of results. We asked: Was this a *reasonable effort* by an airport? Was the Airport *reasonable* in deciding to do what it did? We considered: Is the *amount of noise reduction required by the Resolution reasonable?* Would a *reasonable observer* say that this Airport has done enough? Could the Airport *reasonably have done more?* We address each of these aspects in the discussion below.

Was this a reasonable effort by an airport? As the ACC argued in its October 1995 submittal: "[I]t is results, not good-faith efforts, which the General Assembly Resolution requires." In our view, the issue is not whether the Port has made an effort, even a great effort; the issue is whether there has been a meaningful reduction of impacts.

Although many of the citizens we heard from over the course of this proceeding give the Port little credit for what it has done, we fully recognize that the Port has made a serious effort in many areas, and we strongly applaud the Port for doing so. The Noise Mediation Agreement, while important to the Region, was not revolutionary in terms of the strategies it contained: nighttime operational restrictions had been in place at Washington National, Minneapolis and San Francisco; residential acquisition and residential and public building insulation were being done by many airports. Flight track changes (and preferential runway use) had produced major benefits at Los Angeles and Boston. But the Port took the initiative in the late 1980s to develop substantial noise abatement and mitigation programs at Sea-Tac and has continued them through the 1990s. Although the Noise Mediation Agreement process did not satisfy everyone, and ended rather abruptly just before the FAA implemented the Four Post Plan, it did establish major programs -- particularly the Noise Budget and the Nighttime Limitations Program -- that would be difficult or impossible to institute today, after passage of the Federal Aviation Noise and Capacity Act. In addition, the Port implemented nighttime run-up restrictions at Sea-Tac which helped to curtail that problem, and the power-back ban has answered citizens' demands, even if, as the Port admits, the latter did not appreciably reduce overall aircraft noise levels. We also commend the Port for completing an extensive Part 150 Update in 1993 and for scheduling a major effort on the next Part 150 Update in the summer of 1996. On the noise mitigation side, the Port's residential insulation program is very large, and its current rate of residential insulation work is exceptional.

We have nevertheless concluded, on the basis of all the evidence before us, that the ultimate results of these efforts, in terms of real on-the-ground noise impacts for the communities affected by Airport noise, have not been sufficient to satisfy Resolution A-93-03. Many people at the Port, including its noise consultants, have labored long and hard to develop and implement abatement and mitigation programs; substantial resources have been dedicated to the effort; yet many people in the Region remain severely impacted by airport noise.

Was the Airport reasonable in deciding to do what it did? The Port is viewed by many people, including every member of this Panel, as a leader in the field of airport noise control. The steps it has taken to date are perhaps more than "reasonable" in the sense that many other airports are doing less, and few have undertaken the type of coordinated effort the Port did in the Noise Mediation Agreement. However, the bottom line under the Resolution is results.

Is the amount of noise reduction implied by Resolution A-93-03 reasonable? Our colleague suggests that the noise reduction required by Resolution A-93-03, as we have interpreted it, is so large that it would be impossible to achieve. We disagree. For Sea-Tac, given the nature of the noise-sensitive development around the airport, a 10 dB in outdoor DNL, for example, would probably be an unreasonable reduction. This is not to argue whether 10 dB would be a desired goal, because in many instances, it is. Many highway agencies use 10 dB as a goal for their traffic noise abatement projects. Dr. Suter, serving as an expert for the RCAA, stated that 12 dB would be desirable, if one really wanted to make a difference. A.S. Harris reported a 13 dB reduction in aircraft DNL in South Boston after the implementation of the departure rerouting plan at Logan Airport, with a 76 percent reduction in people over a DNL of 65 dB (Harris, *INTER-NOISE '80*

Proceedings, p. 815). For Sea-Tac and for many airports, however, a goal of 10 dB DNL woul probably be unachievable or infeasible without major structural changes in operations, flight track or land uses, and hence would be interpreted in this sense as unreasonable.

But would, for example, a 5 dB DNL reduction be reasonable? Without endorsing 5 d DNL as a benchmark, *per se*, our answer is: yes, it might very well be achievable, and thu "reasonable." Accomplishing a 5 dB reduction in DNL might be possible only with great difficult given the growth of operations, the nature of the Four Post Plan, and the Port's current program But that does not mean that the Port could not or cannot achieve real impact reduction through variety of measures.

For example, insulation can be highly effective. A 10 dB reduction in *indoor* DNL appear both reasonable and achievable around Sea-Tac Airport. Of the houses the Port has insulated, 7 percent received an average reduction of about 8 dB since 1993 (7 dB inside and 0.9 dB outside and 10 dB over the longer period from 1989/1990 (7 dB inside and 3.4 dB outside). Was that a reasonable noise reduction goal? Yes; and the magnitude of the change was precisely the reason why the Port was able to show, for residents of those homes, a reduction on the order of 90 percen in time lost to speech interference as well as great reductions in the potential for sleep disruption Were those meaningful reductions in noise impacts? Yes. Were they enough, in the context of the number of homes insulated and the entire population adversely affected by airport noise both indoors and outdoors (and indoors with open windows), to tip the balance and persuade the majority of the Panel that the Port had met the test of Resolution A-93-03? They were not.

Would a reasonable observer say that this Airport has done enough? The Port argues that "[a] reasonable observer would conclude that the Resolution has been satisfied because thousands of people have received noise reduction benefits as measured by established scientific methods." We have addressed benefits and methodology elsewhere in this Decision. But who is a reasonable observer? A schoolteacher who loses 40 minutes a day waiting for planes to pass by? A business executive whose livelihood depends on airport growth? The mayor of a town under the flight path? A General Assembly member who believes the runway should be vigorously pursued? There is no definable, completely unbiased "reasonable observer" in this situation. Even the members of this Panel, as observers charged with making an independent, objective evaluation of the reductions of noise impacts, have come to differing conclusions.

Could the Airport reasonably have done more? Mr. Lewis suggests that, even if (as we have found) the Port failed to demonstrate the meaningful reduction in "real noise impacts" required by the Resolution, we should nevertheless find in favor of the Port on grounds that there was no evidence that the Port could have taken other measures that would have been expected to make a significant difference in overall noise impacts.

That is not the view we take. The Noise Mediation Agreement established a basic set of commitments; it did not preclude the Port from taking additional action. Airport noise has been an extremely contentious issue in this Region for more than 25 years, dating back at least to the construction of the second runway. As we observed earlier, the Port has long known that many people were dissatisfied with the Noise Mediation Agreement process, the FAA's introduction of the Four-Post Plan, the prospect of a third runway, and other Airport actions. Controversy, distrust, and pressure for additional action are not new. As the consultants representing the Port in this proceeding stated in their 1993 AIRTRAC *Final Report* (p. 3-35): "There is sometimes a difference

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of opinion about what constitutes a commitment. For example, Sea-Tac did not complete planned land acquisition and home and school insulation programs for areas impacted by the second runway built in 1970, and this has led to a perception by some in the community of broken promises. Apparently, the airport did not consider itself bound by this plan." In 1993, by contrast, the Port took the initiative not only to meet its obligations for residential insulation but to proceed with the insulation work at a rate far faster than the pace stipulated in the 1990 Noise Mediation Agreement. That was a wise decision, in our view, and one that clearly reflects the Port's understanding that, at least in this respect, the Noise Mediation Agreement is not a limiting document: there was more the Port could and should do.

We are uncomfortable with the notion of a ruling that would turn on a speculative interpretation of what more the Port could (or could not) have done, rather than on the merits of the case. The Port did what it did — an exceptional effort in many ways, but one that fell short of generating meaningful, real reductions in on-the-ground noise impacts for the people of the communities subjected to aircraft noise. Our task is to render an informed and objective judgment on the efficacy of the Port's programs in reducing actual noise impacts, not to speculate on what else the Port might have, or could have, or should have done.

Because of the way the logic of this case has developed, however, we are now compelled to address that speculative question. Mr. Lewis believes that any additional efforts the Port might have made would not have amounted to enough to make any difference in meeting the test of Resolution A-93-03 as we interpret it. We believe that the Port could have done more, and that, had it done so, the additional improvement probably would have made a material difference in real, on-the-ground noise impacts, turned a marginal improvement into a meaningful one, and therefore affected the final outcome of this proceeding.

The issue of "what else" the Port could have done was addressed at some length in the course of the Panel's hearings. Our colleague suggests that the community groups have not met "their threshold burden" of showing how the Port could have taken additional action to produce "significantly more meaningful reductions in noise impacts." We believe that primary responsibility for proposing and developing significant noise abatement and mitigation programs rests with the Port, not with the community advocates. In this context, we note, however, that the ACC has suggested a number of additional actions, including the concept of a tradeoff linking a Federal Part 161 program that proposes some new noise abatement restrictions on aircraft operations (some capacity limits) with approval of a third runway (capacity enhancement), as a combination package to produce both improved noise relief and a net capacity gain.

The Port contends — and the entire Panel agrees — that the measures it has taken to date are the ones that were most likely to produce significant benefits, because they addressed airport noise at the source. Those measures were easier to implement than some other strategies – for example, flight track changes, which can also be highly effective in producing significant noise-impact reduction. Moreover, programs that produce smaller benefits to a large group of people or significant benefits to a smaller group of people can have a cumulative impact. Based on the discussions during the hearings, as well as the analysis in the Noise Mediation Committee Technical Report, it is clear that more could have been done before 1990, since 1990, and since 1993.

We list below several abatement and mitigation strategies that we believe had the potential to be meaningful, feasible and reasonable. We are not suggesting that the Port had to pursue every

conceivable strategy; we merely note that some additional -- and potentially very effective -- actio were possible.

With respect to noise abatement, for example, the Noise Mediation Agreement could ha set a faster Stage 2 phase-out schedule in its alternative process to the complex Noise Budg calculation; if the transition to Stage 3 had been completed in 1995, there would have been, by bo the Port's and our estimates, an additional 1.5 dB reduction in DNL (such a faster phase-out, if pa of the NMA, would have pre-dated the Aviation Noise and Capacity Act and the Part 161 process Implementation of minimum population exposure flight tracks could have had an important effec the Port noted in the February 1996 hearing that its consultant had developed "useful" flight trac changes for Four Post Plan noise abatement back in 1990 (as described in the 1991 Noise Mediatio Committee Technical Report), and Resolution A-93-03 has called for efforts to reduce the nois impacts of the Four-Post Plan since April 1993. The Port might also have considered adopting preferential runway plan during "low periods" of activity to reduce population exposure to Airpo noise.

In addition, the Noise Mediation Agreement contemplated the following abatement activitie which have not yet been achieved (which is, in part, why we found the Port to be in substantial bu incomplete compliance with the NMA): enforcement of the North Flow Elliott Bay/Puget Soun nighttime noise abatement departure procedures (which could have been scheduled, pursued, an achieved at any time after these procedures were first implemented); use of the North Flow Ellio Bay/Puget Sound departure procedures or South Flow Arrival Corridor procedures whenever feasibl (e.g., during daytime periods of lower activity); and, finally, implementation of controls on engine thrust reversals, to reduce noise in the immediate vicinity of the airport.

On the mitigation side, the single-family residential insulation program could have been accelerated earlier, as we have previously discussed, and the public buildings and multi-family residential insulation programs could have been pursued much more vigorously. In light of the Port's lack of progress on insulation projects after construction of the second runway, we believe it would have been in the Port's best interest to move as decisively as possible in carrying out its commitments under the 1990 Noise Mediation Agreement.

These lists are by no means comprehensive, but they do persuade the majority of the Panel that the Port could have taken at least *some* additional steps to increase the total amount of benefit (in terms of demonstrated, real reductions of noise impacts) in a manner that cumulatively could have shown us enough objective evidence of on-the-ground results to meet the intent of the Resolution. These strategies would have, in different ways, reduced DNL, reduced mean SEL, reduced the Time Above the various levels, decreased speech interference, reduced sleep disturbance, reduced annoyance, and reduced incompatible land uses in the various DNL contour zones.

Accordingly, we conclude that a straightforward interpretation of Resolution A-93-03 does not impose an unrealistic standard of noise reduction on the Port, as Mr. Lewis contends. We do not believe that the amount of noise abatement and mitigation necessary to produce an objectively meaningful or significant reduction in "real noise impacts" within the meaning of Resolution A-93-03 was infeasible, unreachable, or unreasonable.

VII. Conclusions on the Effectiveness of the Noise Abatement and Mitigation Programs

This Decision represents our best professional judgment, based on many years of experience, many days of public hearings, many months of review and analysis of thousands of pages of data, evidence, and argument, and countless hours of deliberation and debate among the members of the Panel. It was not an easy decision, and it is not a political decision. It is the independent evaluation required by Resolution A-93-03.

How much abatement of aircraft noise is necessary to generate "enough" reduction in on-the-ground noise impacts to satisfy Resolution A-93-03? The ACC, relying on the expert testimony of Dr. Fidell, suggested that a DNL reduction on the order of 4.5 dB -- presumably in conjunction with vigorous action on the mitigation front -- is the minimum needed to produce a meaningful change in noise impacts for the affected population and to support reliable findings of significant benefits in terms of reductions in speech interference, awakenings, and other noise disruption. "To be meaningful," the ACC said in its October 1995 submittal, "a reduction (measured in L_{dn}), must be at least 4.5 dB." Without necessarily endorsing 4.5 dB DNL as a benchmark for determining a meaningful reduction in airport noise, a majority of the Panel has found, after reviewing a very large array of specific evidence at Sea-Tac Airport, that at this Airport, under these particular circumstances, a 3.4 dB DNL reduction over a six-year period has not been sufficient to produce a demonstrated and "meaningful" reduction in real, on-the-ground noise impacts.

We have also carefully reviewed the extensive documentation the Port and other parties provided on the size, nature, and effectiveness of the Port's noise mitigation projects under the Noise Remedy Program. We have found that the Port's mitigation work is effective in producing real indoor (closed-window) noise relief for the residents of insulated homes, but that the scope of the Port's scheduled insulation program remains incomplete with respect to schools, other sensitive-use public buildings, and multi-family dwellings. The Port's mitigation efforts, while substantial, have not yet reached, or been "scheduled" to reach in any concrete sense (i.e., with an explicit timetable and commitment of resources), a large enough portion of the affected population to allow us to conclude that, in combination with the abatement results, the resulting overall reduction in noise impacts has been "enough" to meet the test imposed by Resolution A-93-03.

Accordingly, a majority of the Panel finds:

1. That despite the Port's impressive, good-faith efforts to implement effective noise abatement and mitigation programs, the demonstrated results of the programs it has scheduled, pursued, and achieved since Resolution A-93-03 was adopted (1993-1995 and, alternatively, 1992-1995) do not constitute a "meaningful" reduction of real, on-the-ground noise impacts sufficient to satisfy the noise condition of Resolution A-93-03;

2. That the demonstrated results of the noise abatement and mitigation programs the Port has "scheduled, pursued, and achieved" since 1989/1990 do not provide evidence strong enough to establish, with any degree of confidence, that there has been a "meaningful" reduction of real, on-the-ground noise impacts sufficient to satisfy the noise condition of Resolution A-93-03; and

3. That the Port is not likely to achieve significantly more reduction in real, on-the-groun noise impacts in the near future with the abatement and mitigation measures it has schedule to date and is currently pursuing.

We reach these conclusions for a number of reasons, including:

(i) the absolute size of the changes in measured DNL (we cannot conclude that the Port ha met its affirmative burden under the Resolution on grounds as weak as a maximum DNL chang below the threshold of significance);

(ii) our analysis of the meaning of the small average decrease in Time Above 85 dB at th Port's monitoring sites (2-3 minutes per day), the increase in Time Above 85 dB at RMS 11 sinc 1993, and the current trends in Time Above 65 dB and 75 dB, in terms of real on-the-ground nois impacts;

(iii) our analysis of the corresponding size and direction of the changes in average SEL nighttime L_{eq}, DNL contours, number and percentage of people "highly annoyed," and othe measures discussed above;

(iv) the importance of the factors that are offsetting the improvements the Port has realized to date, such as the increase in the total number of nighttime operations and the unacceptably low rate of compliance with the nighttime noise abatement corridors;

(v) the limited degree of confidence we place in the reliability of the Port's analysis of noise abatement benefits in the absence of needed information on confidence intervals, documentation of INM assumptions and adjustments, and sensitivity analyses, as well as the estimation difficulties inherent in using the available analytic tools to extrapolate significant benefits from very small changes in DNL; and

(vi) the incomplete range of noise mitigation programs the Port has "scheduled, pursued, and achieved" to date, particularly with respect to the sensitive-use public buildings included in the 1990 Noise Mediation Agreement.

On the preponderance of the evidence, we cannot conclude that there has been, as of December 1995, a meaningful or appreciable reduction in the real, on-the-ground noise impacts experienced by a large portion of the population affected by Sea-Tac airport noise, since 1993, since 1992, or since 1989/1990.

There is little doubt that, absent important new initiatives, the Port's current noise abatement efforts will have little additional effect. The steady growth in aircraft operations expected by the Port — which provides the essential justification for constructing the new runway — is already slowing the small DNL improvements the Port has achieved in recent years, and is likely to undermine any additional noise reduction the Port may achieve in the future. In this context, the Port's noise mitigation efforts will become increasingly important; insulation is one area where the Port can readily take additional action. But even a substantially expanded mitigation program can ultimately provide only partial, indoor relief.

Although the Port's ability to substantiate the validity of its estimates of real, on-the-ground noise impacts was weakened by its failure to supply documentation on the statistical reliability of (i) its data, and (ii) its modeling and estimation processes, the Port has nevertheless provided an enormous amount of useful information and analysis. The Port has complied with the Panel's request to provide time-series data on many different aspects of aircraft noise at Sea-Tac, from the basic DNL trends to the distribution of SEL peaks, the minutes per day above 65, 75, and 85 dB, and many other measures. This multifaceted approach to the evaluation of airport noise -- a combination of many different ways of looking at aircraft noise levels and the associated noise impacts on the community -- has been valuable for a number of reasons. It provides a better picture of what is actually happening with Sea-Tac Airport noise levels than DNL alone can convey; it permits the Panel, the PSRC General Assembly, the Port, and the community to assess the actual noise exposure changes and on-the-ground noise impacts more fully; it supplies much-needed detail on critical aspects of those noise impacts (such as the actual amount of time that classrooms are subject to noise levels above the threshold for speech interference); and last but not least, if the results show an internally consistent pattern across a variety of different types of measures (as they, in fact, do in this case), it provides all parties with a considerable degree of added confidence in the robustness of conclusions about the reductions in noise impacts -- the on-the-ground changes in public exposure to Airport noise -- which the Port's current noise abatement and mitigation programs have produced and are likely to produce.

RECOMMENDATIONS
(BY THE MAJORITY)

In the course of this proceeding, the Panel has had the benefit of the creative, analytical thinking of many different parties regarding additional noise abatement and mitigation measures that may, alone or taken together, reduce the future noise impacts associated with Sea-Tac Airport. The Port has invited the Panel to offer our recommendations as to what the next steps should be regarding noise abatement and mitigation. The majority of the Panel accepts that invitation.

On the one hand, we do not think that many easy actions remain; the major programs on Stage 2 phase-out and nighttime Stage 2 restrictions are already in place. On the other hand, there are some additional actions that can be implemented relatively quickly and, in some cases, at relatively low cost.

As Mr. Lewis has noted, noise abatement and noise mitigation are not simple. Externalities abound that make an airport proprietor's job difficult. The Port generally gets all the blame (and the credit) for changes in the aircraft noise environment in the Region. The reality is that actions by the FAA, the airlines, local organizations, and State and local political entities all affect the situation. However, while many actions are not within the Port's legal authority, they are not necessarily beyond its range of influence. (Indeed, the Port has been portrayed by many of the people from whom we have heard, and by a number of the submittals that we have read, as a major force in the Region.) That influence should be brought to bear, wherever possible, to reduce on-the-ground noise impacts.

In the spirit of Resolution A-93-03, we offer the following specific recommendations:

1. That the PSRC and the "Coordinating Committee" established by MOU pursuant t Resolution A-93-03 (the PSRC, the Port, WSDOT, and the FAA) promptly take steps t mediate and resolve the impasse between the Highline School District and the Port on th issue of noise insulation for schools, to enable the Port to move forward rapidly on it commitment to insulate the schools and significantly reduce classroom speech interference

2. That the Port implement its stated plan to upgrade its noise monitoring system, with n fewer than 25 permanent monitoring stations located throughout the affected communities and that the results be publicly disseminated, at regular intervals, in the form of aircraf DNL, SEL, and Time Above metrics.

3. That the Port and the organizations representing the affected communities jointly sponso social surveys at regular intervals to assess the effectiveness of future noise abatement anc mitigation measures in terms of perceived noise impacts. We concur with the view expressec by the Port's noise consultants in the 1993 AIRTRAC *Final Report* (p. 3-33): "The way tc avoid incorrect predictions of community response to a ... [noise reduction] action is to ask the community directly how it feels about a particular airport action and the proposed mitigation program connected to it."

4. That the Port address the impact of ground-related aircraft noise by (i) implementing the thrust-reversal noise impact reduction activities called for in the Noise Mediation Agreement; and (ii) working to minimize the number, level, and duration of daytime engine run-ups, which are likely to increase as operations grow. (We note that the increases in TA 65, 75, and 85 dB at RMS site 11 in recent years may be a consequence of ground-related noise.)

5. That the Port take the following actions to improve the on-the-ground reduction of nighttime noise impacts:

   a. Negotiate and obtain a public commitment from the FAA for full cooperation in rigorously and aggressively enforcing compliance with the current North Flow Nighttime Departure Noise Abatement Procedures. The Port, at a minimum, should notify airlines of violations of these nighttime noise abatement procedures. Better, the Port should institute procedures to apply pressure, through enforcement penalties and/or the power of public opinion in the media, to reduce violations (for example, publishing fines and performance scorecards in the Region's newspapers).

   b. Work closely and aggressively with KCIA and Alaska Airlines to eliminate the carrier's two nighttime Stage 2 cargo flight arrivals and departures, which weaken the effectiveness of the Port's nighttime Stage 2 ban; and develop, in conjunction with KCIA and local government officials, a strategy to avoid additional Stage 2 nighttime flights to and from KCIA in the future.

   c. Work with the airlines to minimize the total number of flights in the middle of the night (e.g., 1:30 a.m. to 5:30 a.m.).

   d. Continue to minimize the number of variances issued for the Nighttime Limitations Program through aggressive persuasion with the airlines, including the use of the media.

   e. Work with foreign air carriers to ensure that Stage 3 aircraft continue to be used for nighttime international flights.

   f. Work with owners/operators of Stage 2 aircraft under 75,000 pounds (which are currently exempt from the Nighttime Limitations Program) to secure their cooperation in minimizing or eliminating the use of such aircraft during the nighttime period. (There were, on average, 13 exempt Stage 2 nighttime flights per month in the second and third quarter of 1995.)

   g. Continue to work with the airlines to minimize nighttime engine run-ups; we note that, although many of the events are exempt from the King County Code, the exempted nighttime events have levels higher than the code permits. Existence of an exemption does not mean elimination of the impacts on people.

6. That the PSRC, the FAA, and the communities affected by airport noise participate actively and constructively in the Port's upcoming Part 150 review, to propose, evaluate, and assist in implementing any feasible noise reduction measures that will maximize the net benefits for the region and provide meaningful noise mitigation for the impacted areas. The Port's Part 150 process should include, but not be limited to, the following actions:

   a. Evaluate the actions needed to apply, monitor and enforce the North Flow Daytime Departure Duwamish/Elliott Bay Noise Abatement Procedures specified in the Noise Mediation Agreement. Investigate, and, if possible, implement, use of this corridor during periods of periods of lighter activity during the day such as mid-morning and mid-afternoon.

   b. Evaluate the feasibility of extending the "nighttime" hours of use for the North Flow Nighttime Departure Noise Abatement Procedures (currently 10 p.m. to 6 a.m.) to the evening "shoulder" (8 to 10 p.m.), and, if possible, to the early morning "shoulder" (6 to 7 a.m.) as well.

   c. Reevaluate, with FAA and community input, the use of "minimum population exposure" flight tracks, in light of the increase in flight operations and the shift in the overall importance of arrival noise as Stage 2 aircraft are phased out. The Port had studied and identified "useful" flight track changes for Four Post Plan during the development of the Noise Mediation Agreement. Any of the following options would be expected to reduce overall population exposure to aircraft noise: (i) over-water southern corridors for all south departures where the east turn does not occur until the aircraft reach Commencement Bay or beyond; (ii) north-flow arrival procedures that route aircraft over the water (with a turn in the Four-Post arrival stream); or (iii) the use of a north-flow stream more often at night, coupled with tightly enforced, high-compliance nighttime departure routes. There are some difficult trade-offs in this process, but we do not accept the contention that all possible changes in flight tracks simply shift noise among communities, with no net reduction

in number of people impacted. Flight track changes offer the potential for abatement of aircraft noise impacts once the Port has exhausted the benefits of the Stage 2 phase-out; we note again that Resolution A-93-03 explicitly requested the FAA to consider modifications to the Four Post Plan to reduce noise impacts.

d. Evaluate, with FAA and community input, the potential net benefits of a noise abatement departure profile employing a steeper angle of climb, coupled with an expanded residential acquisition and insulation program if, as a result of a steeper departure profile, the 75 dB DNL contour expands in the immediate vicinity of the airport while areas farther out receive benefits.

e. Evaluate, with FAA and community input, the potential net benefits of preferential runway use during "low activity" periods (would more use of the east runway, for example, result in reduced overall population noise exposure?) -- coupled with an expanded residential insulation and acquisition program, as needed.

7. That, with respect to the Noise Remedy Program, the Port take the following actions:

a. Begin a rapid, full-scale program of school insulation as soon as the impasse with the Highline School District is resolved, with the maximum feasible commitment of resources and the earliest possible completion schedule.

b. Complete the "sensitive-use" public buildings insulation pilot studies and fund the full program envisioned in the Noise Mediation Agreement, as well as a program for insulation of multi-family dwellings, with an aggressive schedule to allow completion as soon as possible. The Port Commission is on record as committed to these programs.

c. Evaluate the possibility of an expanded residential acquisition program offering more of the most severely impacted people the buy-out option, even if no additional Federal money is made available for this purpose. While relocation is not desired by all (nor easy for anyone), the environs of a major airport are plainly not the best location for residential neighborhoods.

d. Work with the PSRC and the affected communities to design and implement alternative, noise-compatible uses of the land within the current acquisition zone. We note that the acquisition program has some very strong critics because of its adverse effects on the quality of neighborhoods for the remaining houses and businesses.

e. Further accelerate, if possible, the rate of insulation for homes now included in the residential noise insulation program, and consider expanding the area eligible for noise insulation if the Airport's 65 dB DNL contour remains at or near the 1993 contour boundaries.

f. Investigate possible modifications to the insulation program to mitigate the impacts of low frequency noise and vibration (a concern the public raised repeatedly during the Panel's hearings).

8. That the PSRC and the Coordinating Committee take the lead in addressing the difficult, controversial task of reducing present and future noise impacts, with the following actions:

a. Recognizing the degree to which parties and factors outside the direct authority of the Port are undercutting the effectiveness of the Port's current efforts to reduce noise impacts, initiate and coordinate remedial action. Such coordination may include facilitating the use of mediation, marshalling State and local public resources where needed, providing public information via the media, or otherwise addressing the roadblocks that now prevent the residents of the Region from realizing the full benefits of the Port's existing abatement and mitigation programs. The PSRC and the Coordinating Committee are the principal entities in a position to take effective action to resolve the local problems caused by the "balkanization" of responsibility among the Port, the FAA, KCIA, the Highline School District, and other parties.

b. Create guidelines or other equitable procedures for dealing fairly with the conflicting views and needs of different communities when a proposed noise reduction strategy results in a net improvement but causes a transfer of noise impacts.

c. Take effective action on land use issues to minimize the introduction of incompatible land uses and to facilitate compatible redevelopment of currently incompatible land uses, including implementation of the recommendations on land use issues in the 1993 AIRTRAC *Final Report*.

d. Investigate creative ways of linking noise reduction objectives with airport demand and system management strategies, including intermodal solutions to local and regional transportation needs.

DISSENT
(BY MR. LEWIS)

I would find that the Port has met its obligation to show under PSRC Resolution A-93-03 that "noise reduction performance objectives" have been "scheduled, pursued and achieved ... based on measurement of real noise impacts." As a result, I cannot join my colleagues in concluding that the Port has failed to satisfy the noise reduction condition of the Resolution and must dissent from their Decision. I am convinced that my colleagues have imposed upon the Port a burden that was never contemplated by the General Assembly.

The Port showed us that it has scheduled, pursued and achieved the objectives of the two major noise abatement programs contemplated by the Noise Mediation Agreement -- the Noise Budget and the Nighttime Limitations Program -- by significantly reducing the use of the loudest, Stage 2 aircraft at Sea-Tac, and virtually eliminating them at night. The resulting impact on the level of real noise measured on-the-ground has been captured by an extensive array of noise

measurements compiled by the Port that shows a consistent pattern and continuous reduction in DNL since these programs began, associated with the reduction in the loudest aircraft events (which, as the majority concedes, does make a difference in on-the-ground noise impacts). The Port also showed that its residential noise mitigation program has insulated several thousand homes, producing noticeable and meaningful reductions in measured interior noise levels. After carefully considering all of the evidence, it is my judgment that these achievements, confirmed by the measurement of real on-the-ground noise, should be sufficient to satisfy the noise reduction condition of the Resolution.

The majority of the Panel, unfortunately, does not agree. Their determination that the Port has not shown a sufficiently "meaningful" reduction of noise impacts to satisfy the noise condition of the Resolution ultimately depends, as I understand it, upon two essential points: (i) that as to its noise abatement programs, the Port has not established through the use of "established scientific methods" that the reductions in measured noise *levels* it has shown signal a "meaningful" reduction in noise *impacts*; and (ii) that as to its noise mitigation programs, the Port has missed an "opportunity" to provide insulation benefits to thousands of additional residents of the affected community.

I do not believe that the General Assembly required a reduction in measurable on-the-ground noise that would cross an undefined technical threshold of "meaningfulness" so high that doubts about the significance of the resulting reductions in noise impact would be resolved to the satisfaction of the scientific community. The majority places too much emphasis on measurements of noise impacts that could not be made by the Port and were not expected by the General Assembly, and on the failures, rather than the successes, of the Port's insulation program.

It seems unlikely to me that the PSRC would decide not to authorize the third runway simply because: (i) the Port cannot prove through the use of established scientific methods that a measured reduction in DNL of 3.4 dB since the Noise Mediation Agreement was implemented, with continuing reductions since 1993 when the Resolution was enacted, reflects a "meaningful" reduction in noise impacts; (ii) the Port was unable to eliminate the unavoidable uncertainty associated with the extrapolation of noise impacts from incremental changes in measured noise and did not document the assumptions and adjustments it made when using the Integrated Noise Model; (iii) the number of aircraft operations has increased, as the General Assembly assumed it would when it determined that a new runway should "vigorously" be pursued; (iv) significant reductions in the loudest noise events associated with the greatest interference with speech and disturbance with sleep have, in recent years, been offset to some extent by increases at lower sound levels that inevitably accompanied the recent, expected growth in the number of aircraft operations; and (v) the Port's noise mitigation programs have not yet reached their full potential. Yet this appears to me to be why the majority has ruled against the Port. In my judgment, based upon all the evidence, there has been a sufficient reduction in real, on-the-ground noise impacts to satisfy the requirements of the Resolution.

In recognition of increasing capacity problems at the Airport, the General Assembly declared in the Resolution that "the region should pursue vigorously ... a third runway at Sea-Tac" and determined that, under present circumstances, the third runway shall be authorized by April 1, 1996 "[w]hen noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation, and based on measurement of real noise impacts."

The Resolution was adopted by the PSRC three years after the Port implemented the Noise Mediation Agreement. The Agreement was, as the majority observes, an "important milestone" in the reduction of adverse environmental impacts from airport operations. It scheduled three bold initiatives: the Noise Budget, the Nighttime Limitations Program and the Noise Remedy Program. Unfortunately, the precipitous conclusion of the noise mediation, the disturbing introduction of the Four Post Plan, and lingering doubts about the motives of the Port left many in the community unconvinced that the Port would meet its commitments, that these programs would make any difference, and that the Port's sophisticated computer models had anything to do with the real "on-the-ground" noise they perceived. The General Assembly therefore called for an "independent evaluation" of whether the Port had scheduled, pursued and achieved "noise reduction performance objectives ... based on measurement of real noise impacts." The enactment of Resolution A-93-03 manifested the General Assembly's apparent desire for independent, objective answers to several basic questions:

- Did these programs establish significant noise reduction objectives?
- Has the Port done what it said it would do to reduce on-the-ground noise?
- Do actual measurements of on-the-ground noise confirm that the noise reduction objectives of the Port's programs are being achieved?

I believe the correct answer to all of these questions is "yes."

The Port's Noise Budget and Nighttime Limitations Program established ambitious noise and access restrictions under the Noise Mediation Agreement that were, as the majority acknowledges, most likely to produce significant benefits because they addressed airport noise at the *source*: the use of loud Stage 2 aircraft, especially at night. These restrictions were far more stringent than the national rules established by Congress when it later enacted the Airport Noise and Capacity Act of 1990, requiring a phase-out of Stage 2 aircraft. In fact, if the Noise Mediation Agreement had not been negotiated before November 1990, and therefore exempted from the Act, the Port would have been unable to reduce or limit Stage 2 aircraft operations as it has under its noise abatement programs.

All of the members of the Panel have found that the Port is in substantial (if incomplete) compliance with the Noise Mediation Agreement, and that the scheduled noise reduction objectives of the Noise Budget and Nighttime Limitations Program have been pursued and have achieved a reduction in measured "on-the-ground" noise captured by DNL at the Port's permanent monitoring sites both since the Agreement was made in 1990 and since the Resolution was enacted in 1993.

In our January 9, 1995 Noise Order, however, the Panel determined that the Resolution required the Port to show more than just compliance with the Noise Mediation Agreement and a resulting measurable reduction in noise *levels*; the Port, we felt, had to show a "meaningful" or "significant" reduction in noise *impacts* on the community. In retrospect, it seems to me that the Panel may have been mistaken. The subsequent hearings, our protracted deliberations and the split on this Final Decision all reflect the difficulty of determining *how* the "meaningfulness" of noise reductions should be assessed for the purposes of the Resolution.

When we issued our Order in January 1995, the Panel reasoned that the General Assembly did not need to obtain an "independent evaluation" by a panel of outside experts if the only question was whether *any* reduction in noise impacts evidenced by actual on-the-ground sound measurements had been "scheduled, pursued and achieved" by the Port, and so we held that the reduction in noise impacts had to be "meaningful." At the same time, however, we explained that the Resolution did not impose upon the Port a standard of performance that it could not possibly meet. The General Assembly, after all, had voted to pursue construction of the third runway "vigorously" if the stated conditions were satisfied, and it would have made little sense to impose an "unreachable" or "infeasible" condition in those circumstances. I thought that our consideration of the Noise Issues required the Panel to assess the significance of the reductions in noise impacts scheduled, pursued and achieved by the Port given what it was reasonable to expect (from the General Assembly's perspective) that the Port could do to reduce the impact of airport-generated noise on the surrounding community by the time the third runway was to be authorized by the PSRC.

The "meaningfulness" and "reasonableness" standards we imported to the Resolution do not provide a definitive benchmark or prescribe the use of established scientific methods to assess the adequacy of the reductions in noise impacts achieved by the Port. We acknowledged in our December 1995 Preliminary Order on Phase II Noise Issues, in fact, that the Resolution called upon the Panel to use our "best professional judgment ... to determine whether, taken as a whole, the pattern of change in noise impacts is sufficient ... to meet the requirements of the Resolution." In my view, the Panel's assessment should reflect both "the best insights we can gain from established scientific sources about the significance of changes in various noise metrics as indicators of changes in the impact of noise on the people in the communities surrounding the Airport," and our knowledge and experience in dealing with the institutional, operational, and regulatory constraints that limit an airport owner's ability to reduce the noise impacts of a busy, growing jet airport. Based upon these considerations, I am confident that the pattern of change in measured real on-the-ground noise levels shown by the Port is sufficient show a reduction in noise impacts that satisfies the requirements of the Resolution.

Noise Abatement. The Port showed that its noise abatement programs have produced reductions in on-the-ground noise measured by a variety of different metrics that are related to adverse impacts for many people throughout the region.

The Port stressed the reduction in aircraft DNL over the years because the relationship between DNL and human "annoyance" is well accepted in the airport industry and the scientific world as the best aggregate indicator of adverse noise impacts. As the majority puts it, "[a]ircraft and total DNL metrics are the principal tools used to summarize the overall changes in environmental sound levels associated with airport operations." Measured aircraft DNL around the Airport has fallen by 2.8 dB since 1986, 3.4 dB since 1989/1990, 2.3 dB since 1992 and 0.9 dB since 1993. These reductions can be expected to be related to significant reductions in the numbers of people "highly annoyed" by aircraft noise, on an aggregate basis, even if the difference in sound levels, occurring over time, might not be distinguished by an individual observer.

The Port supplemented its analysis of DNL with a review of on-the-ground measurements using the TA and SEL metrics that confirm that there has been, as expected, a significant reduction in the highest-noise-level aircraft events. While the relationship between these metrics and adverse noise "impacts" is less well understood, the Port has shown that reductions in the loudest events, which are segregated by these metrics, can be expected to be related to reductions in both "high level" speech interference and, possibly, sleep disturbance.

The majority of the Panel has nevertheless concluded that the Port's noise abatement efforts have not produced a sufficient reduction in real, on-the-ground noise impacts to satisfy the requirements of the Resolution. While I greatly respect their thorough review and technical analysis, I do not believe that the General Assembly intended us to apply a standard so exacting as they have used and, therefore, I cannot accept their ultimate assessment of the significance of the noise reductions the Port has shown.

The reliability of the Port's technique of imputing estimates of the population exposed to different sound environments over time, and the methods it used to convert incremental changes in noise exposure into estimates of reduced annoyance, speech interference and sleep disturbance, are subject to serious reservations. But when it called in the Resolution for "measurement of real noise impacts," the General Assembly did not require, and could not reasonably have expected, rigorous scientific proof that incremental, measured improvements in on-the-ground noise levels can be related to particular reductions in noise "impacts" that could be said by some objective measure to be "meaningful."

Based upon the evidence offered to us, I would find that the "established scientific methods" for assessing the impact of aircraft noise are not designed to provide precise estimates of the significance of incremental changes in noise exposure over time and do not establish a definitive DNL threshold for measuring meaningful aircraft noise reductions.

The majority of the Panel has nevertheless found that the 3.4 dB reduction in aircraft DNL shown by the Port is "below the threshold of 'meaningfulness' in terms of producing a real, appreciable reduction in airport noise impacts for an affected population," especially when that DNL change occurs over a period of six years and is coupled with an increase in operations. The majority concluded, therefore, that the Port's noise abatement efforts have not produced a sufficient reduction in real, on-the-ground noise impacts to satisfy the noise condition of Resolution A-93-03.

This approach imposes an "unrealistic standard of noise reduction" on the Port. When the Resolution was enacted, it was to be expected by the General Assembly that (i) any reductions in noise levels would occur incrementally over a period of many years; (ii) that at the same time, aircraft operations would increase; and (iii) that, as the majority recognizes, analytic tools like the FICON Curve "cannot provide robust estimates of the population impacts of the small reductions in DNL" that could be expected to be realized by the Port's noise abatement programs. Under these circumstances, it is unreasonable to impute to the General Assembly an expectation that the Port should show a reduction in noise levels, measured by DNL or otherwise, so significant that it would resolve scientific doubts about its meaningfulness, before the third runway would be authorized. Accordingly, I cannot accept my colleagues' conclusion that the Port's noise abatement programs have not achieved a meaningful reduction in noise impacts.

Noise Mitigation. I must also distance myself from their assessment of the Port's insulation program. As they acknowledge, the Port has done an "impressive job" on its residential noise mitigation programs since the Resolution was enacted and has provided appreciable benefits to thousands of residents of the Region. The Port has already insulated 3,647 homes and is continuing

its accelerated program of insulating about 110 homes each month. There is no dispute that this program provides noticeable and meaningful indoor noise reductions.

While the majority applauds the success of the Port's noise mitigation program, it focuses on the Port's failure to accelerate the pace of the residential insulation program *before* the Resolution was enacted and to implement a comprehensive program for the insulation of public buildings. I share their concern, especially about the public schools, but for me the determinative facts are (i) that thousands of residents have benefitted from residential insulation; (ii) that since 1993, when the Resolution was enacted, the pace of the Port's residential insulation program has accelerated to an "exceptional" rate, as the majority puts it, that is almost four times faster than the rate contemplated under the Noise Mediation Agreement; (iii) that in recent years the number of sensitive-use public facilities (schools, hospitals, churches, and libraries) within the loudest noise contours has been markedly reduced; and (iv) that the Port's failure to insulate the many primary and secondary schools in the Highline School District cannot properly be charged to the Port's account in this proceeding, because the Port has agreed for some time to fund the insulation of these schools and its offer has been refused.

The Port's noise mitigation program has provided significant benefits to thousands of residents of the neighborhoods most adversely affected by airport noise and has contributed to, not detracted from, the achievement of a meaningful reduction in noise impacts.

Reasonableness. The significance of the noise reductions scheduled, pursued and achieved by the Port has properly been the focus of the Panel's hearings, its deliberations and this Final Decision. But as the Panel previously interpreted it, the Resolution has both a "meaningfulness" requirement and a "reasonableness" constraint. I believe that the General Assembly did not intend to give up its plan "vigorously" to pursue the runway, even if the Port's noise reduction was not sufficiently "meaningful" to satisfy a majority of this Panel, unless there was clear and convincing evidence that the Port could reasonably have been expected to have been able to schedule, pursue and achieve a *significantly* more meaningful reduction in noise impacts than it has shown.

The community advocates (and at various times, each of the members of the Panel) have raised questions about noise abatement and mitigation measures that have *not* been scheduled, pursued or achieved. But the opponents of the runway have not met their threshold burden to show that in spite of whatever legal, operational and practical constraints it faced, the Port could have undertaken additional noise abatement or mitigation programs that could reasonably have been expected to produce a material change in noise impacts during the pertinent time frame (that is, they would have made an otherwise insignificant reduction meaningful), given the approach to assessing "meaningfulness" adopted by the majority.

While a rigorous analysis of the impact of potential alternative noise measures would have been desirable, the evidence presented to the Panel does not show that the Port squandered opportunities to "schedule, pursue or achieve" *significantly* more meaningful reductions in noise impacts after the Resolution was enacted in 1993 and, in the words of the majority, "served notice to the Port that it would ... have to show that its noise programs were, in fact, producing results in the form of meaningful, measurable, on-the-ground reductions in noise impacts."

I take little comfort from the majority's speculation that the 5 dB reduction in DNL they imply would be necessary to satisfy the Resolution "might very well be achievable." The Port has

scheduled, pursued and achieved the objectives of the noise abatement programs that have been most likely to produce a meaningful reduction in noise impacts. While the Port can, and should, continue to find creative ways to reduce the burden of aircraft noise on its neighbors, there was no evidence before the Panel that the Port could have caused a significantly greater reduction in DNL without imposing artificial capacity constraints at the Airport that would be inconsistent with Federal policy and with the core objective of the PSRC Resolution: the *expansion* of regional airport capacity.

Conclusion. I doubt that the General Assembly contemplated that its decision to authorize the third runway under the Resolution would depend upon the success of the Port's unprecedented efforts to use established scientific methods to convince a panel of experts exactly how the impacts of measured reductions in on-the-ground noise can be expected to benefit the community. Ultimately, the Panel had to resolve what both Dr. von Gierke (an expert for the Port) and Dr. Fidell (for the ACC) recognize is a social, economic, or political question, not a search for an elusive, "scientifically accurate" judgment, about whether the noise reductions shown by the Port were sufficiently "meaningful" to satisfy the Resolution. I am convinced that given the achievement of the objectives of the Port's noise abatement programs; the reductions in measured on-the-ground noise shown by the Port that resulted from the accelerated reduction in Stage 2 operations, especially at night; and the insulation of thousands of homes, the Port has met its burden.

The Panel's focus has been on what the Port has done in the *past* to meet its obligation to reduce the impacts of aircraft noise on the community. While members of the Panel ultimately reached different conclusions about the Port's success, we all recognize that in the *future*, the need to find new ways effectively to reduce aircraft noise impacts will intensify as the number of aircraft operations at Sea-Tac continues to grow, with or without the new runway.

The Port was able, in my judgment, to achieve a significant reduction in noise impacts in the past by reducing noise levels at their source: the aircraft that use the airport. In the future, that approach is unlikely to be effective. The Port has little, if any, ability to control the noisiness of aircraft, the number of operations, or the flight tracks they use. The Port and the community must seek creative approaches to noise reduction that take new forms, even if they are more controversial than reductions in aircraft noise that come at the expense of commercial airlines.

The members of the "Coordinating Committee" -- the PSRC itself, the Port, the FAA and the WSDOT -- have, it seems to me, both an obligation and an opportunity to work together to achieve future reductions in noise impacts that have not been realized in the past. I am confident that I speak for the entire Panel in urging the Coordinating Committee to overcome the institutional barriers between the Port and local government that have prevented the Port from mitigating *learning* interference by insulating public schools in the Highline School District; between the Port and County government that have allowed Alaska Airlines to avoid the Nighttime Limitations Program and insult the community by moving flights to Boeing Field; and between the Port and the FAA, which has been unduly resistant to changes in flight procedures that could reduce noise impacts. The Coordinating Committee can, and should, play an important role in minimizing the adverse environmental impacts of any necessary expansions of the Region's airfield capacity.

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CLOSING REMARKS
(BY THE PANEL)

We have not been asked to consider, and we have expressed no views about, whether the proposed third runway should be built, about the value of the capacity enhancement it would bring or about its environmental impact. We have not considered, and do not offer any opinion about, whether the adverse environmental impacts associated with a major runway expansion project can be fully mitigated.

Our findings and conclusions are based upon a unique set of facts, at the existing Airport, that were presented to us under an unusual local resolution. While we hope that the PSRC, the Port, the FAA, and the affected communities will benefit from our work, our analyses here do not necessarily provide a precedent for the resolution of noise issues at other airports. Whether resort to an expert "arbitration" panel is, in general, a productive approach to help resolve these issues remains to be seen.

The process has generated an exceptionally detailed and thorough public record of data and analysis with respect to past and present noise levels, noise impacts, and the effectiveness of noise reduction measures at a major airport. We commend and thank all of the participants for their considerable contributions to this proceeding; the extent and analytical depth of the evidence presented to this Panel reflected an extraordinary commitment of effort and resources by many different parties. We also wish to acknowledge the outstanding logistical support work provided by the staff of the PSRC, particularly Mr. Jerry Dinndorf and Ms. Clare Impett, throughout this proceeding.

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There is nothing simple or easy about the Port's effort to improve Airport capacity while reducing public exposure to Airport noise, or about the public's effort to maintain livable communities and improve the quality of life for which this Region is rightfully known. Airport noise is a tough problem. We deeply appreciate the trust that the PSRC General Assembly and the parties to this proceeding have placed in our ability to reach a careful and impartial judgment, and we have each given our best effort to the task of making that judgment. We are grateful to have had the opportunity to serve the Puget Sound Region.

For the Majority:

William Bowlby m2c
William Bowlby

Martha J Langelan
Martha J. Langelan

For the Dissent:

Scott P. Lewis m2c
Scott P. Lewis, Chair

March 31, 1997

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Mr. Dennis Ossenkop
Northwest Region FAA
1601 Lind Avenue Southwest
Renton, WA 98055-4056

Subject: Comments regarding the Sea-Tac Airport draft Supplemental Environmental Impact Statement (SEIS) and the draft Air Quality Conformity Determination

General Comments/Questions

Please justify how FAA/DOT can accept a CWA and CAA certification of this project that is: 1) Conditional; 2) Deferred to an alternate state agency which does not have the federal authority to issue the certificate and; 3) Was submitted to the wrong official?

Please explain why the Port did not use the FAA TAF numbers, but chose a lower number instead? Please also justify why higher more "worst cast" numbers were not thoroughly evaluated, especially considering that the runway plus technology can push the numbers up to over 600,000 to 800,000 annual aircraft operations? Please explain why elsewhere in the country, a doubling of operations is predicted to occur by 2008 and trippling by 2018 but is not considered in the Sea-Tac estimates, documentation and evaluation?

The process for the review and public comment on the SEIS has not been conducive to a thorough understanding and knowledge of the document or public participation. The only public hearing was at an inconvenient location and time. The SEIS was not available in a timely manner at the local libraries and were not allowed to be used outside the library due to the lack of reference copies. FAA should now offer a public comment period and review and response for the release the FSEIS and place at least three copies in all of the libraries.

I do not agree that this project is in compliance with the Clean Air and Water Act and as such, it would be impossible for FAA to fund, approve or support the construction of a third Sea-Tac Runway. There are probably hundreds of unresolved and underestimated environmental impacts which can and will render this project a local disaster. Please consider other viable reasonable alternatives to the proposed action according to the provisions of NEPA and resubmit another EIS which discusses these alternatives.

Sincerely,

Mr. David J. Wagner
16247 8th Avenue SW
Burien, WA 98166

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March 28, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
Airport Division
1601 Lind Avenue SW
Renton, Washington 98055-4056

Comments regarding the Draft Supplemental Environmental Impact Statement for Expansion of Seattle-Tacoma International Airport

1. A filled area of 26.4 million cubic yards of dirt changes the terrain and drainage pattern of Miller and Des Moines Creeks and other small tributary streams on the west side of the airport. The third runway will add many acres of impervious surfaces to these water sheds. This mountain of dirt can't be considered natural for the drainage ways.

2. In 1970 residents in the Miller Creek basin (Kludt et. ux. et al. # 762259) filed litigation against King County, Washington State Highway and the Port of Seattle. These municipalities were attempting to increase the rate of flow of runoff into Miller Creek. This would have changed its natural character by channeling Miller Creek into a drainage ditch. Settlement agreements were made in conjunction with this litigation placing restrictions on future activities affecting Miller Creek. This settlement required that future facilities "prevent surface water from being collected and discharged into Miller Creek in excess of its' natural capacity." It also contained agreements that future facilities "maintain or improve the present character of Miller Creek" and provided that defendants " will not in the future attempt channelization of Miller Creek except in limited amounts in connection with retention facilities." The Port of Seattle was required to install Lake Reba for a retention facility to limit storm water outflow. There is no sunset on this agreement. A detailed explanation of the proposed Miller Creek Relocation Plan should be required to show how it complies with the intent and requirements of the settlement.

3. I do not agree that a wetland replacement in Auburn should qualify for the loss of wetland acres in the Miller Creek basin. There are places in the Burien area that could be helped immensely by projects in the Miller Creek watershed. These projects would help with drainage problems and visually improve the area.

4. It is unconscionable that governmental agencies such as the Port of Seattle have become exempt from all rules and regulations set forth by State and Federal Departments. Any other private developer or governmental agency must comply with these regulations. The ramifications of this development are not only local, but will multiply exponentially over a greater and greater area as the expansion theory continues. The governmental agencies should be setting an example of how to work with existing regulations, not how to ignore and delete them. It is no wonder that many people are disenchanted with government. In the book "A History of the Port of Seattle" by Burke,it states, "Uncontrolled competition among Ports has additionally lead to a tunneling of vision among some port administrators and a rather callused emphasis on development, regardless of the resulting environmental damage."

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5. Sea-Tac is not the only airport having expansion problems. Many cities across the nation are having similar difficulties. The more you expand, the area of damage becomes bigger and bigger, since existing urbanization continues in a large radius around the airports. I think it is time for the Port of Seattle and Downtown Seattle Chamber to "put a feather in their caps" and be one of the first to put a limit on the number of flight operations. They should lead the way to a more reasonable and cost effective approach to the operation of urban airports.

Helen D. Kludt

Helen D. Kludt
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Seattle, WA 98166

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REC'D ANM-610 PLAN, PGM, & CAP BR
MAR 31 1997
ANM-610

REC'D ANM-610 PLAN, PGM,
MAR 31 1997
ANM-610

COMMENT SHEET

Public Hearing
March 4, 1997

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

1/3

YOUR SEIS AND THE ORIGINAL ARE A JOKE! HOW CAN YOU SAY THAT THERE WILL BE LITTLE OR NO EFFECT? ALREADY THE NOISE IS UNBEARABLE & I AM NOT EVEN IN THE DIRECT FLIGHT PATH. DON'T THE REST OF US ~~DESERVE~~ DESERVE NOISE INSULATION & MORE FLIGHTS HAS TO MEAN MORE NOISE ESPECIALLY SINCE YOU DON'T CONSIDER THE HIGHER NUMBER OF FLIGHTS IN YOUR SEIS. YOU ALSO NEED TO CONSIDER GROUND NOISE RUN UPS. MORE FLIGHTS MEANS MORE TAKE OFFS AND AGAIN MORE NOISE

(*Please Print*)Name: SUSAN OVERHOLT
Address: 12611- 4th SW
City: SEATTLE WA Zip Code: 98146

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4058 or *leave in the box* as you leave the meeting.

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PAGE 2 2/3

I AM ALSO WORRIED ABOUT OUR WETLANDS & OUR WATER SUPPLY MOVING THE WETLANDS CREATES LASTING DAMAGE TO OUR LOCAL ECOSYSTEM WATER WON'T BE FILTERED NOR SLOW DOWN. THE CREEKS DOWN STREAM CAN POTENTIALLY FLOOD MORE CAUSING MUCH ECONOMIC DAMAGE OUR WATER WON'T BE FILTERED EITHER AS WETLANDS SLOW WATER RUN-OFF DOWN. WATER WILL NEED TO BE TREATED BEFORE BEING RELEASED. IT WILL ALSO NEED TO BE CONTROLLED BY DAMS & RETENTION PONDS TO KEEP THE INSTREAM FLOW CONSTANT & TO LIMIT PEAK FLOWS & FLOODING (FLOODING). IT COULD EFFECT OUR SALMON RUNS IN MILLER AND WALKER CREEK

NOW CONSTRUCTION ALSO WORRIES ME. WHERE IS THE SOIL COMING FROM, AND NOW ESTIMATE FOR HOW MUCH DIRT TO NEED HAS GONE UP HOW MUCH HIGHER WILL

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PAGE 3

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THE # DIRT AMOUNT GO. IT COULD MEAN MORE TRIPS TO BRING IN MORE & MORE DIRT. I TRAVEL 509 & 518 & 405. I DO NOT WISH TO RECEIVE A BROKEN OR CRACKED WINDSHIELD FROM AN IMPROPERLY COVERED LOAD OF FILL. HOW MUCH DIRT WILL NEED TO BE REMOVED WHEN YOU FIND OUT THAT A LOT OF THE CURRENT AREA IS COVERED BY UNSTABLE SOIL.

WILL THE SOIL BE PACKED WELL? LOOK AT THE JAPAN EARTHQUAKE LAST YEAR IN JANUARY. WILL THE 3RD RUNWAY LIQUIFY & TURN INTO A DEATH TRAP. IF THE 3RD RUNWAY COULD DESTROY BURIEN AND NORMANDY PARK, PLEASE NO 3RD RUNWAY!

SUSAN OVERHOLT

CC: ADAM SMITH, CASE, EPA
MARK STILES

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REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1997

COMMENT SHEET

Public Hearing
March 4, 1997

ANM-610

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

What engineering studies have been made about the seismic abnormality section that lies on the westside of the Port property? cause? breach of the aquifer?and procedures to remedy the problem?

What effects will the additional compacted fill(weight) have on the aquifer?(min. 1 ton per sq. ft.-source Architectural Graphic Standard). Has any engineering study been made of this?

If some of the borrow fill is from Port property,what effect will this have on adjacent wet lands? and what will be required to bring the "mined" area to usable standards?

(*Please Print*)Name: Simon and Sandy Miedema

Address: 638 So. 146 Street

City: Burien Zip Code: 98168

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

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March 28, 1997

Mr. Dennis Ossenkop
FAA Northwest Mountain Region
1601 Lind Ave. SW
Renton, WA 98033-4056

ANM-610

Regarding the Supplemental Environmental Impact Statement for the proposed third runway at SeaTac, I have intimate knowledge of environmental impacts on our area when the second runway was built, since I have lived here for most of my fifty-five years. I can only conclude that the impacts will be the same and worse. More pollution. More problems with my asthma. More noise. More impact on learning in schools. Further devaluation of property. More run-down neighborhoods. Worse traffic.

My mother was bought out by the Port when the second runway was built. Our house was in a nice neighborhood, with neat lawns, and people proud to keep up their houses. Now that area is a wasteland, and until recently, filled with boarded up houses where addicts and prostitutes broke in. The Port, over twenty years after the second runway was built, is finally getting around to selling that property to industrial companies. Our Burien used to be a nice place to live, but since everything has gone downhill since the second runway was built, it has a shabby look, and business is slow, and there are poorer people moving in, because the rents are among the lowest in the County. Poorer people moving in also affected our schools. More kids with huge problems, learning problems, family problems, poverty. Our school districts test scores dropped.

G-348-1

My thirteen year old daughter has attended special ed since she was three, at Riverton, North Hill, Olympic and Beverly Park at Glendale, all in high noise levels. Not only does she battle to pay attention because of her disability, but must struggle to focus when planes thunder over. She stops, looks at the plane. It takes her another couple of minutes to focus again. I can only imagine the thousands of times that must have happened in her school experience.

The Port has never mitigated adequately for the second runway's impact on schools. There are schools that should have been closed long ago, that should have been insulated long ago. The Port offered a pitiful sum for insulation, not half enough to cover costs, yet had money enough to build themselves luxurious quarters and is now replacing the perfectly fine floor tiles at the airport because they're "not shiny enough." Where are our priorities?

The review process for the SEIS was flawed. After the statement was released, it was not easily available to those who would be most severely impacted should a third runway be built. For instance, the statement was available only at the Burien Library for only two weeks before the public hearing. It was not available at any other site for public review.

I hope you remember that we the people with the most potentially severe impacts if a third runway is built, should have the greatest say and power on *whether* it is built.

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Sincerely,

Elizabeth Desimone

Elizabeth Desimone
14966 20th SW
Seattle, WA 98166
(206)248-3641

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PLNG, PGM, & CAP BR

MAR 31 1997

ANM-610

11849 16th So.
Seattle, Wa
98168
March 28,1997

Mr. Dennis Ossenkop
Federal Avaition Administration
Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, Wa 98033-4056

Why was the DRAFT SEIS meeting scheduled during rush hour traffic on a working day? Not many people were able to attend. However there was a fairly nice size group of opponents who gave testimonials or allocated their time to a better informed speaker. Only one proponent gave a testimony and that individual was a representive of Air Washington, a Public Relations firm hired by the Port to promote the third runway.

Why can't the Port state true figures instead of the outrageously deceiving ones they use? the general public is finally waking up to these absurd calculations regarding not only the cost of an additional runway (including all expenses) the amount of dirt needed to fill in the valley, the length of time it wil take to haul 26 million cubic yards of dirt, the damage to our highways, the devastating loss of homes, the cost of replacing schools, etc. etc. etc.--- They haven't come close to admitting the total cost of every expense involved.

Why can't Paine Field be considered as the supplemental airport we all know will be necessary before a third runway could even be ready for use. We were told it was out of the running because a promise had been made never to use it for commercial traffic. We were promised a third runway would never be constructed when the second one went in. Isn't a promise to us as binding as a promise to Snohomish Coounty home owners???? Paine Field is a public airport and was licensed for unrestricted commercial flights in the mid 1980's. This could be made into a supplement airport much less expensive than adding to Sea-Tac. Plus about 80% of all local passengers live closer to that area.

Why was the Port given over a year to compile the SEIS Report, yet 95% of the opponents were unable to even SEE a copy before the meeting? The Burien library recieved their copy one week before that meeting and the Des Moines library had yet to see a copy of theirs'.

Why is more air traffic even considered in this congested area? We are not only one of the most populated areas, but already have two smaller airport within 10 miles of Sea-Tac.

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When will the schools be insulated? When will they be air conditioned? You cannot have 30 or more children in a room and keep the windows closed. I went to both Sunnydale elementary school and Highline High School so am well aware of the need for open windows in both schools. Insulation means NOTHING when fresh air is needed.

When will the Port have the money to complete the insulation program?? Our homes was half insulated five years ago and we have been told repeatedly, by Rick Herz, they haven't enough money to complete the job.

How does the Port plan to alleviate th traffic on already congested roads? They have led us to believe they will do this, but without funds to complete old jobs, how can they begin new ones? I-5 is now bumper to bumper during most rush hours so adding approimatelt 1250 huge earth mover sounds extremely dangerous to everyone I've spoken to about this.

How does the Port plan to protect us from the enormous negative impact more flights will have on our water and air quality? With two runways, my patio is practically useless. The noise is horrible and the dumped fuel rots our patio furniture and coats any broadleaf shrubbry with a grimy residue.

Why was the search for a supplement airport closed after such a very short time? Moses lake wanted to be considered and a 50,000 acre site in Tenino could have solved the whole argument. These sites would have been outside the Port's sweet domain. What is more important, their egos or the safty and convience of all others concerned? That land will be purchased by investors who can then charge many times what they paid for it.

What are the animals in the wetlands to do if the wetlands are moved 15 or 20 away?

The SEIS report completely overlooks the effect additional aircraft noise and pollution will have on our schools and parks. Highline High and Sunnydale are both listed as historic buildings, dating back to the 1920's. What will become of them?

Why is Sea-Tac the only site to be considered when there are others avialable but in other counties? My parent fought to keep the first runway away from what was called 'Wilcox Hill' and I will do all I can to stay in the home we built before the loud jets were heard of.

I AM NOT WILLING TO GIVE UP MY HOME TO SATISFY THE EGOCENTRIC PERSONALITIES OF A GROUP OF PEOPLE WHO SIT IN

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THEIR IVORY TOWERS AND TRY TO PUSH THIS BOONDOGGLE DOWN OUR THROAT.

Sincerely,

Alice M. Bilz

Alice M. Bilz
11849 16th So.
Seattle, Wa
98168

CC: RCAA

G-350

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R.A. McKeeman
430 SW 183rd St
Seattle WA 98166
March 31, 1997

Environmental Protection Specialist Dennis Ossenkip, ANM-611
Federal Aviation Administration (FAA)
NW Mountain Region
1601 Lind Ave SW
Renton WA 98055-4056

Re: Sea-Tac Airport SEIS due March 31, 1997 Concerns/Questions

Following are the concerns/questions I would like addressed on the SEIS subject:

1. The underestimated number of operations ..that is so mis leading. (ignoring the FAA Terminal Air Forecasts).
2. What are the risk factors on F-coli and what are the other health hazards?
3. Strip mining in violation of the strip mining rules RCW-78-44.
4. Ignoring the facts established that the third runway cost factor far exceeds the value the runway provides and other facts showing the detrimental results to health, safety, real estate etc etc.

Please include these include these question and your response in the Record of Decision.

Also, information in accordance with NEPA chapter 1503.4 (5).

Sincerely,

Rosemarie McKeeman

Rosemarie McKeeman

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1997
ANM-61

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8414 - 9th Ave. S.W.
Seattle, Wash. 98106
29 March 1997

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Mr. Dennis Assenkop
Federal Aviation Administration
Airports Division, ANM-611
1601 Lind Ave S.W.
Renton, Washington 98055-4056

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1991
ANM-610

Subject : Sea-Tac 3rd Runway Dementia

Dear Mr. Assenkop,

I have been an aviator most of my working life, first in the military and then as a commercial pilot for Pan American World Airways and have constantly flown around the world. I love flying and try to promote flying but Only with the Safety and Convenience for All People and All Areas involved !

I am appalled at the Port of Seattle with their " Bull Headedness " about the 3rd Sea-Tac Runway at this unbelievable cost for so little benefit !

The First Red Flag : The cost of being the most expensive runway in the United States should be the first indication that maybe the public is far from and not getting their money's worth with such an expensive project.

The Second Red Flag : Trying to put in a Second " Dependant " Runway is not going to solve that much with the number of instrument approaches that Sea-Tac needs year around because of weather conditions. As a crew member I can vouch for the fact that there are too many built-in hazards already in flying let alone to have " Non-crew members " plan on having 3 parallel runways close together. I expect Safety to be the first three items of

concern for any airport around the world. These are : #1. Separation , #2. Separation, #3. Separation. #1. is for ample separation between planes in flight at all times and to allow for those emergencies that occur all to often. #2. is separation of Airports themselves so that there are nearby alternates in cases of in flight emergencies or bad weather that's below minimums conditions and we have our share in this department. #3. is separation of airports for the convenience of Passengers and Transportation in cars, busses, etc.. Each County should be planning for their own airport eventually so that people don't have to drive 2 and 3 hours in order to catch a plane. Sea-Tac's highway can hardly handle the traffic it has already let alone ten years from now. Getting to the terminal already is a traffic jam and a mess and what is it going to be like in 10 to 20 years ? Look just recently with the traffic accidents that tied up highway 99 and many people missed their planes because of the inadequate access to the airport already with todays volume of traffic.

The Third Red Flag : It appears that with the third runway that the Port of Seattle is going to disregard the " Noise Abatement Departures " and try to have planes taking off in All Directions otherwise why would they need a third runway ? " Noise Abatement Departures " is a major reason for delays in take off's with the proper distant separation between planes. The Port of Seattle is not keeping within the " Noise Abatement Limits " already. How is a third runway going to help ?

The fourth Red Flag : I understand that when the airport reaches 60% of it's capacity that they have to consider alternatives for the future. I understand also that the Port of Seattle is considering a 4th and a 5th runway already. This would mean the End of Several Towns and some of the best residential property in the Seattle area. The cost of theat would make

the 3rd runway expenses seem like " Small Potatoes " and think of the dirt that would have to be hauled then !!! This is absolutely unbelieveable !!!

The Fifth Red Flag : It appears to me that the Port of Seattle is trying to compete with the new airports like Dallas and Denver that have vast areas of open Land suitable for building 10 or so runways in all directions. The Port wants to have an international " Hub " in this small postage stamp area of an airport. This is absolutely a waste of Tax Payer's Money !! We need to have the start of a major " Hub " airport for through flights at a place like Moses Lake or Yenino that has 50,000 acres available already and it's on the railroad Lines and I-5 for freeway access. Sea-Tac should be planned as one of many " Destination " airports in the Seattle area and then the money would be well spent and the future for aviation in the great Northwest would be adequate for the next one hundred years atleast. Portland would be interested in going in with something like this to alleviate the growth of air traffic. This would be a major help to Eastern Washington as well with easier and faster agriculture shipments to the Orient.

The Sixth Red Flag :, The Port of Seattle wants to haul an unbelievable amount of soil to pile on top of a " Wet Lands Area " and this same area is the local drinking water from the aquiferous area for much of the residential neighborhoods. There could be tremendous law suits against the Port of Seattle if this water supply is depleted, diverted, or contaminated due to all the toxic fuel, ethylene glycol, ozone, and nitrogen oxides that are in the runoffs that would enter the subterranean wells. A third runway is Not the answer for this case either.

The Seventh Red Flag : When the second runway was being negotiated for the local neighborhoods were promised that there would be no 3rd runway. What happened to the promise from the Port of Seattle to the " Public " ?

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I guess that goes with the saying that " Promise them anything and then just do as you please anyway. ". This sure doesn't set well with us citizens of Seattle and the nearby neighborhoods !!!

The Eighth Red Flag : Pierce, Snohomish, and Kitsap Counties want King County to pay all the expenses, build the airports, put up with all the traffic of airlines, people, pollution, auto transportation, and freeway congestion and yet they get the benefits of the King County Tax Payers without any obligations of any kind on their part. What a deal for them ! That's right Port of Seattle. Sock it to the Tax Payers of King County !!! Now really , is that fair to our citizens just because the Port of Seattle wants to have " Total Control " of Transportation. To me this is a State of Washington problem and a Northwest problem and not just a Sea-Tac 3rd Runway Dementia by the Port of Seattle. Please explain this to me very clearly.

The ninth Red Flag : Pay Attention to Aviation Engineer Arlene Brown !!! She has made quite a study with charts and graphs and is fully qualified in this matter. She is doing her best to keep the Port of Seattle from wasting millions of dollars from the Tax Payers needlessly as well as ruining fine neighborhoods any more.

The Tenth Red Flag : On the March 4th Public Hearing was the first time I even heard about the Supplemental Enviremental Impact Statement and all comments are to be returned by 31 March 1997. This is not much time to study all the information in the few copies of the publication that was made available. Why the rush of time on such an expensive and important project ? The most expensive runway in the United States and only 8500 feet long. Is it to keep the " Public " from understanding what is in it ???

The eleventh Red Flag : I understood that all parties agreed to have "Binding Arbitration" with an outside and independent board. When the Port of Seattle is found to be in non-compliance by the independant board then the Port of Seattle now says that it was "Only Advisory". If the tables had been reversed I am sure that the Port of Seattle would have said "That was Binding Arbitration!" so please explain this to me in fine detail as this is total unbelievable to me.

The Twelth Red Flag : How is it that the Port of Seattle can build, expand, develope projects and tax the Public and still not be regulated by a "Direct Vote of the People"? This is not how our country was made Great. Unless I am mistaken and have lost my memory I understood that it was "Of the People and for the People and By the People!" How did we lose so much of our rights in these matters by having to pay the bills for projects and yet Not having the "Public" Vote on these items ???

The thirteenth Red Flag: On what logical basis do you consider an airport runway length of 8,500 feet adequate for All planes nowdays and at this extreme cost ? When I was flying 707's many times I needed every bit of a 12,000 foot runway for takeoff. Please explain to me in great detail how a short part time runway of this nature is even worth considering and also how you figure that this is a help when some planes will have to cross two runways .

The Tourteenth Red Flag : How can you begin to justify this 3rd, short, Dependant runway when another "Master Plan" will be needed in the year 2000 ? Do you think that the Tax Payers just have money to "Burn"?

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The Fifteenth Red Flag: I cannot begin to see how a project like this is justified and with the rush of time also unless it's tied to Mayor Rice's wish to have the OlympicSports here in Seattle in 2008. The people of Seattle have not even had a chance yet to express their feelings on this matter. Most cities that have been the Host for the Olympic Games ended up deep in debt and with a lot of "White Elephants" that the poor Tax Payers have to pay for afterwards. Let's not rush into this without a lot of thought and approval by the "Public" first. This 3rd runway sure seems to fit into this year 2008 scheme.

Please write to me justifying all these "Red Flags" in detail. I have so many more questions that need answers but I have not had enough time to study all the Enviremental Statement in detail as I really feel I should have at this time. After all I put my life and the lives of my passengers on the line with every flight and now the enviroment is a major part to be concerned with as well. Flying is hazardous even at it best so let's not even consider short cuts in Safety either in the air or on the ground. It's only our lives and future at stake !!!

Include a copy of this letter and your responses in the "Record of Decision". Your response should be in accordance with N.E.P.A. 1503.4 (5).

Your answers will be sent to our neighborhoods and to the news media for publication. How many more "Red Flags" do we need in order for the Port of Seattle to start listening to the "Public" for a change ???

Awaiting your complete, thoughtful, and detailed answers.

Sincerely,

Harvey Rowe

Harvey Rowe

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Washington State Department of Transportation
Sid Morrison
Secretary of Transportation

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401 Second Avenue South, Suite 307
Seattle, WA 98104-2862

(206) 464-5878 /SCAN 576-5878
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March 27, 1997

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 31 1997
ANM-610

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
Airports Division
1601 Lind Ave. SW
Renton, WA 98055-4056

Seattle-Tacoma International Airport
Master Plan Update
Draft Supplemental Environmental Impact Statement
Agency Review

Dear Mr. Ossenkop:

The comments contained in this letter have been prepared in response to the issuance of the Draft Supplemental Environmental Impact Statement (DSEIS) for the proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport which was noted in the Federal Register on February 13, 1997. This effort is a joint lead with the Port of Seattle.

The DSEIS has been issued in response to new aviation activity and enplaned passenger forecasts that indicate the FEIS did not adequately account for the actual growth which has taken place at Sea-Tac Airport during the past year. As a result projected future growth rates must also be reexamined.

The main effect of this increased activity on the Port's Master Plan is to shift priority away from completion of the third runway to the construction of the terminal/landside facilities including the new north terminal complex (alternative 3) which has been selected as the preferred terminal alternative. The construction schedule for the third runway has been expanded from 3 to 5 years and other third runway construction operations have been time expanded as well. The net result is a delay in the opening of the third runway from the year 2000 to the year 2005 and an expansion of the third runway's construction schedule accordingly. For example, the construction schedule for hauling fill material for

- G-354 -

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the third runway has been expanded from 3 years to 5 years. It also is apparent that the Port over estimated their ability to construct and open the third runway by the year 2000. Limitations on financial resources as well as the probable inability to purchase the required right of way and accommodate the ensuing relocations are also significant factors in the 5 year delay.

Three basic issues are addressed in the DSEIS; airside capacity, terminal configurations/ locations, and ground transportation. The following comments concern the issues of most importance to WSDOT on the matter of ground transportation but several of the comments are also significant for the terminal configuration/location issue.

Chapter 2 - Impact on Project Definition and Purpose and Need

1) Table 2-7, page 2-22 & 2-23 - This table presents phasing information for both the new parallel runway and the terminal/landside improvements. The parallel runway phase on page 2-22 lists temporary construction interchanges off SR 509 and SR 518 as phasing components. Both locations will require a temporary break in limited access which will need to be negotiated through the NW Region TransAid Section. WSDOT will also require that these temporary construction interchanges be built to current WSDOT standards for horizontal and vertical alignment, ramp tapers, and sight distance. Provisions will also need to be made for drainage, the removal of the temporary ramps, and the revegetation of the disturbed areas upon completion of the project.

Also listed in Table 2-7 on page 2-23 under Terminal and Landside Improvements Phase II, are proposed slip ramps off SR 518 near 24th Ave S. and a new interchange at SR 518/20th Ave. S. The slip ramps seem to be a new addition to the Port's overall surface transportation proposal since publication of the FEIS.

In WSDOT's August 3, 1995 response letter to the DEIS the point was firmly made that "based on the drawings provided in the DEIS, WSDOT would **not** allow [the 20th Ave. S.] interchange to be constructed without closure or major modifications of the upstream and downstream interchanges". With publication of this Supplemental DEIS, the Port now proposes two new access points to SR 518 between the S. 154th Street interchange and the Des Moines Memorial Drive Interchange. Construction of these two proposed access points coupled with the existing interchanges at S. 154th Street and Des Moines Memorial Drive would result in four access points to SR 518 in the space of approximately 1 mile. Normally, WSDOT requires a minimum spacing of one mile between interchanges.

If WSDOT were to approve these closely spaced access points on SR 518, significant operational problems due to the merge and weaving patterns associated with interchange

operation could result. A six point added access evaluation will need to be performed to determine the acceptability of the Port proposal. WSDOT has final approval over the permitting of access points on limited access state highways. As currently presented, it is **extremely doubtful** the Port will receive WSDOT approval for these proposed transportation system changes. The addition of the proposed slip ramps at 24th Ave. S. serve to make the proposal even more problematical. WSDOT requests that the Port consider if the proposal is fatally flawed if they are unable to gain approval from WSDOT for these surface transportation revisions.

Another factor that needs to be considered is the surface transportation issue for the city of Sea Tac. Both S. 154th Street and 24th Ave. S. are two of the city of SeaTac's primary arterial routes. The DSEIS does not address any proposed plans for closing or modifying the existing interchange from SR 518 to S. 154th Street or how the traffic currently utilizing 24th Ave. S. will be accommodated once the north terminal complex is constructed.

- G-355 -

Chapter 5, Section 5-1 - Surface Transportation

1) Although the DSEIS acknowledges the fact that the RTA was passed by the voters in 1996, it does not attempt to quantify the number of RTA patrons which will use the new facility to access the airport. Table 5-1-2 (page 5-1-11) indicates that **no** passengers will arrive or depart the airport via the RTA. WSDOT requests that the Port determines how to best maximize the patronage the RTA can provide by analyzing potential RTA station locations and the means to provide reliable transport from the RTA station to the airport terminal facilities.

Also, this same table indicates that the Port expects only a 1% increase in transit patronage over 1994 levels through the year 2010. The use of scheduled buses, charter buses, and other buses does not increase at all. As regional policy leans heavily on Transportation Demand Management (TDM) and increasing the number of people who travel by means other than single occupant vehicles, we feel that the overall percentage of transit patrons should increase over time.

2) The issue of Transportation Demand Management is touched on in both Section 5 (page 5-1-7) and Appendix C in the document. As was the case with the FEIS, TDM is discussed in very general terms only and specific actions which will be implemented are not mentioned. In reiterating the comment provided for the FEIS, WSDOT would like to see this section expanded with a detailed explanation of the TDM strategies under consideration.

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3) Page 5-1-16 presents a map that is meant to illustrate regional origin/destination trip patterns. This map seems to show all trips to and from the airport begin and end in the Puget Sound Region. As this is a "regional" facility, it seems apparent that a significant number of trips begin and end outside the Puget Sound Region.

4) The map on page 5-1-21 illustrates transportation improvement projects in the year 2010. A roadway improvement project is shown at the SR 518/SR 99 interchange. It appears to indicate the addition of a loop ramp in the southwest quadrant of the interchange. There is nothing in WSDOT's 20 year plan indicating this improvement will be made by the State and we are unaware of any local agency projects under consideration at this location. Is this a project the Port proposes to fund?

5) Section 5-4 beginning on page 5-4-1 discusses construction impacts associated with the preferred alternative. Although the DSEIS states that construction only (temporary) interchanges were previously assumed in the FEIS, this document *specifically* calls for the construction of two temporary interchanges, one from SR 518 near 24th Ave S. and the other from SR 509 near S. 176th Street. The Port feels these temporary construction interchanges are needed to facilitate the movement of fill material to the work sites. The document states that the purpose of the interchanges is to minimize impacts to the off-airport arterial roadway system and adjoining neighborhoods. The DSEIS also states that the proposed SR 518 temporary interchange could be constructed where the port proposes permanent slip ramps off SR 518 allowing direct access to the new North Unit Terminal. A temporary interchange at this location poses the same problems as does the proposed permanent ramps at this location. The lack of space between 24th Ave S. and the existing interchange which serves S. 154th Street will create operational problems due to merging and weaving vehicular movements.

On existing SR 509 at the S. 176th Street crossing, construction of temporary ramps for the southbound off and northbound on movements will *probably* not conflict with ramp movements from the interchange to the south. This needs to be investigated in greater detail. However, for this location as well as the proposed SR 518 temporary interchange, all temporary ramps WSDOT allows will need to meet WSDOT standards pertaining to horizontal and vertical alignment, ramp taper lengths, sight distance, and drainage requirements.

It is of utmost importance that the Port secure the necessary permits for the temporary interchanges prior to committing to use them in their final contract plans. Although willing to consider these temporary construction interchanges WSDOT cannot guarantee their approval and feel it is extremely doubtful the proposed connection off SR 518 will be approved.

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Appendix C-1 - Final Surface Transportation Report

1) For year 2005, Table C-1-1 on page C-1-5 shows the AADT increasing from 77,000 to 85,100 from the no action to the preferred alternative. Table C-1-3 however, shows that the total number of passengers for that and all years does not change from no action to the preferred. These tables seem to be contradicting each other. Further explanation is required.

2) Page C-1-21 - Reference on this page is made to the "Washington Statewide Multimodal Transportation Plan of 1993. The name of this particular plan has since been changed to "Washington's Transportation Plan 1997 - 2016". The most recent publication of this document was April 1996. It is currently being updated and will be republished sometime in 1998.

3) Page C-32 to C-52 - This section of the document deals with future conditions on the ground transportation system. The analyses presented for the freeway systems do not accurately represent true operating conditions. All freeway analysis was conducted using the 1994 HCM ramp and ramp junction procedures. This analysis does not accurately represent the freeway operating conditions under high volume situations and a system operational analysis should be performed. Discussions with the local FHWA staff indicate that they also feel the procedure is an inaccurate representation of freeway and ramp operations and they recommend alternate analyses. This will be particularly critical for the evaluation of SR 518 for the preferred alternative. As a result, we recommend the SR 518 analyses be recalculated using a system operational approach.

Several of the intersection and freeway ramp calculations show that future operations actually improve as a result of the proposed project. This is not intuitive and detailed traffic volume diagrams and analysis sheets should be submitted for our review to properly evaluate the existing, no action and preferred alternatives for the appropriate years. This would include all segments and intersections of the the state routes in the study area.

4) Page C-1-48 - Under year 2000 Future Conditions it is stated that the intersection of 28th Ave. S. and S. 200th Street operates at LOS F and experiences an average delay of 644.0 seconds for the Do-Nothing Alternative. That equates to a delay of nearly 11 minutes. Is the decimal point in the wrong place?

5) On page C-1-50 of the Appendix several ramps to SR 518 are analyzed. In each case the LOS is degraded due to implementation of the preferred alternative. However, in two of the three cases the DSEIS explains it by stating that the speeds and "density" remain

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approximately the same. The northbound I-5 to eastbound SR 518 off ramp is a case in point. The level of service at this ramp junction changes from D to E due to implementation of the preferred alternative. We believe this change will lead to both a lowering of speeds and greater traffic densities and request that appropriate mitigation measures be identified to address this degradation in operational efficiency.

The third location refers to the SR 518/SR 99 intersection discussed above. The DSEIS states that while the LOS is degraded by the Preferred Alternative, a programmed transportation improvement in the year 2006 will mitigate this potential impact. There is no such anticipated improvement in WSDOT's long range plan and even if this improvement was listed, it could not be guaranteed that the project would be implemented in 2006. Again we ask the question, is this a project the Port proposes to fund?

6) In addition WSDOT strongly suggests that:

- the Port provide in their contracts a permitted barge transfer site on the Duwamish,
- the Port emphasize in their contracts **all** limitations for road use, time, cleaning, sweeping, etc. to help eliminate the potential for bid-price renegotiation concerning the haul, and
- the Port ensures the proposed temporary interchanges are permitted prior to committing to their use in any contract plans.

Thank you for the opportunity to review the DSEIS. Should you have any questions regarding these comments, please contact myself or Chris Picard with the Office of Urban Mobility at 206-464-5878 or Bob Josephson with the Northwest Region at 206-440-4711.

Sincerely,

Renee Montgelas

Renee Montgelas
Director, Office of Urban Mobility

RM:cp
cc: John Okamoto, Regional Administrator, Northwest Region
Bob Josephson, Manager of Planning and TransAid, Northwest Region
Bill Brubaker, Director, Aviation Division
Charlie Howard, Manager, Transportation Planning Office

DSEIS
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CITY OF SEATAC

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March 31, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave. S.W.
Renton, Washington 98055-4056

SUBJECT: CITY OF SEATAC COMMENTS ON THE MASTER PLAN UPDATE DSEIS FOR SEATTLE-TACOMA INTERNATIONAL AIRPORT

Dear Mr. Ossenkop:

The City of SeaTac staff, Planning Commission and City Council have reviewed the Master Plan Update DSEIS for the Seattle-Tacoma International Airport and enclose the attached City response to that document. While the City recognizes the importance of regional air passenger growth, the expansion of Sea-Tac international airport directly impacts the City of SeaTac both positively and negatively. In that regard the City has responded to various issues, concerns and questions regarding SeaTac Airport Master Plan DSEIS and the need to adequately mitigate those impacts.

Thank you for the opportunity to respond to the Master Plan DEIS. If you have questions please contact Stephen Butler, Planning & Community Development Director or Bruce Rayburn, Director of Public Works at (206) 241-9100.

Sincerely,

Jay Holman

Calvin Hoggard, City Manager

cc. SeaTac City Council Members
Stephen Butler, Director of Planning & Community Development
Bruce Rayburn, Director of Public Works

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SEA-TAC INTERNATIONAL AIRPORT MASTER PLAN DSEIS COMMENTS

In summary, it is the position of the City of SeaTac that the Sea-Tac International Airport Master Plan Draft Supplemental Environmental Impact Statement (DSEIS) is deficient regarding the issues identified in these comments. Moreover, the City's prior comments regarding the DEIS and FEIS are also valid for the DSEIS, were not resolved in the DSEIS, and must still be resolved. Regarding the DSEIS specifically, the City of SeaTac finds that:

- Current on-site and off site infrastructure limitations will prevent the airport from optimizing the capacity of the existing two runways. The Port of Seattle is incorrect in its position that passenger growth under the "No Action" alternative will continue unimpeded by off site infrastructure limitations. This is a fatal flaw in the environmental documents. Identification of the necessary and appropriate mitigations for growth relating to the existing runway system is not possible until such time as this deficiency is acknowledged and quantified.
- The City holds that the Master Plan EIS is a programmatic EIS except for the construction of the third runway. All other capital projects will require individual and separate environmental reviews.
- Based upon Item #1 above, the Master Plan EIS fails to properly identify and mitigate impacts to the City of SeaTac and its residents.

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The DSEIS supports the City's position with statements including, but not limited to, the following:

> *"These new forecasts are anticipated to exceed the operational capacity of the existing airfield between 2005 and 2010"*(Pg. 1-2).
>
> *"These constraints could result in less than the total demand being satisfied, if demand exceeds capacity of the system"* (Pg. 1-3).
>
> *"The FAA'S Terminal Area Forecast (TAF) does not provide the level of detail needed for environmental analysis such as noise impacts or surface transportation conditions"*(Pg. 1-3).
>
> *"Because demand would not exceed the maximum airfield capacity of the airport until around 2,008, SeaTac would likely accommodate all of the forecast demand for air travel until that time. By 2,005, 94 operations could be accommodated in the peak hours if additional airfield capacity were available. Due to the existing constraints, it would likely not exceed 82 operations"*(Pg. 1-3).
>
> *"As conditions become constrained, passengers would avoid ticket check in areas (through advance ticket purchases and electronic ticketing (ETC), rely on carry on*

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> *baggage, and/or will arrive at the airport sooner. It is assumed that ground travel time would increase 25% to 50%, thus the time passengers would spend in the terminal area would increase from 30 minutes to 45 minutes"* (Pg. 1-4).
>
> *"... the annual service volume of the existing airfield is approximately 380,000 operations, but that a greater level of activity could be accommodated assuming users are willing to withstand greater inefficiencies (i.e., delay). The flight plan found that the capacity of the existing airfield could be expanded to about 460,000 annual operations as hourly peaks are spread (either through delay or flight scheduling)"* (Pg. 2-6).
>
> *"As is shown in the following summary, the airfield has hourly operating constraints which are higher than the constraints of the terminal and land site system. As a result, it is believed that passenger behavior would evolve as congestion mounts without a loss in demand until the maximum airfield maximum capacity is exceeded. Such an evolution would result in passengers incurring additional time accessing the airport (either through congestion on the roadway systems, difficulty finding parking at the airport, waiting at the ticket check in lines, etc.)"* (Pg. 2-7).

Each of these DSEIS statements clearly indicate that current on-site and off site infrastructure limitations will prevent the airport from optimizing the capacity of the existing two runways, illustrate that the focus of the FEIS/DSEIS is programmatic in nature, and mutually fail to adequately assess the full scope of projected airport expansion plans or to mitigate the anticipated impacts of such plans.

The following comments expand upon and reinforce comments made previously by the City of SeaTac on the EIS. Regarding the DSEIS specifically, the City of SeaTac finds that the deficiencies listed below must be resolved.

GENERAL

1. The DSEIS fails to acknowledge the role of Sea-Tac International Airport (STIA) as the primary driver of land use in the immediate area and lacks any responsible examination of its relative impact on the land use plans of the City of SeaTac . An example is the proposed siting of the RTA light-rail line in order to serve the airport - a development that will drive growth further. Furthermore, the DSEIS ignores State mandated SEPA requirements by utilizing "pick and choose" tactics for assessing project-related impacts versus "cumulative" impacts. For example, the DSEIS repeatedly asserts (referring to adjacent communities projects and surface transportation impacts) that: *"... until these specific projects plans are completed for these developments the total cumulative impacts cannot be identified."* The FEIS and DSEIS utilize the City's Comprehensive Plan and PSRC projections when it is convenient, but claim to be unable to apply the same sources to assess cumulative impacts. A DEIS for SR-509 was issued in March of 1997 which provides some data suitable for assessing cumulative impacts of STIA operations. In addition, the environmental documentation for the Comprehensive Plans of the City of SeaTac, City of Burien, City of Des Moines, King County, and other jurisdictions also provide considerable information suitable for projecting cumulative impacts.

Revise the DSEIS to acknowledge that the airport is the key driver of growth in the City of SeaTac, and prepare a comprehensive cumulative impact assessment of the impacts of airport expansion utilizing information from, but not limited to, these sources. Such assessment should include Surface Traffic and related sections, including Land Use, Air, Noise, Biotic Communities, Wetlands And Floodplains, Services and Utilities, and Socio-Economic impacts. Propose appropriate mitigation for each.

2. The DSEIS makes repeated references to additional planning and development phases which will expand upon the assessment and possible mitigation of environmental impacts of the proposed action, such as the FAR Part 150 Update. A detailed explanation of planned subsequent environmental studies and mitigation plans and their relationships to this phase of environmental assessment and mitigation is necessary. For example, a 600 foot extension of runway 34R appears to have been proposed in the Master Plan as being needed after the year 2010. This project was not clearly identified in the Master Plan and its magnitude is only peripherally assessed in the DSEIS. **Revise the DSEIS to specify various projects which are planned for but not assessed in this document which will require project-specific environmental assessment.**

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3. The following statement supports the City's position that construction of the third runway is, in fact, providing additional capacity to the airport: "*... based on the unconstrained demand identified by the new forecast, the existing airfield is not capable of accommodating more than 460,000 annual aircraft operations which is now anticipated to occur by the year 2008*" (Pg. 2-7). **Revise the DSEIS to assess the full impacts of the additional capacity and propose appropriate mitigation.**

4. The DSEIS acknowledges that the revised forecast will alter the timing of impacts of the proposed action, but fails to comprehensively summarize how such changes will correspond to the timing or relationship of proposed or anticipated mitigations. **Summarize the proposed schedule of proposed improvements and provide an assessment of corresponding mitigation plans.**

SECTION 1 - SURFACE TRAFFIC ANALYSIS

1. **Revise the incorrect assumption that the background growth in surface traffic negates the need for mitigation for the airport expansion,** as indicated in the following statement: "*Continued regional population growth will impact the Surface Transportation System in the vicinity of Sea-Tac Airport regardless of the improvements undertaken at the airport*"(Pg. 1-8).

2. **Revise the traffic analysis to address the impact of passengers who are displaced to commercial parking facilities and associated shuttle services,** as identified in the statement: "*The differences between the do nothing and the preferred alternative traffic volumes relate to the availability of on-site parking and how passengers will access the terminal area*" (Pg. 1-8).

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3. The DSEIS acknowledges that the proposed action will impact surface transportation in the statement: "*The preferred alternative would generate an additional 95 PM peak hour trips in the year 2010 over the do nothing alternative*" (Pg. 1-8). Having acknowledged some level of impact, **the DSEIS should be revised to provide a comprehensive assessment of all surface traffic impacts and provide appropriate mitigation.**

4. The supplemental documentation clearly identifies the addition of approximately 2,000 employee parking stalls. This is a clear indication of added capacity being developed for the airport expansion and should therefore also be mitigated. **Revise the DSEIS to reflect the added capacity for employee parking, provide an assessment of impacts to Surface Traffic and related sections, including Land Use, Air, Noise, Biotic Communities, Wetlands And Floodplains, Services and Utilities, and Socio-Economic.**

5. The elimination of access from South 170th Street to Perimeter Road was not adequately assessed. **The elimination of this access and its impacts on the city transportation network must be evaluated in conjunction with the environmental assessment of the north unit terminal.**

6. Several statements are inconsistent regarding whether traffic mitigation is necessary to offset impacts of airport expansion, including the following: "*Therefore, in the long term, surface transportation is likely to serve as the greatest constraint to the long term development of Sea-Tac Airport*" (Pg. 2-27). "*According to the City of SeaTac adopted level of service standards, none of the evaluated intersections are currently functioning at an unacceptable level of service. Further, the analysis does not include or recognize improvements made to a number of intersections in the past three years*" (Pg. 5-1-3). "*In comparison to the do nothing alternative, the proposed Master Plan update improvements would improve the level of service at several intersections*" (Pg. 5-1-4). **Substantiate this conclusion and specify what improvements are proposed to accomplish this goal.**

7. The following statement is incorrect because it assumes an incorrect basis for the calculation of impact fees: "*... since the City of SeaTac collects impact fees only for additional PM peak hour trips on their roadway facilities, the additional PM peak hour trips on the airport express way would not be considered for the developer impact fee*" (Pg. 5-1-7). **Revise this statement to acknowledge that the City's impact fees are based upon new development within the community that generates PM peak trips which are projected to use the City's roadways network.**

8. The following statements interpret the existing data incorrectly to support the invalid conclusion that the Airport Master Plan is limited to beneficial impacts: "*These TDM strategies aim to reduce the number of single occupant vehicle passenger trips within the terminal area. Any success related to this TDM strategy is the result of the limitation of parking facilities on the airport proper"(Pg. 5-1-8).* The DSEIS implies that the preferred alternative will limit these courtesy van and shuttles trips to 1,320 trips per day;

whereas the Do Nothing alternative assumes that the airport will allow the courtesy and shuttle vehicle trips to grow unconstrained to 5,280 trips per day in the year 2010. The DSEIS fails to identify the TDM strategies which would be employed to realize this goal, provides no assessment of the secondary impacts of such strategies to the community, and provides no mitigation for such impacts. **Identify the TDM strategies and assess the direct and secondary impacts of likely alternative TDM strategies on Surface Traffic and related sections, including Land Use, Air, Noise, Biotic Communities, Services and Utilities, and Socio-Economic Impacts.**

SECTION 2 - AIR QUALITY

1. The modeling that is used acknowledged, in responses to previous comments, that because the data is not reliable on aircraft particulate emissions, the analysis was omitted from the model. **Revise the model to predict a range of estimated particulate emissions.**

2. Fuel dumping can have immediate direct impacts on air quality, depending upon the altitude and the rate of dispersion. Repeated fuel dumping could have cumulative impacts on air and water quality and public safety. **Estimate the frequency and volume of fuel dumping practices, project the cumulative impacts, and explain what steps are proposed to mitigate such impacts and protect the civilian population.**

3. The DSEIS discusses "intersection departures" in the Noise section, which would result in shorter departure tracks and lower altitude over non-port controlled properties. As noted in that section, "*90 to 95% of future operations could safely use such a departure option*". Appendix B: Operating Emissions - Proposed New Third Runway predicts "*...an increase in taxi-in and taxi-out distances and travel time*" (pg. B-11). Yet, according to the Noise Section (Source), intersection departures would reduce taxiing distances. **Reconcile this apparent discrepancy, project the relative frequency of intersection departures, and document how taxiing time would be offset by the advantages of intersection departures.** If taxiing distances and intersection departures are offsetting, then intersection departures should be prohibited in order to avoid impacts to air quality and noise.

SECTION 3- NOISE IMPACTS

1. The third runway is predicted to lead to an increase in "intersection departures", which: "*would result in aircraft flying at lower altitudes over nearby neighborhoods than would full length departures...*" (DSEIS-Appendix. C-3). The DSEIS further acknowledges that intersection departures would have a greater impact on local neighborhoods, and that it may become the preferred operational choice: The DSEIS concludes *that "90 to 95 percent of all future operations may safely use the intersection departures."* **Document the number of departures that are predicted to use this approach, and specify what non-noise mitigation is proposed to offset the impacts.**

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2. Increased intersection departures would be expected to increase noise impacts. **Predict the marginal noise impacts resulting from increased intersection departures in terms of revisions to noise contours, and specify what noise mitigation is proposed to offset the impacts.**

3. Noise abatement procedures do not restrict propeller-powered aircraft from using the proposed third runway. **Adjust noise assessments to include impacts of smaller, propeller-powered aircraft.**

4. The Port of Seattle has consistently predicted that noise level reductions will result from fleet upgrades and implementation of the noise abatement program. However, the PSRC Expert Panel concluded that the STIA has not experienced reduced overall noise from either aircraft ground operations or the overall airport operation (see PSRC agreement). **Incorporate the PSRC mitigation package as part of the DSEIS.**

5. The DSEIS states that the year 2000 activities will comply with Stage 3 noise levels. Yet a footnote of Appendix C-3/Noise (pg. C-3-2) states "... *FAR Part 91 set forth a schedule for the removal of most air carrier aircraft which do not meet Part 36, Stage 3 criteria by the end of the year 1999, with possible extensions until the end of 2003.*" **Specify the criteria for granting such extensions, describe what agency determines if the criteria have been met, and specify what opportunities will be available for affected local jurisdictions to participate in such review.**

6. Impacts of ground-level noise associated with STIA are discounted using the assumption that overall air operation noise levels would mask aircraft ground noise impacts. The PSRC Expert Panel, however, found that Stage 3 aircraft can be as noisy as older Stage 2 aircraft on landings. The DEIS also assumes the use of reverse-thrusters during landings. Thus, overall noise impacts would still be present, the aircraft-related ground activities would remain above 65 Ldn, and the duration of both groundside and landside operations would be predicted to increase in both volume and hours of operations. Based upon reported observations of City of SeaTac residents, aircraft runups are quite audible in McMicken Heights on the east side of 42nd Ave. **Computer models that cannot reproduce topographic effects or explain reported observations must be improved in order to reflect reality. Ground -level noise impacts must be assessed, through the use of alternative computer models or use of different noise evaluation techniques, and mitigation provided. Document how the frequency of reverse-thrusts will change over time, and how groundside noise impacts will be affected.**

7. The planned mitigation of noise impacts consistently refers to the proposed update of the Noise Remedy Program, for which recommendations, plans and funding are to be developed. **Describe contingency plans which have been or will be prepared in case funding is inadequate.**

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SECTION 4 - CONSTRUCTION IMPACTS

1. The DSEIS has been modified to include haul routes and times that are unacceptable to the City of SeaTac. The City will oppose any construction access to the Port property from the east unless the Port of Seattle enters into a dirt hauling agreement that is satisfactory to the City of SeaTac prior to the final adoption of the Master Plan environmental documents. **Include a mitigation which acknowledges the intent of creating a dirt hauling agreement that is satisfactory to the City of SeaTac prior to the final adoption of the Master Plan environmental documents.**

2. The DSEIS (Pg. 5-4-2) incorrectly assumes that permits required by local jurisdiction are not enforceable. The DSEIS assumes that the hauling operation could continue for a period lasting as long as five years. It further assumes responsibility for highway or road intersection improvements only after the level of service has dropped to LOS F or below. These criteria are unacceptable. **Acknowledge the need for consistency with City hauling requirements and propose adequate mitigation.**

3. The statement is incorrect that "*This analysis showed that entering sight distance, roadway width, and shoulder conditions are adequate for safe truck traffic along these roadways*" (Pg. 5-4-5). **Acknowledge the need for consistency with City hauling requirements and, in the event that hauling is necessary as a temporary expedient along residential streets, propose adequate mitigation to address the needs of the residents living along these roadways and their ability to safely ingress and egress from properties.**

4. The DSEIS acknowledges, "*Airport construction traffic could result in a degradation in levels of service on area roads during construction. This degradation could be significant, particularly where background levels of congestion are at or exceeds capacity*" (Pg. 5-4-10). As a result, the DSEIS proposes to construct two temporary construction-only interchanges into the airport property for construction of the third runway fill. **The City of SeaTac strongly recommends this proposal as the preferred alternative for hauling material to the airport for the construction of the third runway.**

5. The DSEIS section on construction noise is inadequate in that it considers only incremental increases rather than maximum noise limits. **Revise the DSEIS to identify the maximum noise levels which will be generated by the construction activities, particularly between the hours of 10 PM and 7 AM weekdays, and 10 PM and 9 AM weekends.** Any activity exceeding the allowable noise limits during those evening hours will require a noise variance from the City of SeaTac.

6. The DSEIS inadequately addresses the social impacts of construction activities on the Des Moines Creek Park. The Des Moines Creek Park is scheduled for development before commencement of construction of the third runway. **Identify and mitigate the impacts of borrow pits 1-4 on the Des Moines Creek Park.**

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7. **Complete the lead paragraph, second sentence, that states "*it is anticipated that this listing would be included in the request for bids such that contractors _____ _____.*"**

8. Paragraph A: **Provide provisions for enforcement of any mitigation provisions.**

9. Paragraph B: **Provide assurances that the contractor-assigned Haul Route Supervisor will be a full time employee dedicated to the project.**

10. Paragraph D: While this paragraph provides for consultation with other jurisdictions, i.e., WSDOT and adjacent cities, it does not imply any authority by DOT and the adjacent cities. The last sentence of this paragraph states "*Any deviation from the approved haul route shall be approved by the Haul Route Supervisor and the Port.*" **Include provisions for compliance with the requirements of adjacent cities that control the haul routes.**

11. Paragraph F: **State how would this proposed measure will be enforced.**

12. Paragraph G: The last paragraph states "*The contractor shall appoint one employee as a responsible representative in charge of traffic control and safety.*" **Clarify if this is the same Haul Route Supervisor described in Paragraph B.**

13. Paragraph G: **Revise to provide a 24 hour telephone number to the Port of Seattle for use by the local jurisdiction in case of an off-hour emergency.**

14. Paragraph H: **Clarify how coordination of the sediment disposal area will be assured with the Port of Seattle and the local jurisdiction. Also, revise to read: "*The contractor shall flush and clean storm drainage systems along the haul route within 1,000 feet of the site* when so directed by the City's Public Works Director or designee."**

15. Paragraph J, first paragraph: **Revise the last sentence to read "*The contractor's method for dust control will be continuously monitored and if the method is not controlling the dust to the satisfaction of the Port and the local jurisdiction, the contractor will be required to improve the method or utilize a new method.*"**

16. Paragraph J, last paragraph: **Revise to provide that the cost of clean-up shall be the responsibility of the contractor and provide surety, to reimburse the responsible jurisdiction for the cost of performing the work in the event that the contractor is negligent.**

17. Paragraph K: **Revise this BMP to include advising the contractors that a noise variance is required from the local jurisdiction if they exceed the maximum allowable evening noise limits.**

18. Paragraph L: **Revise references to "Storm Water Management Manual for the Puget Sound Basin, Volumes 1 and 2", to specify the "King County Surface Water Design Manual".**

19. **Revise the remaining paragraphs to acknowledge compliance with requirements of the permitting jurisdiction.**

20. Neither the EIS nor the DSEIS acknowledge or propose mitigation for damage to the pavement structures of the haul routes to be used in conjunction with the construction of the third runway. **Provide mitigation in the form of a proposed dirt hauling agreement to be executed to the satisfaction of affected jurisdictions, or propose specific mitigations for these impacts.**

21. **Specify improvements to be made at deicing locations where the planes are too long and their tails hang out over the storm drain.**

I 22. The DSEIS acknowledges that the proposed action could adversely impact the local transportation network in the following statement: "*This flow is fairly consistent from about 2 PM to 7 PM. Haul traffic should avoid or minimize the use of State Route 99, South 188th Street, South 200th Street, and State Route 518 during these period*" (Pg. C-4-32). **Therefore, revise the DSEIS to acknowledge that such routes will not be utilized pursuant to provisions of an agreement to be executed to the satisfaction of affected jurisdictions.** I G-362

23. The DSEIS states that additional routes have been identified and analyzed since publication of the FEIS. It is the position of the City of SeaTac that the primary haul routes would be SR 509, SR 518, and Interstate 5, and that haul routes through residential areas would not be permitted. **Explain how the proposed haul routes have been revised from the FEIS to be consistent with requirements of the City of SeaTac.**

24. Table 5-4-2 has errors which need to be corrected and factored into mitigations for the impacts to those arterials. The errors are as follows: Sources East of Interstate 5: The speed limit for S. 200th Street is 25 mph, not 35 mph; based upon the residential nature of the area and the location of a elementary school one block away. Also, the existing ADT should be revised to 17,106, not 11,000. **Revise Table 5-4-2 and revise proposed mitigations accordingly.**

25. Table 5-4-3 has errors which need to be corrected and factored into mitigations for the impacts to those arterials. The errors are as follows: *Summary Of Construction Traffic Impacts Review For Use Of Off-Site Borrow Sources Access Routes*: There are no assigned borrow source numbers for the sites east of Interstate 5 referenced in Table 5-4-2 (Pg. 5 of 5). Also note under both *Residential Concerns* and *High Safety Concerns*: The intersection of Military Rd. S., S. 200th Street and Interstate 5 is a high accident intersection in the City (30 injuries in 40 accidents within the past four years), and has LOS E during peak hours. Under *Comments*: S. 200th Street should be a limited use

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route, not a primary route. **Revise Table 5-4-3 and revise proposed mitigations accordingly.**

SECTION 5 - BIOTIC COMMUNITIES, WETLANDS AND FLOODPLAINS

1. The DSEIS proposes to provide mitigation outside of the City of SeaTac for the impacts of constructing a third runway. Section 15.30.320 F of the SeaTac Municipal Code (SMC) requires that the location of wetland mitigation/relocation be within the same sub-drainage basin. **Revise the assessment of wetlands to conform with the City of SeaTac wetland standards, and revise the findings and proposed mitigations accordingly.**

2. The DSEIS does not identify a Class II wetland located approximately at 1000 S. 158th Pl. S. **This wetland should be acknowledged and impacts mitigated accordingly.**

3. Wetlands have been identified on the Vacca Farm (Wetland Report for the RMM Rezone, File REZ0001-91). The Vacca Farm wetlands are located within the 100 year floodplain as identified by FEMA are adjacent to Miller Creek and were identified as Class II Wetlands (Per SMC). The proposed relocation of S. 154th St. would partially fill these wetlands. These wetlands were not shown on any maps identifying wetlands affected by construction (Figure 1.1-1, "Wetland Mitigation Plan for Proposed Master Plan Update Improvements at Seattle-Tacoma International Airport", Parametrix, Inc., December 1996), nor was any mitigation proposed for filling these wetlands. **Revise the assessment of wetlands to conform with City of SeaTac wetland standards, and revise the findings and proposed mitigations accordingly.**

4. The proposed buffers for the relocated Miller Creek, two unnamed Class III creeks, and the relocated upper headwaters of Walker Creek (located just north of S. 176th Street, Class III Stream at this point) do not meet the minimum width requirements as stated under SMC 15.30.190. Following is a comparison of the City's standards and the "Mitigation" proposal.

STREAM BUFFER REQUIREMENTS

STREAM CLASSIFICATION (SMC 15.30.190)	BUFFER WIDTHS	
	SEATAC STANDARD	*PROPOSED*
Class I Stream	100 ft.*	No Class I Streams Proposed to be Moved
Class II With Salmonids**/***	100 ft.*	0 to 45 ft. on Miller Creek Relocation
Class II Without Salmonids**	50 ft.*	0 to 45 ft. on Miller Creek Relocation
Class III Intermittent	25 ft.*	10 to 20 ft. on Stream Relocation A, B, and C in Mitigation Plan

*15 foot building setback required from the edge of the buffer.
**Salmonids are defined as "Any of a familyof elongate bony fishes (such as salmon or trout) that have the last three vertebrae uptumed".

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At least 10 feet of the buffer for the relocated Class III stream (Identified as drainage channels A, B, and C) is identified as a "grass filter strip". Section 15.30.360 of the SMC requires that the "*stream channel, bank, and buffer areas shall be replanted with vegetation native to the City of SeaTac and King County which replicates the original vegetation in species, sizes, and densities.*" The proposed "filter grass strip" of 10 feet as illustrated in the "Miller Creek Relocation Plan" is inadequate. **Acknowledge that the entire 25 foot wide buffer area will be revegetated in conformance with requirements of the SMC.**

5. The DSEIS concludes that no sites were deemed suitable for wetland mitigation within the Miller Creek sub-basin. The criteria utilized ignore that fact that other areas, though developed or partially developed, could have served as possible mitigation sites. **Revise the assessment of wetlands to conform with City of SeaTac wetland standards, and revise the findings and proposed mitigations accordingly.**

6. The maps provided showing sites considered for the relocation of wetlands in the Miller and Des Moines Creek basins were of such poor quality that it is impossible to determine the location of sites in relation to the ownership. This would hinder an independent assessment of the suitability of such properties for wetlands mitigation and/or replacement. **Provide maps which are suitable for such interpretation that include a depiction of ownership.**

7. **Acknowledge that a plan for Lake Reba relative to operation and flood control procedures will be prepared to the satisfaction of the City.**

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SECTION 6 - LAND USE IMPACTS

The DSEIS concludes that considerably more people, households, public facilities and historic sites would be impacted under all alternatives than estimated in the FEIS. Furthermore, the DSEIS incorrectly assumes that noise is the sole airport-induced impact on land use. The mitigation of land use impacts is deferred to the FAR Part 150 Update, and constrained to the specific Noise Remedy Program mitigation options listed in the DSEIS. A comment is made that this measure "*could involve the acquisition of all residential uses, and any vacant, residentially zoned properties which cannot be compatibly zoned, within selected areas both to the north and S. of the new runway.*"

1. **Provide a map which precisely details the properties which would he acquired, insulated, or otherwise mitigated for noise impacts. Summarize all possible acquisitions.**

2. With the exception of population and housing, the land use section does not specify land use impacts resulting from acquiring additional West SeaTac properties. **Assess land use changes to the following types of land uses: residential, commercial, manufacturing/ industrial/ business park, park and recreation, and essential public facilities; and propose appropriate mitigation.**

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3. The assessment of population and housing impacts is likely to fall disproportionately on senior citizens and low-income persons. **Assess the impacts on these special populations and propose a mitigation plan tailored to each.**

4. The City of SeaTac adopted new standards for mobile home relocation. **Reference the standards regarding mobile home relocation, incorporate such plans into the relevant SEIS analysis (including the Socio-Economic section) and propose appropriate mitigation in accordance with these standards.**

5. The impacts on property values and changes of land use resulting from the change of uses to those more compatible with airport-related uses must be evaluated and mitigated. **Amend the estimates of population and housing of the Land Use section, as well as to elements of the Historic, DOT 4(f), Transportation, Social, Socio-Economic, Services and Utilities, and Aesthetics sections; and propose appropriate mitigation.**

6. **Amend the fiscal impact analysis of the economic and tax impacts to the City of SeaTac to include the additional acquisition area being considered, and propose appropriate mitigation.**

7. No proposal is made to mitigate impacts to outdoor activities or reduced property values for residences, commercial uses, public facilities and historic sites. **Acknowledge and address the resulting social, and socio-economic changes and propose appropriate mitigation.**

8. No proposal is made to mitigate impacts to commercial land uses. **Provide an assessment of such impacts and provide appropriate mitigation.**

9. Borrow pits will impact future city land use, aesthetics and socio-economics. **Acknowledge and address the resulting land use, aesthetic and socio-economic impacts, including appropriate mitigation measures and plans for site rehabilitation.**

10. **Provide documentation of the modeling used to predict air quality impacts to DOT SECTION 4(F) properties which justifies the conclusion that "*none of these sites would be exposed to adverse air quality impacts caused by the proposed improvements*".**

11. **Correct the typographical error in section (B,1): "*... compatible with noise levels as up to 75 DNL*".**

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SECTION 7 - OTHER ENVIRONMENTAL ISSUES

Section 5-7 concludes inappropriately that the new forecasts and new information that have become available since the February 1996 FEIS *"would not change the conclusions or finding of the impacts in the following areas:*

1. *Social Impacts,*
2. *Human Health,*
3. *Induced Socio-Economic Impacts,*
4. *Water Quality,*
5. *Public Services and Utilities,*
6. *Earth,*
7. *Solid Waste,*
8. *Hazardous Waste and Materials,*
9. *Energy Supply and Natural Resources, and*
10. *Aesthetics and Urban Design".*

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1. **Document why the proposed action would not change the findings of the impacts for each of these elements of the environment, and proposed mitigation where impacts are identified.**

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SEATTLE COMMUNITY COUNCIL FEDERATION
2511 West Montalke Place East
Seattle, Washington 98112

31 March 1997

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Dennis Ossenkop
Environmental Specialist
ANM-611
Federal Aviation Adminstration
Northwest Region
Room 540, 1601 Lind Avenue S.W.
Renton, Washington 98055-4056

Dear Sir:

Attached please find the original of the comments of our organization on the draft supplemental environmental impact statement for the Master Plan Update, Seattle-Tacoma International Airport.

We regret that the Federal Aviation Administration — or perhaps you personally — insist that only hand-delivered comments meet the test of delivery to the FAA. We would have thought that like most if not all other Federal agencies a timely mailing in the U.S. mails would be sufficient for FAA.

We hope that in the final supplemental EIS greater care will be taken to ensure accuracy of spelling, number consistency, proper pagination, and so forth. The draft bears unmistakeable signs of over-great haste in preparation — certainly understandable in a draft, of course.

Yours truly,

Jorgen G. Bader

Jorgen G. Bader by Chwt
President

Phx55: FED-L

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COMMENTS OF SEATTLE COMMUNITY COUNCIL FEDERATION ON DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR MASTER PLAN UPDATE, SEATTLE-TACOMA INTERNATIONAL AIRPORT

Introduction

I-1. Identity of commenter. Seattle Community Council Federation is the city-wide coalition of Seattle community clubs, community councils, and neighborhood associations. We have participated throughout the Master Plan Update process and predecessor public processes concerned with Seattle-Tacoma International Airport, & with Central Puget Sound transportation planning. Details are to be found in the introductory portion of our comments on the draft environmental impact statement for the Seattle-Tacoma International Airport Master Plan Update, in our scoping comments for the site-specific third runway environmental review, & in earlier submissions.

I-2. Organization of comments. Our comments are organized into the following sections:

I-3. Abbreviations. We frequently refer to the agencies involved in this process by abbreviations:
FAA -- Federal Aviation Administration, U.S. Department of Transportation
POS -- Port of Seattle
PSRC -- Puget Sound Regional Council
KCIA -- King County International Airport (popularly known as Boeing Field)
Sea-Tac -- Seattle-Tacoma International Airport

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We usually refer to the various documents in this process by abbreviations, as follows:
DEIS -- the draft environmental impact statement for the Sea-Tac Master Plan Update
FEIS -- the final environmental impact statement for the Sea-Tac Master Plan Update
dSEIS -- the document now under review: the draft supplemental environmental impact statement for the Sea-Tac Master Plan Update
fSEIS -- the final supplemental environmental impact statement, to be issued after comments on the dSEIS are received and analyzed

Other abbreviations are consistent with those used in the dSEIS.

1. General Comments

1-1. Of all measures proposed for dealing with the purported air-capacity problem at Sea-Tac, the proposed improvements as described & scheduled in the dSEIS are the most expensive and least cost-effective.

1-2. The examination of alternative solutions for the air-capacity problems of the four-county Central Puget Sound area remains arbitrary, incomplete, and tainted by the bias of the FAA and POS for a solution located exclusively at the Sea-Tac site (expanded). In particular, the failure to examine rail alternatives is inexcusable (especially in light of the amazing change of heart on the utility of rail by the Washington Department of Transportation, immediately after the Expert Arbitration Panel of the Puget Sound Regional Council reluctantly ruled out a rail alternative to Sea-Tac expansion in large measure because of the reluctance of the Department of Transportation to support significant rail improvements). Why was a rail alternative not re-considered in the dSEIS?

1-3. The proposed third runway will be obsolete, by the figures of the dSEIS, only a few years after its rescheduled entry into service, as projected air-passenger growth overwhelms the slight additional increase in capacity gained by that improvement. Yet the dSEIS proposes no remedy. Why?

1-4. The increase in projected passenger growth, the significant proposed change in scheduling of construction of various improvements, and the failure to provide any plan for local and regional air traffic after the saturation

point is reached, all seem to require that this entire project be re-submitted to the Puget Sound Regional Council for its re-examination, for the projects & plans approved by that body are not the projects & plans now proposed, & the professed goals of the original proposal will not be met by the new proposal, if the new traffic forecasts are accurate.

1-5. The environmental impacts of Sea-Tac expansion remain under-estimated, especially in the city of Seattle, especially in places where there are disproportionately large numbers of persons of color and other specially-protected classes, as defined by Executive Order 12898.

2. Process Issues

The public-participation and public-information process for the earlier stages of this long exercise were ill-designed, inadequate, and inappropriate. The same is true this time.

2-1. Inadequate distribution of copies of the dSEIS. (a) The dSEIS was not adequately distributed; several copies should of course have been lodged in every branch library in Seattle, but were not.

(b) The dSEIS copies lodged with the libraries should have been available for circulation, rather than restricted to in-library use, given the length and complexity of the document.

(c) The proponents were well aware of the concern in the Columbia City neighborhood arising from the 3-degree shift in north-departing flight patterns, an affair that generated intense interest in Sea-Tac matters in that neighborhood -- yet, the proponents of the project saw fit NOT to lodge even one copy of the dSEIS in the Columbia City branch library (or the Columbia City Neighborhood Service Center, nor in the City's community center in Columbia City).

(d) Copies should have been lodged in the libraries serving other affected Seattle neighborhoods, such as Georgetown, Broadview, Queen Anne, Ravenna-Bryant, Laurelhurst, and Capitol Hill.

(e) We note that the fact sheet included in the dSEIS reveals a failure to lodge copies of the dSEIS in public libraries in several places outside our city where Airport activities have caused concern. These localities, all of which have branch King County libraries, include: Issaquah, Maple Valley, Mercer Island, and Tukwila. We also note that no copies were lodged at Gig Harbor, a city that filed a brief amicus curiae in our lawsuit against FAA over the four-post plan.

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2-2. Scoping. Should there not have been scoping hearings before the dSEIS was prepared?

2-3. Usual inadequate hearings. As we have come to expect in this process, the proponents once again provided:

(i) too few public hearings (only one this time),

(ii) an inconvenient location (an obscure POS space inside the Airport passenger terminal) for the one hearing that was provided,

(iii) the usual inconvenient (rush-hour and dinner-hour) time for the hearing.

(iv) Of course, when the proponents refuse to recognize that their project will have adverse impacts in the City of Seattle, it is no surprise that they refuse to hold hearings on their project in our city. What will it take for FAA and POS to recognize that residents of the City of Seattle have a legitimate concern about the activities of the Airport and about the expansion that FAA and POS are touting?

(v) What will it take for FAA and POS to recognize that they have a duty and a responsibility to schedule a complete suite of public hearings, with actual decision-makers in attendance, at reasonable times and at reasonable places, taking into account the work and family responsibilities of ordinary citizens?

2-4. Critical documents withheld from public. In the last go-round (the preparation of the FEIS), the proponents first issued the FEIS, and then released, seriatim & slowly & to an extraordinarily restricted audience, the Technical Reports on which the FEIS was actually based, containing the actual studies, analyses, computations, &c, relied on by those who wrote the FEIS. This time, the gimmick was to withhold the actual revised traffic forecasts on which the dSEIS is said to be based. These reports should have been included in the dSEIS. Why were they withheld?

Also withheld were the financial planning documents that led to the conclusions averted to so obliquely at p. 2-21 & 2-24, dSEIS (Part 3 A, first bullet point). Why were these financial planning documents not included in the dSEIS? Why were they not at least cited in standard citation form so that interested parties could locate & peruse them?

2-5. Lack of index. One way to make it difficult for the public to participate in the environmental review process is to make the documents hard to use. Particularly troublesome is a failure to provide either a comprehensive analytical table of contents or, much better, a topical index. The dSEIS fails to provide either. This has now become an established pattern with the POS and FAA, to the

point where one has to assume that these failures are deliberate. Are they?

We called for a proper index in our scoping comments before the site-specific environmental review for the third runway began, noted the absence of an index in our comments on the DEIS, note that no topical index was provided for the FEIS (a one-page alphabetized version of a one-page table of contents listing chapter and appendix titles is no substitute for an index) --- and here we are again! Another FAA and POS environmental document with no index! Why?

Does the FAA or the Port not have access to index-preparation software?

Later comments call attention to a few specific examples of readers' difficulties arising from lack of a proper index. See, e.g., Comment 3-17.

3. Revised Passenger-traffic Forecasts

3-1. Where are the actual revised forecasts? (a) Readers attempting to understand the discussion in the dSEIS about various revised traffic forecasts are handicapped by having to rely on the disjunct summaries of those forecasts (evidently prepared by persons other than those who prepared the actual forecasts) without having the actual documents before them.

(b) Why not reprint the FAA & POS forecasts as appendices, since they appear not to have been lodged with any libraries, or, so far as one can tell, published?

(c) If these documents were published, what are the citations and where have these documents been lodged where the public can have useful access to them?

(d) Important to an intelligent, independent understanding of the issues raised by the new forecasts is an understanding of the methodologies & assumptions on which they are based. If the methodologies &c are to be found in the actual forecast documents, it would be important (i) for the public to be so advised, & (ii) for the documents to be included in the EIS. If the forecast documents do not completely spell out the methodologies, &c, then documents setting out the methodologies should be included in the fSEIS or, at the very least, accurately summarized in the fSEIS and accurately cited, so that independent reviewers can consult them?

(e) Why were these critical documents not furnished to previous commenters on the DEIS and FEIS?

3-2. Ranges or hard numbers in forecasts? Do the POS and FAA forecasts referred to in the dSEIS give one hard number or a range? If a range, what is the range? If not a

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range, why not? See RCAA Comment I-9, FEIS, with which we completely concur.

3-3. When were forecasts available? (a) Why does dSEIS, p. 1-1, say that the fiscal year 1996 Terminal Area Forecast was available to regional FAA in May 1996, whereas p. 2-2 says that the FY 1997 forecast came out in December 1996?

(b) Why wasn't FY 1996 Forecast available in December 1995, if the FY 1997 Forecast was available in December 1996?

(c) What is the fiscal year?

(d) When & how was the FAA 1996 forecast referred to at p. 1-1 communicated to (i) the staff of PSRC? (ii) the Executive Board of PSRC? (iii) the membership of the General Assembly of PSRC? (iv) the representative of POS in the General Assembly of PSRC?

3-4. Does use of different years affect analysis? Does it make a difference to the projections & conclusions in the dSEIS that the new FAA traffic forecasts are based on the (undefined) fiscal year, whereas the new POS forecasts are based on the calendar year? If so, what is the difference?

3-5. What additional forecasts were considered? Ch. 2, §I A, p. 2-2, of the dSEIS, refers to the 'fiscal year 1997 Terminal Area Forecast (TAF) for [Sea-Tac]', commenting that the FY 1997 TAF showed that 'forecast demand could grow significantly faster than was predicted by the Master Plan Update'. The paragraph then continues, 'In response to these forecasts ... .'. What other forecast or forecasts, other than the FY 1997 TAF, are here referred to?

3-6. Inconsistent air-carrier load figures. At p. 2-3 of the dSEIS, describing the methodology used for FAA Terminal Area Forecasts, one reads that the TAF assumed, inter alia, that "the domestic air carrier load factor (actual percentage of passengers occuping available seats) was assumed to remain constant at 65.3%". Yet in preparing the DEIS the promoters of the Sea-Tac expansion plan and nominal authors of the DEIS represented to the public and local decision-makers that the load factors were 57 per cent. for the larger (more than 60 seats) planes and 44.5 per cent. for the smaller (less than 60 seats) planes. See RCAA comment II-36.

(a) Please explain the discrepancy.

(b) The fSEIS should provide figures based on actual Sea-Tac load factors, low and inefficient as they are.

(c) We note that among the factors described at 2-3 is a possible (not a predicted) increase of 0.039 per cent. in the number of air-carrier seats per departure, referring, as we understand the term 'air carrier' only to aircraft seating more than 60 passengers.

(d)(i) Is the explanation for the discrepancy a belief by the promoters of the project that there has been, or will be, a sudden increase in efficiency? (ii) If so, (a) how did that, or will that, happen? (b) will there be more increases in efficiency, (c) will increases in efficiency diminish, or even obviate, the asserted need for the third runway?

3-7. Obscure statement about commuter operations needs clarification. Referring again to p. 2-3, dSEIS, it is also said that commuter operations (aircraft seating 60 or less) 'could' (not 'will' or 'are likely to') rise from a 1995 load factor of 30 passengers per flight to 47.1 passengers per flight in the year 2010.

(a) Does this statement refer to the situation at Sea-Tac or all commercial airports in the U.S.?

(b) How was this possible increase in load efficiency dealt with in the FY 1997 TAF projection?

(c) What causes are suggested for such a dramatic increase in load factor (57 per cent.)?

(d) What are the conditions under which the preparers believe that this rise will take place, and what are the conditions that would prevent it from taking place? 'Could' is too vague, so tell us what the likelihood is of this event occuring.

(e) As the foregoing group of questions suggests, the practice of giving the readers disjunct, partial, summaries of critical documents, instead of the documents themselves, is almost a guaranty of confusion, ambiguity, & incompleteness.

3-8. Further vagueness in methodology discussion. Referring to the discussion, beginning at dSEIS, p. 2-4, of the methodology used in preparation of the Port of Seattle updated forecasts:

(a) How was 'demand for air travel' 'identified'?

(b) What does 'demand' mean in this context?

(c)(i) Does 'identified' in this context mean that a numerical value was derived? (ii) If so, how was that numerical value derived? (Or was it just guessed at?) (iii) If a numerical value was not derived, what does 'identified' mean in this context?

(d)(i) How was the 'extent of the constraints associated with the existing airfield, terminal facilities

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[&c.]' 'identified? (ii) Does 'identified' in this context mean that numerical values were assigned to the various factors mentioned? (iii) If not, what does 'identified' mean in this context?

(e) Could the last sentence on p. 2-4 be recast, please, to more conventional and understandable language? The expression "versus after completion of the Master Plan Update improvements" is particularly baffling.

(f) In the DEIS and FEIS, the project proponents took the position that the same number of 'operations' will occur at Sea-Tac in the foreseeable futures, whether or not the third runway is built. See Response 4-3-7, at p. R-32, for a recapitulation of the position. (i) Are the Port and FAA now abandoning that notion? (ii) If so, why? (iii) Are the Port and FAA taking the position that the same number of passengers will use the Airport in the foreseeable future, whether or not the third runway is built? Please explain.

3-9. Unexplained, dramatic decrease in Air Taxi/Commuter operations. At p. 2-6, Table 2-3 projects a decline in "Air Taxi/Commuter" operations from an observed 138,000 in year 1995 down to 110,000 by year 2010. No explanation for this remarkable decrease is provided. What is the explanation?

3-10. Unexplained, dramatic increase in commuter efficiency. At p. 2-17, FAA is said to have projected that commuter seats would jump from 30 seats per departure, at present, to 47.1 in the year 2010.

(a) What is the basis for this projection, especially in light of the somewhat justified but lesser increase in the POS forecast discussed at the same place?

(b) We may note that a co-operating person downloaded from the Internet for the purposes of these comments the materials cited in footnote 3, p. 2-3, supposedly delineating the FAA's methodology in making its TAFs, & that the file -- though it contains much of interest -- does not contain any explanation of the assumptions used in constructing the computer program that constitutes the file. Where are those assumptions published?

3-11. Unexplained inconsistency in departure-usage estimates. We note that at p. 2-17, the dSEIS reports that the POS assumes a one-seat per year increase in departure usage, and FAA, 0.35 seats per departure. This difference yields rather large divergences even in the short-term planning horizon used in the present exercise. The differences in the two assumptions, and the reasons therefor, need further discussion.

3-12. KCIA & other nearby operations not considered. Conspicuously absent from the discussion in the dSEIS is the

interrelationship between operations at Sea-Tac & operations elsewhere, especially at KCIA (also projected to experience great growth, as at least the FAA must know). At some point, the FAA, at least, must face up to the operational problems that arise & will continue to arise from having crowded so many airfields into the heart of the Central Puget Sound area: Paine Field (South Everett), the floatplane 'field' at Lake Union (Central Seattle), Renton Municipal, Sea-Tac, the Kitsap County facility, McChord AFB, and Ft Lewis. With the exception of Ft Lewis, all these facilities put ever-increasing numbers of operations over the residents of the City of Seattle. A complete environmental review of the Port's grandiose expansion plans at the Sea-Tac site should surely encompass the airside issues arising from growth in traffic at the airfields named above. When will that review be conducted, & by whom? Keep us involved, so that we can participate in the scoping & then in the rest of the environmental review of this aspect of Sea-Tac expansion.

3-13. Discrepancy between new forecasts & reported Sea-Tac experience. We note also that both forecasts, as described at p. 2-17, use air-carrier load factors for forecasting that differ radically (upwards) from experienced rates at the airport. The fSEIS should explain the reason(s) for making these forecasting assumptions.

3-14. Delays occasioned by stress on the near-by roadway system. How did the dSEIS preparers arrive at the values referred to in at pp. 2-12 and 2-14 for mean arrival and departure times for passengers? The text suggests that they are simply guesses (assumptions).

3-15. Costs of delay to air passengers. The dSEIS says, at p. 2-21, that poor weather delay costs travellers time and that that delay is described in the FEIS. Where? 'In the DEIS/FEIS process, we were given to understand that delay to passengers was not a factor in the Port's justification for the project, that the justification was delay to airline operators, that the very acceptable passenger-delay figures for Sea-Tac were irrelevant to the delay-to-operator justification. Were we wrong in that understanding? If so, how? Or, have the POS and FAA changed the ground for their justification of the project by now adding alleged passenger delays to the asserted operators delay?

3-16. Poor-weather delay vs. groundside delay. How is "poor weather" delay related, if it is, to the groundside

delay that is advanced as justification for the groundside projects? See last unnumbered paragraph on p. 2-21.

3-17. Description of delay factors inadequate. The dSEIS discussion blandly refers to descriptions of poor-weather delay factors as they affect travellers and airport users (meaning airlines?) as having been "described in the February, 1996 Final EIS". Where?

The failure of the DEIS and FEIS to have real indexes leaves users of those documents no way to find prior discussion of such issues as delay (short of re-reading all the volumes every time some such reference is made in a later document like this dSESIS, or short of constructing one's own index), unless the dSEIS provides accurate references back to prior discussions. We suggest that an actual index be provided for the FEIS and that proper cross-references be provided from dSEIS / fSEIS to any prior documents cited.

3-18. General & summarizing comments on forecasting issues. (a) It is refreshing that someone on the 'official' side of this long discussion at last admits that the forecasting of future air traffic is an arcane art, rather than an exact science. This admission would have been more useful had the new forecasts been couched in terms of ranges or statistical probability.

(b) The discussions in the dSEIS of the details of the new forecasts, the methodologies & assumptions used in the new forecasts, the degree of reliability of the new forecasts, and the interrelationships between them are incomplete, confusing. It would perhaps have been better to provide one full, complete discussion, rather than having piece-meal discussions at various places in the document. The fSEIS should improve on the discussion, as well as including the full texts of the forecast documents & reprinting or citing the documents that set forth the methodologies used in preparing the various forecasts.

(c) The conclusions reached by the authors of the dSEIS from the revised forecasts do not seem to follow from the forecasts. Rather, the informed reader glimpses through the fog two powerful realities not openly dealt with in the dSEIS: (1) The financial resources for constructing the $3000 million worth of improvements in the Master Plan Update do not exist, & no-one on the staffs of the two proponent agencies knows where such funds are likely to be found; (2) No serious engineering work on the third runway itself has been done. Neither POS or FAA has seriously addressed the difficulties of the immense proposed fill operation -- difficulties that led to a negative

recommendation for a similar project in the recent environmental review of the Albuquerque, New Mexico, airport's master plan update. As a result, staffs need more time to do (or to have done) the engineering, & to consider the hitherto-unrecognized difficulties that such work will doubtless reveal.

(d) This project, & its problems, were not adequately understood at the time that it was jammed through the PSRC. The revised traffic forecasts alone would appear to require a (full) re-examination by PSRC, as well as by the Port of Seattle Commissioners and higher, more responsible, levels within the FAA & in the office of the Secretary of the U.S. Department of Transportation.

4. Purpose & Need

4-1. Purpose & need. The dSEIS inadvertently casts serious doubt on the purpose & need discussion in the DEIS & FEIS, as well as the DEIS & FEIS prepared for the "programmatic" environmental review, under the auspices of POS & PSRC. There seems to be a retreat from the major conclusion of thosee earlier documents. Those documents asserted that there was rapidly approaching an air-capacity crisis at Sea-Tac, occasioned by rapid growth in air-passenger traffic coupled with poor-weather restrictions on use of the facility (i.e., an inability to use both runways during 'poor weather' conditions). Do the FAA and POS still stand by that earlier analysis?

4-2. Purpose & need. The earlier documents concluded (to no-one's surprise) that the solution to the predicted air-capacity crisis was construction of a third runway at Sea-Tac, lying parallel to the two existing parallel runways, but at a sufficient separation from them that the new runway could be used together with the more easterly existing runway during 'poor weather' conditions, thus accomodating an additional 100,000 operations per year. Do the FAA and POS still maintain that the proposed third runway would have the effect just described? If not, what is the position of the project proponents in this respect?

4-3. Purpose & need. In contrast to the two earlier site-specific documents (DEIS, FEIS), & the 'programmatic' EISes referred to in Comment 4-1, the dSEIS now seems to suggest that growth of passenger air traffic -- greater growth than predicted in the earlier documents -- does not require an accelerated construction schedule for the most important single measure to relieve the air-capacity crisis.

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(i) Does this mean that the DEIS and FEIS were wrong in arguing that a third runway was needed to meet traffic growth? (ii) What is the explanation for the seeming contradiction that more rapid growth requires slower implementation of the principal proposal for dealing with that growth?

4-4. Definition of 'delay' needed. The dSEIS seems to say that the project is needed to obviate costs of delay. Page 5-1 [second], second bullet point. (Why this discussion is buried in the 'Environmental Consequences' chapter is a separate question. Should it not appear in Chapter 1, Part 2 (B) 'Purpose And Need', or in Chapter 2, part 2, 'Project Purpose And Need'?) 'Delay' as used in dSEIS should be defined clearly and in an obvious location.

4-5. Support needed for assertions about costs of delay. The assertions about costs of delay appearing at dSEIS, p. 5-1 [second], are just that -- mere assertions. Citations to studies supporting the bald assertions about the costs of delay (however defined) are needed.

4-6. Discussion needed as to effects of ASQP delay. The dSEIS refers, p. 2-18, to delay as measured by the Airline Service Quality Performance (ASQP) measure. (i) We do not recall this measure being discussed in the FEIS (the absence of a citation to discussion of it in the FEIS is suggestive). (ii) There should be a citation, in standard form, to whatever study or studies support the assertions about ASQP data at dSEIS p. 2-18. (iii) The significance of the stated ASQP figures needs to be explained, particularly in fiscal terms, for Sea-Tac, and also in comparison to other airports in the U.S. (iv) The discussion at p. 5-1 [second], second unnumbered bullet point, appears to suggest that the proposed third runway would have 'saved' the airlines using Sea-Tac $24 million in 1994. What does 'saved' mean in this context? What is the relation to the ASQP data referred to at p. 2-18? (v) The fSEIS needs to explain in detail how the 'savings' of $24 million would grow to $146 million 'near the year 2013'.

4-7. How much capacity gain is predicted? (a) It may be noted that Exhibit 2-7, p. 2-26, which displays both the delay curve of Ex. 2-2 and the delay curve with the desired third runway, shows a similar (though less aburpt) marked increase in delay for the three-runway airport at about 380,000 operations per annum. The exhibit shows that the writers of the dSEIS believe that the upper limit for practical capacity of the present airport (per NPIAS) is about 445,000 operations, and the proposed airport, about

527,000; thus, according to that Exhibit, the third runway is projected to increase the practical capacity by about 82,000 operations per annum. Is this a correct understanding of the Exhibit, and of the position of the proponents, as to the increase in capacity to be gained (defined in terms of total annual operations) from construction of the third runway? If not, what should the reader understand in this respect, and why?

(b) If 82,000 additional operations per year are to be gained, as suggested in part (a) of this Comment, is there any correlatin (& if so, what?) between that increase in number of operations and the purported savings of $146 million in costs experienced by the airlines 'near the year 2013'? Or are two entirely different concepts being dealt with here?

4-8. Questions of cost effectiveness ignored. (a) Nothing is to be found in the dSEIS about the cost effectiveness of investing in a facility that will be over capacity & obsolete in a very few years --even fewer years under the new timetable than under the old one. A full discussion of this issue is needed in the fSEIS.

(b) Indeed, according to p. 2-7, the Airport is already operating above capacity (annual service volume = 380,000 operations, 1995 operations = 'nearly 387,000' operations, and 1996 operations = 392,500.) On that showing, are we to conclude (i) that the Airport can actually operate with reasonable efficiency at levels above the previously-stated capacity? (ii) that further minor 'tweaks' could extend the usefulness of the facility indefinitely without the third runway?

(c) And where is the legally mandated cost-benefit analysis?

5. Terminal and Other 'Landside' Improvements

5-1. Terminal capability. See Part II.4.B (p. 2-27).

(a) This section needs to be re-written, so that the reader has a clear understanding of what conditions are being discussed, & the dates on which those various conditions are anticipated to occur. As written, the section is too unclear to allow full analysis & discussion.

(b) The suggestion that traffic forecasts can be extended into the decade of the 2020s by a linear extension is disturbing and confusing. In ordinary usage, a 'linear extension' unless further qualified is a straight-line extension. If there is anything clear from the preceding discussion of traffic forecasting in the dSEIS it is that straight-line extensions are the least-probable occurence in

this arcane art.

(c) And from when is the linear extension to start? Where is the straight line that is to be projected?

(d) And what is meant in the second unnumbered paragraph by the expression, "if demand were to continue to grow at the current rate"? What IS the current rate? The demand graphs and tables displayed in the dSEIS to this point (see, e.g., Table 2-5, Table 2-6, Exhibit 2-45, Exhibit 2-5) show increasing rates of growth, not straight-line projections (with the exception of the Master Plan Update, which, as could have been predicted, has already been proven wrong).

5-2. Requirement for additional gates not justified.

(a) Why would more gates be needed past the activity level of 317,000 passengers per NBEG or 19 million enplanements p.a.? The discussion here needs to be fleshed out.

(b) The confusing discussion here leaves the reader with an initial impression that the activity level 317,000-passengers-per-NBEG is equivalent in some way to the activity level of 19 million enplanements p.a. Only if the reader has already perused, understood, and remembered the discussion at the top of p. 2-11 will the reader realize that the 19 million enplanement p.a. level is equivalent to 422,000 passengers per NBEG, not the lesser figure of 317,000.

(c) It is also unfortunate that the expression 'level of service' (which, one learns on careful perusal, does NOT mean level of service) is used in this discussion, leading the casual reader to think that 'service' means 'service'. This discussion would be usefully improved if some other term could be substituted for 'level of service' here. Perhaps 'groundside passenger delay' could be used, with a cross-reference to the discussion now appearing in the first full paragraph at p. 2-11.

5-3. Landside capability. Part II.4.C (p. 2-27).

(a) Surely this Part is mislabelled, for surely terminal capacity or capability is part of landside capability? It would be useful to designate this as the Airport-vicinity Roadway part.

(b) Here again 'level of service' conveys a misleading impression. Anyone unfamiliar with Sea-Tac would think that this paragraph says that there is not much ground traffic in the vicinity of the airport. It would be better to say that the roadways in the immediate vicinity are very busy and will become more so, to the extent that under applicable ICAO standards congestion will be so severe that

the roadways will be deemed inadequate at some or another date, stating the date.

(c) The text statement that the RTA plan (which?) will relieve congestion seems at odds with statements in the accompanying appendix. See Table C-1-3, which plainly states that NO passengers will use the RTA system as their means of access to Sea-Tac.

(d) Note that the RTA plan included in the Metropolitan Transportation Plan, such as it is, adopted by PSRC (or 'Region', as the dSEIS puts it) is NOT the operative plan, is NOT the plan approved by the voters.

5-4. No need for groundside enhancements. The discussion of terminal/landside contraints, p. 2-10 & seq., seems to show that in the worst-case scenario for groundside passenger delays (19 million annual enplanements), the gate-usage measure would rise to 422,200 passengers per narrow-body gate equivalent, somewhat less than the comparable measure for Pittsburgh and O'Hare in the recent past. On this measure, there is no showing of significant groundside delay for passengers at any conceivable level of enplanements. Is this is a correct reading, & if not, why not?

5-5. Groundside constraints could be met by enlargement of lobby space. Assuming that we have read the text correctly, it follows that the showing of significant passenger delay groundside under extreme growth conditions boils down to an evaluation of the average amount of floor space in the terminal lobby. The result is an assertion that at 6.6 square feet per passenger (the 17.9 million enplanements per year level) there would be unacceptable 'levels of service' (quality of service) and severe congestion (compared to an adequate 13 square feet per person in 1995) (p. 2-11). Assuming that this conclusion is valid, what should follow? Presumably, an examination of various alternative means of reducing severe congestion and degradation of passenger service on the ground. In fact, our reading is that only two alternatives are referred to in the dSEIS. One is the package of groundside projects discussed in the FEIS, which is recommended by the dSEIS for early implementation. The other alternative is described in a half sentence: "... the use of other existing check-in locations would increase the passenger per square footage of lobby space ..." (p. 2-11). In the latter half of that sentence, this alternative is discussed, and dismissed, in perhaps the shortest & least satisfactory discussion of alternatives yet seen around here: "the conditions would still likely produce a LOS [level of service] F [unsatisfactory]." Period. How did the author(s) reach

that conclusion? Surely the fSEIS needs to give a fuller discussion. At first blush, it would seem that relatively inexpensive improvements could be made to prevent the degradation of service that is posited by the dSEIS when passenger levels reach 17.9 million per year. What less-expensive improvements have been analyzed, by whom, and with what results?

6. Impacts and Mitigation.

6-1. Impacts & mitigation discussion still inadequate. The dSEIS is utterly inadequate in its discussion of impacts & mitigation thereof.

(a) The obsolete 65 LDN standard is still used. It was never an appropriate standard, was not adopted in any acceptable or scientifically defensible manner, and has been recommended for replacement by the US EPA and the Natural Resources Defense Counsel.

(b) Single-event impacts should be studied.

(c) We note the utter absence of analysis of impact of jet-aircraft exhuast fumes, including airborne particulate matter in the size range 2 to 10 microns. This omission should be cured in the fSEIS.

(d) We note the utter absence of analysis of impacts from the practice of fuel dumpiing, especially prevalent over Beacon Hill in Seattle. This omission should be cured in the fSEIS.

6-2. Impact on Seattle schools. (a) The fSEIS should examine the impacts on schools (public & private) in Seattle on the basis of 55 LDN and an appropriate SEL level.

(b) Appropriate mitigation measures should be presented after the study called for in part (a) of this comment.

6-3. Impact on property values. We note that the FEIS and the dSEIS are both silent on the issue of diminution of property values caused by jet-aircraft operations. This phenomenon is well-documented, having been most recently addressed (as the proponent agencies well know) in detail & depth by the international consulting firm HOK, conducting a mitigation & impact study in areas generally South of Sea-Tac under a State grant. Loss of property values should be candidly addressed in the fSEIS.

6-4. Loss of tax revenues. A companion issue to diminution of property values is loss of municipal & school-district revenues based on the real-property tax. This, too, is a well-documented phenomonon, & needs to be addressed forthrightly in the fSEIS.

6-5. Benefits versus harm. (a) While the dSEIS presents some useful information about origins & destinations of air passengers using Sea-Tac, it does not go far enough. The information in Table C-1-2 and Exhibit 2, and similar tables and maps, is not cross-correlated, the areas are ill-defined (ZIP codes would be beter, & such data are available). A fuller analysis would show that the users of the Airport in large measure do not live in high-impac zones. A similar analysis of residences of persons holding jobs directly related to the Airport, especially if constrained by income level, would doubtless show that the higher the income, the less likely that the employee lives in a high-impact zone.

(b) In short, lower-income areas (like Georgetown, Rainier Valley, White Center) bear a great deal of the direct adverse impacts from present & projected Sea-Tac activities but enjoy few if any direct benefits.

(c) Unfortunately, most of these same neighborhoods also bear the brunt of KCIA's activity, & some also receive noise impacts from operations based at Renton Municipal. A proper EIS would analyze ALL these impacts, instead of following the typical FAA & POS prectice of dealing with such impacts piece-meal, airfield by airfield. There obviously are cumulative impacts, which should be studied & reported on.

(d) Useful work on this subject was shown in the preliminary draft of the hOK study (which, we know, was shared with POS); the fSEIS should seize the opportunity to deal with the unequal distribution of supposed benefits and known detrimental impacts.

6-6. 'Environmental Justice' Executive Order. The FAA at least is bound by Executive Order 12898. It is not even mentioned, so far as we can tell, in the dSEIS. Why not?

6-7. Water quality. (a) It seems likely that the greatest impacts on water quality from the project will fall in areas literally adjacent to the Airport, including the underlying aquifer (not even discussed in the dSEIS as far as we could tell). We leave it to others to comment in detail on the inadequacies of the discussion of these issues. But we observe that the discussion seems superficial.

(b) Insofar as water-quality issues concern the City of Seattle directly, we note that there is NO discussion of this possibility -- yet the City is now overflown by exhaust-producing, fuel-dumping, Sea-Tac traffic day & night, with more to come, sooner than predicted. No impacts? Impossible.

7. Miscellaneous Comments

7-1. Capacity limits arising from travelling public's preferred usage times. Where in Appendix R (the response-to-comments Appendix of the FEIS) are readers to find the discussion of limits on the airport's capacity caused by the travelling public's desire to travel at certain times? (See dSEIS 2-10.)

7-2. Helpful exhibits. Exhibits 2-4 and 2-5, p. 2-16, are particularly useful and easy to understand. They should be retained in the fSEIS. We found especially helpful the two-scale presentation in Ex. 2-4.

7-3. Lists of Tables, Exhibits. It would be helpful in the fSEIS to havea tables listing the tables and exhibits.

7-4. Better Table of Contents. There are independent documents contained in the Appendices that are not separately identified in the present Table of Contents. All documents should be separately identified.

7-5. Working papers. One finds at dSEIS, p. 2-7, *n.* 5, a reference to a working paper prepared for this exercise.

(b) We deprecate the practice of doing the 'grunt work' of environmental reviews in working papers that are not included as part of the dSEIS released for public comment & we ask that the proponents of the project put an absolute end to this practice.

(b) All such papers should be included in the dSEIS, & in the fSEIS.

(c) A full listing of such papers should be included in all draft and final EISes.

(d) If not included in draft EISes, they should be distributed with such drafts.

7-6. Secrecy. We deprecate the practice of hiding the identity of those who act for public agencies in writing EISes. What is to be lost by putting the blame (or, credit) where it belongs? We ask that the fSEIS state the authorship of its various parts clearly & unmistakeably. This is particularly important in the case of the FAA, with its incomprehensible multi-level structure of authority. We know who the principal actors are for the Port -- though not necessarily the identity of consultants -- and can evaluate their work accordingly. But it would seem from the dSEIS that insofar as the FAA is concerned, the leval of approval and participation may be anything from a direct & personal approval by the Secretary of the U.S. Department of Transportation or only the approval of Dennis Ossenkop, and anything in between. This is most unsatisfactory.

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March 31, 1997

Mr. Dennis Ossenkop
Northwest Mountain Region
Airports Division
Federal Aviation Administration
1601 Lind Avenue SW
Renton WA 98055-4056

G-374-1

Dear Mr. Ossenkop:

Thank you for the opportunity to review the draft supplemental environmental impact statement (DSEIS) for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, proposed by the Federal Aviation Administration and the Port of Seattle (Port). Staff from several programs have reviewed the DSEIS and their comments are included below. The Department has also reviewed the air conformity analysis and comments are being sent under separate cover.

- Page 1-10: Construction Impacts -- The DSEIS mentions that On-Site Borrow Source #5 will not be used as a source of fill material. This appears to be in response to water-quality related concerns expressed in several comment letters. Ecology supports this decision as a way to avoid groundwater and drinking water contamination. However, later in the document, Borrow Source #5 is described as the future location of an employee parking lot (see page 5-5-7 and page A-2, Response to Comment). This proposed use could result in similar water quality concerns as were expressed in the comment letters. If this site is being considered for use as a parking lot (or for any other use), the effects should be fully analyzed.

- Page 1-11: Biotic Communities, Floodplains, and Wetlands -- Generally, Ecology looks for compensatory mitigation for wetland and aquatic resource impacts at or near the site of a proposed project. We understand the safety concerns behind the Port's decision to focus its mitigation efforts away from the airport, and we concur with the proposal to minimize "wildlife attractions" within 10,000 feet of any active runway. We also concur with the decision that mitigation for hydrologic functions lost due to the expansion project occur at or near the airport site. As part of the mitigation for lost hydrologic functions, however, we expect to see some habitat mitigation that will not result in danger to aircraft -- for instance, habitat for fish, amphibians, and small passerine birds that use the riparian areas. This section of the Final SEIS (FSEIS) should clarify that mitigation at or near the airport will

include some wildlife habitat for those species that do not present a safety hazard to aircraft. This should also be clarified throughout the document, especially in Section 5-5.

- Table, Page 1-11 -- This table includes a 1.7 acre wetland impact due to the South Aviation support Area (SASA). Ecology understands that the permit application being reviewed by the Corps of Engineers (Corps) does not include the SASA area, and that this area of wetland impact is not considered a part of the third runway expansion project. However, if the proposed SASA is likely to be considered for permit review in the near future, Ecology would support an effort by the Port to provide mitigation now for the potential 1.7 acre wetland loss. Including mitigation now in advance of this potential wetland loss could allow a successful mitigation site to develop before the impact takes place, and depending on the size and type of mitigation, could result in either a lower ratio of required mitigation or mitigation credit.

- Pages 4-6 and 4-7: Local Land Use Actions -- If a water quality certification is issued for the proposed project, it will be provisional upon compliance with all applicable state aquatic protection regulations, including those required by the State Environmental Policy Act (SEPA) and the Growth Management Act (GMA). The Port should work with the surrounding jurisdictions to ensure that comprehensive plans in those affected communities include recognition of the proposed airport expansion project and are in compliance with the GMA.

- Page 5-4-1: Construction Impacts -- Project-related impacts to wetlands or other waters of the state will be addressed during the 404/401 permit process. This includes any impacts at on- or off-site borrow sites used to supply fill material for the proposed project. Any proposed sources of fill material added after completion of this DSEIS should be fully analyzed in the FSEIS and/or the 404/401 permit review.

- Page 5-4-2: Off-Site Borrow -- Sites used to offload barged fill material for the proposed project may need a new shoreline permit, or may require that the proposed activity is authorized under an existing shoreline permit. This includes the Des Moines Creek conveyor system as described on page 5-4-6.

- Pages 5-4-11 and 12 -- All of the borrow sites will required to comply with the NPDES and State General Sand and Gravel Permit. This permit contains conditions, such as the requirement to implement an Erosion and Sediment Control Plan, that are intended to prevent impacts to waters of the state. The requirement to obtain these permits will be a condition of any water quality certification issued for the proposed project.

- Page 5-4-36: Table 5-4-8 -- Applicable provisions of the Construction Best Management Practices described in this table will probably be included as conditions of any water quality certification issued for this proposed project.

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- Section 5-5: Biotic Communities, Wetlands and Floodplains -- This section will receive a fuller and more detailed review as part of the Section 404/401 permit review process and when final proposed plans are developed.

- Page 5-5-1 -- The DSEIS states that sections of two creeks will require realignment due to the proposed project. About 200 feet of Des Moines Creek will be realigned due to runway expansion and about 2,200 feet will be realigned due to SASA. Even if SASA is handled as a separate permit application, the Port should consider including the entire length of the realignment in its 404 permit application to the Corps if the SASA will be proposed in the near future. This may minimize impacts to the creek by allowing all the work to be done at once rather than in two or more stages.

- Pages 5-5-1 through 5-5-9 -- The project impacts to wetlands have been increased by nearly 20 percent, from 10.4 to 12.23 acres. Ecology staff spent two field days last year reviewing the impact areas and the proposed mitigation site. Most of the wetlands being affected are highly degraded wetlands in a highly urbanized area. Given the low quality of the affected wetlands, we believe the increase in impact area is not significant and can be mitigated. The hydrologic and water quality functions currently provided by the affected wetlands will be mitigated on-site, within existing drainage basins. The wildlife habitat-related functions provided by the wetlands will be mitigated for at the off-site mitigation area next to the Green River in Auburn. The wetland impacts will be closely examined during the Army Corps Section 404 permit process. Ecology will conduct a concurrent evaluation during the review for the Section 401 Water Quality Certification that is attached to the 404 permit. At that time, we will negotiate mitigation ratios and mitigation performance standards.

- Pages 5-5-2 and 5-5-9 -- The DSEIS describes two options for routing South 154th/South 156th Streets around the Runway Safety Areas (RSAs) at the north end of the proposed runway expansion. Option 1 would affect 2.34 acres of wetlands, and Option 2 would affect 3.04 acres of wetlands. These two options represent about one-quarter and one-third of the proposed project's direct wetland impacts. In addition, one proposed scenario includes routing the streets through a tunnel under the RSA, which would result in significant avoidance of wetland impacts. The DSEIS describes this scenario as the most costly, but there is no breakdown of the associated costs. These should be fully analyzed as part of the FSEIS and the Alternatives Analysis required through the Corps' Section 404 permit review.

- Pages 5-5-17 through 5-5-21 (also Page 5-7-4 and the Miller Creek Relocation Plan for Proposed Master Plan Update Improvements at Seattle-Tacoma International Airport [Parametrix, December 1996]) -- The DSEIS states that hydrologic functions (water quality, flood storage, and stormwater storage) lost in the Miller Creek Basin due to the proposed project will be mitigated with a replacement ratio of at least 1:1. This ratio should be increased if the proposed project will result in increased hydrologic inputs to the Miller Creek basin (e.g., increased "flashiness" of flows, change in overall conveyance of stormwater, etc.), or would result in a need for increased capacity to buffer exceedances of physical,

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chemical, or biological water quality standards. In addition, the proposed relocation of Miller Creek, as described in the above-referenced Relocation Plan, shows that two rather severe angles are part of the main channel design. The design and contingency plan for the stream relocation should recognize that the stream will likely evolve into a different channel configuration with smoother curves and different accretion/deposition areas than the design calls for. The plan should allow for more "wiggle room" (literally) so the channel can locate itself based on the actual hydraulics of the stream.

- Appendix A, Page A-1 Response to Comment -- Ecology would likely support efforts by the applicant to include appropriate riverbank stabilization on the Green River as part of the mitigation for the proposed project. Part of our analysis during the water quality certification review is to determine whether the mitigation site will be successful, and bank stabilization may be necessary to ensure that the mitigation site is protected in a way to allow success.

- The DSEIS forecasts a 40% increase in jet fuel usage by the year 2010. The document does not discuss how this increase in fuel usage will be accomplished without causing further contamination of the soil and groundwater at Sea-Tac Airport. This issue should be addressed in the FSEIS or during the permitting process.

If you have questions regarding the above comments, please contact Mr. Mike Rundlett (206/649-7010) or myself (360/407-6907).

Sincerely,

David Bradley
Section Supervisor
Environmental Review and Sediment Management Section

EIS 953377
SEPA 9700799

cc: Mike Rundlett, NWRO
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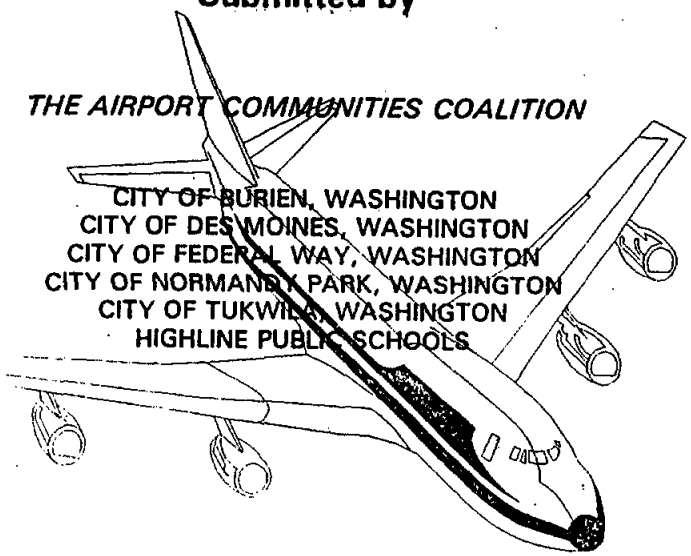
COMMENTS ON THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MASTER PLAN UPDATE DEVELOPMENT ACTIONS AT SEATTLE-TACOMA INTERNATIONAL AIRPORT

Submitted by

THE AIRPORT COMMUNITIES COALITION

CITY OF BURIEN, WASHINGTON
CITY OF DES MOINES, WASHINGTON
CITY OF FEDERAL WAY, WASHINGTON
CITY OF NORMANDY PARK, WASHINGTON
CITY OF TUKWILA, WASHINGTON
HIGHLINE PUBLIC SCHOOLS



March 31, 1997

Prepared for Submission

to

The Federal Aviation Administration and the Port of Seattle

by

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EXECUTIVE SUMMARY

- **THE PORT HAS SIGNIFICANTLY CHANGED THE SEA-TAC EXPANSION PLAN**

  - ✓ The Port previously stated that a new third runway was urgently needed at Sea-Tac: that without an additional runway, the Airport would experience intolerable delays during poor weather conditions. *The Port now is saying that a new runway is a second priority which can wait for almost ten years while it builds a new terminal, parking garage and internal roadways.*

  - ✓ The Port consistently says that poor weather conditions occur at Sea-Tac 44 percent of the year. *An accurate analysis of actual weather conditions shows that poor weather often occurs in the middle of the night when no planes are flying into or out of Sea-Tac, and that overall poor weather conditions only occur 2.8 percent of the time during peak arrival periods.*

  - ✓ The Port warns that unless the Airport is expanded, passengers would suffer substantial delays and inconvenience. *The Port acknowledges, however, that even without the proposed expansion, Sea-Tac would be able to accommodate all of the passengers likely to use the Airport for at least the next 12-15 years.*

  - ✓ The Port assured the region that the proposed third runway would be used to handle no more than 12 percent of arriving aircraft, and therefore, it would do little to increase the amount of aircraft noise to which the community would be subjected. *The Port and the FAA now admit that a third runway will be used to handle approximately 44 percent of arrivals by 2010.*

  - ✓ The Port previously stated that the same number of aircraft operations would occur at Sea-Tac with or without a third runway. *The Port now concedes that as many as 170,000 more aircraft operations would occur at Sea-Tac if a third runway is constructed.*

  - ✓ The Port claimed last year that the proposed third runway would cost less than $455 million. *The Port now admits that the cost of the runway really is $587 million, which does not include the cost of debt service, long-term inflation, and the inevitable cost overruns which could push the price tag up to $1 billion.*

The Draft SEIS Demonstrates That The Third Runway Is Unnecessary To Accommodate All Of The Passengers Wanting To Use The Airport For The Foreseeable Future And Will Not Meet The Long-Term Capacity Needs Of The Puget Sound Region.

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- **THE PORT AND THE FAA HAVE NOT SERIOUSLY CONSIDERED ALTERNATIVES TO A THIRD RUNWAY**

  - ✓ The Draft SEIS ignores the effects of using technological improvements to increase the capacity of the existing two runways. *Current and near-term technology would allow the existing two runways to accommodate additional aircraft operations in less than optimal weather conditions.*

  - ✓ The Draft SEIS insists that only an 8,500-foot runway would meet the need for additional capacity at Sea-Tac. *A shorter runway could satisfy the asserted need for increased poor weather aircraft arrival capacity.*

  - ✓ The Draft SEIS, like the FEIS, insists that the region's need for additional airport capacity could only be met at Sea-Tac. *Data in the Draft SEIS, however, indicates that sufficient passenger demand would exist in 2010 to make a supplemental airport competitive with Sea-Tac.*

  - ✓ The Draft SEIS ignores the possibility of diverting commuter aircraft to another airport within the region. *Recent airline industry trends show an increased emphasis on point-to-point service by commuter planes, making the diversion of commuter operations a realistic means of relieving capacity problems at Sea-Tac.*

The Draft SEIS Does Not Consider Alternatives Which Could Make Construction Of The Third Runway Unnecessary.

- **THE PORT AND THE FAA SERIOUSLY UNDERESTIMATE THE ENVIRONMENTAL CONSEQUENCES OF THE EXPANSION PROJECT**

  - ✓ The Draft SEIS refuses to examine the environmental impacts of the proposed third runway beyond the year 2010, even though the runway would not be operational until 2005, at the earliest. *Thus, the Draft SEIS obscures and grossly underestimates the actual extent of environmental impacts which will be caused by the construction and operation of a third runway.*

  - ✓ The Draft SEIS addresses only the impacts which would result from 474,000 operations projected to occur by 2010. *Since the Master Plan Update improvements could accommodate as many as 630,000 operations, the Draft SEIS should have examined the impacts caused by that maximum number.*

The Draft SEIS Trivializes Substantial Negative Impacts Of The Third Runway On Air Quality, Local And State Roads, Parks, Schools And The Quality Of Life In The Region.

- **NOISE WITH THE THIRD RUNWAY WILL BE GREATER THAN TODAY**

  ✓ The Draft SEIS states that in the future, even with a third runway, fewer people would be exposed to unacceptable noise levels than are subjected to those levels today. *Since the Port already has achieved most of the possible noise reductions from its Mediated Noise Agreement and from the phase-out of noisier Stage 2 aircraft, the increased numbers of operations at Sea-Tac resulting from a third runway will cause more people to be exposed to high noise levels.*

  ✓ The Draft SEIS minimizes the noise impacts of the proposed third runway by only addressing the noise effects attributable to the 474,000 operations it projects for the Airport for the year 2010. *The Draft SEIS should have analyzed the noise impacts for alternative numbers of operations, including the 585,000 operations projected for 2020 and the 630,000 maximum number of operations which the Airport could accommodate with the third runway.*

  ✓ The Draft SEIS does not consider increased noise levels which will interfere with instructional activities in the schools in the vicinity of Sea-Tac. *The Draft SEIS ignores the interference with speech and learning which will result from increased operations at Sea-Tac.*

Inaccuracies, Omissions, Errors And Implausible Assumptions Result in a Misleading and Unrealistic Evaluation Of Noise Impacts In The Draft SEIS.

- **CONSTRUCTION IMPACTS HAVE NOT BEEN FULLY REVEALED**

  ✓ The Port previously stated that 23 million cubic yards of fill dirt would be required to construct the projects in the Master Plan Update. *Now the Port admits that although it does not really know how much fill will be required, it will take at least 26 million cubic yards.*

  ✓ The Draft SEIS underestimates the amount of fill that will be needed and the number of truck trips that will be required. *The natural "shrinkage" and "swelling" of the fill material will require a significantly larger number of trucks to transport the fill than indicated in the Draft SEIS.*

  ✓ The Draft SEIS indicates that extending the time for transporting fill dirt would be less disruptive to the community. *Transporting over 26 million cubic yards of fill dirt for five years – rather than the 2½ years previously indicated – will prolong the region's exposure to extreme traffic congestion and dangerous road conditions.*

  ✓ In order to supply the maximum amount of fill from "on site" sources, the Port will have to conduct massive excavation of property it owns in neighboring communities. *The Draft SEIS ignore the consequences of strip-mining on local water resources, neighborhood character and the potential for future development.*

The Draft SEIS Downplays The Negative Impacts On Communities – Both Near To, And Far From, The Airport – Of Mining And Transporting Over 26 Million Cubic Yards Of Fill.

- **THE THIRD RUNWAY PROJECT WILL DEGRADE AIR QUALITY**

  ✓ The Draft SEIS states that a third runway would not contribute to the deterioration of regional air quality even with a substantially greater number of aircraft operations and more surface traffic. *It is preposterous to assert that air pollutants emitted by aircraft during take-offs would decrease even though the number of departing aircraft will increase.*

The Draft SEIS Ignores Scientific Evidence That Construction Of A Third Runway At Sea-Tac Would Increase Air Pollution In The Puget Sound Region.

- **ADDITIONAL SURFACE TRAFFIC RESULTING FROM EXPANSION OF THE AIRFIELD WILL ADD TO ALREADY-CONGESTED ROADS**

  ✓ The Draft SEIS minimizes the effect of Airport-bound vehicles on commuter traffic and does not analyze the effect of increased operations at Sea-Tac on surface traffic during the peak hour of Airport activity. *Since many more people will be arriving at, and departing from, the Airport during peak periods than was revealed in the Draft SEIS, the effect on surface transportation and traffic conditions was substantially underestimated.*

The Draft SEIS Underestimates The Impact Of The Third Runway Project On Surface Transportation Facilities In The Puget Sound Region.

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- **THE PORT AND THE FAA IGNORE THE SOCIO-ECONOMIC IMPACTS THAT AN EXPANDED AIRPORT WILL HAVE ON SURROUNDING COMMUNITIES**

  ✓ The Draft SEIS overemphasizes the positive economic impacts of Airport expansion and minimizes the financial, social and economic costs to neighboring communities. *The widely dispersed economic gains which might result from Airport expansion do not off-set the localized economic and social deterioration which this $3.3 billion airport expansion project will create.*

  ✓ The Draft SEIS does not consider the spiraling process of economic and social deterioration of neighborhoods that results from high levels of aircraft noise and other negative environmental impacts associated with airport operations. *The proposed expansion of Sea-Tac is likely to have a negative effect on the price of residential housing leading to lower property values and declining property tax collections coincident with an increased demand for enhanced social services and police protection.*

The Draft SEIS Contains No Discussion Of The Effect Of The Expansion Of Sea-Tac On The Social And Economic Fabric Of Neighboring Communities.

- **THE PORT AND THE FAA HAVE SHIRKED THEIR RESPONSIBILITIES TO EXAMINE REASONABLE MITIGATION MEASURES**

  ✓ The Draft SEIS erroneously assumes that little mitigation would be required, because it seriously underestimates the environmental impacts of the Airport expansion proposal. *Major mitigation actions will be required to address the serious negative environmental impacts of increased noise, air pollution, congested streets and highways and the overall deterioration of the quality of life in the South King County and Puget Sound region.*

  ✓ The State Legislature appropriated $500,000 for an objective study of the projected environmental, transportation and socio-economic impacts associated with the expansion of Sea-Tac and of appropriate mitigation measures. *The Draft SEIS totally ignores the state-funded independent Airport Impact Mitigation Study.*

The Cursory Discussion Of Mitigation Measures In The Draft SEIS Does Not Address The Substantial Negative Impacts Of The Proposed Airport Expansion On The Overall Quality Of Life In South King County And The Entire Puget Sound Region.

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1.0 INTRODUCTION

The cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila, Washington and the Highline School District (known as the Airport Communities Coalition or the "ACC"),[1] individually and collectively submit these Comments[2] on the Draft Supplemental Environmental Impact Statement ("Draft SEIS" or "DSEIS") prepared jointly by the Federal Aviation Administration ("FAA") and the Port of Seattle ("Port") for the proposed Master Plan Update development actions at Seattle-Tacoma International Airport ("Sea-Tac" or "Airport").[3] The DSEIS is proffered by the FAA and the Port in fulfillment of their respective obligations under the National Environmental Policy Act ("NEPA")[4] and the Washington State Environmental Protection Act ("SEPA").[5]

The ACC and its constituent members previously have submitted extensive comments on the Draft Environmental Impact Statement ("DEIS")[6] and the Final

[1] The Airport Communities Coalition ("ACC") is a voluntary association of local governmental entities created and established pursuant to state law and Chapter 39.34 of the Revised Code of Washington ("RCW").

[2] In preparing these Comments, the ACC relied upon the expertise of the consultants listed on the inside cover page of this document. Their contributions are reflected in the body of these comments, as well as in separate reports appended to this document.

[3] Fed. Aviation Admin. and Port of Seattle, Draft Supplemental Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport ("DSEIS") (Feb. 1997).

[4] 42 U.S.C. §§ 4231-4370d.

[5] Chapter 43.21C RCW.

[6] Airport Communities Coalition, et al., Comments on the Draft Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport ("DEIS Comments") (Aug. 3, 1995).

Environmental Impact Statement ("FEIS")[7] for this proposal. Because the DSEIS perpetuates most of the flaws and omissions in the DEIS and FEIS, the ACC's earlier comments remain in effect and are incorporated by reference into these Comments.[8]

Since the publication of the FEIS in February 1996, the Port and the FAA have recalculated the numbers which form the basis for this project – the forecast of aviation demand for Sea-Tac. According to the FAA, a Supplemental EIS was necessitated by the fact that the original forecast developed for the Master Plan Update has been surpassed by a higher-than-estimated rate of growth in operations: in 1996 Sea-Tac experienced more actual operations than the number forecast for 2005.[9] This discrepancy initially was identified in the FEIS – in a footnote to an appendix[10] – but its implications for the

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[7] Letter from Perry M. Rosen, Cutler & Stanfield, L.L.P. (Counsel to the ACC) to Dennis Ossenkop, FAA Northwest Mountain Region, and Barbara Hinkle, Health, Safety and Environmental Management, Port of Seattle (Mar. 18, 1996).

[8] In addition to its comments on the DEIS and FEIS, the ACC submitted a request to the Puget Sound Regional Council ("PSRC"), pursuant to the Washington State Environmental Protection Act and in accordance with Washington Administrative Code ("WAC") 197-11-600(4)(d) and PSRC Resolution EB-92-02, Section 7, that a Supplemental EIS be prepared for the amendment of the Metropolitan Transportation Plan to include a third runway at Sea-Tac. The ACC's request was denied by the PSRC. In taking this action, the PSRC chose to rely upon existing environmental documentation, including the FEIS for the Master Plan Update. The ACC's SEIS request and the reports appended thereto are incorporated by reference into these Comments. See letter from Peter J. Kirsch and Sarah M. Rockwell, Cutler & Stanfield, L.L.P. to Norman Abbott, PSRC Responsible SEPA Official (June 11, 1996), attached to these Comments as Appendix A.

[9] The Master Plan Update projected 392,500 operations for 2005. DSEIS at 2-2. Actual operations in 1996 reached 395,216. See Chris Greana, Passenger Volume Soars at Sea-Tac, South County Journal (Mar. 26, 1997) A-6.

[10] FEIS at R-9, n. 5.

environmental analysis contained in the body of that document were ignored.[11] As a result of these forecasting errors, the FEIS significantly underestimated the number of aircraft that would be using the expanded Airport in any given year, and discounted the project's environmental impacts significantly.

Under both NEPA and SEPA, a Supplemental EIS is intended to be more than an errata sheet. New or corrected information must be considered in light of the overall project, and its implications for the project's purpose and need as well as its environmental impacts must be thoroughly analyzed. As these Comments will show, the revised forecast numbers have far greater repercussions than the DSEIS portrays.

Although the need to prepare a Supplemental EIS presented the FAA and the Port with a chance to correct some of the many errors in the FEIS, they have chosen to ignore the fundamental deficiencies in their previous analysis. For example:

- Even though the Port and FAA now concede that there will be an increase in the level of aircraft operations if the third runway is constructed, they limit the environmental analysis to the 2010 forecast, providing them license to wholly ignore most of the adverse impacts that actually will result from this project;
- While the DSEIS acknowledges some of the mammoth construction impacts of the project, the Port proposes dealing with these not by finding ways to alleviate the negative effects, but by stretching them out – which means that dirt hauling trucks will now spend two more years cluttering up the roads in South King County;
- Even though the Port has revised its cost estimates upward by hundreds of millions of dollars to include such previously missing line items as construction contingency ($15 million), sales tax ($32 million) and inflation, and it still has no visible financing plan

[11] The Port consciously avoided public discussion of the implications of the FEIS' erroneous forecast data, even after the FAA made it clear that revised forecasts would necessitate additional analysis. See Anita Risdon, Public Affairs Strategy: Change in Forecasting Numbers ("Risdon Memorandum") (Aug. 22, 1996), attached to these Comments as Appendix B.

in place, the Port continues to assure residents of South King County that it will not raise taxes;

- Although the DSEIS reveals that noise, air quality and traffic impacts would be worse than previously thought, the Port neither identifies nor commits to implement additional mitigation measures;
- The revised forecasts project a level of operations which could support a supplemental airport, yet the DSEIS fails to analyze this alternative in any meaningful way;
- Despite concluding that an additional runway is not needed until 2005 – five years later than originally planned, the Port persists in its claim that the third runway is designed solely to address an existing need.

Rather than taking this opportunity to re-evaluate the wisdom of the project and to reconsider alternatives which would meet the region's needs at a lower financial and environmental cost, the Port continues to adhere to a 1994 runway expansion plan[12] which has been overtaken by events and which cannot be justified even on the basis of higher forecasts. By adopting an approach which, at best, would meet regional air capacity needs for five to ten years at an enormous cost, the Port squanders valuable financial and political resources which could be invested in developing the facilities which are needed to provide adequate air transportation capacity to the region well into the twenty-first century. In refusing to re-examine either the rationale for the proposed project or reasonable alternatives to its full-scale implementation, the Port and the FAA have hampered the region's ability to reach an optimal solution to both short-term and long-term regional aviation needs – and violated SEPA and NEPA in the process.

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[12] P&D Aviation, Airport Master Plan Update for Seattle-Tacoma International Airport, Technical Report No. 6: Airside Options Evaluation (Sept. 19, 1994).

2.0 PURPOSE AND NEED

The statement of purpose and need for a proposed action serves as the foundation for the analysis of environmental impacts under NEPA and SEPA. The project's purpose must be defined in reference to the underlying needs which it is meant to address. Because the purpose and need for the project drive the identification of reasonable alternatives, any change in underlying needs or revisions to the approach being taken to meet those needs must be fully disclosed and analyzed in the environmental documentation. The DSEIS fails to comply with this fundamental tenet of NEPA and SEPA.

The DSEIS provides the justification for a package of landside improvements while it demonstrates that a third runway is not only unnecessary but also would be incapable of meeting the future air transportation needs of the Puget Sound region. The Port and the FAA have reordered the sequence of the projects included in the Master Plan Update to address a set of circumstances and projections which differ significantly from those presented in the previous environmental review documents, but deny the full implications of the revised forecast on the purpose and need for the project. The significant alteration in the purpose and need for the proposed Master Plan Update development actions requires the FAA and the Port to examine *de novo* alternative means of addressing the demand for aviation services in the Puget Sound region.

2.1 THE PORT HAS FUNDAMENTALLY RESTRUCTURED ITS PROPOSED PROJECT

The original rationale behind the proposal for a third parallel runway at Sea-Tac was to reduce poor weather delay, which is predominantly arrival related.[1] With the publication of the DSEIS, the Port has changed its tune. The urgent need for improved poor weather arrival capacity appears to be not so urgent after all. The DSEIS states that "[t]he third parallel runway is proposed to address an existing operational constraint that exists during poor weather – the limitation to a single arrival stream,"[2] yet the Port also says that a new runway can be deferred until 2005. By that time, operations are projected by the Port to reach 445,000[3] – an increase of more than 25 percent over the level of operations experienced at the Airport in 1994,[4] when the Port's consultants identified an existing poor weather capacity shortfall.[5] Delays caused by poor weather conditions appear to have become less of a concern, even though the forecast number of operations has increased by 17 percent, and the weather forecast is unchanged. Instead, according to the Port, landside facilities now constitute the more imminent constraint on Sea-Tac's ability to meet the aviation needs of the region.

[1] FEIS at IV.1-1.

[2] DSEIS at 2-19 (emphasis addded).

[3] DSEIS, Table 2-5 at 2-13.

[4] Sea-Tac experienced 339,500 operations in 1993. P & D Aviation, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport: Unconstrained Aviation Forecast Update, Table 1-2 at 1-6 (Port of Seattle Working Paper No. 1, Jan. 2, 1997) ("Working Paper No. 1").

[5] P&D Aviation,Technical Report No. 3. at 2-3.

By placing the need for landside improvements ahead of runway expansion, the Port has re-conceived its entire project. The third runway is not even afforded coequal status with the terminal and other landside projects – it has been relegated to a desirable but not urgent category. Indeed, the Port's approach to the need for the new runway can best be characterized as "hurry up and wait." The FEIS reported that the runway was desperately needed to accommodate all of the passengers that were forecast to use Sea-Tac. When, through the SEIS process, the Port and the FAA determined that their original forecasts were too low and that many more people would be using the Airport than originally forecast, the Port's response was to delay the construction of the runway, concluding that it now isn't needed as quickly as all the original planning had concluded. Such "logic" clearly reveals that there is no pressing need for the third runway, and that the Port is working from stale assumptions and an outdated examination of alternatives.

This re-ordering of priorities reveals the true impetus for the third runway: increasing capacity in all weather – a purpose and need that has not been studied in any environmental document produced by the Port or the FAA. The Port's unstated intent to use the new runway to maximize overall Airport capacity also is reflected in changed assumptions about its usage. Whereas the Port previously maintained that the third parallel runway would be used only for about 12.1 percent of arrivals and 2.6 percent of departures,[6] the DSEIS states, without exposition, that about 44 percent of arrivals would

[6] FEIS at IV.1-1.

be expected to use the new runway by 2010.[7]

Thus, the justification for the entire Airport expansion has changed considerably. The primary need articulated in the DSEIS is to accommodate the 38 million annual passengers projected to be using the Airport in 2010.[8] In light of the higher demand identified in the Port's revised forecasts, improvements in landside facilities have been transformed from a long-range goal to an immediate need.[9] According to the DSEIS, the new forecast numbers "show a potential need to accelerate, sooner in time, the terminal and landside facilities."[10] In balancing airside and landside needs, the Port now has concluded that terminal and other landside improvements take precedence over airside development in both timing and the allocation of financial resources.[11]

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[7] DSEIS at 5-3-4. This quantum leap in usage, which goes unmentioned elsewhere in the DSEIS, is in keeping with statements made by the FAA. See letter from C. Roger Wall, Program Director for Air Traffic Operations, Federal Aviation Administration, to Wilton Viall (Sept. 24, 1996) (asserting that "dual arrival streams [using the proposed third runway] will be used whenever the volume of traffic dictates this. This will be true in nearly all weather conditions.") (emphasis added). This letter is attached to these Comments as Appendix C.

[8] DSEIS at 2-27.

[9] Landside facilities were previously identified as needing improvement sometime before 2020. FEIS at I-19.

[10] DSEIS at 1-4.

[11] DSEIS at 3-7.

2.2 THE DRAFT SEIS DEMONSTRATES THAT THE THIRD RUNWAY IS UNNECESSARY TO MEET IDENTIFIED NEEDS

2.2.1 The Third Runway is Unnecessary to Meet Projected Passenger Demand

The Port's revised forecast projects that by 2010, approximately 35.8 million passengers will use Sea-Tac on an annual basis.[12] The forecasting methodology used by both the FAA and the Port assumes that sufficient airfield capacity will be available: on that basis, Sea-Tac is projected by the Port to experience 474,000 operations in 2010.[13] When constraints associated with the existing airfield, terminal facilities, support facilities, and the landside/roadway system are taken into consideration, the Port caps its forecast at 460,000 operations, producing a "constrained" forecast.[14] However, the Port projects the same number of enplanements under the constrained and unconstrained forecasts.[15] In other words, the Airport could be expected to handle the same number passengers with or without construction of the third runway.

If the existing airfield would accommodate the projected number of passengers through 2010, then the rationale for constructing a third runway cannot be to accommodate projected increases in passenger demand. According to the DSEIS, the existing Airport would be able to handle the same projected number of passengers

[12] Working Paper No. 1 at 1-9. The Port's revised forecast projects 17.9 million enplanements in 2010. DSEIS at 1-2. Enplanements are approximately half of total passengers. FEIS at I-7.

[13] DSEIS at 1-2.

[14] DSEIS at 1-3.

[15] DSEIS, Table 1-2 at 1-3.

without a new runway primarily through a spreading out of operations throughout the day.[16] Under the "constrained" scenario, "passenger behavior would evolve as congestion mounts, without a loss in demand until the maximum airfield operating capacity is exceeded."[17] Additional "modest adjustments" – an average increase in aircraft size of one seat and an increase in the load factor of each aircraft of one percentage point – would make up the rest of the difference between the "constrained" and "unconstrained" level of operations.[18] These adjustments were judged by the Port's consultant's to be "feasible and reasonable responses by airlines" to the constraints of the existing airfield.[19]

If one accepts the Port's numbers at face value, the existing airfield could and would continue to satisfy passenger demand through the planning period. This conclusion exposes the fallacy of building a third runway to meet "demand." Since demand comes from passengers wishing to travel, not aircraft clamoring to be flown, construction of the third runway would do nothing more than allow 14,000 more planes to fly in and out of Sea-Tac, each emitting noise and pollutants, without any greater benefit to the economy of the region.

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[16] DSEIS at 2-11 to 2-13; P&D Aviation, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport: Airport Capacity Analysis 1-5 (Port of Seattle Working Paper No. 2, Jan. 2, 1997) ("Working Paper No. 2").

[17] DSEIS at 2-7.

[18] Working Paper No. 2 at 1-5.

[19] Working Paper No. 2 at 1-5.

2.2.2 The Third Runway is Unnecessary to Address Existing Problems

Although higher than anticipated growth in passengers over the past few years could be expected to bolster the Port's claim that an expanded airfield is urgently needed, the data and analysis in the DSEIS provide support for the opposite conclusion. In fact, far from offering compelling justification for spending over half a billion dollars and subjecting the region to significant environmental impacts, the DSEIS includes convincing evidence that a third runway at Sea-Tac is an even bigger boondoggle than previously alleged by its harshest critics.

The premise of the Master Plan Update and previous environmental studies was that the existing Airport would become severely congested when activity surpassed the "annual service volume" of the airfield, identified as approximately 380,000 annual operations.[20] This number previously was interpreted by the Port as "an ultimate limit on the level of activity that could be accommodated by the two parallel runways."[21]

In the face of the revelation that operations have already surpassed the "efficient" operating capacity of the existing airfield,[22] the DSEIS recharacterizes the annual service volume of 380,000 as "the threshold where inefficiencies in the airfield operating system become highly visible."[23] According to the DSEIS, "[a]s activity has exceeded the annual

[20] DSEIS at 2-7.

[21] DSEIS at 2-7.

[22] In 1995, actual aircraft operations reached a total of 386,500. Working Paper No. 1, Table 1-2 at 1-6.

[23] DSEIS at 2-7.

service volume, delay has increased."[24] In particular, the DSEIS claims that between 1993 and 1995, as a result of a 15 percent increase in activity levels, delay and associated costs have increased.[25] This claim is directly contradicted by FAA Air Traffic Operations Measurement System ("ATOMS") data (referenced obliquely but not included in the DSEIS) which show just the opposite: in 1995, when operations reached 378,974 (a 9 percent increase over the previous year), Sea-Tac experienced a 15 percent decline in significant delays.[26]

The FEIS claimed the existing runway system's constraints produces "extensive arrival delays"[27] in poor weather, which is calculated by the Port and the FAA to occur 44 percent of the year.[28] The FEIS stated unequivocally that "improvements are needed

[24] DSEIS at 2-7.

[25] DSEIS at 3-7.

[26] Federal Aviation Admin., Air Traffic System Management, Air Traffic Activity and Delay Report -Top Twenty Airports Ranked by Operations, Period: January 1, 1995 through December 31, 1995 With Previous 12 Month Comparison ("ATOMS Report"). ATOMS measures delays in excess of 15 minutes per 1,000 operations.

[27] FEIS at I-15. This claim has never been adequately documented. See PSRC, In the Matter of: Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport, Final Phase I Order on Demand/System Management Issues (July 27, 1995) ("Final Phase I Order on Demand/System Management Issues") ("We have not found in the evidence presented to us a succinct, well-documented statement of the delay and capacity problems that have led the [Port] to seek approval of the third runway.") This Order is attached to these Comments as Appendix D.

[28] DSEIS at 2-9, n.6. This number is based on highly questionable methodology and analysis, and its significance for actual operations at Sea-Tac is debatable. See DEIS Comments at 2-11 to 2-12.

today and current poor weather delay is excessive."[29] However, FAA data shows that in 1995, only 0.48 percent of Sea-Tac operations experienced significant delays.[30]

The DSEIS acknowledges that ATOMS data through August 1996 confirm that delay has substantially decreased since 1989, but makes the unsubstantiated statement that "delay has been reduced as far as it can through other non-development action."[31] The DSEIS references the FEIS in support of this claim, but review of the FEIS's discussion of these "non-development actions" reveals that none of them has been developed or implemented to their maximum potential.[32] Application of some or all of these technologies would significantly reduce delay and forestall the need to construct a third parallel runway.

[29] FEIS at I-17.

[30] ATOMS Report.

[31] DSEIS at 2-18.

[32] FEIS at II-12 to II-17. For example, installation of Localizer Directional Aid ("LDA") approaches could further reduce arrival delay from an average of 7.7 minutes to an average of 4.4 minutes. FEIS at II-17. See also discussion of alternatives, infra § 3.

3.0 ALTERNATIVES

The DSEIS does not identify or examine alternatives which address the newly articulated justification for this project, and as a result fails to analyze whether such alternatives might achieve the same goals at a lower environmental and financial cost. The Port admits that the Master Plan Update development actions are designed to satisfy separate and distinct needs,[1] yet it persists in presenting its Preferred Alternative as an indivisible package of improvements which must be considered on an all or nothing basis. The DSEIS fails to examine different combinations of the Master Plan Update components which might meet the purpose and need of the project as effectively as the Preferred Alternative.

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3.1 THE DRAFT SEIS CONFLATES AIRSIDE AND LANDSIDE PROJECTS

The DSEIS decries the "congested and inefficient conditions" which would result from foregoing Airport expansion, but cites problems primarily associated with landside constraints: an increase in the average flights per gate, a growth in the average number of passengers per gate, use of remote aircraft parking and passenger loading, and declining levels of service in the ticketing, gates and baggage claims areas.[2]

[1] DSEIS at 2-18.

[2] DSEIS at 1-4. The Port currently is promoting Sea-Tac as a "public gathering place" for the citizens of the region "where people can shop, eat and learn about aviation as well as catch planes headed elsewhere." Destination Sea-Tac, Seattle Times, Mar. 17, 1997 at C 1, attached to these Comments as Appendix E. Apparently, the Port's concerns about existing and future Airport congestion and resulting inconveniences to airline passengers do not prevent it from promoting Sea-Tac as a combination shopping mall and food court for people who may not even be traveling.

Putting aside the observation that many of these conditions are routinely encountered and tolerated by passengers at high-volume airports,[3] the obvious means of addressing these problems would be the improvement of terminal and other landside facilities. None of these "congested and inefficient conditions" would be ameliorated by construction of a third runway. As a corollary to that proposition, resolution of the identified problems is not dependent on an expanded airfield. Terminal expansion, improvement of the access road system, additional parking facilities, and other landside improvements would meet these needs without requiring any corresponding expansion of the airfield. By bundling these discrete projects together into one alternative (or three variations of one alternative), and contrasting these with a total "do-nothing" scenario, the DSEIS artificially inflates the need for the third runway.

The third runway project not only would fail to solve most of the problems identified by the DSEIS, but it would put additional strain on landside facilities and increase the need for terminal expansion by facilitating the concentration of operations in the peak hours. The DSEIS notes that at 6,300 peak hour enplanements, the existing terminal would operate at an inadequate level of service, with severe congestion.[4] Under the Port's unconstrained forecast (i.e., with the third runway), this level of peak hour enplanements would be reached in 2010, corresponding to annual enplanements of 17.9 million.[5] In contrast, under the No-Action scenario the same number of annual

[3] As the DSEIS acknowledges, "[t]his is the historical trend of busy congested airports throughout the world." DSEIS at 2-7.

[4] DSEIS at 2-11.

[5] DSEIS at 2-11.

enplanements would translate into just 5,930 peak hour enplanements,[6] due to a slight shifting of flights and passengers occurring as a result of capacity constraints.[7] While the DSEIS presents this phenomenon as a negative effect of insufficient runway capacity, this type of "peak spreading" is a sound method of maximizing airport facilities and meeting demand for air travel more efficiently, and could reduce the extent of landside improvements needed to handle the Port's projected number of passengers.[8]

The DSEIS unintentionally presents a persuasive argument that improvements to landside facilities are all that are really needed in the near term. Landside improvements, perhaps in combination with improvements to taxiways and aprons and implementation of demand and system management measures,[9] would provide an acceptable level of capacity until 2010 and beyond. Therefore, since the Port anticipates undertaking a new

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[6] DSEIS at 2-12.

[7] DSEIS at 2-12.

[8] The PSRC Expert Panel on Noise and Demand/System Management ("Expert Panel") noted that the Port itself admits that operational delays at Sea-Tac are very sensitive to small changes in the level of peak operations. PSRC, In the Matter of: Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport, Final Order on Phase II Demand/System Management Issues 3 (Dec. 8, 1995). This Order is attached to these Comments as Appendix F.

[9] The DSEIS dismisses the entire range of demand management measures, including peak spreading, on the basis of the Flight Plan Study and the Final Order of the Expert Panel. DSEIS at 3-5. The Expert Panel only considered congestion pricing as a means of inducing peak spreading, and concluded that it could not be implemented before 2001, due to existing agreements with the airlines which will remain in force until that date. Final Phase I Order on Demand/System Management Issues at 5. However, the Expert Panel expressed its confidence that congestion pricing "is an important tool that could improve the efficiency of the use of scarce airfield resources in Seattle, and therefore deserves careful study by the [Port] and the airlines." Id..

master plan near the year 2000,[10] it should defer consideration of any long-term plans to expand airfield capacity until the need for a third runway can be evaluated objectively in that process. Given the problems identified in the DSEIS, the Port should have evaluated whether some combination of landside improvements would substantially meet the project's purpose and need.

3.2 THE DRAFT SEIS IGNORES THE IMPLICATIONS OF THE REVISED FORECAST FOR PREVIOUSLY-REJECTED ALTERNATIVES

Despite major revisions to the data used to support the original project proposal in the FEIS, the DSEIS asserts that "[t]he new demand forecasts, and operating capability of the existing and future airport facilities would not affect the viability of any alternative considered in the Final EIS."[11] In fact, the viability of several alternatives discussed and dismissed in the FEIS are altered significantly by the changes in the underlying need and the means by which the Port now proposes to meet that need.[12]

For example, the alternative of constructing a new supplemental airport was rejected in large part because "it has been demonstrated that it takes 10-15 years from conceptualization to implementation."[13] With completion of a third parallel runway now deferred until 2005, a 10-15 year timeframe no longer makes such an alternative unreasonable.

[10] DSEIS at 2-14.

[11] DSEIS at 1-5.

[12] The following discussion is offered for illustrative purposes only. The ACC is not endorsing any particular alternative at this time.

[13] FEIS at II-10.

Furthermore, the FEIS cited, as a reason for its determination that a supplemental airport would be an infeasible alternative, a study which concluded that a two-airport system would not succeed until the origin and destination ("O&D") market exceeds 10 million annual enplanements.[14] The revised forecasts indicate that this threshold is likely to be reached at Sea-Tac by 2005.[15] While the DSEIS concedes that "O&D demand is anticipated to grow faster, possibly making a supplemental airport competitive with Sea-Tac,"[16] it inexplicably fails to discuss the implications of this change for the feasibility of a supplemental airport, and instead concludes, without any substantiation, that a supplemental airport would fail to draw enough traffic from Sea-Tac to address poor weather operating conditions.[17]

Likewise, the FEIS dismissed the alternative of diverting a particular class of aircraft operations, such as commuter operations, to another existing airport within the regional system.[18] According to the analysis in the FEIS, commuter operations primarily serve connecting passengers, and so any diversion of commuter air traffic to another airport would result in the need for ground transportation so that passengers could connect to air carrier flights to and from Sea-Tac.[19] Recent trends in the airline industry,

[14] FEIS at II-10.

[15] DSEIS at 3-5.

[16] DSEIS at 3-9.

[17] DSEIS at 3-5.

[18] FEIS at II-11.

[19] FEIS at II-11 to II-12.

however, show an increased emphasis on point-to-point service by commuter airlines,[20] a phenomenon which could make diversion of commuter operations a more effective means of relieving capacity problems at Sea-Tac. The recent proposal by Horizon Air to initiate service from Paine Field is evidence of the viability of this alternative.[21]

The DSEIS contains no further consideration of alternative runway lengths. The discussion of a commuter runway in the FEIS was cursory: 5,200-foot commuter runways with either 1,500 or 2,500 foot separation from Runway 16L/34R were identified as options, but only the latter was subject to even a preliminary screening analysis, purportedly because of similarities between the two options.[22] The results of this preliminary screening were presented in the FEIS in a chart containing minimal data and no analysis.[23] Even though commuter runway options were acknowledged to result in the least impact on natural resources as well as the human environment, they were eliminated from further consideration based upon a conclusory and unexplained determination that they would not satisfy the need for increased runway capacity in poor weather.[24]

[20] See David A. Siebenburgen, Growth Strategies for the 21st Century - Part 1, The Regional/Commuter Industry: Adapting to New Markets (paper given at 1997 FAA Aviation Forecasting Conference "Growth Strategies for the 21st Century" (Mar. 5, 1997)), attached to these Comments as Appendix G.

[21] See Diane Brooks, Horizon Air eyes Paine for new routes, Seattle Times, Feb. 11, 1997 at B1, B2; Paging Horizon Air passenger Adam Smith, Seattle Times, Feb. 13, 1997, (editorial) attached to these comments as Appendix H.

[22] FEIS at II-33.

[23] FEIS, Table II-5.

[24] FEIS at II-34.

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The conclusion in the FEIS that a commuter length runway would not meet the Port's stated purpose and need hinged on the unreasonable prerequisite that any new runway must be able to accommodate close to 100 percent of the aircraft using Sea-Tac.[25] This is an illogical premise given the stated need of decreasing arrival delay for a limited number of planes during limited periods of the time, and it is unsupported by available information about the future fleet mix. Although the DSEIS' revised forecast shows a diminishing percentage of commuter operations,[26] this is largely attributable to the planned replacement of many commuter aircraft with regional jets, which minimally exceed the seat capacity used to designate commuter aircraft.[27] Horizon's plans to upgrade its fleet reflects the trend towards increased use of regional jets, which may significantly affect future fleet mixes at Sea-Tac.[28] A commuter length runway which could accommodate these smaller aircraft would free the existing single arrival stream to handle the larger air carriers.[29] The projected fleet mix is shown in **TABLE 3-1**.

[25] FEIS, Table II-3.

[26] Working Paper No. 1, Table 3-3 at 3-10.

[27] DSEIS at 2-17; Working Paper No. 1 at 3-27.

[28] See Adam Bryant, Small Jets Alter Airline Economics, N.Y. Times, Feb. 17, 1997 at Section 1, page 1.

[29] See Consulting Services, Ltd., Review of Assumptions and Alternatives in the Supplemental EIS, 11, 14, Tables 1 and 2 (attached to these Comments as Appendix I).

TABLE 3-1

Presented and Projected Air Traffic Mix[30]

Type of Aircraft	Number of Operations - 1995	Percentage of Operations - 1995	Number of Operations - 2010	Percentage of Operations - 2010
Air Carrier	226,200	58.5	306,000	64.6
Air Taxi/Commuter	149,400	38.6	157,000	33.1
General Aviation	10,300	2.7	10,300	2.2
Military	600	0.2	600	0.1
Total	386,500	1000	474,000	100

The data in the Port's Master Plan Update, when combined with the updated information which accompanied the DSEIS, demonstrate that 94.6 percent of total operations could have been accommodated on a 5,200-foot runway in dry weather conditions and 63.9 percent of operations could have been accommodated on a 5,200-foot runway in wet conditions. In 2010, 97.6 percent of operations could land on a 5,200-foot runway in dry conditions and 57.6 percent of operations could land in wet conditions. (See **TABLE 3-2.**)

TABLE 3-2

Percentage of Total Landing Operations Accommodated by 5,200-Foot Runway[31]

	1995		2010	
	Dry	Wet	Dry	Wet
Commuter /GA/Military	41.5	41.5	35.4	35.4
Air Carrier	53.1	22.4	62.2	22.2
Total	94.6	63.9	97.6	57.6

[30] Source: Working Paper No. 1, Table 3-13.

[31] Source: Consulting Services, Ltd., Analysis of Data in Technical Rep't No. 6, Table 2-9 and Working Paper No. 1.

In rejecting these and other alternatives, the DSEIS continues to insist that the proposition that the third runway project is designed solely to address poor weather arrival delay. The DSEIS provides no justification for spending over half a billion dollars to address a problem which occurs only 2.8 percent of the time.[32] The scope of the alternatives analysis is further narrowed by the Port's assumption that this delay could be sufficiently decreased only by an airfield design which would allow dual arrival streams in low-visibility (IFR) conditions. As a result, the Port and the FAA have predetermined the outcome of the alternatives analysis, and disregarded other alternatives which might be as effective in reducing or limiting the impact of poor weather delay.

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3.3 THE IMPACT OF THE REVISED FORECAST IS NOT RECOGNIZED IN THE ANALYSIS OF ALTERNATIVES

The revised forecasts for Sea-Tac and the resultant re-ordering of priorities require the Port and the FAA to reevaluate alternatives previously rejected as well as alternatives which may never have been considered. In the absence of an evaluation of these alternatives in the context of the revised forecasts, the FAA and the Port have no basis for the assertion that "[n]o significant information has come to light concerning any alternative that has not already been discussed. . . ."[33]

The same imperative that required the preparation of a Supplemental EIS also mandates a thorough re-examination of alternatives which – either singly or in combination – could solve the problems which the proposed Master Plan Update

[32] See Consulting Services, Ltd., Review of Assumptions and Alternatives in the Supplemental EIS at 4-5.

[33] DSEIS at 1-5.

improvements at Sea-Tac are meant to address. The DSEIS either ignores such alternatives or dismisses them without serious consideration.

4.0 ENVIRONMENTAL IMPACTS

The DSEIS obscures and grossly underestimates the true extent of environmental impacts which would be caused by the construction and use of the third runway. Unlike earlier environmental studies of this project which implausibly assumed that expansion of the airfield would have no impact on the number of planes using Sea-Tac,[1] the DSEIS concedes a difference in activity levels between the no-action and with-project scenarios. The Port and the FAA limit the effect of abandoning this central fiction, however, by cutting short the DSEIS' environmental analysis at 2010, instead of looking to 2020 as the FEIS did.

The Port and the FAA disingenuously cite the inherent unreliability of long-term forecasts as the justification for adopting this near-sighted approach to environmental analysis. According to the DSEIS, "year 2020 was determined not to be reasonably foreseeable at this time,"[2] despite the fact that elsewhere in the DSEIS the long-term development capability of the airfield improvements is assessed, and found to be sufficient to provide operating capacity at Sea-Tac well beyond 2030.[3] The FAA and the

[1] See, e.g. FEIS I-8.

[2] DSEIS at D-1 to D-2. The DSEIS cites various reasons for reaching this conclusion. The fifth reason given, that "[n]umerous environmental approvals ... will likely expire within the next 3-5 years" is nonsensical, and is followed by the *non sequitur* that an approved FEIS is only valid for three years, while a final conformity determination lapses in five. DSEIS at D-2. None of this has any remote bearing on the analysis of future environmental impacts under NEPA and SEPA. If it were relevant to this analysis, the logical inference would be that the DSEIS need not discuss the third runway project at all, since it will not be implemented within that three to five year period.

[3] DSEIS at 2-25 to 2-26.

Port completely ignore the environmental impacts that would result from the continued use of the third runway after 2010.

4.1 THE ANALYSIS OF ENVIRONMENTAL IMPACTS SHOULD NOT BE ARTIFICIALLY LIMITED BY THE PROJECTED LEVEL OF OPERATIONS IN 2010

As the DSEIS notes on its very first page, because forecasting assumptions are based on a number of variables, "airport master plan improvements are typically associated with a level of activity instead of a precise year."[4] In other words, although it may be difficult to ascertain with precision when activity will reach a certain level, the whole premise of the master planning process, and the justification for the third runway project, is that certain activity levels would be reached at some point within the planning period.

The Master Plan Update improvements are designed to accommodate a "theoretical maximum" of 600,000 to 630,000 operations.[5] Since it would be poor airport planning to construct facilities that are not likely to be fully used, it is reasonable to assume that operations would reach that number at some point in the foreseeable future, even if it is difficult to assign a specific year in which that would be likely to occur.

The environmental impacts of the third runway must be evaluated based on its reasonably foreseeable future use. The 630,000-operation "build-out" scenario represents the basis upon which environmental impacts attributable to this project must be examined. Viewed from this perspective, the real difference between the No-Action and

[4] DSEIS at I-1 (emphasis added).

[5] DSEIS, Exhibit 2-7 at 2-26.

With-Project alternatives is not the 14,000 operations identified in the DSEIS,[6] but the 170,000 additional operations that the expanded airfield could accommodate at its maximum capacity.[7]

The implications of the actual gap between the No-Action and With-Project alternatives for environmental impacts is significant, since aircraft operations are directly responsible for almost all airport noise and a significant amount of the air pollution associated with airports. The DSEIS, like the previous environmental studies prepared for this project, trivializes the extent of adverse environmental impacts stemming from the third runway project by comparing them with a base case of future No-Action impacts. In other words, activity levels have been assumed to increase regardless of any airport expansion, and only the impacts caused by operations in excess of the general trend have been attributed to this project.

The fallacy of this approach is apparent when one looks beyond the 2010 horizon. Although the DSEIS attempts to diminish the import of post-2010 forecasts by burying them in an appendix to the main volume,[8] it is clear that even under a conservative growth scenario, the gap between operations under existing conditions and operations with an expanded airfield would widen dramatically in the not-so-distant future.

Simply by extrapolating from the new Port forecast, operations in the year 2020 with the third runway are projected to reach 532,000, or 72,000 more than under the No-

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[6] DSEIS, Table 1-2 at 1-3.

[7] Compare DSEIS, Exhibit 2-2 at 2-9 with DEIS, Exhibit 2-7 at 2-26.

[8] See DSEIS, App. D.

Action scenario.[9] If demand grows at a faster rate than forecast, the Port concedes that operations could reach 585,200 in 2020,[10] representing an additional 125,200 operations above the No-Action scenario.

In fact, there is every reason to believe that additional demand – beyond that predicted by the Port's forecast – would be generated by the third runway project. There is empirical evidence that, all other things being equal, airports with greater runway capacity will have higher levels of activity.[11] Whether this is due to increased competition at a larger airport which drives down airfares, more convenient and reliable schedules of service offered by a larger facility, less congestion which leads to reduced travel times, or more aggressive marketing by an airport eager to pay off an expensive capital investment, the data show that capacity is a key factor in determining the level of demand at any airport.[12] While some air travel is relatively immune to changes in cost or delay, there is a significant amount of discretionary travel which is sensitive to changes in airfares, airline schedules, and other factors more difficult to quantify. An expanded airport would be poised to capture this latent demand, and may induce large numbers of

[9] DSEIS, Table D-1 at D02.

[10] DSEIS at D-s, Table D-1.

[11] See Clifford Winston, Review of the Revised Aviation Forecast for Seattle Tacoma International Airport (Mar. 1997), attached to these comments as Appendix J.

[12] The FAA's terminal area forecast ("TAF") does not reflect existing facility constraints or proposed future airport improvements. DSEIS at 2-3. The Port's forecast recognizes the role played by capacity only in terms of capacity constraints, by cutting off the "constrained forecast" at a specific level of operations. However, like the TAF, the Port's forecasts do not include capacity as a variable in the equation used to calculate future activity levels.

passengers to fly who otherwise would take fewer trips, drive, take a train or bus, or simply stay home. Yet according to the analysis in the DSEIS, this effect is non-existent.

By limiting its analysis of impacts to the 2010 planning horizon, and failing to consider the additional demand which may be stimulated by an expanded Airport, the DSEIS underreports the impacts likely to be caused by the third runway project. This fundamental flaw infects the entire analysis of environmental impacts, and renders the DSEIS inadequate under both NEPA and SEPA.

4.2 THE NOISE IMPACTS ATTRIBUTABLE TO THE THIRD RUNWAY PROJECT ARE FAR GREATER THAN REVEALED BY THE DRAFT SEIS

The DSEIS, like previous environmental studies of this project, concludes that the area exposed to noise of DNL 65 dB and greater is expected to decline in size in the future regardless of new development at Sea-Tac Airport.[13] Based on this implausible thesis, the DSEIS posits that while the development of a third parallel runway would increase noise impacts over the No-Action scenario, year 2020 impacts still would be 53 percent less than current noise impacts.[14] This reduction "is expected due to the Port's noise reduction program and the Federal mandate to phase-out Stage 2 aircraft by the year 2000."[15]

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[13] DSEIS at 5-3-1. In contrast to the position taken in the FEIS and the current DSEIS, the Port admitted in its final submission to the Expert Panel that for some people, the recent trend is upward after many years of significant downward movement because the number of operations is growing. Port of Seattle, Position Statement and Compliance Report Prepared for the PSRC Expert Panel in Response to the Preliminary Order on Phase II Noise Issues ("Statement of Position") 7, 8 (Jan. 30, 1996).

[14] DSEIS at D-3. The DSEIS does not specify what this number is a percentage of, or how it was derived.

[15] DSEIS at 5-3-1. Noise contours for the year 2020 are not provided in the DSEIS.

The DSEIS purports to compare future With-Project noise levels with "current" or "existing" noise levels.[16] In fact, the DSEIS simply repeated the analysis in the FEIS which used noise contours developed in 1994 – as the baseline for the analysis of the noise effects of the proposed third runway.[17] Despite the fact that the aircraft fleet in 1997 contains a considerably smaller proportion of Stage 2 aircraft than it did three years ago, – and, consequently, the noise exposure contours no longer extend as far from the Airport as they did in 1994[18] – the FAA and the Port of Seattle continue to use the 1994 noise contours as the baseline for measuring future noise impacts. Three years after the original contours were developed, the DSEIS continues to represent noise contours which have been wholly overtaken by events as depicting "existing noise" exposure conditions. By completely ignoring the current reality with respect to noise conditions, the DSEIS thus presents a spurious comparison of noise impacts between the No-Action and With-Project alternatives.[19]

This sleight-of-hand maneuver performed by the FAA and the Port obscures the fact that most of the potential decreases in noise exposure which could be attributed to the

[16] DSEIS at 1-9 to 1-10, 5-3-2 through 5-3-17.

[17] FEIS at IV.1-3 through IV.1-14R.

[18] See Sanford Fidell, Preliminary Report on the Analysis of Noise Impacts in the Draft Supplemental Environmental Impact Statement for Seattle-Tacoma International Airport ("Fidell Report") at 2-3 (Mar. 1997), attached to these Comments as Appendix K.

[19] Fidell Report at 2.

Port's noise reduction programs already has been experienced at Sea-Tac. Consequently, future noise levels with the third runway would be higher than otherwise could be anticipated based on nationwide trends.

The fiction of a future overall decrease in noise begins to crumble when one looks carefully at the benefits which remain to be gleaned from both the Port's noise reduction program and the phaseout of Stage 2 aircraft. The primary elements of the current noise remedy program, based on the Mediated Noise Agreement, are linked to the phaseout of Stage 2 aircraft. The most effective programs put into place under the Mediated Noise Agreement (e.g., the Noise Budget and the Nighttime Noise Limitations) already have achieved their goals of accelerating the transition to a Stage 3 fleet and have little effect now that the phaseout of Stage 2 aircraft has been nearly completed.[20] The Port itself concedes that once the fleet is converted to mostly Stage 3 aircraft "the amount of noise reduction that can be achieved will not be as great because the number of remaining loud aircraft for removal is smaller."[21] In fact, most of the noise reduction achievable from the Stage 2 phaseout already has been accomplished.

The Port's assumption of continually improving noise conditions is further suspect because Stage 3 aircraft are not always quieter than Stage 2 – some heavy Stage 3

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[20] As of January 1996, Stage 3 aircraft accounted for 86 percent of the fleet at Sea-Tac. Statement of Position at 3. That number is likely even higher today, as Stage 2 aircraft have been retired and replaced.

[21] Port of Seattle, Response to Expert Panel Request for Information, Response to Question 12 – Future Noise Reductions Levels (Feb. 1995).

aircraft are louder than some light Stage 2 aircraft,[22] and a Stage 3 aircraft may be as noisy on landing as a Stage 2 aircraft of equal weight.

Given the diminishing returns of the Stage 2 phaseout, it is unrealistic to assume that noise contours will continue to shrink. Now that the Stage 2 phaseout's potential for achieving noise reduction has been almost fully exploited, increases in operations necessarily will lead to increased noise. The Port has conceded that this is precisely what is happening at Sea-Tac.[23] Therefore, the Port's conclusion that noise would continue to decrease indefinitely is not only implausible, but it is unsupported by data in the DSEIS or elsewhere in the record.

The Port predicts that construction of a third runway would result in 11 percent more people being affected by noise by the year 2010 than if the runway were not built. The Port admits that nearly 1,300 additional people are likely to be subjected to noise levels of DNL 65 dB or above by 2010, compared to the No-Action scenario.[24] That number is projected to grow to more than 5,000 additional people by 2020.[25] Whereas the FEIS dismissed such increases by concluding that "areas where significant noise exposure would result from the proposed improvements ... either have already been mitigated through the Port's existing Noise Remedy Program or are proposed for mitigation,"[26] the DSEIS

[22] FEIS at R-71.

[23] Statement of Position at 7, 8.

[24] DSEIS at 5-6-4. This number would likely be significantly higher. See Fidell Report at 3-4.

[25] DSEIS, Table D-2 at D-8.

[26] FEIS at R-65.

acknowledges that the new noise contours for the year 2010 would exceed the boundaries of the Port's existing Noise Remedy Program.[27] As a result, the Port's assumption in the DSEIS and in the FEIS that only token mitigation would be required to offset noise impacts from the third runway is not defensible.[28]

The potential noise impacts of the Master Plan Update proposal should be measured using the maximum number of operations which would occur at an expanded Airport in the future, rather than in terms of the number of operations projected for a given year.[29] The DSEIS only depicts noise contours for approximately 474,000 operations.[30] An analysis of impacts associated with the maximum number of operations sustainable by the expanded airfield would more accurately reveal the extent of the noise problems which could be caused by the third runway project, and would provide graphic evidence that the hard-won gains of the last decade would be eroded as noise contours once again expand.

In its discussion of mitigation, the DSEIS again makes the spurious observation that future impacts would be less than current noise exposure.[31] Even if it were true, this statement ignores the fact that construction of a third runway would reverse the ongoing

[27] DSEIS at 1-10.

[28] See discussion of mitigation, infra § 5.

[29] Such an approach would be consistent with the Port's assertion that the projects included in the Master Plan Update are "associated with a level of activity [e.g., the projected number of operations] instead of a precise year." DSEIS at 1-1.

[30] DSEIS, Exhibit 5-3-7 at 5-3-17. An appendix to the DSEIS purports to summarize the noise impacts associated with activity levels up to 585,200 operations. DSEIS, Table D-2 at D-8. It is unclear from the documentation in Appendix D how the numbers for population and housing units projected to be subject to DNL 65 and above were derived.

[31] DSEIS at 5-3-7.

efforts to provide relief to residents impacted by airport noise. The benefits from the Port's current noise reduction program and the Stage 2 phaseout which otherwise would be enjoyed by the region would be canceled out by increases in the overall number of operations.

Furthermore, it would be more relevant to compare 1997 noise contours with the noise contours associated with 630,000 annual operations – the maximum capacity of the proposed Airport expansion. Such a comparison would expose the fallacy of the DSEIS' assertion that future noise exposure would be less than current conditions. The inescapable conclusion of a real comparison between existing and future conditions is that noise impacts attributable to the third runway would be greater than current noise exposure.

4.3 THE DRAFT SEIS IGNORES THE IMPACTS OF AIRPORT EXPANSION ON SCHOOLS AND SCHOOL CHILDREN

There is convincing evidence that chronic exposure to aircraft noise can negatively affect school performance. These performance effects have been shown to occur both when children are tested inside their noisy school and when children from noisy schools are tested in quieter settings.[32]

[32] A. Moch-Sibony, A Study of the Effects of Noise on the Personality and Certain Psychomotor and Intellectual Aspects of Children, After Prolonged Exposure (French), 47 Travail Humain 155-165 (1984); S. Cohen et al., Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from the Laboratory to the Field, 35 Am. Psychologist 231-243 (1980). Additionally, children who are exposed to noisy home environments tend to perform worse than those who are not, even when both types of children attend quiet or noise-abated schools. S. Cohen et al., Aircraft Noise and Children: Longitudinal and Cross Sectional Evidence of Adaptation to Noise and Effectiveness of Noise Abatement, 40 J. Personality and Soc. Psychology 331-345 (1981).

The primary explanation for the negative effect of noise on performance in the classroom is that noise consistently interferes with the teaching and learning processes, resulting in a cumulative loss of available teaching time. For example, periodic, intense noise events interrupt classroom routines and decrease productive classroom time by causing instructors to cease teaching temporarily or by making it impossible for teachers and students to hear one another.[33]

Other research demonstrates that significant classroom disruption begins when interior noise reaches 60 dB.[34] At levels of 78 dB, interruption occurred half of the time, and at levels of 82 dB, continuous interruption was inevitable.[35] One report also noted that even a highly motivated adult observer was unable to hear the teacher from the back of the classroom half of the time when flights produced noise levels of 78 dB.[36] EPA has identified an $L_{eq}(24)$[37] of 45 dB as the maximum appropriate interior noise level for

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[33] Numerous studies verify this effect. See, e.g., K. B. Green et al., Effects of Aircraft Noise on Reading Ability of School Children, 37 Archives Envtl. Health 1, 24-31 (1982); M. A. Crook & F. J. Langdon, The Effects of Aircraft Noise in Schools Around London Airport, 34 Sound and Vibration 221-323 (1974).

[34] The Effects of Aircraft Noise in Schools Around London Airport, at 221-234; R. D. Kryter, The Effects of Noise on Man, (2d ed. 1985).

[35] The Effects of Aircraft Noise In Schools Around London Airport at 227.

[36] The Effects of Aircraft Noise In Schools Around London Airport at 227.

[37] The $L_{eq(24)}$ differs from DNL only by the lack of a nighttime 10 dB penalty.

classrooms.[38] Other studies have concurred with this finding.[39]

Speech interference is a particularly critical issue in analyzing the effects of the Airport expansion on the local schools. "Time Above (TA) (the total time that the noise level exceeds a 'threshold' level during a specified interval), provides a useful 'single number' indicator of the potential for speech interference."[40] Moreover, as the Expert Panel observed, the time-above metric is "[o]ne of the most useful and illuminating ways to assess changes in noise impact. . . ."[41]

The noise effects of Airport operations on the schools particularly are evident in an analysis of time-above 65 dB levels.[42] "We note that Time Above 65 dB – not to mention 75 dB – does more than merely cause 'low levels' of speech interference [as claimed by the Port];[43] it disrupts a wide variety of everyday activities (relaxation,

[38] U.S. Envtl. Protection Agency, Rep't No. 550/9-74-004, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (Mar. 1974).

[39] See, e.g., Effects of Noise on Academic Achievement and Classroom Behavior; D. DeJoy, Environmental Noise in Children: Review of Recent Findings, 23 J. Auditory Res. 181-194 (1983).

[40] Federal Interagency Committee on Noise ("FICON"), Federal Agency Review of Selected Airport Noise Analysis Issues ("FICON Report") at 3-10 (1992).

[41] Final Decision on Noise Issues at 19.

[42] 65 dB is considered by EPA be capable of interfering with speech in some degree. See U.S. Envtl. Protection Agency, Rep't No. 550/9-79-100, Protective Noise Level: Condensed version of EPA Levels Document Figure 10 at 19 (Nov. 1978. The Expert Panel identified time-above 45 dB as "a benchmark for the threshold of speech interference. . . ." Final Decision on Noise Issues at 20.

[43] Statement of Position at 19.

thinking, reading, learning and listening) and is correlated with increased levels of stress, tension and annoyance."[44]

The Highline School District, the ninth largest in the state, serves nearly 18,000 students in kindergarten through twelfth grade. All of the children live in the communities which surround Sea-Tac: the cities of Burien, Des Moines, Normandy Park, Tukwila and SeaTac and the unincorporated areas south of Seattle. Every year, more than 8,000 students attend schools with unacceptable noise levels. The Expert Panel expressed its concern over the fact that a majority of the classrooms in the vicinity of the Airport "remain uninsulated and heavily impacted by aircraft noise."[45]

The excessive noise levels to which Highline School District students and personnel are subjected results from the Port's failure to mitigate the noise conditions attributable to the construction of the second runway in 1973. The School District already has expended a considerable amount of its own capital funds to remodel its schools for noise attenuation, and has been forced to divert basic educational funds and maintenance and operating levy funds to provide remedial support to students whose learning ability has been impaired by exposure to unacceptable noise levels from operations at Sea-Tac.

Notwithstanding the enormous impact of increased operations at Sea-Tac on the operations of the Highline Schools and on the ability of its students to study and learn,

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[44] Final Decision on Noise Issues at 20 (emphasis added).

[45] PSRC, In the Matter of: Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport, Final Decision on Noise Issues ("Final Decision on Noise Issues") (Mar. 27,1996), attached as Appendix L of these Comments.

there is only a cursory discussion of these impacts. There has been no examination of the time-above noise levels to which these schools would be subjected, and no committment to mitigate the effects of Airport noise, beyond what the Port has already committed to do to mitigate the effects of the second runway.

4.4 THE PROPOSED MITIGATION OF WETLANDS IMPACTS REMAINS INADEQUATE

The DSEIS identifies an additional two acres of wetland impacts, resulting in "unavoidable" impacts to a total of 12.23 acres of wetlands under the Preferred Alternative.[46] The DSEIS also notes that additional wetlands may be identified when access is made available to all of the property in the acquisition area.[47] The Port and the FAA recognize the need to mitigate the loss of these wetlands, but continue to ignore any mitigation options which would create replacement wetlands within the same drainage basin as those which will be destroyed.[48]

The DSEIS states that "[a]ll undeveloped, non-forested, non-wetland sites with average slopes less than 5% were identified" in both the Miller Creek and Des Moines Creek basins.[49] The DSEIS presents no explanation for why these limiting conditions were imposed. There is no substantiation for the assertion that only non-forested sites

[46] DSEIS at 1-11.

[47] DSEIS at 5-5-2, n.1.

[48] DSEIS at 1-11, 5-5-13. In Washington, the first choice for wetland replacement is on-site; the secondary preference is off-site, but within the same watershed. DSEIS at 5-5-12. Likewise, ordinances adopted by the cities of SeaTac, Burien, Des Moines, Federal Way, Normandy Park and Tukwila all require wetlands mitigation within the same watershed or drainage basin. See DEIS Comments, Table 5.6-1.

[49] DSEIS at 5-5-13.

would be suitable for replacement wetlands – indeed, many of the wetlands which would be destroyed by this project are forested.[50] The DSEIS does not define what is meant by "undeveloped," but if this condition were applied to areas with low-density development, the search may have excluded many potentially suitable sites. Similarly, defining eligible sites as those with average slopes less than 5 percent appears to be an unjustified restriction.

The Port apparently confined its in-depth consideration of suitable in-basin mitigation sites to areas within the 10,000-foot radius of concern for wildlife hazards to aircraft,[51] conveniently allowing it to dismiss each of the 19 potential sites identified in its search as infeasible for "safety" reasons.[52] The DSEIS' assertion that "[w]etland mitigation... within the watersheds where the impacts may occur, is not feasible" remains unsupported by evidence in the record.

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4.5 CONSTRUCTION IMPACTS CONTINUE TO BE UNDERESTIMATED

The Port has revised its estimates of construction impacts since issuing the FEIS, without managing to provide any better understanding of how more than 26.4 million

[50] DSEIS, Table 5-5-1 at 5-5-4.

[51] DSEIS at 5-5-13. The FAA discourages airports from creating areas which might attract birds, which in turn can create hazards for aircraft using the airport. DSEIS at 5-5-16. In furtherance of this policy, the FAA "has indicated that 'wildlife attractions' within 10,000 feet of the edge of any active runway is not recommended." DSEIS at 1-11.

[52] DSEIS, Table 5-5-3 at 5-5-25 to 5-5-28.

cubic yards of fill would be transported, unloaded, placed and compacted to create the massive embankment required for the third parallel runway.[53]

4.5.1 Fill Requirements

Both the amount of fill required for this project and the number of trucks (or alternative vehicles) needed to transport the fill to the project site have been underestimated. The analysis in the DSEIS begins with the end result – the compacted in-place fill requirements.[54] That number was then increased by a 15 percent "shrinkage" factor, and divided by the average capacity of each truck to arrive at the estimated number of truckloads required for the project.[55]

This calculation is erroneous on several counts. The term "shrinkage" refers to the volume change in bank material (fill material in its original location) when it is compacted in its final destination. However, bank material first "swells" when it is excavated and placed in a hauling unit. This swell factor itself may be 15 percent or more, depending on the characteristics of the fill material.[56] Thus, ten cubic yards of bank material may swell to 11.5 cubic yards for transport. It is this "loose volume" of fill that is relevant to the calculation of how many trucks would be required. The 11.5 cubic yards unloaded from the truck may amount to only 9 cubic yards compacted in

[53] The amount of fill which would be required is variously stated as 23.64 cubic yards and 26.4 cubic yards. Compare DSEIS at 5-4-3 with DSEIS, Table 5-4-1 at 5-4-20.

[54] DSEIS at 5-4-2, 5-4-3.

[55] DSEIS at 5-4-3.

[56] See Christopher Brown and Jimmie Hinze, Comments on the Analysis of Construction Impacts in the Draft SEIS for Seattle-Tacoma International Airport, ("Brown and Hinze Report") Figure B (Mar. 1997), attached to these Comments as Appendix M.

place, due to shrinkage. Therefore, both shrinkage and swell factors need to be applied in order to arrive at credible estimates of fill and transport requirements. The DSEIS' single "shrinkage" factor of 15 percent is inadequate and misleading. In reality, fill can be expected to shrink 20-25 percent from its loose volume (in the trucks) to its final compacted volume.[57]

As a result of these erroneous and incomplete calculations, the DSEIS seriously underestimates the number of trucks and truck trips required to transport the fill. This underestimation in turn affects the consideration of impacts on air quality, local roads and traffic congestion.

4.5.2 Fill Sources

The Port is assuming that at least 26.4 million cubic yards of fill would be required to construct the Master Plan improvements.[58] A small percentage of this material, up to 3.10 million cubic yards,[59] could be obtained as the result of "cut and fill" –material taken from another portion of the construction site in the course of the project. The DSEIS does not discuss how or where this fill would be stockpiled if it cannot be transported immediately to the construction site.

The bulk of the fill material will have to be mined and transported to the construction site. Eighteen existing mining operations are identified in the DSEIS as

[57] See Brown and Hinze Report at 1.

[58] DSEIS, Table 5-4-1 at 5-4-20.

[59] DSEIS, Table 5-4-1 at 5-4-20.

potential sources of this fill,[60] but the DSEIS also claims that it is not possible to determine the exact sources that will be used, and holds out the possibility that new sites would be developed.[61] The analysis of construction impacts, however, considers only the haul routes associated with the eighteen identified sites.

The Port also has identified potential fill sources on property it currently owns in the vicinity of the Airport. The DSEIS refers to these as "on-site" sources, but while they are on property owned by the Port, they are not on the construction site. Fill mined from these sources will have to be transported to the construction site, potentially by trucks using public streets.[62] These Port-owned sites, none of which is currently permitted for surface mining, are expected to provide as much as 12.35 million cubic yards of fill.[63] The Port has thus far publicly ignored the environmental consequences of embarking on strip-mining operations on this property.

For example, the Port is proposing to mine as much as nearly 7 million cubic yards of fill from sites located within the the City of Des Moines. Strip mining is not permitted under current zoning in Des Moines, and amendments to the City's comprehensive plan would be required in order to allow this activity.[64] In order to obtain

[60] DSEIS, Table 5-4-2 at 5-4-22 to 5-4-26.

[61] DSEIS at 5-4-2.

[62] DSEIS at 5-4-4 to 5-4-5.

[63] DSEIS at 5-4-3.

[64] The Port has only recently made a request for such amendments. Letter to Judith Kilgore, Community Development Director, City of Des Moines from Michael D. Feldman, Director, Aviation Professional & Technical Services, Port of Seattle (Mar. 10, 1997).

the requisite approvals from the City of Des Moines and comply with possible permit conditions, the Port might need to commit to post-excavation restoration of these sites.

The DSEIS not only fails to consider the immediate environmental impacts of mining these properties, but it also ignores the permanent effects of excavation on the future productive value of the site as well as impacts to adjacent properties. While the DSEIS includes a section purporting to address concerns about post-excavation site aesthetics,[65] and provides a drawing depicting "redevelopment concept sections,"[66] there is no discussion of the potential impacts of excavation and redevelopment on surface or groundwater, nor is any consideration given to the loss of natural noise buffers provided by those areas currently covered by trees and other heavy vegetation. The DSEIS also fails to address whether the removal of trees, vegetation and other natural insulating materials would adversely affect Des Moines Creek, which would be subjected to increased water temperature from greater exposure to warming rays of the sun.

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4.5.3 Quality of Fill Material

The DSEIS does not describe the characteristics or quality of the material available from cut and fill operations or from other Port-owned sources, nor is there any indication that preliminary geotechnical investigations have been conducted to verify that these sources could provide fill material of suitable quality for construction of the third

[65] DSEIS at 5-4-11 to 5-4-13.

[66] DSEIS Exhibit 5-4-6 at 5-4-47.

runway. Fill quality can affect the amount of material required and the rate of compaction, as well as the seismic stability of the embankment.[67]

Furthermore, the DSEIS contains no discussion of how material excavated from the construction site itself or from Port-owned property would be disposed of should it prove to be of unsuitable quality for use in the third runway embankment. Contaminated soils, organic materials and debris also would need to be removed from these sites.

4.5.4 Transport of Fill

The DSEIS assumes that transporting the fill exclusively by truck represents a worst case scenario.[68] However, this assumption overlooks the distinction between the types of impacts associated with truck transport (primarily air quality and surface traffic) and those which might be associated with alternative transport methods (e.g., water quality impacts associated with a conveyor belt along Des Moines Creek). An analysis of truck-hauling impacts cannot substitute for an analysis of potential impacts on streams, wildlife corridors, steep slopes, drainage, and shoreline resources associated with alternative transport methods. While in the final analysis the alternative fill transport methods might be judged to have a less detrimental impact on the environment, the DSEIS fails to substantiate such a conclusion.

[67] The DSEIS contains no reference to the potential for earthquakes in the Seattle area, and their impact on an 8,500-foot runway built primarily on an artificially-constructed plateau. The seismic stability of such a runway is, as yet, unexamined and unproven.

[68] DSEIS at 5-4-3.

4.5.5 Duration of Haul Period

The DSEIS implies that impacts would be reduced by lengthening the haul period from three to five years. However, the community disruption caused by the project would only be exacerbated by being prolonged for an additional two years. Noise, vibration, traffic, dust and exhaust from construction equipment, spread out over a longer period of time, are likely to be even worse than the same impacts with a shorter duration. Once certain thresholds of annoyance or health effects are reached, any increase in the time span of the project will produce additional impacts. The DSEIS fails to identify these threshold levels and ignores the additional impacts created by extension of the construction period. The DSEIS also ignores the safety impacts of thousands of double-dump trucks on the roads daily on the same routes used by hundreds of school buses.

4.5.6 Construction Equipment

The DSEIS asserts that "it is not possible to identify the specific types of construction equipment and frequency of usage that could occur."[69] This is a critical deficiency, because emissions from heavy-duty construction equipment, operating on paved and unpaved areas, are potentially significant sources of volatile organic compounds (VOC), oxides of nitrogen (NO_x), particulate matter (PM) and carbon monoxide (CO).

Furthermore, the DSEIS does not consider how the fleet of off-road construction equipment, including bulldozers, backhoes, front loaders, graders, scrapers, compactors

[69] DSEIS at 5-4-1. This inability to identify construction equipment with any specificity did not prevent the FAA from concluding in its draft conformity determination that emissions from such equipment would not exceed *de minimis* levels. DSEIS at B-12.

and water trucks, which would be required on this project, would be transported to the construction site nor how they would maneuver around the site once construction is underway. The existing and future topography of the third runway construction site would make ordinary construction staging practices difficult if not impossible to carry out. The potential for off-site impacts from construction activities is far greater than the DSEIS acknowledges.

4.6 AIR QUALITY IMPACTS ATTRIBUTABLE TO INCREASED AIRCRAFT OPERATIONS ARE IGNORED OR INACCURATELY IDENTIFIED

The air quality analysis in the DSEIS presents the dubious finding that the airport expansion actually would reduce emissions of CO, NO_x and VOC by 2005.[70] According to the DSEIS, by 2010, the Master Plan Update projects would reduce CO emissions by 15 percent, reduce VOC emissions by 12 percent, and would result in no change in NO_x emissions compared with the No-Action scenario.[71]

It defies logic that NO_x emissions, which unlike CO and VOC are not primarily associated with aircraft taxiing and idling, would decrease as the number of operations climbs.[72] This conclusion not only is implausible on its face, but is directly contradicted

[70] DSEIS at 5-2-3.

[71] DSEIS at 5-2-3.

[72] The DSEIS identifies a possible exceedence of the Nitrogen Dioxide ambient air quality standards at one receptor, and acknowledges that pollution concentrations at this location are "influenced" by aircraft takeoffs. DSEIS at 5-2-5.

by a growing body of evidence that NO_x emissions worldwide are increasing as air traffic grows.[73]

The majority of NO_x emissions occur during takeoff, climbout, and engine braking (reverse thrust) during deceleration.[74] As a result, each additional aircraft landing or taking off would increase NO_x emissions, an increase which would not be offset by reductions in delay. Thus, the higher number of operations associated with the third runway alternative after 2008 – just three years after the third runway would be completed – necessarily would result in higher NO_x emissions when compared with the No-Action alternative. Nonetheless, data in the DSEIS show With Project NO_x levels in 2010 as identical to No-Action levels, despite the projected 14,000 additional operations.[75] Perhaps even more incredibly, the DSEIS projects that by 2020, an expanded Sea-Tac would produce lower levels of NO_x emissions than under the No-Action scenario, even though the Airport would experience 72,000 more operations.[76] Errors in both data input and reporting offer the only apparent explanation for this anomalous result.[77]

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[73] See generally Natural Resources Defenses Council, Flying Off Course, Environmental Impacts of America's Airports (Oct. 1996).

[74] See Energy and Environmental Analysis and K.T. Analytics, Inc., Air Pollution Mitigation Measures for Airports and Associated Activity 4 (California Air Resources Board, May 1994).

[75] DSEIS, Table C-2-5 at C-2-17.

[76] DSEIS, Table D-2 at D-8.

[77] See Memorandum from Michael G. Ruby, P.E., President and Director, Engineering, Envirometrics, Inc., to Cutler & Stanfield, L.L.P. (Mar. 27, 1997), attached to these Comments as Appendix N.

Furthermore, while newer aircraft engine types might emit less CO and hydrocarbons, they generally produce higher levels of NO_x, and consequently may actually increase NO_x emissions.[78] In addition, because ground support equipment activity increases in direct proportion to the number of aircraft using the airport, and most aircraft ground support equipment are diesel-powered and emit a significant quantity of NO_x as well as VOC and CO, emissions would be expected to increase as operations increase.[79] The DSEIS confines its analysis of air quality impacts to the "two pollutants of concern" – CO and No_x.[80] The rationale for limiting the analysis in this fashion is that the Airport is located in area which, until recently, was designated as "non-attainment" for CO and Ozone (formed by the photochemical reaction NO_x and Hydrocarbons), and which is still subject to the region's maintenance plan for these pollutants.

While CO and NO_x may be relevant to the FAA's obligation to undertake a Conformity Analysis pursuant to the Clean Air Act,[81] the DSEIS' focus on these pollutants to the exclusion of others fails to satisfy the requirements of NEPA and SEPA. Airport-related emissions of particulate patter ("PM") should have been included in this analysis, especially in light of the pending revision to National Ambient Air Quality

[78] See Energy and Environmental Analysis and K.T. Analytics, Inc., Air Pollution Mitigation Measures for Airports and Associated Activity 5 (California Air Resources Board, May 1994).

[79] See Energy and Environmental Analysis and K.T. Analytics, Inc., Air Pollution Mitigation Measures for Airports and Associated Activity 52 (California Air Resources Board, May 1994) ("[T]he best statistical correlation was found between the total GSE population and the total departures.").

[80] DSEIS at 5-2-1.

[81] 42 U.S.C. § 7506(c).

Standards ("NAAQS") for PM. Volatile Organic Compounds, which like NO_x, are precursors to the formation of Ozone, are omitted from the DSEIS' analysis. In addition, air toxics, which could pose a substantial threat to Airport employees as well as to nearby residents, should have been, but were not, analyzed in the DSEIS.[82] To comply with both state and federal law, the FAA and the Port must redo their air quality analysis before they can approve the Master Plan Update development actions.

4.7 THE THIRD RUNWAY PROJECT'S IMPACT ON SURFACE TRAFFIC IS NOT FULLY IDENTIFIED IN THE DRAFT SEIS

The analysis of vehicular traffic in the DSEIS acknowledges that the expanded airport would generate additional peak hour motor vehicle trips by the year 2010,[83] but attempts to minimize the impact of that additional traffic by claiming that it would be subsumed in existing surface traffic congestion. While the greatest cumulative amount of traffic may occur during the evening commute, airport-related traffic appears to be at its worst at midday, coinciding with the peak hour of arrivals and departures.[84] By omitting

[82] An EPA-sponsored study of toxic emissions at Chicago's Midway Airport, conducted in response to community concerns, evaluated cancer risks attributable to all air pollution sources in Southwestern Chicago. It indicated that Midway's arriving and departing planes constitute a considerable source of particulate matter as well as toxic compounds such as benzene, 1,2-butadiene, and formaldehyde, releasing far more of these pollutants than other industriel pollution sources within the 16-square mile study area. ViGYAN, Inc., Estimation and Evaluation of Cancer Risks Attributable to Air Pollution in Southwest Chicago: Final Summary Report (Apr. 1993).

[83] DSEIS at 5-1-1.

[84] Current flight schedules indicate that the Airport's weekday peak period occurs between 11:00 a.m. and 1:00 p.m. DSEIS at 5-1-2.

an in-depth analysis of airport peak hour traffic, the DSEIS fails to identify and disclose fully the surface traffic impacts attributable to this project.[85]

In addition, the DSEIS avoids analyzing a true worst-case scenario, which would consider the impact of the expanded airport operating at full peak-hour capacity.[86] An expanded airfield could handle upwards of 14,000 passengers in a peak hour.[87] Whereas the No-Action scenario assumes that the same number of passengers could be accommodated by spreading them out throughout the day, construction of the third runway would allow more of these passengers to fly during peak hours. As a consequence, many more people would be arriving and departing during these peak periods – a possibility which the DSEIS does not appear to take into account.

Furthermore, the DSEIS contains some unexplained discrepancies in its reported data which may have skewed the comparison of With-Project to No-Action surface traffic. For instance, the DSEIS shows the same number of airport employee and maintenance trips in each of the future years studied,[88] despite an increase in the size of the airport and number of operations associated with the preferred alternative.

[85] See Smith Engineering & Management, Traffic Analysis of Draft Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport ("Smith Report")1 (Mar. 11, 1997), attached to these Comments as Appendix O.

[86] See Smith Report at 1.

[87] This number was derived by extrapolating from the estimated enplanements for maximum peak hour capacity under the No-Action scenario, in which 82 peak hour operations are estimated to correspond to 5,930 enplanemnts. The DSEIS does not identify a theoretical maximum hourly capacity for the expanded airfield. See DSEIS at 2-25. The Port's revised forecast for 2010 projects a peak hour demand of 99 operations, which could be accommodated with a third parallel runway. DSEIS,Table 2-6 at 2-14.

[88] DSEIS, Table 5-1-1 at 5-1-10.

4.8 THE DRAFT SEIS CONTINUES TO IGNORE THE SOCIO-ECONOMIC IMPACTS OF THE PROPOSED AIRPORT EXPANSION

Major airport development programs have the potential to affect the social and economic life of a community by causing residential and commercial displacement, promoting industrial development and contributing to changing surface transportation patterns. The FEIS failed to adequately describe the impacts of the proposed third runway and associated Master Plan Update development actions on the social and economic life of the Puget Sound region, and cavalierly concluded that "[t]here are no mitigation measures proposed to compensate for socio-economic effects on the study area, because no significant adverse effects are expected to occur."[89] The DSEIS summarily dismisses those socio-economic impacts with barely more than a page of text and does not even attempt to consider the effects on the community of much greater and faster-than-predicted growth in passengers and operations at the Airport.[90] Paradoxically, while the Port and the FAA have fashioned a DSEIS which characterizes the negative community impacts from the proposed Airport expansion as minimal,[91] the Port's previous Master Plan Update definitively asserted that "no new runways at Sea-Tac would be considered, primarily because . . . (3) construction of a new runway would have a large environmental impact."[92] Rather than further disadvantage the communities

[89] FEIS at IV.8-13. See also FEIS at sections IV.6 and IV.8.

[90] DSEIS at 5-7-3, 5-7-4.

[91] See DSEIS at 5-7-3, 5-7-4.

[92] Port of Seattle, Master Plan Update for Sea-Tac International Airport (Final Report) at 1, 2-3 (Sept. 1985) (emphasis added).

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surrounding the Airport, the Port and its consultant concluded at that time that there should be no additional runways developed at Sea-Tac.

A major passenger and cargo transportation facility such as Sea-Tac affects the surrounding community in many ways. Whatever aggregate economic gains might be associated with airport activities usually are widely dispersed and typically are experienced across a large number of households and businesses located in the entire region. By contrast, economic losses and social costs – often attributable to aircraft noise, increased emissions of air pollutants, and increased traffic congestion – are burdens which are borne disproportionately by the communities located near the airport. The environmental review documents issued by the Port and the FAA focus primarily on the positive economic benefits that the Puget Sound region would be expected to enjoy as a result of the expansion of Sea-Tac.[93] For those individuals residing near Sea-Tac, however, the Airport expansion would mean higher levels of aircraft noise, constant traffic jams resulting from the transportation of at least 23 million cubic yards of fill for five years; air and water quality degradation; the loss of environmentally sensitive areas; and overall increases in vehicular traffic on already crowded streets and highways.

The process of localized economic and social deterioration which often results from a major airport expansion such as the construction of a third runway and other Master Plan Update development actions at Sea-Tac can be summarized generally as follows: increased aircraft noise exposure and other adverse impacts to the local environment from increased airport operations result in economic losses which would

[93] See, e.g., FEIS at section IV.8; DSEIS at 5-7-3, 5-7-4.

lead, over time, to reduced property values in the community. The local property tax base deteriorates with the decline in property values, and the existing housing stock is transferred to lower-income residents. Decreased property revenues for the local communities results in a decreased tax base to fund local services, at the same time that the demand for such services increases in deteriorating neighborhoods. Lower per capita income levels compromise the economic ability of the community to support existing local businesses and result in decreases in retail sales and sales tax revenues.

The spiraling process of economic and social deterioration attributable to the expansion of an airport can have devastating impacts upon the fiscal and social well-being of communities in the vicinity. Previously stable neighborhoods become blighted in an accelerated period of time, thus placing enormous strains on the financial integrity of those local governments and school districts charged with the primary responsibility for educating the community's children and ensuring the basic public welfare.

Thus, there is considerable credible evidence from the experience of other communities that additional exposure to persistent aircraft noise and other detrimental environmental impacts in the ACC cities would have a negative effect on the price of residential housing stock, and would have a generally negative effect on their economies. It is likely that, as the price of housing declines, new buyers would have lower average household income than the preceding owners, and neighborhoods would deteriorate. If long-term residents move away from the community and are replaced by families who do not have a long history of commitment to the community, there may be cascading effects on the level of personal income which would have an impact on the earnings of local businesses and on local tax collections.

The DSEIS prepared by the Port and the FAA ignores the fact that lower property values might result in areas adjacent to the proposed buyout areas in the cities of Burien, Des Moines and SeaTac and other communities affected by Airport Operations. Lower property values also would result in decreased property tax receipts. Even a modest decline in property values would dramatically increase the net costs to local governments and the school districts of providing necessary services.

The DSEIS should have analyzed these socio-economic impacts that would result from the increased number of operations and passengers which are projected to occur as a result of the construction of a third runway and other Master Plan Update development actions at Sea-Tac. Since, however, the Port and the FAA seek to perpetuate the fiction that there would be, in effect, no difference in the use of the Airport with or without a third runway, it is not surprising that the DSEIS fails to provide any description or analysis of the socio-economic impacts of the implementation of the Master Plan Update development actions.

Moreover, while the DSEIS acknowledges the fact that most of the neighboring jurisdictions (including the City of SeaTac and the ACC member cities of Des Moines, Federal Way, Normandy Park and Tukwila) have adopted comprehensive plans[94] in accordance with the State of Washington Growth Management Act ("GMA"),[95] there still is no attempt to consider the impacts of the third runway on the cities' comprehensive

[94] DSEIS at 1-8, 4-6 to 4-7.

[95] Chapter 36.70A RCW.

plans or to make the Port's Master Plan Update consistent with those comprehensive plans.[96]

4.9 THE DRAFT SEIS DISREGARDS IMPACTS ON SURFACE AND GROUNDWATER RESOURCES

The DSEIS concedes that implementation of the development actions included in the Master Plan Update would increase the amount of impervious surfaces, increase stormwater runoff flow rates and volumes and increase pollutant loading.[97] Notwithstanding their serious nature, the document includes no more than a cursory mention of these impacts and includes only a vague reference to mitigation which it is alleged "would prevent significant pollution or degradation of surface and groundwater resources.[98] The entire subject is covered in only three brief paragraphs.

State government agencies and the public frequently have expressed concern about contamination of public drinking water wells and Miller and Des Moines Creeks due to Airport operations. Recently, the Washington Department of Ecology required the Port to undertake a major study of groundwater impacts of the proposed Airport expansion.[99] Nowhere in the DSEIS is there any mention of this study or of any plans for mitigating problems which the study might bring to light. The DSEIS also neglects to consider the impact of an increased number of aircraft operations on potential contamination of runoff with jet fuel, and de-icing fluids and other hazardous substances.

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[96] See WAC 197-11-444(2)(b), 365-195-340(2)(B)(iv), -770(2).

[97] DSEIS at 5-7-4.

[98] DSEIS at 5-7-4.

[99] Port OKs $1.1M for Water Study, Des Moines News, Mar. 19, 1997 at A2.

Although the ACC and other citizen groups previously have raised questions about the effect that the creation of a substantially larger impervious area would have on both water quantity and water quality in Miller and Des Moines Creeks,[100] the Port continues to give only general and insubstantial responses and provides no detailed plans for safeguarding the water resources in the region. Given the Port's past failure to adequately maintain its Industrial Wastewater System,[101] it is incumbent upon the Port – and its partner in the environmental review process, the FAA – to undertake a *bona fide* examination of the impacts of airport expansion on ground and surface water resources, to disclose the results of such an investigation and to provide a detailed plan of how it intends to mitigate the unavoidable negative effects.

[100] DEIS Comments at 5.5-5 to 5.5-6.

[101] The Port recently settled a lawsuit with a local citizens' group by admitting that it had not lived up to the requirements of the federal Clean Water Act and had failed to adequately monitor the discharge of polluted water into streams that empty into the Puget Sound.

5.0 MITIGATION MEASURES

The brief and insubstantial consideration of mitigation measures included in the DSEIS fails to meet the requirements of either state or federal law. The FAA has an affirmative obligation to discuss in the DSEIS how the adverse effects of the increased use of Sea-Tac could be avoided through the implementation of mitigation measures.[1] Similarly, the Port is required to discuss "reasonable mitigation measures" that would significantly mitigate the impacts identified. The DSEIS must "clearly indicate those mitigation measures . . . that could be implemented or that might be required," and the intended environmental benefits of each.[2] Under SEPA,[3] the terms "mitigation" and "reasonable alternative" are functionally interchangeable: "mitigation" is avoidance and amelioration of environmental harm, and a "reasonable alternative" is an action which would attain or approximate a proposal's objective with less environmental harm.[4] Consequently, the analysis of alternatives forms the basis for considering mitigation measures.

As discussed elsewhere in these Comments,[5] the discussion of impacts in the DSEIS is incomplete and misleading. Thus, it comes as no surprise that the discussion of mitigation – to the extent that it exists at all – is woefully inadequate. Moreover, most references in the DSEIS

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[1] 40 C.F.R. § 1508.25(b) (1996).

[2] WAC 197-11-440(6)(a), (c)(iii), (iv).

[3] Chapter 43.21C RCW.

[4] WAC 197-11-786.

[5] See supra § 4.0.

to mitigation defer both the details of potential mitigation measures and any commitment to implement them to some unspecified point in the future.[6]

Mitigation of residential noise impacts is, for the most-part, relegated to consideration in the Port's recently-initiated FAR Part 150 Noise Compatibility Plan ("NCP").[7] The Port's reliance on the FAR Part 150 process to meet its obligation to identify and discuss appropriate mitigation measures, moreover, is improper. The Part 150 NCP will be based on existing noise contours and those projected for a period five years into the future – most likely 2002 – before the proposed third runway would be completed. FAA regulations would not allow the NCP to even consider, much less to plan for, the mitigation of noise impacts for an additional runway which would not be operational until 2005 – two or three years after the end the FAR Part 150 planning horizon. The Port thus far has made no commitment to undertake another Part 150 study in 2002.

In addition, several statements in the DSEIS that "eligibility" for residential noise insulation would be defined with reference to the Port's existing Noise Remedy Boundary,[8] also

[6] See, e.g., DSEIS at 5-1-7 ("Mitigation is proposed for each adverse impact [on surface transportation] that would occur with the Preferred Alternative"); 5-4-19 ("Based on the [unspecified] hauling plan, the Port of Seattle will develop a Construction and Earthwork Management Plan"); 5-6-19 (The additional residences which the DSEIS concedes would be subject to an increase of 1.5 dB DNL or greater noise impact "would be addressed by the existing Noise Remedy insulation program, if the owners agree."); 5-7-4("Although pollutant loading will increase somewhat because of greater amounts of stormwater runoff associated with the 'With Project' alternatives, implementation of [unspecified] mitigation would prevent significant pollution or degradation of surface and groundwater resources."); 5-7-6 ("Mitigation for potential construction-related hazards include developing a [presently unspecified] Spill Prevention, Control; and Countermeasures Plan . . . and a[n also unspecified] Hazardous Substances Management and Contingency Plan") (emphasis added).

[7] DSEIS at 5-6-6.

[8] See DSEIS at 5-6-7, 5-6-17, 5-6-19.

are a cause for alarm, since the Noise Remedy Boundary was established in the Port's 1985 NCP and is based on a projection of 280,000 operations in 2010. The Port's revised forecast projects that operations will reach 474,000 by that year, but the DSEIS contains minimal discussion of the additional mitigation that would be necessitated by this increase.[9] The DSEIS contains absolutely no discussion of mitigation required to address impacts beyond 2010, despite the fact that by the Port's own reckoning, the expanded airfield could accommodate as many as 630,000 annual operations – more than twice the number that serves as the basis for the existing Noise Remedy Program.

Finally, as the ACC already has asserted,[10] the Port's wetlands mitigation plan does not comply with the requirements of the comprehensive plans adopted pursuant to the Washington Growth Management Act by the cities of Burien, Des Moines, Normandy Park, SeaTac or Tukwila.

The lack of consideration of adequate mitigation in the earlier environmental review documents prepared by the Port and the FAA prompted the Washington State Legislature, in 1996, to appropriate the sum of $500,000 for a study which would assess the potential impacts of the proposed Airport expansion on neighborhoods in the surrounding communities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila, and on facilities owned and operated by the Highline School District and Highline Hospital. While the grant has been administered by the State Department of Community, Trade, and Economic Development, the study itself was undertaken by nationally recognized airport consultants.

[9] See DSEIS at 5-6-5 to 5-6-7 (describing proposal to offer sound insulation to nine public facilities and historic sites that would experience an increase of 1.5 DNL or more in 2010).

[10] See DEIS Comments at 5.6-4 through 5.6-6.

The study was confined to potential impacts associated with the proposed third runway and related facility improvements,[11] with the primary objective being to identify mitigation measures necessary to preserve and protect neighborhood integrity. The study examined potential environmental, transportation and socio-economic impacts.[12] The experience of other American airports and other major Washington State infrastructure projects also was reviewed to determine the appropriate mitigation approaches.[13]

During the year-long course of the study, the consultants conducted over 100 meetings, interviews, presentations, workshops and question-and-answer sessions with local elected and appointed officials and staff members; the Port of Seattle staff and its consultants; county and state elected officials; representatives from various city, county, state, regional and federal agencies; and the general public.[14] Moreover, throughout the study period, the consultants met regularly with citizens, city staff and elected officials and staff from the Port of Seattle, among others.[15]

The study concluded that the costs associated with the construction of the proposed third runway and the implementation of associated Master Plan Update development actions, would be "disproportionately borne by those communities immediately surrounding the Airport.

[11] The Mitigation Study was based on data in the FEIS, and did not consider the additional impacts attributable to the revised forecast in the DSEIS.

[12] Hellmuth, Obata + Kassabaum, Inc.; Thomas/Lane & Assocs., Inc.; Michael J. McCormick, AICP, Sea-Tac International Airport Impact Mitigation Study, Initial Assessment and Recommendations ("Mitigation Study") (Mar. 1997) §§ 2, 3, 4, submitted with these Comments as Appendix P (bound separately).

[13] See Mitigation Study §§ 5 and 6.

[14] Mitigation Study at ES-1.

[15] Mitigation Study at 1-4.

Communities such as Burien and Des Moines are projected to be impacted by noise, traffic congestion, and socio-economic hardship merely because of their location near the Airport."[16] The study estimates that approximately $2.95 billion would need to be expended by the Port of Seattle and other appropriate public and, possibly, some private agencies to sufficiently ameliorate effects of these conditions on the communities surrounding Sea-Tac.[17]

The Port is a member of the Technical Advisory Committee for the Mitigation Study. As an active participant on the Committee, the Port worked with the consultants conducting the study, and reviewed the interim working papers which became sections of the report. Nonetheless, there is absolutely no mention of the Mitigation Study in the DSEIS. More importantly, given the inadequate discussion of potential mitigation measures in the DSEIS, there is no mention of any of the potential mitigation measures identified during the course of this study.

By showing little interest in appropriate mitigation, and by ignoring completely the Mitigation Study, the Port and its partner, the FAA, have failed to satisfy the requirements of their respective legal mandates that they discuss and evaluate "reasonable mitigation measures" that could be implemented and which might be required.

[16] Mitigation Study at ES-5.

[17] Mitigation Study.

6.0 CONCLUSION

The DSEIS fails in the central purpose of any environmental study: to conduct the type of scientific review and rigorous analysis required to make informed decisions. Instead, the Port and the FAA hope that by ignoring impacts, making faulty assumptions, providing as little scientific data as possible, and refusing to grant extensions of the comment period, it can push through a decision based on an inadequate record.[1]

The Port also is seeking to move forward with the implementation of the Master Plan Update without having demonstrated its financial feasibility. In fact, in February 1997, the Port was forced to acknowledge that it had revised the third runway cost estimate upward by 30 percent.[2] The Port's previous estimate inexplicably did not include such basic items as a construction contingency, sales tax, and inflation. Accounting for these items added $132 million to the Port's original projection. At an estimated cost of $585.4 million, the third runway at Sea-Tac would be the most expensive single runway of comparable length ever constructed in the United States.[3]

[1] The attitude of the Port is perhaps best exhibited by its officials publicly complaining at an industry conference about being forced by the FAA to even have to do a Supplemental EIS – despite the fact that it was their own reluctance to recognize the import of higher than-anticipated levels of operations in the FEIS which necessitated a Supplemental EIS. The Port's arrogant attitude also is apparent in the strategy it developed to conceal from the media and from the public the fact that, by the time the Port Commission approved the Master Plan Update and the FEIS (in August 1996), the Commissioners and the staff were aware that the number of operations at Sea-Tac in 1995 and the first half of 1996 had exceeded previous forecasts, and that the FAA's most recent projections of future operations levels were substantially above the levels projected in the Port's Master Plan Update. See generally Risdon Memorandum.

[2] See Port of Seattle, Commission Briefing: Third runway Financing Plan, (Feb. 25, 1997), attached to these Comments as Appendix Q.

[3] A table prepared using data from the FAA's most recent Aviation Capacity Enhancement Plan is attached to these comments as Appendix R.

The Port's new estimate still cannot be relied upon, because it does not include debt service and it has substantially underestimated the construction contingency amount and the effect of inflation on a longer construction schedule. Inevitable cost overruns would be expected to further increase the price tag of the third runway. With the addition of these costs, the federal government, King County taxpayers, airlines, the traveling public and concessionaires eventually would be expected to pay close to $1 billion to construct a single dependent runway which cannot meet the long-term needs of the Puget Sound region for additional airport capacity.

By failing to disclose fully the basis for this project, the true extent of its environmental impacts or the magnitude of its cost, the Port and the FAA have thrown the burden of conducting detailed technical analysis onto the public. Although the law does not require public commenters to supply the missing analysis, the inadequacies of the DSEIS, compounded by flaws in previous environmental documents on which the DSEIS is based, forced neighboring jurisdictions (including the ACC) and members of the public to retain their own experts in an attempt to recreate or generate data in order to critique the analysis presented in the DSEIS.

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Not only have the Port and the FAA shortchanged the public by issuing an inadequate document, they have provided an insufficient period of time in which to conduct the requisite review and analysis of the DSEIS. A 45-day comment period is the minimum required by federal law, and is wholly inadequate for a complex and controversial project like this one. Contrary to the FAA's contention that the DSEIS' "narrower focus" produced "a much smaller document than the preceding Draft and Final Environmental Impact Statements" that eliminates the need for additional time to review

the document,[4] the very fact that the DSEIS omits more than it includes increases the time needed to address its conclusions.

Although the FAA and Port attempt to obscure the fact that the purpose and need for the selected project has been radically altered, this change requires a re-examination of feasible alternatives and an analysis of the environmental impacts. That undertaking simply has not been made by the FAA or the Port in the DSEIS.

The DSEIS continues along the path established by the previous environmental studies: predetermine the desired outcome, and then obfuscate or ignore any data which might get in the way. The DSEIS' flawed assumptions, invalid inferences drawn from inaccurate data, and biased conclusions, taken together with similar transgressions in the DEIS and FEIS, prevent both the decision-makers and the public from making informed judgments about the wisdom of this project.

A draft supplemental EIS, like a draft EIS, must provide sufficient information and analysis for other agencies and the public to make constructive comments. A draft EIS that is so inadequate as to preclude meaningful analysis must be revised and reissued by the agency.[5] For the reasons set forth in these Comments, the DSEIS fails to meet this threshold requirement. The FAA and the Port must revise and reissue a DSEIS that is sufficiently detailed to provide the public and other government agencies with information to facilitate thoughtful review and useful comments.

[4] Letter from S. Kurland, Associate Admin. for Airports, to Honorable Adam Smith (Member of Congress) (Mar. 17, 1997) at 2. See also letter from Dennis Ossenkop, FAA Northwest Mountain Region, to Perry Rosen, Cutler & Stanfield, L.L.P. (Counsel to the ACC) (Mar. 19, 1997).

[5] 40 C.F.R. §1502.9(a).

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June 11, 1996

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VIA OVERNIGHT MAIL

Mr. Norman Abbott
Responsible SEPA Official
Puget Sound Regional Council
1011 Western Avenue, Suite 500
Seattle, WA 98104

Re: Request for a Supplemental Environmental Impact Statement for Proposed Action to Amend the Metropolitan Transportation Plan to Include a Third Runway at Sea-Tac Airport with Specific Noise Reduction Measures

Dear Mr. Abbott:

On behalf of the cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila and the Highline School District, individually and collectively as the Airport Communities Coalition (the "ACC"), we hereby request that the Puget Sound Regional Council ("PSRC") prepare a Supplemental Environmental Impact Statement ("SEIS") for its proposed action to amend the Metropolitan Transportation Plan ("MTP") to include a third runway at Sea-Tac Airport ("Sea-Tac") with specific noise reduction measures. We are making this request pursuant to WAC 197-11-600(4)(d) and PSRC Resolution EB-92-02, Section 7.

The PSRC states that it seeks to amend the MTP to permit the Port of Seattle (the "Port") to proceed with construction of a third runway at Sea-Tac. As its environmental review documentation, the PSRC staff has indicated that the PSRC will rely on two existing documents, the Final Environmental Impact Statement, issued in October 1992 for the Flight Plan Study (the "Flight Plan EIS") and the Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Sea-Tac, issued in February 1996 (the "Master Plan EIS"). (The Flight Plan EIS and the Master Plan EIS are referred to together as the "EISs".) In an effort to update these documents, the PSRC staff has issued a 6-page addendum (the "Addendum").

What is so troubling about the Addendum is the manner in which it was prepared and issued. The Addendum was issued on May 28, 1996, well before the PSRC staff, Executive Board or General Assembly had made any determination about the contents of the MTP amendment. As a result, the Addendum contains only a general description of the MTP amendment, and no information on the mitigation measures that will be adopted as part of the amendment. Furthermore, with no supporting information before it, the PSRC staff predetermined that the amended proposal would have none of the characteristics that would require the PSRC to prepare an SEIS. Such a predetermination is highly inappropriate and violates the legal requirements of the Washington State Environmental Quality Act ("SEPA").

Even if the Addendum had been properly prepared, the use of the Addendum in this case falls far short of the legal requirements of SEPA and the PSRC's own SEPA rules. Rather, the PSRC legally is required to prepare an SEIS for the proposed MTP amendment. First, substantial changes in the proposal are likely to have significant adverse environmental impacts not identified in the EISs. Second, new information made available since preparation of the EISs indicates the existence of probable significant adverse environmental impacts related to the third runway that are not identified in the EISs.

I. Background

The Puget Sound Council of Governments ("PSCOG") (predecessor to the PSRC) adopted its Regional Airport System Plan ("RASP") in 1988 to serve as the interim air transportation element of the MTP. The RASP stated that the region should "proceed expeditiously with the detailed evaluation and selection of a preferred regional air carrier system alternative." In 1989, the Port and the PSCOG entered into an interagency agreement creating a regional airport planning task force, known as the Puget Sound Air Transportation Committee ("PSATC"). The PSATC was charged with developing and evaluating alternatives and presenting recommendations to the two agencies for meeting the region's long-term air transportation needs.

In January 1992, the PSATC issued a report referred to as the "Flight Plan Study". The Flight Plan Study recommended a preferred alternative consisting of a phased, multiple airport system including a new dependent runway at Sea-Tac, scheduled airline service at Paine Field in Snohomish County by the year 2000 and the identification of a site for a third commercial airport in central Pierce County or Thurston County to be developed by 2010. The Flight Plan Study culminated in the Flight Plan EIS, which assessed a range of alternatives at the system planning level for providing sufficient airport capacity in the Puget Sound region beyond the year 2020.

In April 1993, the General Assembly of the PSRC adopted Resolution A-93-03 to amend the RASP. The resolution stated that the region should pursue vigorously, as the preferred alternative, a major supplemental airport and a third runway at Sea-Tac. The resolution further stated that the third runway shall be authorized by April 1, 1996: (1) unless shown through an environmental assessment that a supplemental site is feasible and can eliminate the need for a third runway; (2) after demand and system management programs are pursued and achieved or determined not to be feasible based on independent evaluation; and (3) when noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation and based on measurement of real noise impacts.

Pursuant to Resolution A-93-03, the PSRC undertook the Major Supplemental Airport Study in which the PSRC retained a consultant to review potential new airport sites. At the conclusion of Phase I of the study, the PSRC Transportation and Growth Management Policy Boards jointly determined that three sites appeared to meet the guidelines set forth in Resolution A-93-03 and recommended that they be subject to further, detailed evaluation. Instead, the PSRC Executive Board decided to terminate the study and adopted Resolution EB-94-01 which summarily concluded that there were no feasible sites for a major supplemental airport within the four-county region. No environmental review was conducted as part of this action.

Also pursuant to Resolution A-93-03, the PSRC appointed an expert arbitration panel (the "Expert Panel"), which conducted an extensive review of demand and system management programs and noise reduction performance. In July and December 1995, the Expert Panel concluded that demand and system management programs would not eliminate the need for a third runway at Sea-Tac. In March 1996, the Expert Panel issued a Final Decision on Noise Issues concluding that the Port had not shown a reduction in real on-the-ground noise impacts sufficient to satisfy the noise reduction condition imposed by Resolution A-93-03. As a result, the third runway was not authorized by April 1, 1996.

Faced with this dilemma, the PSRC Executive Board met on April 25, 1996, to determine how to address the Expert Panel conclusions. The Executive Board adopted a

resolution directing staff to initiate the process of amending Resolution A-93-03 to remove the deadline of April 1, 1996, and to provide for (a) additional noise reduction measures, based on the recommendations of the Expert Panel; (b) establishment of a plan for implementation of such noise mitigation measures, including milestones; (c) monitoring compliance with such implementation plan; and (d) an agreement between the PSRC and the Port for implementation of such plan. The resolution also authorized the expenditure of up to $60,000 to carry out this process, including environmental review, and initiated review of Resolution A-93-03: Implementation Steps to insure consistency with such action.

Based on this direction, the PSRC staff on April 30, 1996 requested agencies and communities which would be responsible for implementing noise reduction measures, including the ACC, to review the Expert Panel recommendations and assess such issues as the feasibility and cost of the recommendations. Responses to this request were required to be submitted to the PSRC by May 17, 1996.

On May 10, 1996, the PSRC issued a document entitled "Public Participation Process for 1996 Amendment to the Metropolitan Transportation Plan." This document explained that the PSRC intended to adopt an amendment to the MTP to include the third runway at Sea-Tac with specific noise reduction measures. In explaining its intended SEPA process, the PSRC stated that it would be relying on the EISs as its environmental documentation and would prepare an addendum to the EISs. In spite of the fact that the PSRC staff had not yet prepared the proposed MTP amendment or recommended any specific noise reduction measures, the document stated that the additional information and/or analysis provided in the Addendum would not substantially change the analysis of significant impacts and alternatives in the existing environmental documents.

The PSRC staff issued the Addendum on May 28, 1996. The Addendum described the proposed action as "a proposal to amend the Aviation Program and Appendix F - Resolution A-93-03 of the MTP to include a third runway at Sea-Tac with specific noise reduction measures." However, because the proposed MTP amendment was not yet developed, the Addendum could not include any analysis of the proposed MTP amendment or describe any of the proposed noise reduction measures. Instead, the Addendum provides nothing but a cursory discussion of the process and findings of the Expert Panel. Not surprisingly, it also lacks any discussion of the potential impacts of the proposed amendment.

On May 30, 1996, two days after the Addendum was issued, the PSRC Executive Board held a workshop on noise reduction measures. At that workshop, the Executive Board heard comments from the public regarding specific noise reduction measures recommended by the Expert Panel, but took no action to recommend any such measures for inclusion in the MTP amendment.

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Finally, at 5:15 p.m. on June 10, less than 48 hours before the June 12 deadline for requesting preparation of an SEIS, the PSRC staff issued its "Draft Action Item" on the draft MTP amendment. The Draft Action Item still did not describe the proposed MTP amendment. Instead, as its Draft Recommended Action, the PSRC staff recommended that the Executive Board "select a package of noise reduction measures from the recommendations of the Expert Panel . . . . and recommend the package to the General Assembly as part of an amendment to include a third runway at Sea-Tac Airport in the Metropolitan Transportation Plan."

II. SEPA Requires Preparation of an SEIS When Changes in the Project or New Information Are Likely to Result in Significant Impacts Not Addressed in the Previous Environmental Documents.

When an agency seeks to use existing environmental documentation to fulfill its SEPA responsibilities, it must review that documentation to determine whether additional environmental review is required. WAC 197-11-600. If the agency determines that some level of additional review is required: (1) it can prepare an addendum, if the new information adds analyses or information about a proposal but does not substantially change the analysis of significant impacts and alternatives in the existing environmental document, WAC 197-11-600(4)(c), or (2) it must prepare an SEIS if there are substantial changes to a proposal so that the proposal is likely to have significant adverse environmental impacts or there is new information indicating a proposal's probable significant adverse environmental impacts. WAC 197-11-600(4)(d).

The critical difference between an addendum and an SEIS is not just the information presented in each, but also how each is processed. There is no requirement that the agency make an addendum available for widespread public comment, receive comments on the addendum or respond to such comments in writing. WAC 197-11-625. An SEIS, on the other hand, must be prepared in the same way as a draft and final EIS; it must be made available for public comment, and the agency must respond to those comments in writing. WAC 197-11-620. This difference in processing reflects one of SEPA's primary goals: to encourage public involvement in decisions that significantly affect environmental quality. WAC 197-11-030(2)(f). In other words, when new information or a change in the proposal present significant impacts not previously discussed, SEPA intends that the public have an opportunity to know of, and comment on, those impacts and alternatives to the proposal.

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III. The PSRC is Required to Prepare an SEIS for the Proposed MTP Amendment

As described above, the PSRC has not even identified the specific MTP amendment that is the subject of environmental review. Therefore, proper environmental review requires the analysis of all of the noise reduction alternatives recommended by the Expert Panel. In addition, regardless of the specific amendment that the PSRC adopts, other substantial changes in the proposal, as well as new information that has become available since completion of the EISs, clearly indicate the likelihood of significant impacts that the public should have an opportunity to review and consider through an SEIS.

A. Because the Proposed Amendment is Not Yet Available, the PSRC Must Analyze in an SEIS the Impacts of All the Noise Reduction Alternatives Recommended by the Expert Panel

The PSRC staff has attempted to conduct environmental review on a proposed MTP amendment that would include specific noise reduction measures that have not been determined. Under these circumstances, proper environmental review requires analysis of the impacts of all of the noise reduction alternatives recommended by the Expert Panel.

Review of those recommendations indicates that they would cause changes in the proposal resulting in significant adverse environmental impacts. For example, most operational noise abatement procedures achieve a net decrease in noise impacts by shifting noise from one area to another. Changing flight tracks may reduce noise impacts for some people, but this benefit comes at the expense of increased noise for others. Similarly, implementing a noise abatement departure profile or requiring a steeper angle of descent for arriving aircraft benefits outlying areas only by concentrating noise impacts closer to the airport. These and other impacts should be analyzed in an SEIS.

B. Other Substantial Changes in the Proposal Will Likely Result in Significant Adverse Environmental Impacts That are Not Discussed in the EISs

1. The Proposed Amendment Replaces a Regional Approach to Air Transportation Needs With a Site-Specific Approach

As the body charged with developing regional plans and planning solutions, the PSRC must take a regional approach to addressing the air transportation needs of the Puget Sound region. Consistent with this regional approach, the PSRC's Flight Plan Study and Flight Plan EIS evaluated a series of air transportation solutions, including, among others, a major supplemental airport, demand management systems and a third runway at Sea-Tac. Resolution A-93-03 supported this regional approach by directing the region to pursue vigorously both a major supplemental airport and a third runway at Sea-Tac. The Master

Plan EIS prepared by the Port focused on only one prong of the proposal contemplated by Resolution A-93-03: the third runway.

Regardless of its specifics, the proposed MTP amendment completely changes the PSRC's focus. Instead of continuing to pursue a regional solution, the PSRC has abandoned its support for an airport system which includes the two elements agreed to in Resolution A-93-03, and now adopts a single site-specific answer to addressing the region's air transportation needs.

This enormous change in the proposal -- from a region-wide to a site-specific proposal -- necessarily results in significant impacts not discussed in the EISs. Most important, while the regional approach spread the impacts throughout the Puget Sound region, the site-specific approach concentrates the adverse impacts in the area surrounding Sea-Tac. For example, while the region as a whole may benefit from increased air transportation capacity at Sea-Tac, the environmental costs will be borne primarily by South King County residents and the financial costs of the project will be borne by King County taxpayers. This approach conflicts with the policies of Vision 2020 which call for equitably distributing the burden of regional capital facilities. The proposed MTP amendment will cause new and significant impacts which must be discussed in an SEIS.

2. The Proposed Amendment Authorizes Construction of a Third Runway In the Absence of Meaningful Noise Reduction Required by Resolution A-93-03

Resolution A-93-03 contemplates that a third runway at Sea-Tac would not be constructed unless the Port demonstrated that noise reduction performance objectives had been scheduled, pursued and achieved. This condition was imposed in response to widespread community complaints about the Port's failure to implement aggressively the noise reduction measures it had committed to undertake in order to abate and mitigate the noise attributable to the construction of the second runway in 1973. Before the Port could proceed with another expansion project, the PSRC sought assurance by way of its Expert Panel that it had first addressed its existing noise problems. In fact, the Expert Panel found that the Port had not successfully mitigated the noise impacts of current airport operations; in other words, the existing noise problem is more severe than the PSRC assumed it would be by April 1, 1996.

The PSRC now seeks to avoid the finding of its own Expert Panel by authorizing the third runway with only limited mitigation measures, and no assurances that those measures ever will be implemented. This means that the baseline for evaluating noise impacts contemplated by the proposed MTP amendment will be much higher than those contemplated in Resolution A-93-03. Consequently, construction of the third runway under

the MTP amendment will result in total noise impacts greater than those assumed in either the Flight Plan EIS or the Master Plan EIS. SEPA requires that these greater impacts be identified and analyzed in an SEIS, and that the public have an opportunity to review and comment on them.

C. New Information Made Available Since Preparation of the EISs Indicates Probable Significant Adverse Environmental Impacts That Have Not Been Described or Analyzed in the EISs.

Since preparation of the EISs, a great deal of new information has become available that indicates the existence of probable significant adverse environmental impacts. SEPA requires that these significant impacts be analyzed in an SEIS.

1. Noise

The most extensive and important area of new information comes from the materials submitted to the Expert Panel. The ACC retained Dr. Sanford Fidell, a nationally-recognized expert on airport noise, to assist it in its presentations to the Expert Panel and to review noise data in the Master Plan EIS. A copy of Dr. Fidell's report comparing information provided to the Expert Panel with data in the Master Plan EIS ("Fidell Report") is attached as Exhibit A.

The Expert Panel insisted that the Port produce reliable evidence of reductions in noise impacts, based upon actual measurements of on-the-ground noise. The information gathered by the Port and submitted to the Expert Panel in response to this request updated and enhanced the information contained in the Draft Master Plan EIS. In recognition of the greater accuracy of this data, the PSRC urged the Port to incorporate the latest information developed as part of the Expert Panel process into the Master Plan EIS, and suggested that finalization of the Master Plan EIS should be deferred until the Expert Panel's final report was available in April 1996. The Port, however, chose to ignore the PSRC's comments, and issued the Master Plan EIS in February 1996. Despite acknowledged discrepancies between predicted (1994 computer modeled) and actual (1994 measured) noise levels brought to light by the Expert Panel process, the Port continued to rely on the earlier predicted data and did not integrate the more recent and detailed information.

New information submitted to the Expert Panel indicates the likelihood of significant noise impacts not discussed in the EISs. First, information submitted to the Expert Panel demonstrated that the predicted noise exposure levels on which the analyses in the Master Plan EIS are based are on average 1.5 decibels below actual noise levels. Underestimating noise impacts by this degree is significant, because a change of 1.5 decibel or greater at 65

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DNL is the threshold established by the FAA for requiring analysis of impacts in greater detail.

Second, both the Flight Plan EIS and the Master Plan EIS are premised on the assumption that the area exposed to noise of DNL 65 and greater is expected to decline in the future regardless of new development at Sea-Tac Airport. Based on this assumption of continuing decline, the Master Plan EIS concluded that while the development of a third parallel runway would be expected to increase noise impacts, these future impacts would be less than the current noise exposure. However, information submitted to the Expert Panel raises questions about this assumed decline. In its final submission to the Expert Panel, the Port admitted that for some people, the recent trend is slightly upward after many years of significant downward movement because the number of operations is growing.

The assumption of an overall decrease in noise in the future is based upon the elimination of Stage 2 aircraft. The Port itself concedes that once the fleet is converted to mostly Stage 3 aircraft the potential for achieving additional noise reductions through this program will be greatly diminished. As a result, the Port admits that there are noise impacts that will not decline and may even grow as flight operations increase at the airport.

In fact, evidence provided by the Port to the Expert Panel shows that most of the noise reduction achievable from the Stage 2 Phaseout has already been accomplished. Stage 3 aircraft already account for 86 percent of the fleet at Sea-Tac, and operations of the loudest Stage 2 aircraft, the B727, have been greatly reduced. Given the diminishing returns of the existing noise reduction program, it is unrealistic to assume that noise contours will continue to shrink indefinitely. In fact, the contrary is true -- as the accompanying graph shows, noise decreases appear to have leveled off and can be projected to rise with increased operations.

The Expert Panel recognized that the gains the Port achieved are being eroded by the growth in operations. The Expert Panel also noted that the evidence at Sea-Tac suggests that the additional DNL improvements which the Port anticipates from its current noise abatement programs are likely to be overtaken by the continuing increase in operations. Figure 1 in the Fidell Report illustrates this scenario, and counters the assumptions underlying the analysis of future noise impacts in both EISs.

If, in fact, noise levels are higher today than the Master Plan EIS assumes, and are not continuing to decline, any additional noise impacts caused by the third runway project could create significant adverse environmental impacts. The Port predicts that under certain scenarios, construction of a third parallel runway could expose thousands of

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additional people to DNL of 65 dB or above by the year 2020, a number which is derived from admittedly unreliable noise contours which tend to underpredict actual noise levels. Potentially, an even greater number of people could be subjected to higher noise levels.

The Master Plan EIS dismisses such increases by concluding that "areas where significant noise exposure would result from the proposed improvements ... either have already been mitigated through the Port's existing Noise Remedy Program or are proposed for mitigation through the actions included in this EIS." Master Plan EIS at R-65. The Port's confidence that it will have remedied the problem is misplaced, since it cannot predict with any certainty where those areas will be or what levels of noise exposure those areas will experience. It is just as likely that significant noise exposure will occur in areas which fall outside of the current noise mitigation programs.

The PSRC's environmental review must consider the cumulative impacts of the proposed airport developments and projected growth in operations attributable to increased levels of demand. Because the Master Plan EIS relied on admittedly inaccurate data and invalid assumptions, its conclusions about the noise impacts of the proposed third runway project already are outdated and unreliable. The PSRC must conduct additional analysis, including projections of future noise exposure levels based upon current and accurate data, in order to fully assess the noise impacts of this proposal.

2. Air Quality

The EISs also fail to consider new information and analysis submitted to the FAA just last week in response to the agency's preliminary Clean Air Act general conformity determination for the third runway and related Sea-Tac expansion projects. The FAA first included a draft conformity determination in the Master Plan EIS when it made that document available to the public in mid-February 1996. As a result of on-going discussions with the federal Environmental Protection Agency ("EPA"), held specifically to address concerns that the EPA had raised about the conformity and air quality analysis contained in the Master Plan EIS, the FAA extended the deadline for comments until June 6, 1996.

In accordance with that deadline, the local, state and federal agencies charged with ensuring air quality in the Seattle area each filed written comments which are highly critical of the air quality and Clean Air Act general conformity analysis contained in the Master Plan FEIS. The ACC also filed comments, which identified additional deficiencies in the Master Plan EIS air quality analysis. Copies of the agencies' and the ACC's comments are attached to this letter as Exhibits B - E.

a. Puget Sound Air Pollution Control Agency

The Puget Sound Air Pollution Control Agency ("PSAPCA"), the local air quality agency for King, Kitsap, Pierce and Snohomish counties, filed comments indicating that the Master Plan FEIS air quality analysis failed to demonstrate conformity for carbon monoxide at certain key intersections in the Airport environs. (See Exhibit B) PSAPCA was particularly concerned about the absence of solid commitments to additional monitoring or mitigation measures. Thus, the agency opined that the FAA and the Port of Seattle must implement one of two options in order to demonstrate conformity with the SIP: (1) exclude all post-2010 project components from the conformity determination until additional field monitoring is undertaken by independent environmental agencies; or (2) implement a host of remedial measures including, but, not limited to, making specific, binding commitments now to require a "menu" of mitigation measures; performing additional modeling analysis that demonstrates quantitatively that the proposed mitigation will cure the predicted carbon monoxide exceedances; committing to re-examining carbon monoxide impacts in the future in a "full" SEPA/NEPA environmental analysis; developing a monitoring protocol "consistent with the normal monitoring protocols used by state, local and federal air quality agencies and agreed to by those agencies ([Washington State Department of] Ecology, PSAPCA and EPA)" to govern future monitoring; and executing a Memorandum of Agreement ("MOA") with the Port, PSAPCA, and Ecology which establishes a funded program for monitoring carbon monoxide levels in the Sea-Tac Airport Master Plan project area.

b. Washington Department of Ecology

Ecology expressed three primary concerns: (1) that the project described in the FEIS does not conform to the SIP; (2) that air quality in the Airport area would deteriorate as a result of the project; and (3) that the determination does not contain a written commitment to "specific, enforceable mitigation measures with a process for implementation." (See Exhibit C) In fact, Ecology determined that in order for the project to conform to the SIP, the FAA and the Port must either commit to and implement additional mitigation or exclude those aspects of the project which would result in air quality violations. Ecology also recommended that the Record of Decision contain a commitment to comprehensive, long-term air quality modeling in the airport area, funded primarily by the FAA and the Port, and implemented through a Memorandum of Agreement among the Port, PSAPCA, Ecology and EPA.

c. Federal Environmental Protection Agency

The federal EPA also filed comments stating that it "continue[s] to have concerns about future air quality around the airport as well as the air quality analysis in the final EIS." (See Exhibit D) Specifically, EPA believes that the underlying air quality analysis contained in the Master Plan FEIS "does not support . . . [the] conclusion that the project conforms to the State Implementation Plan (SIP)." To show conformity, EPA asserts that it is necessary to create an expanded emissions inventory which includes all additional projects expected to be built in the Sea-Tac environs. In addition, EPA believes that the Port and the FAA must perform additional modeling and monitoring, evaluate additional mitigation measures and obtain commitments to additional mitigation from appropriate governmental entities.

d. ACC Expert Reports

In expert reports submitted to the FAA as part of the ACC comments (see Exhibit E) on the conformity determination, Enviromctrics, Inc. ("Enviromctrics") and Smith Engineering & Management ("Smith") concluded that the proposed expansion of Sea-Tac is likely to have significant adverse environmental effects on air quality in the Sea-Tac environs. See Enviromctrics, Inc., "Air Quality Review for Sea-Tac Master Plan Update" (June 5, 1996), attached as Exhibit F ("Enviromctrics Report"); Smith Engineering & Management, Revised Traffic Analysis for Air Quality Conformity Review of Sea-Tac Master Plan Update (June 5, 1996), attached as Exhibit G ("Smith Engineering Report"). Because they contradict conclusions in the Master Plan EIS, and tend to support the conclusions reached by all three agencies responsible for ensuring air quality in Seattle, the findings in the Enviromctrics and Smith reports warrant additional study and consideration in an SEIS.

The reports also raise serious questions about the validity and credibility of the underlying modeling methodology in the Master Plan EIS. Using the models employed by INCA Engineering, Inc. (consultants retained by the Port and the FAA to conduct the air quality analysis), Enviromctrics and Smith determined that the Master Plan EIS substantially underestimates the adverse effect that the proposed expansion would have on air quality, particularly with respect to nitrogen oxides (a precursor to ozone) and carbon monoxide. Enviromctrics and Smith concluded that the Master Plan EIS underestimated the effects because INCA Engineering, Inc. used questionable assumptions, erroneous data and improper methodologies that substantially biased the outcome in favor of the preferred alternative in the Master Plan EIS.

One important example of this bias stems from the use of a core assumption that underlies all of the air quality analysis -- that precisely the same number of aircraft

passengers and cars would use Sea-Tac whether or not it is actually expanded. Envirometrics and Smith showed that if the models had been run without using this core assumption, the agencies would have concluded that the expansion would result in significant increases in carbon monoxide (CO) levels at key intersections in the Sea-Tac area, and likely would result in a substantial increase in the number of days the area would exceed air quality standards for CO. In addition, based on the data contained in the Master Plan EIS, Envirometrics estimated that the airport expansion would result in two to three times as many exceedances of air quality standards for nitrogen dioxide.

A critical purpose of an EIS is to give decisionmakers sufficient information to make an informed decision about whether to approve a project. To be "informed", decisionmakers must have a fair and complete understanding of the true environmental impacts that would be likely to result from the project's construction and operation. The air quality analysis prepared by INCA Engineering, Inc. does not present a fair, unbiased picture of the adverse effects that the proposed expansion would have on the Airport environs and on the surrounding communities. Thus, SEPA mandates that the PSRC prepare an SEIS to consider the new information and findings presented by PSAPCA, Ecology and EPA and contained in the Envirometrics and Smith reports. Specifically, the SEIS should address the flawed and improper methodologies contained in the Master Plan EIS's air quality analysis, the determination that the Sea-Tac expansion and associated planes, passengers and cars are likely to cause a further deterioration of air quality in the Sea-Tac area and the failure to commit to sufficient and binding mitigation measures to address significant increases in criteria pollutants.

3. Traffic

The Smith Report also evaluated the underlying traffic modeling in the Master Plan EIS. The modeling served both as the foundation for the air quality analysis and conclusions in the Master Plan EIS and independently as an assessment of the likely traffic conditions that are projected within the immediate Sea-Tac surroundings and nearby communities if the proposed expansion is approved. The Master Plan EIS used the modeling to compare environmental impacts caused by building or not building the proposed third runway, terminal and cargo facilities. The traffic modeling, like much of the environmental analysis in the Master Plan EIS, is based on the unreasonable assumption that exactly the same number of cars and trucks would use Sea-Tac regardless of whether Sea-Tac is expanded. As a result of this assumption, the model minimizes the differences in the environmental effects of the two scenarios.

The core assumption is not the only flaw in the traffic analysis, however. Smith also discovered (1) that the FAA projected surface traffic using a model that was not designed for use over large study areas or for a long-range planning period; (2) that the forecasting

assumptions and input data used to project the Preferred Alternative and the No Action Alternative are inconsistent and biased in favor of the Preferred Alternative; (3) that the FAA's traffic forecasting assumptions ignored contrary assumptions elsewhere in the Master Plan EIS; and (4) that the traffic data used is inconsistent with other studies performed by the Washington Department of Ecology.

Combined, these flaws resulted in a significant under-estimation of the traffic congestion that is likely to occur under the Preferred Alternative. As a result, the Master Plan EIS gives the Port, the PSRC and the public a skewed perception of what this expansion would mean for the quality of life in nearby communities and in the Seattle metropolitan area. Before approving the MTP, the PSRC must evaluate carefully, thoroughly, and even-handedly in an SEIS, the ACC's revised modeling, the FAA's traffic modeling and FAA's corresponding air quality analysis.

4. Capacity and Delay

Another important body of new information that should be analyzed in an SEIS relates to the actual extent of problems associated with capacity and delay at Sea-Tac, and resulting questions about the purpose and need for the third runway. The EISs justify the third runway project as needed to reduce current and future delay in poor weather conditions. The primary purpose of a third parallel runway would be to increase the efficient operating capability of Sea-Tac during peak periods by accommodating two staggered arrival streams. The analysis of alternatives is both dictated and circumscribed by this identified purpose and need.

The conclusions of the Expert Panel, which are not discussed in the EISs, raise serious questions about the validity of this stated need. After reviewing all of the documents and data provided by the Port, the FAA and the Washington State Department of Transportation,[5] the Expert Panel indicated that it was uncertain about how grave the delay problems at Sea-Tac would turn out to be over the next five or ten years.

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[5] The Expert Panel expressed frustration that it had not received the best available evidence of the potential cumulative impact of all of the demand and system management methods or a succinct, well-documented statement of the delay and capacity problems that led the Port to seek approval of the third runway. Based upon the information that it had received, the Expert Panel somewhat reluctantly determined that neither congestion pricing nor gate controls alone would obviate the need to construct a third runway. See In re: Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport, Final Phase I Order on Demand/System Management Issues (July, 1995) at 6.

Consequently, it raised questions about whether there was really a need for an additional runway at Sea-Tac. The Expert Panel cited the potential impacts of rapidly improving air traffic control technology and improved rail service on scheduling of peak period operations, both of which could contribute to a significant reduction in delays at Sea-Tac.

In fact, recent FAA data show that aircraft delays at Sea-Tac declined by 66 percent between 1990 and 1994, and that delays have decreased from 30 per thousand in 1990 to 4.77 per thousand in 1995. This information supports the Expert Panel's doubts about the need identified in the Master Plan EIS, suggesting that the question should be revisited in an SEIS.

The Expert Panel ended its inquiry with a call to continue the rigorous examination of the planning assumptions that underlie the proposal, and to persist in efforts to determine whether adequate solutions to the problems of capacity and delay can be found without building a new runway at Sea-Tac. The PSRC should heed the advice of its own Expert Panel and revisit this issue in an SEIS.

IV. Even if the PSRC Decides to Prepare an Addendum, its Process Has Been Flawed and Inappropriate

As described earlier, the PSRC staff issued the Addendum on May 28, 1996, almost two weeks before it issued the Draft Action Item and almost one month before the PSRC Executive Board will make any recommendation on any specific MTP amendment. Notwithstanding the fact that the elements of the amended proposal had not yet been determined, the Addendum concluded that the proposal would have none of the characteristics that would warrant preparation of an SEIS. Moreover, the PSRC staff issued its Draft Action Item amendment on June 10, 1996, only two days before the June 12 deadline for the public to request the PSRC to prepare an SEIS.[4]

The contents of the Addendum and the process for issuing it raise serious questions about the PSRC's motives in preparing the Addendum. The short timeframes prevent any meaningful consideration or comment, either by the public or the PSRC, about the appropriate level of environmental review that the PSRC should conduct prior to adopting the proposed MTP amendment. The PSRC's real motive appears to be to authorize the Port

[4] In fact, the PSRC staff did not issue the Draft Action Item until 5:15 p.m. on June 10. This required an ACC representative to wait at the PSRC for the document and send it by facsimile and Federal Express to the ACC's attorneys in order that an appropriate SEIS request could be sent by overnight mail on June 11, less than 24 hours later.

to proceed with the third runway as quickly and with as little public comment or participation as possible.

In short, the PSRC cannot fulfill its SEPA obligations simply by relying on the EISs and preparing a hasty and incomplete Addendum. Changes in the proposal result in significant impacts that must be considered and analyzed. In addition, a great deal of new information that has become available since publication of the Master Plan EIS indicates the likelihood of significant impacts. Much of that information has become available through a process established by the PSRC itself. These significant impacts must be described in the PSRC's environmental review and made available for public comment through an SEIS.

In his letter dated February 18, 1993 to the City Manager of Federal Way regarding the adequacy of the Flight Plan EIS, Mr. Jerry Dinndorf of the PSRC staff confirmed the PSRC's commitment to "adequate environmental review throughout all phases of this project", and stated that "the public and other governmental agencies need not fear that issues deferred at this level of planning will not be revisited later by the Regional Council, if necessary." The PSRC should honor this commitment by preparing and circulating an SEIS for the proposed MTP amendment.

Sincerely,

Peter J. Kirsch
Sarah M. Rockwell

EXHIBITS

A Dr. Sanford Fidell, "Comparison of Noise Data Presented to the Expert Arbitration Panel with Noise Data in the Sea-Tac Master Plan Update EIS" (June 7, 1996)

B Puget Sound Air Pollution Control Agency, "SeaTac Airport Master Plan Final Environmental Impact Statement Comments" (June 6, 1996)

C State of Washington, Department of Ecology, Comments on the Draft General Conformity Determination for Proposed Master Plan Update Development Actions at Sea-Tac Airport (May 30, 1996)

D U.S. Environmental Protection Agency, Comments on the Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (June 6, 1996)

E Airport Communities Coalition, "Comments on the FAA's Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport" (June 6, 1996)

F Envirometrics, Inc., "Air Quality Review for Sea-Tac Master Plan Update" (June 5, 1996) (separate document)

G Smith Engineering & Management, "Revised Traffic Analysis for Air Quality Conformity Review of Sea-Tac Master Plan Update" (June 5, 1996) (separate document)

Summary Comparison of Noise Data Presented to the Expert Arbitration Panel with Noise Data in the Sea-Tac Master Plan Update EIS

Dr. Sanford Fidell
June 7, 1996

The Expert Arbitration Panel created by the PSRC to weigh evidence of "meaningful reductions in aircraft noise impacts" asked the Port of Seattle to provide a "Compliance Report" containing a detailed retrospective analysis of aircraft noise exposure levels measured at the airport's monitoring stations. The empirical data which the Port supplied in response to this request are considerably more definitive and reliable than the uncertain exposure estimates contained in the Draft EIS ("DEIS") for the Master Plan Update. In particular, the Port's Compliance Report contained information about actual instead of forecasted noise exposure and operational figures, as well as information useful for gauging the magnitude of errors of prediction and the degree of uncertainty in the predictions of the DEIS.

This latest available factual information reveals significant discrepancies between the projected figures contained in the Final EIS ("FEIS") and actual levels of aircraft noise exposure. In addition, the Port's data does not indicate a consistent downward trend in actual, day-to-day noise exposure in Airport neighborhoods. Certain noise metrics have shown little or no long-term reductions in values, while the values of some metrics (particularly those most sensitive to increases in numbers of flight operations) have shown a recent upward trend as air traffic has steadily increased at Sea-Tac.[1]

Discrepancies between forecasted and actual aircraft operations

In Appendix R of the FEIS ("Response to Comments"), the Port indicates that as of September 1995, actual aviation activity levels are 20 percent higher at Sea-Tac than forecasted in the DEIS released less than a year earlier (FEIS at R-9, n. 1). Simple extrapolation of the rate of growth that actually occurred immediately after

[1] For example, the amount of time that people are exposed to both indoor and outdoor noise at levels which can interfere with speech has increased in recent years, a trend which is "directly reflective of the increase in operations that has occurred at the Airport." (Compliance Report § 1.0 at 35). Similarly, although the phaseout of Stage II aircraft has reduced the occurrence of noise levels above 95 dB, the number of noise events between 75 and 94 dB has risen since 1993. (Compliance Report § 1.0 at 25, Table 1-12).

release of the DEIS to the previously estimated annual number of operations would yield nearly 90,000 more operations in 2020 than had been asserted in the Port's Master Plan Update Forecast.

This example demonstrates the great uncertainty and unreliability of predictions of aircraft operations, even in the very short term. It also serves both as a warning to all who prepare or evaluate aircraft noise exposure contours of the highly speculative nature of airport activity forecasting, and as a clear demonstration of the very limited confidence that can be placed in noise exposure contouring exercises that extend decades into the future.

Operational forecasts are the basis not only for noise exposure predictions, but also for noise impact assessments. Uncertainties in operational forecasts are compounded when areas within speculative noise contours are used to drive imprecise estimates of the sizes of future affected populations.

Consider, for example, the implications of small differences in assumed operational growth rates for average values of DNL as measured at the airport's original 11 noise monitoring stations, illustrated in the accompanying graph (Figure 1). The triangular data points in Figure 1 are actual measurements of average DNL at the 11 monitoring stations from 1988 to 1995 as disclosed in the Port's Compliance Report. The steep decline in average values between 1990 and 1994 is due almost entirely to the replacement of Stage II B-727 aircraft with quieter Stage III aircraft of comparable size. The airport has acknowledged that it has already derived the bulk of the noise abatement benefit that can be expected from this source, since 86% of the fleet serving Sea-Tac (97% at night) are already Stage III aircraft.

Following the Port's example of considering "three cases ... representative of possible variations from the current aviation demand forecast" (FEIS at R-9), Figure 1 also displays a range of projected increases in future average DNL at the 11 monitoring points for three assumed growth rates. These projections are based on assumptions that the aircraft serving Sea-Tac in the future will make no more noise than those serving Sea-Tac at present, and that little (if any) further reductions in average DNL are likely to be secured from replacement of the remaining B-727's with a mix of other aircraft.[9]

[9] For a variety of reasons, completing the conversion of the fleet to 100% Stage III aircraft would have only slight effect on the implications of Figure 1. Landing noise from Stage III aircraft does not differ as dramatically from that of Stage II aircraft as does the departure noise of Stage III aircraft. Likewise, not all Stage II aircraft will be replaced by Stage III aircraft of comparable size: success in attracting long haul traffic to a third runway could well increase the proportion of four engine aircraft in the Sea-Tac fleet beyond that projected by the Port. Uncertainties associated with such factors are unlikely to exceed the Port's expressed tolerance, vide infra, for either a 1.5 dB systematic underprediction of actual noise exposure or a 3 dB general margin of error in noise exposure prediction.

The lowest of the growth rate projections shown in Figure 1 (about 1% per year) is based on the growth in numbers of operations that the Port assumed in preparing the noise contours contained in the DEIS and the FEIS (from about 340,000 operations in 1993 to 440,000 in 2020). The next highest growth rate assumption (4% per year) mirrors the recent national average increase. The highest assumed growth rate is twice the national average.

Figure 1 indicates that unless flight activity at Sea-Tac grows at a rate much lower than the recent national average, it is a matter of only a few years before the short term benefits of the retirement of Stage II aircraft are completely dissipated. If flight activity at Sea-Tac grows at a rate comparable to or higher than recent national experience, areas within noise contours at Sea-Tac will resume their former expansionary trend well before the turn of the century. In this case, the noise reduction achievements of the early 1990s will prove to have been only a temporary respite in a long term trend of increasing aircraft noise exposure in airport neighborhoods.

Discrepancies between predicted vs. actual noise exposure levels

Appendix R also contains a table summarizing discrepancies between predicted (1994 INM contours) and measured (1994 actual) noise levels (FEIS at R-68). These discrepancies were disclosed as a by-product of the Panel's insistence that the Port produce "reliable evidence [of reductions in noise impacts], based upon actual measurements of on-the-ground noise" (Phase II Order at 1). The Port's table indicates that the average of the modeled noise exposure values for 1994 at the eleven noise monitoring stations underpredicts by 1.5 dB the average of the actual noise exposures measured during 1994 at these sites. As the Port notes in the FEIS

> "... an increase of 1.5 decibels in the DNL level at any noise-sensitive location falling within the 65 DNL noise exposure contour is significant. This increase equates to an increase of approximately 41% in total noise energy ...." (FEIS at R-65)

The Port further notes that "[t]he 1.5 decibel or greater change at 65 DNL is established by FAA Order 1050.1D as the threshold requiring analysis of impacts in greater detail" (FEIS at R-65).

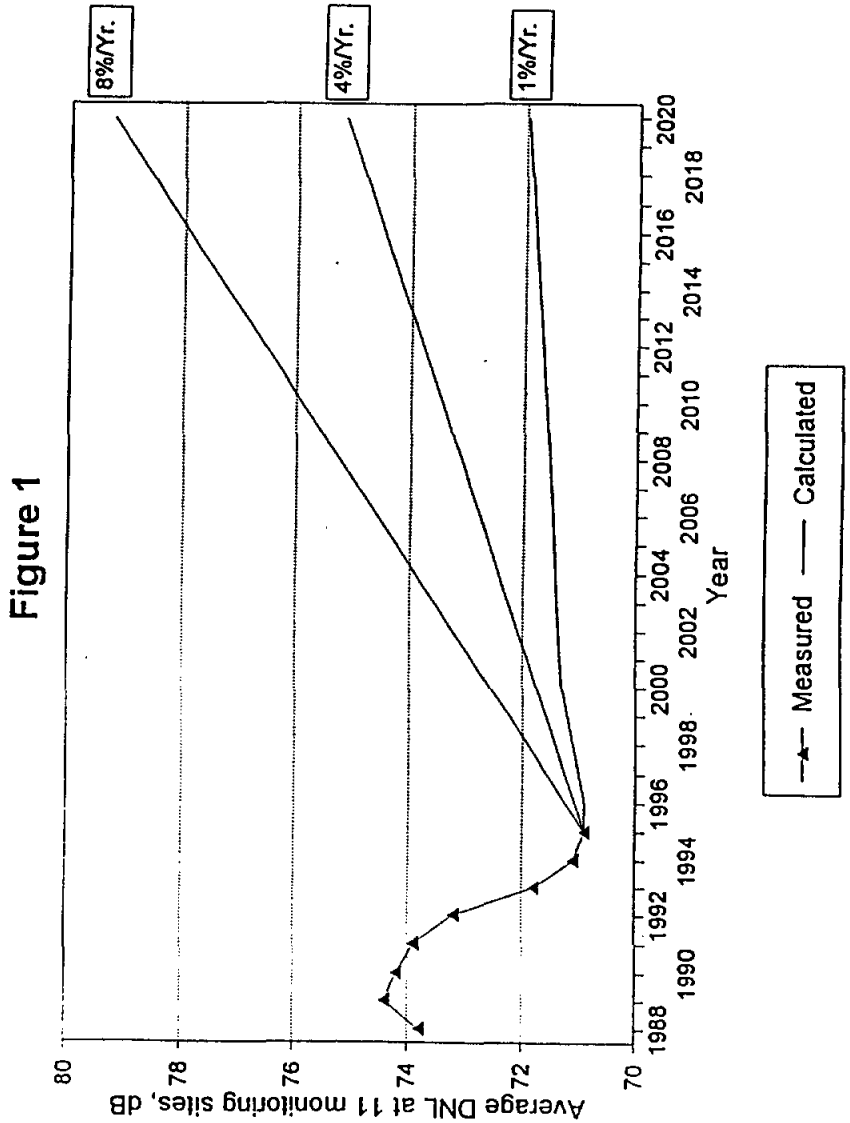
Equally noteworthy is the Port's general characterization of errors as great as 3.6 dB in underprediction of actual noise exposure as "within the bounds of reasonable expectation": in the Port's view, a "reasonable expectation" of accuracy of aircraft noise exposure prediction is "typically described as three decibels". The Port's tolerance for a 3 dB margin of error in reconciling short term predicted aircraft noise

exposure levels with actual measurements underscores 1) the magnitude of general uncertainty inherent in predictive uses of INM, and 2) the attendant unreliability of decisions based on modeled rather than actual noise exposure values. When the documented magnitude of the margin of error is comparable to the magnitude of expected changes in noise exposure, very little confidence can be placed in fine grained interpretations of areas, populations, and noise impacts within putative contour intervals.

The FEIS does not include any revisions to the demonstrably inaccurate 1994 aircraft noise exposure contours to correct them for the errors revealed after completion of the DEIS (as evidenced by the fact that the file names and creation dates of the predicted noise exposure contours published in the FEIS do not differ from those published in the DEIS). Instead, the FEIS' analyses are based on predictions known at the time of its publication to include both an underprediction bias of 1.5 dB and inaccuracies in noise exposure estimation in excess of 3 dB.

The Port's conclusions about the mitigation of future noise impacts (FEIS at R-65) are difficult to reconcile with its tolerance for substantial errors of estimation of aircraft noise exposure. Full disclosure of probable noise impacts, based on the use of best available information and technology, would require that the Port revise, moderate and qualify claims made in the FEIS on the basis of the information contained in its Compliance Report, rather than continuing to rely on inaccurate and imprecise estimates.

Figure 1



Summary Comparison of Noise Data Presented to the Expert Arbitration Panel with Noise Data in the Sea-Tac Master Plan Update EIS

Dr. Sanford Fidell
June 7, 1996

The Expert Arbitration Panel created by the PSRC to weigh evidence of "meaningful reductions in aircraft noise impacts" asked the Port of Seattle to provide a "Compliance Report" containing a detailed retrospective analysis of aircraft noise exposure levels measured at the airport's monitoring stations. The empirical data which the Port supplied in response to this request are considerably more definitive and reliable than the uncertain exposure estimates contained in the Draft EIS ("DEIS") for the Master Plan Update. In particular, the Port's Compliance Report contained information about actual instead of forecasted noise exposure and operational figures, as well as information useful for gauging the magnitude of errors of prediction and the degree of uncertainty in the predictions of the DEIS.

This latest available factual information reveals significant discrepancies between the projected figures contained in the Final EIS ("FEIS") and actual levels of aircraft noise exposure. In addition, the Port's data does not indicate a consistent downward trend in actual, day-to-day noise exposure in Airport neighborhoods. Certain noise metrics have shown little or no long-term reductions in values, while the values of some metrics (particularly those most sensitive to increases in numbers of flight operations) have shown a recent upward trend as air traffic has steadily increased at Sea-Tac.[1]

Discrepancies between forecasted and actual aircraft operations

In Appendix R of the FEIS ("Response to Comments"), the Port indicates that as of September 1995, actual aviation activity levels are 20 percent higher at Sea-Tac than forecasted in the DEIS released less than a year earlier (FEIS at R-9, n. 1). Simple extrapolation of the rate of growth that actually occurred immediately after release of the DEIS to the previously estimated annual number of operations would yield nearly 90,000 more operations in 2020 than had been asserted in the Port's Master Plan Update Forecast.

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Consider, for example, the implications of small differences in assumed operational growth rates for average values of DNL as measured at the airport's original 11 noise monitoring stations, illustrated in the accompanying graph (Figure 1). The triangular data points in Figure 1 are actual measurements of average DNL at the 11 monitoring stations from 1988 to 1995 as disclosed in the Port's Compliance Report. The steep decline in average values between 1990 and 1994 is due almost entirely to the replacement of Stage II B-727 aircraft with quieter Stage III aircraft of comparable size. The airport has acknowledged that it has already derived the bulk of the noise abatement benefit that can be expected from this source, since 86% of the fleet serving Sea-Tac (97% at night) are already Stage III aircraft.

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BBN Acoustic Technologies 21120 Vanowen Street Canoga Park, California 91303 Tel: 818-347-8360

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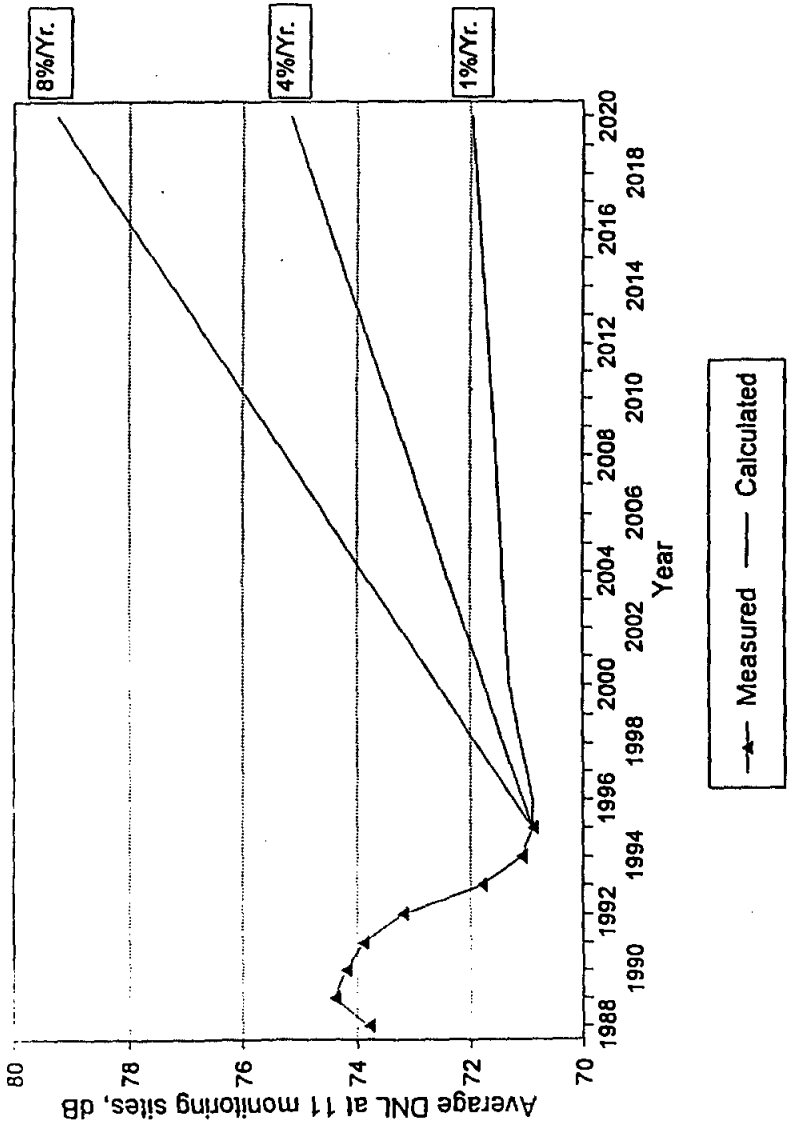

Figure 1

PUGET SOUND AIR POLLUTION CONTROL AGENC

KING COUNTY · KITSAP COUNTY · PIERCE COUNTY · SNOHOMISH COUNT

June 6, 1996

Mr. Dennis Ossenkop
Environmental Protection Specialist
Federal Aviation Administration
NW Mountain Region-Airports Division
1601 Lind Avenue SW
Renton, WA 98055

Dear Mr. Ossenkop:

SeaTac Airport Master Plan
Final Environmental Impact Statement Comments

We have been notified of your extension of the SeaTac Airport Master Plan Final Environmental Impact Statement comment period to June 6, 1996. Consequently, the Puget Sound Air Pollution Control Agency (PSAPCA) offers the following comments pertaining to air quality conformity. These comments also address SeaTac Airport vicinity air quality monitoring issues raised in recent interagency discussions with the Port of Seattle, the Federal Aviation Administration, Ecology and the US Environmental Protection Agency (EPA)-Region 10.

FEIS Conformity Determination for Carbon Monoxide

Several modeled carbon monoxide (CO) exceedences were identified in the FEIS at arterial roadway intersections, under existing conditions as well as the preferred alternative. For post-2010 project components, most notably the North Passenger Terminal, modeling indicates that ambient CO air quality would worsen without additional mitigation. Plan-level conformity with the Central Puget Sound State Implementation Plan (SIP) for CO requires that the Port specify mitigation commitments, and an implementation timetable, demonstrating that future pollutant concentrations at problem intersections will not exceed or exacerbate the national ambient air quality standard (NAAQS) for CO.

The FEIS describes mitigation actions for these intersections as being "contingent" on the outcome of Port-sponsored CO air quality field monitoring, conducted sometime in the future on an unspecified schedule. Presumably, this field monitoring data will be utilized by the Port to "interpret" (confirm, dismiss or otherwise clarify) the modeled exceedences and help the Port determine the cost and type (s) of mitigation measures that need to be implemented, if any. However, the FEIS contains no protocol or schedule for how and when CO monitoring activities would be conducted and no explanation for how the Port would determine the need for "appropriate" mitigation on the basis of modeled vs. monitored CO emissions data comparisons.

It is PSAPCA's understanding that the Port is reluctant to commit to mitigation of the identified CO exceedence problems in detail at this time for two main reasons: first, a firm, although as yet undocumented, belief that the modeled results represent an excessively high (worst case) scenario, and therefore do not mirror actual air quality conditions; and second, that construction of the project phase that will cause the exceedences is too far off (North Passenger Terminal, circa 2010) to make absolute and meaningful mitigation commitments today.

While appreciative of the Port's perspective in this regard, PSAPCA believes that it is necessary that the Port make more certain commitments regarding post-2010 project components before conformity to the SIP can be demonstrated. We would suggest the following two options exist:

1. One option would be for the Port to exclude post-2010 project elements from the conformity determination being made now and to make a clear commitment that post-2010 project elements modeled to create future air quality exceedences would not be pursued until additional field monitoring is conducted by other independent environmental agencies. The following would be recommended elements of such an approach:

   - commit to revisit in future, via a full SEPA/NEPA environmental analysis, the CO air quality impacts and conformity-related mitigation needs of those master plan phases identified as causing post-2010 CO intersection exceedences, e.g., the North Passenger Terminal phase.
   - develop a protocol to govern the conduct of future Port-funded CO monitoring activities consistent with the normal monitoring protocols used by state, local and federal air quality agencies and agreed to by those agencies (Ecology, PSAPCA and EPA);
   - specify the schedule and technical approach to be relied upon for evaluating modeled vs. monitored data in the future in order to refine exceedence mitigation measures, coordinating with other state, local and federal air quality agencies as necessary; and
   - institute a memorandum of agreement (MOA) signed by the Port, PSAPCA, Ecology and EPA laying out a funded program for monitoring CO air quality in the SeaTac Airport Master Plan project area, and interpreting the results for purposes of implementing conformity-related mitigation measures, ensuring future NEPA compliance and determining future CO monitoring needs. A specific Port commitment to contribute funding should be included in such an MOA.

2. A second option would be for the Port to advance their current FEIS as published—and thus a positive conformity finding for all Master Plan elements—but commit now to actions affecting those post-2010 project phases for which CO air quality exceedences have been modeled, as follows:

   - specify and commit to implementing a menu of intersection exceedence mitigation measures appropriate to the identified (modeled) CO air quality problems;
   - regardless of project phasing, demonstrate quantitatively that the identified modeled air quality problems can be resolved by reliance on all or part of this mitigation menu;
   - commit to revisit in future, via a full SEPA/NEPA environmental analysis, the CO air quality impacts and conformity-related mitigation needs of those master plan phases identified as causing post-2010 CO intersection exceedences, e.g., North Passenger Terminal phase.
   - develop a protocol to govern the conduct of future Port-funded CO monitoring activities consistent with the normal monitoring protocols used by state, local and federal air quality agencies and agreed to by those agencies (Ecology, PSAPCA and EPA);
   - specify the schedule and technical approach to be relied upon for evaluating modeled vs. monitored data in the future in order to refine exceedence mitigation measures, coordinating with other state, local and federal air quality agencies as necessary; and
   - institute a memorandum of agreement (MOA) signed by the Port, PSAPCA, Ecology and EPA laying out a funded program for monitoring CO air quality in the SeaTac Airport Master Plan project area, and interpreting the results for purposes of implementing conformity-related mitigation measures, ensuring future NEPA compliance and determining future CO monitoring needs. A specific Port commitment to contribute funding should be included in such an MOA.

SeaTac Airport Vicinity Air Quality Monitoring Program Issues

In parallel with PSAPCA's review of the FEIS, recent discussions with the Port, Ecology, and EPA have determined the desirability of additional interagency collaboration in the funding, implementation and reporting/analysis of improved baseline air quality monitoring information in the SeaTac Airport "vicinity".

PSAPCA heartily supports this sentiment and views actual data monitoring activity as generating several benefits: improved baseline criteria pollutant (CO, NOX, VOC, particulate matter) emissions data critical to a regional development subarea projected to experience considerable traffic and population growth and development over the next 15-20 years; model validation information helpful to airport vicinity project proponents who conduct future environmental analyses and conformity determinations and/or evaluate mitigation commitments; reference points for determining long-term monitoring needs; and better information with which to respond to air quality inquiries from the general public.

G-427-1

It is important that PSAPCA, EPA, Ecology, the Port, and FAA consult with other state, regional and local jurisdictions and groups when developing monitoring program activities for the SeaTac Airport vicinity. A separate MOA-type vehicle designed to solicit participation, funding, and technical assistance from all interested parties may be appropriate for this purpose. Finally, PSAPCA recommends that this additional monitoring commitment be acknowledged by and incorporated into the FAA Record of Decision for the SeaTac Airport Master Plan.

Thank you very much for the opportunity to comment on the SeaTac Master Plan FEIS.

Sincerely,

Dennis J. McLerran
Air Pollution Control Officer

DJM:ls

cc: Mary Riveland, Ecology
Chuck Clark, EPA-Region 10
Joe Williams, Ecology

G-428-1

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

P.O. Box 47600 • Olympia, Washington 98504-7600
(206) 407-6000 • TDD Only (Hearing Impaired) (206) 407-6006

May 30, 1996

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave, S.W.
Renton, WA 98055-4056

Dear Mr. Ossenkop:

Thank you for extending the comment period on the draft General Conformity Determination for Proposed Master Plan Update Development Actions at SeaTac Airport. The draft Environmental Impact Statement (EIS) did not contain a conformity analysis so this is our first comment on this issue. We have been coordinating our review and comments with the Environmental Protection Agency (EPA) and Puget Sound Air Pollution Control Authority (PSAPCA). Each agency is focusing its efforts on the areas of its primary responsibility. Our intent is to provide the Federal Aviation Administration (FAA) with information to enable a thorough, final conformity analysis and to ensure that the project conforms to the State Implementation Plan (SIP) as required by the Clean Air Act (CAA).

We have two concerns: (1) the project as described in the final EIS does not meet the purposes of conformity; and (2) air quality in the airport area. We recommend: (a) modifying the project so that it will meet the conformity requirements; and (b) conducting a monitoring study.

The final EIS identified projected exceedances of the National Ambient Air Quality Standard for Carbon Monoxide (CO) that occur in 2010 at two intersections near SeaTac Airport. The final EIS identifies mitigation measures but does not include a commitment to implement those measures. Under the CAA and the conformity regulations, a written commitment to specific, enforceable mitigation measures with a process for implementation, and enforcement and explicit timeline for accomplishment, is necessary for a determination that the project conforms to the CO SIP. We recommend the Record of Decision include such a written commitment.

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There are several major projects proposed for the area around the airport including the extension of State Road 509. These projects, together with the airport project, cause concern for the cumulative impacts on air quality in the area. These projects are also reasonably foreseeable changes in circumstances that could affect the airport project conformity mitigation measures. Modeling of this and other projects indicates air quality impacts. Data on the actual air quality in the area is critical to address public concern about air quality impacts and to provide a baseline for modeling efforts. For these reasons we recommend the Record of Decision include a commitment to a long-term air quality monitoring program to develop a baseline of conditions in the SeaTac Airport area.

We are prepared to contribute to and participate in such a comprehensive air quality study and monitoring program. The FAA and Port of Seattle as proponent agencies should provide the primary funding. The study would be most effective if other agencies with expertise such as PSAPCA and EPA were also involved. The scope of the study, pollutants and sources examined, area monitored, years examined and other technical issues should be refined through a memorandum of agreement among the participating agencies.

Thank you again for the opportunity to comment on this project and your willingness to discuss these issues. A Record of Decision that includes our recommendations would ensure that the project conforms to the SIP, there is appropriate mitigation, and the air quality around the airport is not endangered. Detailed comments are enclosed. If you have any questions, please contact Doug Brown at (206) 649-7082.

Sincerely,

Joseph R. Williams
Program Manager
Air Quality Program

JRW:PC:mh
Enclosure

cc Bonnie Thai, EPA
Dennis McLerran, PSAPCA
Barbara Hinkle, Port of Seattle
Doug Brown, Ecology
Paul Carr, Ecology
Elizabeth Phinney, Ecology

- G-429 -

DEPARTMENT OF ECOLOGY

AIR QUALITY COMMENTS ON THE DRAFT GENERAL CONFORMITY DETERMINATION AS CONTAINED IN THE FEIS FOR THE SEATAC INTERNATIONAL AIRPORT MASTER PLAN

June 6, 1996

The SeaTac airport is located in King County within a designated non-attainment area for Carbon Monoxide (CO) and Ozone (O3). The Department of Ecology (Ecology) and the Puget Sound Air Pollution Control Agency (PSAPCA) are currently working with the US Environmental Protection Agency (EPA) to redesignate the area into attainment status based upon the recent history of monitoring, control strategies and maintenance plans.

General Conformity

The assumptions used to develop the emissions inventory presented in Appendices D and R differ from those used to develop the State Implementation Plan (SIP). These include transportation assumptions such as the inclusion of a regional transit system (RTA) and the use of oxygenated fuel and reformulated gasoline.

The use of these factors may be inappropriate because: 1) The implementation of RTA seems unlikely (although it is still in the Puget Sound Regional Council Transportation Plan); 2) Ecology is proposing to eliminate the use of oxygenated fuels beginning with the 1996 winter season; and 3) Reformulated gasoline has never been required in Washington State.

The **Draft Conformity Determination** in the FEIS estimates the project will result in a modeled increase in the number of exceedances of the 8-hour CO standard at the intersection of International Boulevard and South 170th Street, and an increase in the severity of exceedances at the intersection of International Boulevard and South 160th Street. The FEIS discusses possible mitigation measures that may be established for these intersections, but does not *commit to any enforceable mitigation measures*, with defined timelines, that will be employed to prevent the modeled increase in the severity or frequency of these exceedances. As presented, the project does not conform to the SIP.

The project could be modified to conform by (a) the proponent providing a written commitment to select and implement mitigation measures that eliminate the modeled exceedances, or (b) the FAA only approving those portions of the project that do not worsen air quality.

Given when the exceedances are modeled to occur, a commitment should be to a menu of mitigation measures that would have the ability to mitigate the modeled exceedance at the intersections rather than only those measures identified in the FEIS. A menu approach would be more responsive to changed circumstances arising from other major projects planned for the area, new data on air quality, and to general changes in air quality in the area. In this approach the proponent selects and implements a mitigation measure from a list of mitigation measures each of which can eliminate the modeled exceedances. A non menu mitigation measure could be selected and implemented provided it would eliminate the modeled exceedances.

Alternatively, only those portions of the project that can conform to the SIP could be approved. For example, the North Terminal and associated portions of the project that result in the modeled exceedances at the two intersections could be removed from the project. In this approach however, there must be a new conformity determination and air quality analysis before the removed portions could be approved.

Air Quality Monitoring

Ecology is concerned about the lack of baseline information about the nature and extent of air pollutants in the airport region. A comprehensive air quality study and monitoring program which would establish this information is necessary both to provide information to the public about the actual air quality in the airport area and to provide a basis to monitor changed circumstances so that National Ambient Air Quality Standards (NAAQS) will not be violated in future projects and that appropriate mitigation measures will be adopted. A study should include a thorough characterization of current emissions of both criteria and toxic pollutants from:

a. Ground based mobile sources
b. Ground based stationary sources
c. Aircraft ground operations
d. Aircraft airborne operations, including fuel deposition.

In addition to its importance to the evaluation of the SeaTac Airport Master Plan, this information would be valuable to establish cumulative impacts related to other major projects such as the SR 509 proposal.

A commitment to a long-term air quality study and monitoring program should be contained in the Record of Decision. Ecology has committed partial funding for such an effort. Primary funding should be supplied by the proponent agencies, the FAA and the Port of Seattle. EPA and PSAPCA also have an interest in sponsoring this study.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: OAQ-107

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave, S.W.
Renton, Washington 98055-4056

JUN 0 6 1996

Dear Mr. Ossenkop:

This letter supplements our March 18, 1996 comments on the Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (final EIS) and it details our concerns with this and adjacent projects regarding air quality. Our review is in accordance with our responsibilities under Section 309 of the Clean Air Act (CAA) and the National Environmental Policy Act (NEPA).

We continue to have concerns about future air quality around the airport as well as the air quality analysis in the final EIS. Our comments are based primarily on conformity with the State Implementation Plan as required by the Clean Air Act (CAA) and cumulative impacts from other projects around the airport.

The conformity analysis in the final EIS is a draft conformity analysis. While we have been discussing this with FAA and other agency representatives in recent weeks, the draft EIS did not contain such an analysis and therefore this is the first formal opportunity EPA has had to comment on this issue. The intent of our comments is to provide the information needed for a final conformity analysis that will meet the requirements of the CAA.

The conformity provisions of the CAA mandate that any federal agency proposing a project in a nonattainment or maintenance area for air pollutants must demonstrate that the project conforms to the State Implementation Plan for pollutants of concern. Because with the project, the final EIS shows an increase in the severity of exceedances of the National Ambient Air Quality Standard for carbon monoxide (CO) at two intersections near the Seatac Airport, we believe the draft conformity analysis does not support your conclusion that the project conforms to the State Implementation Plan (SIP).

In order to demonstrate conformity with the SIP, the final conformity analysis should include the following items.

1. Creation of an emissions inventory that includes: (a) all reasonably foreseeable direct and indirect emissions for the pollutants of concern for the year of peak construction

emissions prior to 2000[1], the years 2010 and 2020; (b) emissions from sources such as construction and haul vehicles, associated increased congestion; and (c) mobile emissions associated with the use of regular gasoline.

2. An air quality analysis that compares the "no project" and "with project" air quality impacts for the years stated in item one above.

3. Appropriate mitigation measures—if the "with project" scenario results in an increase in either the frequency or severity of exceedances above the levels in the "no project" scenario, measures should be developed to mitigate these impacts.

4. Commitments from appropriate governmental entities to conduct adequate, specific and enforceable mitigation measures that will prevent any increase in the severity or frequency of predicted exceedances of the National Ambient Air Quality Standards (NAAQS). Since the increased modeled exceedances occur at intersections outside of airport property, it may be necessary to obtain commitments to conduct these mitigation measures from other agencies or local authorities.

We have discussed our comments with the Washington Department of Ecology (WDOE) and the Puget Sound Air Pollution Control Agency (PSAPCA). All three agencies believe that monitoring is needed to assess the actual air quality near the airport and to determine the measures needed to mitigate any adverse air quality impacts from the project. Accordingly, we support the comments set out in WDOE's and PSAPCA's letters. In particular, we support the steps identified in PSAPCA's comment letter for establishing a monitoring program, which could be used for subsequent modeling and air quality analysis.

EPA understands that several major projects are proposed for the area around the airport, including the extension of SR 509 which will connect to the airport at the south end. We are concerned that cumulative air quality impacts from these projects are not understood. For this reason, we believe the Record Of Decision (ROD) should contain a more comprehensive cumulative impacts analysis, including a commitment to working with other agencies to implement a short-term and long-term air quality monitoring program that will accurately reflect baseline conditions and reflect the changes in air quality as several proposed projects in and around the Seatac Airport are developed.

We expect that the FAA and the Port of Seattle will address these issues as well as provide commitments to work with regional and local authorities to ensure that air quality standards are not violated around Seatac Airport. EPA, along with WDOE and PSAPCA, is committed to continue to work with FAA and the Port on developing appropriate monitoring, modeling and air quality analyses.

[1] Because conformity requirements for "worst case analysis" differ from NEPA requirements, analysis of emissions during the year of highest impact is required.

Detailed comments are enclosed, and if you have any further questions please contact me at (206) 553-1234 or Anita Frankel, Director of the Office of Air Quality at (206) 553-0218. Thank you for the opportunity to review this document.

Sincerely,

for Chuck Clarke
Regional Administrator

Enclosure

cc: Doug Brown, Ecology
Paul Carr, Ecology
Barbara Hinkle, Port of Seattle
Gene Peters, Landrum and Brown
Mary Vigilante, Synergy Consultants
Dennis McLerran, PSAPCA
Brian O'Sullivan, PSAPCA

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Attachment to the Environmental Protection Agency Air Quality Comments On the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport

General Conformity

The conformity provisions of the Clean Air Act mandate that any federal agency proposing to conduct a project in a non-attainment or maintenance area make a determination that its project would not:

> (i) cause or contribute to any new violation of any standard in any area;
> (ii) increase the frequency or severity of any existing violation of any standard in any area; or
> (iii) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

Through Section 176(c) of the Federal Clean Air Act, Congress established a higher test for federal agencies and the expenditure of federal money than is the case for non-federal public or private entities. The conformity provisions require a federal agency to affirmatively find that its actions will not worsen air quality conditions in areas that have previously violated the National Ambient Air Quality Standards (NAAQS). EPA recognizes that the modeling used to determine carbon monoxide impacts at intersections is for screening purposes to predict worst-case scenarios. However, the conformity provisions require that a federal agency ensure that worst-case pollutant impacts with its project are no worse than the worst-case pollutant impacts without such a project.

The general conformity rules establish certain public notification and comment procedures that a federal agency must follow when making a conformity determination (58 FR 63214, November 30, 1993). The conformity determination contained in the Final EIS is the draft conformity finding, and implies that it may be modified after the public comment period. The FAA has stated that the final conformity determination will be included in the Record of Decision for this EIS. While the draft conformity analysis does not support a conformity determination, the final determination could, based upon a corrected emissions inventory and commitment to appropriate mitigation measures.

Mitigation Measures

Section 93.160 of the general conformity rule sets forth the requirements for enforceable mitigation measures that must be taken when an increase in the frequency or severity of exceedances is modeled. This section states:

> (a) Any measures that are intended to mitigate air quality impacts must be identified and the process for implementation and enforcement of such measures must be described, including an implementation schedule containing explicit timelines for implementation.
>
> (b) Prior to determining that a Federal action is in conformity, the Federal agency making the conformity determination must obtain written commitments from the appropriate persons or agencies to implement any mitigation measures which are identified as conditions for making conformity determinations.

Given the EIS's projected increases in the severity of exceedances of the CO NAAQS, mitigation measures meeting the requirements of 93.160 are necessary in order to demonstrate conformity.

Changes in Mitigation Measures

It should be noted that the general conformity rule also foresees situations where mitigation measures may need to be modified in the future due to changed circumstances. Section 93.160 (c) establishes the mechanism where mitigation measures may be modified so long as the new mitigation measures continue to support the conformity determination. While the mitigation measures need to be clearly specified, they may be changed, if needed.

The results from a monitoring program, such as the type identified in the EPA, WDOE, and PSAPCA comment letters of June 6, 1996, may form the basis for modifying mitigation measures. Air quality analysis based on such monitoring and related modeling could demonstrate that mitigation measures committed to in order to demonstrate conformity were no longer needed, or that different or additional measures were appropriate.

Alternative to Mitigation Measures

One alternative approach to determining conformity that would not necessarily include mitigation measures might be a phased development of the project. With this option, FAA would grant a full approval for certain projects that are proposed in the FEIS while conditionally approving implementation of other projects contingent upon further environmental analysis. This assumes that the projects are truly separable, and therefore that the FAA would be able to show conformity for each of the major subsets of proposed projects. It should be noted that both the general conformity rule and NEPA regulations identify criteria for determining when projects can be assessed separately. Both sets of criteria would need to be met. If this approach is used, then the monitoring program supported by EPA, WDOE, and PSAPCA would be useful to support the modelling that would be required to demonstrate conformity for the conditionally approved projects. Elements of such an approach are set out in the PSAPCA letter to FAA, dated June 6, 1996.

Cumulative Impacts

The Council on Environmental Quality Regulations for Implementing the Provisions of The National Environmental Policy Act state in 40 CFR Part 1502.16(a) and (b) that the Environmental Consequences section of an EIS will include discussions of direct effects and their significance and indirect effects and their significance (section 1508.8). According to 40 CFR Part 1508.8, cumulative impacts are considered "effects" and should therefore be discussed in this section of the EIS. A Cumulative Impact is the effect "on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (Section 1508.7) We believe the ROD should reflect consideration of the cumulative impacts of the following projects since they may affect one another: Seatac expansion, the SR 509 proposal, the South Aviation Support Area, the

DesMoines Creek Business Park, the Federal Detention Center, the Seatac Hotel, the City of Seatac improvements to three miles of International Boulevard near Seatac Airport, the proposed CTI campus and the 28/24th Arterial.

We noted several inconsistencies in projected air quality for the same intersections in the EIS's for the aforementioned projects. This variability underscores the need for additional coordination between project leads. The inconsistences are as follows:

1) The modeling results for air quality in the Seatac final EIS conflict with those from the draft EIS for the SR 509/South Access Road Corridor Project at two intersections (both EIS's used the same models). The two EIS's model conflicting results for existing conditions and future action alternatives at South 188th and International Blvd., and South 200th and International Blvd. for the average CO concentrations indicated on page 4-7 in the SR 509 EIS, as compared with the same analyses on page IV.9-11H in the Seatac final EIS. Both analyses model CO violations for existing conditions, but for future action alternatives the Seatac analysis shows modeled CO violations where the SR 509 analysis does not.

2) Modeled air quality impacts at South 200th and International Blvd. are shown in the South Aviation Support Area Final EIS (pages 4-106 to 109 and 112), the 28/24th Street Arterial Final EIS (page 3.22) and the CTI Final EIS (page 4-7, 8). The results vary for each project ranging from 5.0 to 13.3 parts per million CO.

The ROD should clearly indicate that the FAA has taken all of these local projects into consideration when modeling air impacts. The data from modeling should be available to other agencies so that their analyses will be consistent with FAA's. Data sharing will contribute to a better overall air modeling analysis that will also assure a more comprehensive cumulative impacts presentation.

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June 6, 1996

BY HAND DELIVERY

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
Airports Division
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Re: Additional Comments of the Airport Communities Coalition on the FAA's Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport

Dear Mr. Ossenkop:

On behalf of cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila, Washington and the Highline School District, individually and collectively as the Airport Communities Coalition (the "Coalition"), we are submitting the following additional comments on the Federal Aviation Administration's draft Clean Air Act general conformity determination for the proposed expansion of Seattle-Tacoma International Airport ("Sea-Tac" or the "Airport"). Each of the constituent members of the Coalition either abuts or is in the immediate vicinity of the Airport and suffers directly from the emission of air pollutants from airport-related operations and activities.

The Port of Seattle seeks FAA approval, as well as over $200 million in federal grants, for an array of projects that would expand substantially the operational capacity of Sea-Tac. A partial list of the expansion projects proposed includes the construction and operation of an additional runway (as well as corresponding taxiways and utilities); the extension of an existing runway; the development of a new air traffic

control tower; the expansion of existing terminal facilities and the addition of new terminal, parking, cargo, maintenance and support facilities. Together, these projects would result in an airport that is markedly larger, and as a result, capable of handling and attracting a significant amount of additional aircraft, passenger and surface traffic.

Before granting approval, providing funding, or otherwise supporting the expansion project, the FAA must comply with section 176(c) of the Clean Air Act by determining that the proposed activity would conform to the applicable state implementation plan ("SIP") -- the state plan designed to bring Seattle into compliance with federal air quality standards. Despite the considerable expansion of the land and airside facilities currently proposed in the Master Plan Update, and the inevitable air and surface traffic it would bring, the FAA's March 18, 1996 draft conformity determination implausibly concludes that "the proposed improvements at Sea-Tac conform to the applicable SIP for the Puget Sound Region." FEIS at IV.9-11. Specifically, the FAA determined that with the addition of little more than a few new turn lanes at a limited number of intersections, the proposed expansion of Sea-Tac would easily conform to the SIP.

On its face, the conclusion that an extensive, multi-billion dollar expansion of an airport would have little or no air quality impacts is counter-intuitive. In fact, as demonstrated in the comments below and in the enclosed reports prepared by the Coalition's experts, the FAA's conformity determination and its underlying analyses are fundamentally flawed. Our examination of the underlying air quality projections prepared by the FAA and/or its consultant makes it clear that the draft conformity determination is based on an analysis which does not comply with the Clean Air Act, other applicable federal laws, or accepted modeling protocol.

As a result of skewed assumptions, erroneous data and improper methodologies, the FAA's analysis substantially underestimates the adverse effect that the proposed expansion would have on air quality in the Seattle metropolitan area, particularly with respect to nitrogen oxides (a precursor to ozone) and carbon monoxide. These pollutants are especially relevant to citizens of Seattle and the Coalition cities -- since the adoption of the 1990 Clean Air Act Amendments, the area has been designated as "nonattainment" for ozone and carbon monoxide.

Congress did not intend for the Clean Air Act's conformity determination to be merely a procedural speedbump on the road to inevitable federal funding. The statute prohibits federal agencies such as the FAA from "supporting" projects "in any way" unless and until the agency determines through objective, well-reasoned and fair analysis that the activities would not worsen existing air quality or cause additional violations of federal air quality standards. 42 U.S.C. § 7506. In the balance of these

comments, we describe the reasons why the Coalition believes that the FAA's conformity analysis fails to provide a credible basis for determining that the Sea-Tac expansion would fully conform with the state's plan to bring Seattle's air quality within federal standards.

A. Infirmities in the FAA's Draft Conformity Determination and Analysis[v]

The FAA concluded that "the proposed Master Plan Update improvements at Sea-Tac conforms [sic] to the requirements for the Puget Sound Region and to the State of Washington's plan for 'eliminating or reducing the severity and the number of violations of the national ambient air quality standards and achieving expeditious attainment of such standards.'" FEIS, IV.9-1. In support of this conclusion, the FAA and/or its consultants prepared an airport emissions inventory, an areawide dispersion analysis and a roadway intersection analysis.

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[v] In addition to the substantive objections set forth in these comments, the Coalition also objects to the FAA's failure to establish a predictable and open process for submitting comments on its conformity determination and analysis. Instead of making all relevant information available when the draft conformity determination was first issued, the FAA provided significant data and information critical to understanding the analysis in a disjointed, piecemeal fashion over nearly a two month period and only in response to repeated written requests filed by the Coalition. See correspondence from Cutler & Stanfield, L.L.P. to the FAA dated March 18, April 2, April 9, April 18, May 1, and May 28, 1996, and corresponding responses from the FAA. In some cases (e.g., EDMS data for nitrogen dioxide levels), the computer files provided by the FAA contained erroneous and incomplete information that made it impossible to recreate or understand the FAA's analysis.

Other procedural irregularities include the FAA's failure to notify all affected federal land managers responsible for managing protected Class I areas located within 100 kilometers of Sea-Tac, including three of the State of Washington's most important parks -- Mount Rainier National Park, Olympic National Park and Mount St. Helens Volcanic National Monument. For the past decade, the United States Department of Interior has certified Mount Rainier National Park as "visibility impaired" from anthropogenic pollution, originating in large part from mobile and stationary sources in the Seattle metropolitan area. Olympic and Mount St. Helens also may be affected. Federal land managers for each of these areas should be provided with notice of the FAA's determination and given adequate time to review and comment on the FAA's analysis.

1. Area Dispersion Analysis

The FAA's primary conclusion resulting from its area dispersion analysis is somewhat less than reassuring: the agency concludes that there are likely to be numerous violations of air quality standards in the Airport area, but those exceedances would happen regardless of whether the multi-billion dollar expansion occurs. It further concludes that "[d]evelopment of the proposed third parallel runway would not worsen air pollution in the Airport area." Id. The Coalition strongly disputes the conclusion that the third runway would not worsen air quality. Moreover, the question is not whether the third runway alone would worsen air pollution in the Airport area, but whether all of the Master Plan Update projects in aggregate would result in a facility that would attract additional planes, passengers and employees and the cars, trucks, vans, and buses needed to transport those passengers and employees -- thus creating substantial additional air pollution.

The FAA conclusion that violations are likely regardless of whether the new facilities are built appears to be based, in large part, on a single, core assumption that underlies its air quality analysis -- that exactly the same number of aircraft, passengers and vehicles would use Sea-Tac regardless of whether the expansion is ever completed. This assumption is unreasonable and results both in an overestimation of the pollution likely to be caused by the No Action scenario, and a significant underestimation of the air quality impacts that would be caused by the proposed expansion.

The FAA's area dispersion analysis concludes that construction of the third runway and related facilities called for in the Preferred Alternative would result in violations of both the carbon monoxide standard and the nitrogen dioxide standard. Exceedances of the carbon monoxide standard would result from surface traffic -- cars and trucks -- in the Airport area. An exceedance of the nitrogen dioxide standard would result from aircraft departures, particularly from newer aircraft that typically have engines which produce less carbon monoxide, but greater amounts of nitrogen dioxide.

Violations of the federal standards for carbon monoxide and nitrogen dioxide can not be taken lightly. Health studies recognized by Congress have established that even modest levels of carbon monoxide pollution pose risks to fetuses, children, persons with heart disease, and the elderly. Carbon monoxide is more readily absorbed into the blood than is oxygen, and thus displaces oxygen and threatens brain and other critical functions. S. Rep. No. 228, 101st Cong., 2d Sess. 7 (1990), reprinted in 1990 U.S.C.C.A.N. 3385, 3393.

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As a precursor to ozone, nitrogen oxides also pose a threat to human health and the environment in the Seattle metropolitan area. Ozone, or smog, is formed through the interaction of volatile organic compounds, nitrogen oxides and sunlight. Ninety percent of the ozone inhaled into the lung is never exhaled, but instead reacts quickly with the cells and fluids in the lung, causing irritation and susceptibility to respiratory infections. Long term exposure to ozone may produce an accelerated aging of the lung similar to that found in cigarette smokers. Id. at 3392.

The FAA claims that while the preferred alternative would worsen nitrogen dioxide levels, it would result in a violation at no more than two receptor locations. It appears that this conclusion is based in large part on the assumption that not one additional plane would use Sea-Tac if the new facilities were built. Using the FAA's EDMS modeling results, Dr. Michael Ruby, President of Envirometrics, Inc., estimated that, without this core assumption, the FAA would have found that as many as five receptor locations would exceed federal and state air quality standards in 2020. See Envirometrics, Inc., "Air Quality Review for Sea-Tac Master Plan Update" (June 5, 1996) ("Envirometrics Report"). Some of these receptor locations are located in the terminal area, and several others are located on public roadways. Depending on the level of operations, violations could also be expected in 2010.

These projections raise serious concerns about the credibility of the FAA's determination that the construction and operation of a third runway would not worsen the Airport area's air quality or cause new exceedances of air quality standards.

2. Roadway Intersection Analysis

The FEIS concedes that often the major source of air pollution stemming from airport operations is not aircraft, but surface traffic -- the cars, trucks, buses and maintenance equipment needed to transport passengers to and from the facility and service their needs. Carbon monoxide is the pollutant of primary concern from cars and trucks.

Although the FAA's roadway intersection analysis focuses on the fact that numerous intersections in the Airport area currently exceed federal carbon monoxide standards, it also acknowledges that "the addition of the proposed North Unit Terminal would result in changes in traffic volumes and patterns which would increase pollutant levels above already high levels." FEIS, IV.9-1. Specifically, the Preferred Alternative traffic patterns would "result in possible exceedances of the AAQS at International Boulevard (SR 99) and South 170th Street, and at South 160th Street." Id. at IV.9-9. The FAA further concedes that any reduction in CO levels resulting from improvements in vehicle emissions would be countered by an increase in traffic volume. Id. at IV.9-7.

The FAA proposes mitigation measures for the intersection of SR 99 and South 170th Street such as the construction of an additional turn lane in each direction by the year 2010 and an additional traffic lane by the year 2020. One additional turn lane by 2010 and one additional traffic lane by 2020 are also proposed for SR 99 and South 160th Street. None of the mitigation measures proposed by the FAA would bring these intersections into compliance with the 8 hour CO standards.

Perhaps even more troubling, our review of the FAA's carbon monoxide "hot spot" analysis indicates that despite the FAA's admission that the Preferred Alternative would worsen air quality in the Airport area, and that mitigation would not bring these intersections into compliance with federal and state standards, the agency's analysis contains numerous errors, questionable methodologies and unjustified assumptions resulting in a substantial underestimation of the adverse effect that the expanded Airport would have on CO levels in the area.

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The FAA's roadway intersection analysis consists of two primary components: air quality modeling and the underlying traffic modeling. Each component contains numerous significant flaws that caused the FAA to underestimate the levels of CO that are likely to result from the Preferred Alternative.

a. Air Quality Modeling

Like its analysis of nitrogen dioxide, the FAA's analysis of CO is based on the fundamental assumption that exactly the same number of passengers and cars can be expected at Sea-Tac whether or not the new runway and terminal become operational.

The Coalition's experts, Dr. Ruby, an air quality specialist, and Mr. Daniel Smith, President of Smith Engineering & Management, a traffic specialist, re-ran the model used by the FAA at two key intersections -- SR 99 and South 160th Street and SR 99 and South 188th Street. See Envirometrics Report; see also Smith Engineering & Management, Revised Traffic Analysis for Air Quality Conformity Review of Sea-Tac Master Plan Update (June 5, 1996) ("Smith Engineering Report"). Instead of assuming that the Preferred Alternative would result in absolutely no additional traffic as the FAA's consultants did, Dr. Ruby and Mr. Smith assumed that passenger and employee traffic at the Airport would increase by approximately 20 percent by 2010. Additional passengers would be expected from enhanced peak hour aircraft operations during poor weather conditions -- defined by the FAA and the Port of Seattle as occurring 44 percent of the time -- and additional employees would be expected from the much larger terminal and cargo facilities.

Even with the conservative assumption that traffic trips from the Airport would increase only 20 percent above the FAA projected levels in 2010, the air quality model predicted considerably higher levels of CO, in violation of both federal and state standards. Violation of CO standards at these intersections could be expected as many as 33 days per year at SR 99 and South 160th Street and 245 days per year at the intersection of SR 99 and South 188th Street. See Envirometrics Report. In the case of South 160th Street, violations could be expected nearly twice as often as are predicted to occur with the No Action Alternative in 2010. Id. Equally important, the predicted levels of CO at these key intersections indicate that the mitigation measures proposed would not bring the intersections into compliance with air quality standards.

Increases in CO levels well above the levels predicted by the FAA's analysis (based on the assumption that no additional traffic would occur) would be expected at several other intersections in the Airport environs. The FAA's analysis failed to show this, in part, because the FAA's traffic forecasting analysis examined only roadway intersections that would predictably show an improvement in traffic performance for the Preferred Alternative. Although the intersections selected by the FAA are primary intersections under the No Action Alternative, changes in the roadway system near the Airport that are expected as a result of the expansion lessen the importance of these intersections by eliminating certain Airport access routes and shifting the traffic to new entries. An objective analysis also must examine the traffic and air quality impacts at these roadway intersections that are expected to receive traffic as a result of the new routes to the Airport -- so that the FAA can make a fair assessment of the overall impact of the Preferred Alternative compared to the No Action. See Smith Engineering Report; see also Envirometrics Report.

b. Traffic Modeling

A primary component of the FAA's CO analysis was the traffic modeling prepared by INCA, a private consulting firm retained by the FAA and the Port to develop a model that would predict the surface traffic patterns, volumes and congestion that would be likely to occur both with and without the expanded Airport facilities. In predicting CO levels, the underlying surface traffic analysis is a critical part of the equation since it is traffic congestion and volume that most frequently causes unlawful CO levels. Thus, to have any confidence in the model's prediction of air pollutant levels, the underlying traffic modeling data, assumptions and methodologies must be sound.

As noted above, the FAA's traffic analysis, like much of its environmental analysis, is based on the unsupportable assumption that not one additional car or truck would use the new, expanded facility. Concealed behind this glaring weakness,

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however, are a plethora of less obvious infirmities and assumptions that undermine the integrity of the analysis. Key flaws, include, but are not limited to, the following:

- The Surface Traffic Forecasts Were Projected Using a Model That Was Not Designed To Be Used for Large Study Areas Over a Long-Range Planning Period

In its evaluation of the traffic impacts of the proposed expansion of Sea-Tac, the FAA's consultant used a modeling software known as TRAFFIX. Unlike other land-use based traffic forecast models, such as the one used by the Puget Sound Regional Council ("PSRC"), the TRAFFIX model was designed to be used primarily for relatively small study areas (such as an area immediately around an office building complex) with stable or predictable "background" or base traffic and for a relatively immediate forecast period (approximately 3-5 years). See Smith Engineering Report.

Using the TRAFFIX model for predicting traffic volumes and patterns in the widespread Airport area in the years 2010 and 2020 resulted in highly unreliable projections. The inaccuracies resulting from using a TRAFFIX-type model to project traffic patterns around the Airport are exacerbated here where land use growth patterns and development (other than the project) within the study area are highly variable, where the road network is likely to change substantially over time, and where drivers are time-sensitive and would be expected to seek alternative routes to avoid congestion. In addition, because the TRAFFIX model requires a significant amount of operator judgment -- judgment which, as the attached reports of the Coalition's experts demonstrate), is neither sound nor objective, but frequently biased in favor of the Preferred Alternative -- the use of data generated by the TRAFFIX model here does not meet even minimum standards for reasonableness or fairness. This is particularly true here because an alternative traffic forecast model (developed by the PSRC) better suited for analyzing the Airport area was available, and in fact, was employed by the FAA's consultants to estimate traffic growth rate data in the Sea-Tac FEIS.

- The Traffic Forecasting Assumptions and Input Data Used to Project the Preferred Alternative and the No Action Alternative Are Inconsistent and Biased in Favor of the Preferred Alternative

The weaknesses of the TRAFFIX model resulted in the use of inconsistent data and assumptions between the "action" and "no action" scenarios in the Sea-Tac traffic analysis. In comparing the Preferred and No Action Alternatives, the FEIS and conformity analysis made different, unjustified assumptions about the amount of traffic that certain activities would create. In many cases, these assumptions resulted in the conclusion that the expansion of Sea-Tac would generate as much as fifteen percent less

traffic than if the larger Airport facilities were not built -- even though the FEIS also asserts that the passenger levels would remain the same under both scenarios and the number of employees would increase if the larger facilities were constructed.

One example of unjustified inconsistencies in the treatment of the Preferred Alternative and the No Action Alternative concerns the roadway route choices that the FAA assumed that drivers would make. In the Preferred Alternative model run, data inputs were encoded so that drivers would take routes that avoided congested intersections; conversely, in the No Action scenario, data inputs were encoded so that drivers would routinely take routes that were overcrowded.

The result of these subtle differences in encoding and assumptions is that the FAA's traffic modeling supporting its conformity determination and air quality analysis was skewed in favor of the Preferred Alternative. Other detailed examples of these types of biases are contained in the Smith Engineering Report attached to, and submitted with, these comments. See Smith Engineering Report.

Smith Engineering performed alternative modeling using the TRAFFIX model and basic data provided by the FAA, revising forecasting assumptions and data inputs underlying the No Action and the Preferred Alternative analysis so that they were equal and consistent. When Smith Engineering assumed that the expanded Airport would result in a modest amount of additional surface traffic, the model showed that traffic performance under the Preferred Alternative would be markedly worse at four out of five key intersections in the Airport environs. See Id..

- The FAA's Traffic Forecasting Assumptions Ignored Contrary Assumptions Elsewhere in the FEIS

The FAA's traffic analysis offered in support of its conformity analysis is further tarnished by contrary assumptions that the agency made elsewhere in the FEIS. A good example of this concerns the Port of Seattle's claimed need for an additional runway. A third runway is needed purportedly to reduce weather-related delays that the Port argues occur nearly 44 percent of the time. Yet, in the traffic analysis underlying the conformity determination and air quality calculations, the FAA's consultants assume that delays from poor weather would have no impact on the level of traffic at the airport. At a minimum, arriving passengers delayed by inclement weather could not land, and thus, would not augment existing ground traffic during a given peak hour.

If weather delays are factored into the No Action analysis, and it is assumed that additional surface traffic would increase by about 20 percent over the FAA

projections by the year 2010, the FAA's model would show that traffic performance in the No Action Alternative (when planes supposedly can not land because of inclement weather) would be markedly better at all five key intersections in the Airport environs.

- The Traffic Data Used Is Inconsistent with Other Conformity Studies Performed by the Washington Department of Ecology

The traffic data input used by the FAA's consultant is inconsistent with data used by the Washington Department of Ecology ("WDOE") for WDOE's air quality analyses for roadway projects in the area. Use of WDOE's data in the FAA traffic modeling would have shown an even greater difference in the traffic performance and air quality effects between the No Action and Preferred Alternative scenarios.

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B. Invalid Assumptions, Inconsistent Treatment of Alternatives and Unreasonable Methodologies Undermine the FAA's Positive Conformity Determination and Compel the Agency to Undertake a Revised Analysis

The infirmities and deficiencies identified above and described in more detail in the Envirometrics and Smith Engineering Reports raise serious concerns about the credibility and validity of the conformity and air quality analysis offered by the FAA in support of its positive conformity determination. Inconsistent treatment of alternatives, unorthodox modeling methodologies and unreasonable assumptions contained in the analysis compel the FAA to re-examine its determination and re-analyze the Preferred Alternative and the No Action Alternative in accordance with accepted and objective modeling techniques.[7]

Accordingly, the Coalition requests that the FAA refrain from granting approval for any element of the proposed expansion, or otherwise "supporting in any way" the project unless and until the FAA can make a positive conformity determination based on a revised air quality and traffic analysis that complies with Clean Air Act requirements, applicable federal law and accepted modeling protocol.

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[7] Although some of the issues raised here were raised previously in comments on the draft environmental impact statement (by the Coalition and others), the FAA's responses to comments (contained in Appendix R of the FEIS) are conclusory and fail to adequately address the fundamental concerns raised here.

We have enclosed with these comments the Smith Engineering Report, the Envirometrics Report, and résumés for Daniel Smith, Jr., Jeffrey Maxtutis (Smith Engineering & Management) and Dr. Michael Ruby (Envirometrics, Inc.). We respectfully request that these comments and the attached items be included in the administrative record.

Sincerely,

Thomas D. Roth

cc: EPA (Region X)
PSRC
Enclosures

DANIEL T. SMITH, Jr.
Principal

EDUCATION

Bachelor of Science, Engineering and Applied Science, Yale University, 1967
Master of Science, Transportation Planning, University of California, Berkeley, 1968

PROFESSIONAL REGISTRATION

California No. 21913 (Civil) Nevada No. 7969 (Civil) Washington No. 29337 (Civil)
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PROFESSIONAL EXPERIENCE

Smith Engineering & Management, 1993 to present. President.
DKS Associates, 1979 to 1993. Founder, Vice President, Principal Transportation Engineer.
De Leuw,Cather & Company, 1968 to 1979. Senior Transportation Planner.
Personal specialties and project experience include:

Urban Corridor Studies/Alternatives Analysis. Principal-in-charge for State Route (SR) 102 Feasibility Study, a 35-mile freeway alignment study north of Sacramento. Consultant on I-280 Interstate Transfer Concept Program, San Francisco, an AA/EIS for completion of I-280, demolition of Embarcadero freeway, substitute light rail and commuter rail projects and TSM strategies. Principal-in-charge, SR 238 corridor freeway/expressway design/environmental study, Hayward (Calif.) Project manager, Sacramento Northeast Area multi-modal transportation corridor study. Transportation planner for I-80N West Terminal Study, and Harbor Drive Traffic Study, Portland, Oregon. Project manager for design of surface segment of Woodward Corridor LRT, Detroit, Michigan. Directed staff on I-80 National Strategic Corridor Study (Sacramento-San Francisco), US 101-Sonoma freeway operations study, SR 92 freeway operations study, I-880 freeway operations study, SR 152 alignment studies, Sacramento RTD light rail systems study, Tasman Corridor LRT AA/EIS, Fremont-Warm Springs BART extension plan/EIR, SRs 70/99 freeway alternatives study, and Richmond Parkway (SR 93) design study.

Area Transportation Plans. Principal-in charge for transportation element of City of Los Angeles General Plan Framework, a program to shape nations largest city two decades into 21'st century. Project manager for the transportation element of 300-acre Mission Bay development in downtown San Francisco. Mission Bay involves 7 million gsf office/commercial space, 8,500 dwelling units, and community facilities. Transportation features include relocation of commuter rail station; extension of MUNI-Metro LRT; a multi-modal terminal for LRT, commuter rail and local bus; removal of a quarter mile elevated freeway; replacement by new ramps and a boulevard; an internal roadway network overcoming constraints imposed by an internal tidal basin; freeway structures and rail facilities; and concept plans for 20,000 structured parking spaces. Principal-in-charge for circulation plan to accommodate 9 million gsf of office/commercial growth in downtown Bellevue (Wash.). Principal-in-charge for 64 acre, 2 million gsf multi-use complex for FMC adjacent to San Jose International Airport. Project manager for transportation element of Sacramento Capitol Area Plan for the state governmental complex, and for Downtown Sacramento Redevelopment Plan. Project manager for Napa (Calif.) General Plan Circulation Element and Downtown Riverfront Redevelopment Plan, on parking program for downtown Walnut Creek, on downtown transportation plan for San Mateo and redevelopment plan for downtown Mountain View (Calif.), for traffic circulation and safety plans for California cities of Davis, Pleasant Hill and Hayward, and for Salem, Oregon. Projects involved traffic and parking surveys, travel forecasts, modal split evaluation, regional and local transportation network assessment, freeway corridor location, traffic operations evaluations and circulation plan improvements.

Special Event Facilities. Evaluations and design studies for football/baseball stadiums, indoor sports arenas, horse and motor racing facilities, theme parks, fairgrounds and convention centers, ski complexes and destination resorts throughout western United States.

Transportation Centers. Project manager for Daly City Intermodal Study which developed a $7 million surface bus terminal, traffic access, parking and pedestrian circulation improvements at the Daly City BART station (including successful negotiation for a state TCI grant to fund the improvements) plus development of functional plans for a new BART station at Colma. Project manager for design of multi-modal terminal (commuter rail, light rail, bus) at Mission Bay, San Francisco.

Campus Transportation. Campus transportation planning assignments for UC Davis, UC Berkeley, UC Santa Cruz and UC San Francisco Medical Center campuses; San Francisco State University; University of San Francisco; and the University of Alaska and others. Also developed master plans for institutional campuses including medical centers, headquarters complexes and research & development facilities.

Transportation System Management & Traffic Restraint. Project manager on FHWA program to develop techniques and guidelines for neighborhood street traffic limitation. Project manager for Berkeley, (Calif.), Neighborhood Traffic Study, which pioneered application of traffic restraint techniques in the U.S. Developed residential traffic plans for Santa Cruz, Mill Valley, Oakland, Palo Alto, Piedmont, San Mateo County, Pasadena, Santa Ana and others. Participated in development of photo/radar speed enforcement device. Co-author of Institute of Transportation Engineers reference publication on neighborhood traffic control.

Parking. Prepared parking programs and facilities for large area plans and individual sites; also,resident preferential parking programs.

Bicycle Facilities. Project manager to develop an FHWA manual for bicycle facility design and planning. Project manager on bikeway plans for Del Mar, (Calif.), the UC Davis and the City of Davis. Consultant to bikeway plans for Eugene, Oregon, Washington, D.C., Buffalo, New York, and Skokie, Illinois. Consultant to U.S. Bureau of Reclamation for development of hydraulically efficient, bicycle safe drainage inlets. Consultant on FHWA research on effective retrofits of undercrossing and overcrossing structures for bicyclists, pedestrians, and handicapped.

Litigation Consulting. Provides consultation, investigations and expert witness testimony in highway design, transit design and traffic engineering matters including condemnations involving transportation access issues; traffic accidents involving highway design or traffic engineering factors; land use and development matters involving access and transportation impacts; parking and other traffic and transportation matters.

MEMBERSHIPS

Institute of Transportation Engineers
Transportation Research Board

PUBLICATIONS AND AWARDS

Residential Street Design and Traffic Control, with W. Homburger *et al.* Prentice Hall, 1989.

Co-recipient, Progressive Architecture Citation, *Mission Bay Master Plan*, with I.M. Pei WRT Associated, 1984.

Residential Traffic Management, State of the Art Report. U.S. Department of Transportation, 1979.

Improving The Residential Street Environment, with Donald Appleyard et al., U.S. Department of Transportation, 1979.

Strategic Concepts in Residential Neighborhood Traffic Control, International Symposium on Traffic Control Systems, Berkeley, California, 1979.

Planning and Design of Bicycle Facilities: Pitfalls and New Directions, Transportation Research Board, Research Record 570, 1976.

Co-recipient, Progressive Architecture Award, *Livable Urban Streets, San Francisco Bay Area and London*, with Donald Appleyard, 1979.

SMITH ENGINEERING & MANAGEMENT

JEFFREY MAXTUTIS, AICP

Transportation Planner

EDUCATION

Master of City Planning, Boston University, Boston, Massachusetts, 1989
Bachelor of Science, Resource Management/Forestry, State University of New York, Syracuse, 1983

REGISTRATION: American Institute of Certified Planners, No. 10896.

WORK HISTORY

Project Manager/Transportation Planner, Smith Engineering & Management (1996)
Project Manager/Transportation Planner, DKS Associates, Oakland, California (1989-1996)
Transportation Planner, Vanasse Hangen Brustlin, Inc. Boston, Massachusetts (1987-89)

PROFESSIONAL EXPERTISE/SKILLS

- Project manager responsible for directing transportation studies.
- Project management and supervision for assistant and associate level staff.
- Technical expertise including traffic models; level of service analysis programs; neighborhood studies; circulation studies; EIRs; freeway operations; GIS.

RELATED EXPERIENCE

General Plan/Master Plan Work

Project manager for San Jose Airport Master Plan ground transportation element. Responsible for developing traffic projections and analysis associated with the planned expansion of the airport. Analyzed access, circulation and parking concepts including new roadways and parking facilities to develop a preferred concept. Circulation for the proposed third terminal was a critical component of this project.

Principal project planner for several public sector General Plans in the Bay Area including City of Brentwood General Plan and Master Plan, City of Novato General Plan and City of San Francisco Golden Gate Park Master Plan. Important aspects of the Golden Gate Park Study include developing goals, policies and actions to meet various user needs; three key issues evaluated were commuter cut-through traffic, parking and neighborhood traffic. Conducted a feasibility study to assess alternative sites for the deYoung Museum.

Project manager for San Domenico High School and Dominican College Master Plan studies in Marin County. Conducted transportation studies to determine appropriate transportation improvements to accommodate enrollment increases. Conducted detailed vehicle tracking surveys to determine origin and destination of users.

Freeway and Highway Projects

Project planner for two Caltrans freeway operations studies (State Route 92 and I-880) using the FREQ11 model to evaluate freeway and ramp vehicle congestion and queuing for existing and future conditions. Performed future model runs using planned freeway improvements and travel demand model volumes. Critical issues evaluated for the State Route (SR) 92 study included freeway operations on the San Mateo Bridge, toll plaza operations, freeway mainline ramp metering and electronic toll collection.

EIR/Traffic Impact Analysis

Project manager for Antioch Future Urban Areas (FUAs) 1 and 2 Specific Plan EIRs. Both projects combined consist of over 9,500 single family homes; over three million square feet of office/commercial space; a hospital; schools; and golf courses. The focus of the work was to evaluate the impacts of the proposed projects on the local and regional transportation systems. Used the East Contra Costa County EMME2 traffic model for this study. Developed and applied a unique approach of capping County growth for different future scenarios.

Currently project manager for the Cowell Ranch EIR. The project consists of 6,000 dwelling units and 2.5 million square feet of commercial development proposed for eastern Contra Costa County. Evaluated impacts of the project on the surrounding transportation systems through year 2025. Used the EMME/2 computer model to develop traffic demand estimates and compiled land use information into traffic analysis zones for use in EMME/2. Creative mitigation measures such as timing and phasing of housing and employment are being evaluated to overcome the challenge of accommodating project traffic on the regional roadway system.

Project manager for two neighborhood traffic studies for the Town of San Anselmo (Marin County). Mitigation measures to improve vehicle access and safety in mountainous terrain included vehicle turn-outs, road widening, sight distance improvements, parking restrictions and emergency evacuation routes. Project planner for Atherton Neighborhood Study to develop a comprehensive plan for reducing neighborhood cut-through traffic. A key aspect of the study included coordination with the neighborhood to develop and implement alternative improvement techniques.

Project manager on several special event and recreation studies. The Pier 35 Cruise Ship Terminal project in San Francisco focused on developing parking and traffic improvements to accommodate up to 10,000 visitors to trade shows and conferences.

Project planner for the West Concord Area Transportation Study. Evaluated future roadway access and circulation. Determined new roadways and bridges required to serve the project area for years 2000 and 2010; developed turning movement volumes from EMME/2 model projections; performed level of service analysis; made recommendations and cost estimates for alignment of future roadways.

Geographical Information Systems (GIS) Experience

Summarized census data using ArcView computer program for Arroyo Verdugo (Los Angeles County) and Tulare County projects. Developed large scale and report size graphics using socio-economic data (e.g., median income, percent using transit). For the Arroyo Verdugo project, output was used for transit planning work.

Boston Area Studies

Project planner for EIR, traffic impact and access studies in Boston, including the Longwood Medical Center, the Portland Place Development, Prudential Center Redevelopment EIR, Boston University Commonwealth Armory Development, and the New Boston Garden project.

Involved in establishing transportation and development guidelines for the Central Artery North Area project; participated in a regional transportation study of the Lebanon/Hanover (New Hampshire) area and a corridor study of Route 20 East for the City of Marlborough (Massachusetts).

PROFESSIONAL AFFILIATIONS

American Planning Association
American Institute of Certified Planners
Volunteer member of the City of San Francisco, State of the City Report, Transportation Working Group

ENVIROMETRICS INC.

Resume

Michael G. Ruby, P.E.

President and Director, Engineering

Dr. Ruby has been solving air pollution control problems for more than twenty years. He has worked in the university, in government, and as a consultant to industry. He has conducted air quality management studies, investigated and designed air pollution control equipment, and conducted research in various aspects of air pollutant sampling and control technology.

Dr. Ruby joined Envirometrics in 1984 and now serves as its President and Director of Engineering. Prior to coming to Envirometrics he served as a professor in the Department of Civil and Environmental Engineering and as the Director of the U.S. Environmental Protection Agency's Area Training Center at the University of Cincinnati. He has also served as the Director of the International Environmental Engineering Institute for the World Health Organization.

His experience in air quality management includes:

- Developing the first Transportation Control Plan for Seattle, Washington
- Conducting benefit-cost studies of ambient air quality standards
- Consulting to Pan American Health Organization on industrial emission standards
- Serving on the Board of Directors of the Puget Sound Air Pollution Control Agency
- Conducting extensive benefit-cost analysis of acid deposition policy alternatives, including probabilistic estimates of variables and outcomes and first estimates of Washington soils' and lakes' sensitivity to acid deposition
- Organizing and conducting short courses and training programs for the U.S. Environmental Protection Agency, the World Health Organization, the U.S. Agency for International Development, and the Canada International Development Agency
- Consulting to the World Bank on Air Quality Action Plans.

His experience in ambient and source monitoring and sampling includes:

- Establishing meteorological and particulate monitoring networks for source-receptor and fugitive dust analysis
- Conducting research in stack emissions particle sizing using electric sensing zone technology
- Conducting research in use of the integrating nephelometer to measure visibility
- Conducting research on cutpoint of PM-10 sampler inlets
- Co-developer of the high volume surface sampler (HVS3) for the U.S. Environmental Protection Agency and project manager for field testing and research.

His experience in control equipment design includes:

- Conducting research into new, low pressure-drop monolithic packing for packed tower scrubbers
- Conducting research on and designing dry sorbent injection systems for removal of acid gases
- Conducting economic evaluations and preparing reports on best available control technology for a variety of sources

- Evaluating and designing spray dry systems for removal of acid gases
- Conducting research on the use of PTFE-membrane filter media
- Designing and specifying packed towers for odor and gas control
- Designing and specifying baghouses and scrubbers for particulate control
- Designing and specifying carbon adsorption units for organics control.

His experience with waste-fired boilers and incinerators includes:

- Conducting detailed particulate emissions study of wood-waste fired boiler
- Conducting study of gas flow patterns in municipal waste incinerator
- Developing computer model of hazardous waste incinerator combustion chamber
- Preparing engineering reports and recommendations on poorly functioning municipal waste incinerators
- Conducting studies of the fully-mixed zone in a waste incinerator.

His experience in dispersion modeling includes:

- Conducting dispersion modeling studies and preparing reports for prevention of significant deterioration (PSD) permits
- Conducting dispersion modeling studies for sources in mountain and coastal valleys
- Conducting studies of emissions from industrial sources and electric power plants
- Conducting studies of emissions from motor vehicles on roads and in parking garages
- Conducting studies of hazardous materials spills
- Conducting dispersion modeling studies for air toxics reviews
- Conducting studies of fugitive dust from industrial activities and roadways
- Developing dispersion model to predict visual characteristics of saturated plumes.

Dr. Ruby is the author or co-author of more than seventy books, journal articles, book chapters, meeting papers, and technical reports. Examples of his recent publications are two papers in the proceedings volume of the Air and Waste Management Association's Odor Symposium, a technical report published by the U.S. Environmental Protection Agency, and a chapter on the integrating nephelometer in *Methods of Air Sampling and Analysis*. He is the co-author of the text *Benefit-Cost Analysis of Air-Pollution Control*.

Dr. Ruby is a registered Professional Engineer (Mechanical Engineering) in Washington and Alaska and is board certified in Air Pollution Control. He has served as both a Technical Committee and a Division chair for the Air and Waste Management Association and as a member of the Board of Trustees of the American Academy of Environmental Engineers. He is a member of Sigma Xi and is listed in *American Men and Women of Science* and *Who's Who in Engineering*. Dr. Ruby is a currently a member of the U.S. Technical Advisory Group to the International Standards Organization.

Dr. Ruby received his B.S. degree in Engineering Physics from the University of Oklahoma and his M.S. degrees in Physics and Civil Engineering and Ph.D. in Civil Engineering, all from the University of Washington.

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Air Quality Conformity Review

for

Sea-Tac Master Plan Update

Prepared for

Airport Communities Coalition

June 5, 1996

SUMMARY AND CONCLUSIONS

This report describes Envirometrics' review and analysis of the Federal Aviation Administration's air quality study of the implementation of the Master Plan Update for the Seattle-Tacoma International Airport. In its draft Clean Air Act Conformity finding, the FAA concludes that, based on the FEIS modeling, "with mitigation, the proposed improvements would not result in any new exceedances, nor increase the frequency or severity of any existing violations of the ambient air quality standards for carbon monoxide (CO) or nitrogen dioxide(NO_2) at any modeled receptor locations."

The FAA's conclusion is based on the assumption that aviation traffic will be the same regardless of whether or not the Master Plan projects are completed. In fact, implementation of the third runway could mean an increase in airport operations by as much as an annual average 33 percent above that projected by the Master Plan Update by 2020, which could translate into an increase of up to 50 percent above the projections for the peak hour. Therefore, to test the impact and validity of this assumption, Envirometrics estimated NO_2 and modeled CO concentrations based on the alternate assumption that the expanded airport would result in increased aircraft and passenger vehicle traffic. Our analysis provides predictions of the effect of a 30 percent increase in passengers in the peak hour in 2010 on CO concentrations at surface street intersections from increased vehicle traffic and the effect on NO_2 concentrations from a 33 percent increase aircraft activity by 2020.

We conducted our intersection modeling with the same models used by the FAA for the FEIS, preserving many of the original option choices but correcting the many errors made in the FEIS modeling and with the intersections revised to represent the geometries actually used in the FEIS traffic model. Traffic volumes and signal light timings were supplied by Smith Engineering and Management from their runs of the same traffic model.

Envirometrics modeled CO concentrations at these intersections for three scenarios for 2010: the Do Nothing alternative, the Project alternative, and a Project alternative which assumes an increase in passengers above the Do Nothing alternative. Modeled predictions show that the expected maximum CO concentration will be greater with implementation of the project and greater still with the increased passengers case. With the project, the frequency of CO exceedances of the NAAQS increases and with the increased passengers case it increases significantly. At the S 160th St. and SR 99 intersection the frequency more than doubles.

The FEIS modeling for NO_2 projected future concentrations at 11 sites. From the results presented in the FEIS, we estimated the effect of the increased passengers scenario on NO_2 concentrations at these receptor sites. Our calculations indicate it is reasonable to conclude that the number of modeled receptor locations where the annual NAAQS for NO_2 will be exceeded will increase, in

2020, from one for the Do Nothing alternative to at least three and perhaps five for the Project with increased passengers alternative.

The data presented in this report clearly establishes that, with the expected increases in passenger activity above that projected in the Master Plan Update, the proposed improvements will result in new exceedances of the NO_2 ambient air quality standards and will increase the frequency and severity of the CO ambient air quality standards at modeled receptor locations. The increased NO_2 and CO concentrations associated with aircraft activity and motor vehicle traffic expected from the increased passenger load will delay the attainment of the ambient air quality standards.

INTRODUCTION

This report describes an air quality study of traffic associated with the implementation of a Master Plan Update for the Seattle-Tacoma International Airport. The Master Plan proposes the development of a third runway, the addition of a North Unit Terminal, resulting revisions to the location of air cargo handling facilities, revisions to parking facilities, and further revisions to other support facilities. Development of the South Airport Support Area (SASA) is included in the Master Plan and the analysis as part of the proposed action, although a separate Environmental Impact Statement has previously been issued for that project. Similarly, only the proposed action alternative includes a revision to the terminal roadway system that provides passenger-related traffic access to the southern portion of Air Cargo Road, although such a connection is currently under discussion by the Port, independent of the third runway project.

In the draft Clean Air Act Conformity finding contained in Chapter IV, Section 9 (p. 11) of the Final Environmental Impact Statement (FEIS) for the Master Plan Update, the Federal Aviation Administration (FAA) concludes that, "with mitigation, the proposed improvements would not result in any new exceedances, nor increase the frequency or severity of any existing violations of the ambient air quality standards for carbon monoxide (CO) or nitrogen dioxide(NO_2) at any modeled receptor locations."

The FEIS includes in Chapter IV, Section 9 (with additional detail in Appendix O) a description of the air quality modeling conducted for aircraft activity and traffic associated with the airport. The aircraft activity was analyzed using EDMS, a specialized model developed by the FAA for pollutants from aircraft activity. This model was also used to analyze some traffic activity, but it is only able to consider through traffic movements and not queuing at intersections, so it is not capable of modeling the traffic activity which generates the greatest amount of traffic pollutants. Both traffic queuing and through traffic at intersections was modeled with an EPA model, CAL3QHC, which is designed to predict pollution impact at intersections. The EDMS modeling is described in Sections 3 through 7 of Appendix O and the CAL3QHC modeling in Section 9 of Appendix O.

The EDMS modeling of aircraft activity included estimates for nitrogen dioxide (NO_2) and carbon monoxide (CO). The CAL3QHC intersection modeling covered only CO. The NO_2 National Ambient Air Quality Standard (NAAQS) is an annual average standard and should therefore be modeled for an average rate of emissions activities. The NAAQS for NO_2 is an annual average not to exceed 0.053 ppm. The CO NAAQSs are for one hour and eight hours, not to be exceeded more than once a year. Thus CO should be modeled using a peak emissions condition, the highest expected emissions condition during the year, with the least favorable meteorological conditions. The eight-hour average CO NAAQS is 9 ppm.

The FEIS aircraft activity modeling used eleven receptor locations on and at the edges of the airport. These locations are shown on Exhibit IV.9-1 of the FEIS, which is included for convenience in the Appendix of this report. The EDMS model includes emissions of ground service activity, aircraft taxi movements to and from the terminal, waiting in queues for takeoff, takeoff, and landing. It also includes automobile traffic through the airport and on adjacent roads.

Technical Report No. 5 of the Airport Master Plan Update projects approximately 406,000 annual operations and 91 operations in the peak hour in 2010. In Table I-5 of the FEIS this level of activity is projected to result in an arrival delay of one to eight hours at the existing airport during adverse weather conditions. In Table II-4 it is pointed out that an arrival delay of more than one hour under existing conditions would be reduced to about 13 minutes with the new runway. In a paper prepared for the Airport Communities Coalition, Dr. Clifford Winston argues that this reduced delay will result in an increased passenger demand and an increase in annual operations above that projected by the Master Plan Update of up to 33% by 2020 (and, presumably, by a lesser, incremental amount each year along the way to 2020). Table 3-8 of Technical Report No. 5 reports almost twice as many passengers in the peak hour as the average hour in the peak month. Thus, an annual average increase of 33% would mean a much greater increase in the peak hour, perhaps more than 50% above the operations expected without the proposed project. Therefore, construction of the third runway would mean the number of arriving and departing passengers in the peak hour, and their associated surface traffic, could increase by more than 50% above the usage without the third runway.

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This increase in passengers and passenger traffic will require a similar but smaller increase in employees and employee traffic and associated (e.g., shuttle vans) traffic. Thus an additional scenario should be evaluated which reflects this increased passenger load during the peak hour with the implementation of the proposed project. A conservative estimate of this increased load in the peak hours for 2010 would be a 30% increase in arriving and departing passengers and in aircraft activity, a 10% increase in associated and employee vehicle traffic, and no increase in airport overhead employees.

The FEIS intersection modeling included four intersections, all on SR 99 (International Boulevard S): S 160th St., S 170th St., S 188th St., and S 200th St. These locations are shown on Exhibit IV.9-2 in the FEIS and included for convenience in the Appendix to this report. Traffic movements through all of these intersections are directly affected by the proposed project. The construction of the North Unit Terminal cuts Air Cargo Road and closes the portion of S 170th St. that accesses the airport (it becomes only an access to a hotel parking lot and the back entrance to the cemetery). Access to S 160th is similarly, but less, affected since there would be no access to Air Cargo Road, and thus to S 160th, from Airport Expressway. Traffic moving on SR 99 through S 188th and S 200th would be reduced by the opening of an access from the terminal roadways to Air Cargo Road South and onto an improved 28th Ave S. Other traffic was displaced to the freeway network. Of these intersections, the S 160th St. at SR 99 intersection is most representative of the impact of the project on the wider community, as increased passenger traffic is only marginally diverted to other routes.

The FAA's transportation consultants assigned traffic to and from the airport to particular routes and then utilized the Traffix model for intersection capacity analysis to make estimates of the number of vehicles that would pass through or turn at a given intersection. This model is also used to optimize the traffic signal timing at each intersection, to the extent possible.

The same traffic model was used to prepare traffic data for air quality modeling for this report. Data for three scenarios were utilized: 1) the Do Nothing alternative as described in the FEIS but including the connection from the terminal roadway to Air Cargo Road South and some changes in the traffic route assignments, 2) the Project as described in the FEIS but with some changes in the traffic route assignments, and 3) the Project as in item 2 but with the additional traffic from the 30% increase in passenger activity described above. The traffic implications of each of these scenarios was developed by Smith Engineering and Management for this study and is described in detail in their report[1].

Only about 30% of the passenger traffic to and from the airport moves on surface streets. The modeling described in this report does not estimate the effects on air quality of the remaining 70% of the traffic, which moves along the I-5, SR 518 and Airport Expressway network. Most of the backups created by increased traffic to and from the airport will be on the ramps between I-5 and SR 518. Tables O-B-17 and O-B-21 in Appendix O of the FEIS report that several of these ramps can be expected to degrade to a very marginal level of service. Such slow moving traffic will result in high emission rates of CO and potentially high concentrations along these ramps during adverse weather conditions. Undoubtedly a proper evaluation of these ramps would show numerous locations on the ramps where the CO concentrations would be similar to those described in this report.

[1]Smith Engineering & Management, "Revised Traffic Analysis for Air Quality Conformity Review of Sea-Tac Master Plan Update" (1996)

INTERSECTION MODELING PROCEDURES

The modelling of air quality at an intersection requires the development of the quantities of pollutants released by the vehicles, a description of the meteorological conditions and how they will affect the dispersion of the pollutants from the roadway sources to receptors located near the edge of the road, and a precise description of the geometry of the sources and receptors. The most significant source of air pollutants at an intersection are the vehicles queued and waiting at the stop light. These vehicles may be waiting to turn left, to go straight through, or to turn right. The longer the vehicles must wait to clear the intersection, the greater the emissions. Also important are the moving vehicles approaching and departing from the intersections. The slower the vehicle speed, the greater will be the pollutant emissions[2]. Emission rates are calculated by an EPA-developed program, MOBILE 5A. This program requires information about the mix of vehicle types on a road, ages, local regulations about vehicle inspection and maintainance, etc.

Intersection models such as CAL3QHC include, from traffic engineering studies, estimation procedures for the lengths of queues, given the traffic signal timing and the rate vehicles approach the intersection from each direction. Since air quality modeling requires the use of the least favorable meteorological conditions, intersection models systematically apply winds from 10 degree increments around the compass, to find the wind direction which results in the highest value at a given receptor. As a result the highest value at one receptor might be with winds from the north and the highest value at a receptor across the street might be with winds from the southwest.

The air quality analysis for the FEIS, which is offered in support of the FAA's draft Clean Air Act Conformity finding, included intersection modeling results for the intersections of S 160th St., S 170th St., S 188th St., and S 200th St., all at SR 99 (International Boulevard S) and for S 160th St. and S 170th St., at SR 99, each with an additional turn lane as mitigation. Envirometrics obtained the computer files used for the modeling of these intersections from the FAA. These files were found to contain numerous errors. For all of the intersections, the intersection geometries used in the CAL3QHC modeling were different from the intersection geometries used by the FAA's consultants, INCA Engineers, in preparing the traffic study. Because the traffic study provided the basis for the traffic volumes and signal timings used in the CAL3QHC modeling runs they should have used identical geometries, but they inexplicably did not (generally one more lane was added to at least one branch of the intersection and in some cases one less lane was used). Some lanes were positioned incorrectly (overlapping another lane or just misplaced). There were errors in entering the traffic volumes (at every intersection the number of vehicles entering the intersection exceeded the number leaving the intersection, by a substantial amount). Some of the signal timings were not properly computed. The emission rate for moving vehicles appears to include

[2] Emission rates of CO decline with speed at the speeds encountered on surface streets. At freeway speeds CO emission rates will increase with speed for certain types of engines.

only automobiles and excludes vans, gas and diesel trucks, heavy duty vehicles, etc. Nor does it use the actual Washington state vehicle registration distribution for vehicle age. Further, the emission rate calculations assume the use of reformulated gasoline, which is currently in the first stages of use in California but has not been adopted for use in Washington. Apparently, the inspection and maintenance program was included in the calculations for idling emissions but not for emissions from moving vehicles. As a result, the emission rates used in the FEIS were under stated by approximately 20 percent.

Two intersections were modeled by Envirometrics for this report, chosen as representative of the intersections affected by the proposed project. We chose S 188th St. at SR 99 as representative of the intersections which have been significantly relieved of traffic by project actions (i.e., S 200th St. at SR 99 and S 170th St. at SR 99) while S 160th St. at SR 99 was chosen as representative of other intersections in the vicinity which are less directly affected and reflect more the increase in vehicle movements to and from the airport. We modeled the S 160th St. at SR 99 intersection only in the mitigated arrangement described in the FEIS as this change is likely to be implemented prior to 2010. We chose the year 2010 for modeling as, from among the years modeled in the FEIS, this most closely matches the target years for the current Air Quality Maintenance Plans, for which conformity is to be demonstrated.

Envirometrics created new base files for each of the intersections modeled in the FEIS. The option choices made in the FEIS CAL3QHC input files (e.g. signal types, clearance lost time, wind speed, stability class, etc.) were not changed in developing the new files. The same persistence factor[3] was used to move from the calculated one-hour average to the eight-hour average required for comparison with the NAAQS. However, we prepared new intersection geometries for each of the modeled intersections, placing the traffic lanes properly and using the number and orientation of the lanes used in the FEIS and Smith traffic studies. In the new files, the potential pollutant receptor locations were generally the same as in the FEIS input files but approximately half as many receptors were used in order to reduce coding and computer run time.

Smith Engineering and Management developed new traffic volumes for the year 2010 using the same traffic modeling program used by INCA Engineers (specifically, the "Initial Future" volumes modified to include all right turn volumes were used as the actual traffic counts). The changes made in traffic generation volumes and origin-destination assignments by Smith for the proposed project and the do-nothing alternative have been described separately in their report. Smith also developed an additional scenario for the greater passenger load described above, which is also described in detail in their report.

Because the traffic modeling program optimizes the traffic signal timing at each intersection to the new traffic volumes, we used the new signal times from the traffic data supplied by Smith in the

[3] Persistence factor is the ratio between the eight-hour average CO concentrations and the peak one-hour concentration during peak periods as developed from statistical studies of the frequency distribution of the hourly concentration values. This is generally assumed to be 0.7 for intersection modeling studies.

new input files. Turn opportunity time ("green time") for right turns was assumed to include 100 percent of red time for lanes with no traffic conflicts, 70 percent of red time for lightly opposed lanes and 30 percent for heavily conflicted lanes. A protected right-turn lane was assumed for S 188th St. northbound onto SR 99.

Envirometrics modeled three scenarios which are reported here: 1) a base case which assumes the proposed project is not implemented, using the peak annual/peak hour background and airport traffic assumed in the FEIS, but assuming the proposed connection between Airport Expressway and Air Cargo Road S is completed by 2010, allowing access to Air Cargo Road S; 2) a case which assumes the project is implemented, again using the peak annual/peak hour traffic assumed in the FEIS; 3) a case which assumes the project is implemented and total passenger and employee traffic increases by about 20 percent beyond the estimate in the FEIS in the peak hour of the peak day, as discussed in the previous section (*vide*, p. 2).

In the Envirometrics modeling runs, concentrations of carbon monoxide (CO) were estimated for receptors located 3 meters back from each roadway margin and along each side of each street at the intersection. One receptor was placed at each of the four corners of the intersection and three additional receptors along each side of each street. The effect of traffic on overall CO concentrations can be summarized by averaging the receptors along each street, although the overall maximum is the number used for air quality management purposes. The background concentration of CO from sources away from the intersection being modeled was assumed in the FEIS to be 3.5 ppm over an 8 hour averaging period, which is appropriate for current urban conditions. Although 3.5 ppm is an acceptable assumption for background levels in 1994, in their recent studies the Washington Dept. of Transportation has generally used about 1.5 ppm as more representative of the anticipated value in future years, such as 2010, when overall emissions are reduced by the lower emissions of future model year vehicles. This study used a compromise value of 2 ppm.

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INTERSECTION MODELING RESULTS

The tables below summarize the predicted carbon monoxide (CO) concentrations for each of the conditions modeled for 2010: Do Nothing, the Project with traffic as described in the FEIS, and the Project with greater passenger traffic. For the intersection at S 160th St. and SR 99, the mitigation described in the FEIS (a dual southbound left turn lane) is assumed to be implemented. A schematic drawing of a typical intersection showing the location of receptors is in the Appendix.

Table I. Predicted CO Concentrations for S 160th St. and SR 99 (ppm)

	Do Nothing	Project	Incr Pass
East stop line	10.8	11.7	12.2
Average East	7.5	7.6	7.9
Max East	10.8	11.7	12.2
South stop line	10.8	11.8	12.3
Average South	9.3	10.4	10.9
Max South	10.8	11.8	12.3
West stop line	10.7	12.0	12.5
Average West	5.7	6.2	7.2
Max West	10.7	12.0	12.5
North stop line	9.7	10.1	10.7
Average North	9.7	10.9	11.7
Max North	11.2	12.1	12.4

The maximum value predicted at S 160th St. and SR 99 for the Do Nothing alternative is 11.2, at a receptor on the northeast side of the intersection. The high value there is primarily from northbound traffic leaving the intersection and the east-turning queue of southbound traffic, delayed by northbound traffic. The maximum value predicted for the increased passenger traffic alternative of the proposed Project is 12.5, at the west stop line of eastbound traffic. This receptor is influenced by several sources, those mentioned previously and the southbound through traffic.

In the FEIS the "With Project" condition at S 160th St. and SR 99 is said to "result in a maximum concentration equal to or below the Do-Nothing condition" with the highest concentration at 11 ppm over an 8-hour period. However this value includes the higher background concentration

assumed in the FEIS. When the background is adjusted from 3.5 ppm to 2 ppm, as used in this report, the equivalent FEIS value at this intersection would be 9.5 ppm. The lower values predicted by the FEIS are partly due to the lower emission rates, partly due to leaving out the traffic departing from the intersection, and partly due to the assumption of no increase in passenger traffic with the implementation of the project.

Table II. Predicted CO Concentrations for S 188th St. and SR 99 (ppm)

	Do Nothing	Project	Incr Pass
East stop line	17.9	18.1	18.5
Average East	14.0	14.4	14.4
Max East	17.9	18.1	18.5
South stop line	15.7	15.9	15.9
Average South	13.5	13.7	14.0
Max South	16.1	16.1	16.5
West stop line	15.3	15.7	15.9
Average West	13.2	13.3	13.5
Max West	15.3	15.7	15.9
North stop line	17.1	17.4	17.7
Average North	12.4	12.4	10.9
Max North	17.1	17.4	17.7

The maximum value predicted at S 188th St. and SR 99 for the Do Nothing alternative is 17.9, at a receptor at the east stop line of westbound traffic. The high value here is primarily from northbound traffic approaching, queued, and leaving the intersection, southbound traffic leaving the intersection, and the westbound traffic approaching and queued at the intersection. The maximum value predicted for the increased passenger traffic alternative of the proposed Project is 18.5, at the same location and influenced by the same traffic.

In the FEIS the "With Project" condition at S 188th St. and SR 99 is said to "result in a maximum concentration equal to or below the Do-Nothing condition" with the highest concentration at 18 ppm over an 8-hour average. When the background is adjusted to the values used in this report, that would be 16.5 ppm.

The number of days[4] when the CO concentration will exceed the NAAQS can be estimated from the approximately lognormal frequency distribution of measured air pollutant concentrations[5]. If the value estimated by the modeling represents the value which will not be exceeded more than once a year (as the NAAQS is defined) then the number of days on which the standard will be exceeded can be determined directly from the frequency distribution, given the characteristics of the frequency distribution for observed urban CO concentrations[6]. Using conventional techniques for estimating the frequency interval value of a distribution, it can be estimated that for the predicted maximum values for the S 160th St. and SR 99 intersection in Table I, with the Do Nothing alternative the NAAQS will be exceeded up to 15 times in a year, with the Project alternative as presented in the FEIS the NAAQs will be exceeded up to 26 times in a year, and with the Project alternative with a higher passenger load the NAAQS would be exceeded up to 33 times in a year, more than double the Do Nothing alternative.

Again for the maximum CO concentrations reported for S 188th St. and SR 99 in Table II, estimating from the statistical distribution of urban CO concentrations, the Do Nothing alternative predicts there will be up to 220 periods during the year when the CO NAAQS will be exceeded, 230 periods with the Project alternative, and the Project alternative with a higher passenger load would mean the NAAQS would be exceeded in up to 245 periods during the year at this intersection.

These results are summarized in Table III, on the following page.

The output files for each of the six model runs described here are included in the Appendix to this report.

[4] To be strictly correct, we should say "the number of non-overlapping periods", of which there are three 8-hour periods in a day. Although there can be more than one non-overlapping period during the day that exceeds the standard, it is most likely for the exceedance to occur with respect to the evening peak, which is also the period which has been modeled here, and not occur during the morning or late night periods. Thus we use "days" as a short-hand expression.

[5] Larsen, R.I. "An Air Quality Data Analysis System for Interrelating Effects, Standards, and Needed Source Reductions," *J. Air Pollution Control Assn.* 23(1973):933-940

[6] Larsen, R.I. "An Air Quality Data Analysis System for Interrelating Effects, Standards, and Needed Source Reductions - Part 2," *J. Air Pollution Control Assn.* 24(1974):551-558

Table III. Summary of CO Modeling Results

	Maximum CO (ppm)	Days above NAAQS
S 160th St/SR 99		
Do Nothing	11.2	15
Project	12.1	26
Increased Passengers	12.5	33
S 188th St/SR 99		
Do Nothing	17.9	220
Project	18.1	230
Increased Passengers	18.5	245

AIRCRAFT ACTIVITY MODELING

The air quality analysis for aircraft activity in the FEIS utilized the FAA's EDMS model, which provides emission rates for ground service activity, the taxi movements of aircraft to and from the terminal, waiting in queues for takeoff, takeoff, and landing. These emissions are located by the model at the position on the airport where they will take place. Takeoff and landing emissions are modified to reflect the elevation of the aircraft during the takeoff and landing processes, resulting in ground level concentrations higher at the end of the airport where the aircraft are on or near the ground. These emissions coupled with emissions from motor vehicle traffic are used to estimate the concentrations of air pollutants on and adjacent to the airport.

The EDMS model is a relatively complex model which requires extensive input data to be used effectively. There was simply not enough time available during this review to prepare the input files which would have permitted the use of EDMS directly to project the potential for higher NO_2 concentrations associated with the 33 percent increase in passenger load by 2020 suggested by Dr. Clifford Winston (*vide*, p. 2). However the results of the EDMS modeling for the FEIS (reported in Table D-10 of the FEIS) can be used to provide an estimate of the impact[7]. The projected NO_2 concentrations presented in the FEIS for the Do Nothing and the Project alternatives for 11 receptor sites are reproduced in Table IV, on the following page.

Because increased operations do result in some congestion delays, as seen by the increased time in mode for departure queue for all alternatives for 2020 as compared to 2010 (*cf*, Page 3 and Page 4 of Table D-2) the emissions of hydrocarbons and the pollutants associated with low aircraft engine speed will increase by an amount greater than the increase in operations. Annual emissions of NO_x, on the other hand, will increase approximately proportionally to the number of operations in any one year. The results presented in the table have already been adjusted for NO to NO_2 conversion, so simply increasing the Airport Sources values presented in Table D-10 by 30 percent and rounding to the initial accuracy of the table will produce a useful estimate of the NO_2 concentrations for the higher passenger load case that is consistent with the FEIS presentation.

The influence on receptors by Roadway Sources will be strongest by those sources closest to the receptor. Thus the estimated increase at receptors within or adjacent to the terminal complex can be calculated by assuming a 30 percent increase in NO_2 concentrations similar to the increase from aircraft activity, while concentrations at receptors near adjacent public streets should be calculated

[7] It would have been more desirable to work directly from the output files of the EDMS model runs rather than the less accurate summary tables in the FEIS. However the output files supplied to us by the FAA do not appear to be the output files utilized by the FAA's consultants in developing the FEIS. For example, the output file for the 2020 Do Nothing alternative contains data for only a single wind direction and the output file for the 2020 With Project alternative contains only error messages.

Table IV. Estimated NO_2 (ppm) Concentrations in 2020

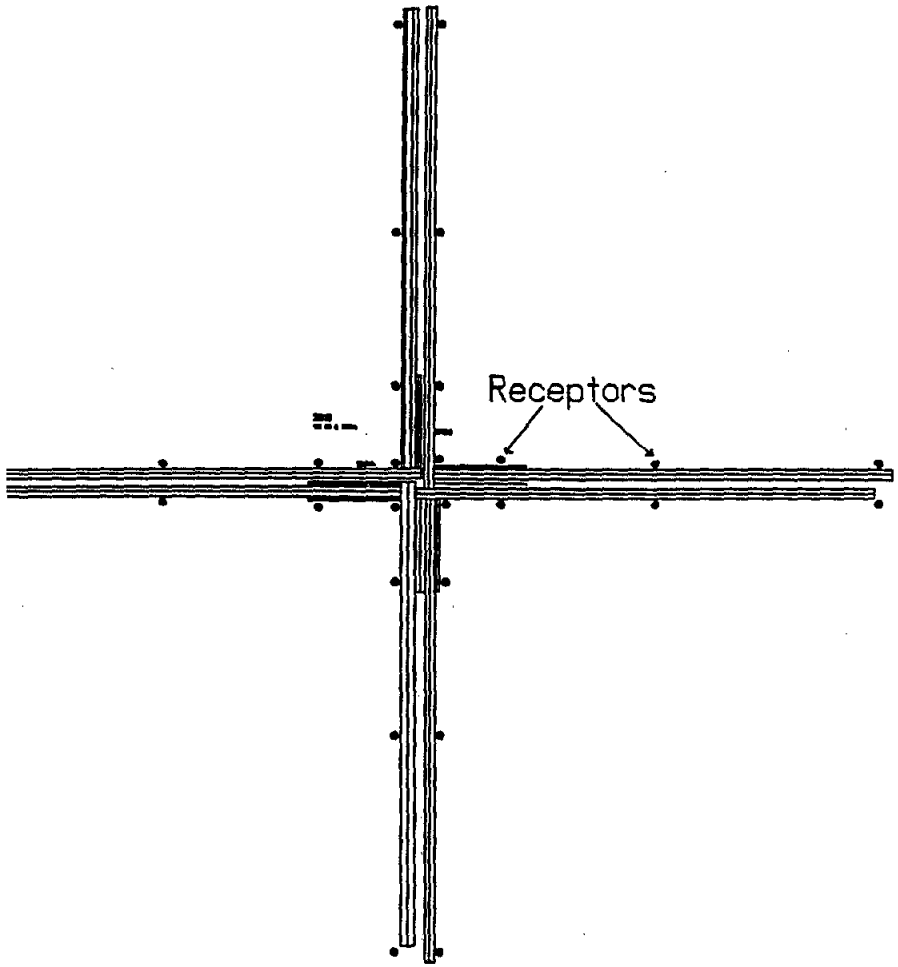
	Terminal South	Terminal Hotel	Highline Nurseries	SeaTac Regrowth	SeaTac Indus Pk	Des Moines Creek Pk	Existing 154th St.	Future 154th St.	188th St. (S)	188th St. (W)	North Terminal
Do Nothing											
Airport Sources	0.00	0.00	0.01	0.01	0.01	0.01	0.08	N/A	0.03	0.01	N/A
Roadway Sources	0.02	0.03	0.01	0.01	0.01	0.01	0.01	N/A	0.02	0.01	N/A
Background	0.02	0.02	0.02	0.02	0.02	0.02	0.02	N/A	0.02	0.02	N/A
Total Do Nothing	0.05	0.05	0.04	0.03	0.04	0.04	0.11	N/A	0.06	0.05	N/A
Project											
Airport Sources	0.00	0.00	0.01	0.01	0.01	0.01	N/A	0.03	0.02	0.02	0.00
Roadway Sources	0.02	0.02	0.01	0.01	0.01	0.01	N/A	0.01	0.02	0.01	0.02
Background	0.02	0.02	0.02	0.02	0.02	0.02	N/A	0.03	0.02	0.02	0.02
Total Project	0.04	0.01	0.04	0.04	0.04	0.04	N/A	0.07	0.06	0.05	0.04
Inst Pass Project											
Airport Sources	0.00	0.01	0.01	0.01	0.01	0.01	N/A	0.04	0.03	0.02	0.00
Roadway Sources	0.03	0.03	0.01	0.01	0.01	0.01	N/A	0.01	0.02	0.02	0.02
Background	0.02	0.02	0.02	0.02	0.02	0.02	N/A	0.02	0.02	0.02	0.02
Total Inst Pass	0.05	0.05	0.05	0.04	0.04	0.04	N/A	0.07	0.07	0.06	0.05

by assuming only an approximately 10 percent increase in observed NO_2 (since airport traffic will represent about one-third of the traffic on these streets). The contribution from additional airport vehicular traffic in residential neighborhoods can be assumed to be small.

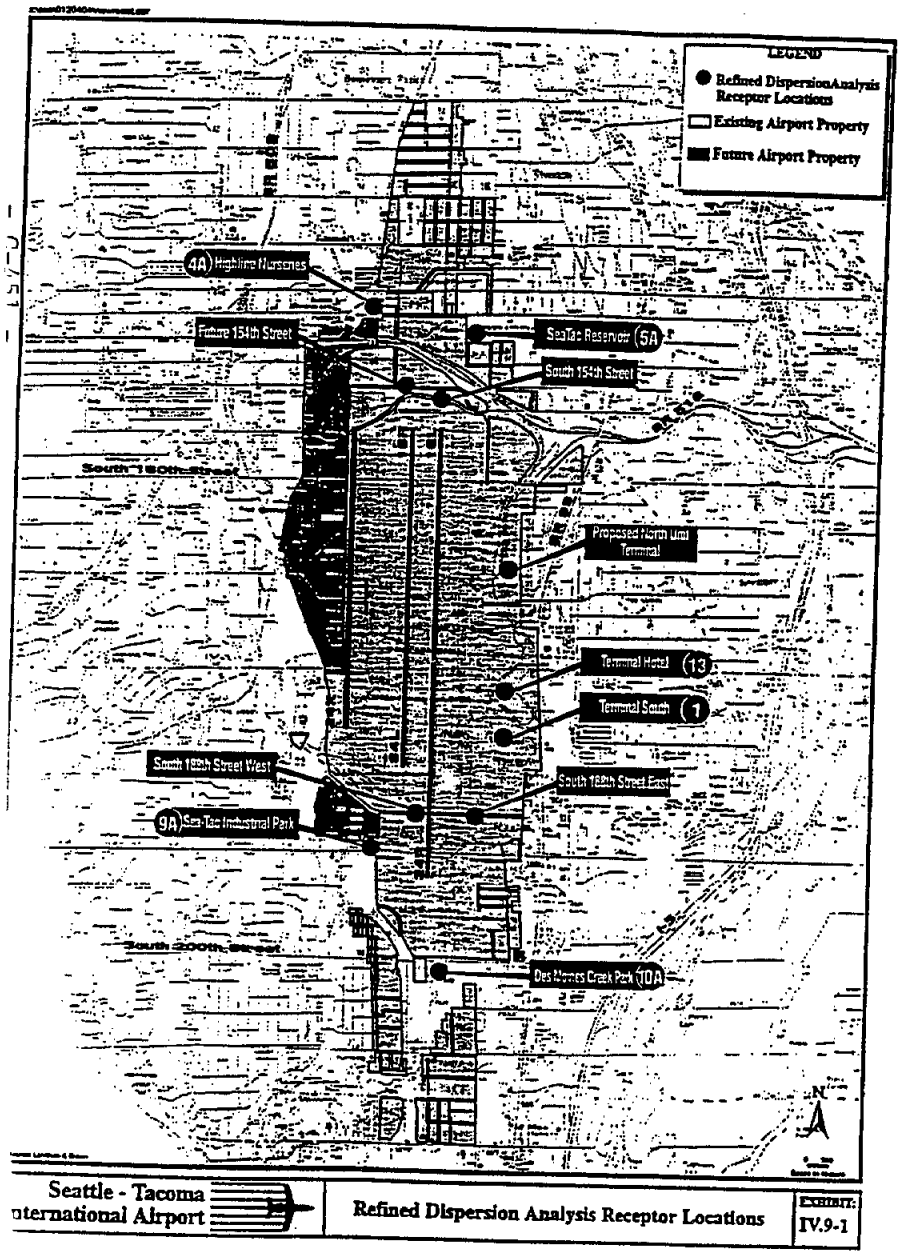
Because the data in Table D-10 (and thus in Table IV) are presented to only one significant digit, it is difficult to know if an entry shown as 0.5 ppm is less than the NO_2 NAAQS of 0.53 ppm or if it actually exceeds 0.53 ppm. Based on the numbers presented in the table and in Table IV.9-6, it is likely that the Do Nothing alternative reports one location where the NO_2 standard will be exceeded in 2020. Similarly, it is likely that the estimates for the Project alternative with an increased passenger load report an additional two and perhaps four locations where the NO_2 NAAQS will be exceeded, in addition to the one noted for the Do Nothing alternative, where it will be exceeded by a greater amount. In the one case where the estimated concentration decreases, this is accomplished by moving the receptor location.

Although the analysis presented here is based on the minimal information provided by the FAA, it is sufficiently illustrative of the potential results from a more detailed study to generate a requirement for the EDMS modeling to be repeated for the increased passenger load case.

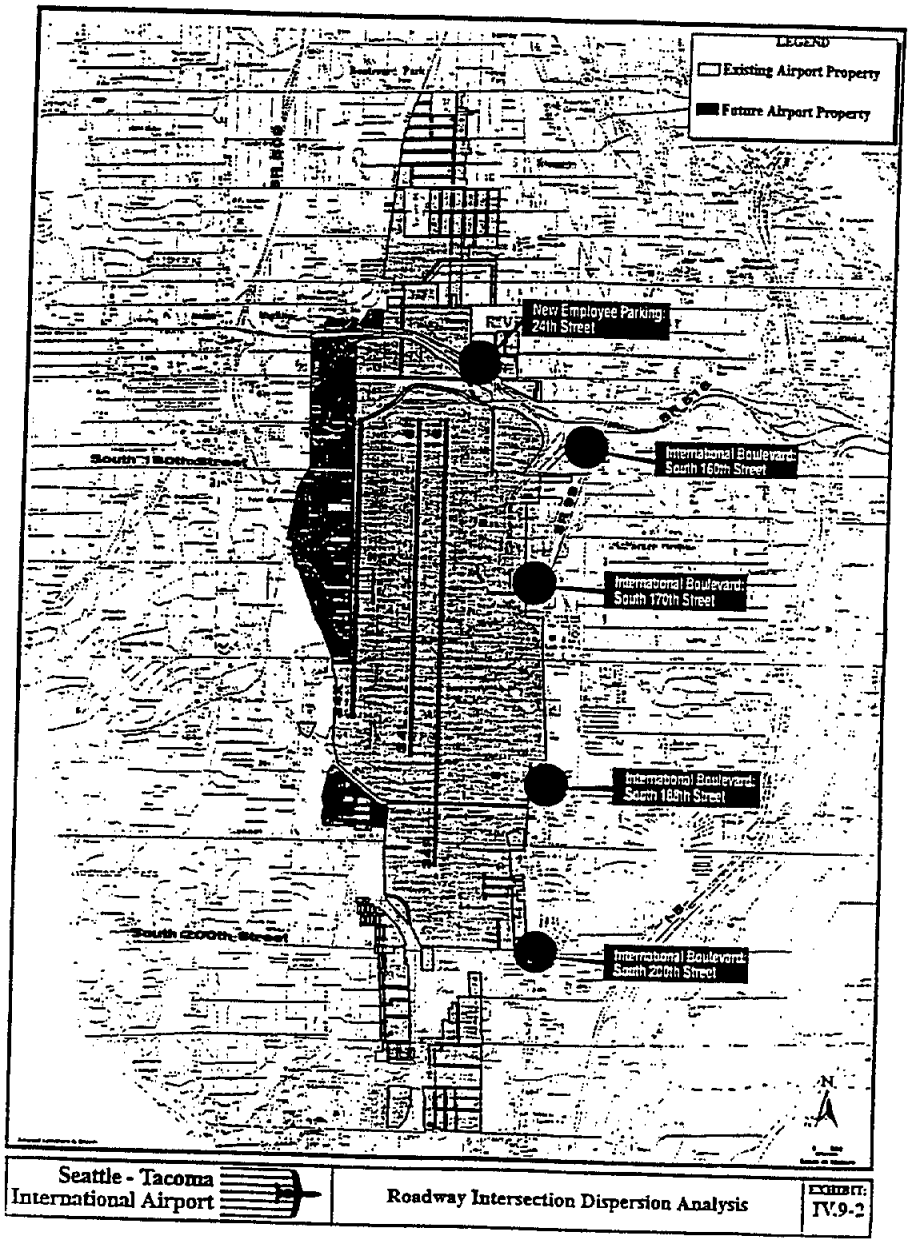
APPENDIX



ENVIROMETRICS



Seattle - Tacoma International Airport | Refined Dispersion Analysis Receptor Locations | EXHIBIT: IV.9-1



Seattle - Tacoma International Airport | Roadway Intersection Dispersion Analysis | EXHIBIT: IV.9-2

DATE : 5/20/96
TIME : 10:38:35

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 626. M AMB = 5.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. SR99 NB Approach	-41.7	-300.0	-3.1	-8.0	295.	8.	AG	1958.	28.3	.0	12.0		
2. SR99 NB Queue	3.1	-8.0	-57.6	-404.0	401.	189.	AG	756.	100.0	.0	6.0	1.09	66.8
3. SR99 NB Queue Left	-1.4	-7.3	-12.2	-76.6	70.	189.	AG	703.	100.0	.0	6.0	1.01	11.7
4. SR99 NB Depart	4.4	-.7	66.4	300.3	307.	12.	AG	2217.	28.3	.0	3.0		
5. SR99 SB Appr TH L	53.9	303.2	-6.0	11.2	298.	192.	AG	2144.	28.3	.0	12.0		
6. SR99 SB Appr RT	49.8	304.1	-10.6	12.2	298.	192.	AG	125.	28.3	.0	12.0		
7. SR99 SB QueueTH	-6.0	11.2	21.6	145.9	137.	12.	A	703.	100.0	.0	9.0		
8. SR99 SB QueueRT	-10.6	12.2	-9.6	16.9	5.	12.	AG	102.	100.0	.0	6.0	.96	22.9
9. SR99 SB Queue Left	.1	10.1	28.6	146.8	140.	12.	AG	1361.	100.0	.0	3.0	.09	.8
10. SR99 SB Depart	-8.6	2.6	-56.4	-296.4	303.	189.	AG	1879.	28.3	.0	6.0	1.09	23.3
11. 160 EB Approach	-301.1	2.8	-14.9	-5.5	286.	91.	AG	648.	28.3	.0	15.0		
12. 160 EB QueueT R	-3.5	-14.9	-57.0	-11.7	54.	273.	AG	1326.	100.0	.0	12.0		
13. 160 EB Queue Left	-14.7	-1.5	-211.0	10.5	197.	273.	AG	681.	100.0	.0	6.0	.81	8.9
14. 160 EB Depart	-2.4	-3.8	299.6	6.6	302.	88.	AG	862.	28.3	.0	3.0	1.17	32.8
15. 160 WB Queue Left	10.5	2.0	50.7	3.4	40.	88.	AG	739.	100.0	.0	12.0		
16. 160 WB Approach	298.6	14.8	10.5	5.0	289.	268.	AG	664.	28.3	.0	3.0	.99	6.7
17. 160 WB Queue TH	10.5	5.0	356.7	18.8	346.	88.	A	739.	100.0	.0	9.0		
18. 160 WB Queue RT	10.5	8.0	63.6	9.9	83.	88.	A	503.	100.0	.0	3.0	1.92	57.7
19. 160 WB Dep.	2.8	5.7	-300.7	11.6	304.	271.	AG	482.	28.3	.0	3.0	.50	8.9
										.0	12.0		

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DATE : 5/20/96
TIME : 10:38:35

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. SR99 NB Queue	180	85	1.0	1787	1600	298.55	1	3
3. SR99 NB Queue Left	180	158	1.0	170	1600	298.55	1	3
7. SR99 SB QueueTH	180	79	1.0	1680	1600	298.55	1	3
8. SR99 SB QueueRT	180	23	1.0	125	1600	298.55	1	3
9. SR99 SB Queue Left	180	153	1.0	464	1600	298.55	1	3
12. 160 EB QueueT R	180	149	1.0	400	1600	298.55	1	3
13. 160 EB Queue Left	180	153	1.0	249	1600	298.55	1	3
15. 160 WB Queue Left	180	166	1.0	96	1600	298.55	1	3
17. 160 WB Queue TH	180	166	1.0	186	1600	298.55	1	3
18. 160 WB Queue RT	180	113	1.0	282	1600	298.55	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. REC 1 WB1	14.0	14.0	1.8
2. REC 2 WB2	33.0	14.5	1.8
3. REC 3 WB3	80.0	15.0	1.8
4. REC 4 WB4	299.0	23.0	1.8
5. REC 5 WB5	299.0	.0	1.8
6. REC 6 WB6	80.0	-8.0	1.8
7. REC 7 WB7	33.0	-9.0	1.8
8. REC 8 WB1	9.0	-12.0	1.8
9. REC 9 WB2	4.0	-41.0	1.8
10. REC10 WB3	-4.0	-99.0	1.8
11. REC11 WB4	-35.0	-300.0	1.8
12. REC12 WB5	-66.0	-300.0	1.8
13. REC13 WB6	-33.0	-99.0	1.8
14. REC14 WB7	-25.0	-41.0	1.8
15. REC15 EB1	-19.0	-10.0	1.8
16. REC16 EB2	-125.0	-8.0	1.8
17. REC17 EB3	-235.0	-6.0	1.8
18. REC18 EB4	-300.0	-4.0	1.8
19. REC19 EB5	-300.0	18.0	1.8
20. REC20 EB6	-235.0	17.0	1.8
21. REC21 EB7	-125.0	15.0	1.8
22. REC22 SB1	-16.0	16.0	1.8
23. REC23 SB2	-12.0	28.0	1.8
24. REC24 SB3	-1.0	84.0	1.8
25. REC25 SB4	13.0	155.0	1.8
26. REC26 SB5	42.0	300.0	1.8
27. REC27 SB6	73.0	300.0	1.8
28. REC28 SB7	43.0	155.0	1.8
29. REC29 SB8	28.0	84.0	1.8
30. REC30 SB9	17.0	28.0	1.8

... AND 160TH ST. (2010 W/mitigation S- RUN: SR9. 160TH ST.w/mit S-DN

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	16.8	9.1	5.5	5.0	6.7	7.7	12.8	17.6	16.2	16.2	15.8	7.4	8.5	9.4	9.0	7.0	5.9	5.6	5.0	5.0
10.	13.2	6.7	5.1	5.0	6.4	7.2	10.6	15.4	13.3	13.0	13.2	11.3	13.3	13.7	13.6	7.0	5.9	5.7	5.0	5.0
20.	8.0	5.3	5.0	5.0	6.3	7.1	9.3	11.1	9.1	8.2	7.8	12.7	15.4	16.3	17.4	7.1	5.9	5.8	5.0	5.0
30.	5.6	5.0	5.0	5.0	6.2	7.2	9.4	9.5	7.4	6.3	5.8	10.9	14.2	14.9	16.1	7.5	5.9	5.9	5.0	5.0
40.	5.2	5.0	5.0	5.0	6.3	7.5	9.6	9.5	7.2	5.8	5.5	9.9	12.4	13.4	12.6	8.7	6.3	6.0	5.0	5.2
50.	5.2	5.0	5.0	5.0	6.4	7.7	9.5	9.8	6.9	5.8	5.2	9.2	11.1	13.2	10.6	9.5	7.2	6.4	5.2	5.4
60.	5.1	5.0	5.0	5.0	6.4	8.2	9.4	10.0	6.7	5.8	5.1	8.4	10.2	12.5	10.7	9.9	8.1	6.9	5.5	5.9
70.	5.2	5.1	5.1	5.1	5.9	8.8	9.3	9.9	6.6	5.6	5.0	7.8	9.8	12.0	12.4	10.3	9.1	7.8	6.0	6.4
80.	6.6	6.4	6.4	5.5	5.4	8.8	9.1	9.0	6.2	5.1	5.0	7.4	9.1	11.0	13.8	11.5	10.1	9.0	6.8	7.6
90.	9.5	9.0	8.7	6.4	5.1	7.1	7.6	7.1	5.3	5.0	5.0	6.7	8.8	10.0	13.7	11.2	9.7	9.1	9.0	10.0
100.	11.5	10.6	9.7	7.3	5.0	6.5	5.8	5.5	5.0	5.0	5.0	6.3	8.9	9.8	14.2	8.4	7.2	7.0	8.7	10.6
110.	11.7	10.7	9.1	7.5	5.0	5.1	5.2	5.0	5.0	5.0	5.0	6.1	8.9	9.7	15.5	6.9	6.0	5.8	7.6	8.7
120.	11.3	10.6	8.6	7.3	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.1	9.0	9.8	16.0	6.4	5.9	5.8	7.0	7.5
130.	10.9	10.5	8.1	7.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.2	9.1	10.1	16.0	6.3	5.9	5.7	6.8	7.1
140.	10.3	10.3	7.9	6.8	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.2	9.5	10.4	16.1	6.3	5.7	5.4	6.5	6.7
150.	10.2	10.1	7.7	6.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.3	10.0	10.7	16.2	6.3	5.5	5.1	6.0	6.5
160.	9.9	9.7	7.7	6.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.4	10.7	11.1	16.5	6.2	5.1	5.0	5.8	5.9
170.	10.2	9.8	7.6	7.0	5.0	5.0	5.0	5.3	5.3	5.3	5.1	6.2	11.8	11.9	17.2	5.6	5.0	5.0	5.8	5.8
180.	12.1	10.1	7.6	7.3	5.0	5.0	5.3	7.3	7.5	7.2	5.9	5.6	11.6	11.6	17.3	5.1	5.0	5.0	5.6	5.9
190.	16.0	11.8	7.9	7.5	5.0	5.2	6.7	11.9	11.8	10.7	7.4	5.1	9.0	8.8	14.2	5.0	5.0	5.0	5.3	5.8
200.	17.5	13.9	8.8	7.6	5.0	6.0	8.4	14.6	14.4	12.9	8.4	5.0	6.2	5.9	10.8	5.0	5.0	5.0	5.1	5.8
210.	15.3	14.6	9.7	7.9	5.0	6.8	8.9	13.9	13.9	12.3	8.4	5.0	5.3	5.2	9.9	5.0	5.0	5.0	5.1	5.9
220.	12.9	14.9	10.2	8.3	5.2	6.8	9.0	12.8	13.2	11.3	8.0	5.0	5.2	5.1	10.2	5.0	5.0	5.0	5.1	5.9
230.	11.7	14.4	10.6	8.9	5.6	6.9	8.7	12.5	12.4	10.7	7.8	5.0	5.1	5.0	10.8	5.0	5.0	5.0	5.0	6.1
240.	11.7	13.8	11.8	9.5	5.8	7.1	8.6	12.5	11.7	10.1	7.7	5.0	5.1	5.0	11.6	5.0	5.0	5.0	5.0	6.1
250.	12.2	12.7	13.3	10.3	5.9	7.3	9.2	13.8	11.4	9.9	7.6	5.0	5.1	5.0	12.6	5.1	5.1	5.0	5.0	6.2
260.	13.2	11.8	15.6	11.3	7.2	8.5	10.6	15.8	11.0	9.7	7.8	5.0	5.0	5.0	13.3	5.3	5.2	5.0	5.0	6.1
270.	13.2	10.5	11.0	9.7	10.0	10.4	11.7	17.3	11.1	9.6	8.2	5.0	5.0	5.2	12.9	6.3	5.6	5.0	5.0	5.7
280.	12.7	9.7	8.5	6.9	10.6	12.1	10.8	16.1	11.9	9.7	9.0	5.0	5.0	5.6	11.5	7.5	6.1	5.0	5.0	5.2
290.	12.2	9.4	7.6	6.0	9.5	11.9	10.0	12.7	13.1	9.9	9.4	5.0	5.2	6.2	9.8	8.0	6.3	5.0	5.0	5.1
300.	12.3	9.4	7.6	5.6	8.6	11.6	11.0	9.8	14.3	10.3	9.8	5.0	5.5	6.6	8.5	7.8	6.3	5.0	5.0	5.0
310.	12.5	9.5	7.6	5.4	8.1	11.0	12.9	8.3	14.9	10.7	10.2	5.0	5.8	7.2	8.1	7.6	6.2	5.1	5.0	5.0
320.	13.0	9.8	7.8	5.2	7.8	10.5	13.5	8.3	14.9	11.3	10.7	5.0	5.8	7.7	7.8	7.3	6.0	5.1	5.0	5.0
330.	13.8	10.2	7.7	5.0	7.3	10.0	14.0	9.6	14.9	12.5	11.5	5.2	5.8	7.9	7.4	7.1	5.9	5.1	5.0	5.0
340.	14.9	10.6	7.1	5.0	7.0	9.4	14.3	12.2	14.8	13.8	12.7	5.4	6.1	7.9	7.4	7.0	5.9	5.2	5.0	5.0
350.	16.3	10.6	6.3	5.0	7.0	8.7	14.4	15.1	15.2	15.7	14.3	5.6	6.6	7.9	7.4	7.0	5.9	5.4	5.0	5.0
360.	16.8	9.1	5.5	5.0	6.7	7.7	12.8	17.6	16.2	16.2	15.8	7.4	8.5	9.4	9.0	7.0	5.9	5.6	5.0	5.0
MAX	17.5	14.9	13.6	11.3	10.6	12.1	14.4	17.6	16.2	16.2	15.8	12.7	15.4	16.3	17.4	11.5	10.1	9.1	9.0	10.6
DEGR.	200	220	260	260	280	280	350	0	0	0	0	20	20	20	20	80	80	90	90	100

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JO. ...9 AND 160TH ST. (2010 W/mitigation S- RUN: SR9 160TH ST.w/mit S-DN

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30
0.	5.0	6.0	6.3	5.8	5.5	5.0	5.0	10.9	14.8	16.3
10.	5.0	9.7	10.2	8.7	6.9	5.0	5.0	9.4	11.8	12.7
20.	5.0	14.2	15.2	12.5	8.7	5.0	5.0	6.8	7.5	7.8
30.	5.4	15.5	16.6	14.7	9.5	5.0	5.0	5.5	5.7	5.5
40.	6.1	14.5	15.2	14.5	9.1	5.1	5.0	5.2	5.3	5.2
50.	6.8	13.4	14.1	13.8	8.7	5.2	5.0	5.2	5.2	5.2
60.	7.1	12.7	13.1	13.1	8.3	5.5	5.0	5.2	5.2	5.1
70.	7.1	12.3	12.6	12.5	8.1	5.9	5.0	5.1	5.1	5.1
80.	7.9	13.1	12.5	12.2	8.0	6.4	5.0	5.0	5.1	5.3
90.	9.8	15.3	13.8	12.1	7.8	7.1	5.0	5.0	5.1	6.4
100.	11.2	16.0	15.3	12.5	8.1	7.6	5.0	5.0	5.5	7.6
110.	10.9	13.7	15.6	12.9	8.7	7.8	5.0	5.2	5.9	7.8
120.	10.0	10.2	15.6	13.1	9.9	7.8	5.0	5.5	6.0	8.0
130.	9.2	8.2	14.5	13.2	11.1	8.0	5.1	5.7	6.0	8.2
140.	8.8	8.1	13.1	13.0	12.2	8.4	5.2	5.6	6.0	8.3
150.	8.6	9.5	12.2	14.9	13.3	8.8	5.5	5.7	6.1	8.4
160.	8.4	11.7	12.1	15.8	14.8	9.2	5.5	5.7	6.5	8.3
170.	7.6	14.2	13.5	16.7	16.5	10.1	5.7	6.1	6.9	8.4
180.	7.3	14.8	14.4	16.7	17.4	12.0	7.8	8.4	8.9	10.1
190.	7.1	12.2	12.1	12.8	13.9	11.3	12.1	13.9	14.0	14.0
200.	7.0	9.4	8.9	8.0	8.4	7.2	13.7	18.2	17.2	15.4
210.	7.2	8.6	7.8	6.4	5.8	5.5	11.7	17.9	17.4	13.9
220.	7.3	8.5	7.6	5.8	5.5	5.3	10.1	15.6	16.3	13.2
230.	7.6	8.4	7.1	5.8	5.5	5.0	9.2	13.7	15.3	14.1
240.	7.8	7.9	6.8	5.8	5.3	5.0	8.5	11.8	14.3	14.7
250.	8.2	7.7	6.8	5.6	5.0	5.0	8.1	9.9	13.4	14.5
260.	8.3	7.8	6.7	5.3	5.0	5.0	7.7	8.8	12.8	14.0
270.	7.1	6.8	5.8	5.0	5.0	5.0	7.0	8.3	12.4	13.1
280.	5.7	5.6	5.1	5.0	5.0	5.0	6.3	8.4	12.5	12.3
290.	5.1	5.0	5.0	5.0	5.0	5.0	5.5	8.3	12.3	12.2
300.	5.0	5.0	5.0	5.0	5.0	5.0	5.2	8.3	12.3	12.1
310.	5.0	5.0	5.0	5.0	5.0	5.0	5.1	8.5	12.6	12.5
320.	5.0	5.0	5.0	5.0	5.0	5.0	5.1	8.7	13.2	13.0
330.	5.0	5.0	5.0	6.0	5.0	5.0	5.1	9.1	14.0	13.8
340.	5.0	5.0	5.0	5.0	5.0	5.0	5.0	9.7	14.8	14.8
350.	5.0	5.1	5.1	5.1	5.0	5.0	5.0	10.5	15.4	16.2
360.	5.0	6.0	6.3	5.8	5.5	5.0	5.0	10.9	14.8	16.3
MAX	11.2	16.0	16.6	16.7	17.4	12.0	13.7	18.2	17.4	16.3
DEGR.	100	100	30	170	180	180	200	200	210	0

THE HIGHEST CONCENTRATION OF 18.20 PPM OCCURRED AT RECEPTOR REC28.

JO 99 AND 160TH ST. (2010 W/mitigation S- RUN: SR5 160TH ST.w/mit S-DN

DATE : 5/20/96
TIME : 10:38:35

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 200	REC2 220	REC3 260	REC4 260	REC5 280	REC6 280	REC7 350	REC8 0	REC9 0	REC10 0	REC11 0	REC12 20	REC13 20	REC14 20	REC15 20	REC16 80	REC17 80	REC18 90	REC19 90	REC20 100
1	2.0	1.0	.2	.1	.0	.1	.0	.0	.5	1.6	4.0	1.4	1.2	.3	.0	.1	.0	.1	.1	.2
2	2.7	1.2	.2	.2	.0	.1	.0	.0	2.1	3.1	4.0	1.6	.9	.1	.0	.1	.0	.1	.1	.2
3	1.3	.8	.1	.1	.0	.1	.0	.0	.5	1.3	.1	.1	.9	.1	.0	.1	.0	.1	.1	.1
4	1.6	.1	.3	.1	.2	.4	1.4	3.5	1.7	.8	.2	.3	1.0	1.6	1.7	.3	.2	.1	.2	.1
5	.0	.0	.1	.0	.2	.2	1.1	1.9	1.5	.8	.2	.2	.7	1.5	2.5	.2	.2	.1	.1	.0
6	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0
7	.0	.0	.1	.0	.2	.2	.8	1.4	1.2	.6	.2	.1	.5	1.2	2.2	.2	.2	.1	.1	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.3	.1	.4	.4	1.9	3.9	2.5	1.1	.3	.3	1.1	2.3	3.2	.5	.4	.2	.3	.1
10	1.7	.9	.3	.2	.0	.2	.0	.0	.2	.8	1.5	3.1	3.1	1.9	1.0	.1	.0	.1	.1	.2
11	.0	.0	.3	.1	.0	.2	.0	.0	.0	.0	.0	.0	.0	.1	.5	1.1	1.2	1.1	.4	.6
12	.3	.3	.8	.2	.1	.4	.0	.0	.2	.5	.2	.1	.4	1.7	.0	.5	.2	.2	.2	.4
13	.0	.0	.6	.2	.1	.6	.0	.0	.0	.1	.1	.0	.1	.2	.9	1.5	1.5	.7	.7	2.0
14	.5	.6	.4	.8	1.8	1.4	.8	.7	.3	.1	.0	.1	.1	.1	.0	.2	.1	.2	.1	.1
15	.5	1.4	.9	.1	.1	.9	1.2	.4	.1	.1	.0	.1	.1	.0	.0	.2	.1	.1	.1	.1
16	.2	.5	.6	.8	.6	.3	.3	.1	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1
17	.8	1.7	1.9	3.1	1.8	.9	1.1	.4	.1	.1	.0	.2	.2	.0	.0	.6	.3	.4	.4	.3
18	.9	1.4	1.3	.1	.1	.4	.7	.2	.1	.1	.0	.1	.1	.0	.0	.2	.1	.1	.1	.1
19	.0	.0	.2	.1	.0	.3	.0	.0	.1	.1	.0	.0	.0	.1	.3	.4	.5	.3	.6	1.0

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JO 99 AND 160TH ST. (2010 W/mitigation S- RUN: SR. 160TH ST.w/mit S-DN

DATE : 5/20/96
TIME : 10:38:35

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 100	REC22 100	REC23 30	REC24 170	REC25 180	REC26 180	REC27 200	REC28 200	REC29 210	REC30 0
1	.2	.0	.0	.3	.5	.2	.2	.4	.2	.0
2	.2	.0	.0	.5	.7	.3	.3	.5	.2	.0
3	.2	.0	.0	.2	.2	.1	.1	.2	.1	.0
4	.1	1.1	1.8	1.2	1.3	1.6	4.6	4.4	3.9	4.8
5	.1	1.4	3.2	2.6	2.7	2.8	1.7	1.3	1.3	1.8
6	.0	.1	.3	.2	.2	.2	.1	.1	.1	.1
7	.1	1.4	2.7	2.3	2.8	.3	.4	1.2	1.2	1.2
8	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0
9	.2	1.8	3.6	3.0	3.1	.7	.8	3.8	3.8	3.7
10	.2	.0	.0	.2	.4	.2	.2	.5	.4	.0
11	.4	.0	.0	.0	.0	.0	.0	.0	.1	.0
12	.8	.0	.0	.1	.2	.1	.2	.4	.7	.0
13	1.6	.0	.0	.0	.0	.0	.1	.1	.3	.0
14	.3	.7	.0	.2	.1	.1	.0	.0	.0	.0
15	.2	.8	.0	.3	.2	.1	.0	.1	.0	.0
16	.1	.5	.0	.1	.0	.0	.0	.0	.0	.0
17	.5	2.0	.0	.3	.2	.2	.0	.1	.0	.0
18	.1	.9	.0	.2	.1	.1	.0	.0	.0	.0
19	.9	.1	.0	.0	.0	.0	.0	.1	.1	.0

...LINE SOURCE DISPERSION MODEL - VERSION ted 95221

JOB: ..99 AND 160TH ST. (2010 W/mitigationnut RUN: SR99 & 160TH ST.w/mitnutl

DATE : 5/20/96
TIME : 10:38:53

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 626. M AMB = 5.0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. SR99 NB Approach	-41.7	-300.0	-3.1	-8.0	295.	8.	AG	2265.	28.3	.0	12.0		
2. SR99 NB Queue	3.1	-8.0	-92.8	-633.0	632.	189.	AG	703.	100.0	.0	6.0	1.17	105.4
3. SR99 NB Queue Left	-1.4	-7.3	-36.3	-232.5	228.	189.	AG	698.	100.0	.0	3.0	1.27	38.0
4. SR99 NB Depart	4.4	-.7	66.4	300.3	307.	12.	AG	2466.	28.3	.0	12.0		
5. SR99 SB Appr TH L	53.9	303.2	-6.0	11.2	298.	192.	AG	2462.	28.3	.0	12.0		
6. SR99 SB Appr RT	49.8	304.1	-10.6	12.2	298.	192.	AG	122.	28.3	.0	9.0		
7. SR99 SB QueueTH	-6.0	11.2	96.6	511.5	511.	12.	A	685.	100.0	.0	6.0	1.13	85.1
8. SR99 SB QueueRT	-10.6	12.2	-9.7	16.8	5.	12.	AG	102.	100.0	.0	3.0	.09	.8
9. SR99 SB Queue Left	.1	10.1	40.0	201.5	195.	12.	AG	1379.	100.0	.0	6.0	1.19	32.6
10. SR99 SB Depart	-8.6	2.6	-56.4	-296.4	303.	189.	AG	2255.	28.3	.0	15.0		
11. 160 EB Approach	-301.1	2.8	-14.9	-3.5	286.	91.	AG	709.	28.3	.0	12.0		
12. 160 EB QueueT R	-3.5	-14.9	-74.7	-10.7	71.	273.	AG	1326.	100.0	.0	6.0	.94	11.9
13. 160 EB Queue Left	-14.7	-1.5	-256.8	13.2	243.	273.	AG	690.	100.0	.0	3.0	1.26	40.4
14. 160 EB Depart	-2.4	-3.8	299.6	6.6	302.	88.	AG	868.	28.3	.0	12.0		
15. 160 WB Queue Left	10.5	2.0	79.8	4.4	69.	88.	AG	743.	100.0	.0	3.0	1.10	11.6
16. 160 WB Approach	299.6	14.8	10.5	5.0	289.	268.	AG	565.	28.3	.0	9.0		
17. 160 WB Queue TH	10.5	5.0	243.4	14.3	233.	88.	A	721.	100.0	.0	3.0	1.40	38.9
18. 160 WB Queue RT	10.5	8.0	63.6	9.9	53.	88.	A	803.	100.0	.0	3.0	.50	8.9
19. 160 WB Dep.	2.8	5.7	-300.7	11.6	304.	271.	AG	534.	28.3	.0	12.0		

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JOB) AND 160TH ST. (2010 W/mitigationnut RUN: SR9) 60TH ST.w/mitnutl

DATE : 5/20/96
TIME : 10:38:53

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. SR99 NB Queue	180	79	1.0	2040	1600	298.55	1	3
3. SR99 NB Queue Left	180	157	1.0	225	1600	298.55	1	3
7. SR99 SB QueueTH	180	77	1.0	1998	1600	298.55	1	3
8. SR99 SB QueueRT	180	23	1.0	122	1600	298.55	1	3
9. SR99 SB Queue Left	180	155	1.0	464	1600	298.55	1	3
12. 160 EB QueueT R	180	149	1.0	464	1600	298.55	1	3
13. 160 EB Queue Left	180	155	1.0	246	1600	298.55	1	3
15. 160 WB Queue Left	180	167	1.0	97	1600	298.55	1	3
17. 160 WB Queue TH	180	162	1.0	186	1600	298.55	1	3
18. 160 WB Queue RT	180	113	1.0	282	1600	298.55	1	3

RECEPTOR LOCATIONS

RECEPTOR	X	Y	Z
1. REC 1 NB1	14.0	14.0	1.8
2. REC 2 NB2	33.0	14.5	1.8
3. REC 3 NB3	80.0	15.0	1.8
4. REC 4 NB4	299.0	23.0	1.8
5. REC 5 NB5	299.0	.0	1.8
6. REC 6 NB6	80.0	-8.0	1.8
7. REC 7 NB7	33.0	-9.0	1.8
8. REC 8 NB1	9.0	-12.0	1.8
9. REC 9 NB2	4.0	-41.0	1.8
10. REC10 NB3	-4.0	-99.0	1.8
11. REC11 NB4	-35.0	-300.0	1.8
12. REC12 NB5	-66.0	-300.0	1.8
13. REC13 NB6	-33.0	-99.0	1.8
14. REC14 NB7	-25.0	-41.0	1.8
15. REC15 EB1	-19.0	-10.0	1.8
16. REC16 EB2	-125.0	-8.0	1.8
17. REC17 EB3	-235.0	-6.0	1.8
18. REC18 EB4	-300.0	-4.0	1.8
19. REC19 EB5	-300.0	18.0	1.8
20. REC20 EB6	-235.0	17.0	1.8
21. REC21 EB7	-125.0	15.0	1.8
22. REC22 SB1	-16.0	16.0	1.8
23. REC23 SB2	-12.0	28.0	1.8
24. REC24 SB3	-1.0	84.0	1.8
25. REC25 SB4	13.0	155.0	1.8
26. REC26 SB5	42.0	300.0	1.8
27. REC27 SB6	73.0	300.0	1.8
28. REC28 SB7	43.0	155.0	1.8
29. REC29 SB8	28.0	84.0	1.8
30. REC30 SB9	17.0	28.0	1.8

JOB: ... AND 160TH ST. (2010 W/mitigationnut RUN: SR99 ... 160TH ST.w/mitnut1

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPH) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	18.7	10.8	6.2	5.0	5.7	9.1	14.3	19.0	17.1	17.1	17.9	8.1	9.2	9.8	9.6	7.1	6.8	5.7	5.0	5.0
10.	15.2	7.9	5.2	5.0	5.4	7.5	11.5	17.0	14.8	13.9	15.0	13.1	14.6	15.1	15.1	7.0	6.8	5.9	5.0	5.0
20.	9.7	5.5	5.0	5.0	5.2	7.3	9.6	11.9	9.7	8.5	8.5	14.7	17.0	17.9	19.2	7.4	6.8	5.9	5.0	5.0
30.	5.7	5.0	5.0	5.0	5.1	7.2	9.4	9.4	7.6	6.4	5.8	12.0	15.1	15.9	17.0	8.6	7.1	6.1	5.0	5.1
40.	5.3	5.0	5.0	5.0	5.1	7.5	9.6	9.5	7.4	6.0	5.5	10.5	13.6	14.1	13.2	9.5	7.6	6.3	5.2	5.5
50.	5.2	5.0	5.0	5.0	5.1	7.7	10.0	9.8	7.1	5.9	5.1	9.5	12.7	13.8	11.3	10.0	8.4	7.1	5.5	5.9
60.	5.2	5.0	5.0	5.0	5.1	8.2	10.3	10.1	6.9	5.7	5.1	8.7	11.7	13.1	11.3	10.1	8.9	7.8	6.0	6.3
70.	5.2	5.1	5.1	5.0	5.0	8.6	10.3	10.3	6.6	5.5	5.1	8.2	11.0	12.5	13.2	10.8	9.5	8.8	6.4	6.7
80.	6.5	6.4	6.2	5.0	5.0	8.4	9.6	9.3	5.9	5.0	5.0	7.5	10.4	11.3	14.2	12.2	10.3	9.0	7.4	7.6
90.	9.6	9.0	8.3	5.0	5.0	6.9	7.5	7.1	5.2	5.0	5.0	6.8	10.3	10.3	14.2	11.9	9.8	9.6	9.8	10.6
100.	12.0	11.2	9.4	5.0	5.0	5.5	5.7	5.4	5.0	5.0	5.0	6.2	10.5	10.1	14.7	9.1	7.4	7.1	9.9	12.1
110.	12.1	11.7	9.0	5.0	5.0	5.1	5.2	5.0	5.0	5.0	5.0	6.1	10.2	10.1	15.9	7.2	6.3	6.0	8.2	11.2
120.	11.4	11.4	8.5	5.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.0	10.4	10.3	16.4	6.7	6.1	6.1	7.5	10.0
130.	10.9	10.8	8.1	5.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.1	10.6	10.5	16.5	6.7	6.1	5.7	7.1	9.5
140.	10.5	10.4	7.8	5.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.1	11.1	11.0	16.6	6.8	6.0	5.5	6.7	9.3
150.	10.2	10.2	7.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.2	11.7	11.5	16.9	6.8	5.6	5.3	6.3	8.5
160.	9.9	9.7	7.7	5.1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.4	12.6	12.4	17.4	6.6	5.3	5.2	6.1	8.1
170.	10.1	9.7	7.9	5.3	5.0	5.0	5.0	5.3	5.3	5.3	5.2	6.6	13.9	13.8	18.7	5.8	5.1	5.0	5.8	7.8
180.	12.5	10.3	8.1	5.6	5.0	5.0	5.3	7.8	8.1	7.6	6.2	6.5	13.8	13.8	19.3	5.2	5.0	5.0	5.6	7.6
190.	17.3	12.4	9.0	5.8	5.0	5.4	7.2	13.3	13.5	12.4	8.1	5.7	10.2	10.1	15.6	5.0	5.0	5.0	5.4	7.7
200.	18.8	15.0	10.6	5.9	5.0	6.3	9.4	15.8	16.2	15.2	8.8	5.1	6.6	6.3	11.1	5.0	5.0	5.0	8.2	7.8
210.	16.0	15.3	11.7	6.3	5.1	7.3	9.7	14.6	15.1	14.6	8.3	5.0	5.4	5.2	9.9	5.0	5.0	5.0	5.1	7.8
220.	13.5	15.1	12.2	6.5	5.4	7.6	9.4	13.3	13.6	13.3	7.9	5.0	5.2	5.1	10.3	5.0	5.0	5.0	5.1	8.0
230.	12.2	14.7	12.4	7.0	5.8	7.3	9.0	12.8	12.7	12.4	7.7	5.0	5.2	5.1	10.8	5.0	5.0	5.0	5.1	8.2
240.	12.4	14.2	13.2	7.5	6.0	7.4	8.9	12.7	12.1	11.8	7.8	5.0	5.1	5.0	11.7	5.0	5.0	5.0	5.0	8.5
250.	13.2	13.5	14.4	8.1	6.2	7.2	9.4	14.2	11.7	11.6	7.5	5.0	5.1	5.0	12.8	5.1	5.1	5.0	5.0	8.4
260.	14.1	12.5	14.3	9.5	7.5	8.8	11.1	16.7	11.4	11.2	7.7	5.0	5.0	5.0	14.2	5.4	5.2	5.0	5.0	7.8
270.	14.0	11.2	11.4	9.2	10.0	11.3	12.5	18.4	11.4	11.1	8.3	5.0	5.0	5.2	14.2	6.6	5.7	5.0	5.0	6.5
280.	13.2	9.9	8.6	6.8	10.2	12.6	11.3	17.0	12.7	11.1	9.2	5.0	5.0	5.9	12.5	8.0	6.2	5.0	5.0	5.5
290.	12.6	9.6	7.7	6.3	8.7	13.0	10.3	13.0	13.9	11.5	9.8	5.0	5.3	6.8	10.1	8.4	6.5	5.0	5.0	5.1
300.	12.6	9.6	7.7	6.1	7.8	12.7	11.1	9.6	15.0	11.9	10.1	5.0	5.6	7.5	8.6	8.0	6.5	5.0	5.0	5.0
310.	13.0	9.8	7.9	5.8	7.4	12.4	12.9	8.5	15.3	12.6	10.5	5.0	5.8	8.0	8.2	7.6	6.7	5.1	5.0	5.0
320.	13.4	10.0	7.9	5.5	6.9	11.9	13.8	8.4	15.4	13.3	11.2	5.0	5.9	8.1	8.0	7.5	6.9	5.1	5.0	5.0
330.	14.2	10.4	8.2	5.2	6.5	11.7	14.3	9.8	15.2	14.2	12.1	5.2	6.2	8.1	7.7	7.3	6.9	5.1	5.0	5.0
340.	15.4	11.0	8.2	5.1	6.1	11.3	14.4	12.5	15.2	15.1	13.3	5.4	6.6	8.0	7.4	7.0	6.8	5.2	5.0	5.0
350.	17.2	11.5	7.6	5.0	6.0	10.7	15.2	15.7	15.7	16.2	18.6	5.7	7.0	8.0	7.6	7.0	6.8	5.4	5.0	5.0
360.	18.7	10.8	6.2	5.0	5.7	9.1	14.3	19.0	17.1	17.1	17.9	8.1	9.2	9.8	9.6	7.1	6.8	5.7	5.0	5.0
MAX	18.8	15.3	14.4	9.5	10.2	13.0	15.2	19.0	17.1	17.1	17.9	14.7	17.0	17.9	19.3	12.2	10.3	9.8	9.9	12.1
DEGR.	200	210	250	260	280	290	350	0	0	0	0	20	20	20	180	80	80	80	100	100

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JOB: ... AND 160TH ST. (2010 W/mitigationnut RUN: SR99 ... 60TH ST.w/mitnut1

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPH) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30
0.	5.0	6.4	6.8	6.4	5.9	5.3	6.6	15.2	18.1	18.5
10.	5.0	11.2	11.9	10.7	9.0	6.3	5.9	11.7	14.5	14.9
20.	5.3	16.0	17.1	15.7	12.8	7.4	5.2	7.5	8.7	8.8
30.	6.1	16.5	17.5	16.7	14.5	7.4	5.0	5.6	5.8	5.7
40.	6.9	15.0	15.7	15.4	14.5	7.2	5.0	5.3	5.3	5.2
50.	7.4	13.9	14.5	14.2	13.7	7.1	5.0	5.2	5.2	5.2
60.	7.3	13.1	13.6	13.4	13.2	7.3	5.0	5.2	5.2	5.2
70.	7.3	12.7	13.0	12.8	12.6	7.6	5.0	5.1	5.1	5.1
80.	8.0	13.5	12.9	12.4	12.3	8.1	5.0	5.0	5.1	5.3
90.	10.1	15.9	13.9	12.4	12.3	9.8	5.0	5.0	5.0	6.1
100.	11.8	16.5	15.5	12.9	12.1	9.4	5.0	5.0	5.3	7.6
110.	11.8	14.1	16.3	13.1	12.3	9.6	5.0	5.0	5.7	8.2
120.	10.7	10.6	16.0	13.2	12.6	9.7	5.0	5.3	5.9	8.5
130.	9.7	8.2	14.9	13.8	13.0	9.9	5.0	5.6	6.0	8.5
140.	9.4	8.3	13.5	14.3	13.5	10.3	5.0	5.6	6.1	8.3
150.	9.3	9.7	12.5	15.3	14.4	11.0	5.4	5.7	6.4	8.4
160.	9.9	12.1	12.4	16.3	15.6	11.9	5.5	5.8	6.6	8.4
170.	8.2	15.1	14.4	17.5	17.3	13.2	5.8	6.2	7.0	8.4
180.	7.4	16.4	16.0	17.7	18.1	15.9	8.2	9.0	9.5	10.6
190.	7.2	13.5	13.3	13.7	14.8	14.3	14.1	15.0	15.0	15.2
200.	7.2	9.6	9.3	8.5	8.6	8.6	16.8	19.4	18.3	16.8
210.	7.3	8.6	7.9	6.6	6.0	5.7	14.6	19.0	18.3	14.6
220.	7.5	8.7	7.9	6.1	5.6	5.4	12.3	16.7	17.3	13.9
230.	7.6	8.9	7.8	6.0	5.5	5.1	11.1	15.2	16.1	14.6
240.	8.0	8.9	7.5	5.9	5.4	5.0	10.2	14.4	14.9	15.5
250.	8.4	8.5	7.1	5.7	5.1	5.0	9.7	13.1	14.1	15.2
260.	8.6	8.2	6.8	5.4	5.0	5.0	9.1	12.7	13.2	14.6
270.	7.7	7.1	6.0	5.0	5.0	5.0	8.4	12.7	12.7	13.6
280.	6.0	5.6	5.2	5.0	5.0	5.0	7.5	12.8	12.8	12.9
290.	5.2	5.0	5.0	5.0	5.0	5.0	6.7	12.7	12.8	12.6
300.	5.0	5.0	5.0	5.0	5.0	5.0	6.3	12.7	12.8	12.6
310.	5.0	5.0	5.0	5.0	5.0	5.0	6.3	12.9	13.1	12.8
320.	5.0	5.0	5.0	5.0	5.0	5.0	6.3	13.5	13.6	13.4
330.	5.0	5.0	5.0	5.0	5.0	5.0	6.4	14.3	14.5	14.2
340.	5.0	5.0	5.0	5.0	5.0	5.0	6.5	15.3	15.6	15.4
350.	5.0	5.1	5.2	5.1	5.1	5.0	6.6	15.9	17.3	17.1
360.	5.0	6.4	6.8	6.4	5.9	5.3	6.8	15.2	18.1	18.5
MAX	11.8	16.5	17.5	17.7	18.1	15.9	16.8	19.4	18.3	18.5
DEGR.	100	30	30	180	180	180	200	200	200	0

THE HIGHEST CONCENTRATION OF 19.40 PPH OCCURRED AT RECEPTOR REC28.

DATE : 5/20/96
TIME : 10:38:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 200	REC2 210	REC3 250	REC4 260	REC5 280	REC6 290	REC7 350	REC8 0	REC9 0	REC10 0	REC11 0	REC12 20	REC13 20	REC14 20	REC15 180	REC16 80	REC17 80	REC18 80	REC19 100	REC20 100
1	2.3	1.3	.4	.2	.0	.0	.0	.0	.6	1.9	4.7	1.7	1.3	.3	2.2	.1	.0	.0	.2	.2
2	2.6	1.5	.3	.2	.0	.0	.0	.0	1.9	2.8	3.7	1.5	.8	.0	1.9	.1	.0	.0	.2	.2
3	1.9	1.1	.3	.1	.0	.0	.0	.0	.5	1.3	1.0	1.0	1.0	.1	1.4	.1	.0	.0	.2	.2
4	1.8	.0	.1	.1	.2	.6	1.6	3.8	1.9	.9	.2	.3	1.1	1.8	.0	.4	.3	.2	.1	.1
5	.0	.0	.0	.0	.2	.4	1.2	2.2	1.7	1.0	.3	.2	.8	1.7	.0	.3	.2	.2	.0	.1
6	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.2	.4	1.1	1.9	1.6	.9	.3	.3	.8	1.6	.0	.2	.2	.2	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.1	.1	.4	.8	2.1	4.2	2.7	1.3	.4	.3	1.3	2.7	.0	.5	.4	.4	.1	.1
10	2.0	1.2	.5	.2	.0	.0	.0	.0	.2	.9	1.8	3.8	3.8	2.3	4.3	.1	.1	.0	.2	.2
11	.0	.0	.1	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.1	.0	1.3	1.3	1.4	.7	.6
12	.3	.1	.8	.2	.1	.1	.0	.0	.2	.5	.3	.1	.4	1.7	4.5	.9	.2	.1	.3	.5
13	.0	.0	.2	.2	.1	.2	.0	.0	.0	.1	.1	.0	.1	.2	.0	1.5	1.5	1.3	1.4	3.2
14	.5	.5	.7	.8	1.8	1.3	.8	.7	.3	.1	.0	.1	.1	.1	.0	.2	.1	.1	.1	.1
15	.5	1.3	1.8	.1	.1	1.6	1.2	.4	.1	.1	.0	.1	.1	.0	.0	.2	.1	.1	.1	.1
16	.2	.5	.7	.8	.6	.4	.3	.1	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.0	.1
17	.8	1.5	2.4	1.2	1.2	1.3	1.1	.4	.1	.1	.0	.2	.2	.0	.0	.5	.2	.2	.2	.2
18	.9	1.3	.9	.1	.1	.7	.7	.2	.1	.1	.0	.1	.1	.0	.0	.2	.1	.0	.0	.1
19	.0	.0	.1	.1	.1	.1	.0	.0	.1	.1	.0	.0	.1	.2	.0	.4	.5	.5	1.1	1.1

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DATE : 5/20/96
TIME : 10:38:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 100	REC22 30	REC23 30	REC24 180	REC25 180	REC26 180	REC27 200	REC28 200	REC29 200	REC30 0
1	.2	.0	.0	1.1	.5	.2	.2	.5	.9	.0
2	.2	.0	.0	1.3	.7	.3	.3	.5	.9	.0
3	.2	.0	.0	.8	.4	.2	.2	.4	.7	.0
4	.2	1.9	2.0	.8	1.4	1.8	5.1	4.9	4.5	5.1
5	.1	3.2	3.6	2.6	3.1	3.3	2.0	1.5	.8	2.1
6	.0	.2	.2	.2	.2	.2	.1	.1	.0	.1
7	.1	2.5	2.8	1.9	2.4	2.6	1.6	1.2	.6	1.9
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.2	3.7	3.9	2.0	3.1	1.5	1.5	3.8	2.6	4.3
10	.3	.0	.0	1.0	.5	.2	.3	.6	1.2	.0
11	.4	.0	.0	.0	.0	.0	.0	.1	.0	.0
12	1.1	.0	.0	.4	.2	.1	.2	.4	.5	.0
13	1.6	.0	.0	.1	.0	.0	.1	.1	.1	.0
14	.3	.0	.0	.1	.1	.1	.0	.0	.1	.0
15	.3	.0	.0	.1	.2	.1	.0	.1	.1	.0
16	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	.4	.0	.0	.1	.2	.2	.0	.1	.1	.0
18	.1	.0	.0	.1	.1	.1	.0	.0	.1	.0
19	1.0	.0	.0	.1	.0	.0	.0	.1	.1	.0

JOB: SR99 AND 160TH ST. (2010 W/mitigationnut RUN: SR99 & 160TH ST.w/mitnut2

DATE : 5/20/96
TIME : 10:39:13

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 626. M AMB = 5.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. SR99 NB Approach	-41.7	-300.0	-3.1	-8.0	295.	8.	AG	2397.	28.3	.0	12.0		
2. SR99 NB Queue	3.1	-8.0	-110.0	-745.2	746.	189.	AG	685.	100.0	.0	6.0	1.21	124.3
3. SR99 NB Queue Left	-1.4	-7.3	-41.1	-263.6	259.	189.	AG	690.	100.0	.0	3.0	1.29	43.2
4. SR99 NB Depart	4.4	-.7	66.4	300.3	307.	12.	AG	2578.	28.3	.0	12.0		
5. SR99 SB Appr TH L	53.9	303.2	-6.0	11.2	298.	192.	AG	2552.	28.3	.0	12.0		
6. SR99 SB Appr RT	49.8	304.1	-10.6	12.2	298.	192.	AG	132.	28.3	.0	9.0		
7. SR99 SB QueueTH	-6.0	11.2	136.4	705.4	709.	12.	A	703.	100.0	.0	6.0	1.20	118.1
8. SR99 SB QueueRT	-10.6	12.2	-9.5	17.6	5.	12.	AG	111.	100.0	.0	3.0	.10	.9
9. SR99 SB Queue Left	.1	10.1	51.4	256.3	251.	12.	AG	1397.	100.0	.0	6.0	1.31	41.8
10. SR99 SB Depart	-8.6	2.6	-56.4	-296.4	303.	189.	AG	2378.	28.3	.0	15.0		
11. 160 EB Approach	-301.1	2.8	-14.9	-3.5	286.	91.	AG	763.	28.3	.0	12.0		
12. 160 EB QueueT R	-3.5	-14.9	-108.2	-8.7	105.	273.	AG	1326.	100.0	.0	6.0	1.02	17.5
13. 160 EB Queue Left	-14.7	-1.5	-290.4	15.3	276.	273.	AG	690.	100.0	.0	3.0	1.31	46.0
14. 160 EB Depart	-2.4	-3.8	299.6	6.6	302.	88.	AG	883.	28.3	.0	12.0		
15. 160 WB Queue Left	10.5	2.0	132.8	6.3	122.	88.	AG	752.	100.0	.0	3.0	1.37	20.4
16. 160 WB Approach	299.6	14.8	10.5	5.0	289.	268.	AG	571.	28.3	.0	9.0		
17. 160 WB Queue TH	10.5	5.0	263.8	15.1	253.	88.	A	721.	100.0	.0	3.0	1.44	42.2
18. 160 WB Queue RT	10.5	8.0	63.6	9.9	53.	88.	A	503.	100.0	.0	3.0	.50	8.9
19. 160 WB Dep.	2.8	5.7	-300.7	11.6	304.	271.	AG	576.	28.3	.0	12.0		

JOB: AND 160TH ST. (2010 W/mitigationnut RUN: SR99 & 160TH ST.w/mitnut2

DATE : 5/20/96
TIME : 10:39:13

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. SR99 NB Queue	180	77	1.0	2146	1600	298.55	1	3
3. SR99 NB Queue Left	180	155	1.0	251	1600	298.55	1	3
7. SR99 SB QueueTH	180	79	1.0	2088	1600	298.55	1	3
8. SR99 SB QueueRT	180	25	1.0	132	1600	298.55	1	3
9. SR99 SB Queue Left	180	157	1.0	464	1600	298.55	1	3
12. 160 EB QueueT R	180	149	1.0	508	1600	298.55	1	3
13. 160 EB Queue Left	180	155	1.0	256	1600	298.55	1	3
15. 160 WB Queue Left	180	169	1.0	97	1600	298.55	1	3
17. 160 WB Queue TH	180	162	1.0	192	1600	298.55	1	3
18. 160 WB Queue RT	180	113	1.0	282	1600	298.55	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. REC 1 NB1	14.0	14.0	1.8
2. REC 2 NB2	33.0	14.5	1.8
3. REC 3 NB3	80.0	15.0	1.8
4. REC 4 NB4	299.0	23.0	1.8
5. REC 5 NB5	299.0	.0	1.8
6. REC 6 NB6	80.0	-8.0	1.8
7. REC 7 NB7	33.0	-9.0	1.8
8. REC 8 NB1	9.0	-12.0	1.8
9. REC 9 NB2	4.0	-41.0	1.8
10. REC10 NB3	-4.0	-99.0	1.8
11. REC11 NB4	-35.0	-300.0	1.8
12. REC12 NB5	-66.0	-300.0	1.8
13. REC13 NB6	-33.0	-99.0	1.8
14. REC14 NB7	-25.0	-41.0	1.8
15. REC15 EB1	-19.0	-10.0	1.8
16. REC16 EB2	-125.0	-8.0	1.8
17. REC17 EB3	-235.0	-6.0	1.8
18. REC18 EB4	-300.0	-4.0	1.8
19. REC19 EB5	-300.0	18.0	1.8
20. REC20 EB6	-235.0	17.0	1.8
21. REC21 EB7	-125.0	15.0	1.8
22. REC22 SB1	-16.0	16.0	1.8
23. REC23 SB2	-12.0	28.0	1.8
24. REC24 SB3	-1.0	84.0	1.8
25. REC25 SB4	13.0	155.0	1.8
26. REC26 SB5	42.0	300.0	1.8
27. REC27 SB6	73.0	300.0	1.8
28. REC28 SB7	43.0	155.0	1.8
29. REC29 SB8	28.0	84.0	1.8
30. REC30 SB9	17.0	28.0	1.8

JOB: . AND 160TH ST. (2010 W/mitigationnut RUN: SR99 . 160TH ST.w/mitnut2

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	19.5	11.6	6.8	5.0	5.7	10.1	15.1	19.7	17.6	17.7	18.9	8.5	9.3	10.2	9.8	7.2	7.0	5.7	5.0	5.0
10.	16.2	8.4	5.4	5.0	5.4	8.6	11.9	17.8	15.6	14.5	15.6	13.7	15.2	15.7	16.0	7.3	7.0	6.0	5.0	5.0
20.	9.2	5.7	5.0	5.0	5.2	8.5	9.8	12.2	10.0	8.7	8.8	15.6	17.6	18.6	20.0	7.9	7.1	6.3	5.0	5.1
30.	5.7	5.0	5.0	5.0	5.1	8.6	9.5	9.4	7.6	6.5	6.0	13.0	15.4	16.1	17.6	8.9	7.4	6.8	5.1	5.3
40.	5.3	5.0	5.0	5.0	5.1	8.9	9.8	9.6	7.4	6.2	5.6	11.0	13.9	14.2	13.6	9.9	8.0	7.3	5.3	5.7
50.	5.2	5.0	5.0	5.0	5.1	9.3	10.1	10.0	7.3	6.1	5.3	9.8	13.0	14.1	11.5	10.2	8.7	8.2	5.6	6.2
60.	5.2	5.0	5.0	5.0	5.1	9.8	10.5	10.2	7.3	5.8	5.1	8.8	12.1	13.6	11.5	10.6	9.4	9.0	6.4	6.5
70.	5.2	5.1	5.1	5.0	5.0	10.1	10.9	10.8	7.0	5.5	5.1	8.1	11.3	13.2	13.5	11.7	9.7	9.6	6.7	6.7
80.	6.8	6.6	6.5	5.0	5.0	9.3	10.4	9.9	6.2	5.0	5.0	7.5	10.7	11.6	14.9	14.6	10.8	10.3	8.2	7.7
90.	10.2	9.6	8.9	5.0	5.0	7.1	8.1	7.4	5.2	5.0	5.0	6.8	10.4	10.5	14.8	15.4	10.3	10.2	11.9	11.1
100.	12.5	12.0	10.7	5.0	5.0	5.5	5.8	5.5	5.0	5.0	5.0	6.2	10.6	10.3	15.0	12.1	7.8	7.5	12.4	12.8
110.	12.3	12.2	10.8	5.0	5.0	5.1	5.2	5.0	5.0	5.0	5.0	6.1	10.3	10.2	16.0	8.7	6.3	6.2	10.2	11.5
120.	11.5	11.5	10.2	5.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.0	10.6	10.3	16.6	7.2	6.1	6.1	8.3	10.3
130.	10.9	10.8	9.8	5.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.0	10.8	10.7	16.7	6.9	6.1	5.9	7.5	9.7
140.	10.6	10.4	9.3	5.0	5.0	5.0	5.1	5.0	5.0	5.0	5.0	6.1	11.3	11.1	16.8	6.8	6.1	5.7	7.0	9.3
150.	10.3	10.2	9.1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.2	11.9	11.6	17.1	7.0	6.7	5.3	6.4	8.8
160.	9.9	9.7	8.9	5.1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	6.3	12.8	12.7	17.4	8.7	5.3	5.2	6.2	8.1
170.	10.2	9.8	8.9	5.4	5.0	5.0	5.0	5.3	5.3	5.3	5.2	6.6	14.3	14.0	19.0	8.0	5.2	5.1	5.9	8.0
180.	12.6	10.4	8.8	5.6	5.0	5.0	5.3	8.0	6.3	7.8	6.3	6.6	14.2	14.1	19.8	5.3	5.0	5.0	5.7	7.7
190.	17.5	12.6	9.4	5.8	5.0	5.4	7.5	13.5	13.8	12.6	8.2	5.8	10.5	10.3	15.9	5.1	5.0	5.0	5.4	7.8
200.	19.0	15.1	10.9	5.9	5.0	6.5	9.6	16.0	16.4	15.4	8.7	5.1	6.7	6.4	11.2	5.0	5.0	5.0	5.2	7.6
210.	18.2	15.5	11.8	6.3	5.2	7.6	9.8	14.8	15.3	14.7	8.2	5.0	5.4	5.2	10.0	5.0	5.0	5.0	5.1	7.6
220.	13.7	15.3	12.2	6.5	5.4	7.6	9.5	13.4	13.6	13.4	7.9	5.0	5.2	5.1	10.3	5.0	5.0	5.0	5.1	8.0
230.	12.6	14.9	12.6	7.1	5.9	7.5	9.0	12.9	12.9	12.5	7.7	5.0	5.2	5.1	10.9	5.0	5.0	5.0	5.1	8.4
240.	12.7	14.3	13.2	7.7	6.2	7.4	8.9	12.9	12.2	11.9	7.5	5.0	5.1	5.0	11.7	5.0	5.0	5.0	5.0	8.8
250.	13.8	13.8	14.8	8.8	6.2	7.5	9.5	14.4	11.9	11.5	7.5	5.0	5.1	5.0	13.0	5.1	5.1	5.0	5.0	9.1
260.	14.9	13.2	14.7	10.3	7.7	9.0	11.7	17.0	11.5	11.2	7.7	5.0	5.0	5.0	15.0	5.5	5.2	5.0	5.0	8.9
270.	14.5	11.5	11.8	9.8	10.4	11.7	13.2	19.2	11.8	11.3	8.3	5.0	5.0	5.2	15.4	6.8	5.7	5.0	5.0	7.6
280.	13.5	10.2	8.8	7.2	10.9	13.0	11.9	17.5	13.4	11.3	9.3	5.0	5.0	5.4	13.9	8.3	6.4	5.0	5.0	6.1
290.	12.7	9.8	7.8	6.4	9.2	13.2	10.3	13.4	14.8	11.6	9.8	5.0	5.4	7.8	10.5	8.6	7.3	5.0	5.0	5.2
300.	12.8	9.7	7.8	6.3	8.4	12.8	11.3	10.1	15.5	12.2	10.3	5.0	5.7	8.5	8.9	8.2	7.5	5.1	5.0	5.0
310.	13.1	9.9	7.9	6.1	7.7	12.5	13.0	8.6	15.5	13.1	10.8	5.0	6.1	8.4	8.2	7.7	7.4	5.1	5.0	5.0
320.	13.7	10.2	8.0	5.7	7.2	11.9	13.9	8.6	15.8	13.7	11.4	5.1	6.9	8.3	8.0	7.8	7.3	5.1	5.0	5.0
330.	14.6	10.6	8.3	5.3	6.6	11.9	14.5	10.2	15.4	14.5	12.4	5.4	6.7	8.2	7.7	7.3	7.1	5.1	5.0	5.0
340.	15.8	11.2	8.4	5.3	6.3	11.6	14.9	12.7	15.3	15.3	13.9	5.4	6.8	8.0	7.6	7.2	7.1	5.2	5.0	5.0
350.	17.6	12.0	8.1	5.1	6.1	11.4	15.5	16.1	15.8	16.6	16.5	5.8	7.0	8.1	7.8	7.2	7.0	5.4	5.0	5.0
360.	19.5	11.6	6.8	5.0	5.7	10.1	15.1	19.7	17.6	17.7	18.9	8.5	9.3	10.2	9.8	7.2	7.0	5.7	5.0	5.0
MAX	19.5	15.5	14.8	10.3	10.9	13.2	15.5	19.7	17.6	17.7	18.9	15.6	17.6	18.6	20.0	15.4	10.8	10.3	12.4	12.8
DEGR.	0	210	250	260	280	290	350	0	0	0	0	20	20	20	20	90	80	80	100	100

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JOB: AND 160TH ST. (2010 W/mitigationnut RUN: SR99 . .TH ST.w/mitnut2

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30
0.	5.0	6.5	6.8	6.6	6.1	5.4	6.9	17.5	19.2	19.3
10.	8.1	11.8	12.7	11.6	10.0	6.8	6.3	13.5	15.6	15.9
20.	5.5	16.9	17.8	16.7	14.6	7.7	5.4	8.1	9.2	9.0
30.	6.6	16.9	18.2	17.5	16.2	7.6	5.0	5.6	5.9	5.7
40.	7.3	15.3	16.0	15.7	15.3	7.3	5.0	5.3	5.3	5.2
50.	7.3	14.2	14.7	14.5	14.3	7.1	5.0	5.2	5.3	5.2
60.	7.4	13.5	13.9	13.7	13.5	7.3	5.0	5.2	5.2	5.2
70.	7.3	12.9	13.2	13.0	12.9	7.6	5.0	5.1	5.2	5.1
80.	8.2	13.7	13.1	12.7	12.5	8.2	5.0	5.0	5.1	5.3
90.	10.4	16.3	14.5	12.7	12.3	9.0	5.0	5.0	5.0	6.5
100.	12.2	17.4	16.1	12.9	12.4	9.5	5.0	5.0	5.4	8.1
110.	12.8	14.4	16.6	13.5	12.4	9.8	5.0	5.0	5.7	8.7
120.	12.4	10.7	16.2	13.9	12.8	9.9	5.0	5.4	6.1	8.8
130.	11.8	6.8	15.2	14.4	13.2	10.1	5.0	5.6	6.3	8.5
140.	10.9	8.3	13.7	14.9	14.0	10.6	5.1	5.9	6.5	8.3
150.	10.2	9.8	12.8	15.9	14.8	11.4	5.5	5.9	6.6	8.4
160.	9.2	12.3	12.8	16.6	15.9	12.9	6.5	6.0	6.6	8.4
170.	8.4	15.4	14.7	17.6	17.5	15.3	5.9	6.4	7.0	8.4
180.	7.6	17.0	16.2	18.0	18.7	18.1	8.8	9.0	9.5	10.7
190.	7.3	14.0	13.6	14.0	14.9	15.4	15.4	15.4	15.4	15.5
200.	7.2	9.6	9.5	6.8	8.8	8.8	19.0	19.8	18.6	17.2
210.	7.3	8.7	7.9	6.8	6.2	5.7	16.3	19.5	19.0	15.0
220.	7.5	8.8	8.0	6.6	5.7	5.4	13.1	17.2	17.9	14.1
230.	7.8	9.1	8.2	6.4	5.5	5.1	11.4	15.6	16.7	15.0
240.	8.1	9.5	8.1	6.0	5.5	5.0	10.4	14.6	15.4	16.1
250.	8.6	9.5	7.9	5.9	5.1	5.0	9.9	13.6	14.4	16.0
260.	8.9	8.8	7.2	5.4	5.0	5.0	9.4	13.0	13.5	15.2
270.	7.9	7.4	6.1	5.0	5.0	5.0	8.5	12.9	13.1	13.9
280.	6.1	5.7	5.2	5.0	5.0	5.0	7.6	13.0	13.2	13.1
290.	5.2	5.0	5.0	5.0	5.0	5.0	6.7	12.8	13.1	12.7
300.	5.0	5.0	5.0	5.0	5.0	5.0	6.3	12.9	12.9	12.8
310.	5.0	5.0	5.0	5.0	5.0	5.0	6.3	13.1	13.3	13.1
320.	5.0	5.0	5.0	5.0	5.0	5.0	6.4	13.7	13.8	13.7
330.	5.0	5.0	5.0	5.0	5.0	5.0	6.5	14.6	14.8	14.6
340.	5.0	5.0	5.0	5.0	5.0	5.0	6.5	15.8	16.0	15.8
350.	5.0	5.1	5.2	5.2	5.1	5.0	6.7	17.2	17.9	17.6
360.	5.0	6.5	6.8	6.6	6.1	5.4	6.9	17.5	19.2	19.3
MAX	12.8	17.4	18.2	18.0	18.7	18.1	19.0	19.8	19.2	19.3
DEGR.	110	100	30	180	180	180	200	200	0	0

THE HIGHEST CONCENTRATION OF 20.00 PPM OCCURRED AT RECEPTOR REC15.

DATE : 5/20/96
TIME : 10:39:13

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	0	210	250	260	280	290	350	0	0	0	0	20	20	20	20	90	80	80	100	100
1	.0	1.4	.4	.2	.0	.0	.0	.0	.6	2.0	4.9	1.8	1.4	.3	.0	.2	.0	.0	.2	.2
2	.0	1.4	.3	.2	.0	.0	.0	.0	1.9	2.8	3.6	1.5	.6	.0	.0	.2	.0	.0	.2	.2
3	.0	1.1	.3	.1	.0	.0	.0	.0	.5	1.3	1.6	1.4	.9	.1	.0	.2	.0	.0	.1	.2
4	5.4	.0	.2	.1	.3	.6	1.6	4.0	2.0	.9	.3	.3	1.1	1.9	2.0	.2	.3	.2	.1	.1
5	2.2	.0	.0	.0	.2	.4	1.3	2.2	1.8	1.0	.3	.2	.8	1.8	3.0	.1	.2	.2	.0	.1
6	.1	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0
7	2.1	.0	.0	.0	.2	.4	1.1	2.1	1.7	1.0	.4	.3	.9	1.7	2.9	.1	.2	.2	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	4.7	.0	.1	.1	.4	.8	2.3	4.5	2.9	1.5	.4	.4	1.5	3.0	4.0	.2	.4	.4	.1	.1
10	.0	1.3	.5	.2	.0	.1	.0	.0	.2	1.0	1.9	4.0	4.0	2.4	1.2	.3	.1	.0	.2	.2
11	.0	.0	.1	.1	.1	.1	.0	.0	.0	.0	.1	.0	.0	.1	.5	1.0	1.4	1.5	.8	.7
12	.0	.1	1.0	.3	.1	.1	.0	.0	.2	.5	.3	.1	.4	1.7	.0	5.1	.4	.2	.5	.9
13	.0	.0	.2	.2	.2	.2	.0	.0	.0	.1	.1	.0	.1	.2	.9	.9	1.5	1.6	3.6	3.2
14	.0	.6	.7	.8	1.8	1.3	.8	.7	.3	.1	.0	.1	.1	.1	.0	.4	.1	.1	.1	.1
15	.0	1.3	1.8	.3	.2	1.7	1.2	.4	.1	.1	.0	.2	.2	.0	.0	.4	.2	.1	.1	.2
16	.0	.5	.8	.8	.6	.4	.3	.1	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.0	.1
17	.0	1.5	2.4	1.7	1.6	1.3	1.1	.4	.1	.1	.0	.2	.2	.0	.0	.6	.3	.2	.2	.2
18	.0	1.3	.9	.1	.1	.7	.7	.2	.1	.1	.0	.1	.1	.0	.0	.1	.1	.0	.0	.1
19	.0	.0	.1	.1	.1	.1	.0	.0	.1	.1	.0	.0	.1	.2	.4	.2	.5	.6	1.2	1.2

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DATE : 5/20/96
TIME : 10:39:13

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30
	110	100	30	160	180	180	200	200	0	0
1	.4	.0	.0	1.1	.6	.2	.2	.5	.0	.0
2	.3	.0	.0	1.3	.8	.4	.3	.6	.0	.0
3	.3	.0	.0	.8	.4	.2	.2	.4	.0	.0
4	.0	1.3	2.1	.8	1.5	1.9	5.3	5.1	5.4	5.3
5	.0	1.7	3.8	2.7	3.2	3.4	2.1	1.5	2.1	2.2
6	.0	.1	.3	.2	.2	.2	.1	.1	.1	.1
7	.0	1.4	2.9	2.0	2.5	2.7	1.7	1.2	2.1	2.1
8	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	1.9	4.1	2.0	3.2	3.2	3.3	3.8	4.5	4.6
10	.4	.0	.0	1.1	.5	.2	.3	.7	.0	.0
11	.7	.0	.0	.0	.0	.0	.1	.1	.0	.0
12	2.4	.0	.0	.4	.2	.1	.3	.4	.0	.0
13	2.0	.0	.0	.1	.0	.0	.1	.1	.0	.0
14	.1	.8	.0	.1	.1	.1	.0	.0	.0	.0
15	.1	1.5	.0	.1	.2	.2	.0	.1	.0	.0
16	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0
17	.1	1.5	.0	.1	.2	.2	.0	.1	.0	.0
18	.0	.9	.0	.1	.1	.1	.0	.0	.0	.0
19	1.0	.1	.0	.1	.0	.0	.0	.1	.0	.0

JOB: SR99 AND 188TH ST 2010 adn RUN: SR99 & 188TH ST. 2010 adn

DATE : 5/20/96
TIME : 10:30:47

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 626. M AMB = 5.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. SR99 NB Approach	9.1	-306.2	9.1	-7.3	299.	360.	AG	2585.	28.3	.0	12.0		
2. SR99 NB Queue Th	9.1	-7.3	9.1	-869.9	863.	180.	AG	1023.	100.0	.0	6.0	1.40	143.8
3. SR99 NB Queue Left	3.1	-7.3	3.1	-446.2	439.	180.	AG	1344.	100.0	.0	6.0	1.46	73.1
4. SR99 NB Queue RT	13.5	-7.3	13.5	-55.3	48.	180.	AG	356.	100.0	.0	3.0	.42	8.0
5. SR99 NB Depart	8.1	-1.2	8.1	310.6	312.	360.	AG	2883.	28.3	.0	12.0		
6. SR99 SB ApproachTH	-3.3	310.6	-3.3	11.8	299.	180.	AG	1562.	28.3	.0	12.0		
7. SR99 SB ApproachRT	-7.6	-310.6	-7.6	11.8	322.	360.	AG	185.	28.3	.0	9.0		
8. SR99 SB Queue th	-3.3	11.8	-3.3	882.6	871.	360.	AG	1121.	100.0	.0	6.0	1.50	145.1
9. SR99 SB Queue RT	-7.6	11.8	-7.6	38.9	27.	360.	AG	392.	100.0	.0	3.0	.23	4.5
10. SR99 SB Queue Left	1.4	11.8	1.4	299.3	287.	360.	AG	721.	100.0	.0	3.0	1.52	47.9
11. SR99 SB Depart	-4.5	2.9	-4.5	-306.2	309.	180.	AG	2340.	28.3	.0	15.0		
12. 188 EB Approach	-306.5	-3.0	-9.3	-3.0	297.	90.	AG	2371.	28.3	.0	12.0		
13. 188 EB Queue th	-9.3	-3.0	-906.2	-3.0	897.	270.	AG	1086.	100.0	.0	6.0	1.48	149.5
14. 188 EB Queue Left	-9.3	1.4	-558.7	1.4	549.	270.	AG	672.	100.0	.0	3.0	1.61	91.6
15. 188 EB Queue RT	-9.3	-7.7	-87.9	-7.7	79.	270.	AG	378.	100.0	.0	3.0	.68	13.1
16. 188 EB Depart	.2	-4.3	308.7	-4.3	309.	90.	AG	2007.	28.3	.0	12.0		
17. 188 WB Approach	308.7	7.7	11.4	7.7	297.	270.	AG	3005.	28.3	.0	12.0		
18. 188 WB Queue th	11.4	7.7	916.8	7.7	905.	90.	AG	1104.	100.0	.0	6.0	1.50	150.9
19. 188 WB Queue Left	11.4	1.8	419.5	1.9	408.	90.	AG	1362.	100.0	.0	6.0	1.46	68.0
20. 188 WB Queue RT	11.4	12.2	70.9	12.2	60.	90.	AG	165.	100.0	.0	3.0	.78	9.9
21. 188 WB Depart	3.3	8.4	-306.5	8.4	310.	270.	AG	2279.	28.3	.0	12.0		

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DATE : 5/20/96
TIME : 10:30:47

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. SR99 NB Queue Th	180	115	1.0	1547	1600	298.60	1	3
3. SR99 NB Queue Left	180	151	1.0	677	1600	298.60	1	3
4. SR99 NB Queue RT	180	80	1.0	360	1600	298.60	1	3
8. SR99 SB Queue th	180	126	1.0	1360	1600	298.60	1	3
9. SR99 SB Queue RT	180	88	1.0	185	1600	298.60	1	3
10. SR99 SB Queue Left	180	162	1.0	202	1600	298.60	1	3
13. 188 EB Queue th	180	122	1.0	1445	1600	298.60	1	3
14. 188 EB Queue Left	180	151	1.0	371	1600	298.60	1	3
15. 188 EB Queue RT	180	85	1.0	555	1600	298.60	1	3
18. 188 WB Queue th	180	124	1.0	1416	1600	298.60	1	3
19. 188 WB Queue Left	180	153	1.0	624	1600	298.60	1	3
20. 188 WB Queue RT	180	37	1.0	965	1600	298.60	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. REC 1 NB1	14.5	17.5	1.8
2. REC 2 NB2	55.0	17.5	1.8
3. REC 3 NB3	155.0	14.5	1.8
4. REC 4 NB4	300.0	14.5	1.8
5. REC 5 NB5	300.0	-11.0	1.8
6. REC 6 NB6	155.0	-11.0	1.8
7. REC 7 NB7	55.0	-11.0	1.8
8. REC 8 NB1	19.0	-11.0	1.8
9. REC 9 NB2	19.0	-61.0	1.8
10. REC10 NB3	15.5	-161.0	1.8
11. REC11 NB4	15.5	-300.0	1.8
12. REC12 NB5	-13.0	-300.0	1.8
13. REC13 NB6	-13.0	-161.0	1.8
14. REC14 NB7	-13.0	-61.0	1.8
15. REC15 EB1	-13.0	-13.0	1.8
16. REC16 EB2	-63.0	-13.0	1.8
17. REC17 EB3	-163.0	-9.5	1.8
18. REC18 EB4	-300.0	-9.5	1.8
19. REC19 EB5	-300.0	15.0	1.8
20. REC20 EB6	-163.0	15.0	1.8
21. REC21 EB7	-63.0	15.0	1.8
22. REC22 SB1	-13.0	15.0	1.8
23. REC23 SB2	-13.0	65.0	1.8
24. REC24 SB3	-13.0	165.0	1.8
25. REC25 SB4	-13.0	300.0	1.8
26. REC26 SB5	14.5	300.0	1.8
27. REC27 SB6	14.5	165.0	1.8
28. REC28 SB7	14.5	65.0	1.8

JOB\ ,9 AND 188TH ST 2010 adn RUN: SR99 _ 188TH ST. 2010 adn

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	14.8	6.3	5.1	5.0	13.1	13.2	14.6	19.6	16.2	20.4	21.1	16.4	16.0	15.7	21.1	13.6	13.0	12.9	8.0	8.1
10.	8.3	5.1	5.0	5.0	12.9	13.1	13.4	14.9	10.3	11.5	11.4	20.0	19.8	17.8	23.0	15.4	13.1	12.7	8.1	8.8
20.	8.6	5.0	5.0	5.0	12.5	13.2	13.4	13.5	8.7	7.6	7.3	18.6	18.8	17.5	18.8	16.3	13.9	13.1	8.3	6.0
30.	8.3	5.0	5.1	5.0	12.2	13.4	13.5	13.6	8.6	7.2	6.7	16.9	17.3	17.8	14.6	16.5	14.6	13.7	8.6	6.5
40.	8.2	5.0	5.1	5.1	12.0	14.0	14.1	14.2	8.9	7.4	6.5	15.6	16.4	18.2	12.7	16.5	15.6	14.6	8.8	6.9
50.	8.2	5.0	5.2	5.1	12.0	14.9	15.0	15.2	9.0	7.5	6.2	14.3	15.6	17.8	13.3	17.1	16.5	15.8	8.1	6.9
60.	8.1	5.0	5.2	5.1	12.4	16.3	16.4	16.6	9.5	7.0	5.7	13.5	15.0	17.7	16.1	18.2	17.8	17.2	8.3	6.9
70.	8.2	5.2	5.8	5.3	13.0	18.1	18.4	18.5	9.7	6.3	5.3	12.7	13.7	17.5	20.6	19.5	19.9	19.4	8.5	6.8
80.	8.3	8.0	9.4	7.4	12.5	18.6	19.8	20.0	8.6	5.5	5.1	12.5	13.1	16.3	24.0	21.2	23.3	22.7	9.6	10.1
90.	16.0	15.4	17.8	12.4	9.4	14.1	15.2	15.6	8.1	5.1	5.0	12.4	12.8	13.8	21.4	17.5	20.5	20.1	16.6	17.0
100.	20.7	20.1	22.7	15.8	8.1	7.7	8.1	8.2	5.1	5.0	5.0	12.0	12.5	12.6	15.2	10.9	11.8	11.0	19.2	19.6
110.	19.3	19.0	21.0	15.6	5.1	5.5	5.5	5.5	5.0	5.0	5.0	11.2	12.4	12.4	13.0	8.8	7.6	7.1	16.8	17.6
120.	17.3	17.1	18.7	14.8	5.1	5.2	5.2	5.2	5.0	5.1	5.0	10.9	12.8	12.8	13.2	8.6	7.2	6.7	15.4	15.8
130.	16.1	15.9	17.2	14.4	5.1	5.1	5.1	5.1	5.0	5.2	5.0	10.7	13.3	13.3	13.7	8.7	7.2	6.5	14.2	14.9
140.	15.1	14.8	15.9	14.1	5.1	5.1	5.1	5.1	5.0	5.2	5.0	10.9	14.2	14.2	14.6	8.9	7.3	6.1	13.1	14.3
150.	14.6	14.4	15.2	14.2	5.0	5.1	5.1	5.1	5.0	5.2	5.0	11.2	15.5	15.5	15.7	9.2	6.9	5.7	12.3	13.7
160.	15.0	13.9	14.8	14.5	5.0	5.0	5.0	5.3	5.3	5.9	5.3	11.6	16.8	17.2	17.3	9.5	6.3	5.3	11.5	12.6
170.	19.4	14.1	14.6	14.5	5.0	5.0	5.2	8.0	7.6	9.4	7.4	11.2	17.3	18.4	18.7	8.2	5.5	5.0	11.3	11.7
180.	27.7	15.8	14.8	14.7	5.0	5.1	6.9	15.7	14.6	17.4	12.4	8.4	12.7	14.0	14.4	6.0	5.1	5.0	11.3	11.8
190.	27.7	18.7	15.3	14.7	5.1	5.6	9.7	20.4	19.0	22.2	18.5	5.7	7.2	7.6	7.7	5.0	5.0	5.0	11.0	11.2
200.	20.3	19.7	16.4	15.1	5.3	6.4	10.6	19.2	17.9	20.7	15.1	5.0	5.3	5.3	5.5	5.0	5.0	5.0	10.5	11.2
210.	14.9	19.8	17.4	15.9	5.7	7.3	10.3	17.5	16.2	18.5	14.2	5.0	5.1	5.2	5.2	5.0	5.1	5.0	10.1	11.7
220.	12.9	19.9	18.4	17.1	6.1	7.4	9.8	16.2	15.0	16.9	13.6	5.0	5.1	5.1	5.1	5.0	5.1	5.0	9.8	12.1
230.	13.4	19.8	19.4	18.5	6.4	7.3	9.7	15.1	14.0	15.8	13.2	5.0	5.1	5.1	5.1	5.0	5.2	5.0	9.8	12.9
240.	15.5	19.9	20.8	20.2	6.7	7.2	9.6	14.6	13.6	15.0	13.2	5.0	5.1	5.1	5.1	5.0	5.2	5.0	10.1	13.9
250.	18.8	19.9	23.4	22.8	6.8	7.5	9.7	14.7	13.2	14.6	13.8	5.0	5.0	5.0	5.2	5.2	5.8	5.4	10.5	15.5
260.	21.4	19.8	25.4	25.7	9.7	10.5	12.2	17.7	13.2	14.5	14.2	5.0	5.0	5.1	7.8	7.6	9.0	7.4	10.8	16.1
270.	19.1	15.7	20.7	21.5	17.9	17.2	17.7	24.0	14.5	14.7	14.4	5.0	5.1	6.2	14.5	13.6	16.0	11.8	8.7	12.7
280.	13.9	10.0	11.4	11.1	21.3	20.8	19.0	24.5	16.4	15.1	14.6	5.1	5.6	7.9	18.3	17.4	19.6	13.9	8.9	7.4
290.	12.1	8.0	7.2	6.9	19.2	19.6	17.3	18.5	17.1	15.9	14.9	5.3	6.2	8.8	17.2	16.8	18.0	13.0	5.0	5.4
300.	12.4	8.1	6.9	6.3	17.3	17.9	18.1	14.3	17.6	16.7	15.7	5.7	6.7	8.8	15.5	15.3	16.1	12.1	5.0	5.2
310.	12.8	8.2	6.9	6.2	15.9	16.6	18.1	12.7	17.9	17.5	16.6	5.9	6.8	8.5	14.4	14.3	14.8	11.7	5.0	5.2
320.	13.5	8.5	6.9	5.7	14.6	15.8	17.6	14.0	18.7	18.6	17.9	6.1	6.8	8.3	13.4	13.2	13.7	11.5	5.0	5.1
330.	14.4	8.8	6.6	5.6	13.9	15.1	17.4	16.4	19.2	20.1	19.6	6.3	6.5	9.2	13.0	12.9	13.2	11.7	5.0	5.1
340.	16.3	9.1	6.1	5.3	13.4	14.3	17.4	19.9	20.1	22.3	22.1	6.4	6.9	8.5	13.1	12.7	12.8	12.1	5.0	5.0
350.	18.0	8.3	5.5	5.1	13.2	13.6	16.8	22.1	19.9	25.1	25.1	9.0	9.4	10.7	15.3	12.6	12.6	12.4	5.0	5.0
360.	14.8	6.3	5.1	5.0	13.1	13.2	14.6	19.6	16.2	20.4	21.1	16.4	16.0	15.7	21.1	13.6	13.0	12.9	8.0	8.1
MAX	27.7	20.1	25.4	25.7	21.3	20.8	19.8	24.5	20.1	25.1	25.1	20.0	19.8	18.4	24.0	21.2	23.3	22.7	19.2	19.6
DEGR.	180	100	260	260	280	280	80	280	340	350	350	10	10	170	80	80	80	80	100	100

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JOB ,9 AND 188TH ST 2010 adn RUN: SR99 _ 188TH ST. 2010 adn

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	6.0	13.4	12.8	11.6	8.8	8.3	13.2	14.4
10.	7.5	17.2	16.2	15.0	10.1	6.1	7.8	8.2
20.	8.6	16.6	15.4	15.2	9.5	5.2	5.6	5.6
30.	8.6	15.2	13.9	13.9	9.2	5.2	5.3	5.3
40.	8.3	14.2	12.9	12.9	9.1	5.2	5.2	5.2
50.	8.0	13.3	12.1	12.1	9.2	5.2	5.2	5.2
60.	8.1	13.0	11.8	11.8	9.6	5.1	5.1	5.1
70.	8.5	13.3	11.6	11.6	10.0	5.0	5.0	5.0
80.	11.5	17.0	11.6	11.5	10.4	5.0	5.0	5.1
90.	18.1	25.0	13.0	11.6	10.9	5.0	5.1	6.4
100.	19.6	26.6	15.5	12.1	11.3	5.1	5.6	8.8
110.	17.5	20.4	16.6	13.2	11.9	5.4	6.3	9.8
120.	17.2	15.4	16.5	13.9	12.4	5.7	7.1	9.7
130.	17.0	13.2	16.3	14.3	13.1	6.2	7.4	9.5
140.	16.6	13.7	16.7	15.0	14.3	6.6	7.3	9.2
150.	16.3	15.6	17.4	16.0	15.3	6.7	7.4	9.0
160.	16.3	19.4	18.3	17.7	17.0	7.0	7.7	9.4
170.	15.1	22.6	20.0	19.4	18.8	10.3	10.9	12.8
180.	13.1	20.1	16.4	16.4	15.9	17.6	18.4	19.6
190.	11.6	14.0	10.2	9.3	8.8	19.9	20.4	20.6
200.	11.7	12.0	8.1	6.8	6.3	17.4	17.9	17.8
210.	12.1	12.2	8.0	6.6	6.2	15.6	15.0	17.0
220.	12.5	12.6	8.1	6.7	6.0	14.3	15.0	16.5
230.	13.1	13.4	8.2	6.7	5.8	13.3	14.2	15.9
240.	14.1	14.6	8.5	6.6	5.7	12.7	13.7	15.6
250.	15.7	16.1	8.6	6.2	5.3	11.7	12.7	15.1
260.	17.0	17.4	7.8	5.5	5.1	11.3	12.1	14.5
270.	13.7	14.0	6.0	5.1	5.0	11.1	11.8	12.8
280.	7.8	7.9	5.1	5.0	5.0	10.6	11.5	11.6
290.	5.4	5.5	5.0	5.0	5.0	10.1	11.5	11.5
300.	5.2	5.2	5.0	5.0	5.0	10.2	12.0	12.0
310.	5.2	5.2	5.0	5.0	5.0	10.0	12.5	12.5
320.	5.1	5.1	5.0	5.0	5.0	9.9	13.3	13.3
330.	5.1	5.1	5.0	5.0	5.0	9.8	14.4	14.4
340.	5.0	5.2	5.2	5.2	5.1	9.9	16.0	16.2
350.	5.1	7.4	7.2	6.8	6.2	9.9	16.8	17.7
360.	6.0	13.4	12.8	11.6	8.8	8.3	13.2	14.4
MAX	19.6	26.6	20.0	19.4	18.8	19.9	20.4	20.6
DEGR.	100	100	170	170	170	190	190	190

THE HIGHEST CONCENTRATION ...

JOB 9 AND 188TH ST 2010 adn RUN: SR9> .88TH ST. 2010 adn

DATE : 5/20/96
TIME : 10:30:47

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	CO/LINK (PPM)																		
	ANGLE (DEGREES)																		
LINK #	REC1 180	REC2 100	REC3 260	REC4 260	REC5 280	REC6 280	REC7 80	REC8 280	REC9 340	REC10 350	REC11 350	REC12 10	REC13 10	REC14 170	REC15 80	REC16 80	REC17 80	REC18 80	REC19 100	REC20 100
1	3.0	.0	.2	.2	.0	.1	.0	1.6	2.8	5.1	5.5	1.9	1.4	1.8	.9	.2	.1	.0	.2	.2
2	4.4	.0	.3	.3	.0	.1	.0	1.8	3.0	5.1	5.5	2.3	1.7	2.8	1.0	.2	.1	.0	.3	.3
3	3.7	.0	.4	.3	.1	.1	.0	1.4	2.3	4.0	4.7	3.9	3.1	4.1	1.8	.3	.1	.1	.3	.4
4	.7	.0	.1	.0	.0	.0	.0	.8	1.2	.1	.0	.0	.1	.0	.2	.1	.0	.0	.0	.1
5	1.6	.0	.2	.1	.3	.4	.0	.0	.7	.6	.3	.3	.8	.0	.1	.4	.3	.3	.1	.1
6	.0	.0	.0	.0	.1	.1	.0	.0	.5	.4	.2	.1	.3	.0	.0	.1	.2	.1	.0	.0
7	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.4	.4	.4	.2	.0	.0	.0	.0	.0
8	.0	.0	.1	.0	.3	.3	.0	.0	1.1	1.1	.6	.5	1.0	.0	.0	.1	.3	.3	.0	.1
9	.0	.0	.0	.0	.0	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
10	.0	.0	.0	.0	.2	.2	.0	.0	.5	.4	.2	.2	.4	.0	.0	.1	.2	.2	.0	.0
11	1.3	.0	.3	.2	.0	.1	.0	1.2	.9	1.6	2.0	4.4	4.1	4.3	2.0	.5	.1	.0	.2	.3
12	.0	.0	.6	.3	.2	.5	.0	2.5	.2	.2	.2	.0	.1	.0	.0	1.9	4.6	5.0	2.1	1.7
13	.0	.0	1.1	.6	.5	.9	.0	3.9	.3	.3	.3	.0	.1	.0	.0	2.2	5.3	5.8	2.9	2.2
14	.0	.0	.5	.3	.2	.5	.0	1.9	.2	.2	.1	.0	.0	.0	.0	.6	1.8	2.1	1.8	1.5
15	.0	.0	.1	.0	.0	.1	.0	.7	.1	.1	.1	.0	.0	.0	.0	1.3	.2	.1	.1	.3
16	1.0	1.4	1.3	1.7	4.1	3.8	4.1	1.6	.3	.1	.0	.2	.2	.0	2.8	1.1	.4	.2	.2	.5
17	2.2	4.3	5.6	6.1	2.6	1.9	2.5	.0	.1	.1	.0	.2	.3	.0	2.4	1.7	.7	.3	.3	.6
18	2.3	5.0	5.2	5.7	2.8	2.1	3.4	.0	.1	.1	.0	.3	.3	.0	3.2	2.3	1.1	.6	.5	.9
19	2.0	4.2	3.8	4.7	4.6	3.8	4.8	.0	.1	.1	.1	.3	.4	.0	4.3	2.5	1.0	.5	.5	1.0
20	.4	.2	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
21	.0	.0	.5	.2	.3	.6	.0	2.0	.5	.3	.2	.0	.1	.0	.0	.5	1.7	2.1	4.7	4.4

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JOB 9 AND 188TH ST 2010 adn RUN: SR9. .88TH ST. 2010 adn

DATE : 5/20/96
TIME : 10:30:47

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	CO/LINK (PPM)							
	ANGLE (DEGREES)							
LINK #	REC21 100	REC22 100	REC23 170	REC24 170	REC25 170	REC26 190	REC27 190	REC28 190
1	.2	.0	1.5	.6	.3	.2	.5	1.2
2	.2	.0	2.2	1.1	.6	.4	.8	1.7
3	.2	.0	2.5	1.1	.5	.5	1.0	2.4
4	.1	.0	.2	.1	.0	.0	.0	.2
5	.5	1.5	.6	1.8	2.3	6.1	5.7	4.7
6	.1	.9	1.3	2.0	2.3	1.4	1.1	.4
7	.0	.0	.1	.0	.0	.0	.1	.1
8	.2	1.9	2.4	4.1	4.6	3.0	2.3	.7
9	.1	.9	.5	.1	.0	.0	.1	.1
10	.1	.6	.6	1.5	1.9	2.0	1.7	.7
11	.3	.0	1.4	.5	.2	.3	.6	1.6
12	.5	.0	.2	.1	.0	.2	.2	.1
13	.7	.0	.2	.1	.0	.3	.3	.2
14	.6	.0	.1	.0	.0	.1	.2	.1
15	.1	.0	.1	.0	.0	.1	.1	.1
16	1.3	1.7	.2	.2	.2	.0	.1	.3
17	1.4	3.4	.1	.3	.2	.0	.1	.2
18	1.9	4.3	.1	.3	.3	.0	.1	.2
19	2.4	4.5	.2	.4	.3	.1	.1	.3
20	.1	.3	.0	.0	.0	.0	.0	.0
21	3.6	1.6	.5	.1	.1	.2	.3	.3

JOB: SR99 AND 188TH ST 2010 nutl RUN: SR99 & 188TH ST. 2010 nutl

DATE : 5/20/96
TIME : 10:31: 9

The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 626. M AMB = 5.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. SR99 NB Approach	9.1	-306.2	9.1	-7.3	299.	360.	AG	2561.	28.3	.0	12.0		
2. SR99 NB Queue	9.1	-7.3	9.1	-830.9	824.	180.	AG	1023.	100.0	.0	6.0	1.38	137.3
3. SR99 NB Queue Left	3.1	-7.3	3.1	-432.8	426.	180.	AG	1344.	100.0	.0	6.0	1.45	70.9
4. SR99 NB Queue RT	13.5	-7.3	13.5	-56.5	49.	180.	AG	356.	100.0	.0	3.0	.43	8.2
5. SR99 NB Depart	8.1	-1.2	8.1	310.6	312.	360.	AG	2845.	28.3	.0	12.0		
6. SR99 SB ApproschTH	-3.3	310.6	-3.3	11.8	299.	180.	AG	1539.	28.3	.0	12.0		
7. SR99 SB ApproschRT	-7.6	-310.6	-7.6	11.8	322.	360.	AG	181.	28.3	.0	9.0		
8. SR99 SB Queue th	-3.3	11.8	-3.3	840.0	828.	360.	AG	1121.	100.0	.0	6.0	1.47	138.0
9. SR99 SB Queue RT	-7.6	11.8	-7.6	38.9	27.	360.	AG	392.	100.0	.0	3.0	.23	4.4
10. SR99 SB Queue Left	1.4	11.8	1.4	306.1	294.	360.	AG	721.	100.0	.0	3.0	1.53	49.0
11. SR99 SB Depart	-4.5	2.9	-4.5	-306.2	309.	180.	AG	2502.	28.3	.0	15.0		
12. 188 EB Approach	-306.5	-3.0	-9.3	-3.0	297.	90.	AG	2360.	28.3	.0	12.0		
13. 188 EB Queue th	-9.3	-3.0	-907.0	-3.0	898.	270.	AG	1077.	100.0	.0	6.0	1.47	149.6
14. 188 EB Queue Left	-9.3	1.4	-501.8	1.4	492.	270.	AG	672.	100.0	.0	3.0	1.53	82.1
15. 188 EB Queue RT	-9.3	-7.7	-86.4	-7.7	77.	270.	AG	378.	100.0	.0	3.0	.67	12.8
16. 188 EB Depart	.2	-4.3	308.7	-4.3	309.	90.	AG	2035.	30.2	.0	12.0		
17. 188 WB Approach	308.7	7.7	11.4	7.7	297.	270.	AG	3012.	30.2	.0	12.0		
18. 188 WB Queue th	11.4	7.7	872.4	7.7	861.	90.	AG	1086.	100.0	.0	6.0	1.46	143.5
19. 188 WB Queue Left	11.4	1.8	416.2	1.9	405.	90.	AG	1362.	100.0	.0	6.0	1.46	67.5
20. 188 WB Queue RT	11.4	12.2	71.1	12.2	60.	90.	AG	165.	100.0	.0	3.0	.78	9.9
21. 188 WB Depart	3.3	8.4	-306.5	8.4	310.	270.	AG	2272.	30.2	.0	12.0		

DATE : 5/20/96
TIME : 10:31: 9

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. SR99 NB Queue	180	115	1.0	1523	1600	298.60	1	3
3. SR99 NB Queue Left	180	151	1.0	668	1600	298.60	1	3
4. SR99 NB Queue RT	180	80	1.0	369	1600	298.60	1	3
8. SR99 SB Queue th	180	126	1.0	1335	1600	298.60	1	3
9. SR99 SB Queue RT	180	88	1.0	181	1600	298.60	1	3
10. SR99 SB Queue Left	180	162	1.0	204	1600	298.60	1	3
13. 188 EB Queue th	180	121	1.0	1462	1600	298.60	1	3
14. 188 EB Queue Left	180	151	1.0	354	1600	298.60	1	3
15. 188 EB Queue RT	180	85	1.0	344	1600	298.60	1	3
18. 188 WB Queue th	180	122	1.0	1422	1600	298.60	1	3
19. 188 WB Queue Left	180	153	1.0	622	1600	298.60	1	3
20. 188 WB Queue RT	180	37	1.0	968	1600	298.60	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. REC 1 NB1	14.5	17.5	1.8
2. REC 2 NB2	55.0	17.5	1.8
3. REC 3 NB3	155.0	14.5	1.8
4. REC 4 NB4	300.0	14.5	1.8
5. REC 5 NB5	300.0	-11.0	1.8
6. REC 6 NB6	155.0	-11.0	1.8
7. REC 7 NB7	55.0	-11.0	1.8
8. REC 8 NB1	19.0	-11.0	1.8
9. REC 9 NB2	19.0	-61.0	1.8
10. REC10 NB3	15.5	-161.0	1.8
11. REC11 NB4	15.5	-300.0	1.8
12. REC12 NB5	-13.0	-300.0	1.8
13. REC13 NB6	-13.0	-161.0	1.8
14. REC14 NB7	-13.0	-61.0	1.8
15. REC15 EB1	-13.0	-13.0	1.8
16. REC16 EB2	-83.0	-13.0	1.8
17. REC17 EB3	-163.0	-9.5	1.8
18. REC18 EB4	-300.0	-9.5	1.8
19. REC19 EB5	-300.0	15.0	1.8
20. REC20 EB6	-163.0	15.0	1.8
21. REC21 EB7	-83.0	15.0	1.8
22. REC22 SB1	-13.0	15.0	1.8
23. REC23 SB2	-13.0	65.0	1.8
24. REC24 SB3	-13.0	165.0	1.8
25. REC25 SB4	-13.0	300.0	1.8
26. REC26 SB5	14.5	300.0	1.8
27. REC27 SB6	14.5	165.0	1.8
28. REC28 SB7	14.5	65.0	1.8

JOB: 9 AND 188TH ST 2010 nut1 RUN: SR99 - 188TH ST. 2010 nut1

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	14.7	6.2	5.1	5.0	13.4	13.5	14.9	19.9	16.0	20.6	21.3	16.7	16.3	15.9	21.2	13.6	13.0	12.8	5.0	5.1
10.	8.2	5.1	5.0	5.0	13.2	13.3	13.6	15.1	10.4	11.5	11.4	20.5	20.1	18.1	23.2	15.4	13.2	12.8	5.0	5.4
20.	5.6	5.0	5.0	5.0	12.7	13.4	13.6	13.7	8.9	7.8	7.3	18.8	19.1	17.7	19.0	16.3	13.9	13.1	5.9	5.9
30.	5.3	5.0	5.1	5.0	12.3	13.7	13.8	13.9	8.8	7.5	6.6	17.1	17.5	18.0	14.8	16.5	14.7	13.8	5.6	6.5
40.	5.2	5.0	5.1	5.1	12.2	14.4	14.5	14.6	8.9	7.4	6.6	15.8	16.6	18.3	12.9	16.6	15.6	14.6	5.8	6.9
50.	5.2	5.0	5.2	5.1	12.2	15.3	15.4	15.6	9.2	7.5	6.2	14.5	15.8	18.2	13.6	17.2	16.4	15.8	6.1	6.9
60.	5.1	5.0	5.2	5.1	12.4	16.5	16.6	16.8	9.5	7.1	5.6	13.5	15.2	17.9	16.5	18.0	17.6	17.2	6.3	6.8
70.	5.2	5.2	5.8	5.3	13.1	18.6	18.9	19.0	9.7	6.3	5.3	12.8	13.8	17.7	20.8	19.5	20.1	19.5	6.5	6.8
80.	8.2	7.9	9.5	7.3	12.4	19.1	20.2	20.4	8.4	5.5	5.0	12.6	13.0	16.4	24.5	21.3	23.2	22.7	9.6	10.2
90.	16.2	15.6	18.1	12.2	9.3	14.2	15.5	15.9	6.1	5.1	5.0	12.5	12.7	13.9	21.6	17.5	20.7	20.2	16.9	17.2
100.	21.0	20.5	23.2	15.6	6.1	7.7	8.2	8.3	5.1	5.0	5.0	12.1	12.5	12.6	15.4	11.0	11.8	11.2	19.5	20.0
110.	19.6	19.4	21.3	15.6	5.1	5.5	5.5	5.5	5.0	5.0	5.0	11.4	12.5	12.5	13.1	8.8	7.6	7.1	17.1	17.8
120.	17.7	17.5	19.0	14.9	5.1	5.2	5.2	5.2	5.0	5.1	5.0	11.0	13.0	13.0	13.4	8.6	7.2	6.7	15.5	16.0
130.	16.4	16.2	17.5	14.6	5.1	5.1	5.1	5.1	5.0	5.2	5.0	10.8	13.5	13.5	13.9	8.7	7.2	6.5	14.4	15.0
140.	15.4	15.0	16.2	14.3	5.1	5.1	5.1	5.1	5.0	5.2	5.0	11.0	14.4	14.4	14.8	9.0	7.4	6.1	13.3	14.6
150.	14.7	14.5	15.4	14.4	5.0	5.1	5.1	5.1	5.0	5.2	5.0	11.3	15.6	15.7	15.9	9.3	6.9	5.6	12.4	13.7
160.	15.2	14.1	15.0	14.6	5.0	5.0	5.0	5.3	5.2	5.9	5.3	11.6	17.1	17.3	17.6	9.6	6.2	5.2	11.6	12.8
170.	19.4	14.2	14.8	14.8	5.0	5.0	5.2	8.0	7.6	9.4	7.4	11.0	17.5	18.7	18.9	8.3	5.4	5.0	11.4	11.9
180.	27.8	16.1	15.1	15.0	5.0	5.1	6.8	15.8	14.4	17.5	12.2	8.3	12.8	14.2	14.5	6.0	5.0	5.0	11.4	11.5
190.	28.0	18.8	15.4	15.0	5.0	5.6	9.7	20.6	19.1	22.2	15.3	5.8	7.3	7.7	7.8	5.0	5.0	5.0	11.1	11.4
200.	20.9	20.1	16.6	15.3	5.3	6.4	10.7	19.4	18.0	20.7	15.0	5.0	5.3	5.4	5.5	5.0	5.0	5.0	10.5	11.2
210.	15.1	20.0	17.7	16.1	5.6	7.3	10.4	17.6	16.3	18.6	14.2	5.0	5.2	5.2	5.2	5.0	5.1	5.0	10.2	11.7
220.	13.1	20.1	18.8	17.4	6.1	7.4	9.9	16.3	15.1	17.0	13.5	5.0	5.1	5.1	5.1	5.0	5.1	5.0	9.9	12.3
230.	13.5	20.0	19.7	18.9	6.4	7.3	9.7	15.2	14.1	15.9	13.2	5.0	5.1	5.1	5.1	5.0	5.2	5.0	9.9	13.0
240.	15.5	20.1	21.1	20.5	6.7	7.2	9.6	14.7	13.7	15.1	13.2	5.0	5.1	5.1	5.1	5.0	5.2	5.0	10.1	14.1
250.	19.0	20.1	23.8	23.2	7.0	7.5	9.6	14.8	13.3	14.7	13.7	5.0	5.0	5.0	5.2	5.2	5.8	5.4	10.5	15.7
260.	21.6	20.0	25.9	26.1	9.9	10.5	12.3	17.8	13.9	14.5	14.2	5.0	5.0	5.1	7.8	7.5	8.9	7.3	10.6	16.4
270.	19.1	15.9	21.0	21.8	18.2	17.4	17.9	24.1	14.5	14.8	14.5	5.0	5.1	6.2	14.4	13.5	15.8	11.6	8.6	12.8
280.	13.9	10.0	11.5	11.2	22.0	21.4	19.4	24.8	16.3	15.1	14.6	5.1	5.6	8.0	18.4	17.5	19.6	13.8	5.8	7.5
290.	11.9	8.0	7.2	7.0	19.7	19.9	17.8	18.8	17.4	16.0	15.0	5.3	6.2	8.7	17.2	16.8	18.0	12.9	5.1	5.4
300.	12.3	8.1	6.9	6.3	17.6	18.2	18.3	14.7	17.8	16.8	15.7	5.7	6.7	8.8	15.6	15.4	16.1	12.0	5.0	5.2
310.	12.6	8.2	6.9	6.2	16.3	17.0	18.4	13.0	18.2	17.6	16.6	5.9	6.8	8.6	14.4	14.3	14.7	11.6	5.0	5.2
320.	13.4	8.5	6.9	5.7	15.0	16.2	17.9	14.2	18.8	18.7	18.0	6.1	6.8	8.3	13.5	13.3	13.7	11.4	5.0	5.1
330.	14.4	8.8	6.6	5.6	14.2	15.4	17.7	16.6	19.4	20.2	19.8	6.4	6.9	8.4	13.1	13.0	13.3	11.8	5.0	5.1
340.	16.2	9.2	6.1	5.3	13.5	14.4	17.6	20.0	20.3	22.5	22.1	6.5	7.1	8.5	13.2	12.6	12.8	12.0	5.0	5.0
350.	17.9	8.2	5.4	5.0	13.4	13.8	17.0	22.3	20.0	25.2	25.2	9.0	9.6	10.7	15.4	12.7	12.7	12.5	5.0	5.0
360.	14.7	6.2	5.1	5.0	13.4	13.5	14.9	19.9	16.0	20.6	21.3	16.7	16.3	15.9	21.2	13.6	13.0	12.8	5.0	5.1
MAX	28.0	20.5	25.9	26.1	22.0	21.4	20.2	24.8	20.3	25.2	25.2	20.5	20.1	18.7	24.5	21.3	23.2	22.7	19.5	20.0
DEGR.	190	100	260	260	280	280	80	280	340	350	350	10	10	170	80	80	80	80	100	100

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JOB: 9 AND 188TH ST 2010 nut1 RUN: SR99 - 188TH ST. 2010 nut1

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	6.0	13.4	12.7	11.4	8.8	8.3	13.0	14.2
10.	7.5	17.2	16.2	15.1	10.0	5.9	7.8	8.2
20.	8.6	16.6	15.3	15.1	9.5	5.2	5.6	5.6
30.	8.6	15.2	13.9	13.9	9.1	5.2	5.3	5.3
40.	8.3	14.2	12.9	12.9	9.1	5.2	5.2	5.2
50.	8.0	13.4	12.1	12.1	9.3	5.2	5.2	5.2
60.	8.1	13.0	11.8	11.8	9.8	5.1	5.1	5.1
70.	8.5	13.3	11.6	11.6	10.6	5.0	5.0	5.0
80.	11.7	17.1	11.5	11.4	11.1	5.0	5.0	5.1
90.	18.5	25.3	12.9	11.5	11.4	5.0	5.1	6.4
100.	19.9	27.0	15.3	12.0	11.5	5.1	5.6	8.7
110.	17.7	20.8	16.7	13.1	11.9	5.3	6.2	10.0
120.	17.4	15.9	16.6	14.1	12.5	5.7	7.1	9.8
130.	17.3	13.4	16.4	14.5	13.2	6.2	7.5	9.6
140.	16.8	13.9	16.7	15.2	14.3	6.6	7.5	9.1
150.	16.5	15.9	17.4	15.9	15.4	6.8	7.4	9.2
160.	16.4	19.7	18.5	17.5	17.0	7.0	7.7	9.5
170.	15.3	23.0	20.2	19.3	18.9	10.3	11.0	12.9
180.	13.1	20.4	16.5	16.2	16.0	17.5	18.4	19.6
190.	11.8	14.2	10.2	9.1	8.8	19.0	20.5	20.7
200.	11.7	12.0	8.1	6.9	6.3	17.3	17.9	18.0
210.	12.1	12.3	8.0	6.6	6.2	15.6	16.0	17.0
220.	12.7	12.8	8.1	6.7	6.0	14.2	14.9	16.4
230.	13.2	13.5	8.3	6.7	5.8	13.3	14.2	16.0
240.	14.3	14.7	6.4	6.5	5.6	12.5	13.6	15.3
250.	15.9	16.4	8.6	6.1	5.3	11.6	12.5	15.1
260.	17.2	17.7	7.9	5.8	5.1	11.6	12.0	14.5
270.	13.9	14.2	6.0	5.1	5.0	11.6	11.7	12.7
280.	7.9	8.0	5.1	5.0	5.0	11.4	11.5	11.6
290.	5.8	5.5	5.0	5.0	5.0	10.7	11.3	11.3
300.	5.2	5.2	5.0	5.0	5.0	10.5	11.9	11.9
310.	5.2	5.2	5.0	5.0	5.0	10.2	12.5	12.5
320.	5.1	5.1	5.0	5.0	5.0	9.9	13.2	13.2
330.	5.1	5.1	5.0	5.0	5.0	9.7	14.4	14.4
340.	5.0	5.2	5.2	5.2	5.1	9.8	15.9	16.1
350.	5.1	7.4	7.3	6.9	6.2	9.8	16.7	17.6
360.	6.0	13.4	12.7	11.4	8.8	8.3	13.0	14.2
MAX	19.9	27.0	20.2	19.3	18.9	19.0	20.5	20.7
DEGR.	100	100	170	170	170	190	190	190

THE HIGHEST CONCENTRATION OF

DATE : 5/20/96
TIME : 10:31: 9

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 190	REC2 100	REC3 260	REC4 260	REC5 280	REC6 280	REC7 80	REC8 280	REC9 340	REC10 350	REC11 350	REC12 10	REC13 10	REC14 170	REC15 80	REC16 80	REC17 80	REC18 80	REC19 100	REC20 100
1	2.8	.0	.2	.2	.0	.1	.0	1.5	2.8	5.1	5.4	1.9	1.4	1.8	.9	.2	.1	.0	.2	.2
2	3.8	.0	.3	.3	.0	.1	.0	1.8	3.0	5.1	5.5	2.3	1.7	2.8	1.0	.2	.1	.0	.3	.3
3	4.7	.0	.4	.3	.1	.1	.0	1.4	2.3	4.0	4.7	3.9	3.1	4.1	1.8	.3	.1	.1	.3	.4
4	.5	.0	.1	.0	.0	.0	.0	.8	1.3	.1	.0	.0	.1	.0	.2	.1	.0	.0	.0	.1
5	2.4	.0	.2	.1	.3	.4	.0	.0	.7	.6	.3	.3	.8	.0	.1	.4	.3	.3	.1	.1
6	.0	.0	.0	.0	.1	.1	.0	.0	.5	.4	.2	.1	.3	.0	.0	.1	.1	.1	.0	.0
7	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.4	.4	.4	.2	.0	.0	.0	.0	.0
8	.0	.0	.1	.0	.3	.3	.0	.0	1.1	1.1	.6	.5	.9	.0	.0	.1	.3	.3	.0	.1
9	.0	.0	.0	.0	.0	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
10	.0	.0	.0	.0	.2	.2	.0	.0	.5	.4	.2	.2	.4	.0	.0	.1	.2	.2	.0	.0
11	2.3	.0	.3	.2	.1	.1	.0	1.3	1.0	1.7	2.2	4.7	4.4	4.6	2.1	.5	.1	.1	.2	.3
12	.0	.0	.6	.3	.2	.5	.0	2.5	.2	.2	.2	.0	.1	.0	.0	1.9	4.6	4.9	2.1	1.7
13	.0	.0	1.1	.6	.5	.9	.0	3.9	.3	.3	.3	.0	.1	.0	.0	2.2	5.3	5.7	2.8	2.2
14	.0	.0	.5	.2	.2	.5	.0	1.9	.2	.2	.1	.0	.0	.0	.0	.6	1.8	2.1	1.8	1.5
15	.0	.0	.1	.0	.0	.1	.0	.7	.1	.1	.1	.0	.0	.0	.0	1.3	.2	.1	.1	.3
16	1.1	1.6	1.5	1.9	4.5	4.1	4.4	1.7	.3	.1	.0	.2	.3	.0	3.1	1.2	.4	.2	.3	.6
17	1.8	4.6	6.0	6.5	2.8	2.1	2.7	.0	.1	.1	.0	.3	.3	.0	2.6	1.8	.7	.3	.3	.6
18	1.8	4.9	5.1	5.6	2.8	2.1	3.3	.0	.1	.1	.0	.3	.3	.0	3.1	2.3	1.0	.6	.5	.9
19	1.3	4.2	3.6	4.7	4.6	3.8	4.8	.0	.1	.1	.1	.3	.4	.0	4.3	2.4	1.0	.5	.5	1.0
20	.4	.2	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
21	.0	.0	.5	.2	.3	.7	.0	2.1	.5	.3	.2	.1	.1	.0	.0	.5	1.8	2.2	5.0	4.7

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DATE : 5/20/96
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RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 100	REC22 100	REC23 170	REC24 170	REC25 170	REC26 190	REC27 190	REC28 190
1	.2	.0	1.5	.6	.3	.2	.5	1.2
2	.2	.0	2.2	1.1	.6	.4	.8	1.7
3	.2	.0	2.5	1.1	.5	.5	1.0	2.4
4	.1	.0	.2	.1	.0	.0	.0	.2
5	.4	1.5	.6	1.7	2.2	6.0	5.7	4.7
6	.1	.9	1.3	2.0	2.3	1.4	1.1	.4
7	.0	.0	.1	.0	.0	.0	.1	.1
8	.2	1.9	2.4	4.1	4.6	3.0	2.3	.7
9	.1	.9	.5	.1	.0	.0	.1	.1
10	.1	.6	.6	1.5	1.9	2.0	1.7	.7
11	.3	.0	1.5	.5	.3	.3	.7	1.7
12	.5	.0	.2	.1	.0	.2	.2	.1
13	.6	.0	.2	.1	.0	.3	.3	.2
14	.6	.0	.1	.0	.0	.1	.2	.1
15	.1	.0	.1	.0	.0	.1	.1	.1
16	1.4	1.9	.3	.2	.2	.0	.1	.3
17	1.5	3.6	.1	.3	.3	.0	.1	.2
18	1.9	4.2	.1	.3	.3	.0	.1	.2
19	2.4	4.5	.2	.4	.3	.1	.1	.3
20	.1	.3	.0	.0	.0	.0	.0	.0
21	3.9	1.7	.5	.1	.1	.2	.3	.3

JOB: SR99 AND 188TH ST 2010 nut2 RUN: SR99 & 188TH ST. 2010 nut2

DATE : 5/20/96
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The MODE flag has been set to c for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 676. M AMB = 5.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. SR99 NB Approach	9.1	-306.2	9.1	-7.3	299.	360.	AG	2675.	28.3	.0	12.0		
2. SR99 NB Queue	9.1	-7.3	9.1	-1047.9	1041.	180.	AG	1041.	100.0	.0	6.0	1.52	173.4
3. SR99 NB Queue Left	3.1	-7.3	3.1	-449.5	442.	180.	AG	1344.	100.0	.0	6.0	1.47	73.7
4. SR99 NB Queue RT	13.5	-7.3	13.5	-58.7	51.	180.	AG	365.	100.0	.0	3.0	.45	8.6
5. SR99 NB Depart	8.1	-1.2	8.1	310.6	312.	360.	AG	2976.	28.3	.0	12.0		
6. SR99 SB ApproachTH	-3.3	310.6	-3.3	11.8	299.	180.	AG	1647.	28.3	.0	12.0		
7. SR99 SB ApproachRT	-7.6	-310.6	-7.6	11.8	322.	360.	AG	184.	28.3	.0	9.0		
8. SR99 SB Queue th	-3.3	11.8	-3.3	987.6	976.	360.	AG	1121.	100.0	.0	6.0	1.57	162.6
9. SR99 SB Queue RT	-7.6	11.8	-7.6	38.8	27.	360.	AG	392.	100.0	.0	3.0	.23	4.5
10. SR99 SB Queue Left	1.4	11.8	1.4	367.2	355.	360.	AG	721.	100.0	.0	3.0	1.67	59.2
11. SR99 SB Depart	-4.5	2.9	-4.5	-306.2	309.	180.	AG	2604.	28.3	.0	15.0		
12. 188 EB Approach	-306.5	-3.0	-9.3	-3.0	297.	90.	AG	2515.	28.3	.0	12.0		
13. 188 EB Queue th	-9.3	-3.0	-1058.6	-3.0	1049.	270.	AG	1059.	100.0	.0	6.0	1.54	174.9
14. 188 EB Queue Left	-9.3	1.4	-562.1	1.4	553.	270.	AG	672.	100.0	.0	3.0	1.61	92.1
15. 188 EB Queue RT	-9.3	-7.7	-85.7	-7.7	76.	270.	AG	369.	100.0	.0	3.0	.66	12.7
16. 188 EB Depart	.2	-4.3	308.7	-4.3	309.	90.	AG	2189.	28.3	.0	12.0		
17. 188 WB Approach	308.7	7.7	11.4	7.7	297.	270.	AG	3171.	28.3	.0	12.0		
18. 188 WB Queue th	11.4	7.7	1098.0	7.7	1087.	90.	AG	1086.	100.0	.0	6.0	1.60	181.1
19. 188 WB Queue Left	11.4	1.8	479.4	1.9	468.	90.	AG	1379.	100.0	.0	6.0	1.61	78.0
20. 188 WB Queue RT	11.4	12.2	72.1	12.2	61.	90.	AG	165.	100.0	.0	3.0	.79	10.1
21. 188 WB Depart	3.3	8.4	-306.5	8.4	310.	270.	AG	2423.	28.3	.0	12.0		

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ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. SR99 NB Queue	180	117	1.0	1620	1600	298.60	1	3
3. SR99 NB Queue Left	180	151	1.0	678	1800	298.60	1	3
4. SR99 NB Queue RT	180	82	1.0	376	1600	298.60	1	3
8. SR99 SB Queue th	180	126	1.0	1425	1600	298.60	1	3
9. SR99 SB Queue RT	180	88	1.0	184	1600	298.60	1	3
10. SR99 SB Queue Left	180	162	1.0	222	1600	298.60	1	3
13. 188 EB Queue th	180	119	1.0	1591	1600	298.60	1	3
14. 188 EB Queue Left	180	151	1.0	372	1600	298.60	1	3
15. 188 EB Queue RT	180	83	1.0	552	1600	298.60	1	3
18. 188 WB Queue th	180	122	1.0	1560	1600	298.60	1	3
19. 188 WB Queue Left	180	155	1.0	626	1600	298.60	1	3
20. 188 WB Queue RT	180	37	1.0	985	1600	298.60	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. REC 1 NB1	14.5	17.5	1.8
2. REC 2 NB2	55.0	17.5	1.8
3. REC 3 NB3	155.0	14.5	1.8
4. REC 4 NB4	300.0	14.5	1.8
5. REC 5 NB5	300.0	-11.0	1.8
6. REC 6 NB6	155.0	-11.0	1.8
7. REC 7 NB7	55.0	-11.0	1.8
8. REC 8 NB1	19.0	-11.0	1.8
9. REC 9 NB2	19.0	-61.0	1.8
10. REC10 NB3	15.5	-161.0	1.8
11. REC11 NB4	15.5	-300.0	1.8
12. REC12 NB5	-13.0	-300.0	1.8
13. REC13 NB6	-13.0	-161.0	1.8
14. REC14 NB7	-13.0	-61.0	1.8
15. REC15 EB1	-13.0	-13.0	1.8
16. REC16 EB2	-63.0	-13.0	1.8
17. REC17 EB3	-163.0	-9.5	1.8
18. REC18 EB4	-300.0	-9.5	1.8
19. REC19 EB5	-300.0	15.0	1.8
20. REC20 EB6	-163.0	15.0	1.8
21. REC21 EB7	-63.0	15.0	1.8
22. REC22 SB1	-13.0	15.0	1.8
23. REC23 SB2	-13.0	65.0	1.8
24. REC24 SB3	-13.0	165.0	1.8
25. REC25 SB4	-13.0	300.0	1.8
26. REC26 SB5	14.5	300.0	1.8
27. REC27 SB6	[illegible]		

JOB 9 AND 188TH ST 2010 nut2 RUN: SR9: .88TH ST. 2010 nut2

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	15.2	6.4	5.1	5.0	13.5	13.6	15.1	20.3	16.6	21.1	21.9	17.1	16.7	16.5	21.7	13.7	13.1	12.9	5.0	5.1
10.	8.5	5.1	5.0	5.0	13.2	13.3	13.6	15.1	10.6	11.6	11.5	21.0	20.6	18.4	23.7	15.6	13.4	13.0	5.1	5.5
20.	5.7	5.0	5.0	5.0	12.8	13.4	13.6	13.7	8.8	7.9	7.3	19.2	19.3	18.2	19.2	16.4	14.0	13.4	5.4	6.1
30.	5.3	5.0	5.1	5.0	12.4	13.8	13.9	14.0	8.8	7.4	6.7	17.2	17.8	18.5	15.0	16.6	14.8	13.8	5.6	6.6
40.	5.2	5.0	5.1	5.1	12.2	14.3	14.4	14.5	8.9	7.4	6.6	16.0	16.8	18.6	13.3	16.7	15.9	14.8	5.9	6.9
50.	5.2	5.0	5.2	5.1	12.3	15.4	15.4	15.6	9.2	7.5	6.3	14.8	16.0	18.4	13.8	17.4	16.6	16.0	6.1	6.9
60.	5.1	5.0	5.2	5.1	12.5	16.6	16.6	16.8	9.5	7.2	5.8	14.0	15.3	18.0	16.5	18.4	17.9	17.4	6.3	6.9
70.	5.2	5.2	5.8	5.3	13.3	18.8	18.9	19.0	9.8	6.5	5.4	13.0	14.2	17.9	21.1	19.8	20.3	19.7	6.5	6.9
80.	8.3	8.1	9.6	7.6	13.2	19.4	20.4	20.6	8.7	5.6	5.1	12.8	13.4	17.0	24.8	21.6	23.7	23.1	9.6	10.3
90.	16.5	16.0	18.6	13.1	10.3	14.7	15.8	16.1	6.3	5.1	5.0	12.7	13.0	14.4	22.1	17.9	21.1	20.4	17.2	17.4
100.	21.2	20.5	23.4	16.5	6.4	7.9	8.3	8.4	5.1	5.0	5.0	12.2	12.7	12.8	18.6	11.0	12.0	11.3	19.6	20.3
110.	19.6	19.3	21.5	15.8	5.2	5.5	5.5	5.5	5.0	5.0	5.0	11.4	12.6	12.6	13.2	8.9	7.6	7.1	17.2	18.1
120.	17.7	17.5	18.9	14.8	5.1	5.2	5.2	5.2	5.0	5.1	5.0	11.2	13.1	13.1	13.5	8.6	7.3	6.7	15.7	16.2
130.	16.4	16.2	17.4	14.5	5.1	5.1	5.1	5.1	5.0	5.2	5.0	10.9	13.7	13.7	14.1	8.9	7.3	6.5	14.6	15.3
140.	15.4	15.1	16.2	14.3	5.1	5.1	5.1	5.1	5.0	5.2	5.0	11.0	14.6	14.6	15.0	9.1	7.4	6.1	13.4	14.7
150.	14.7	14.5	15.4	14.4	5.0	5.1	5.1	5.1	5.0	5.3	5.0	11.3	15.8	15.8	16.1	9.5	7.0	5.7	12.4	13.9
160.	15.2	14.1	15.0	14.5	5.0	5.0	5.0	5.3	5.3	6.0	5.4	11.7	17.4	17.7	17.9	9.6	6.3	5.4	11.8	12.7
170.	19.7	14.3	14.9	14.8	5.0	5.0	5.3	8.2	7.9	9.5	7.5	11.4	17.9	19.1	19.4	8.4	5.6	5.1	11.6	12.1
180.	28.4	16.2	15.2	15.0	5.0	5.1	7.1	16.1	14.9	17.9	12.6	8.7	13.2	14.5	15.1	6.1	5.1	5.0	11.5	11.7
190.	28.5	19.1	18.7	15.0	5.1	5.7	9.9	20.9	19.5	22.6	15.7	8.7	7.4	7.8	8.0	5.1	5.0	5.0	11.1	11.5
200.	20.8	20.2	16.7	15.4	5.4	6.5	10.7	19.7	18.3	21.2	15.3	8.0	5.4	8.4	5.5	5.0	5.0	5.0	10.5	11.9
210.	15.5	20.1	17.7	16.1	5.8	7.3	10.6	17.8	16.5	18.6	14.3	8.0	5.2	5.2	5.2	5.0	5.1	5.0	10.3	11.8
220.	13.3	20.3	18.8	17.5	6.1	7.5	10.1	16.4	15.2	17.2	13.6	8.0	5.1	5.1	5.1	5.0	5.1	5.0	9.9	12.4
230.	13.6	20.1	19.7	18.9	6.4	7.4	9.8	15.4	14.3	16.1	13.4	8.0	5.1	5.1	5.1	5.0	5.2	5.0	9.9	13.2
240.	15.8	20.2	21.2	20.5	6.7	7.4	9.8	14.8	13.8	15.3	13.4	8.0	5.1	5.1	5.1	5.0	5.2	5.0	10.0	14.1
250.	19.1	20.2	23.8	23.3	7.0	7.6	9.9	15.0	13.5	14.9	13.8	8.0	5.0	5.0	5.2	5.2	5.8	5.4	10.4	15.8
260.	21.7	20.2	26.0	26.1	10.1	10.6	12.4	18.0	13.5	14.7	14.4	8.0	5.0	5.1	7.9	7.6	9.1	7.4	10.8	16.5
270.	19.6	16.1	21.1	21.7	18.3	17.8	18.1	24.6	14.8	14.9	14.7	8.0	5.1	6.2	14.7	13.9	16.2	12.0	8.8	13.0
280.	14.1	10.1	11.5	11.3	21.9	21.6	19.5	24.8	16.9	15.4	14.8	8.1	5.7	8.2	18.6	17.5	19.9	13.9	6.0	7.5
290.	12.1	8.2	7.3	7.0	19.7	20.0	17.9	18.8	17.9	16.2	15.3	8.4	6.3	8.7	17.4	16.9	18.1	12.9	5.1	5.4
300.	12.5	8.2	6.9	6.3	17.7	18.3	18.3	16.9	18.2	17.1	16.0	8.8	6.7	8.7	15.7	15.5	16.3	12.1	8.0	8.2
310.	12.9	8.3	6.9	6.2	16.5	17.1	18.5	13.2	18.7	17.9	16.9	8.9	6.8	8.7	14.5	14.4	16.9	11.6	8.0	8.2
320.	13.7	8.7	7.1	5.7	15.1	16.3	18.2	14.3	19.4	18.9	18.2	8.1	6.8	8.4	13.6	13.5	13.9	11.5	5.0	8.1
330.	14.7	8.9	6.7	5.6	14.3	15.5	17.9	16.9	19.8	20.5	20.0	8.4	6.9	8.5	13.1	13.0	13.3	11.8	5.0	5.1
340.	16.6	9.2	6.2	5.4	13.7	14.6	17.8	20.2	20.6	22.8	22.6	8.6	7.1	8.4	13.1	12.7	12.9	12.1	5.0	5.0
350.	18.5	8.6	5.6	5.1	13.5	13.9	17.1	22.7	20.2	25.7	25.7	9.2	9.8	10.8	15.3	12.7	12.8	12.6	5.0	5.0
360.	15.2	6.4	5.1	5.0	13.5	13.6	15.1	20.3	16.6	21.1	21.9	17.1	16.7	16.5	21.7	13.7	13.1	12.9	5.0	5.1
MAX	28.5	20.5	26.0	26.1	21.9	21.6	20.4	24.8	20.6	25.7	25.7	21.0	20.6	19.1	24.8	21.6	23.7	23.1	19.6	20.3
DEGR.	190	100	260	260	280	280	80	280	340	350	350	10	10	170	80	80	80	80	100	100

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JOB 9 AND 188TH ST 2010 nut2 RUN: SR9: .88TH ST. 2010 nut2

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	6.1	13.8	13.0	12.1	9.2	8.9	13.7	14.8
10.	7.8	17.4	16.6	15.6	10.9	6.2	7.9	8.4
20.	8.7	16.8	15.6	15.4	10.5	5.3	5.6	5.7
30.	8.7	15.4	14.1	14.1	10.6	5.2	5.3	5.3
40.	8.4	14.4	13.1	13.1	10.4	5.2	5.2	5.2
50.	8.1	13.6	12.3	12.3	10.5	5.2	5.2	5.2
60.	8.1	13.1	11.9	11.9	10.8	5.1	5.1	5.1
70.	8.7	13.4	11.7	11.7	11.2	5.0	5.0	5.0
80.	11.8	17.2	11.7	11.6	11.4	5.0	5.0	5.1
90.	18.7	25.8	13.3	11.7	11.6	5.0	5.1	6.6
100.	20.2	27.4	15.8	12.3	11.8	5.1	5.7	8.9
110.	17.8	20.8	16.8	13.4	12.1	5.4	6.4	10.1
120.	17.3	16.0	16.7	14.2	12.7	5.8	7.2	9.8
130.	17.6	13.8	16.6	14.7	13.5	6.3	7.6	9.6
140.	17.0	14.0	16.7	15.4	14.5	6.6	7.5	9.1
150.	16.8	16.2	17.6	16.1	15.6	6.8	7.4	9.2
160.	16.5	19.9	18.6	17.8	17.2	7.1	7.7	9.5
170.	15.5	23.4	20.5	19.8	19.1	10.4	11.1	13.1
180.	13.3	20.7	16.9	16.6	16.3	10.2	10.8	20.3
190.	12.0	14.4	10.4	9.2	9.0	20.3	20.9	21.0
200.	11.7	12.0	8.1	6.9	6.4	17.7	18.2	18.3
210.	12.2	12.3	8.1	6.6	6.2	15.9	16.3	17.3
220.	12.7	12.9	8.1	6.7	6.0	14.5	15.2	16.7
230.	13.4	13.7	8.4	6.7	5.8	13.4	14.3	16.2
240.	14.4	14.8	8.5	6.7	5.7	12.8	13.8	15.7
250.	15.9	16.3	8.7	6.2	5.4	12.0	12.7	15.3
260.	17.3	17.8	9.0	5.6	5.1	11.8	12.3	14.8
270.	14.1	14.4	6.1	5.1	5.0	11.9	12.0	13.1
280.	7.9	8.0	5.1	5.0	5.0	11.6	11.7	11.8
290.	5.5	5.5	5.0	5.0	5.0	11.4	11.5	11.5
300.	5.2	5.2	5.0	5.0	5.0	11.6	12.1	12.1
310.	5.2	5.2	5.0	5.0	5.0	11.4	12.6	12.6
320.	5.1	5.1	5.0	5.0	5.0	11.4	13.5	13.5
330.	5.1	5.1	5.0	5.0	5.0	11.3	14.7	14.7
340.	5.0	5.2	5.2	5.2	5.1	11.4	16.3	16.5
350.	5.1	7.4	7.3	7.0	6.2	11.0	17.2	18.1
360.	6.1	13.8	13.0	12.1	9.2	8.9	13.7	14.8
MAX	20.2	27.4	20.5	19.8	19.1	20.3	20.9	21.0

DATE : 5/20/96
TIME : 10:31:31

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	190	100	260	260	280	280	80	260	340	350	350	10	10	170	80	80	80	80	100	100
1	2.9	.0	.3	.2	.0	.1	.0	1.6	2.9	5.3	5.7	2.0	1.5	1.9	.9	.2	.1	.0	.2	.3
2	4.0	.0	.3	.3	.0	.1	.0	1.9	3.1	5.2	5.6	2.3	1.7	2.9	1.0	.2	.1	.0	.3	.3
3	4.7	.0	.4	.3	.1	.1	.0	1.4	2.3	4.0	4.7	3.9	3.1	4.1	1.8	.3	.1	.1	.3	.4
4	.5	.0	.1	.0	.0	.0	.0	.8	1.4	.1	.0	.1	.2	.0	.2	.1	.0	.0	.0	.1
5	2.5	.0	.2	.1	.3	.4	.0	.0	.7	.6	.3	.4	.8	.0	.1	.4	.4	.3	.1	.1
6	.0	.0	.0	.0	.1	.2	.0	.0	.5	.4	.2	.2	.3	.0	.0	.1	.2	.1	.0	.0
7	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.4	.4	.4	.2	.0	.0	.0	.0	.0
8	.0	.0	.1	.0	.3	.3	.0	.0	1.1	1.1	.6	.5	1.0	.0	.0	.1	.3	.3	.0	.1
9	.0	.0	.0	.0	.0	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
10	.0	.0	.0	.0	.2	.2	.0	.0	.5	.5	.2	.2	.5	.0	.0	.1	.2	.2	.0	.0
11	2.4	.0	.3	.2	.1	.1	.0	1.3	1.0	1.8	2.3	4.9	4.5	4.8	2.2	.6	.1	.1	.2	.3
12	.0	.0	.6	.3	.2	.5	.0	2.6	.2	.2	.2	.0	.1	.0	.0	2.0	4.9	5.3	2.2	1.8
13	.0	.0	1.1	.6	.5	.9	.0	3.8	.3	.3	.3	.0	.1	.0	.0	2.2	5.2	5.7	2.8	2.2
14	.0	.0	.5	.3	.2	.5	.0	1.9	.2	.2	.1	.0	.0	.0	.0	.6	1.8	2.1	1.8	1.5
15	.0	.0	.1	.0	.0	.1	.0	.6	.1	.1	.1	.0	.0	.0	.0	1.2	.2	.1	.1	.3
16	1.1	1.6	1.5	1.9	4.5	4.2	4.4	1.7	.3	.1	.0	.2	.3	.0	3.1	1.3	.4	.2	.3	.6
17	1.8	4.5	5.9	6.4	2.7	2.1	2.6	.0	.1	.1	.0	.2	.3	.0	2.6	1.8	.7	.3	.3	.6
18	1.8	4.9	5.1	5.6	2.8	2.1	3.4	.0	.1	.1	.0	.3	.3	.0	3.2	2.3	1.1	.6	.5	.9
19	1.3	4.3	3.9	4.7	4.6	3.8	5.0	.0	.1	.1	.1	.3	.4	.0	4.4	2.5	1.0	.5	.5	1.1
20	.4	.2	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
21	.0	.0	.5	.2	.3	.7	.0	2.1	.5	.3	.2	.1	.1	.0	.0	.5	1.8	2.2	5.0	4.7

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DATE : 5/20/96
TIME : 10:31:31

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
	100	100	170	170	170	190	190	190
1	.2	.0	1.8	.7	.3	.2	.5	1.2
2	.2	.0	2.3	1.1	.6	.5	.8	1.8
3	.2	.0	2.5	1.1	.5	.5	1.0	2.4
4	.1	.0	.2	.1	.0	.0	.1	.2
5	.5	1.6	.6	1.8	2.3	6.3	5.9	4.9
6	.1	.9	1.4	2.2	2.4	1.5	1.2	.4
7	.0	.0	.1	.0	.0	.0	.1	.1
8	.2	1.9	2.4	4.1	4.6	3.0	2.3	.7
9	.1	.9	.5	.1	.0	.0	.1	.1
10	.1	.6	.6	1.5	1.9	2.0	1.7	.7
11	.3	.0	1.6	.6	.3	.3	.7	1.7
12	.6	.0	.2	.1	.0	.2	.2	.1
13	.6	.0	.2	.1	.0	.3	.3	.2
14	.6	.0	.1	.0	.0	.1	.2	.1
15	.1	.0	.1	.0	.0	.1	.1	.1
16	1.4	1.9	.3	.2	.2	.0	.1	.3
17	1.5	3.6	.1	.3	.3	.0	.1	.2
18	1.9	4.3	.1	.3	.3	.0	.1	.2
19	2.5	4.7	.2	.4	.3	.1	.1	.3
20	.1	.3	.0	.0	.0	.0	.0	.0
21	3.9	1.7	.5	.1	.1	.2	.3	.3

REVISED TRAFFIC ANALYSIS FOR AIR QUALITY CONFORMITY REVIEW OF SEA-TAC MASTER PLAN UPDATE

prepared for
THE AIRPORT COMMUNITIES COALITION

by

SMITH Engineering & Management

JUNE 5, 1996

INTRODUCTION AND EXECUTIVE SUMMARY

We have reviewed the ground transportation related elements of the *Sea-Tac Airport Master Plan Final EIS* and the related documents and data provided by the Federal Aviation Administration (FAA). In our review, we have discovered a number of fundamental flaws which affect the ground traffic analysis and, as a consequence, the air quality conformity analysis.

- There is a substantial inconsistency between the treatment of the Do Nothing Alternative and the North Unit Terminal Alternative (the "Preferred Alternative" in the FEIS) in the encoding of the Traffix forecast model for year 2010. (Traffix is the simulation model used to predict and analyze traffic and provide input to the air quality conformity analysis (the CAL3QHC model)). The nature of the inconsistencies in treatment in the Traffix model bias the outcome in favor of the North Unit Terminal Alternative and to the disadvantage of the Do Nothing Alternative. The nature of the inconsistencies are documented in detail subsequently herein. In response to this issue, we have prepared an updated North Unit Terminal Traffix analysis which attempts to bring consistent treatment to the assessment of the North Unit Terminal Alternative and the Do Nothing Alternative. The results of this effort are described below. It should be noted that although we have attempted to eliminate the largest biasing inconsistencies, time has precluded us from addressing many of the smaller ones. A completely consistent treatment would result in an even less favorable representation of the North Unit Terminal Alternative relative to the Do Nothing Alternative than our analysis presents.

- A primary cause of the difference in traffic performance between the North Unit Terminal Alternative and the Do Nothing Alternative in the FEIS and air quality conformity analysis is the inclusion of a connector road between the existing terminal and the intersection of S. 188th Street with 28th Avenue S. in the North Unit Terminal Alternative (but not as part of the Do Nothing Alternative). Documentation from the Port of Seattle Commission Agenda for the meeting of 3-12-96, Item 8b, (comprised of a memorandum from Doug Holbrook, Mike Ehl and Walter Ritchie to M.R. Dinsmore along with attached engineering reports by Tudor Engineering, P&D Consultants and ICF Kaiser) addresses the subject of this south access road. That documentation makes clear that the Port of Seattle is actively considering this south access roadway in response to existing traffic problems at the existing terminal. There is nothing in the nature of this proposed south access that would make it a feature or asset exclusive to the North Unit Terminal Alternative. An objective traffic analysis for year 2010 would have included this south access road as an element of both the Do Nothing and North Unit Terminal Alternatives. We have prepared a revised 2010 Do Nothing Traffix forecast which includes the south access as part of the Do Nothing street system. These results are also shown below.

- The basic reason for undertaking the proposed SEA-TAC airport project, according to the FEIS, is because under the existing runway configuration adverse weather conditions impair inbound aviation operations about 44 percent of the time. During adverse weather, according to the FEIS, landing capacity is reduced at least 20 percent

(often 40 or 60 percent). Without commenting at this point on the FEIS contention that the same number of air passengers would be served regardless of weather impairment - the consequence is just delay - we note that it is undeniable that in the pm peak commute hour, under conditions of weather impaired flight operations, the numbers of arriving air passengers released onto the ground traffic system would be reduced by at least 20 percent. When a condition that is substantially different from normal occurs as frequently as 44 percent of the time, it should be analyzed as a separate case in an EIS. The fact that the Do Nothing case would have considerably less traffic than "normal" nearly half the time is of particular significance in the air quality analysis where the frequency of violation is a key element. We have prepared an assessment of the Do Nothing alternative traffic for year 2010 under conditions where weather impaired flight operations reduce the numbers of pm peak hour arriving air passengers departing the Airport complex on ground transportation vehicles by at least 20 percent. These results are also presented below.

- The entire FEIS analysis has been based upon the premise that the number of air passengers and the number of airport employees operating the facility would be essentially identical under the North Unit Terminal and Do Nothing Alternatives. This premise is unsustainable. An alternative involving more gate positions unquestionably would involve more ground crews, more gate attendants, more security personnel, more concessionaires, more janitors and the like. This was not taken into account in the FEIS. We have taken EPA comments on the DEIS into consideration, as well as forecast estimates by Dr. Clifford Winston[1] which indicate that the difference in air passenger activity between the North Unit Terminal and Do Nothing Alternatives could be as great as 33 percent. Moreover, if increased air operations capacity is provided and the probability of a high frequency of weather-induced delay is eliminated, the air carriers are likely to schedule more of their service in the peak periods when people naturally want to travel. All of the foregoing elements would tend to cause greater peak hour ground traffic in the North Unit Terminal case than in the Do Nothing case. None of these clear differences between the North Unit Terminal and Do Nothing Alternatives have been addressed in the FEIS or air quality conformity work. In response, we have prepared an alternative North Unit Terminal forecast involving a 30 percent increase in peak period passenger traffic, a corresponding increase in service personnel and a lesser increase in air cargo and maintenance operations at the airport. Results of that forecast are also summarized below.

- The intersections selected by the FAA for air quality analysis using the CAL3QHC model are intended to be indicators for how the airport alternatives affect air quality at similar intersections throughout the area affected by a substantial volume of airport traffic. The selected locations are all in the Highway 99 (International Boulevard) corridor at its intersections with S. 160th, 170th, 188th and 200th Streets. If one examines the locations of these intersections with respect to the configuration of the street networks under the Do Nothing and North Unit Terminal Alternatives, it is obvious that the particular "indicator" intersections selected are clustered in a corridor that is a prime airport access corridor under the Do Nothing Alternative but is a de-emphasized corridor with the North Unit Terminal Alternative. The North Unit Terminal Alternative completely eliminates the connection between Highway 99 and the airport at S. 170th Street, limits access from Highway 99 to the terminal just north of S. 188th street to one way only (both these accesses are fully open in the Do Nothing Alternative) and adds a south access to S. 188th Street at 28th Avenue S. (not included in the FEIS version of the Do Nothing Alternative). This south access allows much traffic to bypass the air quality assessment intersections of Highway 99 with S. 188th and S. 200th Streets. Including the south connection in the Do Nothing Alternative (as we have done) provides a more representative comparison of traffic and air quality effects at the designated indicator intersections. However, adding other intersections to the air quality analysis is necessary to provide an objective assessment. The FEIS and the present conformity analysis examined only intersections along a route where it could have been predicted (without ever running a traffic forecast model) that, given the way the 2010 street networks were defined for the FEIS, the North Unit Terminal Alternative would show an advantage. We have provided analysis for the intersection of Military Road and S. 188th Street as an example of what an objective, broader-seeking analysis would have found. This analysis has been input to the CAL3QHC procedure.

[1] Dr. Clifford Winston, Evaluation of the FAA's Forecasts of Traffic at Sea-Tac Airport (Mar. 15 1996).

SUMMARY OF UPDATED ANALYSIS FINDINGS

FAA provided computer disc copies of the actual Traffix model input, command and output files that are the product of the traffic analysis for and basis for the traffic findings in the FEIS and input to the CAL3QHC air quality analysis. Our scrutiny of these files led to identification of many of the issues of concern cited above. We then loaded the Traffix files provided by FAA on our own licensed copy of the Traffix software, made modifications to the input data structure addressing most of the concerns expressed above and executed revised forecast/analysis runs for some of the alternatives and forecast years.

Table 1 summarizes key findings of our analysis for the year 2010, presenting vital peak period traffic performance data including volume to capacity relationship (vol/cap) and average delay per vehicle (in seconds) for the four air quality indicator intersections specified in the FEIS plus the intersection of Military Road and S. 188th Street. Comparison of the information on the table leads to the following conclusions:

- In its comparative assessment of North Unit Terminal and Do Nothing traffic in the FEIS, FAA's analysis showed North Unit Terminal traffic performance to be superior by large margins at all four of the intersections selected for air quality study (compare columns 1 and 4 for the top four intersections). The results of our independent analysis show that the uniform and clear superiority indicated by FAA in the FEIS no longer prevails when consistent treatments are applied in encoding the alternatives in the Traffix model or when the potential differential in air traffic activity inherent in the two alternatives is considered.

- With consistent forecasting assumptions (relative to those used with the Do Nothing Alternative) regarding trip generation rates, origin-destination patterns, off-site parking by air travelers and baseline traffic, the traffic performance of the North Unit Terminal Alternative is considerably inferior to that represented in the FEIS (compare data in

columns 4 and 5 in Table 1). On all 5 intersections the column reflecting consistent assumptions and encoding shows North Unit Terminal performance considerably inferior to that represented in the FEIS.

- With consistent forecasting assumptions, comparison of the 2010 North Unit Terminal Alternative (S-NUT 1) to the FEIS Do Nothing shows virtually equal performance (compare data in columns 1 and 5). Each alternative has two intersections operating at conditions clearly superior to the other and the fifth has virtually indistinguishable performance. This result is in sharp contrast to the original FEIS results which portrayed the North Unit Terminal as superior in all cases.

- If the assumption is made that the North Unit Terminal would attract a moderately higher level of peak hour activity than the Do Nothing and had higher levels of staffing to service that higher activity and the increased gate positions and physical area of the North Unit Terminal Alternative, the results would be as indicated in column 6 of Table 1 (S-NUT 2). Traffic performance for the Do Nothing Alternative as defined in the FEIS (column 1 on the table) would be clearly superior to the North Unit Terminal Alternative (column 6) at four of the five intersections and essentially equivalent at the fifth.

- If conditions of weather impairment to arriving flights is considered, the Do Nothing would have superior traffic performance at four of the five intersections and essentially equal performance at the fifth compared to the North Unit Terminal Alternative under consistent model assumptions (compare column 3 with column 5). If the North Unit Terminal Alternative is assumed to have moderate increases in passengers and corresponding employment over the Do Nothing, the comparison (column 3 with column 6) shows the Do Nothing to have superior traffic performance over the North Unit Terminal at all five locations. Under the Do Nothing configuration when weather conditions result in 40 percent and 60 percent impairment of arriving flights, the results of this comparison would be even more significantly in favor of the Do Nothing alternative. (We have run such versions of the model; the detailed results are not presented in Table 1 for simplicity).

- If the Do Nothing analysis for 2010 had included the south connection to the terminal, the comparison between the Do Nothing and North Unit Terminal cases would have been even more favorable to the Do Nothing (compare others to S-DN, column 2 in the table).

BACKGROUND DETAILS ON THE REVISED ANALYSIS

The foregoing presented a summary of our analysis in the SEA-TAC matter. This section provides a more detailed discussion of the problems we identified in the FEIS analysis and a description of how we compensated for them in our revised analysis.

Inconsistent Treatments

There are a number of significant inconsistencies in the forecast modeling treatment of ground transportation alternatives in the FEIS which unreasonably bias the results in favor of the "Preferred" North Unit Terminal Alternative as compared to the "Do Nothing" Alternative. Since the output of the ground traffic analysis is a fundamental input to the air quality analysis, these biases would carry over to the air quality analysis comparisons of the North Unit Terminal and Do Nothing Alternatives and could lead to incorrect conclusions regarding air quality conformity assessments. In our analysis we have attempted to rectify the effects of the following instances or types of inconsistency in the FEIS work.

1. The FEIS ground traffic analysis makes inconsistent assumptions between the Do Nothing and North Unit Terminal Alternative about the traffic generating characteristics of certain airport related activities. It also makes inconsistent and unusual assumptions about air passenger use of off-site parking. The result of these inconsistent assumptions is that the North Unit Terminal Alternative is said to generate less traffic than the Do Nothing Alternative The FEIS projects 10027 pm peak hour trips in August, 2020, for the North Unit Terminal versus 11081 for the Do Nothing. That is, the FEIS projects the Do Nothing would generate 1059 more peak hour trips! Because 2816 of the trip total are attributable to non-airport activities near the airport (for example, the Federal Detention Center), the actual difference reflects a counterintuitive assumption that somehow the Do Nothing Alternative would generate about 15 percent more trips than the North Unit Terminal project. This seems completely implausible since the FEIS has asserted that passenger totals would be identical and since the larger complex (the North Unit Terminal) would obviously need a larger work force of ground crews, gate crews, check in attendants, security personnel, janitorial and maintenance personnel and the like.

More of the Do Nothing Alternative's traffic is said to originate at the off-site parking lots which are in close proximity to the intersections which have been selected by the FEIS preparers as the indicator intersections for the air quality conformity assessment. Both these assumptions bias the assessments of ground transportation impacts and air quality conformance in a manner which favors the North Unit Terminal Alternative. Specific elements of inconsistency include the following:

- Physical changes in the airport configuration under the North Unit Terminal Alternative would increase the number of maintenance employees located at the South Airport Services Area (SASA) from 1651 with the Do Nothing Alternative (DN) to 2200 with the North Unit Terminal Alternative (NUT). Yet by assuming a different rate at which employees would make trips during the peak period, the FEIS preparers make the contra-intuitive assertion that SASA with 2200 maintenance employees in NUT would generate 86 fewer trips than it would in DN with only 1651 employees. (This assertion is made both for forecast years 2010 and 2020.) If the trip generation rate used for the DN been applied consistently with the NUT, this unit would generate 88 more trips with NUT than with DN. There is no inherent feature of the NUT alternative which would justify use of a different peak period tripmaking rate for these employees. Hence, this rate change must be viewed as an arbitrary one biasing the analysis in favor of the Preferred Alternative. We have used a single consistent rate for both cases in our analysis.

- A similar inconsistency is evident in the accounting of ground tripmaking for other activity in SASA. Despite the fact that the NUT Alternative intensifies the land uses in SASA as compared to DN, the FEIS traffic analysis shows pm peak non-maintenance-employee tripmaking for SASA is 655 less for the NUT than DN in 2010 and 141 less for NUT than DN in year 2020. No explanation is offered to justify this

counterintuitive result which obviously tends to bias the ground traffic and air quality analyses in favor of the Preferred NUT Alternative.[2] We have assumed consistent employment in this area in our revised analysis.

- The FEIS ground transportation analysis of the DN alternative for years 2010 and 2020 assumes that a substantial degree of off-site parking by air travelers will take place at a number of sites in the Highway 99/International Boulevard corridor. In the analysis of the NUT for years 2010 and 2020, the FEIS assumes that a high percentage of those who would park off-site in the DN alternative will be attracted into the airport terminal parking facilities. This assumption is contrary to well understood behavior patterns. Most people who park off site at major airports do so because parking off site is considerably less expensive than in the terminal; not because terminal parking is unavailable. So increased availability of terminal parking space in the NUT alternative is not likely to alter behavior and attract parkers who favor less expensive off-site parking.

  The off-site parking lots used by air passengers are located in the Highway 99 corridor. This is the corridor where the indicator intersections selected by the FAA for evaluation in the air quality analysis are located. The assumption that many fewer air travelers would park at off-site lots in the North Unit Terminal case than in the Do Nothing case has the effect of keeping a proportional amount of North Unit Terminal traffic away from the air quality assessment intersections. It appears that the assumption of less off-site parking in the North Unit Terminal alternative may have been driven by a desire to influence conditions at the air quality assessment intersections in favor of the North Unit Terminal alternative (by having less traffic in the Highway 99 corridor) rather than by any realistic appraisal of traveler motivation in use of off-site parking.

  Moreover, in the 2010 analysis, in carrying out this shift of parking related traffic to shield it from the air quality evaluation points, the FEIS traffic analysis apparently miscalculates its projection of vehicles carrying air passengers accessing and egressing the terminal area. Although the FEIS asserts the number of air passengers arriving and departing in the peak hour would be equal under the DN and NUT schemes, and although the FEIS assumes 166 peak hour vehicle trips by air passengers who park off-site in the DN Alternative would be drawn into the terminal in the NUT scheme, the traffic analysis inexplicably asserts there would be 109 fewer air passenger vehicles to and from the terminal with the NUT Alternative than with the DN Alternative (4594 versus 4803). This apparent error also tends to bias the transportation and air quality analysis in favor of the NUT Alternative. In our revision to the analysis we have assumed that consistent numbers of terminal patrons would use the off-site parking in the Highway 99 corridor and that consistent amounts of ground traffic would be generated by air passengers at the terminal under both alternatives.

[2] Appendix O-B to the FEIS does explain that, subsequent to the publication of the DEIS, the Port Of Seattle was able to obtain new information on airport employee trip generation and that this information was used in preparation of the FEIS. However, it does not explain why the new and more favorable (lower) rate information was applied in the North Unit Terminal case but not in the Do Nothing case.

2. The encoding of route choices that travelers between airport activity areas and regional locations are predicted to use and the assumptions regarding the percentages of airport tripmaking between various airport activity stations and specific locations in the region and the encoding of base traffic volumes are inconsistent between the NUT and DN alternatives in the FEIS analysis. The nature of the inconsistencies are such as to bias the traffic and air quality analyses in favor of the North Unit Terminal Alternative in comparison to the Do Nothing.

To understand the points being made here, it is necessary to understand the nature of the "Traffix" traffic forecasting and analysis software. Most forecasting software projects the way traffic will spread itself over the street and highway system in traveling from one given point to another through an optimizing algorithm. In such procedures, the computer allocates traffic over the most plausible routes in an iterative process, considering distance, travel time, congestion and other factors. The Traffix model is one of a different class of forecasting programs in which the human user specifies the route or routes traffic will follow through a street and highway system in moving from one given point to another. The computer just does the bookkeeping on the traffic assignments that the human analyst tells it to make. In such user specified assignment programs, the objectivity of comparisons between alternatives is heavily dependent on (or biased by) the understanding, judgement, preferences or biases, habits, penchant for detail and consistency of the human analyst. Where more than one analyst is involved in the work, the objectivity of comparisons between alternatives is further dependent on (or compromised by) the degree of consistency between two or even several human analysts on all of the above characteristics. This type of forecast procedure is readily subject to deliberate human intervention with nuances of internal model details to make one particular alternative emerge seeming to perform in a manner superior to another.

The SEA-TAC project and analysis area is an extremely large one to be analyzed using forecasting methods typified by the Traffix software. The analysis involves large numbers of alternatives. It has been carried out over a lengthy period of time during which the alternatives were doubtless refined and rerun several times. The scale of this forecast model, the large number of alternatives and the duration of the analysis creates a degree of complexity where there is extensive opportunity for unintentional inconsistency in decisionmaking by the human analyst or analysts, to say nothing of direct intervention to advance the relative performance of a particular alternative.

Here is a hypothetical example of one type of subtle difference in encoding of the Traffix model that could accentuate marginal distinctions or blur large distinctions in the traffic performance of alternatives. Assume that four different analysts encode "Traffix" paths between the same two points.

Analyst 1 encodes a single path, the most direct route between the two points and that 100 percent of the trips between them will use it.

Analyst 2 encodes 2 paths, the most direct one and the next most logical route and that 75 percent of the trips will use the most direct route; 25 percent the other one.

Analyst 3 encodes the same paths as Analyst 2 but encodes that 60 percent of the trips will use the most direct path and 40 percent will use the next most logical one.

Analyst 4 also encodes two paths, the same most direct one everyone else recognized and another path that meanders to avoid potentially congested locations. Analyst 4 encodes that 50 percent of the trips will use the most direct path and 50 percent will use the meandering path.

If an identical project alternative is analyzed on the "Traffix" models encoded by the our four analysts and there is some congestion on the most direct route, the results would appear as follows: Analyst 1's results would show the most serious problems. Analyst 2 would show less serious problems than Analyst 1. Analyst 3 would show less serious problems than 2 and much less serious problems than 1. Analyst 4 might show no problem at all.

If the encodings prepared by the different analysts are used to evaluate different alternatives, Analyst 4's might show that an alternative involving much higher volumes of trips as performing similarly to or better than an alternative involving far fewer trips but analyzed on the model as encoded by Analyst 1.

A high degree of consistency in the encoding is essential if accurate conclusions are to be drawn in comparisons between a "do nothing" and a "preferred" alternative. But in fact there is substantial inconsistency in the Traffix encoding for Sea-Tac.

The following are examples of inconsistencies and problematic nuances of the Traffix encoding for the FEIS which appear to bias the comparison of traffic and consequent air quality performance of the Do Nothing and North Unit Terminal Alternatives.

- In the 2010 analysis, where multiple paths are encoded, the split between primary path and secondary path encoded for the Do Nothing Alternative gives more intense traffic on the primary path than the comparable encoding for the North Unit Terminal Alternative. For example, in the encoding for Traffix Zone 2 (representing trucks to and from the north air cargo area), paths to Gateways 2, 4, 6, 7, 13, 28, 30, and 33 (representing various areas of the region outside the airport), the split between the primary path and the secondary path is 65% : 35%. In the comparable encoding for the North Unit Terminal Alternative the split is 60% : 40%.[3] This type of arbitrary difference in the encoding, a type of difference repeated in many other path sequences, makes traffic more concentrated in the Do Nothing alternative. As the result, equal numbers of trips generated by Sea-Tac Airport will appear to cause worse traffic congestion problems in the Do Nothing than the North Unit Terminal analyses where in fact the results should show equal conditions.

- In the 2010 analysis, the encoding of route paths between some locations on the North Unit Terminal Alternative involves meandering paths to avoid congested intersections or take the traffic through them on a favorable movement (i.e., a right turn rather than a through movement or a through movement rather than a left turn). The analogous path in the Do Nothing encoding is invariably a most direct one. A specific example of this is the path from SASA (Zone 29 - non-maintenance employees) to Gateway 6 (representing all the areas north of Route 518 linked to the airport by I-5). In the North Unit Terminal analysis, this path is encoded to backtrack south on 28th Ave. S., turn east on S. 192nd, back north on Highway 99, turn right at S. 188th St. and proceed east to I-5. In the Do Nothing Alternative, this same exchange is encoded for traffic to simply proceed most directly, emerging north from 28th Ave. S. and proceeding east on S. 188th to I-5. The intersection of Highway 99 and S. 188th Street is a heavily congested intersection and one selected as an indicator intersection in the air quality analysis. This difference in path encoding has the effect of changing what are through movements at the 99/S.188th intersection in the Do Nothing case to right turn movements from another approach in the North Unit Terminal Alternative. Through movements at this location have heavy influence on vehicle delay and level of service whereas right turns on the northbound approach have almost no consequence. Hence, our objection is not just to the illogical nature of this particular path encoded in the North Unit Terminal Alternative and the fact of its inconsistency with the path encoded for the Do Nothing Alternative; our objection focuses on the biasing effect such inconsistency has on the outcome of the comparative traffic and air quality evaluations that results from this and accumulations of this type of inconsistency.

  A similar example of this type of inconsistency is in the encoding of paths for Zone 29 to Gates 28 and 29. In the Do Nothing Alternative, all the trips to these gates are encoded to pass through the intersection of Highway 99 with S. 200th Street (one of the intersections evaluated in the air quality conformity work). In the encoding for the North Unit Terminal Alternative, half the trips to Gate 28 and all the trips to Gate 29 are encoded to bypass this intersection. There is no justification for this discrepancy in the encoding.

  In our revised analyses, we have attempted to use consistent paths where appropriate for both alternatives. However, because of the brief time to perform this work, we have not been able to insert consistent logic on every path or verify the logic of all paths encoded in the original FEIS work. Hence, our results probably retain a substantial portion of the original bias in favor of the North Unit Terminal Alternative.

- In the 2010 analysis, the percentages of trips between the various airport activity points and the "gateways" representing various subareas of the region is inconsistent between the Do Nothing and North Unit Terminal Alternatives. In such an analysis it is inappropriate to have differing regional trip distributions (inconsistent gateway percentages) unless something inherent in the nature of the alternatives under consideration changes the mix of people who would use the facility and the places they would come from. In this instance, there is no justification for such a change. The nature of the inconsistency in the 2010 analysis is to increase, in the North Unit Terminal case, the percentage of trips to/from locations north of Route 518 and locations accessed via I-5 and I-405 to the northeast. The effect of this unjustified change in the trip distribution is to place a higher percentage of North Unit Terminal tripmakers on patterns where they immediately access the Airport Expressway and the freeway system and pass out of the area without ever encountering the indicator intersections for the air quality analysis. Conversely, the more dispersed, less north-oriented distribution of air terminal trips in the Do Nothing case means more tripmakers in the Do Nothing case are likely to have paths which take them through the indicator intersections. Hence, this unjustified inconsistency in trip distribution has a biasing influence on the outcome of the traffic and air quality analyses. In our revised analysis we have used consistent trip distributions for all comparable traffic generating activity zones.

[3] Printouts of pages from the relevant Traffix input files from the FEIS as forwarded by FAA and illustrating the cited inconsistency are appended. Comparison of the full input files reveals many similar inconsistencies.

3. Background traffic volumes, normally assumed constant across all alternatives for a given forecast year in a Traffix-type process, are altered at a key air quality indicator intersection in the 2010 analysis. The alteration of background volume is larger (favoring the relative performance of the North Unit Terminal Alternative) than the amount of background traffic that could be affected by differences in fundamental roadway features of the two alternatives.

In forecasting approaches of the Traffix type, project traffic is estimated and added to "background" or "base" traffic to create an estimate of total traffic at particular points before level of service and delay calculations are performed. Base or background traffic is traffic which is in the area but has nothing to do with the project being evaluated. In most cases background traffic is estimated for forecast years by applying growth factors to existing counts or by extracting information from broader scale regional models. Background traffic is normally held constant across all alternatives for a given analysis year. Only where a feature of a project alternative is of such nature that it would cause changes in the routing of background traffic would the background traffic data base be altered.

In the SEA-TAC instance, the North Unit Terminal Alternative incorporates a feature which closes access of S. 170th Street east of the Airport Expressway. This street pattern change necessitates a change in base traffic as well as in the pattern of Airport traffic. However, in estimating base traffic change, it is obvious the preparers of the FEIS erred because in adjusting the relevant movements at the intersection of 170th and Highway 99 they eliminated more base traffic than had previously traveled along 170th at the point where the North Unit Terminal design severs it. In our revised analysis we have limited the amount of base traffic adjustment at this location to the amount justified by the former base traffic passing through the severance point.

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South Access To Terminal

The FEIS definition of the 2010 roadway network for the Do Nothing Alternative is unreasonably constrained, whereas the North Unit Terminal Alternative includes a number of traffic improvements which are entirely separable from the third runway/terminal expansion project. This creates a situation where, by comparison, the North Unit Terminal Alternative must inevitably have superior traffic performance. In a reasonable comparison of the alternatives, the connection between the terminal and the S. 188th Street/28th Avenue S. intersection would be included in the Do Nothing Alternative.

The element which creates the primary distinction in traffic conditions between the North Unit Terminal and Do Nothing Alternatives in the 2010 analysis is the added roadway connection between the terminal complex and the intersection of S. 188th Street and 28th Avenue South. This connection is a key feature of the North Unit Terminal project (since the project cuts off other access points). But the connection to S. 188th/28th S. is not an element which is solely feasible or practical to construct as part of the North Unit Terminal project. It could as readily be constructed as a link to the existing terminal complex. In fact, there is documentation that the Port Of Seattle is actively planning this link as an immediate response to existing problem traffic conditions. Hence, it should be included as part of the Do Nothing Alternative for 2010.

The entire FEIS traffic and air quality analysis is predicated upon a fundamental assertion that the Do Nothing and North Unit Terminal Alternatives would serve identical numbers of air passengers in future years. That fundamental assertion carries with it the underlying presumption that the Do Nothing terminal complex has adequate ground access in those years to sustain that level of airport activity. This underlying presumption is supported in the FEIS 2020 analysis by inclusion of the South Connector to Route 509 in both the Do Nothing and North Unit Terminal Alternatives and the connection to S.188th/28th S. in both alternatives if Route 509 extension is not constructed. However, in the 2010 analysis, the connector to S. 188th/28th S. is assumed to only be part of the North Unit Terminal Alternative.

If roadway connection of the terminal to the S. 188th Street - 28th Avenue South intersection were incorporated in the Do Nothing Alternative for 2010 as it reasonably should be, the Do Nothing Alternative could have superior traffic performance to the North Unit Terminal Alternative. The entire traffic analysis undertaken for the year 2010 (and the consequent air quality analysis) is inconsistent with the basic assumption that the terminal alternatives would serve equal levels of activity. We have not had adequate working time to fully analyze this option in the context of the Do Nothing Alternative. Our preliminary results, shown in column 5 of Table 1 (S-DN), when compared to the revised North Unit Terminal in column 3 (S-NUT 1) show two intersections performing better, two worse (including one in which the North Terminal closes one leg of the intersection to traffic) and one the same.

In addition to the foregoing, we also note that the mitigation assumed for the intersections of Highway 99 with S. 160th St. and with S. 170th St. in the North Unit Terminal Alternative is likely to be carried out by Year 2010 even in the Do Nothing scenario if as much activity is served at the Do Nothing terminal as is asserted in the FEIS. Assessing this mitigation as an exclusive asset of the North Unit Terminal Alternative is unreasonable.

Reduced Peak Period Ground Traffic During Weather-impaired Flight Operations

A fundamental distinction between the alternatives, and the purported reason for the proposed project, is that adverse weather conditions reduce flight operation capacity of the existing facility whereas an additional runway would allow "poor-weather" flight operations to continue at levels similar to those possible at the existing airport under good weather conditions. The lower landing capacity of the Do Nothing Alternative at times when weather conditions impairs flight operations would result in significantly lower peak hour ground traffic generated by that alternative. The number of arriving air passengers released onto the ground transportation system at times of weather-impaired flight conditions would be significantly less than in unimpaired conditions. According to the FEIS impaired conditions occur up to 44 percent of the time and cause increments of 20 percent, 40 percent and 60 percent impairment to normal landing capacity. However, the FEIS ground traffic analysis solely compares the alternatives on the basis of weather conditions which would not impair flight operations. During an episode of bad weather, most departing air passengers might still be assumed to make their ground journey to the airport based on scheduled departure times. But the reductions in landing capacity will certainly preclude, depending on the degree of weather impairment, 20, 40 or 60 percent of the scheduled arriving peak period air passengers from arriving in that period. Hence, they would be unavailable to be released onto the ground transportation system in that peak period. The failure to analyze ground traffic and air quality in the Do Nothing alternative under the various levels of weather impaired flight operations masks a significant distinction between the Preferred and Do Nothing Alternatives on ground traffic effects which could potentially lead to differing conclusions on the air quality conformity assessment.

In our analysis we have performed traffic assessments for conditions at the 20, 40 and 60 percent impairment levels. The results for the lowest level of impairment level, the 20 percent level are shown in the rightmost column of Table 1. Comparison of these results to our revised North Unit

Terminal forecast (S-NUT 1) show that at all five intersections, the Do Nothing Alternative performs better than the North Unit Terminal Alternative. When such a performance difference would occur up to 44 percent of the time, it should be directly addressed in the analysis.

Increased Activity With North Unit Terminal Alternative

It is obvious that a larger terminal complex will have a larger work force and generate more facility-related traffic than the existing facility. It is also highly likely that the presence of increased all-weather flight operations capacity at this currently severely weather constrained facility would lead the air carriers to schedule more of their flights during the peak periods when people prefer to travel. This would increase peak hour traffic even if the total number of people flying daily did not change. These two factors alone would lead to the North Unit Terminal Alternative having higher pm peak traffic characteristics than the Do Nothing Alternative.

In addition, with unconstrained availability of flights at prime times, more people will be able to fly -- people who don't fly now because they can't get space available at the right time. Also, with more frequent flights, price competition among the carriers will increase, allowing more people to afford flying more frequently. This will tend to increase total and peak traffic of the North Unit Terminal Alternative over the Do Nothing Alternative. We have seen economic reports indicating that over time the differential resultant from this could amount to over 30 percent.

Although the FEIS wishes to maintain the presumption that both alternatives will serve the same number of air passengers, because of the controversial and debatable nature of this presumption an objective assessment would at least perform a sensitivity analysis of the consequences of a significant passenger differential. We have performed such an analysis assuming a 30 percent increase in peak period passenger related and passenger service traffic and lesser increases in other airport traffic.

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Unrepresentative Indicator Intersections

The intersections selected as representative intersections for assessing the proposed airport alternatives' impacts on air quality are clustered in a location and orientation relative to the airport facilities and area street network that is predictable as being minimally affected by traffic from the NUT alternative and maximally affected by the DN alternative. An unbiased analysis would have included dispersed indicator sites rather than sites located in a single linear pattern. Selection of air quality analysis sites solely in a corridor which is a primary access/egress corridor for the airport under the DN alternative but which is largely a secondary corridor with constrained access to the Airport in the NUT alternative biases the air quality analysis in favor of the NUT alternative to an extent that renders the air quality conformity findings meaningless.

All of the four intersections chosen as the indicator sites for the air quality assessment are located in the International Boulevard/Highway 99 corridor at its intersections with South 160th, South 170th, South 188th and South 200th Streets. At present and in the FEIS traffic analysis model encoding for the 2010 Do Nothing analysis, S. 170th Street has direct access to the northern air cargo/maintenance areas of the airport and is the first interchange on the Airport Expressway feeding the main terminal and garage. Another access point from Highway 99 is provided just north of South 188th Street. No air passenger ground access is provided to the SEA-TAC terminal from the south (only a service vehicle connection exists). At present all airport traffic to and from the south, southeast and southwest (except a few service vehicles) must use the access points from Highway 99 at S. 170th Street or north of S. 188th Street. Vehicles to and from areas to the north, northeast and northwest also use these access points from Highway 99.

In the North Unit Terminal Alternative this situation is radically altered. S. 170th Street is completely severed from connection to the airport facilities. The connection from Highway 99 just north of S. 188th Street is limited to one way westbound (no airport egress is provided). A new southerly access point connecting the terminal complex with S. 188th Street and 28th Avenue S. is provided. This new link logically becomes a primary route for airport traffic to/from the south, southeast and southwest. As a result of this configuration, the dependence of airport traffic on Highway 99, particularly the segment of Highway 99 between S. 160th Street and S. 188th Street, would be reasonably expected to be sharply reduced. In addition, as discussed earlier, the FEIS chose to assume that most of the off-site parking by air passengers that takes place in the Highway 99 corridor would be drawn into terminal parking by the North Unit Terminal complex. This has the effect of reducing the off-site parking traffic at the monitoring locations.

The setting of SEA-TAC is one where concentrations of airport traffic contribute to traffic congestion and air pollution emissions at numerous locations over a broad area. The four intersections selected for air quality analysis with the CAL3QHC program are meant to be representative of the airport's effects on air quality over the primary area where its traffic concentrates. Yet the indicator intersections are all located in a single linear corridor, which an analyst who understood the proposed project would recognize as most likely to have lower proportions of airport traffic under the preferred scheme. Selecting additional sites to the east and west of the airport and on the roads where the Preferred Alternative orients its traffic, as well as on the road it deemphasizes, would present different results. To illustrate this, our analysis has included data for the intersection of Military Road and S. 188th Street.

SUMMARY OF CHANGES INCORPORATED IN SE&M ANALYSIS

FAA provided computer disc copies of the actual Traffix model input, command and output files which are the product of the traffic analysis for, and basis for the traffic findings in, the FEIS. Our scrutiny of these files led to identification of many of the issues of concern cited above. We then loaded the Traffix files provided by FAA on our own licensed copy of the Traffix software, made modifications to the input data structure addressing most of the concerns expressed above and executed revised forecast/analysis runs for some of the alternatives and forecast years. The specific revised forecast runs we prepared and the nature of the revisions include:

Revised 2010 North Unit Terminal Alt. August PM Peak Hour Forecast/Evaluation including the following adjustments:

- The trip generation rate of SASA maintenance employees was placed on a consistent basis with the rate used for these same employees in evaluation of the Do Nothing alternative. This makes the 2200 employees involved in the North Unit Terminal Alternative generate 88 more trips than the 1651 employees involved in the Do Nothing rather than 86 fewer trips as was the case in the original FEIS work.
- The trip generation total for other activity in SASA was made equal to that used in the Do Nothing alternative rather than 655 less.
- Traffic generated by parking by terminal passengers in the off-site lots was made equivalent to the totals in the Do Nothing alternative. This includes reallocation of the Doug Fox lot totals (lot 15) to the closest nearby sites. Trip totals from the terminal

garage were adjusted downward accordingly on a one-for-one basis and off-site shuttle totals were also adjusted accordingly.

- Origin-destination patterns for the various activities at the airport were set equal to those applied to the equivalent activity in the Do Nothing Alternative.
- Base trips on the northbound left and westbound through movements at the intersection of S. 170th Street and Highway 99 were readjusted so that the adjustment to account for the closure of S. 170th west of the intersection only totaled the number of trips which reached the closure point from these movements. (In the original FEIS runs, the adjustment on these movements eliminated 32 percent more trips than actually reached the closure point when it was open.)

Having made these adjustments, we reran the Traffix model for the 2010 North Unit Terminal Alternative and also reran the evaluations of the proposed mitigation at the intersections of Highway 99 with S. 160th and S. 170th for that alternative.

Performed Traffix runs and evaluation on the 2010 North Unit Terminal Alternative under assumption of higher pm peak hour activity for that terminal than for Do Nothing.

- Runs reflect 30 percent increase (over Do Nothing) in peak period air passengers and in passenger-related services and employment.
- These runs reflect lower increases in activities not directly related to air passengers – generally 15 percent – such as air cargo and maintenance activities.

Performed revised Traffix runs and evaluation on the 2010 Do Nothing Alternative including:

- Runs reflecting 20 percent, 40 percent and 60 percent reductions in arriving peak hour air passengers departing the terminal in ground transportation vehicles reflecting levels of weather impairment to flight operations under the Do Nothing runway configuration.
- Runs incorporating the proposed access connection between the terminal and the intersection of S. 188th Street with 28th Avenue South (as in the roadway system used with the North Unit Terminal alternative).
- Evaluations incorporating the site mitigation identical to the North Unit Terminal Alternative at the intersections of Highway 99 with S. 160th Street and with S. 170th Street.

Due to the brief time we had working access to these files, it was impractical for us to adjust the path files where the original FEIS encoding arbitrarily concentrated more Do Nothing traffic than North Unit Terminal traffic on the primary routes in circumstances involving identical choices about apportioning trips among multiple paths. Likewise, it was impractical for us to adjust all the input files where the original FEIS encoding arbitrarily specified a Do Nothing path directly through a problem site while specifying the North Unit Terminal path for the same point-to-point trip exchange on an avoidance path relative to the problem area. As a result, our forecasts and evaluations still retain some of the bias inherent in the original FEIS work. That is to say, our results still tend to overstate the traffic impact of the Do Nothing case or understate the traffic impact of the North Unit Terminal case.

Additional Comments On Traffix Model

The Traffix traffic forecast and analysis software and procedure for encoding the Traffix model for use in the Seattle-Tacoma International Airport Master Plan Update EIS is poorly suited to an application of this type. Although it produces volumes of detailed results of extensive numeric computations, giving an impression of a high level of technical precision, in a long-range, large-area application such as this one that apparent precision is illusory. The lack of connection between base traffic estimated in this particular application and actual future land use intensities, spatial locations and travel generating characteristics as well as the lack of connection to future transportation network considerations makes this forecast a completely inadequate basis for evaluating traffic impact in the Sea-Tac FEIS or for using the output of the traffic model as input to analysis for air quality conformity evaluations.

To appreciate this point, some understanding of the theory, structure and procedure for applying the Traffix model is needed. In brief, Traffix computes the amount of traffic generated by new land uses (the project) based on quantities and rates the user specifies, computes the added movements through each study intersection (based on what destinations the user tells the program the traffic is going to and what specific routes the user tells the program that traffic will follow), adds the project traffic to "base traffic" at each intersection (non-project background traffic that the user tells the program is there) and then computes the volume/capacity relationship, level of service and average delay per vehicle (per a recognized procedure selected from several options by the user). As originally conceived, Traffix was intended to evaluate fairly short range (say 3-5 years) traffic impacts of a project or projects where it could be assumed reasonably that "base" traffic would not change at all or that its growth could be estimated accurately by a modest annual growth factor. In communities where land use growth (other than the project under study) is generally static and no significant changes to the street network are planned, this forecasting approach can be used reliably for even longer periods into the future. However, in a study area where there is significant land use growth other than the study project itself, the fundamental underlying assumption essential to the validity of this model structure - that base traffic is stable - is no longer applicable.

Compromise to the validity of a Traffix-type model structure can become acute under a number of conditions. These include:

- When the study area is large so that subareas experience differential rates of growth of non-project land uses (hence differential growth of base traffic).
- Where significant new streets and highway routes or improvements to some existing ones (or significant corridor transit facilities) are added that would change the route choices of drivers accounted in the base traffic.
- When land use growth other than the project under study causes base traffic alone to create undesirable congestion levels at study area intersections (suggesting base traffic patterns would not remain stable but rather that drivers accounted in the base would seek to make adjustments to less congested routes).

- When the project under study is quite large and adds significantly to congestion conditions at study intersections (again suggesting that rather than base traffic remaining static, drivers accounted in the base who have alternative routes available would react to project traffic by selecting those alternative routes).

- When there is error or doubt in the original measurement of base traffic.

- When the forecast is a long-range one (since all of the above factors which undermine validity of the model are operative for longer periods of time).

All of the above compromising factors are operative in the Traffix model structure for the Sea-Tac FEIS analysis. The key forecasts are quite long- range in nature, 16 and 26 years. The study area is quite large, certainly large enough that significantly different growth of land use and base traffic would be expected over time. There would be significant congestion from future base traffic alone (average peak hour delay per vehicle of 5 minutes or more at some key intersections according to the model) and even more significant congestion resulting from the project (average additional delay of one minute per vehicle), both tending to cause base traffic to seek alternate routes. The addition of a significant new highway route, the extension of the 509 freeway, would also cause significant alteration of the pattern of base traffic. Although the study did attempt to estimate the base traffic growth and the effect of Route 509 freeway construction by extracting annual growth rates from the Puget Sound Regional Council's regional travel forecast model (which is of the network optimization type), the connection of base traffic projections to actual land use growth and driver reaction to congestion conditions on the street and highway system is too remote for the results to be credible.

What the FAA has put forward in the FEIS is in essence 1994 traffic counts multiplied by 16 or 26 years of growth factors. And the starting point for all of this multiplication may be wrong. In its report entitled "Air Quality Report, SR 99 International Boulevard from S. 188th to S. 170th Street" the Washington State Department of Transportation (WSDOT) published pm peak hour traffic volumes for the intersection of SR 99 with S. 188th Street. These volumes were measured within a year of the traffic volumes used as a base in the FEIS and should be virtually identical. A comparison shows that while total peak hour vehicle movements through the intersection reported by WSDOT differ by 4 percent from those reported in the FEIS, individual approach volumes differ by as much as 26 percent and 40 percent (the westbound and southbound approaches, respectively). Since computations of delay, volume/capacity ratio and Level of Service are much more sensitive to individual approach movement totals than to aggregate movements through the intersection, the differences indicated cast substantial doubt on the reliability of the results reported in the FEIS. The FEIS may well have been multiplying the wrong base -- a number possibly over 40 percent wrong on crucial movements -- by 16 and 26 years worth of growth factors for the 2010 and 2020 analysis.

It might be argued that even though this model is not perfect, it provides an objective basis for comparative evaluation of the relative traffic and air quality impacts of the land use alternatives. We have provided documentation of the lack of objectivity and consistency in the treatment of the airport alternatives in this model in prior sections of this report. But aside from the objectivity issue, a fundamental concern is that the model's Year 2010 and 2020 base traffic estimates, arrived at by inflating 1994 counts by estimated growth rates, is so different from the traffic that would likely result from actual projected land use and reactions of drivers to conditions on the street system at those times that a meaningful comparison of the project alternatives' effects on traffic is impossible.

As an illustration of the lack of realistic assumptions in this model, consider the delay it predicts in the year 2010 for the individual vehicle driving up Highway 99 from S. 200th Street to Route 518. Total delay --sitting and waiting to clear major intersections -- is projected at 18 minutes and 30 seconds. In other words, the model suggests there would be nearly three times as much delay time sitting at intersections as it normally takes in running time to drive this route. Under such conditions, many of the drivers in the base traffic - assumed to maintain a constant driving pattern by the model -would certainly seek other routes.

Our criticism of the Traffix model as applied in the Sea-Tac FEIS might be countered by the argument that, though the model might not be perfect, it is the best tool reasonably available for performing the traffic impact analysis for Sea-Tac. This argument can be dismissed by considering the fact that the Puget Sound Regional Council traffic forecast model (a land-use based optimization model) was available and was actually used by the preparers of the FEIS to estimate growth rate of base traffic. With about the same level of effort as was devoted to preparation of the Traffix model, a variant of the PSRC model focused on the airport area could have been developed. Such an approach would have results directly related to future land use and street and highway network conditions.

Another flaw in the FEIS traffic analysis concerns the use of peak hour factors in the capacity analysis portion of the work. Peak hour factor (peak hour traffic divided by four times traffic in the peak 15 minutes) is a consideration which distinguishes peaks of brief duration from peaks which maintain intensity over the entire peak hour. At urban intersections, peak hour factors significantly less than 1.0 indicate that while undesirable levels of service may occur for a few moments during the peak hour, the duration of that condition is brief and reserve capacity exists within the peak hour. When traffic conditions deteriorate deeply into Level of Service F (as is the case at many locations in the forecast years of this analysis), peak hour factor moves to 1.0 indicative of a steady state demand in excess of capacity throughout the peak hour. In the Sea-Tac Traffix analysis the peak hour factors observed in 1994 were assumed to hold constant throughout the forecast period rather than moving to 1.0 as they would under conditions of serious Level of Service F operations. In one case (Highway 99 and S. 188th Street) a peak hour factor of .84 was assumed to remain constant through all the forecast years, even though by Year 2010 this intersection was projected to operate well into Level of Service F. Recomputing the capacity analysis on this intersection with a peak hour factor of 1.0 as would be operative under the demand projection, the Traffix program indicates several minutes less average delay per vehicle than in the FEIS analysis. Similar, though not so dramatic results are found at the other intersections selected for air quality assessment. Because of the inappropriate treatment of peak hour factor in the entire traffic analysis, it is questionable whether any meaningful conclusions can be drawn from the results presented in the FEIS.

Yet another flaw in the FEIS traffic analysis concerns the treatment of right turning traffic in the delay/capacity utilization computations. On most intersection approaches, the right turns are ignored in the FEIS calculations. Ignoring right turns in the calculations reflects the assumption that right turning traffic can complete its turns generally unaffected by opposed traffic. Such an assumption is appropriate when overall traffic is light, in moderate traffic conditions when right turning traffic has an exclusive approach lane and even in heavily congested traffic conditions if the right turning traffic has an exclusive departure lane as well as an exclusive approach lane. In the 2010 and 2020 forecast situations, the conditions where right turning traffic can move freely (and hence can be ignored in the calculations) will usually not exist. Traffic will be heavily congested but few intersections will have departure lanes available exclusively or almost

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exclusively for right turning vehicles. Hence, at key intersection approaches, the computations should have included, not ignored, right turning traffic. We tested what the implications for FEIS results would be if right turns had been considered in the analysis at key intersections. If one exercises the option within Traffix to consider right turning traffic in the calculations, extreme values of vehicle delay and capacity utilization are indicated (reported as "Overflow" on printouts; indicated as 111318 seconds average delay per vehicle on the computer monitor screen!).

This is yet another indication that the future traffic analysis results in the FEIS lack credibility and are not a suitable basis for drawing conclusions about the alternatives. It also points up a conclusion that might well have been reached in the original FEIS work. That conclusion is that, with a dozen or more key study area intersections loaded seriously over capacity as well as many key freeway and freeway-to-freeway ramp segments loaded seriously over capacity, the level of airport activity projected to justify the North Unit Terminal Alternative for Year 2010 cannot be supported by the area's ground transportation system unless a significant upgrading beyond anything considered in current plans is undertaken.

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Anita Risdon
8.22.96

Public Affairs Strategy:
Change in Forecasting Numbers

Introduction

The recommendations of the Master Plan Update are based on projections that indicate Sea-Tac will experience 38 million passengers and 440,000 operations by the year 2020. In turn, the EIS on the Master Plan based the assessment of potential environmental impacts on these levels.

Earlier this spring, the FAA released its 1996 Terminal Area Forecast (TAF), which projected that those levels would be reached *by 2010*, exceeding the Master Plan projections for that year by approximately 25 percent. By mid-summer, regional FAA representatives advised us that their D.C. forecasting office was preparing updated forecasts that exceeded the 1996 forecasts. With the actual activity levels being experienced at the airport also increasing faster than earlier projected, we have decided (both the FAA and Sea-Tac) to undertake additional environmental analysis to test the effects that sustained higher growth could have within the context of the EIS. We expect that analysis to be complete by December or January, which means we expect the ROD from the FAA in April. It appears the Commission may have to take an additional vote to confirm or modify their decision on the third runway following the additional analysis.

Strategy

We have been working closely with members of other agencies to obtain various permits and the Governor's Certificate. Beginning as early as Monday, August 26, we will begin alerting officials at those agencies of the additional analysis we are undertaking and the new timeline regarding milestones such as the ROD. We expect our message to these agencies to be well-received, since such additional analysis allows us to answer more of their questions and assures additional information on the environmental impacts of the airport receiving greater use than expected.

Once we approach the other agencies, it is likely the general public, and the media, will learn of the analysis and the delays it entails. We have decided to take a reactive public affairs approach, responding to a reporter's questions when asked, with the clear signal that this is a normal course of business issue. This sends the signal that while this additional analysis means a short delay for some project activities, it is not a roadblock for the third runway. This type of additional environmental analysis is not uncommon in a project of this magnitude, and we don't want its significance exaggerated, if possible.

G-480

Key Messages

- As is well-known, we have spent more than eight years studying the need and seeking political approval for the third runway. During that time, this area's growth forecasts have increased significantly. Such an increase merely underscores the need for the third runway.
- This additional analysis allows us to take a look at the results of the newly projected growth and how that kind of growth fits within the context of our EIS. This additional analysis will also provide the opportunity for additional public input.
- The anticipated timeline is: Finish the analysis by December/January; obtain ROD from the FAA in April 1997.
- In the meantime, we can continue with the details approved by the Commission in July. We will continue with our plans to acquire property, prepare the site to accept dirt and provide wetland mitigation.
- At this point, we remain uncertain of the forecasts past the year 2020. We will conduct another Master Plan Update within the appropriate time frame.

Questions and Answers

Q. Will different plans for airport development be needed?
A. The newer forecasts from the FAA do not change the components of the Master Plan. What we do need to evaluate is the timing of the airport improvements in the event that these higher growth rates continue through the year 2010 or so.

Q. What are the new levels of activity outlined in the TAF?
A. See Attached.

Q. Why are you proceeding with work if you need more analysis?
A. The Port is currently investigating what work can begin and what should wit until further analysis is completed. The Port's primary concern is for the residents on the West side. Therefore, we anticipate initiating acquisition of these residents, many of whom have indicated to the Port that they are in limbo and seek some resolution.

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Q. Will different plans for airport development be needed?
A. No. What the new forecasts mean is that these facilities could be needed sooner. The Port has always said that the Master Plan is a living document. It is intended to be modified or updated as changes occur. The forecasts that were prepared for this Master Plan Update were completed in 1993 based on conditions in the industry at that time. These new forecasts reflect more recent conditions. The Master Plan improvements were developed to coincide with a level of passenger and aircraft operations -- 19 million enplanements (38 million annual passengers) and about 440,000 annual operations.

Q. Doesn't this mean the third runway is just a Band-Aid approach?
A. No. The third runway is needed to address existing poor weather operating conditions. Since demand is growing faster than we had anticipated, it means that we need the runway very soon. We believe that the third runway will provide the region with sufficient runway capacity well into the future, at least past 2020. Our initial analysis indicates that the Master Plan may require additional gates and auto parking in the future, but the third runway will enable us to accommodate all of the forecast demand for air travel.

TERMINAL AREA FORECAST ISSUES

	Master Plan Update	1993 TAF	1996 TAF	8/8/96 P&D Refresh	UnPub Sept 1996 TAF
Operations					
1995	-	370,000	356,240	-	
2000	379,200	417,000	406,929	423,000	?
2005	392,500	435,000	452,029	NA	?
2010	405,800	NA	498,683	481,000	528,000
2020	441,600	NA	NA	532,000	
Enplanements					
1995	-	8,400,000	10,989,645	-	
2000	11,900,000	11,360,000	12,916,969	14,300,000	?
2005	13,600,000	13,920,000	15,786,027	NA	?
2010	15,300,000	NA	19,281,922	19,000,000	18,950,000
2020	19,100,000	NA	NA	24,800,000	

Preliminary Refreshed Forecast (8/13/96)

	2000	2010	2020
Operations			
- Do-Nothing *	423,000	460,000	na
- With MPU	423,000	481,000	na
Enplanements			
- Do-Nothing *	14,300,000	18,170,500	na
- With Project	14,300,000	19,000,000	na

* Preliminary Estimates - Flight Plan identified the capacity of the existing airfield at 460,000 operations

Issues

1. Finalization of forecast(s) at a fleet mix level/ FAA September 1996 forecast?
2. Additional analysis to evaluate activity through 19 M emplanements (through 2010)
3. Where does unsatisfied demand of Do-Nothing go?
4. Reflect MPU tweaks by LOB's?
5. Schedule of analysis and process in development

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U.S. Department of Transportation
Federal Aviation Administration

SEP 24 1996

Mr. Wilton Viall
P.O. Box 98242
Des Moines, WA 98198

Dear Mr. Viall:

This is in response to your inquiry of July 26 regarding the proposed third runway at Seattle-Tacoma International Airport (SeaTac) in Seattle, Washington.

Air traffic procedures and operational parameters for SeaTac's third runway have not been finalized since approval for construction was not obtained until recently, and the length of the runway was only determined during the month of August. However, for the purpose of environmental analyses and cost/benefit studies, certain assumptions were developed and used. These assumptions reflect our opinion on how SeaTac will operate with three runways.

We anticipate that dual arrival streams will be used whenever the volume of traffic dictates this. This will be true in nearly all weather conditions. Arrival streams will probably be aligned with the "outboard" (existing easternmost and the new westernmost) runways. The spacing of the outboards (2,500 feet centerline to centerline) would give the most flexible operation with minimal impacts from wake turbulence separation requirements. Departure traffic would, in most cases, use the "center" runway (existing runway 16R/34) during normal traffic volume conditions. We would anticipate that use of the new runway for departures would be limited to peak traffic periods due to the increased taxi distance from the terminal.

We certainly would not rule out the possibility of occasionally having three aircraft on final to each runway during some visual weather conditions. This would, of course, depend on the types and positioning of the aircraft involved.

Operations to parallel runways are conducted at numerous airports throughout the country and specific procedures are in place to ensure their safety. Airport acceptance rates (AAR) are developed for each individual airport considering such factors as runway centerline displacement, departure runway configurations, and varying weather conditions. Traffic management specialists at airports, en route air route traffic control centers, and the Air Traffic Control System Command Center, utilize these AAR's to ensure that the system does not overload the capacity of any individual airport.

Sincerely,

Roger Wall

C. Roger Wall
Program Director for Air Traffic Operations

G-482-1

STATE OF WASHINGTON
PUGET SOUND REGIONAL COUNCIL

In the Matter of:

Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport

FINAL PHASE I ORDER ON DEMAND/SYSTEM MANAGEMENT ISSUES

July 27, 1995

The Expert Arbitration Panel on Noise and Demand/System Management Issues (the "Panel") has held three rounds of hearings on Demand/System Management Issues. We announced, at the close of our May 1995 hearings, that the Panel would soon issue its Phase I decision on Demand/System Management Issues. This is that Order.

Background.

On August 12, 1994, we heard preliminary presentations by Claire Barrett of Claire Barrett & Associates, consultant to the Port of Seattle ("POS") on Demand Management, and from Brian Ziegler, speaking for the Washington State Department of Transportation ("WSDOT"), on the System Management option of "high-speed rail." A few comments from the public, both oral and written, were then also received. On December 2, 1994, we returned to these issues. The WSDOT, through Mr. Ziegler, presented its "Final Report on The Impact of Intercity Passenger Rail on Operations at SeaTac Airport." The POS, through Michael Feldman, Manager of Aviation Planning for the POS, Claire Barrett, and Ronald Ahlfedlt of P&D Aviation, presented a "progress report" on their review of the feasibility of two kinds of demand management programs: congestion pricing and gate controls. We also received oral comments from Alaska Airlines and Horizon Airlines, and both written and oral comments from various members of the public.

On February 24, 1995, the Panel issued its Preliminary Order on Demand/System Management Issues. Our Preliminary Order laid out the framework of the Panel's consideration of Demand/System Management Issues. We summarized the pertinent provisions of Resolution A-93-03 adopted by the Puget Sound Regional Council ("PSRC"), the PSRC's "Implementation Steps" for the Panel, and the Memorandum of Understanding ("MOU") among the PSRC, the Federal Aviation Administration ("FAA"), the POS and the WSDOT. The Resolution, which we have considered to be the controlling document, provides that "the region should pursue vigorously ... a third runway at Sea-Tac" and that the third runway "shall be authorized by April 1, 1996 ... [a]fter demand management and system management programs are pursued and achieved, or determined to be infeasible, based on independent evaluation ...."

In our Preliminary Order, the Panel addressed some basic questions about the scope and nature of our inquiry. After careful consideration of the Resolution, the Implementation Steps and the MOU, we concluded that the Resolution must be interpreted to require the Panel to consider whether any demand or system management options are "feasible" in the sense that they could be implemented in a way that they could be expected to obviate or defer the need to construct the third runway. With this understanding, we announced that we would address the Demand/System Management Issues in two phases. We said that in Phase I, we would continue to focus our attention on the existing capacity constraints, the current and expected levels of demand, and the existing and expected levels of delay at Sea-Tac if the third runway is not built, and would address the determinative questions raised by each of the three methods of demand or system management that had, at that time, been offered to us:

1. When could a method of congestion pricing (for the use of the airfield) be implemented at Sea-Tac, and what impact would it be expected to have on the level of aircraft operations or the amount of delay at Sea-Tac?

2. When could a method of gate controls be implemented at Sea-Tac, and what impact would it be expected to have on the level of aircraft operations or the amount of delay at Sea-Tac?

3. Could a system of true high speed rail be put in operation before 2020, and if so, what impact would it be expected to have on the level of aircraft operations or the amount of delay at Sea-Tac? What is the greatest reduction in the level of aircraft operations or the amount of delay at Sea-Tac that could be expected to result from more readily achievable improvements in existing rail service connections to the principal short-haul air destinations (for example, Seattle - Portland)?

We emphasized that we felt that it was essential, for the Panel responsibly to discharge its duties and for the public to appreciate what motivates the proposal to build a new runway, that the POS present us with a succinct, but well-documented statement of the capacity and delay problems that justify the construction of the third runway, including a reasonable estimate of when the new runway is likely to be put in use if the PSRC gives its approval in April 1996. We went on to underscore that if the POS and WSDOT wished us to find that the implementation of demand management or system management options cannot reasonably be expected to obviate or defer the need to construct the third runway, they should show us why, relating their analysis of the timing and impact of such options to the justifications they offer for constructing the runway. We invited comments from the PSRC, the FAA and the public on these matters.

Finally, we noted that if the Panel determined, in its Phase I decision, that any methods of demand or system management could reasonably be expected to obviate or defer the need to construct the third runway, we would then turn in Phase II, sometime later, to the question of whether such feasible methods were being pursued and achieved as required by the Resolution. We observed, however, that if we determined that no feasible demand or system management options would obviate or defer the need for a third runway within the foreseeable future, the POS and WSDOT would have satisfied the demand/system management condition of the Resolution and our inquiry on Demand/System Management Issues would come to an end.

In an effort to elicit as much pertinent evidence as we could, we established a formal comment period and then, by our Information Requests of March 3, 1995, we solicited a variety of detailed information on these issues from the POS, the WSDOT, the FAA, the airlines and the public.

We held our third round of hearings on Demand/System Management Issues on May 3 and 4, 1995. The POS, mainly through Michael Feldman, Manager of Aviation Planning for the POS, Claire Barrett of Claire Barrett and Associates, and Ronald Ahlfedlt of P&D Aviation, presented evidence and arguments that the two "demand management" programs for which the POS is the "lead agency" under the MOU — congestion pricing and gate controls — are not "feasible" within the meaning of the Resolution. The WSDOT, through Charles Howard, Planning Manager for WSDOT, and Brian Ziegler, revisited its "Final Report on The Impact of Intercity Passenger Rail on Operations at SeaTac Airport" and asserted that the system management option of "high-speed rail" — assigned to the WSDOT as "lead agency" — was not feasible. The FAA, represented by Carolyn Read and Sarah Dalton of its Regional Office, offered a few of its own comments, submitted its Draft Environmental Impact Statement ("DEIS") with respect to the Proposed Master Plan Update Development Actions at Sea-Tac, including the proposed third runway, and offered some useful data on delays at Sea-Tac. Mary Vigilante of Landrum & Brown, Incorporated, who helped prepare the DEIS for the FAA, engaged in limited dialogue with the Panel. During the May hearings, we also received both written and oral comments from the public, including a formal presentation on demand management from Stephen Hockaday, who testified for the Airport Communities Coalition ("ACC"), and on the rail option from Hal B.H. Cooper, Jr., who testified for the Regional Commission on Airport Affairs ("RCAA"). We also heard from representatives of Air Washington and the Airport Noise Group. Regrettably, no representatives of any of the airlines serving Sea-Tac submitted any comments or appeared before the Panel. On June 26, 1995, long after the close of the Phase I hearings and while the Panel was considering its present decision, the RCAA submitted to the Panel a study by G.H. Bogan of G. Bogan & Associates, Inc., which suggested that the use of Localizer Directional Aid ("LDA") procedures might obviate or defer the need for the third runway.

Introductory Comments.

Before turning to our conclusions, we want to comment on the quality of the evidence and to explain why our decision has been difficult, and time-consuming, for us to make.

The Panel does not believe that it has been charged with generalized responsibility for determining whether there is a need to build the proposed third runway. Rather, as we interpret the Resolution, it is our responsibility to determine whether particular methods of demand or system management presented to us could reasonably be expected to defer or obviate the need to construct the new runway. As we said in our Preliminary Order, in order to make that assessment on a sound basis, we felt that it was important (a) for the POS to provide us with a succinct, well-documented statement of the delay and capacity problems that justify the construction of the new runway *and* (b) if they claimed that congestion pricing, gate controls or high-speed rail were not "feasible," for the POS and the WSDOT to show us why, relating their analysis of the timing and impact of such options to the justifications they offer for constructing the runway.

The evidence offered to us during the hearings has not satisfied our desire for rigorous analysis of these admittedly difficult technical issues. The capacity and delay problems that precipitated the proposal to build the third runway are complex and dynamic. There appears to be no dispute, however, that the effective capacity of the airport has been increased in recent years through the introduction of a variety of technological and operational improvements, and that the occurrence of significant delays has been reduced. We have not found in the evidence presented to us a succinct, well-documented statement of the delay and capacity problems that have led the POS to seek approval of the third runway.

More disturbing to us is the failure of both the POS and the WSDOT to justify their positions that the alternatives are not "feasible" by relating the timing and impacts of these methods to the justifications they rely upon for the construction of the new runway. The potential impacts of the various demand or system management methods under consideration are difficult for us to assess on the basis of the evidence offered during the hearings. Neither the POS nor the WSDOT has offered a fully developed analysis that shows, for example, how much of the delay at Sea-Tac (either experienced in the past or forecast for the future) is attributable to the coincidence of peak demand and poor visibility, and how sensitive the resulting delays are to relatively small changes in the level of peak operations.

We would prefer, as experts in the field, to have abundant opportunity to explore these technical issues until we are satisfied that we have been given the best available evidence of the potential cumulative impact of all of the demand and system management methods on the problems of airfield capacity and aircraft delays that appear to motivate the proposal to build a third runway. However, our obligation as members of the Panel is to render a decision based upon the evidence that has been presented to us.

We recognize that the decision as to whether to build the third runway is an important, and controversial, public matter that will affect the entire regional community. Our Order should not be read as the final word on the Demand/System Management Issues we have addressed. We encourage the POS, the WSDOT, the FAA, the airlines and the public to continue rigorous examination of the planning assumptions that underlie the proposal to build the runway and to persist in efforts to determine whether adequate solutions to the problems of capacity and delay can be found without building a new runway at Sea-Tac.

We will now turn to the specific methods of demand and system management that have been presented to us.

Feasibility Determinations.

Congestion Pricing. The Panel has determined that "congestion pricing" is not feasible within the meaning of the Resolution. There are three basic reasons for this determination.

First, even if congestion pricing could be introduced at Sea-Tac today, the Panel could not say, based upon the evidence we have seen, that it could reasonably be expected to have such a significant impact on the delays at the airport that it would warrant deferring or eliminating construction of a third runway. The POS claims that it would not, and no party has shown that the POS is wrong.

Second, there are serious legal questions (which the Panel does not presume to have authority to resolve) as to whether the POS could implement congestion pricing before the year 2001 without the approval of a majority-in-interest of the signatory airlines serving the Airport. Although the United States Department of Transportation ("USDOT") has recently said that airport owners may implement "properly structured" congestion pricing methods, this power is constrained by existing agreements with airlines that prescribe how aeronautical rates and charges are to be established at Sea-Tac. (In the future, we encourage the POS and the airlines to fashion agreements that allow for the introduction of properly structured peak hour pricing.) Even though congestion pricing might reduce the total costs of airline operations at Sea-Tac by reducing the costs of delays, the airlines serving Sea-Tac have not yet given the POS approval to implement congestion pricing and it would be unrealistic to expect them to do so during the term of the existing signatory agreements. The Panel therefore cannot confidently say that the POS has the ability to introduce peak hour pricing before the year 2001.

Third, while there are sound economic reasons to expect peak pricing to reduce airport delays, the potential impact of congestion pricing is very sensitive to the particular configuration of operations and delays at an airport. Local conditions will determine whether the introduction of congestion pricing will alter the level or pattern of demand for use of the airfield and, if it does, what impact the change will have on expected levels of delay. The structure of the market and the nature of the delay function can change significantly over time, as the experience of Sea-Tac in recent years demonstrates. We cannot say whether, in the year 2001 or later, congestion pricing is likely to be effective at Sea-Tac, especially if the USDOT maintains its current policy limiting charges for the common use of an airfield to the recovery of historical costs.

While the Panel is confident that congestion pricing is an important tool that could improve the efficiency of the use of scarce airfield resources in Seattle, and therefore deserves careful study by the POS and the airlines, the Panel finds the potential impact of congestion pricing in the future to be too speculative to rely upon as a justification for eliminating or deferring the construction of the third runway.

For all of these reasons, the Panel has concluded that it is not reasonable to expect that congestion pricing will obviate or defer the need to construct the third runway and, therefore, that congestion pricing is not "feasible" within the meaning of the Resolution.

Gate Controls. The Panel has determined that the use of "gate controls" is not feasible within the meaning of the Resolution. In theory, gate controls (in the form of minimum passenger flow-through requirements) could lead to improved airfield efficiency, and hence fewer delays, if they induced airlines to reduce the number of aircraft operations they use to serve a given flow of passengers, either by consolidating flights on larger aircraft or by improving the load factors on smaller aircraft. Such a system of gate controls would, however, raise a series of questions, in practice, that remain unanswered on the record before us: (i) how would such gate controls be structured; (ii) how would the airlines, and their passengers, respond; and (iii) could the POS lawfully implement such a system of gate controls without the agreement of affected airlines? Gate controls may be useful, in the future, as one component of an overall program to encourage greater airfield efficiency at Sea-Tac, but no party has offered any empirical evidence that the implementation of gate controls could reasonably be expected, in the near term, to obviate or defer the need to construct the third runway. As a

result, the Panel must reject gate controls as a feasible alternative to the construction of a third runway. We nevertheless strongly encourage the POS to continue to examine the potential benefits of gate controls as a means of improving the efficiency of use of scarce airport resources.

High-speed Rail. The Panel has determined that a new system of high-speed rail is not "feasible," within the meaning of the Resolution. We reached this conclusion because even under the most optimistic scenarios, the time frame for implementing a newly-constructed, high-speed rail link between Portland, Seattle and Vancouver is exceedingly long and highly uncertain. Because of the inevitably very long period of time required to put true high-speed rail in service, and because of the uncertainties about the economics and financing of high-speed rail, there is no assurance that a system of high-speed rail would offer any basis for deferring or eliminating the construction of the third runway, even though, if a new high-speed rail link were ultimately put in service, we would expect there to be a very substantial diversion of travelers from air to rail transportation in the Portland-Seattle-Vancouver corridor.

The Panel has, however, been unable to determine, based upon the evidence presented to us, whether more readily achievable improvements in existing rail service connections to the principal short-haul markets served by Sea-Tac — Portland and Vancouver — are "feasible."

The following facts and circumstances suggest that improved rail service along the Portland-Seattle-Vancouver corridor using existing railroad rights-of-way could have a significant impact on the level and pattern of aircraft operations at Sea-Tac and might allow the POS to defer construction of the third runway without suffering unacceptable amounts of delay at the Airport:

- Sea-Tac is not currently a highly congested airport. According to the most recent ASQP data available from the USDOT (for May 1995), Sea-Tac ranks #1 in on-time departures (90.0%) and #6 in on-time arrivals (84.6%). In recent years, the total annual hours of delay (as defined in the 1995 FAA Capacity Enhancement Update) have dropped from 48,000 (in 1988) to only 26,000. Reported delays as compiled in the FAA's ATOMS data series show a similar decline, from 30 delays per thousand operations in 1990 to six delays per thousand operations in 1994.

- The problems of airfield capacity and operational delays that appear to motivate the decision to build the new runway occur when poor visibility coincides with peak demand.

- A small reduction in the total level of aircraft operations occurring during peak periods can have a significant impact upon the delays that would occur during conditions of poor visibility at the Airport.

- The structure of air demand at Sea-Tac includes a large number of flights to and from Portland and Vancouver, especially during peak periods. These high-frequency flights add significantly to airport congestion (particularly in poor-visibility conditions, when capacity is restricted).

- Currently, the airlines have low load factors on many of their flights serving the Portland-Seattle-Vancouver markets.

- More than half of the passengers carried on flights serving Portland and Vancouver are O&D passengers, who are more likely than connecting passengers to opt for improved rail service.

If improved rail service along the Portland-Seattle-Vancouver corridor induced even a relatively small number of airline passengers to switch to rail, and if the resulting reduction in aircraft load factors caused the airlines to eliminate some of their peak period operations, it is likely that there would be a significant reduction in the levels of delay experienced at Sea-Tac, which could defer the need for the new runway.

Unfortunately, despite the Panel's repeated requests for detailed input on these questions, no party has submitted satisfactory evidence on the likely rate of diversion of passengers from air to rail travel, on the impact such a diversion of passengers would have on airline operations at Sea-Tac or on the resulting delay profile at the Airport that could reasonably be expected.

The WSDOT has attempted, in good faith, to meet its burden, as the "lead agency" under the MOU, to show that the high-speed rail option is not feasible within the meaning of the Resolution. The Panel has concluded, however, that the WSDOT (together with the POS and FAA) has not met this burden. (For example, the evidence offered on the diversion of passengers on the Talgo route is not persuasive. Upon review of the underlying survey, it appears to the Panel that there is no support for the claim that all of the new rail passengers have been diverted from automobile travel. In fact, there appears to be a 20 to 1 preference for rail over air travel reflected in the survey results.) We cannot, therefore, find that improvements in rail service are *not* a "feasible" method of system management. At the same time, however, the Panel is reluctant to find that rail improvements *are* feasible, within the meaning of the Resolution, without more persuasive evidence on the issues of passenger diversion and its likely impact on airline operations and airport delay. As a result, after much deliberation, we have concluded that we should continue to examine the rail option during Phase II of our consideration of Demand/System Management Issues.

We will seek, in Phase II, additional evidence from the WSDOT, the POS, the FAA, the airlines and the public, focused on the following issues:

- What improvements in rail service on the Portland-Seattle-Vancouver rail corridor are now underway under the auspices of the WSDOT?

- What improvements in rail service on the Portland-Seattle-Vancouver rail corridor, and along the entire West Coast, are or will be incorporated in WSDOT's Statewide Transportation Plan or other long-range transportation plans?

- How have the elapsed travel times and convenience of scheduling been altered and what further improvements are anticipated?

- What has been the impact on ridership during 1995?

- What are the best estimates of expected air-rail diversion of O&D passengers on the Portland and Vancouver routes served by Sea-Tac?

- What impact would such air-rail diversion be reasonably expected to have on aircraft operations, and resulting delays, at Sea-Tac?

We intend to resolve the question of whether the rail option is "feasible," and if it is, whether it has been "pursued and achieved" as required by the Resolution, before April 1, 1996. In due course, the Panel will issue Information Requests and a Notice of Hearing with respect to these matters.

LDA. Although the MOU and the Implementation Steps do not contemplate the Panel's consideration of methods of demand or system management that have not been offered for consideration by the Coordinating Committee, we have reviewed the Bogan Report (submitted after the close of the hearings by the RCAA) which suggests that the use of LDA might be a technological improvement in system management that could obviate the need to construct the third runway. The Bogan Report is a provocative document that deserves scrutiny by, and a response from, both the POS and the FAA. The Panel has determined, however, that we will not consider LDA as a method of system management to be assessed under the Resolution for a variety reasons.

G-486

First, the RCAA submission was not timely. Under our Preliminary Order, comments from all members of the Coordinating Committee and from the public on the Demand/System Management Issues were to be submitted by April 14, 1995. We established this requirement to ensure that all participants in this process would have a reasonable opportunity to review the comments before the hearings began on May 3, 1995. The RCAA failed to meet this deadline by ten weeks.

Second, we could not fairly consider the Bogan Report without providing an opportunity to the POS and the FAA to offer their comments on it. To do so would require us to reopen the record and defer the completion of our Phase I deliberations for far longer than was ever contemplated when the Resolution was enacted and the April 1996 decision point was established.

Third, the Panel itself has many questions about the Bogan Report. We are concerned that it may not have taken full account of the complex, dynamic interaction between effective airfield capacity, operational activity and airport delays.

Accordingly, the Panel has concluded that it will not consider LDA. We emphasize, however, that nothing in this Order should be interpreted as expressing any opinion about the potential impact of LDA on the problems of congestion and delay that have been offered as justifications for the construction of the third runway. Indeed, the potential impacts of rapidly improving air traffic control technology should continue to be a focus of attention for both the POS and the FAA in their assessments of the need for the new runway.

Closing Comments.

We have now completed our Phase I consideration of Demand/System Management Issues. Under the terms of the PSRC's Resolution, our inquiry was narrow in scope. We have determined that, within the meaning of the PSRC's Resolution as we interpret it, congestion pricing, gate controls and high-speed rail are not "feasible" methods of demand or system management. We have, however, left open the question of whether more readily achievable improvements in existing rail service may be "feasible." This is the only method of system management we will consider in Phase II.

We have not been appointed, and we are unable, to comment upon the entire DEIS or to attempt to resolve two critical questions that remain open for public discourse: (i) whether the need for the third runway has been established, and (ii) whether a combination of improvements in air traffic control, in airport and airline management and in regional transportation infrastructure could defer or obviate the need to build the proposed third runway at Sea-Tac.

Scott P. Lewis, Chair

William Bowlby

Martha J. Langelan

The Seattle Times
WASHINGTON'S LARGEST NEWSPAPER
SOUTH EDITION
MONDAY
MARCH 17, 1997

BUSINESS MONDAY

THE SEATTLE TIMES SECTION C MONDAY, MARCH 17, 1997

Destination Sea-Tac

The Port of Seattle wants you to think of **Seattle-Tacoma International Airport** as more than a stop in transit but as a destination itself.

To that end, the Port purchased advertisements in five Seattle-area newspapers last week promoting Saturday's fourth-annual airport open house, which included everything from clowns, mimes and the **Seattle Seahawks** mascot to games, shopping discounts and 15 airline-ticket giveaways.

The tickets were donated by airlines that operate out of Sea-Tac.

Port spokeswoman **Anita Risdon** said the $39,500 ad campaign and open house aimed to remake the airport's image into a public gathering place, where people can shop, eat and learn about aviation as well as catch planes headed elsewhere.

STATE OF WASHINGTON
PUGET SOUND REGIONAL COUNCIL

In the Matter of:

Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport

FINAL ORDER ON PHASE II DEMAND/SYSTEM MANAGEMENT ISSUES

December 8, 1995

This is the Expert Arbitration Panel's Final Order on Demand/System Management Issues. In our July 27, 1995 Order, we determined that congestion pricing, gate controls and "high speed" rail are not "feasible" programs of demand or system management, within the unique meaning of Puget Sound Regional Council ("PSRC") Resolution A-93-03, because we were not confident that they could be implemented in a way that could reasonably be expected to obviate or defer the need to construct the third runway. We found that "high speed" rail was not "feasible" within the meaning of the Resolution only because it could not be achieved within the limited time frame contemplated by the Resolution. We were unable, however, to determine, based upon the evidence presented to us, whether more readily achievable improvements in existing rail service connections to the principal short-haul markets served by Sea-Tac — Portland and Vancouver — are "feasible" within the narrow meaning of the Resolution. As a result, we convened a fourth round of hearings on the rail option on November 20, 1995.

We have now determined that more readily achievable improvements in existing rail service cannot reasonably be relied upon as a justification for obviating or deferring construction of the new runway at the Airport, even though these improvements, if achieved, are likely to produce significant benefits to the Region. We have concluded, therefore, that the rail option is not "feasible" within the meaning of the Resolution, and, consequently, that the Port of Seattle (the "POS") and the Washington State Department of Transportation ("WSDOT") have satisfied the demand/system management condition of the Resolution. We have laid out below both the reasons why we have reached this conclusion and the reasons why, as experts in the field, we nevertheless continue to believe that significant rail improvements in rail service can and should be made. We therefore encourage the POS and WSDOT aggressively to pursue improvements in the existing rail service in the Region.

Background.

We explained in our July 27, 1995 Order that, based upon the evidence offered to us in the past, we had been unable to determine whether more readily achievable improvements in existing rail service connections to the principal short-haul markets served by Sea-Tac — Portland and Vancouver — are "feasible," and therefore must be pursued and achieved to satisfy a condition for the PSRC's approval of the construction of the new runway in April 1996. We noted that there are some facts and circumstances which suggest that improved rail service along the Portland-Seattle-Vancouver corridor using existing railroad rights-of-way *could* have a significant impact on the level and pattern of aircraft operations at Sea-Tac and might allow the POS to defer construction of the third runway without suffering unacceptable amounts of delay at the Airport. We postulated that if improved rail service along the Portland-Seattle-Vancouver corridor induced even a relatively small number of airline passengers to switch to rail, and if the resulting reduction in aircraft load factors caused the airlines to eliminate some of their peak period operations, there could be a significant reduction in the levels of delay experienced at Sea-Tac, which could defer the need for the new runway. We asked all participants in this "arbitration" to provide input to us on these points.

In anticipation of our November 1995 hearing, we received formal position statements and evidentiary materials from the POS, WSDOT and the Regional Commission on Airport Affairs ("RCAA"). The Airport Communities Coalition ("ACC") submitted a statement of position, without any supporting evidence. In addition, we received comments on the rail option from Air Washington and the Airport Noise Group. The airlines serving Sea-Tac once again declined to appear before the Panel and did not offer us any new information. This is regrettable because delays at the Airport should be a major focus of concern and innovative thinking for the airlines.

Both the POS and WSDOT urged us to find that the rail option is not feasible because improvements in existing rail service cannot be assured and because their impact upon passenger behavior, aircraft operations and airfield delay is unlikely to be sufficient to justify deferring construction of the third runway. This view was supported by Air Washington. At the hearing on the rail option, Michael Feldman was the lead representative of the POS. The WSDOT was represented by Charles Howard and Renee Montgelas.

The RCAA and ACC disputed the positions of the POS and WSDOT, claiming that improvements in rail service *should* be made, and that they could be expected to divert enough air passengers to cause a reduction in aircraft operations during peak periods and, as a result, a reduction in the airport delays that are offered by the POS as its justification for constructing the new runway. Dr. Hal B.H. Cooper, Jr. submitted a thorough and well-articulated analysis of these points and testified for the RCAA.

The RCAA and ACC claimed that the rail option, if pursued and achieved, would *postpone* any need to construct the runway and is, therefore, "feasible" within the meaning of the Resolution. Their views were supported by the Airport Noise Group. No party, however, offered any persuasive arguments or evidence that the rail alternative, if pursued and achieved, would *eliminate* the need to construct the runway sometime in the future.

We were left, then, with responsibility to determine whether readily achievable improvements in existing rail service could reasonably be expected to alleviate the peak period delays at Sea-Tac for long enough to warrant a decision to defer construction of the runway.

Analysis.

Before turning to the rationale of our feasibility determination, we want to reiterate some of the introductory comments we offered in our July 27, 1995 Order. The Panel does not believe that it has been charged with generalized responsibility for determining whether there is a need to build the proposed third runway. The Resolution, in fact, appears to us to manifest a determination by the PSRC that the runway is needed and should be approved *unless* we find that its construction could be deferred or obviated by the use of demand or system management programs. We nevertheless continue to have questions about the complex and dynamic delay and capacity problems that are seen by the POS as justifying the construction of the new runway. We therefore do not express any opinion about whether the POS has shown that the proposed third runway is needed.

We do note, however, that there appears to be no dispute that the volume of aircraft operations at the Airport has begun to grow rapidly due to the introduction of a new carrier, and that some continuing growth is to be expected. At the same time, there also appears to be no dispute that the effective capacity of the airport (its "acceptance rate") during adverse weather conditions has been increased in recent years through the introduction of a variety of technological and operational improvements, and that future developments are likely to continue to enhance the capacity of the existing runways. The POS itself admits that under *current* conditions, the operational delays experienced at the Airport are very sensitive to small changes in the level of peak operations. We are, as a result, uncertain about how grave the delay problems at Sea-Tac will turn out to be over the next five or ten years, and hence uncertain about how large an impact the rail option would have to have in order to justify deferring approval or construction of the new runway.

We have, however, an obligation as members of the Panel to render a decision based upon the evidence that has been presented to us, in spite of our uncertainty. In discharging this responsibility, we have considered the consequences of error on our part. If we reject the runway on the basis of the rail option, and as result it is not built, there is a significant risk that the Region will find itself facing intractable delays at the Airport within a decade even if the rail option has some effect upon peak period operations at Sea-Tac. If, however, we find that the rail option is not "feasible" under the Resolution, and thus need not presently be pursued and achieved before the PSRC approves the runway, the risk is that the runway will be built some time before it is needed.

There are four reasons why we have determined that the rail option cannot reasonably be relied upon as a justification for deferring construction of the proposed third runway at the Airport.

Most importantly, we are not confident that the state funding required to implement even the modest improvements in rail service relied upon by the RCAA will be available on a timely basis. Neither the POS nor the WSDOT has the ability to make these improvements without

legislative action, and there is substantial doubt that the required support will be offered and maintained by the legislature. This is an unfortunate outcome, in the Panel's view. We continue to believe that long-term investments in improved rail service will yield substantial dividends to the citizens of this Region.

If we were confident that the state legislature would appropriate the required funds, the question of whether modest improvements in rail service might permit the POS to defer construction of the third runway would be difficult for the Panel to resolve. Recent enhancements in rail service have been very well received by the public, and continuing improvements are likely to increase ridership significantly, even among business travelers. (We note that compared to short-haul air travel, rail offers some competitive advantages for business travelers: lower cost, all-weather reliability, easy downtown-to-downtown access, more room to work en route and other amenities.)

Based upon the evidence presented to us, however, we cannot reliably predict that significant numbers of business travelers will switch from air to rail for their peak period trips if only readily achievable improvements in rail service along the Portland-Seattle-Vancouver corridor are made. As we indicated during the November 20 hearing, the appropriate standard for air-rail comparisons is total trip time, not merely flight and track time. Depending upon the passenger's points of origin and destination, and the severity of airport delays on the ground and in the air, the actual time differential between air and rail travel can vary considerably. On balance, however, the available data suggest that near-term rail improvements are not likely to eliminate the total trip time advantage of air travel. As the RCAA acknowledges, peak period business travelers tend to be particularly time sensitive, and they are less likely than leisure travelers to alter their behavior in response to marginally improved rail service.

Moreover, we are not confident that reasonably expected levels of diversion of passengers from air to rail during peak periods will have a significant impact on the level or pattern of peak period aircraft operations at the Airport. Airline decision making is difficult to predict, and does not always conform to rational economic theory. Even if many business travelers do alter their behavior and take the train along the Northwest Corridor, the airlines may well continue to operate a pattern of peak period flights to and from Sea-Tac that is very similar to what occurs today.

Finally, we are not able to say, based on the evidence presented to us, that foreseeable changes in peak period aircraft operations attributable to the diversion of passengers from air to rail can be relied upon to reduce delays at the Airport to acceptable levels in future years.

Accordingly, we have determined that the rail option is not "feasible" within the narrow meaning of the Resolution.

We continue to believe, however, that improvements in existing rail service should be pursued by the POS as well as by the WSDOT and community advocates who seek wise solutions to the growing transportation needs of the Pacific Northwest. It is clear to us that short-term improvements in rail service, followed later by the introduction of true "high speed" rail, are in the best interests of the Region. The experience in the Northeast Corridor, to say nothing of Western Europe and Japan, shows that efficient rail service can displace substantial

amounts of travel both in the sky and on the highways. In fact, the remarkable, and unanticipated, success of recent improvements in service between Seattle and Vancouver (the "Mt. Baker" train) and between Seattle and Portland (the "Mt. Adams" and "Mt. Rainier" trains) — achieved under adverse conditions with only marginal reductions in trip times for the "Mt. Baker" and no change in trip times on the Portland trains — demonstrates the potential benefits of enhanced rail service in this Region. If, for whatever reason, the POS is unable to build the third runway, improved rail service will be essential to the Region.

The POS, as manager of both the Airport and the Seaport, should join WSDOT in educating the state legislature about the enormous value of long-term investments in rail improvements, both to serve the traveling public and, as Hal Cooper emphasized, to maintain competitive cargo service to and from the Port of Seattle. The POS should also begin to work with the airlines at the Airport to develop creative solutions to persistent problems of congestion and delay, and should encourage the airlines to forge alliances with rail operators to provide swift and efficient intermodal transportation services to the Region.

Closing Comments.

We have now completed our consideration of Demand/System Management Issues. As we said in our July 27, 1995 Order, our orders should not be read as the final word on the demand and system management issues that we have addressed. Our charge under the PSRC Resolution is limited. We were not appointed to determine whether the need for the third runway has been established or whether a combination of improvements in air traffic control, in airport and airline management and in regional transportation infrastructure could defer or obviate the need to build the proposed third runway at Sea-Tac.

We continue to believe that "congestion pricing" is an important tool that could improve the efficiency of the use of scarce airfield resources in Seattle, and therefore deserves careful study by the POS and the airlines. "Gate controls" could also lead to improved airfield efficiency, and hence fewer delays, if they induced airlines to reduce the number of aircraft operations they use to serve a given flow of passengers. Improvements in technology, including LDA, can be expected to enhance the effective capacity of the airfield at Sea-Tac. We are confident that "high-speed" rail would produce a very substantial diversion of travelers from air to rail transportation in the Portland-Seattle-Vancouver corridor.

We therefore continue to encourage the POS, the WSDOT, the FAA, the airlines and the public to persist in their rigorous examination of the planning assumptions that underlie the proposal to build the runway and to continue their efforts to determine whether adequate

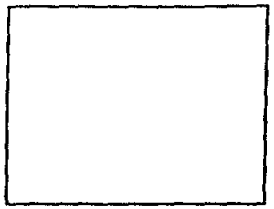
solutions to the problems of capacity and delay can be found without building a new runway at Sea-Tac.

Scott P. Lewis, Chair

William Bowlby

Martha J. Langelan

David A. Siebenburgen
President and Chief Operating Officer
Comair Holdings, Inc.



Mr. Siebenburgen is President and Chief Operating Officer of Comair Holdings, Inc., the parent corporation of Comair, Inc., the Cincinnati and Orlando based "Delta Connection" airline. He began his career with Comair in 1984, served as Executive Vice President and Chief Operating Officer from May 1986 to October 1990 and has been a Board of Director since 1988. After serving a tour in the United States Army, Mr. Siebenburgen received his B.A. degree in Accounting from Xavier University in 1972 and then joined Arthur Andersen & Co. He was employed there until joining Comair.

GROWTH STRATEGIES FOR THE 21ST CENTURY - PART 1
THE REGIONAL/COMMUTER INDUSTRY: ADAPTING TO NEW MARKETS

Thank you for inviting me here today to discuss the Regional Airline business and how COMAIR has utilized the regional jet. While regional jets seem to be the top topic of 1997, jets have been a part of Comair's thinking for many years.

By way of background, COMAIR signed its original letter of intent to purchase 60 Embraer jets in June, 1990. That project was postponed and our contract with Bombardier was signed in 1992 with service starting in June, 1993.

I'm sure by now many of you know that half a dozen or so other regional airlines have now purchased the regional jet with most of them purchasing it for the first time in 1997. These include; SkyWest, Mesa, Mesaba, Continental Express, Atlantic Coast Aviation and Atlantic Southeast Airlines. Very frankly, it has amazed me that these airlines have waited so long before getting into a jet program.

I'd like to share with you briefly the COMAIR jet story and why I believe it has been successful for our company and why I believe it may not be as successful for others. COMAIR's route system today stretches from Oklahoma to Boston and from Montreal to the Bahamas. These distances are impossible to cover from our hubs in Cincinnati and Orlando without jet equipment.

COMAIR's growth story consists of the following:

(1) Delta/COMAIR Expansion In The Cincinnati Hub

Cincinnati is surrounded by many large competitive hubs including Chicago, Detroit, St. Louis, Pittsburgh and Atlanta. The Delta/COMAIR hub in Cincinnati use to be very small in comparison to those hubs and only recently is it growing so that it is able to compete with these other hubs. Delta/COMAIR has spent over $500 million in Cincinnati making physical improvements to the airport including runways, new terminal facilities, road way systems and so forth. COMAIR by itself spent $50 million to build a special purpose, customized terminal facility consisting of 50 gates sized precisely for regional jets. These facilities are new, modern and passenger-friendly. Our passengers have very short distances to walk in the outdoor weather conditions and our terminals are connected with Delta's so that the connections are made with ease. Any hub operation not having these new, modern facilities or where regional passengers have to walk in the rain and snow for long distances would not have the same competitive advantage as we enjoy in Cincinnati. I believe that this is very important to our passengers.

(2) Increase Our Geographic Customer Base

We are now flying jets up to 1,000 miles whereas we flew turboprops only 4 - 500 miles from our hubs. It is important to note that Cincinnati is a very favorable physical location. It is located right in the middle of the country. You can reach close to 80% of the population of North America by a two-hour jet ride from Cincinnati. Very few hubs are able to reach such a large population base in such a short flying time. Again, this is a tremendous advantage to the Cincinnati Delta/COMAIR hub.

Note that 60 of our 80 markets have some amount of jet service. Half of those are 100% jet service and our objective is to have more jets and fewer turboprops as we go forward each and every year.

(3) Pursuing Growth Opportunities Away From Cincinnati

We will continue to be aggressive in identifying opportunities away from our Cincinnati hub. We have been operating in Florida for 10 years and most recently we have started point-to-point service in the Northeast focusing on Boston, Laguardia and Montreal.

Next, I'd like to speak more in specifics about each of our hub operations.

Cincinnati

- It is a very favorable geographic location as I previously indicated and it is right in the heart of the country.

- It has a very favorable competitive environment in that there are many "big little cities" and many "little big cities." There are many market opportunities that do not warrant the use of larger aircraft. This produces a good environment for 50 seat jets and also an environment that allows for a healthy ticket price situation.

- The $500 million spent in Cincinnati differentiates our airport in terms of customer convenience from that of many others. This again is a clear advantage to us.

- Delta and COMAIR have both been adding more flights to more destinations each year making our hub more competitive. The use of the COMAIR regional jets have made Cincinnati very different and very special in aviation hubs. A quick look at Cincinnati's departing flights when we started into the jet program indicates there was a total of 340 flights in Cincinnati with 174 of those COMAIR and 166 Delta. Each year this number has increased. In December, 1996 there were 464 flights with 244 being COMAIR and 220 Delta. Each and every year our hub gets bigger and stronger. Our route system in Cincinnati now serves approximately 60 locations and covers twice as much geographic distance with jets as it did with just turboprops.

Florida/Northeast

- Our Florida and Northeast business is very different and consists of more point-to-point routes. Delta's hub in Orlando is small and therefore, we have less connecting opportunities between our two airlines. With Southwest and Delta Express moving into Florida over the last year, it has created a very different environment for us than that in Cincinnati. While Cincinnati continues to grow, our Florida operation is reacting to the marketplace and right now it is shrinking. The number of total Delta/COMAIR flights over the last several years has been constant at around 150 flights, however, COMAIR's portion of those flights have gone from a high of just over 100 to now being down to around 50 flights in Orlando. Our Florida and Northeast business now consists of 22% of our company's capacity. However, we will be making schedule adjustments in the Northeast and in Florida and this number will shrink and Cincinnati will become an increasingly larger part of our operation in the near term.

- Part of our Northeast operation is tied to obtaining slots through the Business Express bankruptcy. Because of the uncertainty of bankruptcy and the lack of profitability on certain routes, we will be decreasing our presence in LaGuardia until this situation takes on more permanence. If and when that happens, we will then decide on our place in the Northeast. Again, overall our route system is becoming very large, however, over the next 12 months we will see more of our total capacity being focused in Cincinnati.

Fleet

Our theme continues to be more jets and fewer turboprops. When we received our first jet in April, 1993, we had three different turboprops for a total of 68 aircraft. Very shortly, we will be down to just one turboprop type, the Brasilia, with 39 units and we will have 50 jets. Over 75% of our capacity will be in jets by this summer. Our theme going forward is very clear, more jets and fewer props. Of our 50 jets, about one-half are being used on long-haul service that can only be done with a jet and one-half are being used to replace short-haul turboprop flying.

Next, I will cover some statistics of our company.

Financial Profile

Revenues have gone from $248 million in 1993 to double that today and our pre-tax income has tripled. The main ingredient is that our operating margins have increased from 13% to 20%. Our market capitalization, the value of our stock, has gone from $500 million to $1 billion. Even more interesting, when we signed our jet contract in 1992, our market value was around $200 million at that point in time. Needless to say, the jet program has had a significant impact on our company.

Revenue Statistics

Our passengers have increased from 2.4 million to 4.7. Most impressively our load factor has increased from 46% on primarily 30 seat equipment to 56% now on 30 and 50 seat equipment. Very simply, people want to fly on jets. Our yield, the amount we charge per mile, has decreased as our flight distances have increased. It has gone from 43 cents to 34 cents, while our average ticket price has gone from $98 to $112.

Cost Statistics

Available seat miles have grown from 1.2 to 2.7 billion and our cost per seat mile has decreased from 17 cents to 15 cents. That is primarily from flying a longer distance with not as many take offs and landings. An interesting statistic is the number of passengers needed to break even. It used to be 12 per flight and now, with the larger equipment, it is only 18.

Conclusion

Following is a summary of our Company's position for the future:

(1) Very clearly we want more jets and fewer props.

(2) We will continue growing Cincinnati and continue making it stronger every year.

(3) With a changing environment in Florida, we will adapt our operation there so that it will remain profitable.

(4) We will continue to pursue point-to-point opportunities in Florida and the Northeast as market conditions allow.

(5) We will continue to work on the efficiency of our company to lower our cost and increase the quality of our product to the extent possible.

That is the end of my prepared remarks. Now I will be happy to answer any questions.

Horizon Air eyes Paine for new route

BY DIANE BROOKS
Seattle Times Snohomish County bureau

EVERETT — Horizon Airlines might start commuter service between Paine Field and Portland — a plan bound to trigger concerns among residents bracing against any hint of commercial service at the Snohomish County airfield.

The Seattle-based airline plans to tap one or two new markets, and the Everett-to-Portland run is among four potential routes, said Pat Zachwieja, Horizon's vice president of marketing and planning. He declined to identify the other three.

"We believe there may be enough traffic to support four or five flights a day," he said. "This is the market we do best in, the down-and-back-in-a-day business person traveling to Portland."

Paine Field Airport Manager David

PLEASE SEE *Airport* ON B 2

Paine Field eyed for new commuter route

Airport

CONTINUED FROM B 1

Waggoner already has given a heads-up to local leaders and to Save Our Communities, a citizens group that in the past has battled against commercial air traffic at Paine Field.

"I think the community absolutely, positively will have something to say about this," said Don Doran, a Mukilteo city councilman whose constituents live near the airfield, which serves mostly small private and corporate aircraft.

Doran is well-versed in Paine Field planning logistics. Last year he sat on a committee that updated the airfield's master plan, and in 1978 he worked on a mediated agreement in which the county assured residents jet traffic would not be introduced at Paine Field.

That agreement is the community's biggest weapon in debates about using Paine Field to help alleviate congestion at Seattle-Tacoma International Airport. But it hasn't prevented commuter air traffic at Paine Field in the past.

In 1987, San Juan Airlines launched commuter service between Paine Field and Portland, handling about 1,000 passengers a month. But a year later, the airline pulled out.

"The county has always been very forthright and accurate in their contention that regardless of what mediated agreement you want to point to, there has never been a prohibition for commuter flights to fly in and out of Paine Field," Doran said. "The precedent has been set."

The airfield's revised master plan projects a future commuter operation with up to 10,000 flights a year, Waggoner said.

Horizon's proposal is more modest, with 3,500 takeoffs and landings yearly. In 1996, the airfield had 160,000 flights.

The airline would serve the Everett-Portland market with de Havilland Dash 8 planes, turboprops that carry 37 passengers.

"These are very quiet airplanes," Waggoner said, about one-quarter as loud as Boeing 737s.

Flights would be between 7 a.m. and 8 p.m., and fares would be similar to Seattle-to-Portland flights, which now range from $75 to $199 one way.

John Thoresen, president of the Economic Development Council of Snohomish County, yesterday said Horizon commuter service would be "another arrow" in the county's quiver when it came to recruiting new business.

"I've got to believe a lot of those people getting on (Seattle-to-Portland flights) live north of the 520 bridge, which from a logistics standpoint probably makes it a lot easier to take a plane out of Paine Field than driving in to Sea-Tac," Thoresen said.

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Paging Horizon Air

passenger Adam Smith

HORIZON Air's interest in starting flights out of Everett's Paine Field is another indicator of Puget Sound's robust growth and prosperity, and the abiding influence of the marketplace.

Those flights would give potential customers from Shoreline to Everett an easy commuter connection to Portland and spare them the wear and tear of a long drive to Seattle-Tacoma International Airport. Horizon apparently sees enough business to contemplate an experiment.

Developing Paine Field as a satellite airport was a natural for panels and commissions looking at providing relief for Sea-Tac and perhaps avoiding the construction of a third runway. Of all the possible sites fantasized about in Snohomish, Pierce, Thurston, Kitsap and King counties, Paine Field always sat there as a logical alternative.

Before Uncle Sam turned the former military airfield over to civilians, the federal government required that commercial aviation retain the right to use Paine Field. Airlines have come and gone, but the field remains with flights related to airplane manufacturing, airplane overhaul and general aviation.

Even if Paine Field made sense to transportation planners, the advent of airline deregulation meant no airline could be forced to relocate any business from Sea-Tac to Everett. Now instead of a push, there is a pull.

What has changed is the marketplace. Population growth and business development in north King and Snohomish counties is creating a critical mass of travelers. Portland is the destination being talked about now, but travel to Spokane and Canada might keep a good idea alive.

Horizon may yet decide the numbers are not quite right — for now — but the invisible hand of a bustling Puget Sound economy is pointing toward Paine Field.

Seattle Times editorial writers are Ross Anderson, Mindy Cameron, Lance Dickie, Michelle Malkin, Kimberly R. Marlowe and James Vesely. Other members of the editorial board are Frank A. Blethen, William K. Kohlen, Robert C. Blethen and Carolyn S. Kelly.

Reader response line: 464-8429.

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Comments on the Draft Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport

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Comments on the Draft Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport

1. THE ANALYSIS OF ACCEPTABLE DELAY IS A MOVING TARGET

The selection of an "acceptable" amount of delay in the environmental review documents produced in support of a third runway is a moving target that makes it difficult for decisionmakers to make an informed policy choice. The Final Environmental Impact Statement ("FEIS") and the Draft Supplemental Environmental Impact Statement ("DSEIS") make different assertions about the amount of average annual delay to aircraft that is acceptable. These changing assertions are important because average annual delay to aircraft is used in both the FEIS and the DSEIS as a trigger to justify the implementation of improvements to reduce delays to acceptable levels. In the FEIS, 4-6 minutes is used. In the DSEIS, 15-20 minutes is used. This decision-making criterion appears to have been changed in an attempt to continue to justify the conclusion of the previous work, even though the forecast underpinning the analysis changed significantly in the DSEIS.

The FEIS states that "[t]he maximum 'acceptable' delay for any single component of the National Airspace System is extremely subjective and dependent upon a number of factors unique to an individual facility. . . [A] single measure of acceptable delay which applies to all airports has not been established."[1] The FEIS then asserts that "[a]verage all-weather delay at Sea-Tac is expected to reach ten minutes of all-weather delay around 2002 . . . . Because delay rises so quickly when average delay exceed 4-6 minutes, improvements are needed today and current poor weather related delay is excessive, resulting in an inefficient airport."[2]

According to the FEIS, there would be 379,200 airport operations in 2000.[3] In fact, there were 386,536 operations at Sea-Tac in 1995, 396,216 operations in 1996,[4] and the DSEIS now projects 409,000

[1] Fed. Aviation Admin. and Port of Seattle, Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport ("FEIS") at I-16 (Feb. 1996).

[2] Id. at I-16, I-17.

[3] Id. at I-9, Exhibit I-4A.

[4] Fed. Aviation Admin. and Port of Seattle, Draft Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport ("DSEIS"), at 2-2, Table 2-1 (Feb.

operations in the year 2000,[5] an increase of approximately 30,000 annual operations over the same forecast in the FEIS. The number of operations now projected in the DSEIS for the year 2005[6] (445,000) is approximately the same as was projected in the FEIS for the year 2020[7] (442,000).

Faced with the fact that the number of operations at Sea-Tac in 1996 has far exceeded the number of operations which had been forecast to result in intolerable delays by the year 2000, the DSEIS now claims that delays as long as 20 minutes would be tolerable.[8] Based on this new analysis, the DSEIS sets forth a revised schedule of Master Plan Update development projects.[9] While the FEIS asserted that a third runway is "needed today"[10], the DSEIS concedes that the region and the Airport can wait until 2005 based on "the examination of financial resources in light of accelerated need for terminal/landside facilities in addition to the runway."[11] According to the DSEIS, there is a greater urgency to implement proposed landside improvements (e.g., new terminal facilities, expanded parking garages and additional internal roadways) than to construct a third air carrier runway.

The Port of Seattle plans to maintain the existing two-runway airfield though 2005 even though the average delays to aircraft are now expected to increase to 18-20 minutes by 2005[12], because these high delay levels have now been redefined to be acceptable. These delays are twice those considered by FAA to be "severely congested per NPIAS"[13]. As a result, the DSEIS states that 18-20 minute delays (in 2005) are acceptable, while the FEIS states that 4-6 minute delays mean that airfield improvements are needed today.

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[5] Id.

[6] Id.

[7] FEIS at I-9, Table 1-2. DSEIS at 1-2, Table 1-1.

[8] DSEIS at 2-8, 2-26, Exhibit 2-7.

[9] Id. at 2-21 through 2-25.

[10] FEIS at 1-17.

[11] DSEIS at 2-21.

[12] Id. at 2-26, Exhibit 2-7.

[13] Id.

The DSEIS demonstrates that the Airport Communities Coalition correctly analyzed the likely effects of lengthy delays at Sea-Tac.[14] According to the DSEIS, when the existing Airport reaches the maximum number of operations it can handle – identified in the DSEIS as 460,000 operations[15], a number of market responses would occur to curtail the increase in aircraft operations, including:

- the traffic would become more evenly spread over the hours of the day, reducing peak hour demand;
- passenger enplanements per aircraft would increase; and
- gate usage would increase.[16]

The DSEIS acknowledges that these actions would occur naturally in response to the level of service and would enable the Airport to accommodate all of the passenger demand without the construction of an additional runway.[17]

2. THE DSEIS CONTINUES TO MAKE ERRONEOUS ASSUMPTIONS ABOUT THE MAGNITUDE OF AIRCRAFT DELAY WITHOUT A THIRD RUNWAY

The DSEIS asserts that without the development of a third runway, the delays to aircraft at Sea-Tac would be so high that the airport would be unable to satisfy future demand.[18] This assertion is based on a faulty computation of delays to aircraft using faulty assumptions concerning weather conditions, airfield capability, future demand and delays to aircraft.

2.1 The Analysis of Weather Conditions in the DSEIS is Faulty

The DSEIS repeats the faulty analysis in the FEIS with respect to the magnitude of poor weather conditions, and the effect of those weather conditions on operations at Sea-Tac.[19] There was no attempt in

[14] Airport Communities Coalition, et al., Comments on the Draft Environmental Impact Statement for Proposed Master Plan Update Development Actions At Seattle-Tacoma International Airport, at 2-7 through 2-10 (Aug. 3, 1995)

[15] DSEIS at 1-3, Table 1-2.

[16] Id. at 1-4, 2-13, 2-14.

[17] Id. at 2-7.

[18] Id. at 1-2, 1-3, 2-4, 2-6, 2-12 through 2-14.

[19] Id. at 2-18.

preparing the DSEIS to review and revise previous misleading data regarding the occurrence, and effect, of poor weather conditions at Sea-Tac.[20] The analysis of weather conditions in the FEIS which was applied to the revised forecast data in the DSEIS is faulty because (a) it is based on 11 winters and 10 summers of data, thereby overstating the percent of poor weather conditions;[21] (b) it assumes that certain Visual Flight Rule ("VFR") weather conditions (between 2,500 and 1,000 feet ceiling with at least 3 miles visibility) are Instrument Flight Rule ("IFR") conditions;[22] and (c) it assumes that IFR weather lasts for 24 hours continuously, rather than the shorter periods that occur in practice.[23]

According to the Port of Seattle's Technical Report No. 4, the percent of IFR weather (ceiling less than 1,000 feet and or visibility less than 3 miles) is 9.4 percent, based on data from 1/1/82 to 3/31/93. These data include 11 winters and 10 summers and, therefore, overestimate the percent of poor weather conditions. The Sea-Tac February 1992 Airport Layout Plan ("ALP") shows the percent of IFR weather to be 7. 9 percent. The amount of time during which poor weather occurs is significantly less than is reported in the materials referenced in the FEIS and DSEIS.[24] The DSEIS, therefore, both overestimates the amount of delay with the Do-Nothing alternative and overestimates the benefits of the "With Project" development options.

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Analysis of Sea-Tac weather data shows that for the years 1983 through 1994, the average occurrence of IFR weather conditions is 6.6 percent; not the 9.4 percent used to compute delay in the DSEIS. Weather in the peak traffic months is significantly better than the average weather conditions used to arrive at the delay computations in the DSEIS. Analysis of Sea-Tac weather data shows that IFR conditions occur only 5.5 percent of the time in the peak traffic months (i.e., May, June, July, and August), and IFR conditions occur 6.2 percent of the time during peak arrival traffic hours (i.e., 10 am to 9 pm). When these conditions are combined, and weather in the peak arrival traffic hours of the peak traffic months is examined, the occurrence

[20] Id.

[21] P&D Aviation, Airport Master Plan Update For Seattle-Tacoma International Airport, Technical Report No. 4 ("Technical Report No. 4) at 2-14 (Oct. 1994).

[22] Id.

[23] Fed. Aviation Admin., Seattle-Tacoma International Airport, Airport Capacity Enhancement Plan Update, Data Package No. 10 ("Data Package No. 10") at C-1 (Mar. 1995).

[24] See, e.g., Technical Report No. 4 at 2-14, Table 2-5, 2-15; Technical Report No. 6 at 4-2, Figure 4-1, 4-2; FEIS at III. I-12 through I-17.

of IFR conditions even is less frequent: IFR conditions only occur 2.8 percent of the time in the peak arrival traffic hours of the peak traffic months (10 am to 9 pm, during May, June, July, and August).

Since poor weather conditions occur 2.8 percent of the time during peak arrival periods, and not the 9.4 percent used in the FEIS and DSEIS delay computations, weather related delays to aircraft were overestimated.

2.2 The Analysis of Airfield Capability is Faulty

The analysis of airfield capability is faulty because it excludes the favorable effect of the use of existing available air traffic control procedures and future technological advances on the operation of the present two runway configuration because "none of [the technologies mentioned] would address the entire poor weather operating constraint at Sea-Tac."[25] For example, the DSEIS dismisses the advantages of the Localizer Directional Aid ("LDA") approaches already in place at other U.S. airports today. At the St. Louis airport, the published instrument approach procedure poor weather minima required for such approaches have been set as low as 4 miles visibility and 1,200-foot Minimum Descent Altitude ("MDA") above Mean Sea Level ("MSL") (which is approximately 620 - 680 feet above the runway thresholds which are located at 541 feet and 583 feet MSL). Introduction of LDA approaches with similar minima at Sea-Tac (where the runways are approximately 350 - 400 feet MSL) would reduce the effect of poor weather conditions on arrival capacity from the stated 44 percent of the year to approximately 15 percent of the year or less.[26]

The analysis of airfield capability also is faulty because it continues to ignore the impact of Boeing Field on the operation of a potential third runway. Conflicts between aircraft using Boeing Field and those using Sea-Tac would eliminate most of the potential value of a third runway. Aircraft using a third runway at Sea-Tac in poor weather conditions would conflict with aircraft using Boeing Field, thereby reducing the usefulness of the additional runway at Sea-Tac. As a result, the benefits of a third runway are overstated

[25] DSEIS at 3-5 (emphasis added).

[26] The independent Expert Arbitration Panel on Demand/System Management recommended that "the potential impacts of rapidly improving air traffic control technology should continue to be a focus of attention for both the [Port] and the FAA in their assessments of the need for the new runway." Puget Sound Regional Council, In re: Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport, Final Phase I Order on Demand/System Management Issues at 8 (July 1995).

significantly. A more detailed discussion of airspace interactions between Boeing Field and Sea-Tac and the effect of such interactions is found in section 3.2.3 of this Report.

2.3 The Analysis of Future Demand is Faulty

The analysis of future demand is faulty because it excludes peak spreading, use of other airports and other modes of transportation, and other demand management techniques. In addition, demand also would be lower in poor weather (1) because some (particularly general aviation) pilots are not qualified to operate, some aircraft are not properly equipped, some pilots make a choice not to operate in poor weather even though they and their aircraft are qualified, and (2) some aircraft either are diverted to an alternative airport or flights are canceled to avoid poor weather and/or congestion.

Moreover, the FAA has analyzed the impact of demand management, and demonstrated that a reduction in peak traffic of 3 percent would save approximately 23 percent of delays to aircraft.[27]

3. THE DSEIS FAILS TO ADDRESS THE RANGE OF REASONABLE ALTERNATIVES

According to the DSEIS, a new runway is needed to reduce delays for arrival aircraft in poor weather, because there is a need to "[i]mprove the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay."[28] As noted in the FEIS, "[a]rrival delay represents over 85 percent of total current delay experienced by an average flight."[29] The FEIS explicitly emphasizes that, the "primary purpose [of a third air carrier runway] would be to enable two separate arrival streams to Sea-Tac during poor and good weather . . . ."[30] The DSEIS, however, seems to have shifted focus to encompass a larger universe of all delays.[31]

Although the DSEIS significantly alters the purpose, need for, and the timing of the Master Plan Update development actions, the DSEIS does not examine reasonable alternatives to the construction of an

[27] Fed. Aviation Admin., Seattle-Tacoma International Airport, Airport Capacity Enhancement Plan Update, Data Package No. 11 ("Data Package No. 11") at 46 through 48 (Apr. 1995).

[28] DSEIS at 2-17.

[29] FEIS at I-15.

[30] Id. at I-17 (emphasis added).

[31] See, e.g., DSEIS at 2-1, 2-18, 3-1 through 3-7.

8,500-foot air carrier runway at Sea-Tac.[32] Detailed technical analysis, however, would show that the Port of Seattle could meet its stated need either without the addition of a third runway, or, alternatively, with the development of a shorter, less environmentally destructive runway.

3.1 The DSEIS Ignores Potential Effects of Technology and Procedures

The DSEIS minimizes the benefits of both existing deployed technologies and procedures and those likely to become generally available before 2010[33], even though these technologies are relied upon in the DSEIS to attempt to demonstrate that a proposed third runway would provide sufficient capacity until the year 2030.[34] The DSEIS ignores the role that new technology and procedures could play either to increase the capacity of the existing two runways or, in combination with other alternatives, to meet the needs identified in the DSEIS.

For example, the DSEIS excludes use of existing air traffic control technologies and procedures that could increase the capacity of instrument-assisted approaches to Sea-Tac runways in certain weather conditions. The technologies and procedures include Localizer Directional Aid, and Microwave Landing System approaches, as well as other instrument approaches that will be available as a result of the implementation of FAA technological advances. The FAA Office of System Capacity and Requirements has identified Flight Management System, Global Positioning System, Precision Runway Monitor, and Traffic Alert and Collision Avoidance System technologies that are expected to permit increased arrival capacity for parallel runways by the year 2005.[35]

According to the 1993 Aviation Capacity Report,

> "FMS-flight path navigation procedures are expected to allow a reduction in weather minimums and offer alternative arrival paths for FMS-equipped aircraft.... Use of an LDA approach in conjunction with an ILS approach on adjacent closely spaced runways allows an additional arrival stream in weather minimums lower than those required for visual approaches. This procedure has been in use for several years at St. Louis Lambert Field and

[32] Id. at 3-1.

[33] See id. at 3-5, 3-6.

[34] Id. at 2-26.

[35] Fed. Aviation Admin., Aviation System Capacity Annual Report ("1993 Aviation System Capacity Report") at 13-17 (Oct. 1993); Fed. Aviation Admin., 1994 Aviation Capacity Enhancement Plan at 5-6 through 5-8, 5-13 (Oct. 1994); Fed. Aviation Admin., Capacity Initiatives, vol. 2 at 4-11 (Feb. 1994).

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more recently at San Francisco International Airport. St. Louis has experienced a capacity gain of about 18 arrivals per hour."[36]

Even a conservative perspective on the results which could be achieved from the technologies and procedures listed above is that arrival runway capacity could be increased significantly by adoption of these technologies and procedures. The FAA's wake vortex program is investigating ways to support a reduction in the 2,500-foot separation requirement under most meteorological conditions. Reducing the separation required by wake vortex considerations would improve capacity for both arrivals and departures.[37] An FAA analysis of the impact of reduced separations required by wake vortex considerations already has demonstrated that such a reduction would reduce delays to aircraft at Sea-Tac by 12.9 percent.[38]

3.2 The DSEIS Arbitrarily Dismisses Alternatives Which Do Not Provide an 8,500 Foot Runway

3.2.1 Alternative Runway Lengths Arbitrarily Omitted - The asserted need for additional poor weather capacity could be accommodated by a new runway designed only for arrivals; and such a runway would not have to be designed to accommodate departures. Since a runway required for arrivals may be shorter than one required for departures, a shorter runway could meet the stated need with lower environmental, economic and social costs than those associated with the preferred alternative identified in the FEIS and the DSEIS. I C-498 I

Runway landing length analysis was performed as part of the preparation of the Master Plan Update.[39] The length requirements were established for landing weights that are 90 percent of maximum landing weight. The runway length values are conservative, because landing aircraft typically have a decreased load of fuel.

Landing-length requirements for commuter, general aviation and military operations are 3,300 feet with a dry runway and 3,800 feet with a wet runway.[40] A 4,000-foot runway, therefore, could accommodate all

[36] 1993 Aviation System Capacity Report at 14-15.

[37] Id. at 15

[38] Data Package No. 11 at 48.

[39] See P & D Aviation, Airport Master Plan Update for Seattle-Tacoma International Airport, Technical Report No. 6 ("Technical Report No. 6") at 2-19, 2-20, Tables 2-8 and 2-9 (Sept. 19, 1994).

[40] Id. at 2-20, Table 2-9.

current commuter, general aviation and military operations. The mix of present and future aircraft traffic is set forth in Table 1.

TABLE 1

Present and Projected Air Traffic Mix[41]

Type of Aircraft	1995		2010	
	Number of Operations	Percentage of Operations	Number of Operations	Percentage of Operations
Air Carrier	226,200	58.5	306,000	64.6
Air Taxi/Commuter	149,400	38.6	157,000	33.1
General Aviation	10,300	2.7	10,300	2.2
Military	600	0.2	600	0.1
Total	386,500	100	474,000	100

Although the percentage of total operations by commuter aircraft is projected to decrease from 38.6 in 1995 to 33.1 in 2010, there is ample evidence in the Port of Seattle's own Master Plan Update documents that a significant portion of the total aircraft mix in 2010 could be accommodated on a new 5,200-foot runway.[42] Applying these data to the updated information accompanying the DSEIS demonstrates that 94.6 percent of total operations in the year 1995 could have been accommodated on a 5,200-foot runway in dry conditions and 63.9 percent of operations could have been accommodated on a 5,200-foot runway in wet conditions. In 2010, 97.6 percent of operations could land on a 5,200-foot runway in dry conditions and 57.6 percent could land in wet conditions. (See Table 2).

[41] Source: P & D Aviation, Working Paper 1, Unconstrained Aviation Forecast Update ("Working Paper 1"), Table 3-13 (Jan. 2, 1997).

[42] See, e.g., Technical Report. No. 6, Table 2-9.

Note that the existing runways can accommodate the peak hour air carrier arrival demand in the peak month in poor weather conditions, and the need for a third runway is only to accommodate commuter and general aviation aircraft. All of these commuter and general aviation aircraft can be accommodated on a short (e.g. 5,200 feet) parallel runway using dependent instrument approaches.

TABLE 2

Percentage of Total Landing Operations Accommodated by 5,200-Foot Runway[43]

Aircraft Type	1995		2010	
	Dry Conditions	Wet Conditions	Dry Conditions	Wet Conditions
Commuter/GA/ Military	41.5	41.5	35.4	35.4
Air Carrier	53.1	22.4	62.2	22.2
Total	94.6	63.9	97.6	57.6

An additional portion of the aircraft mix in 2010 could be accommodated on a new runway if its length were increased to 6,000 feet. A 6,000-foot runway could accommodate 98 percent of all arrivals in 2010, with the exception of the largest aircraft (e.g., A340-200/400, B747, MD11/12, A330, B777) which comprise only 2 percent of the aircraft mix. Increasing the length of a new runway from 6,000 feet to 8,500 feet would provide only a minimal increase in the percentage of aircraft that could land on a wet runway and still would not permit use by all aircraft.[44] The small benefit to be derived from the additional 2,500 feet would be far outweighed by the large increase in construction cost for the additional length.

The FAA investigated the benefit to be obtained by increasing the length of the proposed runway in order to accommodate all heavy aircraft,[45] and demonstrated that allowing all heavy jets to use a new runway achieved only a 3.5 percent decrease in delays (from 3.95 minutes to 3.82 minutes per aircraft) but resulted in significantly increased construction costs. A 6,000-foot runway could accommodate all large transport jet aircraft and some heavy jets, such as the B-767-200 and -300. The development of an 8,500-foot runway rather than a 6,000-foot runway would result in only a marginal improvement in delay at an enormous financial and environmental cost.[46] Each of these alternative runways would have its southern threshold in the vicinity of Station 123+50, the southern threshold of the 8,500-foot runway described in the DSEIS.[47]

3.2.2 Delays to Aircraft - The amount by which an additional parallel runway could reduce aircraft delay depends both on its separation from Runway 16L-34R and on the number of aircraft that could use the new runway. An FAA analysis of the impact of a commuter runway 1,500 feet west of 16L-34R concludes that with such a runway, average delays to aircraft would be approximately 11 minutes.[48] When combined with the 2.5-mile in-trail separation rule, average delays to aircraft would be reduced to approximately 9 minutes.[49]

The FAA also analyzed the impact of a commuter runway 2,500 feet west of Runway 16L-34R.[50] The FAA data show that with the addition of such a runway, average delays to aircraft would be approximately 6 minutes.[51] When combined with the 2.5-mile in-trail separation rule, average delays to aircraft would be reduced to approximately 5 minutes[52]

It is likely that advances in air traffic control ("ATC") technology by 2010 would permit independent approaches to parallel runways separated by 2,500 feet, and the arrival capacities of the two runways could be added together to achieve a capacity significantly in excess of the hourly demand. If the technology were not available by 2010, existing ATC procedures would allow dependent parallel approaches to the two runways with a capacity that also is sufficient to accommodate the demand.

This analysis of data provided by the Port of Seattle and the FAA demonstrates that alternatives with runway lengths of less than 8,500 feet (with either a 1,500 or 2,500-foot separation from Runway 16L-34R) meet the stated purpose and need for the proposed Airport expansion.

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[43] Source: Consulting Services, Ltd. analysis of data in Technical Report No. 6, Table 2-9 and Working Paper 1, Table 3-15.

[44] Data Package No. 11 at 48.

[45] Heavy aircraft would represent 15.5 percent of the mix in 2000 and 28.1 percent in 2020.

[46] Data Package No. 11 at 48.

[47] DSEIS at 3-18 through 3-20.

[48] Data Package No. 11 at 48.

[49] Id.

[50] Id.

[51] Id.

[52] Id.

3.2.3 Boeing Field Interactions - Conflicts between aircraft using Boeing Field (BFI) and Sea-Tac would reduce the benefits of any new runway. The DSEIS does not examine the effects of a new Sea-Tac runway on BFI. If any negative effects of such a runway were determined, they would have been included in the DSEIS. Therefore, it is fair to conclude that the Port and the FAA intend for any capacity interaction penalties to be taken at Sea-Tac and not BFI. Aircraft using the proposed new runway at Sea-Tac in poor weather conditions would conflict with aircraft using BFI and reduce the effectiveness of the runway at Sea-Tac.[53] As a result, the benefits of a new runway are greatly overstated in the DSEIS.

These interactions would occur in three situations.

- North Flow Instrument Meteorological Conditions - Sea-Tac would not accommodate traffic even with a new runway;
- South Flow Instrument Meteorological Conditions - Sea-Tac capacity gains from a new runway would be small and would reduce BFI capacity; and
- South Flow Visual Meteorological Conditions - Sea-Tac capacity gains from a new runway are not assured.

When problems caused by the interaction with BFI are taken into consideration, the total poor weather arrival capacity of Sea-Tac with a new runway would be only 36-45 aircraft per hour. Since the current arrival capacity of Sea-Tac with a single arrival stream is approximately 40 aircraft per hour, the gain to capacity with the new runway would be questionable and, in fact, there might even be a loss in capacity (from -10 percent to +12 percent).

> During [Instrument Meteorological Conditions ("IMC")], horizontal separation must be maintained between [Sea-Tac] departures and BFI arrivals and between [Sea-Tac] departures and BFI departures. Basically, no flights may go into or out of BFI while flights depart from [Sea-Tac] during IMC.
>
> In the simulation, [performed as part of the study,] no [Sea-Tac] departures from any runway were allowed when a BFI [arrival] was within 4 nm of touchdown. No BFI departure was allowed after a [Sea-Tac] departure until the [Sea-Tac] departure had passed BFI.
>
> The new runway did not alleviate the impact of north flow interactions so this would become the limiting capacity. At the highest, year 2015 demand level, the departure queue at [Sea-Tac] backed up, preventing all taxiing. It was therefore not possible to provide annualized cost data for this demand level.[54]

[53] See generally Aviation Simulations Int'l, Inc., Impact of Boeing Field Interactions on the Benefits of a Proposed New Runway at Seattle-Tacoma International Airport ("Impact of Boeing Field Interactions"). (Prepared for Fed. Aviation Admin., Northwest Mountain Region (July 1992).

[54] Id. at 23.

A single arrival to BFI stops the arrival flow onto the new runway for a significant period.[55] For typical approach speeds (120 to 150 knots), the 10 nautical miles separation required between arrivals to the new runway is equivalent to 4 to 5 minutes, limiting the capacity of the new runway to 12 to 15 arrivals per hour when aircraft are using BFI. There will be five hours each day with 10 or more arrivals per hour at BFI.[56] As a result, disruptions to the capacity of the new runway will be essentially continuous during these hours.

The FAA intends to use dependent instrument approaches to Runway 16L and the new runway. Therefore, any disruption of the new runway arrival flow will also disrupt arrivals to Runway 16L, thereby also reducing its capacity. Up to two aircraft could arrive on Runway 16L in each 10-mile gap between aircraft approaching the new runway. Therefore, the capacity of 16L for arrivals is 24-30 arrivals per hour, when it is used as a dependent runway in conjunction with the new runway, and the total arrival capacity of Sea-Tac with the new runway would be limited to 36-45 aircraft per hour based on projected interaction with BFI. Since the current arrival capacity of Sea-Tac with a single arrival stream is approximately 40 aircraft per hour, the gain in capacity with the new runway is questionable and may be a loss in capacity.

Arrivals to Runway 16L are independent of BFI arrivals only when special procedures are in place.[57] In weather conditions which allow the BFI Air Traffic Control Tower ("ATCT") to see the Sea-Tac arriving aircraft, visual separation is provided by the controllers and no loss in capacity is experienced. This operating arrangement is known as Plan Alpha. Cloud ceilings at BFI must be at least 2,500 feet for Boeing ATCT personnel to see Sea-Tac arrivals. The yearly occurrence of south flow conditions with ceilings below 2,500 feet (no Plan Alpha) is approximately 17 percent. However, the actual time of this impact on capacity is less because of special ATCT procedures. Under these procedures, during certain weather conditions, and for pilots familiar with BFI, aircraft approaching Sea-Tac are advised to maintain 3,000 MSL until the BFI ATCT advises TRACON that the landing of the other aircraft at BFI is assured. At this point, the Sea-Tac approaching aircraft is given final approach clearance and authorization to land. If the BFI approach pilot

[55] Id. 20

[56] Data Package No. 11 at 18.

[57] P & D Aviation, Aviation Master Plan Update for Seattle-Tacoma International Airport, Technical Report No. 4 ("Technical Report No. 4") at 3-10 (Oct. 1994).

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executes a missed approach, TRACON vectors the Sea-Tac approach back into the arrival stream and one arrival interval slot is lost in arrival capacity at Sea-Tac. However, this situation occurs very rarely. If the pilot's familiarity with BFI is unknown, the TRACON will leave an interval or empty slot in the Sea-Tac arrival stream in order to provide for a potential missed approach at BFI. This situation results in the loss of one or two arrival intervals in the arrival capacity of Sea-Tac. The frequency of this occurrence is dependent on arrival demand at the two airports and the percentage of low familiarity pilots in the arrival stream to BFI.

BFI-Sea-Tac interactions also may occur in Visual Meteorological Conditions.

> Presently, because of special procedures, the south flow arrival streams to the existing runways do not require a gap for BFI arrival because vertical separation exists between the normal approach streams, and controllers closely monitor the BFI arrivals for the first sign of a missed approach. [Proposed] Sea-Tac Runway 17, however, is approximately 1,700 feet west of Sea-Tac Runway 16R so that arrivals to Runway 17 will cross the BFI arrival stream while the BFI flights are still airborne. It has not as yet [been] determined whether the [Plan Alpha] procedures can be extended to permit the BFI arrivals to cross without a gap in the Sea-Tac Runway 17 arrival stream.[58]

Adding a new runway at Sea-Tac parallel to BFI Runways 13-31 would overcome this problem and would provide additional capacity for commuter arrivals to the south in VFR and IFR1 weather conditions. With the introduction of additional technology, the weather minimums for this converging approach with arrivals to Runways 16L or 16R could be reduced in the future.

Therefore the report prepared for FAA[59] shows that a proposed third parallel runway at Sea-Tac will not provide any significant capacity gains due to airspace interactions with Boeing Field, and that a runway parallel to BFI Runways 13-31 appears to offer the only opportunity for significant IFR runway capacity increases at Sea-Tac.

3.2.4 The DSEIS Arbitrarily Ignores the Use of a Combination of Alternatives - A combination of alternatives is a valuable means to achieve the stated need. The DSEIS fails to consider such combinations of alternatives. Examples of items that form valuable combinations include the presence or absence of improvements to terminal, parking and internal road facilities; technological innovations; no third runway; or a runway which is significantly shorter than 8,500 feet. Recognizing that

[58] Impact of Boeing Field Interactions at 18.

[59] Impact of Boeing Field Interactions.

there are uncertainties both in the forecast and with respect to other aviation-related decisions in the region, it is prudent to have a flexible plan for development of Sea-Tac that can respond to events as they occur between now and 2020 and beyond.

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REVIEW OF THE FAA'S REVISED AVIATION FORECASTS FOR SEATTLE-TACOMA INTERNATIONAL AIRPORT

Dr. Clifford Winston
March 1997

I-G-502-1

My report reviewing the Final Environmental Impact Statement for the proposed expansion of Seattle-Tacoma Airport, *Evaluation of the FAA's Forecasts of Traffic at Sea-Tac Airport*, (March 15, 1996) evaluated the FAA's forecasts of demand (measured by either passenger enplanements or aircraft operations) at the Sea-Tac International Airport. My primary concern was that the forecasts did not account for the relationship between airport capacity and demand. I concluded that their forecast of demand at Sea-Tac if an additional runway were constructed underestimated growth in the preferred alternative because it did not account for the additional demand that would be generated in response to the new runway.

The FAA responded to this point in appendix A to the *Supplemental Environmental Impact Statement (SEIS)*, by stating that "the Winston report does not question the underlying data used to develop the forecasts nor does it take issue with the regression methodology." *See SEIS, Volume 1-Main Text and Appendices A and D, p. A-6.* This statement mischaracterizes my original report. In fact, I take strong issue with their regression methodology because it contains a fundamental error -- specifically, it fails to measure the effect of capacity on demand. In their forecasting model, the FAA estimates a relationship between passenger enplanements (or aircraft operations) and population, income, and average fares. *See id* P&D Aviation, *Unconstrained Aviation Forecast Update, Working Paper I (Jan. 2, 1997) ("Working Paper I") at 3-1.* The FAA should have included in their specification a measure of airport capacity, such as the number of runways.

There are several reasons why they should have included such a measure in their analysis. Fundamental economic theory suggests that demand would be influenced by capacity. My March 1996 report pointed out that airline travel is influenced by air carriers' fares and their service time. An especially important dimension of service time is the time it takes a passenger to get from his origin to his destination. This time can be increased substantially if planes are delayed from taking off at their origin and landing at their destination. It is clear that greater capacity, that is, a greater number of runways, can reduce this delay because it enables air traffic controllers to allow more planes to take-off and land.

Whether the amount of airline travel time can be reduced by additional capacity is an empirical matter, which should be explicitly tested rather than *assumed* to be negligible as the FAA has done in the SEIS. As an empirical matter, this has important implications for the accuracy of the FAA's forecasts -- that is, if capacity does have an empirically important effect on demand, and if this effect is not accounted for in forecast of future demand, then the FAA's forecasts are likely to understate airline traffic growth in response to the construction of a new runway.

In the appendix to this report, I have included demand models, developed and estimated in collaboration with Dr. Steven A. Morrison, that do include the number of runways in the specification. Our analysis concludes that the number of runways at an airport does have a statistically significant positive effect on enplanements and operations. That is, holding other influences constant, the construction of an additional runway will lead to an increase in enplanements and operations. We estimate that the bias from failing to account for this effect can be considerable. Specifically, the FAA's forecasted enplanements should be increased by 23.8%-32.9% and forecasted operations should be increased by 13.6%-18.6% to account for the direct effect of an additional runway. Our findings constitute specific quantitative evidence that refutes the FAA's core assumption that capacity does not have an effect on demand. Indeed, in its response to my March 1996 report, the FAA did not change its key assumption (that greater capacity has *no* affect on demand) or attempted to provide any additional justification for it. As I concluded in my original report, the implication of this error is that the FAA underestimates the effect that an additional runway at Sea-Tac would have on demand.

In the appendices to the SEIS, the FAA provides a long-range forecast of demand. For example, they estimate that the number of operations in the year 2020 will be 532,000 and that the number of enplanements will reach 22.3 million. *SEIS at D-2 to D-3.* Our findings suggest that this number of operations should be increased by 13.6%-18.6% and that the number of enplanements should be increased by 23.8%-32.9% to account for the effect of an additional runway on demand. It is important to stress that although the FAA's revised forecasts indicate that aircraft operations will be up to 17% higher than they originally projected in the February 1996 EIS, the revised forecasts in no way account for the effect of an additional runway on demand. Thus, the FAA's forecasts for the preferred alternative still need to be increased to account for this effect.

Notwithstanding the quantitative evidence developed in this study, it must be stressed that the FAA also does not adequately explain from a conceptual standpoint why it did not consider the impact of an additional runway on growth. The FAA claims that the runway is needed to ease delay caused by poor weather at Sea-Tac -- but at the same time that it will not induce additional demand. The new runway would reduce travel time not just during bad weather, but during a large portion of the day and during all types of weather. Further, if, as we have found, additional capacity can reduce delay, the absence of delay itself increases demand.

The FAA suggests that it accounts for the effect of capacity on demand by including fares in their specification. That is, in my March 1996 report I concluded that additional capacity could facilitate more competition, which would lead to lower fares and greater demand. The FAA controls for *one* effect of fares -- its direct effect on passenger demand -- but it does not control for how fares would change with greater airport capacity and more competition. This second effect could generate more demand and contribute to the FAA's underestimation of growth.

The FAA also makes some assertions about various magnitudes that are erroneous. The FAA tries to differentiate between operations and enplanements, claiming that passenger demand may rise, but that operations may effectively remain constant. For example, greater demand might be accommodated by a shift to larger planes, which does not lead to an increase in the number of

operations. This could happen in certain cases, but it ignores that fact that we are concerned with long range forecasts. The appropriate issue is the extent to which enplanements and operations are correlated over time. Indeed, based on 1970-1995 data for Seattle, it turns out that the correlation coefficient for enplanements and operations is equal to .98, which indicates that any relative change in enplanements will be associated with nearly the identical relative change in operations. *See Working Paper I at Table 2-2, p. 2-4 and Table 2-5, p. 2-7.*

In their revised forecasts, the FAA assumes that international air fares will increase over time. It gives no justification for this assumption which runs counter to current and expected changes in international airline competition. That is, increasing pressure for Open Skies, especially in Asia, is expected to lead to sharp *decreases* in airline fares. *See Steven A. Morrison and Clifford Winston, The Evolution of the Airline Industry, Brookings Institution, 1995.* This decrease in fares would lead to more demand than the FAA project given that they assume international air fares will increase.

Summary

My central contention--that air travel is related to airport capacity, in contrast to the FAA's maintained assumption that it was not - has been characterized in the SEIS as an endorsement of the agency's regression methodology. As this report indicates, this is an incorrect interpretation, and we have provided quantitative evidence that supports my original conclusion and which demonstrates that the FAA's assumption is untenable.

The FAA's various responses acknowledge my concern in some limited cases, but then incorrectly argue that it does not matter. In other cases, the FAA claims that it accounts for the findings of my report, when in fact it has not. Unfortunately, the FAA's responses serve to cloud the central issue - whether an additional runway will lead to additional growth. We have addressed that point further in this report by offering direct quantitative evidence that demand is indeed affected by capacity. The appropriate conclusion to be drawn is that the FAA still has significantly underestimated the effect that a third runway at Sea-Tac will have on demand.

Appendix

This appendix presents regression models of airport enplanements and operations that control for the influence of airport capacity; and estimates of the forecast error that results from not including the effect of capacity on demand at Sea-Tac Airport.

Our approach was to extend the FAA's model to explicitly control for the effect of capacity on enplanements and operations. The FAA estimated a time series regression model for Sea-Tac that specified enplanements and operations as a function of population, income, and average fares. The problem with their analysis is that they are unable to control for the effect of airport capacity on demand because capacity does not vary during their sample period. We rectified this problem by collecting a sample composed of a cross section of airports in the United States. We report estimates using the top 50, 100, and 150 airports in the country based on their operations in fiscal year 1989 and enplanements in calendar year 1990. Because capacity, as measured by the number of runways, varies across United States airports, we are able to isolate the effect that an additional runway would have on enplanements and operations. We follow the FAA and include in our specification the population of the metropolitan area served by the airport, the per capita personal income of the metropolitan area served by the airport, and the average fare for trips taken to or from the airport. Population and income should have a positive effect on enplanements and operations, and the average fare should have a negative effect. We also include the number of runways at each airport as a measure of capacity. Finally, we indicate whether the airport is a hub airport for a major carrier because it is expected that such airports will have more enplanements and operations, all else constant.

Our estimation results for airport operations are presented in table 1. All of the coefficients have their expected sign, and, in general, are statistically reliable (that is, they are twice as large as their standard error). The coefficient for the number of runways is of primary interest. In each specification, this coefficient has a positive sign, which indicates that an increase in runways leads to an increase in operations, and its effect is statistically significant. The coefficients also have a quantitative interpretation. Based on our sample of 50 airports, the runway coefficient of .31 implies that a one percent increase in the number of runways at a given airport will lead to a.31 percent increase (one percent multiplied by .3 1) in the number of operations at that airport. Similarly, based on our sample of 100 airports, the increase in the number of operations is .4 percent (one percent multiplied by .398), and based on our sample of 150 airports the increase in the number of operations is .42 percent (one percent multiplied by .420).

The estimation results for enplanements, presented in table 2, are similar to those for operations. All of the coefficients have their expected sign, and, in general, are statistically reliable. In this model, based on our sample of 50 airports the coefficient for the number of runways implies that a one percent increase in the number of runways at a given airport will lead to a .6 percent increase (one percent multiplied by .602) in the number of enplanements. The increase for our sample based on 100 airports is .52 percent, and the increase for our sample based on 150 airports is .70 percent.

Thus we have found that airport capacity has a positive statistically significant effect on enplanements and operations and that this effect is quantitatively important. We stress that it is appropriate to interpret our results as indicating the effect that an additional runway will have on enplanements and operations because we have controlled for the other important influences on enplanements and operations (indeed, we use the same controls as the FAA does in its analysis and we also include a hub variable), and because enplanements or operations in a given year do not influence the number of runways in a given year.

The FAA's forecasts of enplanements and operations at Sea-Tac are therefore biased because they did not account for the effect of runway capacity on demand. We now proceed to quantify the extent of this bias. The construction of an additional runway at Sea-Tac will lead to a 50 percent increase in the number of runways at this airport (an increase from 2 to 3 runways). We use our operations regression equations to forecast operations under the assumption that the runway at Sea-Tac is built (that is, the number of runways is increased 50 percent). But in one forecast we account for the effect of increased capacity on demand, and in the other forecast we follow the FAA and do not account for this effect. Both forecasts represent long run forecasts, say 10-20 years, thus enabling carriers to adjust their operations in response to the additional capacity. The results presented in table 3 indicate that operations are *underpredicted* by 13.6 - 18.6 percent by failing to account for the effect of the number of runways on operations. When we perform the same exercise for passenger enplanements, we find that enplanements are *underpredicted* by 23.8 - 32.9 percent by failing to account for the effect of the number of runways on enplanements.

Thus it is clear that the FAA's demand forecasts are in serious error by failing to account for the relationship between capacity and demand. Sea-Tac is not a special airport that will be immune to this relationship. Indeed, our findings are remarkably robust across a wide range of airports-from the top 50 to the top 150. The FAA's forecasts must be re-evaluated, given the importance of this forecast error.

Airport Operations Regression Parameter Estimates
(Heteroskedastic-consistent standard errors in parentheses)

Variable (all variables in natural logarithms)	*Coefficient (50 airports)*	*Coefficient (100 airports)*	*Coefficient (150 airports)*
Constant	7.910 (3.799)	4.484 (2.501)	4.613 (1.792)
Population of metropolitan area served by the airport (thousands)	0.115 (0.075)	0.166 (0.034)	0.154 (0.026)
Per capita personal income of metropolitan area served by the airport (dollars)	0.355 (0.429)	0.618 (0.271)	0.680 (0.188)
Number of runways	0.315 (0.152)	0.398 (0.105)	0.420 (0.093)
Hub dummy variable (defined as 1 if airport is a hub for a major carrier, 0 otherwise)	0.351 (0.115)	0.446 (0.095)	0.556 (0.091)
One-way average domestic fare for trips taken to or from the airport (dollars)	-0.034 (0.231)	0.009 (0.093)	-0.143 (0.104)
R-squared	0.415	0.708	0.668

Data source: Airport operations, enplanements, and number of runways are from U.S. Department of Transportation airports data base. Population and per capita income are from U.S. Department of Commerce's Regional Economic Information System. The hub dummy and average fare are from the Department of Transportation Data Bank 1A.

Table 2

Airport Enplanements Regression Parameter Estimates
(Heteroskedastic-consistent standard errors in parentheses)

Variable (all variables in natural logarithims)	*Coefficient (50 airports)*	*Coefficient (100 airports)*	*Coefficient (150 airports)*
Constant	10.192 (6.108)	2.881 (3.755)	2.338 (3.479)
Population of metropolitan area served by the airport (thousands)	0.229 (0.112)	0.330 (0.082)	0.363 (0.069)
Per capita personal income of metropolitan area served by the airport (dollars)	0.212 (0.704)	1.089 (0.405)	1.244 (0.372)
Number of runways	0.602 (0.256)	0.526 (0.196)	0.701 (0.207)
Hub dummy variable (defined as 1 if airport is a hub for a major carrier, 0 otherwise)	0.592 (0.169)	1.243 (0.166)	1.604 (0.174)
One-way average domestic fare for trips taken to or from the airport (dollars)	0.117 (0.369)	-0.412 (0.208)	-0.772 (0.280)
R-squared	0.433	0.616	0.625

Data source: Airport operations, enplanements, and number of runways are from U.S. Department of Transportation airports data base. Population and per capita income are from U.S. Department of Commerce's Regional Economic Information System. The hub dummy and average fare are from the Department of Transportation Data Bank 1A.

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Estimation of Forecast Error for Seattle:
Long Run Effect on Demand of Increasing Runways from 2 to 3

	Increase in Demand with Additional Runway			
	(50 airports)	*(100 airports)*	*(150 airports)*	*Average*
Operations	13.6%	17.5%	18.6%	16.6%
Enplanements	27.6%	23.8%	32.9%	28.1%

Source: Author's calculations.

PRELIMINARY REPORT ON THE ANALYSIS OF NOISE IMPACTS IN THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR SEATTLE-TACOMA INTERNATIONAL AIRPORT

Dr. Sanford Fidell
BBN Systems & Technologies
March 1997

I. NOISE-RELATED DEFICIENCIES OF THE DRAFT SUPPLEMENTAL EIS

The Draft Supplemental Environmental Impact Statement ("Draft SEIS") should have disclosed and addresssed mis-estimated and previously undisclosed consequences of the proposed Airport expansion project. The noise-related portions of the Draft SEIS fail in these tasks and so perpetuate the defects in prior environmental studies. Review of the Draft SEIS leads to the following findings:

- The tenability of the conclusions reached about the relative magnitudes of aircraft noise impacts between the "no action" and the "with project" alternatives rests on an outdated and misleading characterization of existing noise exposure conditions;
- The full potential noise impacts of constructing a third runway are neither disclosed nor addressed;
- The noise impact consequences of the basic flaws in the original estimates of "demand" - which necessitated the preparation of a Supplemental EIS - remain uncorrected;
- The credibility of the population-weighted noise impact estimates are compromised by reliance on improbable flight track assumptions; and
- Undeniable increases in the duration of aircraft noise capable of interfering with speech associated with the "Preferred Alternative" remain unaddressed.

II. THE DRAFT SEIS MIS-CHARACTERIZES "EXISTING" CONDITIONS AS A BASELINE AGAINST WHICH TO MEASURE CHANGES IN AIRCRAFT NOISE IMPACTS

Even though many more aircraft than had previously been (incorrectly) forecast in earlier EIS documentation are currently operating at Sea-Tac, today's aircraft fleet contains a smaller proportion of Stage II aircraft than it did three years ago. Thus, the integrated noise exposure contours no longer extend as far from the Airport as they historically did in 1994 and prior years. Nonetheless, the FAA and the Port of Seattle continue to cite the 1994 noise contours as the baseline against which changes in noise contours with a third runway are measured. Three years after the original contours were developed, the Draft SEIS still characterizes noise contours which have been overtaken by events as representing "existing noise" exposure conditions. By ignoring the current reality of noise exposure, the Draft SEIS presents a spurious comparison of noise impacts between the "no action" and "with project" alternatives.

The net effect of exaggerating the extent of existing noise exposure conditions is to minimize the apparent salience of noise impacts associated with construction of a third runway with respect to a now fictional base case. The Draft SEIS should be revised to assess future noise impacts, not with respect to an inappropriate historical fleet mix, but rather with respect to actual conditions at the time that the document is prepared.

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III. THE DRAFT SEIS IS DEFECTIVE BECAUSE IT DOES NOT DISCLOSE THE FULL POTENTIAL NOISE IMPACTS OF CONSTRUCTING A THIRD RUNWAY

The Draft SEIS notes that Sea-Tac's two existing runways can support no more than 460,000 annual operations, and anticipates in Table 1-2 (Draft SEIS, page 1-3) that this level of operations will be attained by the year 2010. The Draft SEIS also notes (page 2-26) that a third parallel runway could sustain as many as 630,000 annual operations. Nonetheless, the greatest number of annual operations for which noise contours were prepared in the Draft SEIS is approximately 474,000 (Table C-3-3).[1]

Neither the Draft SEIS nor any of the background documents dealing with noise impacts models the noise effects of 630,000 operations. By failing to disclose or analyze potential noise impacts of more than 150,000 additional operations sustainable by the preferred alternative - about as many as the total number of annual operations at Sea-Tac only two decades ago - the Draft SEIS systematically underestimates the ultimate noise impacts of construction of a third runway. If the appropriate analysis had been performed for 630,000 operations, it undoubtedly would have produced noise contours longer and wider than the contours

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[1] Although Appendix D of the Draft SEIS contains a brief discussion of the more than 585,000 operations projected for the year 2020 (SEIS, page D-8), no noise contour maps support the conclusions reached. The absence of noise contour maps suggests that the authors of the Draft SEIS may not have produced INM contours for the level of operations forecasted for 2020. If so, it would not be possible to accurately calculate predicted numbers of housing units and individuals exposed to DNL 65 dB and above (Table D-2). If noise contours for the 2020 operations were prepared, they should have been provided for public review.

associated with 474,000 operations. Moreover, it would have disclosed additional impacts on the surrounding community.

IV. THE DRAFT SEIS IS DEFECTIVE BECAUSE IT FAILS TO CORRECT THE BASIC FLAW THAT NECESSITATED ITS PREPARATION

The authors of the Draft SEIS were forced to prepare the document because of sizable errors in earlier projections of both near-term and long-term aircraft operations at Sea-Tac. The substantial underestimation of the number of future operations understated the future noise impacts of Airport operations.

The Draft SEIS commendably acknowledges the uncertainties in its aircraft activity forecasts. The timing and magnitude of the currently forecasted increases in aircraft operations, however, are only slightly less uncertain than those of predecessor documents. The accuracy of these estimates is critical for assessment of noise impacts, because errors in estimates of any of the factors that affect predictions of integrated noise exposure levels (not merely total operations, but also fleet composition, time of day of operations, runway utilization, flight profiles, flight tracks, etc.) create errors in locations of DNL contours. These in turn cascade into errors in estimates of affected land areas, and are compounded further into errors in estimates of population-weighted noise impacts.

Despite the fact that conclusions about noise impacts are substantially dependent on aircraft activity levels, neither the Draft SEIS nor any of its predecessor documents deals

systematically with the consequences of errors in forecasting aircraft activity.

Although the Draft SEIS finally acknowledges forecasting uncertainty, it stops short of full disclosure of derivative uncertainties in associated noise impacts because it does not take the logical next step of dealing explicitly with such uncertainty. The authors of the Draft SEIS should also have dealt quantitatively with this uncertainty. They could have done so, for example, by conducting and publishing sensitivity or error analyses and confidence intervals for their estimates. For example, the FAA and the Port of Seattle should have disclosed a range of noise impact predictions associated with a range of demand estimates. Future DNL contours which are shown in the Draft SEIS as crisp lines should have been more accurately depicted as uncertainty bands.

C-508-1

V. THE CREDIBILITY OF POPULATION-WEIGHTED NOISE IMPACTS ESTIMATED IN THE DRAFT SEIS IS GREATLY REDUCED BY RELIANCE ON UNREALISTIC FLIGHT TRACK ASSUMPTIONS

Section A-3-2 of Appendix C-3 of the Draft SEIS states that "Flight tracks from existing runways under the future development condition are not expected to differ from the existing flight tracks discussed in Appendix C of the Final EIS." This is an unreasonable expectation, given FAA's stated intention of using the outboard runways for dual arrival streams "whenever the volume of traffic dictates . . . ." and using the center runway for departures during peak traffic periods(Letter from C. Roger Wall, Program Director for Air traffic Operations, FAA, to Mr. Wilton Viall, Sept. 1996). Under these circumstances, it is easily foreseen that pressures will develop for rapid fanning of departure tracks to ease air traffic controller work load, reduce departure delay, and increase airport capacity. It is even questionable whether details of the current Four Post Plan can survive the substantial increases in air traffic encouraged and hastened by a third runway. The use of unrealistic assumptions about flight tracks will result in an inaccurate analysis of noise impacts.

VI. THE DRAFT SEIS IS DEFECTIVE BECAUSE IT FAILS TO MEANINGFULLY DISCLOSE THE INCREASED DURATION OF AIRCRAFT NOISE AT LEVELS CAPABLE OF INTERFERING WITH SPEECH

Section C of Appendix C-3 contends (on page C-3-8) that "Since 65 decibels is a relatively low environmental noise level, greater insight into the length of exposure at various levels may be gained by looking at the pattern of distribution at higher threshold levels." This non sequitur is contradicted by the noise measurements that the Expert Arbitration Panel ordered the Port to make public. In fact, the total time that aircraft noise in the vicinity of Sea-Tac has exceeded an A-weighted threshold of 65 dB - a level capable of interfering with conversation - has increased appreciably in recent years, even as integrated noise level contours have been shrinking and as total time in excess of higher thresholds has been reduced. The trend toward greater speech interference will increase as operations increase more

rapidly at Sea-Tac with an additional runway than they would if a new runway were not constructed. Thus, even the time above contours seen in Figure 1 (drawn for 50 and 100 minutes per day of aircraft noise in excess of an A-weighted sound level of 65 dB for the preferred alternative in the year 2010) underestimate the eventual geographic extent of potential speech interference when the Airport reaches its full operational capacity.

Figure 2 shows the empirical relationships among integrated aircraft noise exposure and time above three A-weighted thresholds derived from the Port of Seattle's own noise monitoring data. The four panels of the figure document how the duration of aircraft noise in excess of 65 dB increased notably near runway ends in the same time period that integrated noise exposure contours shrank by more than 3 dB.

The inevitable increase in time above 65 dB will have an adverse effect on the school buildings in close proximity to the Airport, many of which have been subjected to high aircraft noise levels for years. Construction of a third runway will only exacerbate these conditions.

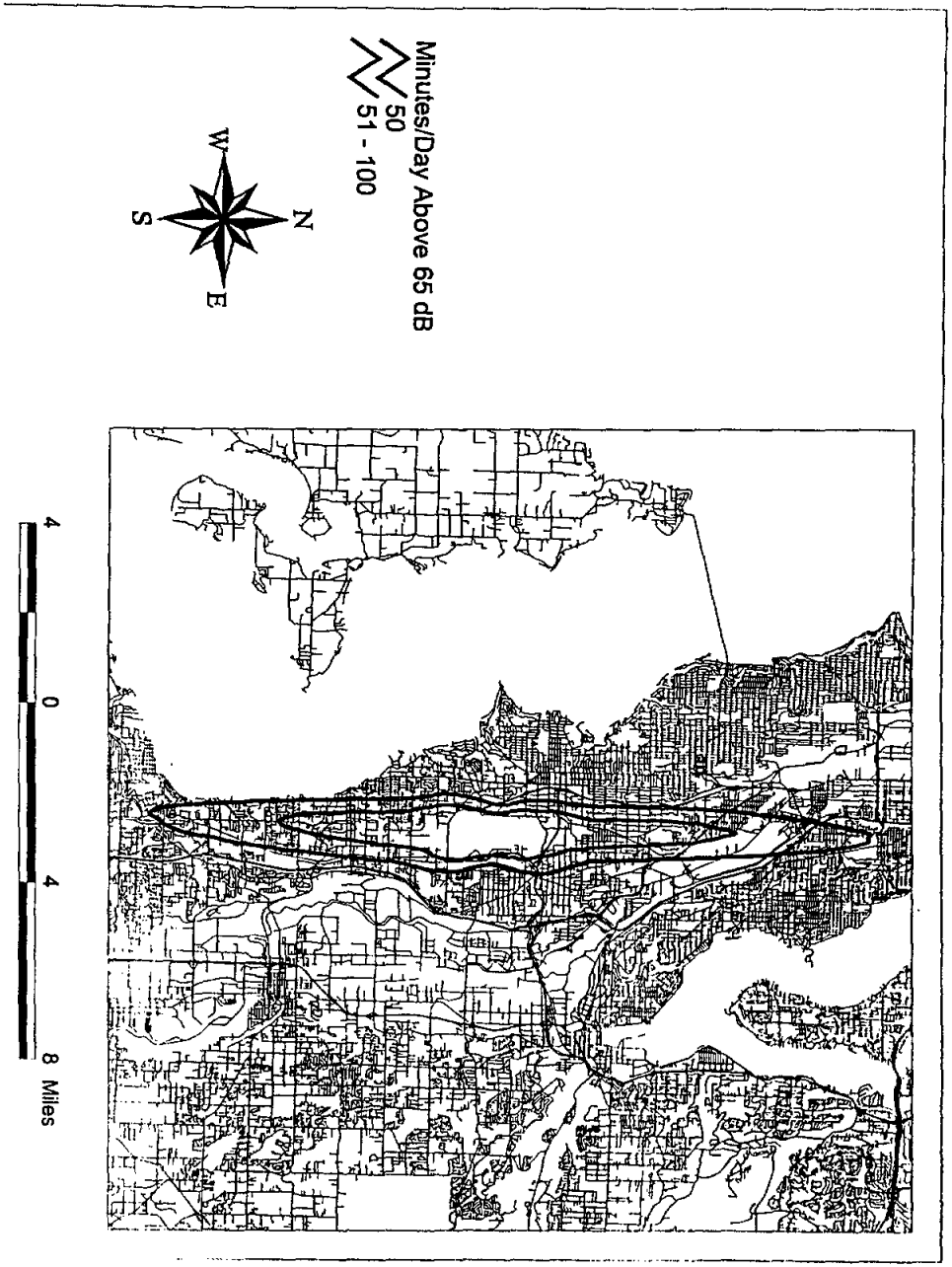

Figure 1

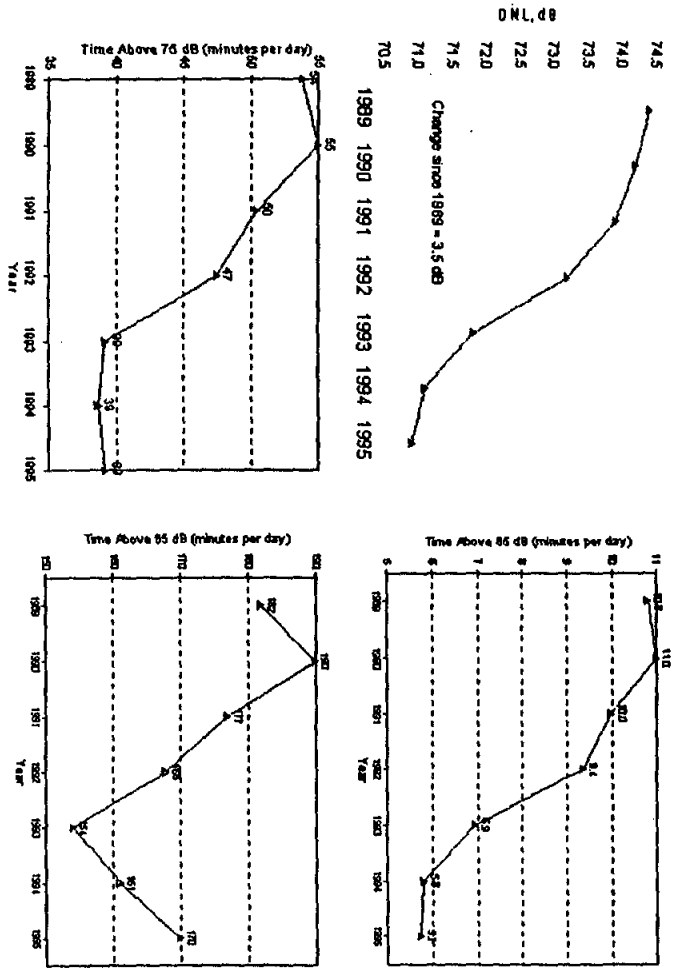

Figure 2

STATE OF WASHINGTON
PUGET SOUND REGIONAL COUNCIL

In the Matter of:

Expert Arbitration Panel's Review of Noise and Demand/System Management Issues at Sea-Tac International Airport

FINAL DECISION ON NOISE ISSUES

March 27, 1996

This is the Final Decision on Noise Issues by the Expert Arbitration Panel on Noise and Demand/System Management Issues (the "Panel"). After making a thorough and independent evaluation of all of the evidence and arguments that have been presented to us with respect to the reduction in noise impacts required by Resolution A-93-03 as a condition for the Puget Sound Regional Council's approval of a third runway at Sea-Tac International Airport, a majority of the Panel, consisting of Professor William Bowlby and Ms. Martha Langelan, has reached the following conclusion:

> Although the Port of Seattle has scheduled, pursued, and achieved an impressive array of noise abatement and mitigation programs, the Port has not shown a reduction in real on-the-ground noise impacts sufficient to satisfy the noise reduction condition imposed by Resolution A-93-03.

Mr. Scott P. Lewis, Chair of the Panel, would find that the Port has satisfied the requirements of the Resolution, and dissents from this Decision.

We offer below a statement of the background and history of the Panel's consideration of Noise Issues under Puget Sound Regional Council ("PSRC") Resolution A-93-03, a summary of the basis of the majority's decision, recommendations about future efforts that could be taken to reduce the burden of aircraft-generated noise on the communities surrounding the Airport, a statement of the dissent, and some closing comments. In the majority's findings and conclusions, we have assessed the Port's compliance with the Noise Mediation Agreement (including the reliability of the Noise Validation Method), evaluated the effectiveness of the Port's noise abatement and mitigation efforts with respect to on-the-ground noise impacts, and addressed the nature of the "meaningful" and "reasonable" reductions in "real noise impacts" required by Resolution A-93-03.

BACKGROUND
(BY THE PANEL)

The Panel was appointed in June 1994 by the Secretary of the Washington State Department of Transportation ("WSDOT"). The appointment of the Panel followed the adoption of Resolution A-93-03 by the Puget Sound Regional Council, the PSRC's promulgation of "Implementation Steps" for the Panel, and the execution of a Memorandum of Understanding ("MOU") among the PSRC, the Federal Aviation Administration ("FAA"), the Port of Seattle ("Port" or "POS") and the WSDOT.

The Resolution, which appears to us to be unique, provides that "the region should pursue vigorously a major supplemental airport and a third runway at Sea-Tac" and that the third runway "shall be authorized by April 1, 1996:

a. Unless shown through an environmental assessment, which shall include financial and market feasibility studies, that a supplemental site is feasible and can eliminate the need for the third runway; and

b. After demand management and system management programs are pursued and achieved, or determined to be infeasible, based on independent evaluation; and

c. When noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation, and based on measurement of real noise impacts."

In October 1994, the Executive Board of the PSRC determined that within the meaning of the Resolution there was no "feasible" site for a major supplemental airport that could eliminate the need for the third runway. See Resolution EB-94-01. It was the Panel's responsibility to make "independent evaluations" to determine whether the demand/system management and noise conditions of the Resolution had been satisfied and, hence, whether the PSRC should authorize construction of the third runway.

After conducting several rounds of hearings on Demand/System Management Issues, the Panel concluded in December 1995 that within the narrow meaning of the Resolution, the demand and system management programs that had been presented to the Panel (including "high-speed" rail, congestion pricing and gate controls) were not "feasible" and, therefore, that this condition of the Resolution had been satisfied. We stress, however, that we did *not* find "high speed" rail (or interim improvements in existing rail service), congestion pricing or gate controls to be infeasible in the sense that they could not be realized or were unworthy of pursuit. In fact, based upon the extensive evidence that was offered to us, it is apparent to the Panel that a coherent, intermodal, cost-effective and environmentally sensitive regional plan for accommodating the rapidly growing need for transportation infrastructure in the Pacific Northwest would include interim improvements of the existing rail service in anticipation of the construction of a high speed rail system in the Portland-Seattle-Vancouver corridor, and the introduction of regulatory measures at the Airport designed to improve the efficiency of use of scarce airport capacity. The Panel's consideration of

Demand/System Management Issues is laid out in three separate orders: the February 24, 1995 Preliminary Order on Demand/System Management Issues; the July 27, 1995 Final Phase I Order on Demand/System Management Issues; and the December 8, 1995 Final Order on Phase II Demand/System Management Issues.

As a result of these two determinations, the only remaining condition for PSRC authorization of the third runway project has been the noise impact reduction condition established by the Resolution.

Throughout our consideration of Noise Issues, the Port, the Airport Communities Coalition ("ACC") and the Regional Commission on Airport Affairs ("RCAA") have participated actively. They offered the Panel volumes of evidence and distinguished expert testimony on the difficult questions posed by the Resolution. We received thousands of pages of noise measurements, analysis and interpretation, and many informative statements of position from the Port, the ACC and the RCAA, as well as from the FAA, the Airport Noise Group, the Pork Patrol, Air Washington and many individual members of the public. The lead witnesses for the Port were Dianne Summerhays, from the Port's staff, and Paul Dunholter, a noise expert with Mestre Greve Associates. The Port has, from time to time, called upon other members of its staff and outside experts to support its position. The ACC has offered the expert testimony of Sanford Fidell of Bolt Beranek and Newman Systems and Technologies, and the RCAA has offered expert testimony by Alice Suter.

We held our first round of hearings on Noise Issues in August 1994, and on September 22, 1994 the Panel issued a "Procedural Order." We summarized the Resolution, the Implementation Steps and the MOU in the Procedural Order, and then acknowledged "that questions have been raised" about the scope of the Panel's inquiry on Noise Issues. As a result, we announced that we would consider Noise Issues in two phases. In Phase I, the Panel would address three distinct questions:

- Has the Panel been asked to determine whether the goals of the Noise Budget and the Nighttime Limitations Program, if achieved, would produce a significant reduction in real noise impacts on-the-ground?

- If so, would achievement of the noise reduction performance objectives of the Noise Budget and Nighttime Limitations Program produce a significant reduction in real noise impacts on-the-ground?

- Is the Noise Validation Methodology proposed by the Port a reliable method for determining, on the basis of measurements of actual on-the-ground noise using the existing noise monitoring system at Sea-Tac, whether the noise reduction performance objectives of the Noise Budget and Nighttime Limitations Program have been achieved?

If the Panel determined, in its Phase I decision, that the Noise Validation Methodology proposed by the Port is a reliable method for determining whether appropriate noise reduction performance objectives have been met, the Panel would turn in Phase II of its deliberations to the question of whether the Port had demonstrated that it had achieved the noise reduction required by the Resolution. We noted in the September 1994 Procedural Order that the Port has the burden of showing the Panel that it has satisfied the noise reduction performance objectives imposed by the

Resolution. Our Procedural Order was accompanied by extensive requests for information from the Port, the FAA and the public.

We returned to Seattle in December 1994 for two days of hearings, including an extended evening session near the Airport devoted to testimony from residents of the affected communities. We then issued our January 9, 1995 Order on Phase I Noise Issues. In our January 1995 Order, we summarized what we consider to be our responsibility under the Resolution with respect to the reduction in noise impacts that must be shown before the PSRC should approve construction of a third runway at the Airport. We held that to meet its burden under the Resolution, as we interpret it, "the Port must offer us reliable evidence, based upon actual measurements of on-the-ground noise, that by 1996 there has been an objectively measurable, meaningful reduction in aircraft noise impacts in the affected communities surrounding the Airport." As we said then, "the POS must establish that through whatever means, it has reduced the impact of on-the-ground noise in a way that residents of the affected communities could appreciate."

We noted, however, that because the Resolution contemplates that objective measurements of on-the-ground noise should be used, the Port would not be required to conduct surveys of residents in the affected communities to ascertain their subjective perceptions of Airport noise, even though such survey results could provide useful information to the Port, the public and this Panel. We recognized that the Resolution does not require the Port to reduce Airport noise to levels "acceptable" to the residents of the surrounding communities, but rather requires only that the Port achieve a significant reduction in the real noise impacts. We observed that "[b]usy jet airports, such as Sea-Tac, are inherently noisy, and it is unrealistic to expect that nearby communities would ever find the noise impacts generated by such airports to be 'acceptable.'"

Finally, both during the December 1994 hearings and in our January 1995 Noise Order, we cautioned the public that "the consequences — particularly the noise impacts — that might occur if a third runway were built at the Airport" were outside our jurisdiction. As we put it then, "this Panel cannot and will not undertake a review of the potential environmental consequences of building the third runway. Our responsibility, with respect to the Noise Issues, is limited to determining whether the POS has scheduled, pursued and achieved a meaningful reduction in real noise impacts at the *existing* Airport."

In anticipation of later hearings, in our January 1995 Noise Order we determined (a) that a showing that the Port had performed its obligations under the Noise Mediation Agreement was necessary, but not sufficient, to show compliance with the Resolution; (b) that the Noise Validation Method then proposed by the Port was not a valid method of establishing the required reduction in noise impacts, and (c) that 1993 should be used as the "base year" for purposes of the measuring whether the reduction in noise impacts required by the Resolution has been achieved (because nothing in the Resolution spoke to reductions in noise impacts that had already been achieved), but that the significance of the 1993-1996 data would "be best understood in the context of as much earlier data as the Port can make available to us."

We said that we would address three sets of subsidiary questions before resolving whether the Port had met its burden: "(a) what measures of noise impacts should be used (that is, what noise 'metrics' should be selected), (b) where should the measurements of noise be made, and (c) how much reduction in noise, by these measures, must be achieved, and over what time period?" We recognized that of these, the articulation of the required reduction in noise impacts presents "the

most difficult question." We did not presuppose that we could provide a satisfactory answer to this question without the benefit of input from the Port and the community. So, in our January 1995 Noise Order, we asked the Port to "show us (i) that it has articulated an appropriate standard for judging whether the reduction in noise impacts is sufficient, and (ii) that by that standard, the Port has achieved the required reduction."

Our January 1995 Noise Order led to a useful discussion of noise metrics that could be used to supplement the information provided by DNL and precipitated the collection of on-the-ground noise measurements by the Port at six supplemental monitoring sites, farther out from the Airport, that better represented significant portions of the affected population. In addition, the ACC subsequently submitted new information. Taking up the Panel's suggestion about the potential usefulness of survey data, the ACC commissioned Dr. Fidell to conduct a social survey to determine whether residents of the affected communities had perceived an improvement in their noise environment. Dr. Fidell conducted a telephone survey of over 1,400 residents in six neighborhoods affected by Sea-Tac-related noise.

When we reconvened in May 1995, the Port did not provide us, as we had asked that it should, with any workable standard that we could use to assess whether the reduction in noise impacts is adequate to demonstrate compliance with the Resolution. We were, as a result, unable to complete "Phase I" of the hearings on Noise Issues with a clear understanding of how the Port or the community advocates thought we should interpret the voluminous measurements of "on-the-ground" noise or the information about noise mitigation efforts that we had asked the Port to provide to us. To accommodate the Port's schedule, we called for a preliminary round of hearings on "Phase II" Noise Issues in November 1995 that was focused upon the question of what standard the Panel should use to make its decision and how the accumulating information about noise levels and mitigation efforts should be interpreted for purposes of resolving whether the Port had satisfied its burden under the Resolution. Following those hearings, we issued, on December 18, 1995, our Preliminary Order on Phase II Noise Issues.

We noted in our December 1995 Noise Order that these hearings had led to a resolution of the first two questions we had posed for Phase II: There was no significant dispute about what noise measures should be compiled or where the measurements of noise should be made. The most difficult, third question, however, remained controversial: "How much reduction in noise, by these measures, must be achieved, and over what time period?" The Panel was unwilling to accept the standard proposed by the Port or the standard proposed by the ACC. We noted that the selection of either of those competing standards for judging compliance with the Resolution would itself determine the outcome of these proceedings.

We felt strongly that it would be premature to decide then whether the Port had met its obligation under the Resolution and said that we would not make that determination until we had reviewed all the data to be offered to us early this year on reductions in noise impacts from 1993 through 1995 and on reductions in noise impacts following the 1990 Noise Mediation Agreement and leading up to the enactment of the Resolution in 1993.

In anticipation of a final round of hearings in February 1996, we provided some guidelines for what the Port should show in its "Compliance Report." We acknowledged that, as both the Port and the ACC had recognized during the course of the hearings, ultimately the Panel would have to rely upon our "best professional judgment ... to determine whether, taken as a whole, the pattern

of change in noise impacts is sufficient, in our judgment, to meet the requirements of the Resolution." We realized that the PSRC General Assembly, in adopting Resolution A-93-03, was seeking an impartial, objective assessment of a complex technical question. We said that, while we have always understood that our decision would have a "social or political character," we have felt strongly that "our exercise of judgment should reflect the best insights we can gain from established scientific sources about the significance of changes in various noise metrics as indicators of changes in the impact of noise on the people in the communities surrounding the Airport."

We asked the Port, and the community advocates, to address the following essential issues in written Position Statements:

- What reductions in on-the-ground noise impacts are shown by the various measurements and evidence compiled by the Port?
- How should the Panel interpret the significance of the reductions in noise impacts shown by the Port?
- Why should the Panel find that the noise reduction condition established by the PSRC's Resolution has been satisfied?

The Port responded to our December 1995 Noise Order by compiling and distributing a vast array of noise measurements and related information about its noise abatement and noise mitigation efforts. In its Position Statement, which was supported by the expert testimony of Paul Dunholter, the Port argued that the Panel should find that it had satisfied the requirements of the Resolution because, based upon the measurements of noise and modeling assumptions used by the Port, thousands of people no longer live in areas judged by the FAA to be incompatible with residential use; thousands of people are no longer "highly annoyed" by aircraft noise; high and medium speech interference has been reduced; the potential for awakenings resulting from loud aircraft events has been reduced; and thousands of homes have been relocated or insulated. In fact, the Port urged the Panel to conclude that its standard had been met "without a detailed review of the data" because noise "must have been" reduced because noisy planes have been greatly reduced overall and virtually eliminated at night; because the insulation of homes and schools has been "aggressively pursued and achieved;" and because people outside the Port have said that its noise programs have been successful.

The ACC submitted an opposing Position Statement, based upon the expert testimony of Dr. Fidell, that made three principal assertions: (i) that the estimates of population benefits used by the Port were not reliable because the tools used to derive them were not sufficiently precise to accurately predict benefits from small changes in noise levels; (ii) that, in any event, the reductions in noise relied upon by the Port were not "significant" in the sense that they could be appreciated as reductions in noise impacts for the affected populations; and (iii) that the Port could have scheduled, pursued and achieved a "meaningful" reduction in noise impacts if it had not rested upon the Noise Mediation Agreement. The RCAA also submitted an opposing Position Statement, and many members of the public wrote to the Panel to express their view that the Port had not reduced the impact of airport noise on their communities. Air Washington submitted a statement in support of the Port.

FINDINGS AND CONCLUSIONS
(BY THE MAJORITY)

Because this has been a lengthy and complex proceeding, we believe it may be useful to set forth our reasoning and the technical bases for our conclusions. Our findings and conclusions follow the general structural framework of the Port's argument.

In brief, the Port contends (a) that the overall noise level at the Airport has shown a consistent downward trend since 1989/1990, and has continued to decline (albeit at a lesser rate) since 1993; (b) that it has complied with the 1990 Noise Mediation Agreement with respect to both noise abatement and noise mitigation programs; (c) that the appropriate base year for comparative purposes should be 1989/1990 (or, alternatively, 1992), rather than 1993, the year Resolution A-93-03 was adopted; (d) that by a variety of noise metrics, the Port has shown reductions in the actual, measured, on-the-ground A-weighted sound levels produced by the Airport since 1989/1990, 1992 and 1993; (e) that those reductions translate, through a modeling and estimation process, into reductions in speech interference, sleep disruption, number of people "highly annoyed" by airport noise, and other "real noise impacts" on the ground; and (f) that the change in "noise impacts" can be translated, in turn, into reliable estimates of thousands of people who have received non-trivial benefits from the noise reductions. Proceeding from that logic, the Port proposed the following standard for our decision:

> Compliance with Resolution A-93-03 will be found if the entire record of reductions, taken as a whole, shows a pattern of reductions for several thousand people, counting for each measure only people for whom the reduction is neither inappreciable nor meaningless. The determination will focus on the reduction in noise impacts from 1993, but will not ignore improvements achieved before Resolution A-93-03 was enacted.

At the Panel's request, the Port measured changes in noise with two metrics in addition to DNL (Day/Night Average Sound Level), an overall measure of daily A-weighted sound levels, which weights nighttime noise more heavily than daytime noise and is commonly used in the industry to assess the total level of airport noise. They are SEL (Sound Exposure Level), a standard measure of the level and duration of single noise events, e.g., an aircraft flyover, and TA (Time Above), a standard measure of the total time in seconds, minutes, or hours that aircraft noise exceeds a 65, 75, or 85 dB level in a 24-hour period. Together with changes in the number and distribution of aircraft operations, these metrics provide a more complete picture of changes in the airport noise environment than is given by DNL alone. The Port also reported the progress of its noise mitigation (building insulation) programs.

The Port has presented its noise data and conducted its analysis on the basis of the actual number of operations at Sea-Tac Airport and the specific fleet mix of aircraft serving the Airport during the relevant time period. Air carriers account for almost 60 percent of operations at the Airport (e.g., 54.0 percent in 1989/1990, and 58.5 percent in 1995), while commuter airlines represent about 40 percent (42.6 percent in 1989/1990, and 38.7 percent in 1995). Air carrier operations have

been increasing, and total operations at Sea-Tac Airport have fluctuated over the past eight years as follows:

TOTAL AIRCRAFT OPERATIONS, SEA-TAC AIRPORT, CY 1988-1995 (IN THOUSANDS)

CALENDAR YEAR	1988	1989	89/90*	1990	1991	1992	1993	1994	1995
TOTAL OPERATIONS	316	335	354	355	339	346	339	353	387
AIR CARRIER OPERATIONS	177	182	191	193	187	196	200	212	226

* Operations for combined 1989/1990 base "year," per Port Compliance Report.
Source: Sea-Tac International Airport, Traffic and Operations Report.

In some cases, the Panel's request for time-series data on the various noise metrics required the Port to back-calculate certain airport data. For example, the Port calculated DNL values for earlier periods using the fleet mix at the time and the aircraft SEL data measured in 1995 at the 11 permanent Remote Monitoring Station ("RMS") sites and the six supplemental monitoring sites.

The Panel's task under Resolution A-93-03 is to evaluate the results of, first, the Port's noise abatement efforts (the impact of reductions in aircraft noise), and second, the Port's noise mitigation programs (the impact of building insulation). The Resolution itself speaks to overall reduction of "real noise impacts," and the Port has presented a substantial body of information on its efforts with respect to both noise abatement and mitigation. Accordingly, we have taken both aspects of noise control -- abatement and mitigation -- into account in our assessment of the reduction of noise impacts.

We address the threshold points first, including the direction of change in noise levels since 1993, the Port's compliance with the Noise Mediation Agreement, and the issue of the base year; turn next to our evaluation of the results of the Port's actions with respect to (i) noise abatement and (ii) noise mitigation; discuss the concept of "meaningful" and "reasonable" reductions in noise; then summarize our findings with respect to the overall reduction in noise impacts the Port has "scheduled, pursued, and achieved."

I. OVERALL DIRECTION OF CHANGE

As a result of the abatement and mitigation programs instituted by the Port under the 1990 Noise Mediation Agreement, the general direction of aircraft noise levels (measured objectively by noise monitors) has been downward since the PSRC General Assembly enacted Resolution A-93-03 in April 1993. The amount of change may be small, but it is not zero. When we rendered our January 1995 Noise Order, however, the Panel determined that the Port had the burden of showing that the reductions in noise impacts were "significant" or "meaningful;" we held that some reductions, while desirable and beneficial, might be too small to be sufficient to satisfy the Resolution. Accordingly, we find that the noise reduction condition of Resolution A-93-03 is not satisfied by the mere existence of a slight downward trend in DNL and SEL since 1993.

II. COMPLIANCE WITH THE NOISE MEDIATION AGREEMENT

Throughout this proceeding, the Port has relied on the 1990 Noise Mediation Agreement ("NMA" or "Agreement") as the cornerstone of its noise abatement and mitigation programs. The Agreement was the culmination of a long public process and includes many important components (principally the Noise Budget, the Nighttime Limitations Program and the Noise Remedy Program). It was, in 1990, an important milestone in the use of Stage 2 aircraft restrictions to reduce the adverse environmental impacts of airport operations. The Port was aware, however, that substantial numbers of residents were unsatisfied with the noise mediation process and the results it produced; many were extremely upset when, hard on the heels of the Agreement, the FAA's adoption of the Four Post Plan also introduced a major realignment of flight tracks (and resulting noise impacts). In addition, there has been vigorous opposition to the prospect of a third runway in the face of promises that many citizens apparently believe were made when the second runway was built. In light of that ongoing history of vocal opposition and concern about airport noise, the enactment of Resolution A-93-03 in April 1993 should have served notice to the Port that it would not only be held accountable for meeting its programmatic obligations under the Noise Mediation Agreement, but would also have to show that its noise programs were, in fact, producing results in the form of meaningful, measurable, on-the-ground reductions in noise *impacts*. Pursuant to the Resolution, the Panel's January 1995 Noise Order stated that compliance with the Port's obligations under the Agreement was a necessary, but not sufficient, element of satisfying Resolution A-93-03.

We have reviewed the Noise Mediation Agreement in detail, to ascertain whether the Port is currently satisfying the noise abatement and mitigation commitments it made under the Noise Budget, the Nighttime Limitations Program, the Noise Remedy Program, and the other elements of the Agreement.

With respect to the Noise Budget, given a measured reduction in DNL of 3.4 dB at the eleven permanent monitoring sites as of the end of 1995, we can be confident that the goals of the Budget have thus far been met. The 3.4 dB reduction realized by 1995 is already 1.8 dB better than the stated goal for 1996 and is only 1.0 dB under the goal for 2001. According to the Port, the complexity of the Noise Budget calculations apparently also encouraged certain airlines to opt for the simpler phased Stage 3 conversion option, which we believe to be a plus.

In connection with the Noise Budget, the PSRC Executive Board's Implementation Steps also requested the Panel to review the validity of the Port's Noise Validation Method ("NVM"), which is used to translate measured DNL into the ANEL metric used in the Noise Budget. We find that the NVM is a sufficiently reliable method for purposes of determining, on the basis of measurements of actual on-the-ground noise, whether the Port has met the *current* noise reduction objectives (expressed in the ANEL metric) of the Noise Budget, but we reach that finding only because the 1995/1996 goal for reduction in ANEL has been exceeded by more than a decibel. We are not convinced that the ANEL goal for the year 2001 will be achieved, because of the growth in the number of aircraft operations; the change in DNL by 2001 may be considerably smaller, thus necessitating greater accuracy in the conversion to ANEL. We find that the Port's Noise Validation Method would only be a reliable method for determining whether the future ANEL goals have been met if it is revised to incorporate the input from the six supplemental monitoring sites, as indicated

in our January 9, 1995 Noise Order, and any additional monitoring sites the Port may establish, with a full accounting for statistical uncertainty in the measured data at all sites.

With respect to the Nighttime Limitation Program, the aircraft operation data compiled by the Port show that its current goals have been met. We note that the number of exemptions is small and the number of variances issued has dropped substantially over the past few years. The Port's expressed attitude about continuing to minimize Stage 2 nighttime operations is encouraging.

Most of the elements in the Ground Noise Control Program have also been accomplished. Powerbacks have been prohibited and are not occurring. The need for use of auxiliary power units has been reduced. The Port is on record that it will pursue a "hush house" if an additional maintenance base is developed at the Airport. We did not hear, however, about actions to reduce reverse-thrust noise upon aircraft landing, as stipulated in the Noise Mediation Agreement.

We find that the improvements to the Duwamish/Elliott Bay Corridor Noise Abatement Procedures anticipated in the Noise Mediation Agreement have not been fully developed or implemented, especially with regard to periods of "low activity" as called for in the Agreement. We also note that the current nighttime departure corridors over Elliott Bay/Puget Sound have a low compliance rate.

The Noise Management System component has been implemented. There is some question about the status of the program to Control Noise from Most Annoying Operations, which is intended to "control or eliminate particular single event operations that occur on a continuing basis and that are the object of community complaints." That program has three elements: (i) improvement of the Port's Aircraft Noise Hotline procedures to crosscheck noise complaints; (ii) use of the Noise Management System, and/or assistance from the FAA, to identify the specific operation or event that prompted the complaints; and (iii) a commitment that the Port will contact the airline or the FAA "to make the parties aware of the specific noise concern and to attempt to reach a solution." From the record before us, it appears that the Port is carrying out that commitment with respect to initial departure only; in addition, it is not clear how cooperative the airlines and the FAA have been in taking action to adjust or discontinue the operations/events that provoke complaints, or how effective the program has been in actually controlling or eliminating such operations and events.

Turning to the NMA's Noise Remedy/Mitigation Program, our review indicates that, with the exception of the insulation of public buildings (most notably public schools in the Highline School District), most of the Port's essential milestones have been reached thus far, and additional mitigation has been scheduled and pursued, as described below.

The planned Acquisition/Relocation Program, a major element of the Noise Remedy Program, was largely completed by 1993; the Port purchased the last few properties by 1995, accomplishing a total buy-out of some 1,400 properties in the most severely noise impacted areas.

Prior to the NMA, the Port was insulating 175 houses a year. At that rate, it would have taken more than 50 years (to the year 2040) to complete the insulation of the 10,000 homes now deemed eligible for insulation treatment. The Residential Insulation Program adopted as part of the NMA called for the Port to insulate 350 houses per year; at that rate it would still have taken about 27 years to complete the needed work. In mid-1993, the Port greatly accelerated the

residential program, and it is now proceeding rapidly (at a rate of about 110 homes per month). By December 1995, the Port had insulated 3,647 houses.

The Audit Procedures for the insulation program have been implemented. The Cost Share Program has been replaced by the standardized insulation program, as approved in the 1993 Part 150 Update. However, the Mobile Home Program has seen little activity, and we have not been told of the existence of the report on possible mitigation actions for mobile homes called for in the Agreement. For reasons that are not entirely clear, there has also been relatively little activity with respect to the Transaction Assistance Program. We are not convinced that the Port is pursuing this program as effectively as it could.

Our chief concern with the Noise Remedy Program involves the insulation of sensitive-use public buildings, including the public schools (where progress has been delayed due to an impasse with the Highline Public School District). In addition, the Noise Mediation Agreement envisioned an insulation program that would cover a broad range of public buildings; it called for the Port to "[e]xpand [the] existing program to provide insulation for additional types of public buildings (e.g., auditoriums, private schools, churches, day care centers, libraries, etc.)." At present, this component is limited to insulation of classrooms at Highline Community College, now underway, and pilot projects at two churches, one private school, one condominium and one convalescent home. For reasons that are more fully discussed below (in the section of the Decision dealing with noise mitigation actions), we find that the Port's compliance with this portion of the Noise Remedy Program is incomplete.

Although the insulation of sensitive-use public buildings is a critical aspect of noise mitigation and we have very serious concerns about the lack of progress in this area, we have concluded, on the basis of the Port's successful efforts to meet or exceed the requirements of most of the other abatement and mitigation measures stipulated in the Agreement, that the Port is in substantial compliance with the Noise Mediation Agreement. Accordingly, we find that, on balance, the Port has met its burden under the Resolution to show that it is satisfying its basic obligations under the Agreement. We note that this finding does not necessarily imply that the programs pursued under the Agreement have been effective in reducing "real noise impacts."

III. Appropriate Base Year

For the reasons stated in our January 1995 Noise Order and reiterated during the hearings in May 1995, the Panel found that it was appropriate to use 1993 as the base year for purposes of the noise reduction condition imposed by Resolution A-93-03. The Resolution does not by its terms establish a base year, and in the absence of *any* expression in the Resolution that the General Assembly itself meant to look to the past for reductions in noise impacts, it would be highly irregular to interpret the Resolution to establish a retrospective test. The Panel said, however, that we would consider improvements in noise impacts achieved before the Resolution was enacted in assessing the significance of the reductions scheduled, pursued and achieved since 1993.

The Port has consistently maintained that 1989/1990 — the "year" immediately preceding the Noise Mediation Agreement — should be used as the base year for purposes of comparison. We have not accepted this position. In its February 1996 Position Statement, however, the Port offered for the first time a new argument that even if the Panel was correct when we concluded in January 1995 that the Resolution should be interpreted to require a meaningful reduction in noise impacts

after it was enacted, the Panel should have used 1992, rather than 1993, as the base year because the Resolution was passed in April 1993. By taking 1993 as the base year, the Port claimed, the Panel gave it no credit for improvements realized during 1993.

The Port contends that the consequences of the Panel's interpretation were magnified by the coincidence of a significant but transitory reduction in operations at the Airport and a resulting drop in airport-generated noise during 1993 -- a distortion which was then compounded, the Port argues, by a sizable increase in operations at the Airport in 1995. As a result of these aberrations, the Port maintains, the use of 1993 as the base year for comparison with 1995 made it very difficult to show a significant change in noise impacts. Accordingly, while reserving its claim that 1989/1990 is the proper base year, the Port urged the Panel to consider the reductions in noise impacts achieved since 1992, rather than 1993. The ACC responded that the Port's argument came too late, that the Port should have offered April-to-April, rather than calendar year, estimates (to reflect exactly the timing of enactment of the Resolution), and that in any event, the changes in noise impacts since 1992 relied upon by the Port are not sufficient to satisfy the requirements of the Resolution.

We have examined the Port's new argument carefully. We find that, although total Airport operations declined in 1993, air carrier operations did not -- and air carrier operations are the driving force behind the noise generated at Sea-Tac. The air carriers account for the majority of the Airport's operations, and the aircraft they use are noisier than commuter aircraft: 2 dB to 12 dB (SEL) louder on arrival, and up to 23 dB (SEL) louder on departure. Air carrier operations have declined in only one of the past seven years: 1991, not 1993. Decreases in air carrier operations do affect airport noise, but no such decrease affected the Sea-Tac Airport noise levels in 1993. In addition, the sharp increase in carrier operations in the first few months of 1995 (instigated by the introduction of Southwest Airlines' new service) subsequently settled back to levels more consistent with the long-term rate of growth.

However, the Port's persistent objections to the selection of a 1993 base year (which were echoed by some members of the PSRC's Executive Board), and our own serious concerns about the potential distortions that could be introduced by the selection of short-term intervals for examination, have led us to review Airport noise levels over the entire ten-year period from 1986 to 1995, using data provided by the Port.* These data show that the 1989/1990 base period preferred by the Port was the single loudest "year" in the past ten years, as measured by the Port's 11 permanent remote monitoring station (RMS) sites and reported in the 1991 Noise Mediation Committee Technical Report and the 1996 Port Compliance Report. Consequently, selecting 1989/1990 as the base period would exaggerate the long-term effects of noise abatement on the neighboring communities.

During that ten-year interval, the sound level changes at the Airport, as reported by the Port, show a reduction in aircraft DNL of 0.9 dB since 1993, 2.3 dB since 1992, 3.4 dB since 1989/1990, and 2.8 dB since 1986. The overall change since 1986 (-2.8 dB DNL) masks some substantial fluctuations in the actual rate of change; there was no reduction in average DNL at the 11 permanent RMS sites in the five-year period between 1986 and 1991, for example, and there was very little change from 1993 to 1995.

* Data on aircraft DNL in 1987 was not available to the Panel.

To avoid biasing our analysis by overstating or understating the trend in noise changes over time, we have decided to take a comprehensive approach. We do not wish to permit the selection of a base year -- a choice that is inevitably arbitrary in some respects -- to prejudice the outcome of this proceeding, and we have therefore examined the results of the Port's noise abatement and mitigation programs over all three periods: since 1993, since 1992, and since 1989/1990.

As this Panel stated in the January 1995 Noise Order, "We are convinced that the Resolution was intended to condition the approval of the third runway upon a showing that the noise impacts of the existing Airport have been reduced in a significant way." Accordingly, we have carefully evaluated all of the evidence presented to us, for each base-year period, in order to determine whether the Port has, in fact, successfully "scheduled, pursued, and achieved" a meaningful and perceptible reduction in real, on-the-ground noise impacts for the people in the communities surrounding the Airport. We present our detailed evaluation below, reporting the specific results of our analytical work for the benefit of the PSRC, the Port, the communities affected by airport noise, and other interested parties.

IV. Effectiveness Of Noise Abatement Programs

The Port argues that its noise data showing reductions in actual, measured, on-the-ground A-weighted sound levels are accurate; that the measured reductions can reliably be converted, through modeling and estimation, into reductions in numbers of people "highly annoyed" by airport noise, speech interference, sleep disruption, incompatible land use, etc.; and that the change in "noise impacts" can be then converted into credible estimates that several thousand people have received non-trivial benefits from the noise reductions, thus demonstrating that the Port has successfully met the requirements of the Resolution.

The ACC has urged that the Panel reject the Port's claim to have achieved a significant or meaningful reduction in noise impacts since 1993 for two related reasons: (i) the analytic tools used to derive the Port's estimates have not been shown to be accurate in measuring changes in noise impacts from small changes in noise levels; and (ii) the reported reductions in measured noise levels and impacts have been too small to be appreciated by the residents of the communities surrounding the Airport.

Reliability of Estimates

The Port presents various estimates of the changes in noise impacts associated with the measured and computed changes in DNL, SEL, and TA since 1993, 1992, and 1989/1990, in terms of numbers of people experiencing annoyance, speech interference, sleep disturbance, and other on-the-ground noise impacts. These estimates are subject to several layers of potential measurement and estimation error: (i) in the initial calculation of the changes in aircraft DNL based on measured SEL data from the permanent and supplemental monitoring sites; (ii) in the application of the revised dose-response Schultz Curve recommended by FICON ("FICON Curve") to estimate noise impacts; and (iii) in the adjustment and application of the Integrated Noise Model ("INM") to estimate DNL contours and the numbers of people benefitted by reductions in noise impacts.

The Panel acknowledged, when we requested the Port to expand its monitoring sites, to supplement its DNL analysis with the additional SEL and TA metrics, and to document its estimates of changes in on-the-ground noise impacts, that the process would "inevitably require the Port to

back-calculate or otherwise estimate some of the required inputs" and that this "would introduce some imprecision into the exercise."

We did not, however, excuse the Port from the burden of addressing the extent and impact of that imprecision. We expected the Port (i) to present information on confidence intervals to support the statistical reliability of its data, (ii) to document the assumptions and adjustments it made when it applied the FICON Curve and the INM to estimate changes in DNL contours, numbers of people benefitted, and other noise impacts, and (iii) to perform sensitivity tests, where appropriate, to evaluate the effects of those assumptions. In the December 18, 1995 letter that accompanied our Preliminary Order on Phase II Noise Issues, for example, we asked the Port to "clearly and completely document every assumption and adjustment it has made in calibrating the INM as used in its Compliance Report." We repeatedly requested confidence intervals and sensitivity tests in the course of the hearings. The Port did not supply that information.

In response to the Panel's questions at the February 1996 hearing, the Port presented some partial details on the confidence intervals for its 0.9 dB reduction in aircraft DNL since 1993. The Port stated that, for the DNL measurements at the permanent RMS sites, the 95 percent confidence intervals were plus or minus 0.2 to 0.4 dB. At the supplemental monitoring sites, the intervals were much wider: "in the neighborhood of" plus or minus 1.5 dB, according to the Port's noise consultant. In other words, the actual change in aircraft DNL since 1993 (per the Port's permanent monitoring sites only) may be as large as -1.3 dB or as small as -0.5 dB; and the change in aircraft DNL at the supplemental sites is not known.

This risk of DNL measurement error is a function of several factors: the possibility of very small inaccuracies in the measurement system calibration over time; the more important fact that noise impacts can vary considerably with slight changes in topography and distance from the noise source; the accuracy with which the system can separate aircraft noise from other sources; and, for the supplemental monitoring sites, the use of data from sample weeks rather than 365 days of measurements to compute measured DNL at the sites.

The principal analytical tools the Port used to translate its measured DNL reductions into on-the-ground noise impacts were the FICON Curve and the Integrated Noise Model.

The FICON Curve, based on the noise dose-response relationships reported from many surveys, is an accepted "model," or method, of estimating noise impacts on populations from changes in measured noise levels (DNL). In making use of the FICON Curve, however, the Port did not take account of the margin of error inherent in the curve. The surveys on which the FICON Curve is based are subject to two kinds of measurement error: error in the physical measurement of the noise (i.e., whether the instruments registered the same levels of noise experienced by the population), and error in the survey reports. Green and Fidell address these issues in an article accompanying the widely accepted 1991 update of the original Schultz Curve by Fidell, Barber and Schultz.* Green and Fidell estimate that the measurement error in the noise variable is 1 to 3 dB, and that the measurement error in the survey reports translates into a 4 dB range in the noise

* D. Green and S. Fidell, *Variability in the Criterion for Reporting Annoyance in Community Noise Surveys*, J. Acoust. Soc. Am 89 [1], January 1991; and S. Fidell, D. S. Barber, and T. Schultz, *Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise*, J. Acoust. Soc. Am 89 [1], January 1991.

variable. They estimate that these errors, together, amount to approximately 5 dB. In other words, DNL differences of less than 5 dB fall within the FICON Curve's margin of error and therefore cannot be used to make reliable estimates of differences in the percentage of the population which is "highly annoyed" by aircraft noise impacts.

Neither the -0.9 dB DNL change reported at Sea-Tac since 1993, nor the -2.3 dB or -3.4 dB DNL changes since 1992 and 1989/1990, approaches the 5 dB margin of error in the FICON Curve. Thus, the estimates of the population effects which the Port derived from the FICON Curve are not statistically reliable. The model is simply not sensitive enough to produce dependable estimates of reductions in noise impacts from such small changes in DNL.

Another way to understand this point is to examine the 95 percent confidence interval around the FICON Curve, which Fidell, Barber and Schultz (1991) calculate. Although the width of the confidence interval varies along the Curve, at the mid-range of the FICON Curve, for a given DNL, the 95 percent confidence interval is nearly 20 percentage points wide. For example, at a DNL of 70 dB on the FICON Curve, we can be 95 percent certain only that the percentage of the population "highly annoyed" by aircraft noise is somewhere between 15 and 35 percent.

The Integrated Noise Model is a complex, FAA-approved computer model used to calculate the land areas impacted by aircraft noise (DNL contours in square miles), and the corresponding numbers of people affected by aircraft noise within various DNL contours. The INM is a standard analytical tool, but the outputs of the INM depend on the specific values the analyst assigns to the input variables. Despite the Panel's specific request, the Port failed to supply detailed information on the assumptions and adjustments it used when it applied the INM to compute changes in (i) DNL contours and (ii) the population adversely affected by noise, from the measured SEL data for each aircraft type. It was not enough for the Port to present, for the first time, at the final hearings in February 1996, tables comparing measured and modeled DNL differences at each monitoring site, with no analysis of the potential effects of these differences on the population estimates and noise impact reductions the Port had derived. Without clear documentation of all the adjustments the Port made to its INM input files, it is very difficult to assess the reliability of the Port's estimates of reduced noise impacts and corresponding population benefits.

Noise analysts frequently must make assumptions in running the INM computer program or otherwise estimating the impacts of noise exposure on an affected population. In such cases, one can use sensitivity tests, in turn, to evaluate how much a change (or a measurement error) in a key input value or assumption might affect the outcome. The Port presented no reports on the results of any sensitivity tests it may have conducted. In short, we do not know what assumptions the Port used in this application of the INM, or how much difference it might have made if the Port had decided to use a slightly different set of assumptions to compute its estimated changes in noise impacts and benefits.

These various types of measurement and estimation error can cascade through the modelling and estimation process, compounding the uncertainty of the final results. Small changes in estimated noise impacts may be a product of the degree of error incorporated in the modelling process, rather than any actual change in on-the-ground noise impacts. Absent the kind of information that would permit us to independently assess the reliability of the Port's estimates, we are left with the possibility that the noise impact results the Port is estimating may very well be smaller than the cumulative measurement error in the Port's methodology.

Our concern about the propagation of error in the Port's analysis does not reflect a normative judgment that the Port made a mistake or did something wrong in its analysis (other than its failure to document the uncertainty in its data and the effects of that uncertainty on its results). Rather, our concern reflects (i) the fact that analytic tools like the FICON Curve cannot provide robust estimates of the population impacts of the small reductions in DNL that were measured by the Port, and, more specifically, (ii) the fact that the Port did not specify the confidence intervals on its data, the INM inputs, assumptions, and adjustments it made, or the sensitivity test results that would allow us to place reasonable confidence in the Port's conclusions about noise impacts.

The Port argues, with some force, that the Panel should at least accept the approximate magnitude of the results it has derived, even if we reject the appearance of precision as unjustified. The Port claims that in order to control for the risk of error, it has systematically biased its assumptions and adjustments to minimize the apparent reduction in noise levels, and associated noise impacts, over time. This claim, however, is difficult to accept without a complete description of the actual assumptions and adjustments the Port made. More persuasively, the Port emphasized that the direction and pattern of changes in noise levels and noise impacts that it has estimated are consistent with the relatively reliable measurements taken at the Port's permanent monitoring sites and with common understanding of the two underlying phenomena that have caused the most significant changes in the Airport's noise environment in recent years: the dramatic reduction of Stage 2 aircraft operations, especially at night, during the years 1989/1990 to 1995, and the marked growth in Stage 3 aircraft operations since 1993.

The Port points out that one would expect, in these circumstances, to see a continuous reduction in DNL over those years; a reduction in the loudest aircraft events, measured by SEL, with a corresponding reduction in average SEL and Time Above 85 dB; and, beginning in 1994, an increase in Time Above 65 dB caused by the increase in flight operations (now running at more than 1,000 flights per day, up 14 percent from 1993). Since this is exactly the pattern that emerges from the Port's noise measurements (and back-calculations), the Port argues that its analysis of noise benefits "makes sense" and should be credited by the Panel. While these arguments have some intuitive appeal, they were ultimately not convincing, in light of our detailed analysis of the Port's noise metrics and estimated population benefits.

We have examined with great care each of the Port's specific arguments about on-the-ground noise impacts and its calculations as to numbers of people benefitted by noise reductions. Wherever possible, we have reviewed and analyzed the underlying data. In general, we find that the underlying data show no serious internal inconsistencies across the various noise metrics; for purposes of analysis, therefore, we accept the Port's DNL, SEL, and Time Above data as generally (if not precisely) reflective of the actual changes in fleet mix and pattern of operations at the Airport. The critical question is what those data actually demonstrate, in terms of meaningful or significant reductions in real, on-the-ground noise impacts.

The Port urges us to accept its interpretation of the data with regard to noise impacts. The ACC and the RCAA urge us to reject that interpretation. We have conducted an independent evaluation, as Resolution A-93-03 explicitly requires. We present, below, our analysis and findings with respect to each of the major types of "noise impacts" addressed in the Port's Compliance Report.

Percentage Highly Annoyed

Noise impacts are often evaluated in terms of changes in the number and percentage of people "highly annoyed" by a given noise source. In its Compliance Report, the Port estimated that some 28,000 people were "highly annoyed" by Sea-Tac Airport noise in 1989/1990, out of a total population of 250,000 to 300,000 people within the 55 dB DNL contour at the time. The Port asserted that the reductions in aircraft DNL at Sea-Tac have produced a 11 percent decrease since 1993 -- and a 33 percent decrease since 1989/1990 -- in the overall number of people "highly annoyed" by aircraft noise: 2,100 fewer since 1993, and 9,900 fewer since 1989/1990, by the Port's estimates.

At the end of the final day of the February 1996 hearing, in response to the Panel's questions about the basis for those statements, the Port supplied the following table to substantiate its estimates of fewer people "highly annoyed:"

PORT ESTIMATES: PERCENTAGE OF PEOPLE HIGHLY ANNOYED

DNL CONTOUR BAND	1989/90	1993	1995
75 dB and above	45	36	34
70-75 dB	29	22	20
65-70 dB	17	12	11
60-65 dB	9	6	6
55-60 dB	5	3	3
OVERALL PERCENT HIGHLY ANNOYED	9	7	6

(Note: The overall percentage highly annoyed reflects a weighted average of the number of people affected by airport noise in each DNL contour band; there are very few people in the 75 dB DNL contour, but many in the 55, 60 and 65 dB contours. 1992 is not included because the Port supplied no estimates on percent highly annoyed in 1992.)

We were then able to trace the logic behind the claim. The Port had placed its reported changes in aircraft DNL on the FICON Curve, calculated a corresponding overall percentage of people "highly annoyed" in 1989/1990, 1993, and 1995 -- 9, 7, and 6 percent, respectively, of the population within the 55-dB-and-above DNL contour -- then multiplied those percentages by its INM population estimates and compared the results with the original estimate of 28,000 people "highly annoyed" in 1989/1990, in order to arrive at its figure of 9,900 fewer people "highly annoyed" in 1995.

That would have been a positive benefit, if we could reasonably conclude that it had actually occurred. Unfortunately, the entire calculation was based on very small movements along the FICON Curve: a shift of -0.9 dB DNL since 1993, and -3.4 dB DNL since 1989/1990, along a curve that does not accurately predict changes in annoyance for DNL changes of less than 5 dB. There is a very large potential for error when one uses the FICON Curve to estimate the percentage of "people benefitted" from very small reductions in DNL; as noted earlier, the 95 percent confidence interval is about 20 percentage points wide. Because the percentage changes the Port computed in its table -- the shifts from 9 to 7 to 6 percent of the overall population -- have no solid basis, one cannot conclude that there has been any change at all since 1993 in the actual number or percentage of people "highly annoyed" by aircraft noise, or more than an insignificant change since 1989/1990.

Consequently, we cannot find that the Port has demonstrated any significant "noise impact" benefits on the basis of its "highly annoyed" population analysis. Contrary to the Port's assertions in the Compliance Report, the actual data are, instead, consistent with the findings of the ACC's 1995 social survey that the majority of residents do not perceive a reduction in annoyance due to aircraft noise impacts.

The ACC social survey results, covering six communities in the vicinity of the Airport, indicated that (i) people in the Sea-Tac area are generally more tolerant of aircraft noise than people elsewhere in the country where such surveys have been done, and (ii) an average of 30 percent of the respondents were more annoyed by aircraft noise over the past two years (February 1993 to February 1995), while an average of 9 percent were less annoyed. The Port criticized the survey technique (which asked respondents to remember a noise situation two years prior and to compare it to the current time period) and offered expert testimony by Dr. Ward discounting the reliability of memory. On review, we find the survey a useful device, conducted by a leading expert on such surveys. Because the technique differed from the usual methodology of asking respondents to describe the then-current situation at two different times and then independently comparing the answers (no such prior survey was available for the Sea-Tac area), we accept the survey's results on the change in annoyance as illustrative rather than definitive. We note that the ACC's survey results are consistent with the relationship between DNL and Percentage Highly Annoyed expressed in the FICON Curve for noise impacts.

Loudest Aircraft: SEL Analysis

The Port also presents data on individual aircraft noise events in terms of Sound Exposure Levels (SEL). There *has* been a reduction in the highest-noise-level aircraft events, as measured by the Port's SEL data and the aircraft operational data for the changing fleet mix at the Airport.

From 1993 to 1995, the total number of Stage 2 flight operations at Sea-Tac declined from 132 per day to 93. Moreover, by 1995 the majority of the remaining Stage 2 planes were F28s, which are measurably quieter (by 5-7 dB SEL) than the Stage 2 Boeing 727s that dominated the noise profile in 1990 and were still the dominant Stage 2 aircraft in 1993. At night, the average number of Stage 2 operations dropped from 20 in 1993 to 9 in 1995; only a handful remained by the end of 1995 (due to the October 1995 deadline in the Nighttime Limitations Program).

In recent years, however, the change in average SEL has been small. We find that the overall fleet-wide average SEL reduction of 2.0 dB since 1993 is too small to produce a meaningful change in on-the-ground noise impacts, especially when coupled with more flight operations. Further, any assessment of the reliability of that figure is complicated, in part, by the range of variation in measured SEL values over various aircraft types and even within individual aircraft categories. We also find that there was relatively little reduction in the number of peak aircraft noise events with a SEL over 95 dB (averaged over the 11 RMS sites) from 1993 to 1995.

Moreover, the Port's data show an *increase* since 1993 in aircraft noise events with an average SEL over 85 dB at the 11 RMS sites (with only a slight decrease at the supplemental sites). There has also been an increase in the number of aircraft events with an average SEL over 75 dB at both sets of sites. The Port did not supply 1992 average SEL data for the Panel's analysis.

Since 1989/1990, there has been an overall 4.5 dB reduction in average SEL for individual aircraft events. That change, which reflects the early phase-out of Stage 2 aircraft at Sea-Tac, would appear to be "significant" and "appreciable," in the sense that people should be able to notice a difference of that magnitude and perceive some benefit. The extent to which residents actually do perceive a difference of 4.5 dB SEL in the average level of individual aircraft events over the course of a six-year period may be tempered, however, by the unreliability of memory (as the Port noted in its criticism of the social survey), and by the countervailing effects of an increase in the number of daily aircraft operations over the same period.

Federal regulations require the phase-out of all Stage 2 operations by 2001. The Port produced earlier benefits for the Puget Sound Region by accelerating the phase-out of Stage 2 aircraft in the early 1990s; 86 percent of the fleet was Stage 3 by 1995. In effect, residents obtained the benefits of the drop in peak SEL (aircraft events above 95 dB) sooner than they otherwise would have, as Sea-Tac outpaced the national phase-out of Stage 2 aircraft. While that early improvement was certainly beneficial, we find that the gains the Port achieved (reflected in reductions in average SEL) are now being eroded by the growth in operations, as the following evaluation of the Time Above (TA) data indicates.

Speech and Activity Interference: Analysis of Time Above

One of the most useful and illuminating ways to assess changes in noise impacts is the Time Above (TA) metric. The Port uses this measure to estimate changes in speech and activity interference (and corresponding numbers of people benefitted) from data on the changes in daytime TA 85, 75 and 65 dB outdoors, and changes in daytime TA 60 dB and 45 dB indoors. While the TA metric is measured directly from the Port's RMS and supplemental monitoring sites, the Port's estimates of the number of people benefitted must be viewed with the same cautions raised previously about the accuracy of the INM-estimated population data.

Because the Port provided no Time Above data for 1992, our analysis is limited to the 1993-1995 and 1989/1990-1995 time periods. Except where noted below, the Port presented data on TA "per day" based on a 15-hour daytime "day."

We evaluated the significance of the reported reductions in Time Above in terms of minutes per day, as well as percent change. For example, in the 1993-1995 time period, the large percentage reductions in daytime TA 85 that the Port cites in its Compliance Report actually represent decreases of less than two minutes per day in noise exposure above 85 dB, while the small percentage increases shown in TA 65 amount to as much as an additional 44 minutes per day of noise exposure above 65 dB.

When we examined the longer 1989/1990-1995 interval, we found a similar pattern. The average daytime Time Above 85 dB at the reported monitoring sites fell from about five and a half minutes a day in 1989/1990, to just under two minutes a day in 1995. The average Time Above 65 dB remained much the same: 2 hours and 53 minutes in 1989/1990, compared to 2 hours and 38 minutes six years later.

It is difficult to conclude that such small reductions in average TA 85 constitute a meaningful reduction in "real noise impacts." How much weight should one give to the decreases in Time Above 85, in evaluating population exposure to aircraft noise? Removing a large share of the loudest

aircraft noise does make a difference in on-the-ground noise impacts. But recent increases in Time Above 65 dB are now partially offsetting the reduction in the peak aircraft noise (TA 85). If one takes the "equal energy principle" at face value -- a ten to one noise-energy tradeoff for a 10 dB difference, one hundred to one for a 20 dB difference, etc. -- then as of 1995, with respect to operations at Sea-Tac, the decreases in TA 85 still outweigh the increases in TA 65, implying an overall net benefit (as the small but continuing reduction in DNL suggests). We view that tradeoff with some circumspection, however, especially as TA 65 grows further into the "several hours per day" range. At that point, the real-world relationship between aircraft noise levels and number of operations comes into play. The pattern of aircraft noise at a site in the community has fewer very loud peaks but becomes far more continuous, and a steady stream of aircraft noise above 65 dB has noise impacts of its own.

For the three RMS sites where the Port presented 24-hour (rather than daytime) measured TA data from the Port's noise monitoring system -- RMS sites 5, 10, and 11 -- the Time Above 65 dB in 1995 was 5 hours per day at RMS 5; 3 hours and 51 minutes per day at RMS 10; and 9 hours and 49 minutes per day at RMS 11. At all three sites, Time Above 65 dB is now higher than it was in 1993, and at RMS 11, TA 65 is also higher than it was in 1989/1990.

Moreover, at one site -- RMS 11 -- *TA 85 was also higher in 1995* than it was in 1993. The increase in TA 85 from 9.5 to 10.4 minutes per day at RMS 11 indicates an *increase* in the loudest aircraft events, perhaps as a result of increased aircraft ground noise.

Our examination of the TA data suggests that the Port may have already obtained most of the net benefit it can expect from the reductions in TA 85 produced by its current noise abatement programs. It appears to the majority of the Panel that the Airport may have reached a plateau in net noise reduction, or will do so shortly, because TA 65 is now increasing steadily, and the earlier downward trend in TA 75 has apparently bottomed out as well. With the rising number of flight operations, the number of minutes (or hours) of Time Above both 65 dB and 75 dB is likely to rise in future years, soon overtaking the real benefits of the Port's reductions in TA 85.

We note that Time Above 65 dB — not to mention 75 dB — does more than merely cause "low levels" of speech interference; it disrupts a wide variety of everyday activities (relaxation, thinking, reading, learning, and listening) and is correlated with increased levels of stress, tension, and annoyance. The Port cites the 1992 FICON Report discounting such effects; however, since that FICON Report was issued, a considerable body of medical literature has been developed, documenting the adverse effects of exposure to noise levels in the 65 to 75 dB range, including psychological distress, loss of concentration and reading comprehension, and other physiological effects. In short, increases in outdoor TA 65 can produce serious on-the-ground noise impacts.

We also evaluated the Port's estimates of indoor speech and activity effects based on changes in interior TA 45 in single-family residences. The Port's data support a finding of substantial improvement in interior TA 45 for insulated buildings with the windows shut, but that is primarily a function of the insulation, not a result of improvements in the outdoor TA. (The data results do demonstrate the significance of achieving an average A-weighted sound level reduction of 7 dB for insulated houses, with windows closed.) For the open-window case, however, it appears that interior TA 45 -- a benchmark for the threshold of speech interference -- has increased, based on the trends in the outdoor TA 75 and TA 65. The Port did not specifically show the interior, open-window TA 45 dB data.

Changes in classroom speech and activity interference were assessed using interior TA 60 and TA 45. In examining the underlying data, we find that the large percentage improvements the Port shows in "medium level" speech interference from 1993 to 1995 amount to actual reductions of just two to three minutes per day. The data also show almost no improvement in the amount of time above the 45 dB threshold for speech interference. Most important, our analysis revealed the striking fact that for the four schools the Port cites, even with the windows closed, the interior noise levels are above the threshold for speech interference (45 dB) for an hour to an hour and a half per day.

Once again, marked improvement is shown when insulation is added. When the Port adjusts its estimates to reflect a 5 dB reduction in A-weighted sound level due to insulation, the number of classroom hours above that threshold noise level of 45 dB are cut in half — still disruptive to the learning process, but much better. These results underscore the critical need for school insulation, because a continued increase in aircraft operations in the future will only increase the number of minutes (or hours) over the threshold for speech interference.

Nighttime Noise Improvements

The Port also presented data and analysis on the change in the potential for sleep disturbance. We note that because the method of analysis is new and untested, the Port's results should be viewed with caution, especially in light of the concerns outlined above about the reliability of the Port's 1NM-estimated population benefits. The method does seem plausible in its approach and its use of the USAF curve on probability of awakenings.

The reported 1.9 dB reduction in the average SEL of nighttime events since 1993 is not a meaningful indication of changes in real, on-the ground noise impacts, and the reliability of that figure is complicated by the range of variation in the measured SEL data across and within aircraft categories. The reported decreases in nighttime L_{eq} in recent years are small as well: -0.9 dB since 1993, -1.9 dB since 1992, and -3.6 dB since 1989/1990. It appears to the majority of the Panel that the small size of the reductions may be due to a combination of three factors: (i) the increase in the number of nighttime flight operations; (ii) the fact that the wide-body Stage 3 aircraft, with the exception of the Boeing 767, have the highest A-weighted sound levels on arrival -- greater than a Stage 2 Boeing 727; and (iii) the fact that, on departure, the wide-bodies and the hushkitted/re-engined 727s and DC8s are within 3 to 6 dB (SEL) of the Stage 2 Boeing 727. Although there are now far fewer Stage 2 flights at night, the total number of nighttime flight operations is not declining. The Port's data show an average of 133 flights per night in 1989/1990, 120 per night in 1993, and 138 per night in 1995 (data on 1992 nighttime operations were not reported).

The Port's analysis shows a modest decrease in the overall potential for awakenings since 1993, which is attributed mostly to the home-insulation program (discussed later in this Decision). With the windows closed, insulation does work. Our analysis of the data, however, shows an increase in the number of potential awakenings for the open-window case, which suggests that the increase in total nighttime operations is overriding the decrease in average aircraft SEL produced by the nighttime Stage 2 phase-out.

Moreover, we are concerned about the Port's decision to use a 5 percent open-windows assumption in its analysis (i.e., the Port estimated the overall rate of nighttime awakenings on the assumption that residents keep their windows closed 95 percent of the time). We are not sure of

the factual basis for that assumption, or the extent to which it may have affected the Port's results. No sensitivity analysis was presented, although we would expect that the difference in noise exposure with open v. closed windows has an important bearing on the rate of nighttime awakenings.

The effectiveness of the Port's nighttime noise abatement programs is being undermined to some degree by poor aircraft compliance rates on the North Flow Noise Abatement Departure Corridors. We commend the Port for its actions in implementing these Corridors; it is clear that such flight track procedures can have a significant impact on population noise exposure. But they produce results only if they are enforced. While compliance with the nighttime Corridor procedures is fairly high on initial departure, we find that the compliance rates are unacceptably poor outside the immediate vicinity of the Airport. In December 1995, for example, significant numbers of aircraft failed to comply with the North Flow Corridors at night: 29 percent on the Elliott Bay Departure, 25 percent on the Puget Sound Departure North, and 27 percent on the Puget Sound Departure South. For the third quarter of 1995, the failure rates for those three Departure Corridors were 21 percent, 19 percent, and 40 percent, respectively. By comparison, the noncompliance rates for the nighttime South Flow Puget Sound Arrival Corridor were 1.4 percent in December 1995 and 0.6 percent in the third quarter of 1995.

Primary responsibility for this problem rests with the FAA, which has operating authority over the more distant sections of the Corridors. In light of the specific language in Resolution A-93-03 requesting the FAA to do more to reduce the noise impacts associated with the Four Post Plan, we find it troubling that the FAA would hinder the Port's noise reduction efforts by failing to enforce the *existing* abatement departure procedures. The Port and the residents of the Region deserve better.

We are also concerned that Alaska Airlines has shifted its two nighttime Stage 2 cargo arrivals and departures to Boeing Field ("King County International Airport" or "KCIA") in order to sidestep, rather than comply with, the Port's nighttime limitations on Stage 2 flights — a move which, we recognize, is outside the Port's jurisdiction (but perhaps not outside its influence). Taking advantage of the fact that KCIA is an unregulated general aviation airport, not subject to the controls that govern commercial airports, the carrier continues to operate these flights. These *very* loud aircraft events have generated many complaints, and this action by Alaska Airlines weakens the effectiveness of the Port's Nighttime Limitation Program.

In light of the small reductions in nighttime SEL and L_{eq}, the *greater* likelihood of awakenings in recent years in the open-window case, and the factors undermining the Port's efforts to reduce nighttime noise exposure, we do not find that the Port has made a convincing case that there is a significant overall reduction in sleep disruption due to aircraft noise.

Airline decisions to shift Stage 2 aircraft operations out of the nighttime period to the "shoulders" of that period -- that is, 8-10 p.m. and 7-8 a.m. -- also have implications with respect to noise impacts (the Port has acknowledged the likelihood of such shifts in the timing of Stage 2 operations). The 8-10 p.m. interval covers the bedtime hour for many children and the period of evening relaxation and early bedtime for many adults. The Apogee survey of people near Dallas/Ft. Worth Airport (which the RCAA supplied for the Panel's review) showed high levels of annoyance with aircraft noise before 10:00 p.m., due to interference with normal evening activities.

Noise Contour Analysis

Another series of measures presented by the Port relates to the "change in DNL land use and population impact." The Port asserts that the population within the high noise contour (75 dB DNL) has now dropped from 3,100 to nearly zero. From the information we have seen, it is not clear that such a reduction actually occurred in the stated 1993-1995 time frame (for example, the 1993 DNL contour map shows virtually no residential land use within the 75 dB zone). Nevertheless, the ability to say that no one is residing inside a DNL contour of 75 dB is an important marker for an abatement program; in keeping with our decision to include earlier time periods, we give the Port full credit for this accomplishment, no matter when it occurred.

Similarly, sizable reductions in the number of people inside the 65 and 55 dB DNL contours are important. The Port states that 8,000 fewer people are inside the 65 dB DNL contour since 1993, and that the population inside the 55 dB DNL noise contour is 19,000 lower since 1993, an 8 percent reduction. Both of these estimates carry with them an unknown but potentially large degree of uncertainty due to the undocumented differences between the modeled and measured DNL levels the Port used in its DNL contour calibration process in the Integrated Noise Model. As we previously explained, we are concerned about the effects of propagating errors in translating noise measurements to noise models to population benefits. Given the size (-0.9 dB) of the 1993-1995 change in DNL and the uncertainty of any appreciable change in noise impacts at that level, it is not clear that the Port's estimated changes in the 65 and 55 dB DNL contours reflect anything more than a marginal shift in levels for houses on the border of the respective contours. If, as the other measures we have examined suggest, the DNL contours have moved only marginally (or not at all) since 1993, the changes are not meaningful, and the estimates of 8,000 and 19,000 people benefitted are laden with uncertainty.

The Port also calculates the change in population exposed to indoor noise levels in excess of 45 dB DNL, reporting data for both open- and closed-window conditions, and closed-window data for both insulated and uninsulated houses. We find that the population noise exposure change resulting from the insulation program is real and undebatable in the closed-window case: These people experienced an average of about 7.9 dB reduction in interior DNL (uninsulated, 1993, compared to insulated, 1995). There is no question about the significance of a change of that magnitude (although the benefits accrue only to the residents of insulated houses, and then only when they are indoors with the windows closed).

With respect to the Port's overall indoor-population-exposure estimates, however, we have the same concerns as we did with the results for the 55 and 65 dB DNL contour analyses: the propagation of error in the population projections due to uncertainties in the underlying data and in the estimation process, coupled with a very small change in mean DNL, as discussed below. Since the Port provided no information that would permit us to judge the accuracy of its population estimates, we cannot give full weight to the Port's reported results.

Summary: DNL Reductions

The DNL metrics provide a very useful -- and widely accepted -- way to characterize overall changes in airport noise. As a summary measure based on the average noise levels of hundreds of thousands of flight operations over time, the annual DNL values incorporate, but mask, the particular variations in sound exposure and noise impacts that are illuminated by the various other

measures discussed above. Total and aircraft DNL metrics are the principal tools used to summarize the overall changes in environmental sound levels associated with airport operations; total DNL reflects the changes in noise around the Airport from all noise sources, while aircraft DNL tracks the changes in noise attributed to aircraft operations.

We find that the reported reductions of 0.9 dB and 0.6 dB in aircraft and total DNL, respectively, since 1993 -- even if they were accepted as statistically reliable -- are too small to justify any finding that there is likely to have been a meaningful or appreciable reduction in speech interference, sleep disruption, the number of people or percentage of the population "highly annoyed" by aircraft noise, land use effects, or other noise impacts. The principal analytical tool used to calculate such population effects from DNL exposure levels -- the FICON Curve -- permits no conclusions about population benefits on the basis of such a small shift in measured DNL levels. If one accepts 1993 as the legally-mandated base period for comparison, the 0.9 dB reduction in aircraft DNL is clearly too small to produce even a reliably measurable -- let alone "meaningful" -- reduction in on-the-ground noise impacts.

Likewise, we find that the use of 1992, rather than 1993, as the base year would not alter our conclusion that the Port has not shown a significant or meaningful reduction in noise impacts since the Resolution was enacted. Given the small size of the change being measured (-2.3 dB in aircraft DNL, -1.8 dB in total DNL), uncertainty remains a concern. Moreover, we are unconvinced that a sound level reduction as small as 2.3 dB in DNL, over a four-year period, can reasonably be expected to produce an appreciable reduction in the on-the-ground noise impacts experienced by the population surrounding a busy airport with rapidly growing operations.

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Over the past ten years as a whole (1986-1995), there has been a change of only -2.8 dB in aircraft DNL as measured by the Port's RMS sites. For the reasons addressed above in our discussion of the "base year" issue, we believe the ten-year change in aircraft DNL provides the most unbiased measure of actual DNL reductions at the Airport. The *maximum* change in aircraft DNL that the Port can show, for any base "year" within that ten-year time frame, is the -3.4 dB change in aircraft DNL from the single worst year (1989/1990) to date.

The scientific literature does not establish any specific figure as a definitive DNL threshold for measuring meaningful airport noise reductions. There is debate about how important a 3.0 dB change in aircraft DNL really is. While a -3.0 dB change in DNL will shift noise contours, and thus, by some measures of effectiveness, give an appearance of importance, it reflects a change in sound levels that is not much more than barely perceptible -- and certainly not "appreciable." In terms of generating real, on-the-ground noise impact reductions that people in their yards or houses would appreciate, a -3.0 dB change in DNL would not generally be considered "significant;" it would not be considered a goal for highway or rail noise abatement programs, for example.

Consequently, if we were to use the more representative -2.8 dB change in aircraft DNL -- the cumulative improvement the Port has actually achieved over the past ten years -- we would conclude that the Port has not demonstrated a sufficient reduction in real noise impacts to meet the requirements of Resolution A-93-03.

Based on our experience, the scientific literature, and our best professional judgment, the majority of the Panel also finds that the maximum reduction the Port has shown (-3.4 dB in aircraft DNL, averaged over the 17 monitoring sites) -- although it is certainly a laudable achievement for

any airport with more than 300,000 operations a year -- is below the threshold of "meaningfulness" in terms of producing a real, appreciable, "on-the-ground" reduction in airport noise impacts for an affected population -- especially when that DNL change occurs in conjunction with an increase in operations that now produces a rising trend in Time Above 65 dB. In short, even over the six-year period the Port has urged the Panel to consider, the majority of the Panel is not convinced that the Port's noise abatement efforts have produced a sufficient reduction in real, on-the-ground noise impacts to satisfy the noise condition of Resolution A-93-03.

This finding will no doubt be controversial. The literature does not precisely define what constitutes a meaningful reduction in DNL, largely because there are so many acoustical and non-acoustical variables that can affect people's responses. (An increase in aircraft operations is one such variable that has been of concern to us here.) Addressing aircraft noise abatement, A. Harris commented indirectly on the meaningfulness of different amounts of noise reduction when he noted, "How effective a noise abatement tool is a displaced [landing] threshold? Not very -- a 4,000 foot displacement is required to obtain *a reduction of 5 dB*.... Even the 3,019 foot displaced runway... produces *only a 3.2 dB reduction* in landing noise...." (A. S. Harris, "Relative Effectiveness of Options for Reduction of Aircraft Noise Exposure around Airports," *INTER-NOISE '80 Proceedings*, p. 814, emphasis added). Both the FAA and the Wyle insulation program report for Sea-Tac note that at least a 5 dB reduction in interior noise is needed, to be noticeable. Should a 5 dB decrease in outdoor noise be viewed any differently? In highway traffic noise analyses, most State Departments of Transportation consider a 10-15 dB increase in "worst hour equivalent sound level" a substantial increase, with a 5 dB increase being noticeable (trends in DNL track trends in "worst hour equivalent sound level" to a large degree); when they consider highway traffic noise abatement, they aim for a "substantial reduction" that is at least 5 dB and typically 7 to 10 dB.

FICON illustrates the debate on the subject, quoting a conversation with W. Galloway at one point ("... in a community noise environment, the majority of a group of persons exposed to a 3 dB change in DNL as a result of a change in aircraft noise exposure would characterize the change as 'clearly noticeable'" [p.3-15]) -- but FICON then goes on to say: "Although a 3 dB change may not represent a significant impact on human health or welfare, particularly below DNL 55 dB, a change of this magnitude is considered as an indicator of the need for additional analysis" (p.3-16). The FAA has established no criterion for airport noise decreases or analysis of the community effects of small reductions in aircraft noise.

The recently issued Federal Transit Administration manual, *Transit Noise and Vibration Impact Assessment* (FTA, April 1995), cites the conclusion "by EPA and others" that a 5 dB increase in DNL is the minimum required for a "change in community response." It also notes that a two percentage-point increase in people "highly annoyed" (e.g., from 10 percent to 12 percent) is the minimum measurable change in community reaction, and that the goal of abatement efforts should be to "gain substantial reduction... not simply to reduce the predicted levels to just below the severe impact threshold" (p. 6-34). Typical rail transit noise mitigation strategies seek reductions of DNL 5 dB or greater.

Some members of the acoustical community suggest that there may be a real difference in the appropriate standard to be used to evaluate the significance of noise decreases, as opposed to noise increases. It is possible that there is a quality of "downward insensitivity" associated with small reductions in already-high noise levels -- that is, people may be more sensitive to increases than to decreases, and once sound exposure levels are high enough to create annoyance and interfere with

routine activities, it may take more than a marginal decrease in noise to "unstick" that perception and produce an appreciable reduction in noise impacts.

As noted above in our SEL and TA analysis, the evidence at Sea-Tac also suggests that the additional DNL improvements which the Port anticipates from its current noise abatement programs are likely to be overtaken by the effects on DNL of the continuing increase in operations. For that reason, we are not confident that the abatement programs the Port has "scheduled and pursued" to date will generate even small reductions in future DNL -- or produce noticeable reductions in future on-the-ground noise impacts.

V. Effectiveness of Noise Mitigation Programs

However, noise abatement is not the only tool in the Port's toolkit. Noise mitigation measures can also generate important and meaningful benefits in terms of a reduction in noise impacts. We turn now to our findings and conclusions about the significance of the benefits attributable to noise mitigation.

Under the Noise Mediation Agreement, the Port made Noise Remedy Program commitments in four major areas: residential acquisition and relocation; a transaction assistance/special purchase program; residential noise insulation; and sensitive-use public building noise insulation.

The Acquisition/Relocation Program has been completed as planned, with the buy-out of some 1400 properties in the worst noise-impacted areas. The buy-out was essentially completed prior to enactment of Resolution A-93-03; with the purchase of the last few properties in 1995, the Port has declared the acquisition program closed. A buy-out of this size is a major accomplishment for any airport, and unquestionably constitutes a meaningful noise reduction benefit to the families who have been successfully relocated. (However, the buy-out has also had some negative economic and social repercussions for the adjacent neighborhoods. The comments in the 1993 AIRTRAC *Final Report: Mitigating the Environmental and Social Impacts of Air Transportation in Washington* (p. 3-35) regarding "...'dead zones' of boarded up houses and ill-maintained streets that frighten residents...." suggest the need for additional action to mitigate the effects of the buy-out.)

With respect to the Transaction Assistance Program, we note that, while it is ostensibly available to 3,000 homeowners, only 254 — fewer than 10 percent of those eligible — have applied to the Port for assistance to date. The low utilization rate invites the suggestion that the program is not structured in a way that homeowners find useful or equitable, or that such assistance is not widely needed, or that the Port has been less aggressive than it might be in making this assistance easily available.

The Port has done an impressive job of residential noise mitigation since 1993. The Residential Insulation Program was accelerated during 1993, shortly after adoption of Resolution A-93-03, and it is now proceeding rapidly (at a rate of about 110 homes per month). As of December 1995, the Port had insulated 3,647 homes, including 2,888 completed since the end of 1992. The interior noise reductions achieved — an average of 7 dB in the most seriously impacted homes, resulting in interior DNL levels of 45 dB or less in post-modification audits — clearly appear to be both noticeable and meaningful for the people affected, as one would expect from the magnitude of the reductions and as evidenced by the positive reactions of the owners of insulated homes in the worst-impacted areas. The benefits are not in question; they are partial -- indoor, closed-window relief only -- but they are directly measurable. We conclude that the indoor, closed-window noise impact benefits are significant for most, and perhaps all, of the 8,570 people residing in the homes insulated to date.

The Port has defined 10,000 homes (with approximately 23,500 residents) as eligible for noise insulation, and has made a commitment to complete its full residential insulation program before beginning construction of a third runway. However, the Port's Compliance Report shows 14,000 "housing units" within the 65 dB DNL contour in 1995, and more than 17,000 within that contour in 1993. As noted above, with a DNL change as small as -0.9 dB, we are not convinced that the DNL contours have changed more than marginally since 1993. If the 65 dB DNL contour is not decreasing in size, expansion of the residential insulation program may become necessary, since the Port expected a decrease in the contour when it defined the present insulation eligibility criteria. We also note that Port Resolution 3125 places certain requirements on the Port staff with regard to residential insulation prior to construction of the proposed new runway and prior to its opening.

Turning to the longer periods of evaluation which the Port has advocated, we observe that, had the Port accelerated its Residential Insulation Program just 18 months sooner — in January 1992, rather than in mid-1993 — it could have insulated an additional 2,000 homes by December 1995: 50 percent more than it did, in fact, complete by the end of 1995. Had the Port accelerated the program three years sooner, in mid-1990, an additional 4,000 homes could have been insulated by now. Doing so would have more than doubled the number of homes insulated by December 1995, from 3,647 to approximately 7,600. The number of people benefitting from that reduction in indoor sound levels would have also more than doubled, from 8,570 to about 18,000. Instead of a Residential Insulation Program about one-third completed, the Port would have presented this Panel with an important mitigation program that was approximately 75 percent completed. We also note that the residents of those homes would have received the benefits sooner and would be enjoying them today.

We give the Port a great deal of credit for "scheduling and pursuing" the residential insulation program vigorously since 1993, but *when* the insulation is achieved does make a difference in how the benefits are weighed. By the Port's own standard, the fact that it chose to apply substantial resources to this program in mid-1993, rather than in 1990 or 1992, represents a missed opportunity to provide demonstrated, meaningful, and continuing noise reduction benefits to several thousand people. Taken alone, this increase would not satisfy the Resolution (substantial progress is needed on public buildings and multi-family dwellings as well), but it will be an essential source of future noise benefits.

The "Sensitive-Use" Public Buildings Insulation Program, another key component of the 1990 NMA Noise Remedy Program, has been partially scheduled, is being pursued, and has had some achievements. Here, the Port cites its progress on various pilot projects: two churches (2,080 people), the SeaTac Convalescent Center (515 residents), the Soundridge Condominium project (134 people), and one private school. The Port has also begun insulation work at Highline Community College. We note that the NMA did not call for insulation of multi-family dwellings, and we commend the Port for this important addition.

The pilot programs are behind schedule, however. The two churches and the convalescent home are not currently scheduled for completion until mid to late 1996. While the Compliance Report lists the completion date as April 1996, the 1993 Part 150 Update set mid-1995 as the

expected time of completion. We also note that the Port has overstated the current benefits of the community college project, by counting every person at the college (4,000 people) as receiving benefits even though the Port has completed only 22 rooms in four out of 17 college buildings.

The 1990 Noise Mediation Agreement specifically envisioned an insulation program that would include many types of public buildings: "auditoriums, private schools, churches, day-care centers, libraries, etc." The Agreement also called for field and feasibility studies for public buildings bordering the 65 dB DNL contour. The Port has not reported appreciable progress in these areas.

In addition to 23 schools, Table 1-7 of the Port's Compliance Report lists 15 hospitals or rest homes, 10 churches, and 2 libraries within the 65 dB DNL contour in 1993. The NMA did not call for the two-step approach the Port is currently using to implement the Public Buildings Insulation Program (pilot projects, followed at some point by a full program); that approach resulted from the 1993 Part 150 Update. While we respect the Part 150 process, we are not sure that pilot studies were necessary, especially for private schools. Different types of buildings do have their own peculiarities with respect to noise insulation work, but there would seem to be enough experience in the field of sound insulation for the Port to have proceeded into a full program. It appears that the larger issue holding up progress on insulation of sensitive-use public buildings and multi-family housing units may be the cost. As of the Panel's February 1996 hearing, Port staff said that they had developed a proposed budget, but funding was still "an issue."

Because insulation of public buildings and multi-family dwellings can reduce indoor DNL substantially, it offers the promise of meaningful, long-term indoor noise relief to a potentially very large number of people in the vicinity of the Airport. The pilot projects are important, but, absent a timetable for the full program and a funding commitment from the Port, we cannot conclude that this component of the Port's Noise Remedy Program is being effectively "scheduled and pursued" per Resolution A-93-03.

Finally, throughout this proceeding, we have repeatedly expressed our concern about the delays in school insulation. We find it difficult to conclude that there has been a "meaningful" reduction in on-the-ground noise impacts as long as the majority of classrooms in the airport vicinity remain uninsulated and heavily impacted by aircraft noise. The record provides ample evidence of speech interference in local schools, and with the continuing increase in the number of daytime flight operations, classroom disruption can only increase. We recognize that responsibility for the failure to move forward with school insulation projects rests primarily with the Highline School District; the Port has made its commitment to funding school insulation projects clear. The factors cited by the School District — general rehabilitation costs, lack of funds, and policy questions concerning noise insulation for older, inadequate school facilities — are legitimate issues, but do not excuse years of inaction on this critical aspect of noise mitigation.

On balance, we strongly commend the Port for its efforts in the buy-out and residential insulation programs, but find that the Port's mitigation programs have had a limited effect in reducing real on-the-ground noise impacts. For the population directly benefitted, relocation and residential insulation have provided real reductions in noise exposure (at least indoors, with the windows closed), but the number of people benefitted remains relatively small, compared to the number of people affected in the Region. In our view, both the Noise Mediation Agreement and Resolution A-93-03 clearly contemplated a broader reach of noise mitigation effects -- especially with

regard to reducing noise impacts in schools and other sensitive-use buildings -- than the Port has scheduled, pursued, and achieved to date.

VI. "Meaningful and Reasonable" Reductions in Noise Impacts

In our January 1995 Noise Order, the Panel stated, "To meet its burden under the Resolution... the [Port] must offer us reliable evidence, based on actual measurements of on-the-ground noise, that by 1996 there has been an objectively measurable, meaningful reduction in aircraft noise impacts in the affected communities surrounding the Airport." We expressed our belief that the PSRC General Assembly, in enacting the Resolution, "intended to condition approval of the third runway upon a showing that the noise impacts of the existing Airport have been reduced in a significant way." And we set the parameters of this proceeding by stating that neither an "unreasonable" (i.e., unreachable or infeasible) nor a "meaningless" (i.e., inappreciable or trivial) reduction in noise was contemplated by the Resolution.

At the simplest level, we intended that particular wording to send a balanced, dual message, signaling the Port that this Panel would not be persuaded by insignificant changes in noise levels or noise impacts, and simultaneously signaling the community that we would not impose an unrealistic standard of noise reduction (for example, requiring a 10 dB DNL reduction). Our choice of wording echoed the language used by various members of the PSRC Executive Board in the legislative debate surrounding Resolution A-93-03, and reflected the extensive discussion at the Panel's August 1994 hearing. With our respected colleague's dissent, however, that language has taken on added weight in this proceeding.

Meaningful Reductions in Noise

In view of the plain language of Resolution A-93-03, we cannot accept our colleague's interpretation of the PSRC General Assembly's intent. That resolution, the governing document in this proceeding, sets a specific test that must be met before the PSRC will approve the third runway: Based on "independent evaluation" and on the "measurement of real noise impacts," are "noise reduction performance objectives" being scheduled, pursued and achieved? In our view, it speaks to the purpose of the Port's noise programs -- the objectives and the results. The Resolution does not ask whether the Port is performing its programs, but whether those programs are producing meaningful results in terms of the public impact of airport noise. The fundamental goal of all of the Port's noise abatement and mitigation programs, from the Stage 2 aircraft phase-out to the noise insulation at Highline Community College, is to reduce exposure to airport noise in a meaningful way -- the "real noise impacts" stated in Resolution A-93-03. The PSRC General Assembly and the Executive Board did not require the services of a panel of outside experts merely to read noise meters at the Airport, or to conduct an administrative audit to determine whether the Port was implementing the noise programs it had promised the residents of the Region.

The Resolution explicitly requires the "measurement of real noise impacts" -- not measurement of A-weighted sound levels, DNL, or SEL values, but measurement of noise *impacts* on real people and real communities. In essence, the Resolution compels the Port to document the effectiveness of its programs: the real, on-the-ground results it is achieving as it works to reduce noise impacts.

We take the Resolution's wording at face value. The use of the term "measurement" required the Port to use a combination of measured noise data and established scientific methods to document its noise reduction results in terms of "noise impacts." The phrase "real noise impacts," in turn, implies a standard based on meaningful results -- a scientifically sound, persuasive showing that the reductions in public exposure to airport noise (i) are actually occurring and (ii) are sufficient to reach at least a threshold of significance, in terms of producing documented, appreciable, and noticeable effects for the affected communities. And the requirement for "independent evaluation" meant that the Port had to demonstrate to an independent body -- the Expert Panel -- that it was in fact accomplishing meaningful results from the noise abatement and mitigation programs it has "scheduled, pursued, and achieved."

At the Panel's initial August 1994 hearing, PSRC Counsel stated that the PSRC Executive Board intended its "Implementation Steps" to be consistent with the Resolution. Accordingly, we believe the Implementations Steps also call for results, i.e., "a reduction in measurable on-the-ground noise" not merely in terms of a measurable change in aircraft SEL or airport DNL, but in the form of a measurable, appreciable, meaningful change in the public impact of airport noise. Counsel for the PSRC explicitly confirmed this interpretation, when the Panel asked, in August 1994, "Is any measurable reduction enough to satisfy the requirements of the governing instruments? Or, are we to examine the question of whether the measured reduction in on-the-ground noise represents a real noise impact within the meaning of the Resolution?" PSRC Counsel replied, "The latter."

In the Panel's December 1995 Noise Order, we emphasized that our judgment "should reflect the best insights we can gain from established scientific sources about the significance of changes in various noise metrics as indicators of changes in the impact of noise on the people in the communities surrounding the Airport." That has been our approach throughout this proceeding, as the hearing record indicates.

In light of the enormous importance of this issue for the Puget Sound Region, we believe that Resolution A-93-03 requires an impartial and scientifically accurate judgment on the substantive question before us: the effectiveness of the Port's programs in producing a meaningful change in public exposure to airport noise. That is the judgment we have presented in this Decision.

Reasonable Reductions in Noise

In reaching our findings, we have also considered the issue of "reasonableness." At a fundamental level, we do not believe that the General Assembly was "unreasonable" in expecting the Port to demonstrate that its noise programs were actually producing a meaningful reduction in "real noise impacts" for the communities surrounding the existing Airport, before launching a major airport expansion. We believe that meaningful, appreciable improvements for the population exposed to Airport noise -- real results in terms of on-the-ground noise impacts on real communities -- are achievable at Sea-Tac.

More specifically, we examined two broad interpretations of the concept of "reasonableness" in this context: reasonableness of effort, and reasonableness of results. We asked: Was this a *reasonable effort* by an airport? Was the Airport *reasonable* in deciding to do what it did? We considered: Is the *amount of noise reduction required by the Resolution reasonable?* Would a *reasonable observer* say that this Airport has done enough? Could the Airport *reasonably have done more?* We address each of these aspects in the discussion below.

Was this a reasonable effort by an airport? As the ACC argued in its October 1995 submittal: "[I]t is results, not good-faith efforts, which the General Assembly Resolution requires." In our view, the issue is not whether the Port has made an effort, even a great effort; the issue is whether there has been a meaningful reduction of impacts.

Although many of the citizens we heard from over the course of this proceeding give the Port little credit for what it has done, we fully recognize that the Port has made a serious effort in many areas, and we strongly applaud the Port for doing so. The Noise Mediation Agreement, while important to the Region, was not revolutionary in terms of the strategies it contained: nighttime operational restrictions had been in place at Washington National, Minneapolis and San Francisco; residential acquisition and residential and public building insulation were being done by many airports. Flight track changes (and preferential runway use) had produced major benefits at Los Angeles and Boston. But the Port took the initiative in the late 1980s to develop substantial noise abatement and mitigation programs at Sea-Tac and has continued them through the 1990s. Although the Noise Mediation Agreement process did not satisfy everyone, and ended rather abruptly just before the FAA implemented the Four Post Plan, it did establish major programs -- particularly the Noise Budget and the Nighttime Limitations Program -- that would be difficult or impossible to institute today, after passage of the Federal Aviation Noise and Capacity Act. In addition, the Port implemented nighttime run-up restrictions at Sea-Tac which helped to curtail that problem, and the power-back ban has answered citizens' demands, even if, as the Port admits, the latter did not appreciably reduce overall aircraft noise levels. We also commend the Port for completing an extensive Part 150 Update in 1993 and for scheduling a major effort on the next Part 150 Update in the summer of 1996. On the noise mitigation side, the Port's residential insulation program is very large, and its current rate of residential insulation work is exceptional.

We have nevertheless concluded, on the basis of all the evidence before us, that the ultimate results of these efforts, in terms of real on-the-ground noise impacts for the communities affected by Airport noise, have not been sufficient to satisfy Resolution A-93-03. Many people at the Port, including its noise consultants, have labored long and hard to develop and implement abatement and mitigation programs; substantial resources have been dedicated to the effort; yet many people in the Region remain severely impacted by airport noise.

Was the Airport reasonable in deciding to do what it did? The Port is viewed by many people, including every member of this Panel, as a leader in the field of airport noise control. The steps it has taken to date are perhaps more than "reasonable" in the sense that many other airports are doing less, and few have undertaken the type of coordinated effort the Port did in the Noise Mediation Agreement. However, the bottom line under the Resolution is results.

Is the amount of noise reduction implied by Resolution A-93-03 reasonable? Our colleague suggests that the noise reduction required by Resolution A-93-03, as we have interpreted it, is so large that it would be impossible to achieve. We disagree. For Sea-Tac, given the nature of the noise-sensitive development around the airport, a 10 dB in outdoor DNL, for example, would probably be an unreasonable reduction. This is not to argue whether 10 dB would be a desired goal, because in many instances, it is. Many highway agencies use 10 dB as a goal for their traffic noise abatement projects. Dr. Suter, serving as an expert for the RCAA, stated that 12 dB would be desirable, if one really wanted to make a difference. A.S. Harris reported a 13 dB reduction in aircraft DNL in South Boston after the implementation of the departure rerouting plan at Logan Airport, with a 76 percent reduction in people over a DNL of 65 dB (Harris, *INTER-NOISE '80*

Proceedings, p. 815). For Sea-Tac and for many airports, however, a goal of 10 dB DNL would probably be unachievable or infeasible without major structural changes in operations, flight tracks, or land uses, and hence would be interpreted in this sense as unreasonable.

But would, for example, a 5 dB DNL reduction be reasonable? Without endorsing 5 dB DNL as a benchmark, *per se*, our answer is: yes, it might very well be achievable, and thus "reasonable." Accomplishing a 5 dB reduction in DNL might be possible only with great difficulty, given the growth of operations, the nature of the Four Post Plan, and the Port's current programs. But that does not mean that the Port could not or cannot achieve real impact reduction through a variety of measures.

For example, insulation can be highly effective. A 10 dB reduction in *indoor* DNL appears both reasonable and achievable around Sea-Tac Airport. Of the houses the Port has insulated, 70 percent received an average reduction of about 8 dB since 1993 (7 dB inside and 0.9 dB outside) and 10 dB over the longer period from 1989/1990 (7 dB inside and 3.4 dB outside). Was that a reasonable noise reduction goal? Yes; and the magnitude of the change was precisely the reason why the Port was able to show, for residents of those homes, a reduction on the order of 90 percent in time lost to speech interference as well as great reductions in the potential for sleep disruption. Were those meaningful reductions in noise impacts? Yes. Were they enough, in the context of the number of homes insulated and the entire population adversely affected by airport noise both indoors and outdoors (and indoors with open windows), to tip the balance and persuade the majority of the Panel that the Port had met the test of Resolution A-93-03? They were not.

Would a reasonable observer say that this Airport has done enough? The Port argues that "[a] reasonable observer would conclude that the Resolution has been satisfied because thousands of people have received noise reduction benefits as measured by established scientific methods." We have addressed benefits and methodology elsewhere in this Decision. But who is a reasonable observer? A schoolteacher who loses 40 minutes a day waiting for planes to pass by? A business executive whose livelihood depends on airport growth? The mayor of a town under the flight path? A General Assembly member who believes the runway should be vigorously pursued? There is no definable, completely unbiased "reasonable observer" in this situation. Even the members of this Panel, as observers charged with making an independent, objective evaluation of the reductions of noise impacts, have come to differing conclusions.

Could the Airport reasonably have done more? Mr. Lewis suggests that, even if (as we have found) the Port failed to demonstrate the meaningful reduction in "real noise impacts" required by the Resolution, we should nevertheless find in favor of the Port on grounds that there was no evidence that the Port could have taken other measures that would have been expected to make a significant difference in overall noise impacts.

That is not the view we take. The Noise Mediation Agreement established a basic set of commitments; it did not preclude the Port from taking additional action. Airport noise has been an extremely contentious issue in this Region for more than 25 years, dating back at least to the construction of the second runway. As we observed earlier, the Port has long known that many people were dissatisfied with the Noise Mediation Agreement process, the FAA's introduction of the Four-Post Plan, the prospect of a third runway, and other Airport actions. Controversy, distrust, and pressure for additional action are not new. As the consultants representing the Port in this proceeding stated in their 1993 AIRTRAC *Final Report* (p. 3-35): "There is sometimes a difference

of opinion about what constitutes a commitment. For example, Sea-Tac did not complete planned land acquisition and home and school insulation programs for areas impacted by the second runway built in 1970, and this has led to a perception by some in the community of broken promises. Apparently, the airport did not consider itself bound by this plan." In 1993, by contrast, the Port took the initiative not only to meet its obligations for residential insulation but to proceed with the insulation work at a rate far faster than the pace stipulated in the 1990 Noise Mediation Agreement. That was a wise decision, in our view, and one that clearly reflects the Port's understanding that, at least in this respect, the Noise Mediation Agreement is not a limiting document: there was more the Port could and should do.

We are uncomfortable with the notion of a ruling that would turn on a speculative interpretation of what more the Port could (or could not) have done, rather than on the merits of the case. The Port did what it did — an exceptional effort in many ways, but one that fell short of generating meaningful, real reductions in on-the-ground noise impacts for the people of the communities subjected to aircraft noise. Our task is to render an informed and objective judgment on the efficacy of the Port's programs in reducing actual noise impacts, not to speculate on what else the Port might have, or could have, or should have done.

Because of the way the logic of this case has developed, however, we are now compelled to address that speculative question. Mr. Lewis believes that any additional efforts the Port might have made would not have amounted to enough to make any difference in meeting the test of Resolution A-93-03 as we interpret it. We believe that the Port could have done more, and that, had it done so, the additional improvement probably would have made a material difference in real, on-the-ground noise impacts, turned a marginal improvement into a meaningful one, and therefore affected the final outcome of this proceeding.

The issue of "what else" the Port could have done was addressed at some length in the course of the Panel's hearings. Our colleague suggests that the community groups have not met "their threshold burden" of showing how the Port could have taken additional action to produce "significantly more meaningful reductions in noise impacts." We believe that primary responsibility for proposing and developing significant noise abatement and mitigation programs rests with the Port, not with the community advocates. In this context, we note, however, that the ACC has suggested a number of additional actions, including the concept of a tradeoff linking a Federal Part 161 program that proposes some new noise abatement restrictions on aircraft operations (some capacity limits) with approval of a third runway (capacity enhancement), as a combination package to produce both improved noise relief and a net capacity gain.

The Port contends — and the entire Panel agrees — that the measures it has taken to date are the ones that were most likely to produce significant benefits, because they addressed airport noise at the source. Those measures were easier to implement than some other strategies – for example, flight track changes, which can also be highly effective in producing significant noise-impact reduction. Moreover, programs that produce smaller benefits to a large group of people or significant benefits to a smaller group of people can have a cumulative impact. Based on the discussions during the hearings, as well as the analysis in the Noise Mediation Committee Technical Report, it is clear that more could have been done before 1990, since 1990, and since 1993.

We list below several abatement and mitigation strategies that we believe had the potential to be meaningful, feasible and reasonable. We are not suggesting that the Port had to pursue every

conceivable strategy; we merely note that some additional -- and potentially very effective -- actions were possible.

With respect to noise abatement, for example, the Noise Mediation Agreement could have set a faster Stage 2 phase-out schedule in its alternative process to the complex Noise Budget calculation; if the transition to Stage 3 had been completed in 1995, there would have been, by both the Port's and our estimates, an additional 1.5 dB reduction in DNL (such a faster phase-out, if part of the NMA, would have pre-dated the Aviation Noise and Capacity Act and the Part 161 process). Implementation of minimum population exposure flight tracks could have had an important effect; the Port noted in the February 1996 hearing that its consultant had developed "useful" flight track changes for Four Post Plan noise abatement back in 1990 (as described in the 1991 Noise Mediation Committee Technical Report), and Resolution A-93-03 has called for efforts to reduce the noise impacts of the Four-Post Plan since April 1993. The Port might also have considered adopting a preferential runway plan during "low periods" of activity to reduce population exposure to Airport noise.

In addition, the Noise Mediation Agreement contemplated the following abatement activities which have not yet been achieved (which is, in part, why we found the Port to be in substantial but incomplete compliance with the NMA): enforcement of the North Flow Elliott Bay/Puget Sound nighttime noise abatement departure procedures (which could have been scheduled, pursued, and achieved at any time after these procedures were first implemented); use of the North Flow Elliot Bay/Puget Sound departure procedures or South Flow Arrival Corridor procedures whenever feasible (e.g., during daytime periods of lower activity); and, finally, implementation of controls on engine thrust reversals, to reduce noise in the immediate vicinity of the airport.

On the mitigation side, the single-family residential insulation program could have been accelerated earlier, as we have previously discussed, and the public buildings and multi-family residential insulation programs could have been pursued much more vigorously. In light of the Port's lack of progress on insulation projects after construction of the second runway, we believe it would have been in the Port's best interest to move as decisively as possible in carrying out its commitments under the 1990 Noise Mediation Agreement.

These lists are by no means comprehensive, but they do persuade the majority of the Panel that the Port could have taken at least *some* additional steps to increase the total amount of benefit (in terms of demonstrated, real reductions of noise impacts) in a manner that cumulatively could have shown us enough objective evidence of on-the-ground results to meet the intent of the Resolution. These strategies would have, in different ways, reduced DNL, reduced mean SEL, reduced the Time Above the various levels, decreased speech interference, reduced sleep disturbance, reduced annoyance, and reduced incompatible land uses in the various DNL contour zones.

Accordingly, we conclude that a straightforward interpretation of Resolution A-93-03 does not impose an unrealistic standard of noise reduction on the Port, as Mr. Lewis contends. We do not believe that the amount of noise abatement and mitigation necessary to produce an objectively meaningful or significant reduction in "real noise impacts" within the meaning of Resolution A-93-03 was infeasible, unreachable, or unreasonable.

VII. Conclusions on the Effectiveness of the Noise Abatement and Mitigation Programs

This Decision represents our best professional judgment, based on many years of experience, many days of public hearings, many months of review and analysis of thousands of pages of data, evidence, and argument, and countless hours of deliberation and debate among the members of the Panel. It was not an easy decision, and it is not a political decision. It is the independent evaluation required by Resolution A-93-03.

How much abatement of aircraft noise is necessary to generate "enough" reduction in on-the-ground noise impacts to satisfy Resolution A-93-03? The ACC, relying on the expert testimony of Dr. Fidell, suggested that a DNL reduction on the order of 4.5 dB -- presumably in conjunction with vigorous action on the mitigation front -- is the minimum needed to produce a meaningful change in noise impacts for the affected population and to support reliable findings of significant benefits in terms of reductions in speech interference, awakenings, and other noise disruption. "To be meaningful," the ACC said in its October 1995 submittal, "a reduction (measured in L_{dn}), must be at least 4.5 dB." Without necessarily endorsing 4.5 dB DNL as a benchmark for determining a meaningful reduction in airport noise, a majority of the Panel has found, after reviewing a very large array of specific evidence at Sea-Tac Airport, that at this Airport, under these particular circumstances, a 3.4 dB DNL reduction over a six-year period has not been sufficient to produce a demonstrated and "meaningful" reduction in real, on-the-ground noise impacts.

We have also carefully reviewed the extensive documentation the Port and other parties provided on the size, nature, and effectiveness of the Port's noise mitigation projects under the Noise Remedy Program. We have found that the Port's mitigation work is effective in producing real indoor (closed-window) noise relief for the residents of insulated homes, but that the scope of the Port's scheduled insulation program remains incomplete with respect to schools, other sensitive-use public buildings, and multi-family dwellings. The Port's mitigation efforts, while substantial, have not yet reached, or been "scheduled" to reach in any concrete sense (i.e., with an explicit timetable and commitment of resources), a large enough portion of the affected population to allow us to conclude that, in combination with the abatement results, the resulting overall reduction in noise impacts has been "enough" to meet the test imposed by Resolution A-93-03.

Accordingly, a majority of the Panel finds:

1. That despite the Port's impressive, good-faith efforts to implement effective noise abatement and mitigation programs, the demonstrated results of the programs it has scheduled, pursued, and achieved since Resolution A-93-03 was adopted (1993-1995 and, alternatively, 1992-1995) do not constitute a "meaningful" reduction of real, on-the-ground noise impacts sufficient to satisfy the noise condition of Resolution A-93-03;

2. That the demonstrated results of the noise abatement and mitigation programs the Port has "scheduled, pursued, and achieved" since 1989/1990 do not provide evidence strong enough to establish, with any degree of confidence, that there has been a "meaningful" reduction of real, on-the-ground noise impacts sufficient to satisfy the noise condition of Resolution A-93-03; and

3. That the Port is not likely to achieve significantly more reduction in real, on-the-ground noise impacts in the near future with the abatement and mitigation measures it has scheduled to date and is currently pursuing.

We reach these conclusions for a number of reasons, including:

(i) the absolute size of the changes in measured DNL (we cannot conclude that the Port has met its affirmative burden under the Resolution on grounds as weak as a maximum DNL change below the threshold of significance);

(ii) our analysis of the meaning of the small average decrease in Time Above 85 dB at the Port's monitoring sites (2-3 minutes per day), the increase in Time Above 85 dB at RMS 11 since 1993, and the current trends in Time Above 65 dB and 75 dB, in terms of real on-the-ground noise impacts;

(iii) our analysis of the corresponding size and direction of the changes in average $\overline{SEL}$, nighttime Leq, DNL contours, number and percentage of people "highly annoyed," and other measures discussed above;

(iv) the importance of the factors that are offsetting the improvements the Port has realized to date, such as the increase in the total number of nighttime operations and the unacceptably low rate of compliance with the nighttime noise abatement corridors;

(v) the limited degree of confidence we place in the reliability of the Port's analysis of noise abatement benefits in the absence of needed information on confidence intervals, documentation of INM assumptions and adjustments, and sensitivity analyses, as well as the estimation difficulties inherent in using the available analytic tools to extrapolate significant benefits from very small changes in DNL; and

(vi) the incomplete range of noise mitigation programs the Port has "scheduled, pursued, and achieved" to date, particularly with respect to the sensitive-use public buildings included in the 1990 Noise Mediation Agreement.

On the preponderance of the evidence, we cannot conclude that there has been, as of December 1995, a meaningful or appreciable reduction in the real, on-the-ground noise impacts experienced by a large portion of the population affected by Sea-Tac airport noise, since 1993, since 1992, or since 1989/1990.

There is little doubt that, absent important new initiatives, the Port's current noise abatement efforts will have little additional effect. The steady growth in aircraft operations expected by the Port — which provides the essential justification for constructing the new runway — is already slowing the small DNL improvements the Port has achieved in recent years, and is likely to undermine any additional noise reduction the Port may achieve in the future. In this context, the Port's noise mitigation efforts will become increasingly important; insulation is one area where the Port can readily take additional action. But even a substantially expanded mitigation program can ultimately provide only partial, indoor relief.

Although the Port's ability to substantiate the validity of its estimates of real, on-the-ground noise impacts was weakened by its failure to supply documentation on the statistical reliability of (i) its data, and (ii) its modeling and estimation processes, the Port has nevertheless provided an enormous amount of useful information and analysis. The Port has complied with the Panel's request to provide time-series data on many different aspects of aircraft noise at Sea-Tac, from the basic DNL trends to the distribution of SEL peaks, the minutes per day above 65, 75, and 85 dB, and many other measures. This multifaceted approach to the evaluation of airport noise -- a combination of many different ways of looking at aircraft noise levels and the associated noise impacts on the community -- has been valuable for a number of reasons. It provides a better picture of what is actually happening with Sea-Tac Airport noise levels than DNL alone can convey; it permits the Panel, the PSRC General Assembly, the Port, and the community to assess the actual noise exposure changes and on-the-ground noise impacts more fully; it supplies much-needed detail on critical aspects of those noise impacts (such as the actual amount of time that classrooms are subject to noise levels above the threshold for speech interference); and last but not least, if the results show an internally consistent pattern across a variety of different types of measures (as they, in fact, do in this case), it provides all parties with a considerable degree of added confidence in the robustness of conclusions about the reductions in noise impacts -- the on-the-ground changes in public exposure to Airport noise -- which the Port's current noise abatement and mitigation programs have produced and are likely to produce.

RECOMMENDATIONS
(BY THE MAJORITY)

In the course of this proceeding, the Panel has had the benefit of the creative, analytical thinking of many different parties regarding additional noise abatement and mitigation measures that may, alone or taken together, reduce the future noise impacts associated with Sea-Tac Airport. The Port has invited the Panel to offer our recommendations as to what the next steps should be regarding noise abatement and mitigation. The majority of the Panel accepts that invitation.

On the one hand, we do not think that many easy actions remain; the major programs on Stage 2 phase-out and nighttime Stage 2 restrictions are already in place. On the other hand, there are some additional actions that can be implemented relatively quickly and, in some cases, at relatively low cost.

As Mr. Lewis has noted, noise abatement and noise mitigation are not simple. Externalities abound that make an airport proprietor's job difficult. The Port generally gets all the blame (and the credit) for changes in the aircraft noise environment in the Region. The reality is that actions by the FAA, the airlines, local organizations, and State and local political entities all affect the situation. However, while many actions are not within the Port's legal authority, they are not necessarily beyond its range of influence. (Indeed, the Port has been portrayed by many of the people from whom we have heard, and by a number of the submittals that we have read, as a major force in the Region.) That influence should be brought to bear, wherever possible, to reduce on-the-ground noise impacts.

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In the spirit of Resolution A-93-03, we offer the following specific recommendations:

I. That the PSRC and the "Coordinating Committee" established by MOU pursuant to Resolution A-93-03 (the PSRC, the Port, WSDOT, and the FAA) promptly take steps to mediate and resolve the impasse between the Highline School District and the Port on the issue of noise insulation for schools, to enable the Port to move forward rapidly on its commitment to insulate the schools and significantly reduce classroom speech interference.

2. That the Port implement its stated plan to upgrade its noise monitoring system, with no fewer than 25 permanent monitoring stations located throughout the affected communities; and that the results be publicly disseminated, at regular intervals, in the form of aircraft DNL, SEL, and Time Above metrics.

3. That the Port and the organizations representing the affected communities jointly sponsor social surveys at regular intervals to assess the effectiveness of future noise abatement and mitigation measures in terms of perceived noise impacts. We concur with the view expressed by the Port's noise consultants in the 1993 AIRTRAC *Final Report* (p. 3-33): "The way to avoid incorrect predictions of community response to a ... [noise reduction] action is to ask the community directly how it feels about a particular airport action and the proposed mitigation program connected to it."

4. That the Port address the impact of ground-related aircraft noise by (i) implementing the thrust-reversal noise impact reduction activities called for in the Noise Mediation Agreement; and (ii) working to minimize the number, level, and duration of daytime engine run-ups, which are likely to increase as operations grow. (We note that the increases in TA 65, 75, and 85 dB at RMS site 11 in recent years may be a consequence of ground-related noise.)

5. That the Port take the following actions to improve the on-the-ground reduction of nighttime noise impacts:

   a. Negotiate and obtain a public commitment from the FAA for full cooperation in rigorously and aggressively enforcing compliance with the current North Flow Nighttime Departure Noise Abatement Procedures. The Port, at a minimum, should notify airlines of violations of these nighttime noise abatement procedures. Better, the Port should institute procedures to apply pressure, through enforcement penalties and/or the power of public opinion in the media, to reduce violations (for example, publishing fines and performance scorecards in the Region's newspapers).

   b. Work closely and aggressively with KCIA and Alaska Airlines to eliminate the carrier's two nighttime Stage 2 cargo flight arrivals and departures, which weaken the effectiveness of the Port's nighttime Stage 2 ban; and develop, in conjunction with KCIA and local government officials, a strategy to avoid additional Stage 2 nighttime flights to and from KCIA in the future.

   c. Work with the airlines to minimize the total number of flights in the middle of the night (e.g., 1:30 a.m. to 5:30 a.m.).

   d. Continue to minimize the number of variances issued for the Nighttime Limitations Program through aggressive persuasion with the airlines, including the use of the media.

   e. Work with foreign air carriers to ensure that Stage 3 aircraft continue to be used for nighttime international flights.

   f. Work with owners/operators of Stage 2 aircraft under 75,000 pounds (which are currently exempt from the Nighttime Limitations Program) to secure their cooperation in minimizing or eliminating the use of such aircraft during the nighttime period. (There were, on average, 13 exempt Stage 2 nighttime flights per month in the second and third quarter of 1995.)

   g. Continue to work with the airlines to minimize nighttime engine run-ups; we note that, although many of the events are exempt from the King County Code, the exempted nighttime events have levels higher than the code permits. Existence of an exemption does not mean elimination of the impacts on people.

6. That the PSRC, the FAA, and the communities affected by airport noise participate actively and constructively in the Port's upcoming Part 150 review, to propose, evaluate, and assist in implementing any feasible noise reduction measures that will maximize the net benefits for the region and provide meaningful noise mitigation for the impacted areas. The Port's Part 150 process should include, but not be limited to, the following actions:

   a. Evaluate the actions needed to apply, monitor and enforce the North Flow Daytime Departure Duwamish/Elliott Bay Noise Abatement Procedures specified in the Noise Mediation Agreement. Investigate, and, if possible, implement, use of this corridor during periods of periods of lighter activity during the day such as mid-morning and mid-afternoon.

   b. Evaluate the feasibility of extending the "nighttime" hours of use for the North Flow Nighttime Departure Noise Abatement Procedures (currently 10 p.m. to 6 a.m.) to the evening "shoulder" (8 to 10 p.m.), and, if possible, to the early morning "shoulder" (6 to 7 a.m.) as well.

   c. Reevaluate, with FAA and community input, the use of "minimum population exposure" flight tracks, in light of the increase in flight operations and the shift in the overall importance of arrival noise as Stage 2 aircraft are phased out. The Port had studied and identified "useful" flight track changes for Four Post Plan during the development of the Noise Mediation Agreement. Any of the following options would be expected to reduce overall population exposure to aircraft noise: (i) over-water southern corridors for all south departures where the east turn does not occur until the aircraft reach Commencement Bay or beyond; (ii) north-flow arrival procedures that route aircraft over the water (with a turn in the Four-Post arrival stream); or (iii) the use of a north-flow stream more often at night, coupled with tightly enforced, high-compliance nighttime departure routes. There are some difficult trade-offs in this process, but we do not accept the contention that all possible changes in flight tracks simply shift noise among communities, with no net reduction

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in number of people impacted. Flight track changes offer the potential for abatement of aircraft noise impacts once the Port has exhausted the benefits of the Stage 2 phase-out; we note again that Resolution A-93-03 explicitly requested the FAA to consider modifications to the Four Post Plan to reduce noise impacts.

d. Evaluate, with FAA and community input, the potential net benefits of a noise abatement departure profile employing a steeper angle of climb, coupled with an expanded residential acquisition and insulation program if, as a result of a steeper departure profile, the 75 dB DNL contour expands in the immediate vicinity of the airport while areas farther out receive benefits.

c. Evaluate, with FAA and community input, the potential net benefits of preferential runway use during "low activity" periods (would more use of the east runway, for example, result in reduced overall population noise exposure?) -- coupled with an expanded residential insulation and acquisition program, as needed.

7. That, with respect to the Noise Remedy Program, the Port take the following actions:

a. Begin a rapid, full-scale program of school insulation as soon as the impasse with the Highline School District is resolved, with the maximum feasible commitment of resources and the earliest possible completion schedule.

b. Complete the "sensitive-use" public buildings insulation pilot studies and fund the full program envisioned in the Noise Mediation Agreement, as well as a program for insulation of multi-family dwellings, with an aggressive schedule to allow completion as soon as possible. The Port Commission is on record as committed to these programs.

c. Evaluate the possibility of an expanded residential acquisition program offering more of the most severely impacted people the buy-out option, even if no additional Federal money is made available for this purpose. While relocation is not desired by all (nor easy for anyone), the environs of a major airport are plainly not the best location for residential neighborhoods.

d. Work with the PSRC and the affected communities to design and implement alternative, noise-compatible uses of the land within the current acquisition zone. We note that the acquisition program has some very strong critics because of its adverse effects on the quality of neighborhoods for the remaining houses and businesses.

e. Further accelerate, if possible, the rate of insulation for homes now included in the residential noise insulation program, and consider expanding the area eligible for noise insulation if the Airport's 65 dB DNL contour remains at or near the 1993 contour boundaries.

f. Investigate possible modifications to the insulation program to mitigate the impacts of low frequency noise and vibration (a concern the public raised repeatedly during the Panel's hearings).

8. That the PSRC and the Coordinating Committee take the lead in addressing the difficult, controversial task of reducing present and future noise impacts, with the following actions:

a. Recognizing the degree to which parties and factors outside the direct authority of the Port are undercutting the effectiveness of the Port's current efforts to reduce noise impacts, initiate and coordinate remedial action. Such coordination may include facilitating the use of mediation, marshalling State and local public resources where needed, providing public information via the media, or otherwise addressing the roadblocks that now prevent the residents of the Region from realizing the full benefits of the Port's existing abatement and mitigation programs. The PSRC and the Coordinating Committee are the principal entities in a position to take effective action to resolve the local problems caused by the "balkanization" of responsibility among the Port, the FAA, KCIA, the Highline School District, and other parties.

b. Create guidelines or other equitable procedures for dealing fairly with the conflicting views and needs of different communities when a proposed noise reduction strategy results in a net improvement but causes a transfer of noise impacts.

c. Take effective action on land use issues to minimize the introduction of incompatible land uses and to facilitate compatible redevelopment of currently incompatible land uses, including implementation of the recommendations on land use issues in the 1993 AIRTRAC *Final Report*.

d. Investigate creative ways of linking noise reduction objectives with airport demand and system management strategies, including intermodal solutions to local and regional transportation needs.

DISSENT
(BY MR. LEWIS)

I would find that the Port has met its obligation to show under PSRC Resolution A-93-03 that "noise reduction performance objectives" have been "scheduled, pursued and achieved ... based on measurement of real noise impacts." As a result, I cannot join my colleagues in concluding that the Port has failed to satisfy the noise reduction condition of the Resolution and must dissent from their Decision. I am convinced that my colleagues have imposed upon the Port a burden that was never contemplated by the General Assembly.

The Port showed us that it has scheduled, pursued and achieved the objectives of the two major noise abatement programs contemplated by the Noise Mediation Agreement -- the Noise Budget and the Nighttime Limitations Program -- by significantly reducing the use of the loudest, Stage 2 aircraft at Sea-Tac, and virtually eliminating them at night. The resulting impact on the level of real noise measured on-the-ground has been captured by an extensive array of noise

measurements compiled by the Port that shows a consistent pattern and continuous reduction in DNL since these programs began, associated with the reduction in the loudest aircraft events (which, as the majority concedes, does make a difference in on-the-ground noise impacts). The Port also showed that its residential noise mitigation program has insulated several thousand homes, producing noticeable and meaningful reductions in measured interior noise levels. After carefully considering all of the evidence, it is my judgment that these achievements, confirmed by the measurement of real on-the-ground noise, should be sufficient to satisfy the noise reduction condition of the Resolution.

The majority of the Panel, unfortunately, does not agree. Their determination that the Port has not shown a sufficiently "meaningful" reduction of noise impacts to satisfy the noise condition of the Resolution ultimately depends, as I understand it, upon two essential points: (i) that as to its noise abatement programs, the Port has not established through the use of "established scientific methods" that the reductions in measured noise *levels* it has shown signal a "meaningful" reduction in noise *impacts*; and (ii) that as to its noise mitigation programs, the Port has missed an "opportunity" to provide insulation benefits to thousands of additional residents of the affected community.

I do not believe that the General Assembly required a reduction in measurable on-the-ground noise that would cross an undefined technical threshold of "meaningfulness" so high that doubts about the significance of the resulting reductions in noise impact would be resolved to the satisfaction of the scientific community. The majority places too much emphasis on measurements of noise impacts that could not be made by the Port and were not expected by the General Assembly, and on the failures, rather than the successes, of the Port's insulation program.

It seems unlikely to me that the PSRC would decide not to authorize the third runway simply because: (i) the Port cannot prove through the use of established scientific methods that a measured reduction in DNL of 3.4 dB since the Noise Mediation Agreement was implemented, with continuing reductions since 1993 when the Resolution was enacted, reflects a "meaningful" reduction in noise impacts; (ii) the Port was unable to eliminate the unavoidable uncertainty associated with the extrapolation of noise impacts from incremental changes in measured noise and did not document the assumptions and adjustments it made when using the Integrated Noise Model; (iii) the number of aircraft operations has increased, as the General Assembly assumed it would when it determined that a new runway should "vigorously" be pursued; (iv) significant reductions in the loudest noise events associated with the greatest interference with speech and disturbance with sleep have, in recent years, been offset to some extent by increases at lower sound levels that inevitably accompanied the recent, expected growth in the number of aircraft operations; and (v) the Port's noise mitigation programs have not yet reached their full potential. Yet this appears to me to be why the majority has ruled against the Port. In my judgment, based upon all the evidence, there has been a sufficient reduction in real, on-the-ground noise impacts to satisfy the requirements of the Resolution.

In recognition of increasing capacity problems at the Airport, the General Assembly declared in the Resolution that "the region should pursue vigorously ... a third runway at Sea-Tac" and determined that, under present circumstances, the third runway shall be authorized by April 1, 1996 "[w]hen noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation, and based on measurement of real noise impacts."

The Resolution was adopted by the PSRC three years after the Port implemented the Noise Mediation Agreement. The Agreement was, as the majority observes, an "important milestone" in the reduction of adverse environmental impacts from airport operations. It scheduled three bold initiatives: the Noise Budget, the Nighttime Limitations Program and the Noise Remedy Program. Unfortunately, the precipitous conclusion of the noise mediation, the disturbing introduction of the Four Post Plan, and lingering doubts about the motives of the Port left many in the community unconvinced that the Port would meet its commitments, that these programs would make any difference, and that the Port's sophisticated computer models had anything to do with the real "on-the-ground" noise they perceived. The General Assembly therefore called for an "independent evaluation" of whether the Port had scheduled, pursued and achieved "noise reduction performance objectives ... based on measurement of real noise impacts." The enactment of Resolution A-93-03 manifested the General Assembly's apparent desire for independent, objective answers to several basic questions:

- Did these programs establish significant noise reduction objectives?
- Has the Port done what it said it would do to reduce on-the-ground noise?
- Do actual measurements of on-the-ground noise confirm that the noise reduction objectives of the Port's programs are being achieved?

I believe the correct answer to all of these questions is "yes."

The Port's Noise Budget and Nighttime Limitations Program established ambitious noise and access restrictions under the Noise Mediation Agreement that were, as the majority acknowledges, most likely to produce significant benefits because they addressed airport noise at the *source*: the use of loud Stage 2 aircraft, especially at night. These restrictions were far more stringent than the national rules established by Congress when it later enacted the Airport Noise and Capacity Act of 1990, requiring a phase-out of Stage 2 aircraft. In fact, if the Noise Mediation Agreement had not been negotiated before November 1990, and therefore exempted from the Act, the Port would have been unable to reduce or limit Stage 2 aircraft operations as it has under its noise abatement programs.

All of the members of the Panel have found that the Port is in substantial (if incomplete) compliance with the Noise Mediation Agreement, and that the scheduled noise reduction objectives of the Noise Budget and Nighttime Limitations Program have been pursued and have achieved a reduction in measured "on-the-ground" noise captured by DNL at the Port's permanent monitoring sites both since the Agreement was made in 1990 and since the Resolution was enacted in 1993.

In our January 9, 1995 Noise Order, however, the Panel determined that the Resolution required the Port to show more than just compliance with the Noise Mediation Agreement and a resulting measurable reduction in noise *levels*; the Port, we felt, had to show a "meaningful" or "significant" reduction in noise *impacts* on the community. In retrospect, it seems to me that the Panel may have been mistaken. The subsequent hearings, our protracted deliberations and the split on this Final Decision all reflect the difficulty of determining *how* the "meaningfulness" of noise reductions should be assessed for the purposes of the Resolution.

When we issued our Order in January 1995, the Panel reasoned that the General Assembly did not need to obtain an "independent evaluation" by a panel of outside experts if the only question was whether *any* reduction in noise impacts evidenced by actual on-the-ground sound measurements had been "scheduled, pursued and achieved" by the Port, and so we held that the reduction in noise impacts had to be "meaningful." At the same time, however, we explained that the Resolution did not impose upon the Port a standard of performance that it could not possibly meet. The General Assembly, after all, had voted to pursue construction of the third runway "vigorously" if the stated conditions were satisfied, and it would have made little sense to impose an "unreachable" or "infeasible" condition in those circumstances. I thought that our consideration of the Noise Issues required the Panel to assess the significance of the reductions in noise impacts scheduled, pursued and achieved by the Port given what it was reasonable to expect (from the General Assembly's perspective) that the Port could do to reduce the impact of airport-generated noise on the surrounding community by the time the third runway was to be authorized by the PSRC.

The "meaningfulness" and "reasonableness" standards we imported to the Resolution do not provide a definitive benchmark or prescribe the use of established scientific methods to assess the adequacy of the reductions in noise impacts achieved by the Port. We acknowledged in our December 1995 Preliminary Order on Phase II Noise Issues, in fact, that the Resolution called upon the Panel to use our "best professional judgment ... to determine whether, taken as a whole, the pattern of change in noise impacts is sufficient ... to meet the requirements of the Resolution." In my view, the Panel's assessment should reflect both "the best insights we can gain from established scientific sources about the significance of changes in various noise metrics as indicators of changes in the impact of noise on the people in the communities surrounding the Airport," and our knowledge and experience in dealing with the institutional, operational, and regulatory constraints that limit an airport owner's ability to reduce the noise impacts of a busy, growing jet airport. Based upon these considerations, I am confident that the pattern of change in measured real on-the-ground noise levels shown by the Port is sufficient show a reduction in noise impacts that satisfies the requirements of the Resolution.

Noise Abatement. The Port showed that its noise abatement programs have produced reductions in on-the-ground noise measured by a variety of different metrics that are related to adverse impacts for many people throughout the region.

The Port stressed the reduction in aircraft DNL over the years because the relationship between DNL and human "annoyance" is well accepted in the airport industry and the scientific world as the best aggregate indicator of adverse noise impacts. As the majority puts it, "[a]ircraft and total DNL metrics are the principal tools used to summarize the overall changes in environmental sound levels associated with airport operations." Measured aircraft DNL around the Airport has fallen by 2.8 dB since 1986, 3.4 dB since 1989/1990, 2.3 dB since 1992 and 0.9 dB since 1993. These reductions can be expected to be related to significant reductions in the numbers of people "highly annoyed" by aircraft noise, on an aggregate basis, even if the difference in sound levels, occurring over time, might not be distinguished by an individual observer.

The Port supplemented its analysis of DNL with a review of on-the-ground measurements using the TA and SEL metrics that confirm that there has been, as expected, a significant reduction in the highest-noise-level aircraft events. While the relationship between these metrics and adverse noise "impacts" is less well understood, the Port has shown that reductions in the loudest events, which are segregated by these metrics, can be expected to be related to reductions in both "high level" speech interference and, possibly, sleep disturbance.

The majority of the Panel has nevertheless concluded that the Port's noise abatement efforts have not produced a sufficient reduction in real, on-the-ground noise impacts to satisfy the requirements of the Resolution. While I greatly respect their thorough review and technical analysis, I do not believe that the General Assembly intended us to apply a standard so exacting as they have used and, therefore, I cannot accept their ultimate assessment of the significance of the noise reductions the Port has shown.

The reliability of the Port's technique of imputing estimates of the population exposed to different sound environments over time, and the methods it used to convert incremental changes in noise exposure into estimates of reduced annoyance, speech interference and sleep disturbance, are subject to serious reservations. But when it called in the Resolution for "measurement of real noise impacts," the General Assembly did not require, and could not reasonably have expected, rigorous scientific proof that incremental, measured improvements in on-the-ground noise levels can be related to particular reductions in noise "impacts" that could be said by some objective measure to be "meaningful."

Based upon the evidence offered to us, I would find that the "established scientific methods" for assessing the impact of aircraft noise are not designed to provide precise estimates of the significance of incremental changes in noise exposure over time and do not establish a definitive DNL threshold for measuring meaningful aircraft noise reductions.

The majority of the Panel has nevertheless found that the 3.4 dB reduction in aircraft DNL shown by the Port is "below the threshold of 'meaningfulness' in terms of producing a real, appreciable reduction in airport noise impacts for an affected population," especially when that DNL change occurs over a period of six years and is coupled with an increase in operations. The majority concluded, therefore, that the Port's noise abatement efforts have not produced a sufficient reduction in real, on-the-ground noise impacts to satisfy the noise condition of Resolution A-93-03.

This approach imposes an "unrealistic standard of noise reduction" on the Port. When the Resolution was enacted, it was to be expected by the General Assembly that (i) any reductions in noise levels would occur incrementally over a period of many years; (ii) that at the same time, aircraft operations would increase; and (iii) that, as the majority recognizes, analytic tools like the FICON Curve "cannot provide robust estimates of the population impacts of the small reductions in DNL" that could be expected to be realized by the Port's noise abatement programs. Under these circumstances, it is unreasonable to impute to the General Assembly an expectation that the Port should show a reduction in noise levels, measured by DNL or otherwise, so significant that it would resolve scientific doubts about its meaningfulness, before the third runway would be authorized. Accordingly, I cannot accept my colleagues' conclusion that the Port's noise abatement programs have not achieved a meaningful reduction in noise impacts.

Noise Mitigation. I must also distance myself from their assessment of the Port's insulation program. As they acknowledge, the Port has done an "impressive job" on its residential noise mitigation programs since the Resolution was enacted and has provided appreciable benefits to thousands of residents of the Region. The Port has already insulated 3,647 homes and is continuing

its accelerated program of insulating about 110 homes each month. There is no dispute that this program provides noticeable and meaningful indoor noise reductions.

While the majority applauds the success of the Port's noise mitigation program, it focuses on the Port's failure to accelerate the pace of the residential insulation program *before* the Resolution was enacted and to implement a comprehensive program for the insulation of public buildings. I share their concern, especially about the public schools, but for me the determinative facts are (i) that thousands of residents have benefitted from residential insulation; (ii) that since 1993, when the Resolution was enacted, the pace of the Port's residential insulation program has accelerated to an "exceptional" rate, as the majority puts it, that is almost four times faster than the rate contemplated under the Noise Mediation Agreement; (iii) that in recent years the number of sensitive-use public facilities (schools, hospitals, churches, and libraries) within the loudest noise contours has been markedly reduced; and (iv) that the Port's failure to insulate the many primary and secondary schools in the Highline School District cannot properly be charged to the Port's account in this proceeding, because the Port has agreed for some time to fund the insulation of these schools and its offer has been refused.

The Port's noise mitigation program has provided significant benefits to thousands of residents of the neighborhoods most adversely affected by airport noise and has contributed to, not detracted from, the achievement of a meaningful reduction in noise impacts.

Reasonableness. The significance of the noise reductions scheduled, pursued and achieved by the Port has properly been the focus of the Panel's hearings, its deliberations and this Final Decision. But as the Panel previously interpreted it, the Resolution has both a "meaningfulness" requirement and a "reasonableness" constraint. I believe that the General Assembly did not intend to give up its plan "vigorously" to pursue the runway, even if the Port's noise reduction was not sufficiently "meaningful" to satisfy a majority of this Panel, unless there was clear and convincing evidence that the Port could reasonably have been expected to have been able to schedule, pursue and achieve a *significantly* more meaningful reduction in noise impacts than it has shown.

The community advocates (and at various times, each of the members of the Panel) have raised questions about noise abatement and mitigation measures that have *not* been scheduled, pursued or achieved. But the opponents of the runway have not met their threshold burden to show that in spite of whatever legal, operational and practical constraints it faced, the Port could have undertaken additional noise abatement or mitigation programs that could reasonably have been expected to produce a material change in noise impacts during the pertinent time frame (that is, they would have made an otherwise insignificant reduction meaningful), given the approach to assessing "meaningfulness" adopted by the majority.

While a rigorous analysis of the impact of potential alternative noise measures would have been desirable, the evidence presented to the Panel does not show that the Port squandered opportunities to "schedule, pursue or achieve" *significantly* more meaningful reductions in noise impacts after the Resolution was enacted in 1993 and, in the words of the majority, "served notice to the Port that it would ... have to show that its noise programs were, in fact, producing results in the form of meaningful, measurable, on-the-ground reductions in noise impacts."

I take little comfort from the majority's speculation that the 5 dB reduction in DNL they imply would be necessary to satisfy the Resolution "might very well be achievable." The Port has

scheduled, pursued and achieved the objectives of the noise abatement programs that have been most likely to produce a meaningful reduction in noise impacts. While the Port can, and should, continue to find creative ways to reduce the burden of aircraft noise on its neighbors, there was no evidence before the Panel that the Port could have caused a significantly greater reduction in DNL without imposing artificial capacity constraints at the Airport that would be inconsistent with Federal policy and with the core objective of the PSRC Resolution: the *expansion* of regional airport capacity.

Conclusion. I doubt that the General Assembly contemplated that its decision to authorize the third runway under the Resolution would depend upon the success of the Port's unprecedented efforts to use established scientific methods to convince a panel of experts exactly how the impacts of measured reductions in on-the-ground noise can be expected to benefit the community. Ultimately, the Panel had to resolve what both Dr. von Gierke (an expert for the Port) and Dr. Fidell (for the ACC) recognize is a social, economic, or political question, not a search for an elusive, "scientifically accurate" judgment, about whether the noise reductions shown by the Port were sufficiently "meaningful" to satisfy the Resolution. I am convinced that given the achievement of the objectives of the Port's noise abatement programs; the reductions in measured on-the-ground noise shown by the Port that resulted from the accelerated reduction in Stage 2 operations, especially at night; and the insulation of thousands of homes, the Port has met its burden.

The Panel's focus has been on what the Port has done in the *past* to meet its obligation to reduce the impacts of aircraft noise on the community. While members of the Panel ultimately reached different conclusions about the Port's success, we all recognize that in the *future*, the need to find new ways effectively to reduce aircraft noise impacts will intensify as the number of aircraft operations at Sea-Tac continues to grow, with or without the new runway.

The Port was able, in my judgment, to achieve a significant reduction in noise impacts in the past by reducing noise levels at their source: the aircraft that use the airport. In the future, that approach is unlikely to be effective. The Port has little, if any, ability to control the noisiness of aircraft, the number of operations, or the flight tracks they use. The Port and the community must seek creative approaches to noise reduction that take new forms, even if they are more controversial than reductions in aircraft noise that come at the expense of commercial airlines.

The members of the "Coordinating Committee" -- the PSRC itself, the Port, the FAA and the WSDOT -- have, it seems to me, both an obligation and an opportunity to work together to achieve future reductions in noise impacts that have not been realized in the past. I am confident that I speak for the entire Panel in urging the Coordinating Committee to overcome the institutional barriers between the Port and local government that have prevented the Port from mitigating *learning* interference by insulating public schools in the Highline School District; between the Port and County government that have allowed Alaska Airlines to avoid the Nighttime Limitations Program and insult the community by moving flights to Boeing Field; and between the Port and the FAA, which has been unduly resistant to changes in flight procedures that could reduce noise impacts. The Coordinating Committee can, and should, play an important role in minimizing the adverse environmental impacts of any necessary expansions of the Region's airfield capacity.

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CLOSING REMARKS
(BY THE PANEL)

We have not been asked to consider, and we have expressed no views about, whether the proposed third runway should be built, about the value of the capacity enhancement it would bring or about its environmental impact. We have not considered, and do not offer any opinion about, whether the adverse environmental impacts associated with a major runway expansion project can be fully mitigated.

Our findings and conclusions are based upon a unique set of facts, at the existing Airport, that were presented to us under an unusual local resolution. While we hope that the PSRC, the Port, the FAA, and the affected communities will benefit from our work, our analyses here do not necessarily provide a precedent for the resolution of noise issues at other airports. Whether resort to an expert "arbitration" panel is, in general, a productive approach to help resolve these issues remains to be seen.

The process has generated an exceptionally detailed and thorough public record of data and analysis with respect to past and present noise levels, noise impacts, and the effectiveness of noise reduction measures at a major airport. We commend and thank all of the participants for their considerable contributions to this proceeding; the extent and analytical depth of the evidence presented to this Panel reflected an extraordinary commitment of effort and resources by many different parties. We also wish to acknowledge the outstanding logistical support work provided by the staff of the PSRC, particularly Mr. Jerry Dinndorf and Ms. Clare Impett, throughout this proceeding.

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There is nothing simple or easy about the Port's effort to improve Airport capacity while reducing public exposure to Airport noise, or about the public's effort to maintain livable communities and improve the quality of life for which this Region is rightfully known. Airport noise is a tough problem. We deeply appreciate the trust that the PSRC General Assembly and the parties to this proceeding have placed in our ability to reach a careful and impartial judgment, and we have each given our best effort to the task of making that judgment. We are grateful to have had the opportunity to serve the Puget Sound Region.

For the Majority:

William Bowlby, m/c
William Bowlby

Martha J Langelan
Martha J. Langelan

For the Dissent:

Scott P. Lewis, m/c
Scott P. Lewis, Chair

COMMENTS ON THE ANALYSIS OF CONSTRUCTION IMPACTS IN THE DRAFT SEIS FOR SEATTLE-TACOMA INTERNATIONAL AIRPORT

PREPARED FOR

Cutler & Stanfield, L.L.P
700 Fourteenth Street, N.W.
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on behalf of

THE AIRPORT COMMUNITIES COALITION

PREPARED BY

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March 28, 1997

* Affiliation listed for identification purposes only.

The following comments are based on our review of the Draft Supplemental Environmental Impact Statement for Master Plan Update Development Actions at Seattle-Tacoma International Airport and the Fill Material Alternative Delivery Method Study for Third Runway prepared by HNTB (Final Draft, Nov. 1996). In addition to the specific comments offered here, we have provided information and observations which have been integrated into the comments prepared by Cutler & Stanfield, L.L.P. on behalf of the Airport Communities Coalition.

Due to the incomplete information available at this time on construction methods and engineering design, these comments are necessarily general and preliminary in nature.

1. Volume of Fill Material

The reduction in volume of the excavated materials to the compacted fill is stated to be 15 percent, which the Draft SEIS refers to as "shrinkage." (Draft SEIS, p. 5-4-3). The Draft SEIS appears to misuse this term, which is properly used to describe the volume change in bank material when it is compacted. The Draft SEIS does not discuss the volume change in material that is taken from the bank and placed on a hauling unit, commonly referred to as "swell" (see Figure A).

In order to calculate the number of trucks needed to transport fill, both a swell factor and a shrinkage factor must be used. The value of 15%, as used in this report, appears to be an attempt to incorporate the two values into one. This number appears small to accurately reflect the change in volume from the trucks to the final embankment site. Using what might be considered more typical values, the actual reduction in the material from loose measure in the truck to the compacted fill volume is likely closer to 21.7% (see Figure B).

Both shrinkage and swell factors may be affected by soil characteristics. The Draft SEIS does not mention the assumed soil characteristics on which the estimates of fill were based. The quality of fill also will affect the seismic stability of the embankment.

2. Construction Equipment

The Draft SEIS does not fully describe the fleet of equipment involved in fill transport, placement and compaction. The actual determination of the number of pieces of equipment required for this project can only be made by determining the cycle times of the various pieces of equipment involved. Queuing theory is one method that can be used to more accurately model field conditions to establish the equipment requirements. Cycle times must be more accurately determined in order to accomplish an accurate estimate of the fleet size.

The Draft SEIS' assumptions (used to estimate emissions from construction equipment) are overly simplistic. Three scrapers, seven dozers, five miscellaneous HDDV trucks and two water trucks (Draft SEIS, p. B-12) are clearly inadequate for a project of this size and complexity. Additional equipment, including motor graders and compactors, would likely be needed to construct the third runway embankment. Mobilization of this equipment to the site, either on flat-bed trucks or under their own power, is not discussed in the Draft SEIS but could add to congestion on local roads and coordination problems at the site itself.

3. Organization of Field Operations

The Draft SEIS contains no discussion of how field operations at the excavation areas, and especially in the fill area, will be organized to accommodate the different pieces of construction equipment, along with the stream of dump trucks transporting fill. Since the fill area is limited in area and accessibility, the organization of equipment in this area is most important. The construction staging area is further limited by the existing topography of the site and the changes in grade which would occur as the project progresses. The logistics of operations at the fill area, including access points, routing on site and egress, must be thought through carefully.

The Draft SEIS seems to assume that each piece of equipment can be fully utilized at all times during the work day. In reality, even a well-coordinated construction project experiences some situations in which one piece of equipment has to wait for another to complete its task before it can proceed. For example, a dump truck may not be able to dump a load of fill until a dozer has spread the previous load. The delay experienced by the dump truck may in turn hold up other equipment which needs to access the site. Finally, this could cause the dump truck to be delayed in getting back to the excavation site, which could reduce the number of round trips each truck could make during the assumed 16-hour day.

3. Disposal of Unsuitable Material

The initial site work will consist of excavating the organic materials (vegetation, etc.) which is unusable as fill. Some of the material excavated from the construction site may also be unsuitable for construction of the embankment due to poor quality, potential contamination, or other undesirable soil characteristics. While the volume of this material is small in comparison to the total fill required for the project, it could amount to a significant quantity (possibly in excess 50,000 cubic yards) of material which must be hauled away and disposed of.

4. Cut and Fill Operations

Approximately 3 million cubic yards of material would be taken from the south end of the proposed third runway as cut material and placed at the north end of the runway as fill. There is no indication that this material has been properly examined and found to be suitable for this purpose. Even if the material is suitable, the time required to perform this work would be considerable. The construction schedule does not appear to include an allowance for transfer of material from one part of the construction site to another, and the Draft SEIS seems to dismiss this cut and fill effort as consuming very little time.

G-535-1

FILL MATERIALS
Volume Changes From Borrow Pit To Final Placement

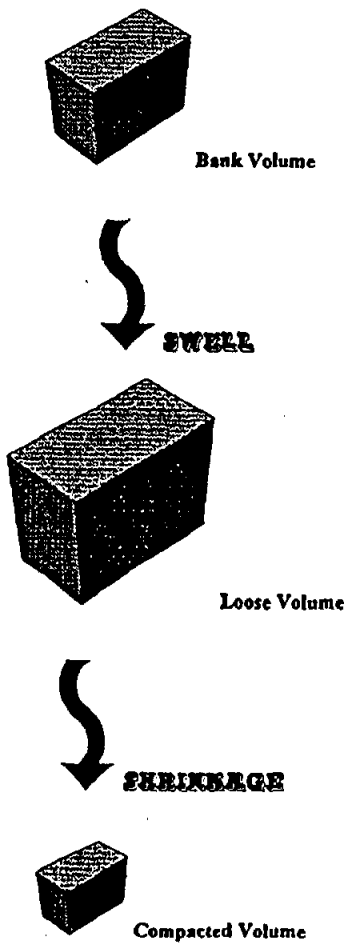
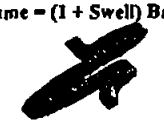


FIGURE A

SWELL AND SHRINKAGE PRINCIPLES

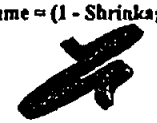
Swell (expressed in percent) reflects the volume change in material that is taken from the bank and placed on a hauling unit.

Loose Volume = (1 + Swell) Bank Volume



Shrinkage (expressed in percent) reflects the volume change in bank material when it is compacted.

Compacted Volume = (1 - Shrinkage) Bank Volume



If one yard of material (with swell of 15% and shrinkage of 10%) is taken from a bank, its loose volume is computed as follows:

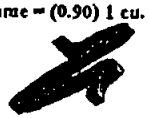
Loose Volume = (1 + 0.15) 1 cu. yd. = 1.15 cu. yd.

If this one bank cubic yard of material (with swell of 15% and shrinkage of 10%) is compacted, its compacted volume is computed as follows:

Compacted Volume = (1- Shrinkage) Bank Volume

Compacted Volume = (1- 0.10) 1 cu. yd.

Compacted Volume = (0.90) 1 cu. yd. = 0.9 cu. yd.



Note: Actual reduction in the material from loose measure in the truck (1.15 cu. yd.) to the compacted fill volume (0.9 cu. yd.) is 21.7%

FIGURE B

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MEMORANDUM

TO: Cutler and Stanfield, L.L.P.

FROM: Mike Ruby

DATE: March 27, 1997

SUBJECT: Comments on Draft Supplemental Environmental Impact Statement for Sea-Tac Airport Master Plan Update

- G-537 -

Although we have not had time to review in detail all of the material presented in the Air Quality study in Appendix C-2 to the Sea-Tac Draft Supplemental Environmental Impact Statement (Draft SEIS), we have found significant problems with both the reporting and the use of the EDMS model for estimating nitrogen oxides (NO_x) and carbon monoxide (CO) emissions and impacts. In addition, the Draft SEIS may understate the full impact of the proposed action by erroneously identifying the operational level of the airport which is being analyzed. Given the inaccurate assumptions and the erroneous reporting, I do not believe that a responsible official can reasonably rely on the data contained in this portion of the Draft SEIS for decisions regarding this project.

The Draft SEIS provides a summary of the total NO_x emissions associated with the proposed action in Table C-2-5. We found this table to be significantly at variance to the results obtained by the FAA's consultant (i.e., in the files SWPAP1, SWPRP10, S10DNR54, and S10DN54EA provided to us by the FAA). The table in the Draft SEIS reports the annual difference in NO_x emissions between the "do nothing" and the "with project" alternatives to be 30 tons per year while the EDMS files report 63 tons per year. The data are summarized in Table I.

Table I. Annual Emissions of NO_x

	2010 do nothing	2010 with project	Difference
DRAFT SEIS	4135 t/yr	4165 t/yr	30 t/yr
L&B calculations	4165	4228	63

Given the consistent understatement of actual operations by planning projections seen in Exhibit 2-1 on page 2-4 of the Draft SEIS, it would be important to also estimate the expected annual emissions at the maximum operations level of the proposed project. Exhibit 2-7 on page 2-26 of the Draft SEIS shows this to be approximately 630,000 per year, as compared to the 474,000

operations per year assumed in the 2010 air quality analysis in the Draft SEIS. In order to make such an estimate it is necessary to have estimates of both the level of airfield operations and the changes in induced vehicle traffic at the higher airfield operational level. At this time the vehicle traffic data are not available so it is only possible to say that when the operations approach that maximum level, the difference between "do nothing" and "with project" mode could be considerably greater, possibly upwards of 80 tons/year.

Use of the EDMS model only to estimate the increased emissions from the "with project" alternative fails to include the emissions associated with added delay at intersections. In its current version this model only estimates emissions from moving traffic and does not include the emissions from idling vehicles stopped at intersections. We estimate that considering only the traffic moving along International Boulevard S, an increase in the average daily delay (between S 192nd St and SR 518) in 2010 of 17 seconds between the "do nothing" and "with project" alternatives will result in an increase in annual NO_x emissions of approximately 20 tons.

Thus consideration of a greater annual operational level and inclusion of the NO_x emissions from the resulting delays at intersections could result in an increase in estimated emissions exceeding the 100 tons per year threshold for conformity decisions.

EDMS was also used to estimate the expected concentrations of pollutants around the airport. The pollutants which appear to be most significant are NO_x and CO. Concentrations of CO approach the ambient air quality standards (AAQS) along the upper terminal drive even without considering the emissions from idling vehicles. Concentrations of NO_x approach and exceed the AAQS at locations on the roadways along the north and south ends of the runways.

The locations of the receptors for NO_x appear to have been chosen contrary to EPA guidance (40 CFR 51, App. W) for meteorological dispersion modeling. The NO_x receptors north of the runway for the "do nothing" alternative were located in an area which is not nominally open to the public. Receptors for the "with project" alternative are placed at a different location, along the relocated S 154/156th St. This roadway should have been the location for receptors for both alternatives as the Draft SEIS states (*vide*, p. 2-19) that this relocation project has already begun and the portion in the vicinity of the receptors will be completed prior to any construction of the third runway. In addition, the receptors were not placed at the probable location of the highest annual concentration of NO_x. This location will be to the east of the location designated "Future 154th St." We estimate that moving the receptor approximately 800 feet to the east will increase the annual average concentration to more than 0.07 ppm (following the same conventions used in the Draft SEIS calculations) for the "with project" alternative. EPA guidance clearly establishes the responsibility of the modeler to determine the location of the peak impact and to utilize receptors at that location in the modeling.

Also contrary to the EPA guidance there was no evidence in the files provided to us that more than one year of meteorological data was used in the modeling. EPA guidance requires five years

of data to be used, with possibly different years at each individual receptor if that produces higher values at those locations. The same year, 1993, appears to have been used throughout.

The data entered into EDMS to represent the "do nothing" and "with project" alternatives is not consistent with the descriptions of these alternatives in the Draft SEIS. For example, the Draft SEIS (*vide*, p. 2-13) describes accommodating the congestion associated with growth constrained by the current terminal and airfield facilities by shifting the hours of flights, more into the late evening and morning hours, and with more hours of the day approaching peak conditions. This more closely describes the temporal distribution assigned in the EDMS modeling to the "with project" alternative, while the description of a greater percentage of operations in the most desired hours describes the temporal distribution assigned to the "do nothing" alternative. It is possible these were simply reversed by the modelers. This and other errors in constructing the temporals means the modeling was completed with the "with project" alternative assuming less than 422,600 annual operations, much less than the 474,000 annual operations assumed for the "with project" alternative in the Draft SEIS. Alternatively, if the temporals are assumed to be approximately correct, then we must have 111 peak hour operations for the "with project" alternative. If we were to examine the full impact of the "with project" alternative and assume the "do nothing" temporals correctly describe an airport operating at the constrained maximum, this same calculation requires approximately 136 peak hour operations at the 630,000 annual operations level.

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It is clear that if the EDMS model had been run correctly, with appropriately chosen receptor locations, correctly assigned operations and traffic levels, and multiple years of meteorological data, the NO_x values reported for the "with project" alternative would have been higher, and for the "do nothing" alternative lower, than the values reported in the Draft SEIS. If each of these errors were corrected and the emissions from idling vehicles had also been included in the calculations of CO concentrations along terminal drive, the values reported for the "with project" alternative at those locations would also have been higher than the values reported in the Draft SEIS.

TRAFFIC ANALYSIS OF DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MASTER PLAN UPDATE DEVELOPMENT ACTIONS AT SEATTLE-TACOMA INTERNATIONAL AIRPORT

prepared for
THE AIRPORT COMMUNITIES COALITION

by

SMITH Engineering & Management
MARCH 27, 1997

INTRODUCTION AND EXECUTIVE SUMMARY

We have reviewed the ground transportation related elements of the *Draft Supplemental Environmental Impact Statement For The Proposed Master Plan Update Development Actions At Seattle-Tacoma International Airport* and the related documents and data provided by the Federal Aviation Administration (FAA). In our review, we have discovered a number of fundamental flaws that affect the conclusions of the ground traffic analysis on impacts and relative performance of the alternatives and, as a consequence, the input to and possibly the conclusions of other analyses that depend on traffic considerations such as air quality conformity analysis. Reasons why we believe the Draft Supplemental Environmental Impact Statement for Sea-Tac (DSEIR) is flawed and inadequate include:

1. The DSEIS does not assess the traffic impact of the Sea-Tac alternatives at ground traffic loadings corresponding to each alternative operating at its air operations capacity. Hence, it does not assess the potential worst case condition. If traffic conditions for the Preferred and No Build Alternatives were analyzed for an hour in which each alternative was functioning at its air operations capacity, the ground transportation analysis would likely conclude that the Preferred Alternative would have significant adverse traffic impacts and the differences might affect the conclusions of air quality analyses relating to ground traffic as well.

1 G-539-1

The traffic analysis in the DSEIS does not include a true worst case condition for ground traffic impacts of Sea-Tac Airport's traffic. A true worst case test of Sea-Tac's traffic impacts would have the Preferred Alternative and the No Build Alternative operating at their actual air operations/air passenger capacities, the condition that causes the greatest airport traffic load on the ground transportation system. The worst case analysis would be carried out during hours of the day when airport traffic would cause the greatest differential in level of service experienced on the street and highway system.

In the supposed worst case traffic analysis carried out in the DSEIS, the No Build alternative is operating at about 72 percent of its apparent capacity and the Preferred Alternative is operating at only about 58 percent of its capacity. There is no detailed traffic analysis of the Preferred and No Build Alternatives operating at their capacities at any time of day. And, except for construction traffic impact analyses, the only time of day analysed is the p.m. commute peak. This is a time of day when many key street and highway facilities are projected to be loaded in excess of capacity by non-airport traffic and the impacts of airport traffic are indistinguishable in the analysis methods used in the DSEIS.

An air travel demand level at which *both* the No Build and Preferred Alternatives would operate at their capacities is entirely plausible. The DSEIS itself takes pains to caution against the unreliability of its air travel forecasts. And the DSEIS cites but does not analyze in depth for traffic impacts an FAA Terminal Area Forecast for Sea-Tac that predicts 11.4 percent more air operations and 5.9 percent more air passengers than the Port of Seattle forecasts that were used as the basis for the DSEIS. The Airport Communities Coalition has presented expert analysis indicating that air travel demand could be as much as 30 percent greater than the forecasts used in the DSEIS (see Winston). And the fact that the DSEIS projects the existing airport configuration - the No Build Alternative - to serve a level of operations and passengers far beyond the forecasts it was designed for is itself a precedent for concluding that the preferred alternative would actually operate at its capacity for peak periods in the forseeable future. Hence, it is entirely reasonable that the "worst case" scenario that should have been assessed for ground transportation impacts in the DSEIS is the Preferred Alternative operating at its full capacity of 99 flight operations.

If a reasonable worst case analysis were carried out with both alternatives operating at their capacities, it would likely show results quite different than that presented in the DSEIS. The Preferred Alternative, generating a ground transportation demand corresponding to 99 flights per hour, would have significantly more adverse traffic impacts than the No Build, which would generate a ground transportation demand corresponding to only 82 flights per hour. If this analysis were carried out for a time of day other than the p.m. commute peak (such as mid-day), the true impacts of airport traffic would not be masked by other traffic. Differences in the outcome of the traffic analysis in such a worst case scenario might also alter the outcome of the air quality conformity analysis.

2. The DSEIS does not assess the airport alternatives ground traffic impact at the hour(s) of the day when the airport may have its most discernable and significant traffic impacts. If the appropriate hours of the day were analyzed, different conclusions would likely be drawn about the significance of the traffic impacts of the preferred alternative and might cause changes in the significance of findings in air quality determinations.

Point "1" above asserts that the true worst case condition that should have been analysed for traffic impacts in the DSEIS is the condition of each Alternative operating at its full air operations capacity. Even if the argument for a "full capacity operation" scenario is dismissed, the DSEIS should have analyzed as a potential worst case the hour(s) of the day when *the airport* generates its maximum traffic.

The DSEIS acknowledges that the actual peak in airport operations and apparent peak in airport related ground traffic occurs at midday. However, the DSEIS does not analyze traffic conditions in depth for the mid-day peak period. This is a crucial omission in the DSEIS which results in failure to disclose potentially significant impacts of the Preferred Alternative.

Data presented with the DSEIS shows current air passenger traffic (that accounts for 80 percent of all airport-related traffic according to the DSEIS) in the mid-day peak is 61 percent higher than in the evening commute peak, a fact that suggests findings of significance would likely be made if an in-depth analysis of the mid-day peak ground traffic were done. Although the cumulative amount of traffic on the street and highway system is probably greatest during the p.m. commute, the worst case of adverse impacts of airport traffic may well occur at mid-day. If airport traffic bottles-up what would otherwise be free-flowing mid-day traffic conditions on the street and highway system, this would certainly be a significant adverse impact and potentially a more important one than incremental contributions to an already gridlocked situation in the commute peak. In situations where a project is likely to have significant adverse traffic impacts at periods of time outside the commute peak and impacts significantly different from those that occur in the commute peak, it is reasonable and expected that the environmental document would analyze those periods in depth. The fact that no such analysis was done despite awareness of evidence that the mid-day condition might be the one where the airport has most significant ground traffic impact makes the DSEIS substantially inadequate as a disclosure and decisionmaking document.

The data also shows that in the mid-day peak by Year 2010, the Preferred Alternative would serve 3.5 percent more originating and destined air passengers than the No Build Alternative. This is a reverse of the relationship that prevails in the p.m. commute peak period that the FAA chose to be the sole period subjected to in depth traffic analysis. In that selected analysis hour, the No Build

alternative is projected to serve 1.9 percent more originating and destined air passengers than the preferred alternative. Hence, there is a likely prospect that if a detailed ground traffic analysis were performed for the mid-day period, it would likely find the Preferred Alternative to have greater traffic impact than the No Build.

Furthermore, in the forecast years, non-airport traffic alone may be sufficient to place key regional traffic facilities in Level of Service F conditions during the p.m. commute peak, making it difficult if not impossible to discern the impacts of airport traffic, to say nothing of determining the differences in impact between one airport alternative and another during that particular period of time. At mid-day, non-airport traffic is generally free-flowing. However, substantial increases in mid-day peaked airport traffic could cause readily quantifiable decrements to level of service. Differences in the impacts of the alternatives might be more readily discerned in this period. This also suggests that probably the most appropriate worst case traffic impact condition (the time the airport has its most significant impact on traffic) that should be evaluated in depth would be the mid-day peak.

Yet another consideration is the disclosure in the DSEIS that a level of air travel activity significantly above that used as a basis for the ground traffic assessments in the document is highly likely. In fact, the FAA's own Terminal Area Forecast of air travel for Sea-Tac predicts 11.4 percent more air operations and 5.9 percent more air passengers than the Port of Seattle estimates that were used as the basis of evaluations in the DSEIS. Had the FAA forecast been used as the basis in the DSEIS, an in-depth mid-day peak traffic analysis would show the Preferred Alternative having proportionately greater adverse ground traffic impacts but the No Build traffic effects unchanged (because in the mid-day peak the No Build is constrained by its air operations capacity while the Preferred Alternative is not).

Considering the preceeding paragraphs, it must be concluded that the DSEIS is deficient because of the lack of a mid-day peak traffic analysis.

3. If one considers traffic impacts of both No Build and Preferred Alternatives operating at their respective full capacities or traffic impacts during the mid-day peak period of Sea-Tac airport operations, or at levels of air traffic demand above the Port of Seattle forecast used in the DSEIS, weather conditions that limit flight operations on the No Build Alternative would create a further differential in traffic impact adverse to the Preferred Alternative nearly half of the time. Weather conditions that limit ground transportation demand of the No Build Alternative should be analyzed as a separate case.

Weather conditions that impair flight operations on the No Build Alternative would likely increase the significant adverse ground traffic impacts of the Preferred Alternative over the No Build. This is true in any periods of the day where the forecast air travel activity approaches or exceeds the capacity of the No Build. Such a condition occurs in the mid-day peak for the Year 2010 Port of Seattle forecast that was used as the basis for the DSEIS, and would be true for a broader period of the day under the higher air travel forecasts of the FAA and of Winston. During conditions of weather impairment, landing capacity on the No Build is reduced by increments of 20, 40 or 60 percent, decreasing by similar increments the numbers of arriving air passengers the No Build could be released onto the ground transportation system. Conditions of weather impaired flight operations have such high frequency of occurrence - 44 percent of the time according to the DSEIS - that that it should be assessed as a separate case in evaluating the impacts on mid-day traffic. Had the DSEIS done this, further significant adverse traffic impacts of the Preferred Alternative would have been disclosed. Because such analysis is not provided, the DSEIS is deficient.

The DSEIS confines its analysis to the p.m. commute hour, a period of time when, according to the Port of Seattle forecasts, the No Build Alternative would only be operating at about 72 percent of its peak capacity. Because the airport is not operating as its peak in the sole hour selected as the sole basis of ground transportation analysis, weather impairment of flight operations is likely only a minor factor in that hour. However, had the DSEIS properly assessed ground transportation impacts in hours when the No Build would be stressed to or near its air operations capacity, the differential effect of weather limitations on air capacity would be evident 44 percent of the time and would result in a differential ground transportation impact unfavorable to the Preferred Alternative.

4. In its structuring of the alternatives considered, the DSEIR is deficient in that it deprives the public of the opportunity to consider the reasonable alternative of optimizing the landside facilities and operations around the existing airfield and limits consideration to a binary choice between an alternative involving massive expansion of the airfield and one involving absolutely no change from existing facilities. The definition of alternatives in the DSEIS is further flawed in that the Port of Seattle is already committed to landside changes in the No Build configuration that would improve its traffic performance significantly over the condition considered in the DSEIS. In essence, the DSEIS analyzes the Preferred Alternative in comparison to a "no project" condition that would not reasonably exist at the year of comparative analysis.

The DSEIS is deficient in that it fails to consider the obvious alternative of building the land-side improvements included in the Preferred Alternative but not building the third runway (in other words, a Preferred Alternative land-side configuration with a No Build air-side configuration). In general, the landside improvements incorporated in the Preferred Alternative are beneficial from air and ground transportation perspectives and could be constructed or implemented independently of whether or not the third runway is built. It is the third runway, its direct impacts and the potential for a 20.7 percent increase in peak hour air operations, air passengers and air passenger ground traffic over the No Build and the derivative impacts of those increases that are most detrimental. In inseparably bundling a set of improvements regarded as impact neutral or beneficial with one regarded as controversial and potentially substantially detrimental, the DSEIS fails to distinguish the potential impacts of the third runway from the benefits of the landside improvements and deprives the public of the opportunity to consider the reasonable alternative of optimizing landside facilities and operations around the existing airfield. It artificially creates an "all-or-nothing" choice between the Preferred Alternative and the No Build. This makes the DSEIS deficient as a disclosure and decisionmaking document.

Another way of stating the same argument is that the DSEIS treats certain improvements affecting ground transportation as exclusive assets of the Preferred Alternative when in reality they could as readily be implemented as readily with the No Build, when in all liklihood they would be implemented by reasonable and responsible government if the No Build were called upon to serve anything like the activity levels ascribed to it in this DSEIS and when in fact, in its current actions, the Port of Seattle is already grafting them onto the No Build condition. The preceeding sections focused on one reason why the DSEIS errantly concludes that the Preferred Alternative has less ground traffic impact than the No Build - because it selected as the sole hour of the day for its analysis an hour when the No Build would serve more air passengers than the Preferred Alternative. Another important reason why the Preferred Alternative appears superior in the DSEIS analysis is because of the terminal parking garage expansion, the shift of employee parking location north of State Route 518, the roadway connection from the terminal system to 28'th Avenue South at S.188th Street and other landside changes that tend to shift traffic away from critical traffic congestion points in the vicinity of the

airport are presumed to be part of the Preferred Alternative but not implemented with the No Build. These changes have no direct linkage to the most significant and objectionable feature of the Preferred Alternative, the third runway proposal and could as readily be implemented with the No Build case. In fact, in its meeting of March 25, 1997 the Port Commission of the Port of Seattle took action to implement the parking garage expansion and the employee parking north of SR 518, essentially making them a part of the No Build condition. The DSEIS is flawed in that it creates a false measure of the Preferred Alternative's traffic impact by comparing it to a No Build condition that would not exist at the time of comparison.

5. The DSEIS may be inadequate in that it relies upon base year conditions data that may no longer describe conditions at and in the vicinity of Sea-Tac airport.

The DSEIS discloses that air operations and air passenger totals experienced in 1995 and 1996 were significantly greater than in 1994, so substantially so that it caused the Port of Seattle to increase its forecast of Year 2010 air operations and air passengers by 17 percent and the FAA to increase theirs by 30 percent for air operations, 24 percent for air passengers. If conditions in 1995 and 1996 were so radically different from 1994 that it caused vast differences in the forecast air travel activity, this suggests that the base year data should be updated also. The DSEIS would appear to be deficient by continuing to rely on 1994 as a base year. We note that in fact, some of the data used in the ground traffic analysis was collected as long ago as 1984 and is almost certainly outdated and inaccurate currently.

6. The responses to our comments on the Draft Clean Air Act Conformity Determination presented in the DSEIS are incomplete, inadequate, unresponsive to the issues raised, mischaracterizations of our comments or are merely self-references to the original inadequate materials that elicited the comment.

The series of responses contained in Responses to Comment 68, 69 and 82 concerning the adequacy of the TRAFFIX model used as a basis for the ground traffic analysis is a good illustration of the inadequacy of the DSEIS responses. In our original comments we carefully documented an extensive patter of inconsistencies in trip generation, trip origin-destination patterns and route assignments encoded into the TRAFFIX model that, taken together, strongly suggest a systematic pattern of human intervention to bias the model results against the No Build Alternative and in favor of the Preferred Alternative. We also commented that the TRAFFIX model procedure was one that offered an exceptionally high level of human intervention to bias results. In its responses, the DSEIS facilely characterizes the inconsistencies as "minor errors" that it claims it has corrected in the current work but ignores the fundamental issues that extensive pattern of the inconsistent treatments appears to evidence a systematic attempt to bias the results in favor of one alternative versus another and that the TRAFFIX procedure is one that is particularly susceptible to such biasing interventions.

The referenced responses on the subject of the adequacy of the TRAFFIX model also mischaracterize our original comments re the PSRC EMME/2 model. It does this by implying that we had suggested employing the PSRC model at the same level of zonal and network detail as is used by PSRC for regional analysis purposes. This mischaracterization enables the response to evasively claim that the TRAFFIX model is able to provide the more highly refined analysis detail that is needed in the airport area while the PSRC model is not. Our original comments clearly speak to a derivative model of the PSRC model "focused" on the airport area. The word "focused model" is a term-of-art meaning starting from a large-area "parent" model such as PSRC's and creating a variant of derivative of it - the focused model - that has a much higher level of zonal and network detail inserted into it in a subarea of particular study interest. Our original comment clearly indicated that a *focused variant* of the PSRC model would have been far superior to the TRAFFIX model employed for this EIS and also noted that the focused variant of the PSRC model could have been prepared at a time, effort and cost comparable to what was needed to prepare the TRAFFIX model. By comparing TRAFFIX to the regional PSRC model rather than a focused variant of it, the DSEIS response makes an inappropriate comparison that leads to an incorrect conclusion.

For the record, let us clearly state that the study should have employed a "network-sensitive" traffic forecast model technique for the traffic forecast and assignment to routes. The TRAFFIX model is not a "network-sensitive" technique. The most logical choice would be to use the PSRC EMME/2 model *with focused modifications to provide a greater level of street and highway analysis zone detail in the area of primary concern for the Sea-Tac study*. If the analyst is uncomfortable or inexperienced in exercising the EMME/2 software package, the model could be redone using similar "network-sensitive" software packages including, but no limited to, TRANPLAN, UTPS or MINUTP. The important point is that "network-sensitive" softwares such as cited above should have been used to forecast how airport traffic and non-airport traffic would spread itself over available routes, including re-routing choices made by non-airport traffic in reaction to congestion created by airport traffic. Regardless of which of these "network-sensitive" softwares is used, the traffic forecast results would then be input to any of a number of suitable capacity analysis/level-of-service evaluation programs - even the intersection level-of-service evaluation module of the TRAFFIX package would be suitable for this final aspect of the work.

We note here that in the DSEIS work, even the TRAFFIX forecast results for intersections were exported to yet another level-of-service evaluation software, despite the fact that TRAFFIX internal capability includes the same 1994 Highway Capacity Manual analysis technique. One reason this seeming unnecessary exportation step may have been taken is because the TRAFFIX module continues to report volume-to-capacity ratios and estimates of average delay per vehicle whereas the HCM evaluation software that was employed withholds this information once Level-of-Service F conditions are reached (capacity is exceeded). We deduce this was done to conceal these results because the excedences of capacity and resultant delay that would result under the DSEIS forecasts are so extensive as to call to question the credibility of entire traffic analysis. For instance, the unreported results of traffic projections for the DSEIS indicate that in Year 2010 under the Preferred Alternative in the p.m. commute peak, traffic approaching the intersection of S. 188th Street and International Boulevard is estimated at 196 percent of capacity (twice as many cars will approach the intersection in that hour as can get through it) and the average delay per vehicle is estimated at 870 seconds per vehicle (on the average, each vehicle would sit in queue for fourteen-and-a half minutes before clearing the intersection). Obviously, before actual conditions reached anything like what is implied by the DSEIS TRAFFIX forecasts, much of the traffic would find an alternate route, an alternate mode of travel, an alternate time for the trip or not make the trip at all. So the entire traffic analysis in the DSEIS has no believable relationship to likely future conditions.

G-541-1

Appendix P

SEA-TAC INTERNATIONAL AIRPORT IMPACT MITIGATION STUDY

INITIAL ASSESSMENT AND RECOMMENDATIONS

FEBRUARY 1997

PREPARED UNDER A GRANT FROM
THE STATE OF WASHINGTON FOR THE:

CITY OF BURIEN, WASHINGTON
CITY OF DES MOINES, WASHINGTON
CITY OF FEDERAL WAY, WASHINGTON
CITY OF NORMANDY PARK, WASHINGTON
CITY OF TUKWILA, WASHINGTON
HIGHLINE SCHOOL DISTRICT
HIGHLINE COMMUNITY HOSPITAL

PREPARED BY:
HELLMUTH, OBATA + KASSABAUM, INC. · DALLAS, TEXAS
RAYTHEON INFRASTRUCTURE SERVICES, INC. · DENVER AND PHILADELPHIA

IN ASSOCIATION WITH:
THOMAS/LANE & ASSOCIATES, INC. · SEATTLE, WASHINGTON
MICHAEL J. MCCORMICK, AICP · OLYMPIA, WASHINGTON

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

There is no doubt that the expansion of Sea-Tac International Airport will have a positive economic benefit for the region and the State. However, the costs associated with these improvements are disproportionately borne by those communities immediately surrounding the Airport. Communities such as Burien and Des Moines are projected to be impacted by noise, traffic congestion, and socio-economic hardship merely because of their location near the Airport. Of the estimated $2.95 billion in potential mitigation costs, $2.3 billion (almost 80%) is projected to be required for Burien and Des Moines alone. Other environmental, transportation, and socio-economic costs have not yet been calculated.

This study does not assign mitigation costs to any particular agency. While the Port of Seattle and the Federal Aviation Administration will be financially responsible for a portion of the mitigation costs, funding from other sources is also expected. For example, increased transportation funding is available through the Washington State Department of Transportation and the Federal Highway Administration. Some environmental mitigation costs may be eligible for State and Federal EPA funding. Costs associated with acquisition and redevelopment may be shared between private and public-sector interests.

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This study also does not dispute the projections included in the EIS, such as noise contours and future flight-tracks. It recommends that these projections be assumed as accurate and that any required mitigation program(s) be based on the Airport meeting - not exceeding - these projections. For example, a permanent noise monitoring program should be established to verify that the projected noise contours are not exceeded. Should these or other parameters be exceeded, the EIS should be re-conducted and additional mitigation programs be developed, This approach positively works with the Port of Seattle to assure both the Airport and Airport-area communities that the EIS will be a valid document.

The study also recommends the need for an overall planning approach to development in Southern King County. The study recommends the development of a "South King County Comprehensive Plan" to weave together a plan that addresses the needs of all interests in the area - communities, residents, businesses, schools, hospitals, the environment, and the Airport.

Project Parameters

This report was produced under a grant from the State of Washington to analyze the proposed Third Runway project at Sea-Tac International Airport. The City of Burien, acting in the capacity of the grant manager, supervised the consultant team. The study examined the potential impacts of the Airport project on neighborhoods in the surrounding communities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila. Potential impacts on facilities owned and operated by the Highline School District and Highline Hospital were similarly examined.

Mitigation of potential impacts was based on the preservation and protection of neighborhood integrity. The consultants conducted an independent investigation into the potential impacts of the proposed project and how these potential impacts could be most appropriately mitigated.

Several other parameters guided this study:

- The basic premise of this study was that the Third Runway project would be constructed. This premise was clearly stipulated in the State grant which states that the funding for the study could not be *"expended directly or indirectly for litigation, public relations, or for any consulting services for the purposes of opposing the construction of the proposed Third Runway"*.
- Neighborhood boundaries were established by each community through their comprehensive planning process.
- The economic importance of Sea-Tac International Airport was never questioned. The Airport is an important economic factor to the Seattle metropolitan area, the Puget Sound Region, and the State of Washington.
- Given the study's budget and schedule, the consultants agreed to utilize as much existing information as possible. No new data was developed as part of this study. Information was primarily taken from the Master Plan Update Environmental Impact Statement, with additional information coming from other agencies including King County, the Puget Sound Regional Council, and various State and Federal agencies.
- The study investigated potential impacts associated with the proposed Third Runway and its associated facility improvements. Mitigation for existing impacts associated with the existing runways and airport operations were not included.

During the course of this study (April 1996 through March 1997), the consultants conducted over 100 meetings, interviews, presentations, workshops, and question-and-answer sessions with: local elected and appointed officials and staff members; the Port of Seattle staff and its consultants; County and State elected officials; representatives from various City, County, State, regional and Federal agencies; and the general public.

Potential Environmental Impacts

The study examined 8 general environmental areas and 26 specific potential impacts.

Potential Environmental Impacts Studied

Area	Specific Impact
Noise and vibration	LDN SEL Overflights (TA) Vibration
Air quality	Air emissions (aircraft) CO emissions (vehicles) HC emissions (vehicles) Air toxics Fugitive emissions Point source pollution
Surface water quality/hydrology	Runoff volume Erosion and sediment Spills
Ground water quality/hydrology	Aquifer recharge Contamination
Wetlands	Wetlands
Floodplains	Encroachment Reduced flood storage capacity Increased flow rate and volume
Aesthetics and visual	Ground shadow Visibility (aircraft) Visibility (fill)
Other	Special status species habitat Cultural resources Coastal zones DOT Section 4(f) resources

Of these 26 parameters, the consultants estimated the costs of mitigating the potential noise and vibration impacts. These costs are estimated to be approximately $2.4 billion, which primarily occur in 5 neighborhoods in 2 communities.

Neighborhoods Identified for Potential Acquisition and Redevelopment

City	Neighborhoods
Burien	North East
Des Moines	West Central North Central East Central South Des Moines

Mitigation of these neighborhoods are estimated to be approximately $1.9 billion - 80% of the total environmental impacts. These 5 neighborhoods are the closest to the proposed project and will experience significant impacts, due primarily to noise and vibration of aircraft operations. The $1.9 billion figure represents the cost to relocate neighborhood residents and redevelop the area.

Acquisition and redevelopment is the most far-reaching mitigation measure for these areas, but it will also fundamentally change these neighborhoods. The study recommends that a "specific area plan" be developed for each of these 5 neighborhoods in order to determine if other mitigation measures are appropriate. Acquisition and redevelopment is recommended only if all other mitigation measures are unsuccessful.

For the other communities, it was estimated that Federal Way would require mitigation due to LDN contours and overflights ($148 million), and that Normandy Park and Tukwila would require mitigation due to LDN and SEL noise, and overflights ($56 million and $114 million, respectively). Mitigation in these 3 communities would involve primarily sound abatement insulation and the purchasing of avigation easements.

The study also recommended the replacement or relocation of 8 schools in 3 communities.

Schools Identified for Potential Replacement or Relocation

Area	Elementary Schools	Middle Schools	High Schools
Burien	Sunnydale Cedarhurst	(none)	(none)
Des Moines	Midway	Pacific	Mount Rainier
Unincorporated King County	Beverly Park White Center	(none)	Satellite Alternate

Twenty-six other schools in the Highline School District were identified for sound abatement insulation and avigation easements. Costs involved with both the replacement and insulation/easement programs were not estimated by this study. Additional structural studies will be required in order to determine the costs involved with school mitigation.

Given the amount of information available and the project's budget and time constraints, it was not possible to calculate the mitigation costs for potential impacts associated with the remaining environmental measures (wetlands, floodplains, aquifer, air quality, etc.). Additional studies should be commissioned to determine the potential impacts associated with the Airport's proposed project.

Potential Transportation Impacts

The study examined 4 general environmental areas and 21 specific potential impacts.

Potential Transportation Impacts Studied

Area	Specific Impact
Congestion	Level of service
	Accidents
	School bus operations
	Transit bus operations
	Police and emergency vehicle operations
	Parking and pedestrian access
	Traffic noise (LEQ)
Physical damage	Local streets
	State roads
	State bridges
	Increased maintenance and reconstruction
Construction impacts	Truck haul routes
	Barge/rail/conveyor system
	Traffic diversion
	Traffic control
	Construction staging and phasing
	Work-force traffic
	Concurrent construction projects
Post-construction impacts	Additional traffic
	Increased operation and maintenance costs
	Master plan update

Of these 21 parameters, potential mitigation costs are estimated to be approximately $479 million. Tukwila accounts for $192 million (40%), due primarily to the number of State-jurisdiction roads and bridges in the City. Burien and Des Moines were projected to have the second and third highest mitigation costs ($117 million and $73 million respectively), due to their close proximity to the Airport's west and south sides. Normandy Park and Federal Way had the lowest potential mitigation costs due to their location relative to the Airport.

An advantage with many transportation mitigation measures is that one measure may concurrently address multiple potential impacts. For instance, improvements to a roadway to increase its capacity simultaneously addresses congestion, accident, and pollution impacts.

While the EIS did a good job of analyzing transportation impacts, it did not study a large enough area. The Airport serves the entire Central Puget Sound Region, yet the transportation impacts studied in the EIS stopped at the Airport's "driveways" - the roadways leading directly into the Airport property. Additional studies are needed to determine the true scope of the transportation-related impacts.

Given the amount of information available and the project's budget and time constraints, it was not possible to distinguish between future traffic directly associated with the expanded Airport and future traffic as a function of the region's natural growth. Additional studies - such as an origin-destination survey, a select link analysis, and a cost allocation model - are needed in order to make this distinction and to appropriately assign costs to appropriate funding sources.

Potential Socio-Economic Impacts

There is an inequity regarding the benefit of the Airport to its immediate neighbors. While the study acknowledges the benefit of the Airport to the region and the State, these benefits are not experienced locally in the 5 impacted communities. Approximately 5% of the persons utilizing the Airport live in the area most impacted. The remaining 95% of Airport passengers and employees come from elsewhere in the region.

Socio-economic impacts tend to blur across neighborhood lines and impact entire communities. In general, communities closer to the Airport are expected to experience a relative "depression" of residential property values (property values do not rise as fast relative to other similar properties in the region). This will have a cascading affect on the population mix in these areas. Single-family homes that cannot be sold will become rental properties. Studies have reported that non-owner-occupied residential areas have a lower average household income and utilize more social services than other areas. While the property value and tax revenues are depressed in these areas, the cost of providing social services increases.

Overall, the 5 communities were projected to experience a loss of $39.9 million during the period 2000 through 2020 as a result of the proposed project. The loss of these revenues is compounded with the problem of increasing demand for community and social services.

The discrepancy between these two trends contributes to the "blighting" of the area. This "blighting" impact has already been observed. Homes take longer to sell in the neighborhoods adjacent to the Airport, and the local real estate market already acknowledges the impact of aviation activity on neighborhoods.

The study recommends that the Port of Seattle make partial off-setting payments to the 5 impacted communities in order to mitigate the loss of local government revenues over the project period (2000 through 2020). An analysis of similar revenue shortfalls in the Highline School District are also needed.

Principal Environmental Recommendations

The following recommendations are included in Section 7 of the study. Please refer to Section 7 for a complete description of the study's environmental recommendations.

- **Oversight Commission** - Establish a working group/oversight commission to interact with the Port of Seattle during Master Plan Update implementation.

- **Acquisition and Redevelopment Program** - A study should be conducted to consider each neighborhood and school to determine if there are other less disruptive alternatives to acquisition and redevelopment. This study should be completed prior to construction of the Third Runway.

- **Sound Insulation and Avigation Easement Program** - The neighborhoods and schools identified in Section 7 (Tables 7.03, 7.04, and 7.05) should be further studied to determine the full extent of the proposed insulation and easement program. This study should be completed prior to construction of the Third Runway.

- **Vibration** - Prior to the start of construction of activities associated with Master Plan Update implementation, additional information should be provided regarding the potential impacts of vibration from construction activities. Also expand the vibration analysis to include qualitative and quantitative information on whole body vibration, annoyance/interference to humans caused by building vibration, and building structural damage for residences, schools and hospitals in the Airport area.

- **Additional Noise and Vibration Recommendations** -
  - Run the latest version of the Integrated Noise Model.
  - Show the SEL contours for the preferred alternative.
  - Show the 55 LDN contour.
  - Expand the permanent noise monitoring program.
  - Use the Third Runway only for arrival flights during inclement weather.
  - Restrict runway use between 9:00 PM and 7:00 AM.
  - Provide additional information regarding the threshold above (TA) noise metric.
  - Use permanent/portable "hush houses" in conjunction with engine maintenance run-ups.
  - Keep departure tracks over water as much as possible.
  - Re-evaluate use of noise barriers.

- **Minimize Overflights** - Minimize low-altitude overflights of residential areas as discussed in the Flight Plan Project EIS.

- **New Technologies** - Consider implementation of new technologies such as Microwave Landing System and Global Positioning Satellite System to reduce noise impacts around the Airport.

- **Aircraft Operations** - Clarify both hourly operational capacity of Airport and the calculation of existing average daily operations.

- **Reduced Noise Levels** - Provide information on the ability to maintain the Airport's reduced noise level goals.

- **Dust and Particulate Matter** - Include a Dust Control Plan in the contractor's permit prior to construction of the Third Runway. Work with appropriate regulatory agencies to obtain PM_{10} data which is more representative of the Puget Sound Region. This should entail the establishment of additional air quality monitoring stations, in particular in the vicinity of the Airport.

- **Air Quality** - Add additional air quality monitors closer to the Airport. Construction vehicle air quality analysis should be re-evaluated and the dispersion analysis should be re-done to better predict potential air quality impacts prior to the start of construction. As part of construction activities, PM_{10} and CO should be monitored in the vicinity of the fill sources, along the haul routes and in the Airport construction area. Provide information on Master Plan Update implementation and conformity with the Clean Air Act. Provide information on the State of Washington's Certification of Compliance with Air Quality Standards and a copy of Governor's Air Quality Certificate. After one year of baseline data has been collected at the new air quality monitoring sites, the area dispersion analysis should be re-evaluated for both the existing and future conditions. Conduct additional studies regarding long-term exposure to air toxics associated with Airport operations.

- **Mobile Sources** - Re-evaluate the existing and future roadway intersection analysis to confirm the accuracy of the evaluation in the EIS and to correct for inconsistencies discussed by EPA. All vehicles associated with Airport operations should comply with required vehicle emissions inspections and maintenance programs.

- **Queuing and Taxiing** - Conduct a study to determine the possibility of reducing aircraft emissions by improving Airport operations associated with queuing and taxiing.

- **Master Plan Update** - Re-evaluate the air dispersion and roadway traffic analysis to accurately monitor potential impacts.

- **Geotechnical Engineer** - Hire a geotechnical engineer for the duration of construction of the Third Runway to ensure that fill is placed appropriately including compaction and to help detect and remove seismically unstable soils, such as in fill sources.

- **Toxic-Free Fill** - Provide evidence including appropriate certifications that all fill material is free of harmful levels of toxic and hazardous materials as defined by current Federal and State regulations. Prior to the start of construction, conduct baseline studies of any area surface waters and the ground water. This information should be used to describe the existing conditions and to help monitor potential changes after the earthwork activities are complete.

- **Plans for Review** - At least two months prior to construction, provide for review and approval the following:
  - Construction Stormwater Pollution Prevention Plan and Erosion/Sediment Control Plan.
  - Spill Prevention, Control and Countermeasure (SPCC) Plan.
  - Construction Management Plan.
  - Construction Waste Management Plan.
  - Geotechnical report.
  - Reclamation plan for proposed fill sources.
  - Earthwork specifications and drawings, in particular for the Third Runway.
  - A copy of the State of Washington Governor's Water Quality Certificate which indicates that there is reasonable assurance that the project will be designed, constructed and operated in compliance with applicable water quality standards.

- **Groundwater** - Prior to the start of construction, permanent, long term surface and groundwater monitoring stations should be established in the Airport area. The locations and number of these stations should be approved by a working group/oversight commission.

- **Highline Aquifer** - Ground water movement in the Airport area should be better defined prior to the start of construction. Additional studies should be reviewed for potential ground water contamination impacts on the Highline Aquifer and other area aquifers.

- **Miller/Des Moines Creek Monitoring Studies** - Provide results of creek monitoring studies prior to the start of construction.

- **Stormwater Detention** - If the preferred alternative is implemented, the hydrologic analysis and stormwater management facilities should be re-evaluated to support final design prior to the start of construction.

- **Wet Vaults/Biofiltration Swales** - Provide detailed information regarding the construction and operation of the wet vaults and biofiltration swales

- **Construction Fence** - Place a construction fence at the outside limits of the construction area.

- **Miller Creek Relocation** - Prior to the start of relocating any part of Miller Creek, provide information on the potential impact on the relocation of litigation concerning King County agreeing not to channelize the Creek except in limited amounts in connection with retention facilities.

- **Expansion Storm Drain System Report** - Provide a copy of the hydraulic analysis with the computer program for review and comment.

- **Surface/Groundwater Monitoring** - Continue the surface and groundwater monitoring prior to the start of construction.

- **Borrow Site Hydrology** - Continue the borrow site hydrology until adequate information is obtained for comparison with the EIS existing or baseline conditions.

- **Operations Erosion and Sediment Control Plan** - At least two months prior to the completion of construction on the Third Runway, provide an operations erosion and sediment control plan, and a stormwater pollution prevention plan.

- **Fuel Handling System** - Upgrade and modernize the Airport's fuel handling system.

- **Floodplains** - At least two months before the start of construction, provide: information on the relationship between the 100 and 500-year floodplains, recent storms in the Puget Sound region and the Master Plan Update implementation EIS analysis; a copy of the final monitoring plan for evaluating the effectiveness of the Miller Creek and Des Moines Creek relocations; and final design information for the Miller Creek and Des Moines Creek relocations including specifications and drawings.

- **Color Photographs** - Provide color photographs taken from the EIS viewpoints and additional viewpoints which show the existing and future conditions. The additional viewpoints should be selected based on discussions with a working group/oversight commission.

- **Landscape Plans** - Landscape plans should consider: landscape requirements from the City of SeaTac; planting temporary vegetation or a cover crop as construction is completed; and should include a variety of native vegetation which requires low maintenance and has a mixture of seedlings and more mature plants in order to avoid a monoculture.

- **Coastal Zone Mitigation** - Potential point sources for pollutants should be identified and a pollution control management plan developed for the neighborhoods identified in Section 7 (Table 7.15).

- **DOT Section 4(F) Resource Mitigation** - Significant open spaces, parks, and recreational areas should be preserved and protected from potential impacts, or should be relocated and replaced if possible.

- **Sub-Regional Comprehensive Plan** - Conduct a comprehensive plan for all communities in the South King County region in order to integrate all future plans for land development, transportation, infrastructure, parks and open space, environmental protection, economic development, and other similar plans.

Principal Transportation Recommendations

The following recommendations are included in Section 8 of the study. Please refer to Section 8 for a complete description of the study's transportation recommendations.

- **Origin-Destination (O-D) Survey** - Conduct an O-D survey to determine the amount of regional traffic attributable to Sea-Tac International Airport. The percentage of traffic attributable to the Airport should be projected to the Year 2020 in 5-year increments and be used for projecting cost-sharing of various transportation projects that serve and benefit the Airport.

- **Recalculate Mitigation Costs** - Estimated mitigation costs calculated in Section 8 of this report should be recalculated taking into consideration the O-D information recommended above. Costs for mitigation projects should be assigned to the Port of Seattle only if those impacts are attributable to traffic as a result of the Third Runway. Other transportation projects would be implemented by the appropriate local, county, State, and/or Federal agencies.

- **Level of Service** - Areas identified in Section 8 (Table 8.03) should be mitigated prior to construction of the Third Runway.

- **School Buses** - Any additional mitigation for Highline School District school bus impacts should be assessed and completed prior to commencement of construction of the Third Runway.

- **Transit** - Any additional transit impact mitigation should be assessed and completed prior to commencement of construction of the Third Runway.

- **Public Safety** - Public safety response times in the five impacted communities should be continually monitored during the construction phase of the Third Runway. Reductions in response times should be addressed by additional equipment, personnel, or new station locations.

- **Local Jurisdiction Roadways** - Areas identified in Section 8 (Table 8.04) for local street mitigation should be continually monitored for serviceability index (SI) decreases. Roadways where the SI decrease should be reconstructed as soon as possible.

- **State Jurisdiction Roadways** - It is recommended that the areas identified in Section 8 (Table 8.05) for State street mitigation be continually monitored for SI decreases. Roadways where the SI decrease should be reconstructed as soon as possible.

- **State Jurisdiction Bridges** - Establish the baseline conditions of the bridges and pavement on the freeway routes most likely to be used from the borrow pit locations to the construction site and establish a system of monitoring prior to any truck movements.

- **Maintenance and Reconstruction** - The areas identified in Section 8 (Table 8.07) for increased maintenance and reconstruction mitigation should be continually monitored for SI decreases. Roadways where the SI decrease should be reconstructed as soon as possible.

- **Fill Haul** - Establish contingency plans for the various alternatives for bringing in the fill material (trucks, barge, and/or conveyor).

- **Traffic Diversion Model** - Prepare a diversion model for the project which includes the network as shown in Section 8 (Figure 8.01). Improvements to the arterial system as a result of diversion should be implemented prior to the start of the hauling activity on the freeways. An arterial improvement program should be implemented prior to the construction of the Third Runway.

- **Additional Traffic** - Areas identified in Section 8 (Table 8.10) should be monitored for additional traffic impacts after the Third Runway is operational.

- **Expand EIS Analysis** - The EIS traffic analysis should be expanded to the entire network as shown in Section 8 (Figure 8.01).

- **Accidents** - Develop a Freeway Incident Management Plan for the construction phase and impose operational restrictions on the heavy trucks involved with the haul

- **Regulatory Compliance** - Comply with all appropriate Federal, State and local noise regulatory requirements for surface transportation of fill and other materials associated with Master Plan Update implementation.

- **Construction Restrictions** - Restrict all construction operations, including heavy equipment and trucks hauling fill, between the hours of 7:00 AM and 9:00 PM Monday through Friday and 9:00 AM to 9:00 PM on Saturdays.

- **Noise Control Devices** - Equip all construction equipment, including trucks hauling fill, with noise control devices.

- **Complaint-Driven Requirements** - If noise complaints are received during construction, implement one or more of the following:
  - Relocate stationary construction equipment as far from nearby noise sensitive properties as possible.
  - Shut off idling equipment.
  - Re-schedule construction operations to avoid periods of noise annoyance.
  - Notify nearby residents whenever extremely noisy work will be occurring.
  - Install temporary/portable acoustic barriers around stationary construction noise sources.
  - Place material stockpiles between crushing or screening operations and the affected dwelling(s).

- **Remodeling** - When the Master Plan Update implementation is started, remodel existing surface transportation noise with the most current version of STAMINA (or the most accepted program) and compare with the 1994 existing baseline conditions and the actual conditions at the start of construction.

- **Clarify Modeled Surface Traffic Noise** - In the Integrated Noise Model, distinguish between construction and other surface traffic, in particular traffic associated with hauling fill.

Principal Socio-Economic Recommendations

The following recommendations are included in Section 9 of the study. Please refer to Section 9 for a complete description of the study's socio-economic recommendations.

- **Additional Community Services/Facilities** - Provide additional services and facilities that match the needs of the changing residential demographic in the impacted communities.

- **Additional School Services/Facilities** - Provide additional services and facilities that match the needs of the changing residential demographic in the Highline School District.

- **Property Values** - Make a partial payment of property taxes for homeowners in the five impacted cities equal to an annuity of the present value of whose payments equal the property's loss of relative value caused by expansion of the Airport. If partial tax payments are not made, then make annual off-setting payments to each of the five impacted cities to compensate them for the relative declines in residential property values caused by construction of the Third Runway and related Airport facilities.

- **Promotion of Home Ownership** - Establish a revolving "Home Ownership Loan Fund" to facilitate the movement of persons living in Burien, Des Moines, Federal Way, Normandy Park and Tukwila from "renter" to "owner" housing tenure status.

- **School Tax Revenues** - Conduct a detailed analysis of the potential shortfall in Highline School District's property tax base that will result from construction of the Third Runway and related Airport facilities.

- **Changing Student Demographic Profile** - Additional research should be undertaken to develop quantitative estimates of the relationship between demographic shifts in the Highline School District's student population, levels of student performance and appropriate mitigation measures to maintain the District's traditional quality of education outcomes.

- **Public Safety Costs** - Establish a program which reimburses the Cities of Burien, Des Moines and Tukwila for the additional public safety requirements they will experience.

- **Cultural Resources Enhancement** - Each of the five impacted cities should develop a cultural resources enhancement plan specifically directed toward meeting the quality of life challenges that the Third Runway and related Airport facilities.

- **Social Services Plan** - Each of the five impacted communities should develop a Southwest King County integrated community social service resource and delivery plan.

- **Public Health Analysis** - It is recommended that the School of Public Health at the University be funded to conduct an Airport health impact assessment, and that if the assessment finds a positive correlation between adverse health impacts and levels of Airport operation, appropriate measures to mitigate these affects be funded.

- **Environmental Justice** - Establish a monitoring system in the area to the north of the Airport under the approach/departure flight track for the Third Runway to insure that the intent of Federal Executive Order 12898, "Environmental Justice" are met.

- **Quality of Life Indicator** - Create a quality of life indicator model for the five impacted cities and for areas in Northwest King County which are appropriate as a comparison area. The model should be used to identify changes in the impacted cities' relative quality of life over time and the major quality of life indicators which contributed to the decline.

- **Airport Operations Assessment** - Conduct an economic and engineering assessment of Airport operations to determine Airport functions which would have positive economic development benefits and could be shifted to the five impacted cities.

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SECTION 1
INTRODUCTION

SECTION 1
INTRODUCTION

1.01 - INTRODUCTION

The Seattle-Tacoma (Sea-Tac) International Airport is operated by the Port of Seattle and located in the City of SeaTac, Washington, in southwestern King County. Development of a third north/south runway (8,500 feet) has been proposed in order to expand the airport's capacity. Other airside, terminal and landside improvements have also been proposed as part of the Master Plan Update for Sea-Tac.

In response to concerns regarding the potential for increased aviation-related impacts upon the neighboring communities, the State of Washington initiated a grant in 1995 to assess the impacts of the proposed Third Runway. This grant was authored by State Senator Mike Heavey and was administered through the State's Department of Community, Trade, and Economic Development (CTED). The purpose of the study was to assess the projected impacts of the proposed Third Runway and to develop mitigation strategies for the Cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila, the Highline School District, and the Highline Community Hospital. The study area is shown in Figure 1.01.

The provisions of this State grant stipulated that the study cannot be used to oppose the proposed Third Runway at Sea-Tac International Airport. Specifically, the grant stated:

> *"State appropriation is provided solely for distribution to the City of Burien for analysis of the proposed Port of Seattle third runway, including preparation of a draft environmental impact statement and other technical studies. The amount provided in this subsection shall not be expended directly or indirectly for litigation, public relations, or for any consulting services for the purposes of opposing the construction of the proposed third runway."*

1.02 - CONSULTANT SELECTION

Acting in the capacity of the grant manager, the City of Burien coordinated the consultant selection process and worked cooperatively with the Cities of Des Moines, Federal Way, Normandy Park, and Tukwila, the Highline School District, and the Highline Community Hospital. Requests for proposals were advertised both locally (metropolitan Seattle area) and nationally. A short-list of consultant teams was selected to be interviewed in November 1995. Upon conclusion of the interviews, the following firms were selected in December 1995 to conduct this study:

- **Hellmuth, Obata + Kassabaum, Inc.** (Dallas, Texas), with **Raytheon Infrastructure Services, Inc.** (Denver and Philadelphia). The HOK/Raytheon team provided environmental, transportation, and community compatibility analysis and mitigation approaches.

- **Thomas/Lane & Associates, Inc.** (Seattle, Washington) provided socio-economic analysis and mitigation measures.

- **Michael J. McCormick, AICP** (Olympia, Washington) provided inter-governmental affairs consulting.

HOK, Thomas/Lane, and Michael J. McCormick contracted individually with the City of Burien. (Raytheon provided professional consulting services as a subconsultant to HOK). The City of Burien coordinated the overall studies.

1.03 - PROJECT SCOPE

The Sea-Tac International Airport Impact Mitigation Study consisted of eight general tasks:

- **Project Initiation (Task 1)** - The consultants met with representatives of the Cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila, the Highline School District, and the Highline Community Hospital to review the project scope and to gather base data, including information from the Federal Aviation Administration (FAA), the Port of Seattle (POS), the Sea-Tac Master Plan Update Environmental Impact Statement (EIS), and other sources of information.

- **Documentation/Discovery (Task 2)** - The consultants reviewed the information provided in Task 1, identified additional data needs, developed project base maps, and documented existing conditions.

- **Meetings, Presentations and Reviews (Task 3)** - During the course of the project, the consultants met five times in the project area and conducted informational meetings and addressed questions and comments from the Cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila, the Highline School District, and the Highline Community Hospital. Meetings were also conducted with city councils, citizens, State and Federal agencies, and other interested parties. The consultants conducted over 100 meetings and presentations during 15-19 April 1996, 20-24 May 1996, 24-28 June 1996, 5-9 August 1996, 21-31 October 1996, and 10-20 March 1997. Project coordination meetings were conducted in Dallas with the consultants and representatives of the Cities of Burien and Federal Way on 16-20 September 1996 and 9-11 December 1996.

- **Define Mitigation State-of-the-Art (Task 4)** - The consultants conducted a literature and Internet search and various telephone interviews to summarize airport mitigation experiences and mitigation precedents set by major projects within Washington State.

- **Environmental Analysis (Task 5)** - The consultants reviewed the Master Plan Update EIS and established a baseline for potential environmental impacts utilizing primarily existing information in the EIS and some additional data collected in Tasks 1 and 2. The potential environmental impacts were assessed and an environmental analysis technical memorandum was produced which was incorporated into the project report.

- **Traffic Analysis (Task 6)** - The consultants reviewed the Master Plan Update EIS and established a baseline for potential traffic impacts utilizing the existing information in the EIS and data collected in Tasks 1 and 2. The potential traffic impacts were assessed and a traffic analysis technical memorandum was produced which was incorporated into the project report.

- **Socio-Economic Analysis (Task 7)** - The consultants reviewed the EIS and established a baseline for projected socio-economic impacts utilizing the existing information in the EIS and data collected in Tasks 1 and 2. The potential socio-economic impacts were assessed and a socio-economic analysis technical memorandum was produced which was incorporated into the project report.

- **Mitigation Plan (Task 8)** - The consultants developed an approach to neighborhood mitigation which addressed the potential impacts of the proposed project. The draft mitigation approach was presented to city staff, citizens, the POS staff, and various State and Federal agencies for review and comment. The plan was revised and incorporated into the project report.

1.04 - PROJECT APPROACH

The approach to this study involved several assumptions:

- A basic assumption of the study was that the proposed Third Runway and associated airport improvements would be approved and constructed.

- The data developed by the Port of Seattle for the project's Environmental Impact Statement was the basis for the information to be analyzed. Additional supplemental information was provided by King County, the City of Seattle, various Washington State and Federal agencies, the Puget Sound Regional Council (PSRC), the Puget Sound Air Pollution Control Agency (PSAPCA), the study area cities, the Highline School District, and the Highline Community Hospital. No new information, data, studies, or models were generated as a component of this study.

- The proposed project at Sea-Tac International Airport consists of a new 8,500-foot north/south runway (west of the existing outboard runway) and associated terminal and capacity improvements necessary to accommodate projected airport demand through the Year 2020. This project was generally referred to as Alternative 3 in the EIS.

- The study analysis was based on individual neighborhood areas as defined by each of the five study area cities. Potential impacts were projected for each neighborhood based upon the above data. Various mitigation measures were developed to address the needs of each neighborhood, rather than just individual properties.

- Appropriate legislation from the State of Washington - specifically the Growth Management Act (GMA) and the State Environmental Policy Act (SEPA) - was utilized to evaluate and assess the mitigation necessary to address the potential impacts. The experience of other American airports and other major Washington State projects also was reviewed to determine appropriate mitigation approaches.

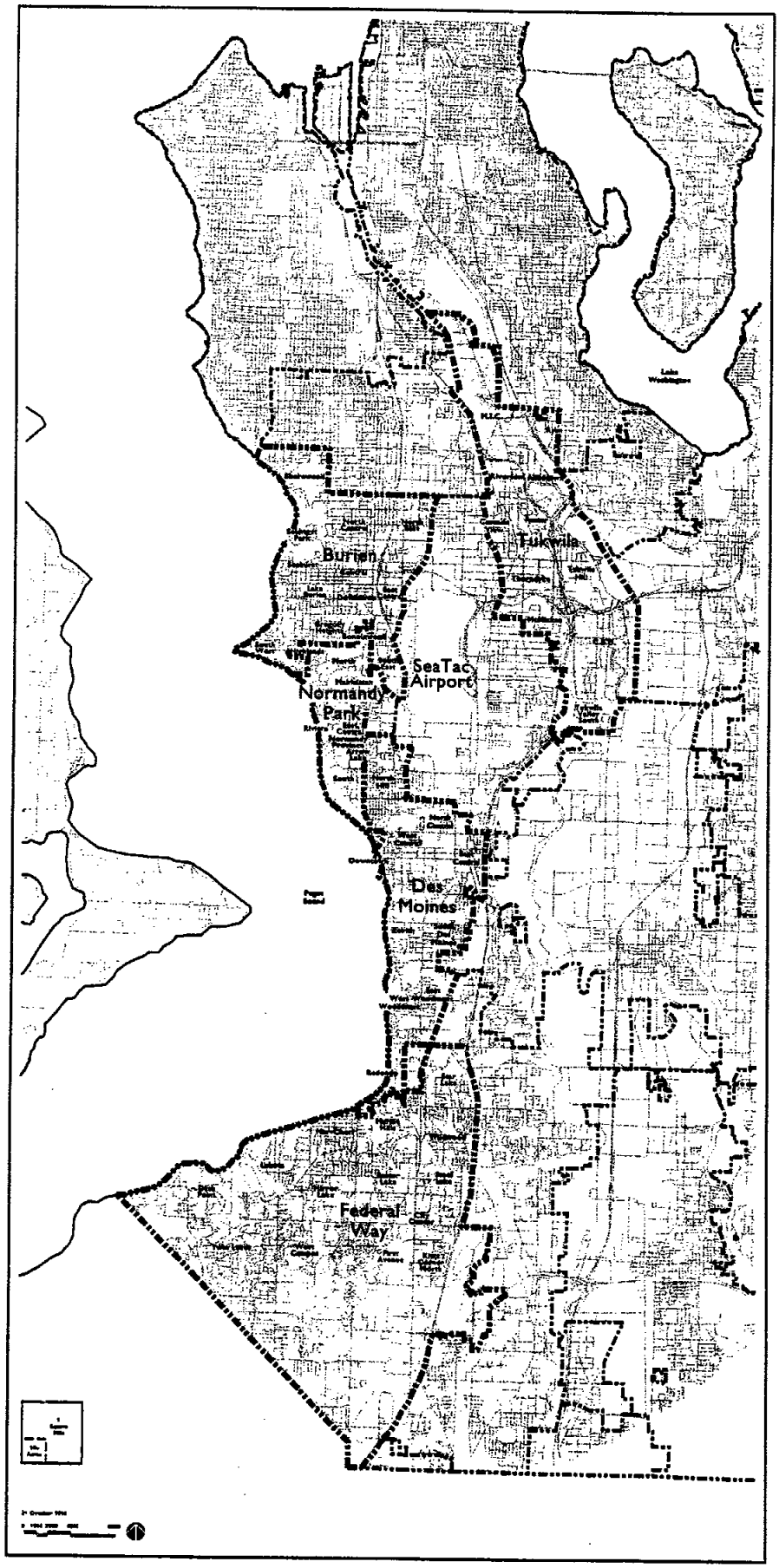
This report documents the consultant analysis which was conducted during the period April 1996 through February 1997. During the study, the consultants met regularly with citizens, city staff, elected officials, Highline School District and Highline Community Hospital representatives, staff from the Port of Seattle, and representatives from various city, County, regional, State, and Federal agencies.

Sections 2, 3 and 4 present an evaluation of the Environmental Impact Statement with respect to environmental (Section 2), transportation (Section 3) and socio-economic (Section 4) issues.

Sections 5 and 6 present a summary of case studies of mitigation at selected US airports (Section 5) and for major projects within Washington State (Section 6).

Sections 7, 8 and 9 project the potential impacts for the study area and propose mitigation measures for environmental impacts (Section 7), transportation impacts (Section 8) and socio-economic impacts (Section 9).

Section 10 presents a summary of the findings of this report. Several appendices are also included which address equity issues and socio-economic impacts (Appendix A), technical references (Appendix B), project contacts (Appendix C), and a glossary of terms (Appendix D).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SeaTac Airport
Normandy Park
Des Moines
Federal Way

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SECTION 2
EIS ENVIRONMENTAL ANALYSIS

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SECTION 2
EIS ENVIRONMENTAL ANALYSIS

2.01 - INTRODUCTION

Task 5 of the consultant scope of services focused on analysis of the Sea-Tac International Airport's EIS if Alternative 3 is implemented. The following areas were analyzed:

- Noise and vibration impacts.
- Air quality impacts.
- Impacts on water resources, water quality and hydrology, wetlands, and floodplains.
- Aesthetics and visual impacts.

For each of these areas, the scope of services involved the following:

- Evaluate the adequacy of the studies which were part of the Master Plan Update's Final EIS.
- Establish a baseline for potential project impacts.
- Assess the impacts for both project construction and operation.
- Identify issues in the EIS and recommend methodologies to enhance the analysis.

This environmental analysis will be the basis for formulating mitigation measures to minimize potential project impacts and to address the issues raised in this Section. In order to fully evaluate the appropriate areas of the EIS, each area was reviewed for the following:

- Methodology: assumptions; monitoring stations; baseline data/modeling.
- Existing conditions.
- Future conditions and impacts.
- Mitigation.

The evaluation is based on a review of the different EIS Chapters, appropriate literature information and discussions with the agencies and persons contacted. The specific EIS Chapters reviewed are shown in Table 2.01.

Table 2.01
EIS Chapters Reviewed for Environmental Issues

Chapter	Section	Title
--	--	Executive Summary
I	--	Project Background and Purpose and Need
II	--	Alternatives
III	--	Affected Environment
IV	1	Noise
IV	2	Land Use
IV	7	Human Health
IV	9	Air Quality
IV	10	Water Quality and Hydrology
IV	11	Wetlands
IV	12	Floodplains
IV	19	Earth
IV	20	Solid Waste
IV	21	Hazardous Substances
IV	23	Construction Impacts
IV	24	Aesthetics and Urban Design
V	--	Probable, Unavoidable, Adverse Environmental Impacts and Mitigation Measures
Appendix C	--	Noise Impacts
Appendix D	--	Air Pollutant Methodology
Appendix F	--	Stream Survey Report for Miller Creek
Appendix G	--	HSP-F Hydrological Modeling Analysis
Appendix H-A	--	Jurisdictional Wetland Delineation
Appendix H-B	--	Wetland Function and Values Assessment
Appendix N	--	Aesthetic Views and Photos
Appendix P	--	Natural Resource Mitigation Plan
Appendix Q	--	Water Studies
Appendix Q-A	--	Baseline Groundwater Study
Appendix Q-B	--	Preliminary Water Conservation Plan
Appendix Q-C	--	Concepts for Using a Constructed Aquifer to Manage Airport Stormwater
Appendix R	--	Responses to Public Comments

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

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2.02 - NOISE AND VIBRATION

Noise and vibration issues in the EIS are discussed in Chapter IV, Sections 1, 7 and 23, Chapter V, Appendix C and part of Appendix R. In Appendix C, standard aircraft noise descriptors or metrics are described as follows:

- **LDN (Day-Night Average Sound Level)** - "LDN" is the FAA specified noise descriptor; it employs the LEQ or equivalent sound level which is a single numerical noise rating in A-weighted decibels (dBA) which would contain the same noise energy as the time-varying sound level in a given period of time; the LDN provides a numerical description of the weighted 24-hour cumulative noise energy level using the A-weighted decibel scale over one year.

- **LEQ (Average Daily Sound Level)** - "LEQ" is used to define noise exposure without the penalty of nighttime activity over a specified period of time (e.g., 24 hours, a school day); in general, the closer the 24 hour LEQ and LDN values are to each other, the less the impact of nighttime activity; if the LDN is 3 dBA or greater than the LEQ, the nighttime noise is considered to be a major contributor to the overall noise environment.

- **SEL (Sound or Single Event Exposure Level)** - "SEL" is the noise associated with a single aircraft noise event either on the ground or while in flight. Noise complaints are generally a result of a SEL.

- **TA (Threshold or Time Above)** - "TA" represents the number of minutes per average annual day that a location is exposed to noise in excess of given decibel thresholds such as 65 dBA.

These metrics are used to describe sound pressure or amplitude and sound frequency. Sound pressure is a direct measure of the sound magnitude without consideration for other factors that may influence its frequency. A standard unit of measuring sound pressure is the decibel (dB). Because the range of sound pressures in the environment is so large, these pressures are expressed on a logarithmic scale. This scale compresses the wide range in sound pressures.

Sound frequency is expressed as Hertz (Hz) or cycles per second. Young adults normally have an audible frequency range of 2 to 16,000 Hz; whereas, aircraft noise is between 50 to 5,000 Hz. The human ear has different sensitivities to various frequencies, with some louder or quieter than others. Thus, methods for frequency weighting have been developed with the most common being the A-weighted noise curve or dBA. The A-weighted scale performs this compensation by discriminating against frequencies similar to the human ear. All Federal agencies dealing with community noise use the A-weighted sound level as the basic unit for environmental impact analysis.

In the EIS, it is indicated that noise levels in flight are regulated by the FAA's aircraft certification process. Certain non-flight activity at the Airport is regulated by state and local regulations.

Chapter 173-60 of the Washington Administrative Code (WAC) specifies maximum noise levels that one property can project onto another. However, under the code the following are exempt:

- Sounds created by aircraft engine testing and maintenance not related to flight operations between 7:00 AM and 10:00 PM, provided that testing and maintenance is conducted at a remote site, whenever possible.
- Sounds originating from aircraft in flight and sounds that originate at airports which are directly related to flight operations.

Therefore, the WAC applies only to aircraft engine testing and maintenance at night which are not related to flight activity.

King County has adopted the WAC regulations within their areas of jurisdiction as shown in Table 2.02.

Table 2.02
King County Maximum Permissible Noise Levels

Land Use Zone of Noise Source	Land Use of Receiving Property/dBA			
	Rural	Residential	Commercial	Industrial
Rural	49	52	55	57
Residential	52	55	57	60
Commercial	55	57	60	65
Industrial	57	60	65	70

(Source: Washington Administrative Code, March 1987)

The maximum permissible noise levels are:

- Reduced by 10 dBA at night (10:00 PM to 7:00 AM) when the receiving land use zone is residential.
- Reduced by 5 dBA at night for sounds that are periodic or contain pure tones..
- Increased by 15 dBA for up to 1.5 minutes, 10 dBA for up to 5 minutes, 5 dBA for up to 15 minutes (all per hour) for noises of short duration.

The US Environmental Protection Agency (USEPA) has identified the 55 LDN as the desirable noise level for protecting the public health and welfare with an adequate margin of safety (EPA, March 1974).

SEA-TAC INTERNATIONAL AIRPORT
IMPACT MITIGATION STUDY

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Industrial	57	60	65	70

(Source: Washington Administrative Code, March 1987)

The maximum permissible noise levels are:

- Reduced by 10 dBA at night (10:00 PM to 7:00 AM) when the receiving land use zone is residential.
- Reduced by 5 dBA at night for sounds that are periodic or contain pure tones..
- Increased by 15 dBA for up to 1.5 minutes, 10 dBA for up to 5 minutes, 5 dBA for up to 15 minutes (all per hour) for noises of short duration.

The US Environmental Protection Agency (USEPA) has identified the 55 LDN as the desirable noise level for protecting the public health and welfare with an adequate margin of safety (EPA, March 1974).

- **INM Version 5.1** - Version 5.1 is a Windows '95-based program which was released in late 1996. It has the ability to plot noise contours on a street map and has an expanded data base of aircraft including the Boeing 777 and MD-90. At the time the EIS was done, noise data for a Boeing 767-200 with JJ-9-D was substituted for the Boeing 777 aircraft.

Because of at least the greater accuracy of the INM, Version 5.1 - the ability to plot noise contours on a street map and the expanded data base of aircraft information - the noise model should be rerun using Version 5.1. This will allow confirmation of the data from INM, Version 4.11 and the most up-to-date information available on the newer aircraft noise characteristics. The noise study did not include an extensive evaluation of sound exposure level (SEL). According to Horonjeff and McKelvey (1994):

"In addition to LDN contours, SEL contours can be helpful in addressing issues of sleep and speech interference and for analyzing the effects of noise abatement procedures, such as proposed noise abatement flight tracks. Graphical comparisons of SEL contours of various aircraft types can also provide powerful images for comparing noise emissions of different aircraft types."

They also indicate that:

"Tabular listings for user-specified ground locations show not only the predicted LDN but also the SEL and LDN contribution of individual aircraft by runway and flight corridor. This information is invaluable to understanding the major contributors to the total LDN. It can also be used to compare the model predictions with data from noise-monitoring locations. Such comparisons often provide the basis for fine-tuning model inputs as well as promoting public confidence in the computer model and the contours it produces."

In the EIS, the INM was used to show the SEL contours for one approach to Runway 16R and one departure from Runway 16L for five aircraft types which dominate the current and future fleet mixes at the Airport. Based on the comments by Horonjeff and McKelvey (1994), it appears as if it would be useful to have a more extensive discussion of the SEL contours; their relationship to the LDN contours; and their relationship to health problems, in particular, sleep and speech interference. Thus, this should be done concurrent with re-evaluating the noise data using INM, Version 5.1.

The EIS for the Flight Plan Project (Puget Sound Regional Council and Port of Seattle, October 1992), included noise assessment information associated with the 55 LDN level and a SEL of 80 dBA. This SEL was selected because it is often used to supplement the LDN analysis and 80 dBA corresponds to the level at which sleep disturbance and speech interference start to occur. This EIS used the following overall noise assessment criteria in the analysis:

- Population exposed to cumulative noise levels in excess of 55 LDN.
- Population that would be newly exposed to cumulative noise levels in excess of 55 LDN.
- Population exposed to cumulative noise levels in excess of 65 LDN.
- Population that would be newly exposed to cumulative noise levels in excess of 65 LDN.
- Population that would be exposed to single event SEL noise levels in excess of 80 dBA.

The assessment criteria related to the 65 LDN were used in the Master Plan Update Alternative EIS; but the other criteria were not. Since the Flight Plan Project included the proposed Third Runway as an Airport capacity enhancement measure, the results of this EIS and assessment criteria should have been included in the Master Plan Update EIS. A more detailed evaluation of the SEL information would be particularly relevant since the information in EIS Table C-28 shows numerous receptors with peak levels above 80 SEL. In Appendix R of the EIS, it is indicated that computation of noise contours below 60 LDN is unreliable using the INM. Thus, a combination of noise measurement methods may be required to evaluate population exposure at the 55 LDN. This will, in part, depend upon INM, Version 5.1 capabilities.

The EIS approach to aircraft noise focused mostly on flight noise impacts taking into consideration run-up noise and aircraft taxing noise. The South Aviation Support Area EIS used the previously mentioned NOISEMAP model to also look at aircraft run-up and taxing operations (US Department of Transportation, Federal Aviation Administration and Port of Seattle, March 1994). It would have been useful if this information also had been developed and discussed for the Master Plan Update implementation EIS. The run-up evaluation should include a discussion of line maintenance run-ups, base maintenance run-ups and run-up locations with particular reference to the proposed Third Runway and facilities proposed as part of Master Plan Update implementation.

Appendix C Noise impacts in the EIS indicates that existing aircraft operations were based on average daily operations. It is not completely clear how many operations per hour this equates to. The air quality analysis used an aircraft peak hour activity level of about 88 operations (43.9 arrivals and 43.9 departures). The relationship, if any, between the noise and air quality aircraft operations or activity levels should be explained better taking into consideration the noise and air quality analyses used the August and June 1994 Official Airline Guide (OAG), respectively. Also, the discussion should include comments on the Airport being able to accommodate 60 arrivals per hour which was recently mentioned by the Port of Seattle (26 March 1996; 1 August 1996).

Existing Conditions

The FAA has established the 65 LDN as the critical level for the determination of noise impacts. The 60 LDN level was provided in the EIS for information only to allow a better understanding of aircraft noise levels in the Airport area. It is of interest to note that for the Flight Plan Project EIS (Puget Sound Regional Council and Port of Seattle, October 1992), the 55 LDN level was used as one of the noise assessment criteria. In this EIS, it was observed that:

"A noise level of 55 LDN and greater indicates the population to which the aircraft noise will be noticeable and some degree of annoyance or adverse community response would be expected to occur. Experience at Sea-Tac showed most areas (but not all) where noise complaints occurred were exposed to LDN levels of 55 or greater. For a new airport site, the 55 LDN represents that area in which future residential land use development may consider land use zoning, and other land use control measures to avoid significant noise-related residential land use impacts."

Based on the 65 LDN contour the following was concluded in the EIS for the Master Plan Update implementation:

- This contour includes 12.23 square miles.
- The 65 LDN noise exposure contour extends from north to south from the Duwamish River (just south of the Boeing Field Plant to near 280th Street South); to the west of the Airport the contour tapers to the southeast from the vicinity of 188th Street and 8th Avenue to its southern end; to the east and north of the Airport the noise contour is generally east of and parallel to State Route 509; east and west of the runway ends, the contour bulges outward which reflects the areas from thrust at takeoff to begin the role for departing flights; the contour between the runway ends curves in toward the Airport.
- Approximately 31,800 people in 13,620 homes are impacted by noise levels 65 LDN and greater; this represents a 52% reduction in population exposure over the 1991 conditions.
- The predominant use of the southerly traffic flow and the prevailing winds results in the largest portion of the 65 LDN contour falling south of the Airport.
- Because of increased thrust levels during take-off, noise levels are several decibels higher than approaches and noise contours extend further into communities south of the Airport.
- When traffic is in south flow, the east parallel Runway 16L is used for most departures and the west Runway 16R is used for most arrivals; when traffic is in north flow, Runways 34L and 34R (west and east runways) are used for departures and approaches, respectively; the noise exposure contours show greater exposure along the centerline of the approaches to Runways 16R and 34R.

The existing runway utilization is shown in Table 2.03.

Based on a visual examination of the data and results for the existing conditions description, it appears as if the results are appropriate for INM, Version 4.11. As indicated above, the results of this analysis should be compared with data generated by the INM, Version 5.1. In addition, the existing conditions description should include a better discussion of the relationship between the LDN, SEL and TA calculations and contours. The EIS indicates that TA:

"... is helpful in determining the exposure of certain noise sensitive users (schools, sleeping quarters, etc.) to extended periods of noise at various levels which may be disruptive to the activity occurring there."

However, the EIS did not address in detail the TA or other noise metrics issues with respect to these sensitive receptors. As part of checking the noise contours generated by the INM, a comparison was made with the measured noise level at the eleven existing noise monitoring stations. The comparison indicated a relative close relationship between the INM and actual measured data.

Table 2.03
Existing Runway Utilization

Runway	Aircraft Category[a]	Arrivals Day[b]	Arrivals Night	Departures Day	Departures Night
South Traffic Flow - 65%					
16L	Heavy	17.7%	1.73%	62.6%	47.3%
	Jets	13.2%	20.0%	56.5%	58.2%
	Props	19.1%	29.4%	58.6%	57.1%
16R	Heavy	47.3%	47.7%	2.4%	17.7%
	Jets	51.8%	45.0%	8.5%	6.8%
	Props	45.9%	35.6%	6.4%	7.9%
North Traffic Flow: 35%					
34L	Heavy	2.2%	0.0%	21.0%	21.0%
	Jets	7.0%	8.4%	30.0%	29.9%
	Props	13.0%	8.8%	24.8%	27.4%
34L	Heavy	32.8%	35.0%	14.0%	14.0%
	Jets	28.0%	26.6%	5.0%	5.1%
	Props	22.0%	26.3%	10.2%	7.6%

A - Aircraft category use as follows: Heavy (jet-powered aircraft with a takeoff weight of 300,000 or more); Jets (jet-powered aircraft with a takeoff weight of less than 300,000 pounds); Props (all piston or turboprop-powered aircraft).
B - "Day" indicates 7:00 AM to 9:59 PM. "Night" indicates 10:00 PM to 6:59 AM.

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

However, in Appendix R of the EIS, it is indicated that:

"Noise monitoring sites are not sufficient in numbers and are not located at distances far enough from the Airport to be used in the delineation of the noise exposure contours. Although there are sufficient sites near the Airport to provide information for input adjustment, the absence of sites at greater distance preclude the full array of data necessary for the modification of input information."

Based on this, it appears as if the number of permanent noise monitoring stations is inadequate and should be increased to help validate the INM noise contours.

In addition, the noise monitoring stations have inadequate coverage of the area surrounding the Airport, in particular, to the northwest, west, southwest and northeast of the Airport. The need for more monitoring stations will become particularly important as a result of Airport activities moving approximately 1/2 mile west with Master Plan Update implementation. As part of adding more noise monitoring stations, the system also should be upgraded to replace old noise monitoring equipment.

It should be noted that the Port of Seattle is currently evaluating the need for additional monitoring stations and upgrading their equipment (Port of Seattle, 1 August 1996). Representatives from the cities and concerned groups/citizens in the Airport area should participate with the Port of Seattle in the selection of appropriate monitoring sites that are not limited primarily to the north/south flight paths.

As part of the existing conditions discussion, the EIS provides information on the aircraft noise reduction/abatement programs. These include:

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- **Noise Budget Program** - The Airport will move toward an all Stage 3 aircraft fleet by limiting the amount of noise airlines are allowed to make each year; the goal agreed to in the Noise Mediation Agreement (Port of Seattle and Mestre Greve Associates, 31 March 1990) is to reduce noise by the Year 2001.

- **Nighttime Limitations Program** - This program involves phasing out Stage 2 aircraft during nighttime hours; effective 1 October 1995, Stage 2 jet aircraft may not operate between 10:00 PM and 7:00 AM unless granted an exemption or variance (e.g., delays due to weather, air traffic control delays, etc.).

- **Ground Noise Control Program** - Airplanes are not allowed to back away from gates using engine power, instead they must be pushed away by "tugs"; run-ups during the daytime are allowed only at designated locations on the north and south ends of the Airport (aircraft must face into the wind so that jet blast is directed back across the airfield); between 10:00 PM and 7:00 AM run-ups are allowed only under special circumstances such as for a departure.

- **Overflight Noise Abatement Procedures** - Initial "straight-out" departure corridors are in a narrow flight path; Duwamish/Elliot Bay corridor for arriving and departing flights keep aircraft over water and industrial areas as much as possible; nighttime procedures to keep flights over Puget Sound waters as much as possible.

- **Flight Path Monitoring** - The Airport's Noise Abatement Office monitors jet flights in the noise abatement corridors.

- **Noise Monitoring** - Eleven station permanent noise monitoring system to record noise exposure levels in the Airport area.

- **24-Hour Noise Information Line** - Provides information on noise issues or accepts noise complaints.

In Appendix R of the EIS, it is indicated that the nighttime noise budget and limitations program is designed to address noise issues associated with aircraft categorized as having FAR Part 36 Stage 2 noise levels. Therefore, the program will expire with the completion of the scheduled phase out of these aircraft between 2000 and 2003. These two components are an integral part of the aircraft noise reduction/abatement programs and discussions should be held with the Port of Seattle about continuing the implementation of the nighttime limitations program beyond the Stage 2 phase out schedule. Depending on the status of the nighttime noise budget program in relation to Stage 3 aircraft, this program also should be continually evaluated and updated based on the different stages of aircraft.

INM Version 4.11 has the capability to compute noise levels due to airplane engine run-up operations. This is particularly useful for noise information around airplane maintenance facilities. Because concern has been expressed about noise levels associated with existing run-up and maintenance operations, and the proposed south aviation support area activities, a discussion of this feature and data for the Sea-Tac International Airport would be useful. This information should be provided for both the existing and future conditions.

Future Conditions

Future conditions were based on the following average day operations:

- Year 2000 - 1,038 average daily operations.
- Year 2010 - 1,112 average daily operations.
- Year 2020 - 1,210 average daily operations.

Based on these operations, the runway utilization was predicted as shown in Table 2.04 with Runways 16X and 34X indicating the south and north flow, respectively, on the new Third Runway. This utilization reflects the requirements for Stage 3 aircraft.

Under the future development condition flight tracks are not expected to differ from the existing flight tracks. These flight tracks also were duplicated for the new Third Runway 16X (south flow) and 34X (north flow). Conclusions concerning the future conditions were as follows:

- Alternative 3 and the other project alternatives would result in an increase of 5% to 7% in the 65 LDN noise exposure area over the "Do-Nothing" alternative.

- The length of the new runway would have little effect on the area within the noise pattern.

- The noise exposure pattern of each future alternative would be 42% to 50% smaller than the pattern of the existing condition.

- Of the 1,252 sites where LDN levels were computed, 33 sites would experience significant increases in the Year 2000, 40 in the Year 2010, and 47 in the 2020 with "significant" defined as a 1.5 LDN increase in aircraft noise.

- Aircraft noise levels of 65 LDN and greater would impact the following areas for Alternative 3:

  - Year 2000 - 2.86 square miles, 4,020 dwelling units, 9,890 persons.
  - Year 2010 - 2.98 square miles, 4,190 dwelling units, 9,860 persons.
  - Year 2020 - 3.34 square miles, 4,740 dwelling units, 11,240 persons.

Table 2.04
Future Runway Utilization

Runway	Arrivals	Departures
South Traffic Flow - 63.9%		
Runway 16L	31.9%	23.7%
Runway 16R	19.9%	37.6%
Runway 16X	12.1%	2.6%
North Traffic Flow - 35.1%		
Runway 16L	17.5%	14.2%
Runway 16R	15.3%	20.6%
Runway 16X	3.3%	1.3%

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

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Based on the review of the information presented in the EIS for the future conditions, the information appears reasonable. As part of the Final Decision on Noise Issues (Puget Sound Regional Council, 27 March 1996), the expert noise arbitration panel indicated that with respect to the INM, a number of assumptions must be made which can affect the outcome. Sensitivity tests can be used to evaluate how much change in a key input value or assumption might affect the outcome. A similar approach would be useful in evaluating the assumptions used in the future noise modeling and the resultant data. Thus, sensitivity tests should be conducted and evaluated. Also, if possible, information on the range and standard deviations of the LDN and other data in the EIS should be presented. The range and standard deviations of the data could provide an indication of potential impacts beyond the noise contours shown in the EIS.

As discussed in EIS Appendix R (and as previously mentioned), actual noise information for the Boeing 777 was not available and alternate information was used. The INM, Version 5.1 should be used to re-evaluate the future noise contours since it is supposed to contain this information.
The noise mediation agreement (Port of Seattle and Mestre Greve Associates, 31 March 1990) indicates that as technology with noise barriers develops, the Port of Seattle will evaluate their use. It is not clear if during the future conditions evaluation the use of noise barriers was

included. This may be particularly useful in the vicinity of any new maintenance facilities in addition to the use of "hushing" equipment. Appendix R of the EIS also mentions the use of vegetation to help reduce noise. The EIS indicates in Chapter 1 that as part of the Master Plan Update objectives, Airport noise is to be attenuated through the use of berms and barriers (Port of Seattle, May 1994).

2.04 - SURFACE TRANSPORTATION NOISE EFFECTS

Surface transportation noise effects focused on the noise issues associated with the proposed surface transportation.

Methodology

For this analysis, the Federal Highway Administration (FHWA) computer program STAMINA 2.0 was used. The model calculated roadway noise levels at 108 user-specified receivers. The input to the model included:

- **Roadway Description** - Sets of roadway requests were defined within a network of sixteen area thoroughfares.

- **Traffic Volume** - Traffic on each of the major roadway requests during the peak hour of the day was evaluated based on final Metropolitan Transportation Plan traffic volumes which were updated.

- **Vehicle Classification** - Proportion of vehicle type, passenger cars, medium trucks and heavy trucks.

- **Travel Speeds** - For minor arterial roads travel speeds were assumed to be equal to the posted speed limit; for major roads including freeways, theoretical speeds were obtained by performing capacity analysis calculations, which correspond to the traffic conditions on the road link; this procedure followed the techniques contained in the Highway Capacity Manual (Transportation Research Board, 1985).

The receiver locations modeled were approximately 50 to 500 feet from a road edge in noise sensitive residential areas or facilities. The selection of these locations was coordinated with the aircraft noise analysis.

The STAMINA program produces peak hour LEQ levels for each receiver location. A LEQ is approximately 3 to 4 decibels less than a LDN.

Noise levels were calculated for the base year, 1994 and compared to ambient noise measurements conducted as part of the State Route 509/South Access Road Corridor EIS Phase II Study. Following this comparison, the STAMINA model was calibrated to more closely represent existing conditions.

Use of the FHWA STAMINA 2.0 program was appropriate for the surface transportation noise effects study. The data which was used in the model based on the information in the EIS, also seems reasonable.

Existing Conditions

The following summarizes the existing transportation/road noise conditions:

- Peak hour surface traffic noise levels range from 48.5 to 73.5 dBA LEQ (peak-hr).
- Thirty-five sites were identified as being noise impacted according to the FHWA sensitivity criterion of 67 dBA or greater.
- A total of 51 sites experience a LEQ (peak-hr) in excess of 65 dBA.
- The highest noise levels are generally located along SR 518, SR 509, IH-5/Military Road South 154th Way, and International Boulevard.

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The existing conditions of the roadway noise evaluation appears to be adequate and provides a good start from which to predict and evaluate future changes. Depending on when the Master Plan Update implementation is started, consideration should be given to remodeling the surface transportation noise with the then current version of STAMINA or the most accepted program. This will allow a comparison with the 1994 existing baseline conditions and the actual conditions at the start of construction. In order to plan for this re-evaluation, the following should be done:

- Specific roadway noise monitoring sites should be established at key locations, possibly some of the sites identified as being noise impacted by the FHWA noise sensitivity criterion; the locations of these sites should be coordinated with the establishment of additional aircraft noise monitoring sites; data collection from these noise monitoring sites should begin as soon as possible in order to provide up-to-date baseline information before Master Plan Update implementation construction starts; and,
- More accurate traffic information should be obtained for the roads in the Airport area (e.g., vehicle categories and road use); the EIS indicates that relevant data was available only on IH-5 and International Boulevard for surveys conducted on 3 August 1987; 8 July 1991; and 25 February 1992.

Future Conditions

For the "Do-Nothing" Alternative, the transportation analysis indicates that noise levels will continue to be in excess of 65 dBA at the existing locations plus the following:

- By the Year 2000 five additional sites would exceed the peak hour LEQ noise level of 65 dBA; these sites will be along Kent-Des Moines Road west of International Boulevard and along South 200th Street east of International Boulevard; increases at these sites would be 2 to 3 dBA.
- In the Year 2010 noise levels at the 108 receptor sites will range from 50.8 to 74.8 dBA LEQ (peak-hr); eight additional sites would exceed the 65 dBA sensitivity level; all new sites will be located on major arterials such as South 154th Way, Des Moines Memorial Drive South, South 160th Street/Military Road, and South 200th Street; all increases are less than 2 dBA increase over 2000 levels, except for along South 24th Avenue which is 2.7 dBA.
- By 2020, 71 of the 108 receptor sites will experience LEQ (peak-hr) sound levels in excess of 65 dBA; 57 sites will experience sound levels at or above the FHWA level of 67 dBA LEQ (peak-hr); noise levels would range from 54.1 to 74.7 dBA LEQ (peak-hr); the greatest roadway related noise increases would occur along the new State Route 509/South Access Road.

A comparison between the "Do-Nothing" alternative and Alternative 3 indicates that:

- In the Year 2000 the greatest increase in noise of 4.7 dBA LEQ (peak-hr) would occur in the vicinity of one receptor at 8th Avenue South, north of SR 518; other noise receptors generally had levels similar to or below the "Do-Nothing" alternative.
- In the Year 2010 the 8th Avenue South location exceeds the "Do-Nothing" alternative location noise level by 2.3 dBA LEQ (peak-hr); other noise levels at receptor sites generally continue to be below or at the "Do-Nothing" alternative levels.
- By the Year 2020 the 8th Avenue South receptor is 0.6 dBA LEQ (peak-hr) below the "Do-Nothing" alternative and other receptor sites continue to be at or below the some "Do-Nothing" alternative noise levels.

The traffic analysis also used the STAMINA 2.0 model to evaluate earthwork and site preparation activities noise levels. Information was provided on typical noise levels of different types of construction equipment. It was indicated that based on the fill haul routes discussed in the EIS, noise levels will increase as follows on the indicated streets:

- 200th Street - 5.5 dBA.
- Des Moines Memorial Drive between 200th Street and SR 509 - 3.6 dBA.
- 24th Street near 154th Street - 6.4 dBA.
- South 160th Street east of the SR 509 interchange - 7.6 dBA.

According to the State of Washington Department of Transportation, because these noise increases are temporary, they are not subject to their noise level criterion during the daytime. They are subject to the criterion between 10:00 PM and 7:00 AM and the Port of Seattle has indicated that the Construction and Earthwork Management Plan will include steps to minimize nighttime noise impacts along the haul routes. However, area residents west of the earthwork activities for the Third Runway will experience construction related noise.

The future conditions for the roadway impact analysis was adequate based on the information available and assumptions used. Like the existing conditions analysis, it is recommended that the future analysis be evaluated again in order to reflect more accurately the information available prior to the start of construction for Master Plan Update implementation. This, is in part, to reflect more accurately actual Sea-Tac International Airport area traffic information due to growth, changes in any traffic patterns, etc. The re-evaluation would benefit from the following:

- More accurate information on construction activities, in particular haul routes, so that construction traffic can be included in the roadway noise re-evaluation.
- More accurate information on vehicle classification and their use of the various roadways.
- The additional monitoring data obtained from the roadway noise monitoring sites.

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The re-evaluated future conditions discussion also should include information on the relationship between Master Plan Update implementation and the Port of Seattle's ability to maintain its Airport's reduced noise level goals. This discussion is particularly relevant because of the recent concerns about the Port of Seattle not sufficiently reducing on-the-ground noise impacts by 1 April 1996 (Puget Sound Regional Council, 27 March 1996).

2.05 - VIBRATION

The EIS vibration analysis was qualitative. A comparison was made between decibel levels recorded in the frequencies between 1 and 80 Hertz (Hz) for several different aircraft currently operating at the Airport. The range of low frequency noise levels for Stage 2 and 3 aircraft were as follows:

- **Stage 2** - 75-90 dBA (takeoff), 70-85 dBA (climb-out), 61-70 dBA (approach).
- **Stage 3** - 66-84 dBA (takeoff), 65-78 dBA (climb-out), S3-71 dBA (approach).

Based on this comparison, it was concluded that the intensities of vibration will decline as the aircraft fleet becomes entirely Stage 3. This is because the decibel levels at the low frequency levels associated with vibration are less for the aircraft that will makeup the future fleet at the Airport.

This vibration analysis was cursory and was more of a qualitative than a quantitative approach. A more extensive evaluation should be done because of the numerous complaints about vibration from aircraft activities, in particular, in homes and schools. Some of these complaints have been reported in areas such as on 160th Street and 10th, where noise/ vibration impacts will move closer with construction of the Third Runway.

More information on vibration should be presented because, "These induced vibrations - caused by airborne sound or transmitted through ground or structures - may generate additional annoyance, beyond that due to simple audibility of the impulse, because of "house rattling" and "startle," as well as additional contributions to interference with speech or sleep" (Committee on Hearing, Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences, and The National Research Council, 1977).

Vibration should be evaluated qualitatively and quantitatively for at least the following for residences, schools and hospitals:

- Human whole body vibration.
- Annoyance and interference to humans caused by building vibration.
- Building structural damage.

With respect to humans, the evaluation should look at impacts on working efficiency, health, safety and comfort. The evaluation should incorporate the information and methodology discussed by the International Organization for Standardization (ISO; International Organization for Standardization, 1985 a and b; 1989).

Cumulative Impacts

The cumulative impact discussion for noise indicated that until specific project plans are completed for several other developments, total cumulative impacts can not be developed. Thus, only the State Route 509/South Airport Access Road development was included in the Year 2020 "Do-Nothing" and other alternatives roadway noise analysis.

This was a cursory approach to discussing cumulative impacts. At least tentative plans for these other developments should be discussed with respect to Airport Master Plan Update implementation. Therefore, the cumulative impacts evaluation should be redone and re-evaluated.

Mitigation Measures

The EIS indicates that all noise mitigation measures currently in effect to reduce aircraft noise levels will be continued. This includes the previously mentioned noise abatement programs plus the following:

- Insulation treatment of homes.

- Home sales assistance in the most severely noise impacted areas to make sure that homes sell at fair market value based upon a Port of Seattle hired independent appraiser.

- Insulation of schools, health facilities and churches.

A home acquisition and relocation program was concluded in 1993. This program was conducted from 1974 to 1993 during which the Port of Seattle acquired 1,300 homes and relocated approximately 3,900 residents. Additional mitigation measures discussed in this Section include the need to improve and expand the Airport and road noise monitoring sites to obtain more information on area noise levels. These and other mitigation measures will be discussed in Section 9. It should be noted that the Port of Seattle (1 August 1996) in its Resolution No. 3212 calls for the following:

- Working with the FAA and airlines to continue various noise reduction practices and to evaluate potential additional actions.

- Seeking commitment from the FAA to evaluate actions needed to prevent apparent violations of the north flow nighttime departure noise abatement procedures.

- Working with communities and Airport users to update the Federal Aviation Regulation (FAR) ISO Noise Compatibility Plan.

- Working with the Highline School District to insulate public schools.

- Completing "sensitive-use" public buildings and multi-family home insulation pilot programs.

- Designing and implementing a noise compatible land use plan for Port of Seattle properties within the current noise acquisition area.

- Reviewing methods for mitigating the impacts of low frequency noise and vibration.

- Upgrading the permanent noise monitoring sites from eleven to approximately twenty-five monitoring sites by the end of 1998 (data will include LDN, SEL and TA metrics).

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2.06 - AIR QUALITY

Air quality issues associated with current Airport operations and the proposed Master Plan Update improvements are of major concern to the surrounding areas. This is, in part, due to the close proximity to the Airport to numerous residential neighborhoods. Implementation of the proposed improvements, in particular, construction of the Third Runway, also will bring these issues closer to the businesses along First Avenue in the City of Burien and along the southwestern part of 188th Street in the City of SeaTac.

EIS Chapter IV, Sections 7, 9 and 23, Chapter V, Appendix D, and part of Appendix R, focus on the air quality issues of the proposed Master Plan Update improvements.

It should be noted that more than one regulatory agency is responsible for air quality issues in the Puget Sound region. Three agencies have jurisdiction: US Environmental Protection Agency (USEPA); Puget Sound Air Pollution Control Authority (PSAPCA); and Washington State Department of Ecology (DOE). Their functions are as follows:

- **USEPA** - Has established the National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (ozone, carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide and lead); air quality standards specify the maximum short-term and long-term concentrates of air contaminants; and EPA sets aircraft emissions standards.

- **PSAPCA and DOE** - Have state and local ambient air quality standards (AAQS) that are at least as stringent as the national standards; and operate thirty-two permanent air quality/meteorology monitoring stations in the Seattle-Tacoma Puget Sound area including seasonal stations (Puget Sound Air Pollution Control Agency, October 1995). EPA, Washington State and Puget Sound AAQS are shown in Table 2.05.

- **PSAPCA** - The primary agency for air quality in the region; responsible for enforcement of federal, state and local air quality standards for stationary sources; and responsible for developing plans and programs to attain and maintain NAAQS.

As indicated above, EPA has a NAAQS for particulate matter or PM. The current EPA standard for PM is 10 microns or less (i.e., PM_{10}) and for a 24-hour average is not to exceed 150 micrograms per cubic meter or an annual average not to exceed 50 micrograms per cubic meter as shown in Table 2.05. EPA is reevaluating the PM standard and may promulgate new standards which retain the PM_{10} standard and set a new $PM_{2.5}$ standard.

Research indicates that large particulate matter is cleared off by the lungs. However, smaller particulate matter, 10 microns or less, go deeper into the lungs and cause the most damage. This includes increased respiratory problems, short term mortality from specific air pollution episodes and long term mortality.

The EPA Office of Air Quality Planning and Standards has proposed that the 24-hour $PM_{2.5}$ standard be somewhere between 18 and 65 micrograms per cubic meter; the annual standard would be between 12.5 and 20 micrograms per cubic meter. The annual PM_{10} standard would be retained and would be between 40 to 50 micrograms per cubic meter.

Table 2.05
Ambient Air Quality Standards

Pollutant[a]	National		Washington State	Puget Sound Region
	Primary	Secondary		
Carbon Monoxide				
8 hour average	9 ppm[b]	N/A[b]	9 ppm	9 ppm
1 hour average	35 ppm	N/A	35 ppm	35 ppm
Particulate Matter (PM_{10})				
Annual arithmetic ave.[c]	50 $\mu g/m^3$[(b)]	50 $\mu g/m^3$	50 $\mu g/m^3$	50 $\mu g/m^3$
24 hour average[d]	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
Particulate Matter (TSP)				
Annual geometric average	N/A	N/A	60 $\mu g/m^3$	60 $\mu g/m^3$
24 hour average	N/A	N/A	150 $\mu g/m^3$	150 $\mu g/m^3$
Ozone				
1 hour average[e]	0.12 ppm	0.12 ppm	0.12 ppm	0.12 ppm
Sulfur Dioxide				
Annual average[f]	0.03 ppm	N/A	0.02 ppm	0.02 ppm
30 day average	N/A	N/A	N/A	0.04 ppm
24 hour average	0.14 ppm[h]	N/A	0.10 ppm[h]	0.10 ppm[f]
3 hour average	N/A	0.05 ppm	N/A	N/A
1 hour average[g]	N/A	N/A	0.25 ppm	0.25 ppm
1 hour average	N/A	N/A	0.40 ppm[h]	0.40 ppm[f]
Lead				
Calendar quarter average[f]	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	N/A	1.5 $\mu g/m^3$
Nitrogen Dioxide				
Annual average[f]	0.053 ppm	0.053 ppm	0.053 ppm	0.053 ppm

a Annual, quarter and 30 day pollutant standards are never to be exceeded; short term standards are not to be exceeded more than once per year unless noted.

b ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter; N/A = no applicable standard.

c Standard attained when the expected annual arithmetic mean concentrations is less than or equal to 50 $\mu g/m^3$.

d Standard attained when the expected number of days per calendar year with a 24 hour average concentration above 150 $\mu g/m^3$ is equal to or less than one.

e Standard attained when expected number of days per calendar year with maximum hourly average concentration above 0.12 ppm is equal to or less than one.

f Never to be exceeded.

g Not to be exceeded more than twice in seven consecutive days.

h Not to be exceeded more than once a year.

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

Methodology

In order to determine Airport Master Plan Update implementation potential construction and operation impacts, the air quality analysis involved the following:

- Preparation of airport emissions inventory using the Federal Aviation Administration's (FAA) Emissions and Dispersion Modeling System (EDMS) computer model.
- Area dispersion analysis using EDMS.
- Airport roadway intersection dispersion analysis using the CAL3QHC air quality computer model.
- Human health - air toxics evaluation.
- Construction vehicles air quality analysis using the CAL3QHC model.
- Clean Air Act conformity.
- Certification for compliance with air quality standards.

The methodology for each of these is evaluated below followed by information on results in the *Air Quality Results* section.

Airport Emissions Inventory

The FAA's EDMS computer model Version 944 was used to perform the air emissions inventory. Use of this model was confirmed with the EPA, PSAPCA and DOE. Aircraft and vehicle emission rates are included in the EDMS model and are based on information provided in EPA technical reports: Compilation of Air Pollutant Emission Factors (AP-42) and Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources. The EDMS model also includes vehicle emission factors provided through an EPA mobile source emission program, MOBILE5A.

As indicated above, the EDMS model includes information provided by AP-42. However, during the course of this evaluation, public comments were made indicating that AP-42 emissions data may not have been consistently used, in particular with respect to particulates. It also was indicated that there may not have been particulate data within EDMS and it may have been removed from the model.

The Airport emissions inventory is used to summarize the total quantity of each pollutant from Airport activity within a defined area. The EIS indicates that this is not comparable to ambient air quality standards. However, the EIS indicates that the:

"....inventory can provide an indication of the impact development will have on overall air quality."

The aircraft characteristics which were used to define the quantity of pollutants from aircraft activity for the emissions inventory were:

- Aircraft activity levels, fleet mix and engine types.
- Time in operations mode for taxi/idle/delay; takeoff; climbout; and approach.
- Emission factors from the EPA technical reports based upon engine classification and operational modes.

The EDMS computer model is an accepted tool for determining an aircraft emissions inventory. In addition, the aircraft characteristics or data which was used was appropriate and adequate.

The aircraft activity level for the air pollutant emissions inventory was based on a peak hour of about 88 operations (43.9 arrivals and 43.9 departures). The relationship between this activity level and a 60 airplane arrival level per hour recently mentioned by the Port of Seattle (26 March 1996; 1 August 1996) should be discussed in relation to the modeling.

Area Dispersion Analysis

The EDMS computer model evaluates the design and operation of an airport by modeling aircraft emissions during the different operational modes. This includes takeoff, climbout, approach and taxi/idle/delay. Emissions are calculated for up to an altitude of 3,500 feet since emissions above this altitude are not considered to have discernible impacts on ground level air quality.

Vehicle emission rates also are part of the EDMS model which includes MOBILE5A, an EPA mobile source emission program. The emission rates are used to predict air pollutant dispersion from vehicle sources on Airport area roadways and parking lots.

Initially, a screening dispersion analysis was done to determine where there might be potential ambient air quality standard (AAQS) exceedances. This analysis presents worst case conditions in terms of meteorological conditions and Airport operations. The meteorological conditions include: wind direction and speed; temperature; mixing height; and stability class or factor that determines the amount of pollution dispersion (i.e., low to high stability).

The screening analysis involved having a receptor grid in the Airport area for which emission levels were calculated. This receptor grid was confined to approximately 4,900 feet to the east and west of Airport property and approximately 3,000 feet north and south of Airport property not including the land owned by the Airport extending to the north and south of the existing runways.

The receptor grid consisted of 400 receptor locations in a rectangular area around the Airport. Based on this grid, pollutant contours for nitrogen dioxide (NO_2) and carbon monoxide (CO) were developed to determine the locations where the highest concentrations might be found.

NO_2 and CO were selected because according to the EIS they are the two primary parameters of concern around the Airport. However, the screening analysis also included particulate matter (PM_{10}) and sulfur dioxide (SO_2). For the receptor locations which showed a potential problem and receptor locations recommended by EPA, a refined dispersion analysis was done. The dispersion analysis involved the receptor locations for the draft (D) and final (F) EIS shown in Table 2.06.

Table 2.06
Refined Dispersion Analysis Receptor Locations

Receptors[a]	Location
4 (D)	Riverton Heights, SeaTac
4A (F)	Highline Nurseries
5D	Highline, Burien
5A (F)	SeaTac Reservoir
9 (D)	SW SeaTac
9A (F)	Sea-Tac Industrial Park
10 (D)	SeaTac Trailer Park
10A (F)	Des Moines Creek Park
1 (F)	Terminal South
13 (F)	Terminal Hotel
-(F)	Proposed North Unit Terminal
EPA Receptors	**Location**
A (F)	South 154th Street (existing and future)
B (F)	South 188th street on either side of Runway 34R Tunnel (east and west)

(a - Receptor locations are designated by D for Draft EIS and F for Final EIS.)

The purpose of the refined dispersion analysis was to provide a more detailed analysis of the receptor locations which indicated possible exceedances of the AAQS during the screening analysis. The screening analysis indicated that concentrations of NO_2 and CO were of concern and concentrations of PM_{10} and SO_2 were not. Therefore, no further analysis was performed for PM_{10} and SO_2.

This methodology of initially conducting a screening analysis to determine potential areas which exceed AAQS and then conducting a refined analysis of these areas, is an accepted and approved methodology. The data which was used in the modeling appears to be reasonable and the best data available. Also, the Final EIS incorporated changes in the air quality dispersion analysis recommended by EPA, PSAPCA and other groups.

With respect to the receptor locations, it is typical to select locations which are shown to potentially violate AAQS. However, it would have been interesting to have included more receptors in more areas which have experienced air quality complaints (i.e., residential areas) and additional areas with different terrain features in the Airport vicinity. The predicted emissions levels would be useful, even though the screening analysis did not show violations of AAQS.

As discussed below, analyses were also conducted for Airport roadway intersections and construction vehicles. However, it was not clear if the area dispersion analysis also included construction vehicles and aircraft operations together. This should be clarified. Comments from the public indicated that the EDMS area dispersion analysis did not include construction vehicles. Also, the construction haul truck analysis evidently did not include the intersections and EDMS data.

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Airport Roadway Intersection Dispersion Analysis

Motor vehicles are believed to be a major source of air pollutants in the Airport area. Thus, a separate more detailed analysis was conducted for the following congested roadway intersections along International Boulevard:

- At South 160th Street.
- At South 170th Street.
- At South 188th Street.
- At South 200th Street.

In addition, the new employee parking area on 24th Street north of SR 518 was included.

EPA's approved model CAL3QHC was used to predict CO levels from motor vehicles. The model requires the following data:

- Traffic volumes for left and right turns and through traffic.
- Level of service determinations.
- Signal cycle lengths.
- Number of traffic lanes available.
- Vehicle speed.
- Vehicle emission rates.
- Meteorological conditions (temperature, wind speed, mixing height, and stability class).

Vehicle emission rates/factors were obtained from the EPA mobile source emission program MOBILE5A. CO levels were evaluated because it is the pollutant emitted in the greatest quantity by motor vehicles and for which short-term health standards exist. Pollutant concentrations were calculated for locations at 12 feet from the edge of a roadway in accordance with the EPA "Guidelines For Modeling Carbon Monoxide From Roadway Intersections." A total of thirty-two receptor locations were modeled in the vicinity of each intersection.

Like the area air quality dispersion analysis, the roadway intersection dispersion analysis in the Final EIS used acceptable methodology. This included incorporating comments on the Draft EIS in the Final EIS, from regulatory agencies, citizens and community organizations.

Human Health - Air Toxics Evaluation

Appendix D and Chapter IV, Section 7 of the Final EIS deals with air quality human health issues. The methodology involved:

- Using the results of the emissions inventory and dispersion modeling.
- Using data from the Port of Seattle's air toxic monitoring program; benzene and thirty-eight additional air toxics were monitored at thirteen on- and off-airport locations for four days during October through December 1993.
- Using information in the April 1993 EPA publication, "Estimation and Evaluation of Cancer Risks Attributed to Air Pollution in Southwest Chicago", which deals with the Chicago Midway Airport area.
- Comparing the toxic emissions information with the DOE's Acceptable Source Impact Levels (ASILs).
- An evaluation of residue samples for evidence of jet fuel related products.

This methodology was acceptable based upon the limited available information on potential air toxics health impacts. The methodology could have been improved as follows:

- The EIS indicates in Chapter IV, Section 7 Human Health: "As the air toxics monitoring program was a preliminary, short-term survey of air toxics over a four day period, it is difficult to assign meaningful significance to short-term measurements as compared to longer-term guidelines. Therefore, as the monitored data was for a limited, short-term period, it is not certain if the actual levels would be exceeded on an annual basis."

  Based on this statement, it would seem reasonable to collect additional, long-term air toxics data throughout different months of the year. Also, limited monitoring sites were off-airport and additional sites should be monitored in particular to the west of the Airport.

Recently a draft Memorandum of Understanding (MOA) was finalized between PSAPCA, EPA, DOE and the Port of Seattle establishing an air monitoring program which may include air toxics depending on the results of airplane engine exhaust residue sampling under flight paths (Puget Sound Air Pollution Control Agency, 24 October 1996).

- The DOE ASILs are established for known or probable carcinogens and other health risks. Thus, the EIS should have contained at least qualitative information on other health risks besides cancer. Based on discussions with citizens and community groups, some health problems appear to be more common in areas near the Airport such as asthma. This should be addressed in more detail.

- The EIS indicates that insufficient information was available to adequately conduct a meaningful cancer risk assessment for human health-air toxics. Data should be collected in order to allow this risk assessment to be conducted.

- The methodology should include an evaluation of potential health impacts on schools, hospitals, nursing homes, and other sensitive areas near the Airport.

- There have been reports or comments from the public concerning fuel odors being worse during periods of inclement weather. These reports need to be verified and evaluated further as part of the air toxics issues studies.

- During discussions with various groups as part of this environmental issues task, there has been repeated comments about vapor recovery at the Airport. This issue should be addressed further since it is unclear what vapor recovery operations there actually are at the Airport. Currently the following vapor recovery operations appear to be in place:

  - The main jet fuel storage tanks have vapor recovery.

  - Individual airlines have vapor recovery on their ground vehicle gasoline fueling operations if they meet PSAPCA throughput requirements.

  - There are PSAPCA regulatory requirements for floating roof tanks.

  - All of the car rental companies located within the Sea-Tac International Airport parking garage are registered with PSAPCA and their underground storage tanks have Stage 1 and 2 Vapor Recovery System equipment.

Construction Vehicles Air Quality Analysis

The construction vehicle air quality analysis also involved a dispersion analysis using the CAL3QHC model and vehicle emission rates from two EPA models: MOBILE5A and Part 5. The overall methodology used was the same as that used for the roadway intersection analysis.

The methodology for the construction vehicle air quality analysis was appropriate for the construction haul routes shown in the EIS. This involved nine haul routes:

- SR 509 - 160th Street on SR 509.
- SR 509 - Des Moines on 160th Street.
- 8th Avenue - 148th Street on Des Moines.
- 8th Avenue - 160th Street on Des Moines.
- 24th Avenue - 16th Avenue on 154th Street.
- 152nd Street to 154th Street on 24th Avenue.
- 200th Street - 188th Street on Des Moines
- 26th Avenue - Des Moines on 200th Street.
- On-airport unpaved haul routes on south side of airport.

However, it appears that the evaluation is based on the assumption that each of these haul routes may be used. Once the sources of fill material are known and the haul routes approved, the construction vehicle air quality analysis should be re-evaluated and dispersion analysis re-done in order to better predict potential air quality impacts.

Air Quality Analyses Results

- **Airport Emissions Inventory** - Airport related emissions are generated by a number of sources including the primary sources: motor vehicles on roadways and in parking lots, and aircraft. The largest source is believed to be vehicles on roadways. For the 1994 condition or base year, the emissions of CO, VOCs and NOx are below the SIP 1990 emissions inventory. The future emissions inventory also indicates that for each EIS alternative and time period, aircraft emissions will be below SIP levels.

  Based on the information presented in the EIS for the EDMS computer model, the existing and future emissions inventory appeared reasonable. Support for the existing conditions air quality was provided by a discussion of DOE/PSAPCA, Port of Seattle and Department of Labor and Industries monitoring programs. However, these are the following issues with these programs and in relation to overall Airport operations:

  - The closest DOE or PSAPCA permanent monitoring sites are approximately 5 miles from the Airport; there are no permanent monitoring sites west, northwest and southwest of the Airport; CO, PM_{10}, are the most frequently monitored parameters at the DOE or PSAPCA permanent monitoring sites.

- The Port of Seattle monitoring was only for compliance with Washington Industrial and Safety Health Act (WISHA) standards and primarily involved indoor air quality monitoring for CO and NO_2; there has been additional monitoring for CO in the main parking garage and the terminal area during late November 1991; it should be noted that the WISHA standards are set for employee, short-term exposure and do not readily apply to areas of public access such as baggage claim and curb front areas; the minimum detection limit for WISHA standards are higher than AAQS and thus are not meant to protect public health.

- The Department of Labor and Industries conducted limited screening for CO for WISHA compliance in seven on-Airport locations and eight off-airport locations during December 1992.

- PSAPCA collected only three samples of black residue for analysis in January 1995 in response to several public complaints.

In order to make monitoring information such as this more useful; permanent monitoring stations should be established in and around the Airport area for select pollutants. Parameters monitored should include the AAQS parameters as well as toxic pollutants of concern such as 1,3 - butadiene, formaldehyde and benzene. Additional comments are made on this monitoring in Section 7. The expanded monitoring to generate baseline data is supported by EPA, DOE and PSAPCA and is addressed by the MOA between these agencies discussed below. The previously mentioned MOA between PSAPCA, EPA, DOE and the Port of Seattle discusses an air monitoring program to be conducted over a 24 month period, commencing the winter 1997. The program that has been funded will focus on the following monitoring activities with the indicated schedule:

- 1996/1997 and 1997/1998 winter seasons: monitoring of CO at roadway intersections modeled in the EIS as creating future exceedances of the CO AAQS and elsewhere in the Airport area.

- Summer/Fall 1997: NO_x emissions monitoring associated with aircraft departure backup queues.

- Schedule to be determined for aircraft fuel particle or residue monitoring.

Depending on the results of the residue monitoring, additional monitoring for air toxics may be conducted. As part of implementing the MOA, public involvement will be solicited via participation in a working group.

It should be noted that funding and a schedule for conducting future fugitive dust measurements at Master Plan Update construction sites and near fill dirt haul routes are not identified in the MOA.

- **Area Dispersion Analysis** - The area dispersion analysis focused on a wider range of sources of air emissions than the air pollutant inventory, which focused solely on aircraft emissions. This dispersion analysis provided information on aircraft and support equipment; on- and off-airport parking lots; roadways; fuel systems; terminal heating and cooling; and aircraft maintenance activities.

The area dispersion analysis for the existing conditions showed the following:

- The highest concentrations of CO occur along the terminal curb front; there are no exceedances of 1- and 8-hour CO standards.

- An exceedance of the NO_2 AAQS was identified at one receptor location on South 154th Street approximately 650 feet north of Runway 162; this receptor is in an area surrounded by Airport property and probably reflected pollutant concentrations from aircraft takeoffs.

- The screening analysis indicated that concentrations of PM_{10} and SO_2 at all receptor locations were below AAQS; however, as discussed previously, public comments indicated that the EDMS data base may not have included information on particulate emissions and impacts from these emissions may be underestimated.

The results of the area dispersion analysis for the future conditions indicated the following:

- With implementation of the Master Plan Update some receptor locations may experience a slight increase in pollutant concentrations; these concentrations would be expected to be below AAQS.

- The highest NO_2 concentration would occur along South 154th Street; the maximum concentrations would be less than if the Third Runway is not built.

- The proposed improvements include extension of Runway 16L/34R and NO_2 concentrations would be expected to increase slightly along South 188th Street by the Year 2020.

- Alternative 3 would result in changes in traffic volumes and movements; therefore, the highest CO concentrations would occur in the terminal area; CO concentrations would be expected to be below AAQS.

This information presented in the EIS for the area dispersion analysis for both the existing and future conditions will provide a good baseline to evaluate impacts as the Master Plan Update is implemented. However, in order to do this the dispersion analysis will have to be periodically updated with data as it becomes available. Also, public comments indicated the following:

- The dispersion analysis underestimated the potential impacts of capacity enhancement.

- When reviewing the Draft EIS, EPA requested that the Final EIS increase peak takeoff figures by 20%; however, this evidently was not done.

- During the modeling, arbitrary adjustments were made to the fleet mix and mode which in combination with the above resulted in at least underestimates of NO_2 emissions.

These comments need to be addressed with respect to the original modeling and any future modeling.

- **Airport Vicinity Roadway Intersection Dispersion Analysis** - The Airport vicinity roadway intersection dispersion analysis identified CO concentrations for specific intersections for existing and future conditions. The purpose of the analysis was to evaluate the potential impacts on air quality given traffic volumes and patterns over time. For existing conditions all locations modeled are below the 1-hour CO standard of 35 ppm; however, these locations are modeled to exceed the 8-hour CO standard of 9 ppm with concentrations of approximately 10 to 18 ppm.

Future conditions were evaluated for the Years 2000, 2010 and 2020. Like the existing conditions, CO concentrations were modeled to be below the 1-hour standard, but to exceed the 8-hour standard. The only exception would be the relocated employee parking area on 24th Street which would be below both standards. This parking area is scheduled to be in use in the Year 2000.

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EPA's technical review of the roadway intersection dispersion analysis raised some concerns about methodological inconsistencies (EPA, 6 June 1996). The EPA indicated the following:

> *"The modeling results for air quality in the Sea-Tac Final EIS conflict with those from the Draft EIS for the SR 509/South Access Road Corridor Project at two intersections (both EISs used the same models). The two EISs model conflicting results for existing conditions and future action alternatives at South 188th and International Boulevard, and South 200th and International Boulevard for the average CO concentrations indicated on page 4-7 in the SR 509 EIS, as compared with the same analyses on page IV.9-11H in the Sea-Tac Final EIS. Both analyses model CO violations for existing conditions, but for future action alternatives the Sea-Tac analysis shows modeled CO violations where the SR 509 analysis does not."*

> *"Modeled air quality impacts at South 200th and International Boulevard are shown in the South Aviation Support Area Final EIS (pages 4-106 to 109 and 112), the 28/24th Street Arterial Final EIS (page 3.22) and the CTI Final EIS (page 4-7, 8). The results vary for each project ranging from 5.0 to 13.3 parts per million CO."*

Based on these comments, the roadway intersection dispersion analysis should be re-evaluated at least for the EPA indicated intersections/roads.

- **Human Health - Air Toxics Evaluation** - As indicated previously, the human health - air toxics evaluation focused on potential changes in toxic emissions from Airport Master Plan Update implementation by conducting an air toxics emissions inventory and comparing the results with the Washington State Acceptable Source Impact Levels (ASILs). The results of the emissions inventory and dispersion modeling indicated the following with respect to volatile gases (TOG), benzene, 1,3-butadiene and formaldehyde:

  - There was insufficient information to conduct a meaningful risk assessment, as previously indicated.

  - The maximum air toxics concentrations at all modeled receptors (i.e., terminal/south, terminal/hotel, SeaTac Reservoir, Highline Nurseries, SeaTac Industrial Park and Des Moines Creek Park) exceeded the annual ASILs; the majority of emissions at each receptor are produced by motor vehicles which contribute about 70% of the toxic emissions, aircraft contribute about 20% (public comments indicated that these percentages need to be better documented since historical data does not support these results).

  - In the future, emissions from roadway sources are predicated to continue to contribute the majority of air toxic emissions; by the Year 2020, motor vehicles are expected to contribute 65% of the toxic emissions and aircraft approximately 25%.

  - Airport activity including heating plants, fuel facilities and surface coating activities, produce low levels of air toxic emissions.

  - By the Year 2000, air toxic emissions are expected to initially decrease as older aircraft are phased-out.

  - Implementation of Alternative 3 would generally result in similar or less air toxic emissions in comparison to the "Do-Nothing" alternative.

The results of the Port of Seattle's 4-day air toxic monitoring program in 1993 indicated the following based on Table 14 in Appendix D of the EIS:

- The mean concentration of the following compounds exceeded the annual DOE Acceptable Source Impact Levels (ASILs): acetaldehyde, benzene; carbon tetrachloride; 1,2-dichloroethane; and dichloromethane.

- Compounds detected which do not have annual or 24-hour ASILs were: CIS-1,2 - dichloroethylene; 1,3,5 - trimethylbenzene; and 1,2,4 - trimethylbenzene.

- Highest concentrations for benzene were along International Boulevard.

- Monitored concentrations for benzene were well below values predicted by a 1991 DOE Study.

- No significant differences in upwind versus downwind concentrations were observed.

- Levels of air toxics were within a range exhibited in other similarly sized urban areas such as St. Louis, Houston and Boston.

- The monitored air toxic pollutant profiles were indicative of automobile exhaust and not due to aircraft exhaust.

The Final EIS also indicated that formaldehyde was above the annual ASIL and acrolein was above the 24-hour ASIL. However, these compounds were not listed in the aforementioned Table 14.

The 1993 monitoring also sampled for CO and found that levels were below the 8-hour AAQS. Because of the limited sampling period, small number of samples, and relatively few sampling stations and their locations, the data is of limited use. It certainly should not be used as a baseline, but should be used as part of a long-term monitoring program.

In January 1994, in response to area resident's concerns, PSAPCA collected and analyzed three samples of residue (black speckles) for analysis. The results indicated that the residues were not similar to unburned jet aircraft fuel and consisted of fungal materials with associated green algae and minerals.

As a follow-up to this sampling, the Port of Seattle conducted another study of the black residues at three separate residences in January 1995. AM Test Labs analyzed these samples as well as a residue sample from the exhaust outlet of a jet aircraft for polynuclear aromatic (PNAs) hydrocarbons and heavy metals. In addition, a microscopic examination was conducted.

The results of this residue sampling indicated that the residue consisted of a variety of substances including fungus, insect particles, minerals/soil and soot. The soot was identified as more typical of motor vehicles or wood burning. Overall the results indicated that the residues are not due to jet fuel-related products. However, comments from the public questioned these results for the following main reasons:

- The quality control procedures followed during sampling were not fully explained.

- The use of the 100 cm swab to collect samples was not related to an overall unit of measurement for surfaces sampled and residue components.

- The soot was not analyzed for specific constituents and therefore the comment in the EIS that residues were not due to jet fuel-related products could not be supported.

As indicated previously, the air toxic analysis primarily discussed cancer effects. The results were not related to other potential health problems such as heart and respiratory disease, which also may be linked to other pollutants such as CO and PM_{10}. This should be discussed in more detail for both existing and future conditions.

Evidence of some of these other health impacts was discussed in, "A Survey and Critique of Epidemiologic Evidence of Adverse Health Effects Attributable Airport-Related Exposure" (Levy, 15 September 1995).

- **Construction Vehicle Air Quality Analysis** - The results of the construction vehicle air quality analysis is presented primarily in Chapter IV, Section 23 and Appendix D. The analysis focused on CO and PM_{10} concentrations and concluded:

  - The maximum CO concentrations along each of the haul routes is expected to be below the CO AAQS.

  - The Alternative 3 concentrations of CO will be equal to or slightly higher that the "Do-Nothing" condition.

  - Without mitigation the PM_{10} concentrations along the haul routes discussed in the EIS are modeled to exceed both the 24-hour and annual AAQS.

  - The Alternative 3-PM_{10} concentrations would be considerably greater than the "Do-Nothing" concentrations.

The construction vehicle air quality analysis was based on particulate information from a more arid area than the Puget Sound Region, due to the lack of region-specific particulate data. Thus, the PM_{10} results are probably worst case. The lack of particulate data for the Region points out the need to monitor for this information as part of a long-term monitoring effort in the Airport area and Region.

The CO and PM_{10} construction impact information in the EIS is adequate for the haul routes studied in the immediate vicinity of the Airport. As the Master Plan Update is implemented, source fill areas and haul routes are identified, the construction air quality impacts should be re-evaluated. This evaluation should extend further than the immediate area around the Airport.

- **Clean Air Act Conformity** - Chapter IV Section 9 of the EIS includes a discussion on the need for the Master Plan Update implementation to show that the project will not:

  - Cause or contribute to any new violations of any of the AAQS in the project or metropolitan area.

  - Increase the frequency or severity of any existing violations of AAQS.

  - Delay timely attainment of the AAQS or any required emission reduction in the project area.

In the EIS, a brief conformity analysis was presented. According to the EPA (6 June 1996), the conformity analysis is only considered a draft and the final analysis should include the following:

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"1. Creation of an emissions inventory that includes: (a) all reasonably foreseeable direct and indirect emissions for the pollutants of concern for the year of peak construction emissions prior to 2000 and 2020 [Because conformity requirements for "worse case analysis" differ from NEPA requirements, analysis of emissions during the year of highest impact is required."]; (b) emissions from sources such as construction and haul vehicles, associated increased congestion; and (c) mobile emissions associated with the use of regular gasoline."

"2. An air quality analysis that compares the "no project" and "with project" air quality impacts for the years stated in item one above."

"3. Appropriate mitigation measures - if the "with project" scenario results in an increase in either the frequency or severity of exceedances above the levels in the "no project" scenario, measures should be developed to mitigate these impacts."

"4. Commitments from appropriate governmental entities to conduct adequate, specific and enforceable mitigation measures that will prevent any increase in the severity or frequency of predicted exceedances of the National Ambient Air Quality Standards (NAAQS). Since the increased modeled exceedances occur at intersections outside of airport property, it may be necessary to obtain commitments to conduct these mitigation measures from other agencies or local authorities."

PSAPCA (6 June 1996) also commented on the Final EIS conformity determination for CO. They indicated that the Port of Seattle should ".... make more certain commitments regarding post-2010 project components before conformity to the SIP can be demonstrated." The PSAPCA then offered two options for SIP conformity as follows:

"1. One option would be for the Port to exclude post-2010 project elements from the conformity determination being made now and to make a clear commitment that post-2010 project elements modeled to create future air quality exceedances would not be pursued until additional field monitoring is conducted by other independent environmental agencies. The following would be recommended elements of such an approach:

- *Commit to revisit in future, via a full SEPA/NEPA environmental analysis, the CO air quality impacts and conformity-related mitigation needs of those master plan phases identified as causing post-2010 CO intersection exceedances, e.g., the North Passenger Terminal phase.*
- *Develop a protocol to govern the conduct of future Port-funded CO monitoring activities consistent with the normal monitoring protocols used by state, local and federal air quality agencies and agreed to by those agencies (Ecology, PSAPCA and EPA).*
- *Specify the schedule and technical approach to be relied upon for evaluating modeled vs. monitored data in the future in order to refine exceedance mitigation measures, coordinating with other state, local and federal air quality agencies as necessary.*
- *Institute a memorandum of agreement (MOA) signed by the Port, PSAPCA, Ecology and EPA laying out a funded program for monitoring CO air quality in the Sea-Tac Airport Master Plan project area, and interpreting the results for purposes of implementing conformity-related mitigation measures, ensuring future NEPA compliance and determining future CO monitoring needs. A specific Port commitment to contribute funding should be included in such an MOA."*

"2. A second option would be for the Port to advance their current FEIS as published - and thus a positive conformity finding for all Master Plan elements - but commit now to actions affecting those post-2010 project phases for which CO air quality exceedances have been modeled, as follows:

- *Specify and commit to implementing a menu of intersection exceedance mitigation measures appropriate to the identified (modeled) CO air quality problems.*
- *Regardless of project phasing, demonstrate quantitatively that the identified modeled air quality problems can be resolved by reliance on all or part of this mitigation menu.*
- *Commit to revisit in future, via a full SEPA/NEPA environmental analysis, the CO air quality impacts and conformity-related mitigation needs of those master plan phases identified as causing post-2010 intersection exceedances, e.g., North Passenger Terminal phase.*
- *Develop a protocol to govern the conduct of future Port-funded CO monitoring activities consistent with the normal monitoring protocols used by state, local and federal air quality agencies and agreed to by those agencies (Ecology; PSAPCA and EPA).*
- *Specify the schedule and technical approach to be relied upon for evaluating modeled vs. monitored data in the future in order to refine exceedance mitigation measures, coordinating with other State, local and Federal air quality agencies as necessary.*
- *Institute a memorandum of agreement (MOA) signed by the Port, PSAPCA, Ecology and EPA laying out a funded program for monitoring CO air quality in the Sea-Tac Airport Master Plan project area, and interpreting the results for purposes of implementing conformity-related mitigation measures, ensuring future NEPA compliance and determining future CO monitoring needs. A specific Port commitment to contribute funding should be included in such an MOA."*

Based on these comments, it is obvious that the EIS Clean Air Act conformity discussion is incomplete. As the Master Plan Update is implemented, the public should be kept abreast of issues and status of the analysis.

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- **Certification of Compliance With Air Quality Standards** - The EIS indicates that the Washington State's Governor's Office must issue a certification indicating that implementation of the Master Plan Update will comply with all applicable AAQS. The Governor's Air Quality Certificate is expected to be issued before completion of the Federal Aviation Administration Record of Decision.

Cumulative Impacts

The EIS did not adequately address air quality cumulative impacts associated with Master Plan Update implementation and other major proposed projects in the area. This also was commented upon by EPA (6 June 1996).

This issue needs to be addressed and would most likely include some revision to several areas of the air quality analysis, in particular, those associated with modeling air emissions and the construction vehicles air quality analysis. The EPA (6 June 1996) specifically indicated that cumulative impacts discussion should include the extension of SR 509; South Aviation Support Area aircraft maintenance facilities; Des Moines Creek Business Park; SeaTac Hotel; the proposed Cell Therapeutics Inc. (CTI) campus; and the 28th/24th Avenue South arterial project.

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The EPA also mentioned the new Federal Detention Center immediately south of the Airport and the improvements to 3 miles of International Boulevard near the Airport. Both of these projects are currently ongoing.

Other projects which the EIS briefly describes in Chapter III Affected Environment are: regional transit authority high capacity, light rail system; and the aviation business center. The CTI campus development is included as part of a larger program, the Des Moines Creek Technology Campus.

The issue of cumulative impacts also was inadequately addressed for noise, water resources, and aesthetics and visual environmental issues. Thus, cumulative impacts need to be seriously evaluated, not just alluded to in a brief discussion.

Mitigation Measures

Mitigation for potential air quality impacts from Master Plan Update implementation are addressed for the following general topics:

- Construction impacts in particular for fugitive dust emissions.
- Mitigation at International Boulevard and South 170th Street and South 160th Street.
- Incentives or other regulatory requirements for reducing emissions.

SEA-TAC INTERNATIONAL AIRPORT
IMPACT MITIGATION STUDY

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Other projects which the EIS briefly describes in Chapter III Affected Environment are: regional transit authority high capacity, light rail system; and the aviation business center. The CTI campus development is included as part of a larger program, the Des Moines Creek Technology Campus.

The issue of cumulative impacts also was inadequately addressed for noise, water resources, and aesthetics and visual environmental issues. Thus, cumulative impacts need to be seriously evaluated, not just alluded to in a brief discussion.

Mitigation Measures

Mitigation for potential air quality impacts from Master Plan Update implementation are addressed for the following general topics:

- Construction impacts in particular for fugitive dust emissions.
- Mitigation at International Boulevard and South 170th Street and South 160th Street.
- Incentives or other regulatory requirements for reducing emissions.

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- 47-year records of hourly precipitation from the Sea-Tac International Airport weather stations.
- 5-year flow records at the Miller Creek and Des Moines Creek stream gauging stations.
- Watershed data such as river basin drainage areas, land use status, and area soil types and classifications.
- Limited surface water and ground water quality information.

The key parameters/assumptions used in the HSP-F hydrological modeling analysis appear reasonable and engineering sound. These parameters include the runoff coefficient for different land surfaces, and the permeability and infiltration rates for the various soil formations. As part of the modeling assumptions, it is stated that:

"The Industrial Waste System (IWS) has a hydraulic capacity of between the 10- and 25-year storm events and overflows to the SDS during large storm events."

This implies that the Airport SDS could receive untreated runoff from the IWS and requires a better explanation. However, the Washington DOE indicated that the IWS does not overflow to the SDS. Evidently, the IWS may backup onto the tarmac and cause local flooding. Also, in an extreme event, the third lagoon could overflow to Des Moines Creek, although this has never been known to have happened. The Port of Seattle is currently sealing manhole lids to surcharge the system in order to prevent localized flooding.

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The RUSLE is an appropriate method of estimating average sediment production from erosion. The HSP-F model also is an appropriate way to assess the effects of the overall land use changes to derive stormwater detention capacity required to meet offsite discharge limitations. However, since a detailed presentation of proposed stormwater facilities (i.e., catch basins, conveyance pipes, stormwater ponds and pond outlet works, etc.) was not incorporated into the HSP-F model, the effect of these facilities on the determination of detention capacity was excluded. To complete the effort, a separate hydraulic analysis with computer program (WATERWORKS), modeling the proposed airport expansion Storm Drain System (SDS) within the Sea-Tac International Airport is being done. This will determine if the SDS would have a significant impact on the results so far obtained from the HSP-F modeling. At the time of the Final EIS only preliminary WATERWORKS model files were available. Therefore, the results of the stormwater system modeling analysis using WATERWORKS needs to be evaluated.

The baseline data used for the limited water quality and hydrology studies is based on available historical information from various agencies and publications. Thus, it is believed to be reliable and of acceptable quality. With the respect to surface water and ground water quality, there is a paucity of data which is typically included in an EIS. The surface water quality information in Table IV.10-3 only addressed 15 parameters and does not include some routinely monitored parameters such as flow and specific conductance.

For some parameters such as dissolved oxygen and temperature there is limited information. If a baseline is to be established to measure both potential construction and operational changes in surface water quality from the Master Plan Update implementation, additional more detailed surface water quality studies need to be conducted. They should be initiated before construction activities begin; seasonal sampling should be conducted (e.g., February, May, August and November); the parameters sampled should include a number of metals and organics (e.g., aviation fuel constituents, and ethylene and propylene glycol) which are based, in part, on the parameters for which water quality standards have been set; and the parameters should include those for which the Port of Seattle monitors for on the Airport such as in stormwater discharges. A recent study of the latter included information on 23 parameters (Port of Seattle, 30 June 1995).

There is essentially no groundwater quality information in the EIS. This information should be developed for parameters similar to those sampled for in surface water plus static surface water level. Also, a seasonal sampling regime should be developed.

A number of surface water sampling stations should be established on Miller Creek, Walker Creek and Des Moines Creek, starting at the headwaters. Ground water sampling stations also should be established in the various aquifers. These stations should take advantage of existing water supply wells including those of the Seattle Water Department and the Highline Water District.

Currently, the Port of Seattle is conducting a Receiving Water Monitoring Study which will contain updated water quality information for Miller Creek and Des Moines Creek. This study is due to be submitted to the Washington DOE on 30 June 1997. The study should be reviewed to ensure that adequate water quality information is provided.

When determining the extent of the groundwater monitoring program, the numerous cleanup studies which have been conducted at Sea-Tac International Airport should be considered. These studies include information on the hydrological conditions at the Airport and groundwater data from the Airport monitoring wells. With respect to monitoring wells, the Washington DOE has indicated that wells should not be drilled into deep drinking water aquifers in areas with known and unknown shallow soil and perched groundwater contamination at the near surface (in particular free product). This is because surficial contamination might spread through the monitoring wells to these aquifers.

According to the South King County Water Advisory Committee, et.al. (April 1991), long-term water level declines of 1 foot/year have been observed in the Des Moines Area. It was speculated that the water level declines may be due to urbanization and associated reductions in recharge. Thus, it was recommended that a comprehensive monitoring program including well water levels and pumpage, stream flows, lake levels and water quality should be implemented. It also was indicated that particular emphasis should be placed on hydrologic monitoring of aquifers in the Des Moines and Federal Way areas.

The South King County Water Advisory Committee, et.al. (April 1991) also made the following observations:

- The Seattle Water District's monitoring well network and the stream gauging on Miller Creek should be adequate for monitoring ground water in this area of the Des Moines Upland.

- Activities along Miller Creek need to be closely monitored and evaluated because of its sensitive recharge characteristics.

- In the Federal Way Upland, surface water monitoring sites should be maintained in order to ascertain impacts to the surface water system.

- Groundwater quality monitoring along International Boulevard should be closely evaluated to ensure that contamination from various activities is not occurring.

- The Sea-Tac International Airport area because of its significant industrial and commercial activities with numerous underground storage tank and fueling operations is a sensitive area and should be closely monitored.

- **Existing Conditions** - The hydrology analysis includes baseline information on the following for Miller Creek and Des Moines Creek Watersheds (Basins):

  - Flood frequencies.
  - Average seasonal flow rates.
  - Annual runoff volumes.

The descriptions of the existing hydrology conditions for Miller Creek Watershed are deemed adequate and form a good baseline from which to monitor future conditions. The information on the approximate 75% of the Des Moines Creek Watershed which was modeled are also adequate. However, consideration should be given to modeling the entire Des Moines Creek Watershed, not just from the headwaters to South 208th Street. It is not completely clear why all of this watershed was not modeled. The hydrology description of the Miller Creek and Des Moines Creek Watersheds was based on the following information (Table 2.07).

Table 2.07
Watershed Hydrology

Watershed	Total Area	Total Impervious Area	Airport Impervious Area
Miller Creek	5,183 acres	1,224 acres	60 acres
Des Moines Creek	3,585 acres	1,202 acres	369 acres

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

The primary land uses in the watersheds are residential and commercial with only 4% and 27% of the land devoted to Airport use in the Miller Creek and Des Moines Creek Watersheds, respectively. Thus, the urbanized watersheds exhibit stream flow characteristics associated with developed watersheds or basins. This includes rapid flow rate increases before and decreases after precipitation events.

Creek flow rates are typically highest from October through April and lowest between May and September. The existing flood frequencies are described as follows based on three and two locations along Miller Creek and Des Moines Creek, respectively:

Table 2.08
Flood Frequencies

	Existing Condition Return Period (Years) / Flow Rate (cfs)			
Watershed	1.11	2	10	100
Miller Creek	47-104	80-173	125-293	171-468
Des Moines Creek	74-76	103-112	154-178	232-280

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

As one would expect the higher flow rates are experienced at downcreek locations. The probability of the flow rate return periods are: 1.11 year, 90%; 2 year, 50%; 10 year, 10% and 100 year, 1%.

Miller Creek and Des Moines Creek and their tributaries are classified as Class AA (extraordinary) waters by the Washington DOE. Although the creeks occasionally violate the Class AA water quality standards for pH, dissolved oxygen and ammonia. These violations are due primarily to pollutants found in urban and Airport stormwater runoff such as nutrients; oil and grease; metals; fecal coliforms; and suspended solids.

Information on estimated pollutant loadings from the Airport and other sources for each watershed are presented for total suspended solids; biochemical oxygen demand; total phosphorus, copper, lead and zinc; and oil and grease. Overall water quality for select sampling locations along Miller Creek and Des Moines Creek are presented for only fifteen parameters.

Four zones of ground water are described in the EIS with the following general characteristics:

- *Perched Zone* - No known use for drinking water; quality unknown, assumed to be good. The Washington DOE has indicated that there is a 30 to 50-foot blanket of glacial till at the Airport which contains numerous perched zones of groundwater. The perched zones are small, discontinuous, have various flow directions, and are often seasonal. Perched groundwater is the most contaminated at Sea-Tac International Airport and in many instances perched groundwater has trapped contamination and prevented it from reaching the deeper QVA aquifer.

- *Upper or Shallow Aquifer (QVA, Vashon Advance Outwash)* - Not used for domestic water supply; localized contamination from leaking jet fuel and rental car fuel distribution systems at the Airport.

- *Intermediate or Highline Aquifer (Qc(3), Third Coarse Grained Deposit)* - Seattle Water Department has three operating potable water supply wells and Highline Water District has two wells; 80 to 200 feet beneath the ground surface; no indication of ground water contamination; wellhead protection plans to protect wells from pollution within at least the 10 year time of travel zone or about 1/2 mile radius around each well.

- *Deep Aquifer (Qc(4), Fourth Coarse Grained Deposit)* - Excellent water quality.

As indicated above, there is inadequate surface water and ground water quality information. Before implementation of the proposed Master Plan Update activities, this data should be developed. It should include both available literature information and seasonal sampling data. In addition, there should be a surface water and ground water sampling plan in case there are spills on Airport property that reach the Miller and Des Moines Creek drainages. The information developed from this sampling should be compared with applicable standards and remedial actions taken, if necessary. The ground water information is particularly important to help determine potential future impacts on aquifers. It should be noted that since June 1995, the Port of Seattle had a *Spill Prevention, Control and Countermeasure (SPCC) Plan* which included a sampling plan in case of spills. The SPCC Plan should be reviewed and any additional surface and groundwater sampling should be consistent and coordinated with the SPCC Plan.

The EIS indicates that the Highline Aquifer is protected from existing contamination by overlying aquitards and various hydrologic characteristics. However, there is evidence that when wells are pumping water from this aquifer, drawdown can be observed in shallower aquifers (Greg Wingard, 22 July 1996, personal communication; Wingard and Smith, 19 June 1995). This is indicative of interconnection between the aquifers and a potential path for contaminated ground water to the Highline Aquifer. Therefore, ground water movement in the Airport area needs to be better defined. According to the EIS, these additional studies are being conducted and the Washington DOE has indicated that modeling will assume that there is a connection between the upper and lower aquifers. When available, the studies should be reviewed for potential ground water contamination impacts on the Highline Aquifer and other area aquifers.

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Parts of the existing Airport's aircraft fuel handling system are known to have leaks and to have contaminated ground water. This is due, in part, to an aging fuel handling system, in particular the Northwest Airline's facilities. The Port of Seattle has recognized the need to upgrade and modernize the Airport's fuel handling facilities. This aspect of Airport operations should be done as part of Master Plan Update implementation.

In the EIS it is indicated that the Port of Seattle was to have conducted a monitoring study of Miller and Des Moines Creeks the winter of 1995 to 1996, both upstream and downstream of Airport stormwater discharges. The purpose of this study is to help determine the toxicity of Airport stormwater runoff and surface water quality. The results of this study need to be evaluated.

- **Future Conditions** - It is estimated that implementation of EIS preferred Alternative 3 would result in the following:

  - *Miller Creek* - 97 acres (new impervious surface area), 264 acres (drainage from fill area).
  - *Des Moines Creek* - 95 acres (new impervious surface area), 282 acres (drainage from fill area).

This is approximately 7% to 11% of the total watershed areas based on 5,183 and 3,585 acres in the Miller Creek and Des Moines Creek Watersheds, respectively. The increases in impervious areas are approximately 8% to 24% with existing impervious areas of 1,224 and 1,202 acres in the Miller Creek and Des Moines Creek Watersheds, respectively.

To minimize the potential impacts of the new impervious areas and drainage areas, new stormwater detention facilities are planned. If the preferred alternative is implemented the hydrologic analysis and stormwater management facilities should be re-evaluated to support final design. This is particularly true since the EIS indicates that the stormwater management facilities and discharge locations are conceptual layout. The re-evaluated hydrologic analysis should then be used as part of the baseline to monitor potential Alternative 3 impacts. During large storm events, the effect of possible overflow from the IWS on the receiving waters also should be addressed.

Limited details on both the construction and operation of the wet vaults and biofiltration swales was provided in the EIS. There was a more lengthy explanation of the constructed aquifer, which the EIS indicates has not been used before to manage stormwater. More detailed design and operating information needs to be provided on the wet vaults and biofiltration swales. If additional consideration is given to the constructed aquifer, its potential use must be more strongly justified. The Sea-Tac International Airport area may not be the most suitable place to try this technology out; especially considering the controversy over disturbing the headwaters of the two watersheds. The King County Surface Water Management Division has suggested that surface water retention facilities are more innovative and effective. Therefore, they should be considered further before the use of wet vaults and/or the constructed aquifer. The surface water facilities potentially could include modifying the Lake Reba facility for better water storage capacity and water quality treatment.

The Washington DOE also believes that if a constructed aquifer is proposed, additional analysis should be provided since it might not be appropriate for the Airport site. However, the Washington DOE has indicated that the constructed aquifer has the potential to provide a better mechanism for groundwater recharge to Miller Creek.

Future Miller Creek and Des Moines Creek flow rates were described for the same locations as the existing conditions. They are summarized in Table 2.09.

Table 2.09
Future Flood Frequencies

	Future Condition Return Period (Years) / Flow Rate (cfs)			
Watershed	1.11	2	10	100
Miller Creek	46-103	76-170	119-285	166-454
Des Moines Creek	68-74	96-108	149-173	232-280

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

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As can be seen from comparing the future condition flow rates with the previously mentioned existing condition flow rates, the flow rates are very similar. However, the EIS indicates that the annual runoff volumes will increase 6% to 11% at various locations in Miller Creek and 1% to 2% in Des Moines Creek. Most of the volume increase (97% to 99% would occur at flow rates less than the 2-year return period flow rate.

Construction impacts on Miller Creek and Des Moines Creek hydrology are really not discussed in the EIS; the emphasis is more on construction water quality issues and post-construction hydrology. If the mitigation procedures discussed in Appendix P, Natural Resource Mitigation Plan, are not adequately coordinated with the embankment fill activities, there could be problems with surface water runoff from precipitation events. The Construction Stormwater Pollution Prevention Plan referenced in the EIS should help control surface runoff quantity and quality. However, the details of this plan need to be developed and evaluated.

Construction impacts on burrow source site ground water hydrology would involve altering geology and changing ground water recharge, movement and discharge patterns. In general, glacial till areas may be removed which will expose more permeable areas. This could result in reductions in perched ground water and increases in upper aquifer recharge depending on the geology at the burrow sites and should be monitored. Construction in the area of the Third Runway would reduce upper aquifer recharge because of the impervious area. However, depending on the locations of the burrow source sites, this loss could be compensated for by the increased recharge at the burrow sites.

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- There is the possibility of building a major stormwater detention system on the Vacca Farm property which encompasses an area in the City of SeaTac of approximately 25 acres.

- If this development were to be operated in conjunction with Lake Laura and Lake Reba, stormwater could be better controlled for this area of Miller Creek.

Also, the Greater Des Moines Comprehensive Plan discusses some issues and mitigation measures associated with streams, ground water, water quality, stormwater and wetlands.

As part of mitigating potential impacts on Miller Creek, the upper reaches will be relocated. In the early 1970's there was litigation concerning development activities in the Miller Creek Basin. Under the settlement agreements, King County agreed that it would "... not in the future attempt the channelization of Miller Creek except in limited amounts in connection with retention facilities." The relationship between this stipulation and the proposed relocation of part of Miller Creek will have to be resolved as construction associated with Master Plan Update implementation proceeds.

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2.08 - WETLANDS

The EIS discussion of project area wetlands is included primarily in Chapter IV, Sections 11 and 23, Chapter V and Appendices H-A, H-B, P and part of Appendix R. Raytheon's comments on wetlands follows.

Methodology

The evaluation and identification of wetlands in an area is always a sensitive issue. Wetlands play an important part in an ecosystem and they should be protected.

The wetlands in the area around the Airport were identified by accepted and appropriate methods. This included a review of literature information, discussions with appropriate staffs of various agencies, and ground-truthing. This resulted in wetlands being identified based on the soil and vegetation characteristics, and hydrologic regime.

Although accepted methodologies were used, these methodologies were not related enough to the wetland provisions of King County's Sensitive Areas Ordinance (King County Ordinance 9614, Sections 97 through 105). Thus, the EIS should have included a better discussion on at least the following key provisions of King County's wetland provisions:

- Wetland rating: unique/outstanding; significant; and low concern.

- Buffers/setbacks: establishes buffers by wetland rating; provisions for increasing the buffer width; and minimum building setbacks.

- Mitigation, restoration, enhancement and replacement.

Existing Conditions

Fifty-five individual wetlands, or approximately 144 acres, were identified in the study area. Based on the information available to Raytheon, it appears as if a good job was done at identifying the wetlands. In fact, one person in the State of Washington, Department of Ecology, believes that some wetland areas to the west of the Airport were over delineated. However, the wetland information in the EIS is a good basis for predicting future impacts.

Future Conditions

Of the 55 wetlands, 34 could be impacted by Master Plan Update implementation of Alternative 3 and construction of the 8,500-foot runway. This would result in approximately 10.4 acres of wetlands being destroyed during construction; there would be no additional disturbance of wetlands during operations unless there is some sort of spill at the Airport which reaches the watersheds or the planned mitigation measures for the hydrologic regime do not work. The latter could result in additional wetlands losses, from areas drying-up.

The wetlands which would be destroyed as part of Alternative 3 include 7.07 acres of forested wetlands, 2.88 acres of emergent wetlands, and 0.39 acres of shrub-scrub wetlands. According to the EIS, forested and shrub-scrub wetlands are usually considered to provide greater flood energy dissipation and wildlife nesting habitat than that provided by emergent wetlands: whereas emergent wetlands are generally considered to provide greater water quality improvement functions and wildlife feeding opportunities. The EIS also indicated in Appendix H-A that:

> *"Removal or alteration of wetlands as a result of the proposed project and other projects in the area, may limit the ability of remaining wetlands to perform the lost or diminished functions. This may be particularly true of stormwater storage functions of wetlands in the project vicinity. Increased impervious surfaces associated with development activities at the Airport may increase both the depth and duration of stormwater in remaining wetlands. This could result in increased floodwater elevations for longer periods of time in the watershed."*

Also, it was indicated that most wetlands in the area provide wildlife habitat, although they are fragmented and small, and:

> *"...their overall wildlife habitat function should not be overemphasized."*

Cumulative Impacts

The discussion of cumulative impacts to wetlands of Master Plan Update implementation and other proposed projects, was cursory. Cumulative impacts should be re-evaluated based on the other known proposed projects as listed in Chapter III Affected Environment. Although the projects listed are located primarily to the east and south of the Airport.

Mitigation

The Port of Seattle believes that it is not possible to mitigate in the Miller Creek Watershed for wetlands which will be lost as part of the Master Plan Update implementation. Thus, the wetland mitigation site is proposed for the lower Green River Valley (City of Auburn) in another watershed. It is a Washington State policy to mitigate for wetlands in the impacted watershed, if possible. But, projects are dealt with on a case-by-case basis and if necessary wetlands can be mitigated in another watershed.

The Port of Seattle has investigated over 100 parcels in the Airport area. Despite this effort, there are many citizens and some government personnel who believe that the loss of the wetlands in the Miller Creek Watershed should still be mitigated in this watershed. Thus, the Port of Seattle should have to continue to justify its wetlands mitigation plan and should be open about the process it is going through. This is particularly true with permitting with the US Army Corps of Engineers and discussions with the City of Auburn.

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2.09 - FLOODPLAINS

Floodplains were discussed primarily in the EIS in Chapters IV, Section 12 and V, Appendix P and part of Appendix R. An evaluation of these parts of the EIS follows.

Methodology

Proposed Master Plan Update area flooding and 100-year floodplain information was obtained from existing information, in particular the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. Potential impacts on flooding and floodplains were then determined by evaluating construction impacts and modeling post-construction flows. This methodology is acceptable and routinely used in evaluating at least 100-year floodplains.

The methodology did not include a discussion on the 500-year floodplain, which is relevant because of recent storms. There should be some discussion about the 500-year floodplain since this information is available in literature such as the FEMA maps.

Existing Conditions

Miller Creek has more extensive 100-year floodplains than does Des Moines Creek. Miller Creek essentially has floodplains along its entire length in depressions and relatively flat areas with little topographic relief. Des Moines Creek only has a 100-year floodplain below South 216th Street. These existing floodplains were adequately described in the EIS.

If the Master Plan Update implementation proceeds, the floodplain information should be updated as new data is available. This particularly includes revision of the FEMA maps. This will then allow a better comparison with future impacts.

Future Conditions

As indicated in the EIS, development requirements prohibit significant floodplain encroachment and reduction of flood storage capacity. As discussed in the EIS, without mitigation the proposed Master Plan Update could result in the following:

- Significant floodplain encroachment.
- Reduced flood storage capacity.
- Increased flow rates and volumes.

This could result in flooding in downstream areas adjacent to Miller Creek and Des Moines Creek.

For Alternative 3, the 8,500-foot runway could result in the loss of approximately 7.2 acres of 100-year floodplain in the vicinity of Lake Lora at the headwaters of Miller Creek. This loss of floodplain results in loss of flood storage capacity and possibly increases in flood heights in downstream areas. These impacts would depend on the amount of flood storage lost; stormwater runoff detention facility storage volume and release rates; and the timing of peak release rates with respect to other areas in the watershed or basin.

The amount of new impervious area also will potentially impact the amount of stormwater runoff and resultant flood impacts. The proposed 8,500-foot runway would have approximately 73 acres of impervious area of the approximate 192 acres of total impervious area.

The EIS evaluation of potential future impacts on floodplains was good. It forms a basis to evaluate actual changes as the Master Plan Update is implemented.

Cumulative Impacts

As with the other water resources related cumulative impacts discussions, this aspect of the floodplains evaluation is cursory and inadequate. Proposed new projects should have minimal, if any, potential impacts on the Miller Creek Watershed. However, there could be negative impacts on the Des Moines Creek Watershed floodplains.

Because of these potential impacts in combination with implementation of the Master Plan Update, there should be a more lengthy discussion of cumulative impacts. If enough information is available on these other projects, the evaluation should include incorporation of this information in the hydrology modeling. The resultant data could then be used for the cumulative impacts discussion associated with all water resources.

Mitigation

Floodplain mitigation would include adherence to floodplain development standards and floodway management requirements of the FAA and the Washington DOE. The development standards prohibit any reduction in the 100-year floodplain or base flood storage volume. State law requires compensatory mitigation for any proposed filling of 100-year floodplain so that there is no net loss in flood storage capacity. Also, the mitigation is to prevent an increased risk of loss of human life on property damage.

According to the Washington DOE, the primary mitigation goal is to replace the basic characteristics of Miller Creek and its tributaries. The mitigation objectives require that Miller Creek and its tributaries must continue to provide baseflow conveyance functions, accommodate the 100-year flow with no net 100-year storage loss, and the new tributary must provide an open channel of equivalent length as the existing tributary. This, mitigation must maintain the natural characteristics and functions of Miller Creek.

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For the Master Plan Update compensatory mitigation primarily involves the following:

- Relocating approximately 1,080 feet of the main channel of Miller Creek approximately 200 feet west.
- Enhancing the habitat features of the relocated channel.
- Replace three intermittent tributaries of Miller Creek that will be in fill by constructing tributary mitigation channels.
- Relocating part of Des Moines Creek, which depends on development of the South Aviation Support Area.

The Washington DOE observed that the proposed mitigation plan would create 5,070 cubic yards of floodplain storage to offset 5,030 cubic yards of storage that would be lost in the proposed fill area. In addition, consideration is being given to modifying the operating procedures at the Lake Reba Regional Detention facility. This is supported by the King County Surface Water Management Division, in particular if the facility can be modified for additional water storage and water quality treatment.

In order to determine the effectiveness of the creek relocations and tributary replacement, a monitoring plan is proposed. The monitoring includes hydrology and hydraulics inspections and maintenance, and a contingency plan. The latter would involve primarily channel modifications to meet required flow rates and stream hydrology.

The proposed mitigation plan for Miller Creek and Des Moines Creek addresses floodplains, and water quality and hydrology. If implemented correctly, the plan should minimize the potential impacts of Master Plan Update implementation. However, with respect to floodplains, the EIS indicates that:

> *"Implementation of these mitigation requirements would be expected to prevent significant floodplain or flooding impacts from the proposed Master Plan Update alternatives."*

The plan does not guarantee that the mitigation measures will work. Therefore, monitoring of the mitigation measures construction and operation is extremely important.

2.10 - AESTHETICS AND VISUAL

Chapter IV, Section 24 and Appendix N of the Sea-Tac International Airport EIS deals with aesthetics and urban design.

Eighteen view-sites around the Airport's perimeter were used to describe the existing visual character of the Airport and to assess impacts of Master Plan Update implementation. Existing conditions were based on black and white photographs from the different viewpoints; three dimensional representations of the Master Plan Update alternatives were overlain on the photographs to show the expected changes or impacts.

The methodology used is routine for visual impact studies. However, the number of viewpoints was inadequate, in particular to the west of the Airport. Additional viewpoints should be included in the study, in particular on high ground. Two examples are in the City of Burien at 153rd and 4th Streets, and 160th between 9th and 10th Streets.

The use of black and white photographs makes it difficult to see existing and Master plan Update conditions. Color photographs should be used to more clearly show the Airport facilities. In addition, different stages of construction such as site clearing, earthwork and final design with/without landscaping should be shown.

Existing Conditions

The initial black and white photographs were used to show the context in which the Airport is located. However, the majority of view sites are located relatively close to the Airport. There are only a few view sites located further away and these are primarily to the northwest and south of the Airport.

As indicated above, more view sites and color photographs should be used to better describe the existing visual conditions of the Airport. The existing conditions description also should include a discussion of the ground shadow which is cast on the surrounding area from the existing embankment.

Additional view sites to the west, northwest and southwest of the Airport are particularly important because construction of the Third Runway will bring the runway activities approximately 1/2 mile closer to these areas.

The larger fill area also will be closer and will eliminate some of the view sites shown on Exhibit IV.24-1 in the EIS.

G1 585 The existing condition view sites to the west, northwest and southwest also should more clearly show aircraft on the existing runways and possibly landing and taking-off. The view sites now show primarily trees and the embankment area and it would have been helpful to show airplanes, where possible.

Future Conditions

The treatment of future visual conditions is inadequate because the conditions are mainly described in the immediate area around the Airport. More view sites should be evaluated, in particular on high topographic relief points to the west of the Airport. The ground shadow which will be cast by the new embankment for the Third Runway also should be discussed in more detail than indicating that it will be about 15 minutes longer than the current shade.

Like the existing conditions, aircraft operations on the proposed Third Runway on the ground should be more clearly shown. This would be particularly helpful for the additional view sites to the west, northwest and southwest of the Sea-Tac International Airport.

Construction of the Third Runway will bring aircraft activities on the ground and in the air approximately 1/2 mile closer to the area west of the airport, in particular during landings and takeoffs. Therefore, the impact of aircraft in the air during landings and takeoffs should be shown and discussed in comparison to the existing conditions.

Cumulative Impacts

It is indicated that cumulative visual impacts could vary depending on what other developments are implemented. These potential developments should be described in relation to the proposed Master Plan Update improvements. If the visual impacts of these developments and the Airport improvements are deemed significant, visual representations should be presented.

Mitigation

As part of evaluating additional view sites, consideration needs to be given to developing short-range, medium-range and long-range views. For example, to the west of the Airport the viewpoints might be as follows: short-range, 1/2 mile or less from the Third Runway; medium-range, 1/2 to 1 mile from the Third Runway; and long-range, 1 to 1 1/2 miles or more from the Third Runway. The different viewpoints and their distance from the Third Runway area will depend, in part, on the topography.

Visual impact mitigation alludes to adherence to applicable design and landscape codes. It is assumed that this refers to the City of SeaTac Chapter 15.14 Development Standards: Tree Retention and Landscaping. These standards should be used taking into consideration the use of native vegetation of different age class that will minimize maintenance. Vegetation plantings should be used to minimize visual impacts on the Third Runway's embankment and off-site at sensitive viewpoints such as along 153rd and 4th Streets. Mitigation is discussed in more detail in Section 7.

SECTION 3
EIS TRANSPORTATION ANALYSIS

SECTION 3
EIS TRANSPORTATION ANALYSIS

3.01 - INTRODUCTION

Section 3 provides analysis regarding the traffic and transportation impacts due to construction of the proposed Third Runway at Sea-Tac International Airport. Section 8 addresses the potential traffic and transportation impacts and mitigation of implementation of the full Airport Master Plan.

The EIS forecasts were used in the analysis to assess traffic and transportation impacts and in development of the Mitigation Plan to address those impacts. This approach was taken due to the fundamental decision made early in the study to base the impact analysis on the data presented in the *Final Environmental Impact Statement, Proposed Master Plan Update to the Seattle-Tacoma International Airport*. The EIS contained traffic forecasts and projections for the following years:

- Year 1994 - Base condition
- Year 2000 - Completion of Third Runway
- Year 2020 - Completion of Master Plan improvements

3.02 - APPROACH

The overall approach in the EIS Transportation Analysis involved four basic steps:

- Determine the existing operating conditions on the highway system in the communities surrounding the Airport using the traditional level of service (LOS) criteria. This traditional LOS criteria was also used by the Port of Seattle in the EIS. The base year was 1994.

- Determine the traffic impacts on this network during the construction of the Third Runway. This analysis focused on the heavy truck traffic generated by hauling the fill material. Impacts of alternate haul methods and other activities of the contractor and suppliers during the construction of the Third Runway also were assessed. The analysis period was 1994 to 2000.

- Determine the traffic impacts after construction of the Third Runway and during implementation of the full Master Plan. This analysis period was 2000 to 2020.

- Develop a staged mitigation plan that addresses the impacts of the proposed full Master Plan Update for each of the following three project phases:

  - Mitigation of existing traffic impacts created by current operations of Sea-Tac International Airport.
  - Mitigation of impacts during construction of the Third Runway.
  - Mitigation of impacts after construction of the Third Runway on a continuing basis through implementation of the full Master Plan Update.

A key element of this phased mitigation plan for traffic and transportation impacts will be Interlocal Agreements which will form the basis for a continued involvement as the full Master Plan Update is implemented.

Table 3.01 shows the EIS chapters which were evaluated as part of the transportation analysis.

Table 3.01
EIS Chapters Reviewed for Transportation Issues

Chapter	Section	Title
--	--	Executive Summary
I	--	Project Background and Purpose and Need
II	--	Alternatives
III	--	Affected Environment
IV	15	Surface Transportation
IV	23	Construction Impacts
V	--	Probable, Unavoidable, Adverse Environmental Impacts and Mitigation Measures
Appendix J	--	Surface Transportation Construction Impacts Report
Appendix O-A	--	Surface Transportation Report
Appendix O-B	--	Revised Surface Transportation Report
Appendix O-C	--	On-Airport Surface Transportation Report

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

3.03 - STUDY AREA

The study area for the traffic impact analysis included the jurisdictional boundaries of the cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila. The study area also included the facilities operated by the Highline School District and the Highline Community Hospital District.

While this study area represents the limitations of the impact analysis, the Sea-Tac International Airport has an influence on the transportation systems within the Puget Sound Region and the State of Washington. This influence can be seen in an analysis of trip origins to the airport and will be felt on a regional level during the construction of the Third Runway since the truck haul route impacts extend along the entire route from the Airport to the borrow source.

An analysis of the origin destination information provided in the EIS as well as the 1991 study data provided by the Evans-McDonough Company for the Port of Seattle:

- Approximately 73% of trips to Sea-Tac International Airport are local and the remaining 27% are made by visitors.

- Of the local trips; 30% are from Seattle, 8% from Tacoma, 8% from Bellevue, 5% from King County outside the study area and the balance of 44% are from the remaining Puget Sound region.

- Of the visitor trips; 50% are from Seattle, 35% are from the City of SeaTac and the balance of 15% are from the remaining region.

It becomes readily apparent that the visitor trips are focused on the City of Seattle and City of SeaTac (where the hotels are) and the local trips are very diverse throughout the region.

It was also discovered that less than 6% of the total trips to the Airport are from the five cities within the study area; however, the traffic impacts tend to be concentrated in these five cities which is near the trip-end. The sole exception is the City of SeaTac which bears the heaviest traffic burden (but is not part of the study area).

3.04 - KEY CONCERNS

During this study, many issues were raised by agencies, organizations, groups and individual citizens regarding the impacts of the Airport Master Plan implementation on the highway system. These issues can be grouped into four categories of concern:

- Potential congestion on local streets expressed in reduced levels of service, increased accidents, parking and pedestrian problems, impacts on school bus operations and crossings, impacts on the efficient operations of police, fire and safety equipment and an increase in delay on transit operations.

- There is a general concern for potential physical damage to the highway system, not only on the local street network, but also on the State network due to increased volume of heavy truck traffic, the resultant lowering of legal bridge load limits and increased maintenance expenditures.

- There is a major concern regarding potential impacts on the highway system during construction of the Third Runway particularly along the main truck haul routes. As heavy truck volumes increase on the main haul routes, which are expected to be the freeways, there is a concern regarding diversion of traffic off the freeways to the local street system. A parallel major concern are the alternate haul methods being considered by the Port of Seattle; such as the Des Moines Creek barge and conveyor system. Construction work-force activity by the contractor and concurrent construction projects are also of concern.

- There is a concern regarding the potential lingering impacts caused by construction of the Third Runway and the ultimate implementation of the full Master Plan expressed in additional traffic on the local street network due to increased operations at the Airport and an increase in the operation and maintenance costs on the local streets.

3.05 - EXISTING TRAFFIC CONDITIONS

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The first step in developing the mitigation measures discussed further in Section 8 was to assess the existing conditions and mitigate those existing impacts. This then becomes the base condition where existing impacts have been addressed thus allowing a wide range of future alternatives to be assessed and effectively mitigated without base condition influences.

The base year in the Sea-Tac International Airport EIS was 1994. This is also the base year chosen for the mitigation plan. The Sea-Tac International Airport EIS contained very limited traffic data which would allow a local network assessment of the impacts. The data collected and the analysis performed in the EIS was well done for 12 major intersections which surround the Airport and form the Airport's entry points or "driveways".

An analysis was not performed in the EIS on any segments of highway connecting these major intersections; however of more consequence, there was no data collected or analysis made of existing traffic impacts on the local network on outside this initial investigation of the entry points.

Traffic volumes into the Airport in 1994 are reported in the EIS as 75,000 AADT (average annual daily traffic) which is projected to increase to 130,000 AADT by the Year 2020 - an increase of over 70%. The local street system will be impacted by this increase; however, an analysis of that impact in sufficient detail has not been made. The Port of Seattle's analysis at the 12 entry points surrounding the Airport show that the intersections that were failing in 1994 (Level of Service "F") are also LOS "F" in 2020. However, the 70% increase in traffic must be absorbed by the State and local street system in the surrounding communities, since only so much traffic can pass these "failed" intersections in a given amount of time. The impact of this 70% increase in traffic on the surrounding street system has not been done, but must be completed as part of mitigation planning.

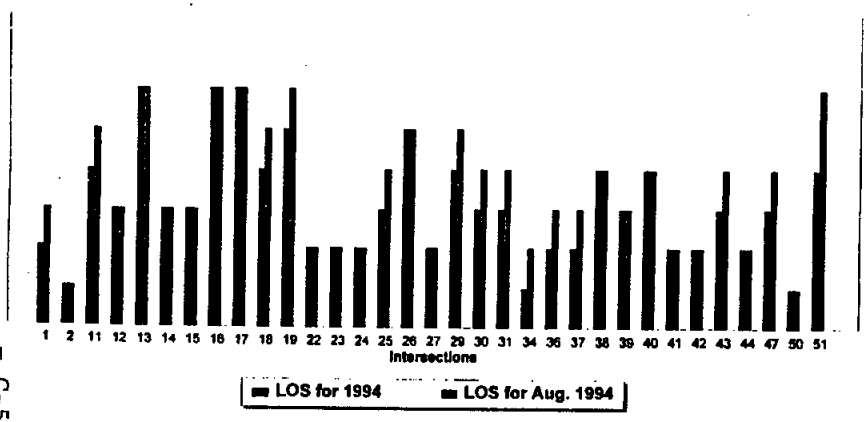
The 12 entry points/intersections evaluated in the EIS included 51 legs of these intersections. The EIS concluded that 20% of these intersection legs were currently failing, LOS "E" to "F" and another 30% were currently at capacity (LOS "C" to "D"), and could not handle more traffic without failing (see Table 3:02 and Figure 3.01). As expected, the failing intersections are on the east side of the Airport (City of SeaTac). The remaining 50% are currently operating at acceptable levels of service (LOS "A" to "B") and are on the west side of the Airport.

Table 3.02
1994 AADT/August Weekday Condition

Intersection Number and Name	1994 AADT Conditions			1994 August Weekday Conditions		
	Critical V/C	Average Delay (sec./veh.)	Level of Service	Critical V/C	Average Delay (sec./veh.)	Level of Service
1) SB SR 509 ramps at SR 518	0.764	10.7	B	0.846	15.0	C
2) NB SR and ramps at SR 518	0.614	1.8	A	0.713	2.3	A
11) SR 99 and South 154th	0.817	34.8	D	0.943	48.5	E
12) SR 99 and South 160th	0.586	21.1	C	0.667	22.6	C
13) SR 99 and South 170th	0.923	60.8	F	1.080	105.6	F
14) SR 99 and South 176th	0.496	18.8	C	0.572	19.5	C
15) SR 99 and South 180th	0.636	15.9	C	0.772	20.0	C
16) SR 99 and South 188th	1.154	247.4	F	1.326	406.8	F
17) SR 99 and South 192nd	---	---	F	---	---	F
18) SR 99 and South 200th	0.788	37.7	D	0.908	48.5	E
19) SR 99 and SR 516	0.687	49.4	E	0.802	70.3	F
22) 24th Ave. South and South 154th/156th	0.627	8.1	B	0.778	10.5	B
23) Des Moines Mem. Dr. and South 156th	0.563	7.6	B	0.710	6.9	B
24) Des Moines Mem. Dr. and South 160th	0.381	6.8	B	0.443	7.0	B
25) NB SR 509 ramps at South 160th	---	---	C	---	---	D
26) SB SR 509 ramps at South 160th	---	---	E	---	---	E
27) Air Cargo Rd. and South 160th	0.464	5.1	B	0.534	6.5	B
29) Air Cargo Rd. at SB Airport Exp. ramps	---	---	D	---	---	E
30) Air Cargo Rd. and South 170th	0.759	15.8	C	0.873	24.3	D
31) NB Airport Exp. and South 170th	---	---	C	---	---	D
34) SB SR 509 and South 188th	---	---	A	---	---	B
36) Des Moines Mem. Dr. and South 188th	0.661	12.6	B	0.755	15.0	C
37) 28th Avenue South and South 188th	0.783	12.6	B	0.840	15.9	C
38) Military Road and South 188th	0.749	27.9	D	0.857	36.2	D
39) SB IH-5 ramps and South 188th	0.546	15.0	C	0.624	16.2	C
40) NB IH-5 ramps and South 188th	0.704	28.1	D	0.812	35.7	D
41) Des Moines Mem. Dr. and South 200th	0.866	9.1	B	0.873	13.7	B
42) Des Moines Mem. Dr. and Marine View	0.447	8.3	B	0.510	8.6	B
43) 28th Avenue South and South 200th	---	---	C	---	---	D
44) Military Road and South 200th	0.562	8.2	B	0.710	9.4	B
47) Military Road and NB IH-5 ramps	---	---	C	---	---	D
50) 28th Avenue South and South 192nd	0.536	3.6	A	0.615	4.4	A
51) SB IH-5 ramps and SR 516	0.915	27.6	D	1.020	75.7	F

(Source: US Department of Transportation, Federal Aviation Administration and Port of Seattle, February 1996)

Figure 3.01
Level of Service Analysis by Intersection Number



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Over time, as the Third Runway is constructed through the Year 2000 and the full Master Plan is implemented through the Year 2020, those intersections west of the Airport also will decline in level of service.

Existing trips (1994) to the Airport are generally oriented in north-south flow with 70% of the trips coming from the north 20% coming from the south and the balance 10% spread among the communities on the east and west. This strong orientation of trip-making makes the development of an effective Mitigation Plan much easier once traffic forecasts are extended beyond the 12 entry points surrounding the Airport.

There is a potential for increased vehicle accidents during the construction phase. The large number of heavy haul trucks will impact the current mix of vehicles on the roadway which will tend to increase the severity of the accidents and could also increase the frequency if the haul trucks were uncontrolled along the route.

Washington DOT accident data was made available for the SR 509/SR 518 interchange providing statistics on 548 accidents over the past 16 years which averages three accidents per month. This is the interchange which the haul trucks currently use for construction of the apron extension at the south end of the Airport. Over these 16 years, there has been no fatal accidents primarily because this interchange area is signalized and vehicle speeds are low at the time of the accidents. As one would expect, 75% of these accidents were angle-type (vehicles turning into each other), and the balance are predominately rear-end collisions.

3.06 - CONSTRUCTION IMPACTS

The EIS estimates that it will take three years to complete the embankment (fill) for construction of the Third Runway which will be completed in 2000. Over this three-year period, the EIS estimates 20 million cubic yards (MCY) of fill will be transported to the site. An additional 3 MCY will be needed to complete the full Master Plan improvements; although, that haul will be over the 2000 to 2020 time frame and should not become an issue on the highway system unless the haul is focused into a single construction season. However, the hauling of this additional 3 MCY should be part of any Mitigation Plan Agreement.

Eighteen borrow sites were identified in the EIS as potential sources of fill material. It is possible and likely that material will be transported from multiple sites depending on the contracting procedures of the Port of Seattle and market conditions at the time of contract bidding. Since it is not possible to either predict or control the borrow sources site(s), a Mitigation Plan Agreement must be developed to address impacts which arise from all potential sites. Of these 18 sites, 15 are south of the Airport, 2 are north and 1 is east. There also have been reports of borrow sites that would use Puget Sound as a transport route enabling borrow sites west of the Airport and in Vancouver to become economically feasible.

Hauling of 20 MCY by truck is a concern of the potentially impacted communities regarding safety, congestion and physical damage to their street network. This hauling operation would average 109 single bed trucks per hour in each direction or approximately 2,336 trucks per average day. By contrast, the current apron expansion contract moves 0.45 MCY or approximately 3% of the fill to be moved for construction of the Third Runway. The apron contract uses 10 trucks per hour, 6 days per week for 22 weeks, and is a source of controversy within the surrounding cities, including the City of SeaTac.

Due to the large volume of fill material to be hauled for construction of the Third Runway, double-bed and larger trucks are certain to be in the mix of general traffic. While the number of these larger trucks will be less, (109 singles - equivalent to 55 doubles or 36 triples) the operational characteristics and additional weight of these larger trucks are not directly proportional to the impact they will have on traffic operations and physical damage to the highway system. The Mitigation Plan must consider the impacts caused by the maximum permit weights allowed by Washington DOT and local ordinances.

Due primarily to economic factors as opposed to community opposition, alternate methods have been, and are being, explored by the Port of Seattle to haul 20 MCY to the site. One of the most discussed is a barge and conveyor system that would transport fill material by barge on Puget Sound to a newly constructed off-load facility at the mouth of the Des Moines creek and transfer material to an above ground conveyor belt that would run along the Des Moines Creek sewer right-of-way three miles to the Airport property where on-site equipment would transport it to the construction site. Such a concept has been proposed to the Port of Seattle by the Westco Company. The primary advantage of this barge/conveyor system is that it will complete the haul in 18 months - a 50% time-savings over truck hauling.

There are other non-traffic alternatives being considered, such as barge transport along the Duwamish Waterway and transfer to a four-mile conveyor running along SR 509 and rail transport to the former long-acres site in Tukwila and transfer to a three-mile conveyor along IH-405/SR 518 with a tunnel under IH-5. In October 1996, the Port of Seattle released a Draft report entitled *Fill Material Alternative Delivery Method Study for the Third Runway* which considers the economic feasibility of these and other haul alternatives. This particular study ranks the alternatives as follows:

1) Barge to the Duwamish Waterway and truck along SR 509 to the Airport.
2) Trucking only.
3) Barge to Des Moines Creek and conveyor to the Airport.

Before the actual construction begins, there will be additional alternatives proposed with varying impacts to the communities. While the market conditions will influence the final decision, the impacted communities must have a Mitigation Plan Agreement in place prior to the haul that will address the impacts of that particular alternative, participate in the discussions and issue the necessary local permits. The Mitigation Plan must not only address the impacts of the truck and non-truck methods, but also be flexible enough to address changes proposed by the contractor during construction.

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3.07 - POST-CONSTRUCTION IMPACTS

While the impacts during the construction phase would be mitigated through 2000, there will be additional impacts created by implementation of the full Master Plan between 2000 and 2020, including construction of the north unit terminal, cargo warehouse, the Runway 34R extension, gate expansions and expansion of the parking garage. Airport traffic is projected by the EIS to increase from 75,000 AADT in 1994 to 84,000 AADT in 2000, a 12% increase and to 130,000 AADT in 2020 a 55% increase over 2000. This 55% increase in traffic will be the focus of the Post Construction Impact Mitigation Plan. In the EIS analysis, the level of service decreased on 20 of the 51 intersection legs (40%) evaluated by the Year 2000. The impact of this reduction in level of service should be addressed in the Construction Phase Mitigation Plan, to be developed by either the Port of Seattle or its contractor. By the Year 2020, 80% of the legs have decreased levels of service which should be addressed in a Post-Construction Mitigation Plan.

Currently, parking for Airport operations is concentrated on Airport property and along SR 99 in the City of SeaTac. The Master Plan provides for additional required parking to be on Airport property or on the eastside of the Airport. Parking operations and impacts are therefore not part of the current Mitigation Plan; however if parking issues become apparent in the future, the Mitigation Plan Agreement will provide the mechanism to address them.

There would be associated increased operation and maintenance costs to the surrounding communities on the local street system. These would be assessed as part of Mitigation Plan in all three phases - base condition, construction and post construction.

3.08 - FINDINGS

In the EIS, the Port of Seattle made efforts to consider other proposed improvements to the Regional Transportation system within their planning for implementation of the full Master Plan. This is the appropriate approach. The regional projects considered in the EIS were as follows:

- Completion of the proposed regional transit authority (RTA) system.
- Completion of the proposed high-occupancy vehicle (HOV) system.
- Completion of the proposed SR 509 extension.
- Completion of the proposed Southern Airport Expressway.

Each of these regional transportation projects will move forward with varying schedules. The effect of including these four regional projects in the Year 2020 traffic forecast is to underestimate the impacts on the local street systems. Because it cannot be determined at this time which of these regional projects will be implemented and when, a Year 2020 forecast should be made without these projects to assess the worse case impacts on the local street system.

While the intersection analysis performed in the EIS was well done, the number of intersections studied was limited to the access "driveways" or entry points surrounding the Airport. Currently the heavy traffic impacts are east of the Airport (City of SeaTac); however, over time those heavy impacts will be felt throughout the surrounding area. There was minimal analysis performed in the impacted communities. A comprehensive area-wide traffic study needs to be prepared in order to assess potential impacts to the local street system in a comprehensive manner. This need is further indicated by the forecast of a 70% increase in Airport traffic and accompanying 80% decrease in traffic level of service by the Year 2020.

Based upon the EIS forecast of the fill requirements of the Third Runway, a convoy of haul trucks will be necessary in the peak periods of one truck every 30 seconds, 500 yards behind each other for three years. This a staggering statistic. For this reason doubles, triples and maximum weight carriers will be employed to contain the costs of transporting the fill material. The only highway type capable of handling this volume of heavy trucks is the regional freeway system with the Interstate Highways being the best prepared to handle this demand. If the fill material is transported by truck, the haul trucks must remain on the freeway system, be subject to operational restrictions by the DOT and access the construction site via a direct connection between the freeway system and the site. The area along SR 518 and the northern Airport boundary offers such an opportunity for this direct connection which could operate as a temporary construction entrance and be dismantled after completion of the contract.

There has been no analysis made of potential physical damage to the highway system, particularly the bridge decks, of this heavy truck volume in the EIS. This includes both the State and local highway systems.

While the context of this impact analysis is the communities immediately surrounding the Airport (excluding the City of SeaTac). The analysis of potential physical damage should be conducted along the entire fill haul route(s).

From the potential burrow sites to the Airport, the barge/conveyor system alternate avoids the physical damage and congestion on the highway system and would physically complete the haul in less time than the trucking alternate; however, there are potentially severe environmental impacts associated with this system along Des Moines Creek. There is the potential for spillage of material into Puget Sound along the route and at the transfer pier, above ground conveyor noise and visual impacts, loss of recreational use of the corridor during construction, safety issues with people, and the restoration of the entire corridor upon completion of the operation.

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While traffic volumes in the areas surrounding the Airport is forecast to increase by 70% with corresponding decrease in highway level of service of 80%; not all of this increase/decrease is due to construction of the Third Runway or other Master Plan projects. Also included in this traffic are local trips, regional trips, shopping trips, work trips, recreation trips, etc. The approach that must be taken in the Mitigation Plan is to determine the actions necessary to mitigate the entire impact, determine the costs associated with mitigation the particular impact and finally, to the best extent possible, allocate these costs among the various parties in a responsible and equitable manner. This equitable distribution or *pro-rata* share has not yet been determined but should be a key element of the Mitigation Plan. Preliminary indicators in the EIS traffic figures point to a pattern of 33% of traffic on SR 518 is Airport traffic, 50% of all southbound traffic on SR 99 volume is Airport traffic and 25% of northbound SR 99 volume is Airport traffic. This is, of course, not reliable enough to base a cost allocation model upon; however, such a model must be prepared. This effort also would include an updated origin-destination study and a select link/screen line analysis along the principal arterials on an area-wide basis surrounding the Airport. The 1984 O-D study by the Port of Seattle is not adequate to develop this cost allocation model.

SECTION 4

EIS SOCIO-ECONOMIC ANALYSIS

SECTION 4
EIS SOCIO-ECONOMIC ANALYSIS

4.01 - INTRODUCTION

The impacts of an airport on a region's socio-economic environment manifest themselves through indirect and induced effects - unlike an airport's physical and biological impacts which impress themselves directly on the natural environment. This is true both for an airport's beneficial and adverse impacts.

In terms of an airport's beneficial impacts, the FAA defines the benefits to a community of an airport as including direct benefits, indirect benefits and induced benefits. In Butler and Kiernan (September 1996), the FAA states:

> *"The primary [transportation] benefits of an airport are usually the time saved and cost avoided by travelers who use it over the next best alternative"; . . . . and the resulting "economic activities [measured in terms of employment and income] that would not have occurred in the absence of the airport."*

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In these definitions of airport beneficial impacts, it is not the Airport itself but the social and economic consequences of the Airport, measured in time savings and business activity, that generate the impacts. Specifically, there are three types of benefits - Direct, Indirect, and Induced:

- **Direct Benefits** - Defined as the time and cost saving to travelers compared with alternative modes of transportation and the jobs, income and business activity generated at the airport.

- **Indirect Benefits** - Defined as the jobs, income and business activity generated by companies that are not at the Airport but are users of, or closely linked to, aviation transportation services.

- **Induced Benefits** - Defined as the jobs, income and business activity generated by multiplier effects from inter-industry linkages to direct and indirect impact companies.

In line with the FAA's analysis of how airports generate beneficial impacts, the 1994 report, *The Local and Regional Economic Impacts of the Port of Seattle* (Martin O'Connell Associates, 31 May 1996) measures 4 types of impacts - jobs, personal earnings, business revenue and taxes paid. It estimates the direct job benefits to be 38% of the total. Equivalent measurement techniques have been used to estimate similar airport beneficial impacts both elsewhere in Washington State (Thomas/Lane & Associates, June 1991) and throughout the country (Hewings, et.al. 1995).

Similar to beneficial impacts, an airport's adverse impacts have a direct component but are primarily the result of indirect and induced effects. This Section defines and discusses the different types of adverse impacts produced by airports, and the significance of these impacts for the communities that lie within Sea-Tac International Airport's adverse impact area.

4.02 - DIRECT ADVERSE SOCIO-ECONOMIC IMPACTS

Direct adverse impacts of commercial airports on surrounding communities are measured by the decline in residential property values compared to what they would have been if the Airport were located elsewhere in the metropolitan area.

Airports generate noise, visual blight, surface traffic congestion, air pollution and other effects which cause most households to consider the areas immediately surrounding them to be less desirable places to live. Some households may have a primary wage earner employed at (or near) the Airport and consider the reduction in commuting time a more than off-setting factor to the Airport's direct adverse impacts. For others, there may be neighborhood or individual house characteristics that off-set the Airport's direct adverse impacts. But for most households, close proximity to an airport reduces a property's residential desirability. (Crowley, 1973). As a result, a residential housing unit located close to an airport will normally have a market value less than it would have had if located elsewhere in the region, other things (such as lot size and view) being the same.

Most studies of direct adverse impacts of airports have concentrated on measuring the noise impacts on property values (Newman and Beattie, 1985; Frankel, 1991; and Mieszkowski and Samper, 1978). A recent report by Booz-Allen & Hamilton, Inc. (September 1994), prepared for the FAA, reported:

> *"Impacts on property values of airport noise varies from negligible [$627 for lower priced housing units around Baltimore International Airport] to significant [$60,873 for moderately priced housing units around Los Angeles International Airport] and appears to be more pronounced in higher priced neighborhoods."*

A *Sea-Tac Airport Vicinity Land Use Inventory Project* report prepared for the Port of Seattle in 1994 looked at the noise issue by comparing the assessed values of 32 residences located within Sea-Tac International Airport's "Noise Remedy Area Boundary - 16 residences were within both the Airport's 65 LDN and Noise Remedy Area boundaries and 16 residences were outside the Airport's 65 LDN boundary but within the its Noise Remedy Area boundary (Shapiro and Associates, April 1994). For a variety of methodological and research procedure issues (the most notable being the lack of comparison between houses near to the Airport with comparable units in other parts of the central Puget Sound region), the report concludes (page 55):

"Given the limitation of this study, neither the existence nor the magnitude of any general effect on rates of appreciation of property values from airport noise is demonstrated."

The Airport's direct impacts primarily result in private costs, which are measured as the decline (or reduction in the rate of growth) of privately owned residential property. This cost is borne by the property owner at the time the Airport is created or at the time the Airport undergoes a significant increase in the magnitude of its adverse impacts - such as occurred when jet airplanes came into wide spread commercial use.

Direct public costs are measured by the decline in the local tax base that results from the reduced (or more slower growing) property values of residences in close proximity to the Airport.

4.03 - INDIRECT ADVERSE SOCIO-ECONOMIC IMPACTS

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Indirect adverse impacts of commercial airports on surrounding communities are measured by the change in residential and business land uses that result from the decline in property values (or the decline in the rate of increase of property values) caused by the airport's direct impacts. The importance of indirect effects is that they are the intermediary through which direct impacts lead to induced impacts - and as will be discussed below, there are significant costs associated with induced impacts. Indirect impacts occur only at the community level and generally there are no private indirect costs.

An individual household or business that observes a relative decline in the value of land directly impacted by Sea-Tac International Airport will make a decision about changing land use to maximize its household welfare. From the perspective of the community however, the result of these individual welfare maximizing decisions is:

- An increase in single family residential rentals and the development of multi-family rental properties;
- A shift in a community's population from primarily home owners to a mix of stable home owners and more transient renters;
- The growth of business activity whose market is the more transient rental population; and,
- Resistance by impact area residents to pass levies needed for city and school district operations.

The net effect of such indirect effects is to produce significant induced adverse impacts in the 5 cities immediately surrounding Sea-Tac International Airport that are the focus of this study.

4.04 - INDUCED ADVERSE SOCIO-ECONOMIC IMPACTS

Induced adverse impacts of commercial airports on surrounding communities are measured by both:

- Costs associated with community service requirements such as community centers, schools, nuisance abatement, child care, and public safety; and,
- Declines in a community's property tax base produced by altered demographic and business profiles that result from the airport's indirect (land use) impacts.

The manner in which Sea-Tac International Airport's induced impacts can result in a fiscal squeeze (increased service requirement costs and reduced property tax revenues) on local jurisdictions is illustrated by the Highline School District. Sea-Tac International Airport's direct and indirect impacts produced lower relative land values, increased rental properties and a change in the District's population profile to include more transient (i.e.: renter) households with lower incomes. The close association between higher/lower income households and owner/renter occupancy status has been documented in a report entitled *Washington Housing Needs* Study (1986, prepared for the State of Washington Department of Community Development by Thomas/Lane & Associates, Phillips Associates, and Raj Joshi Associates).

The children of the lower income renter households, on average, require a higher level of service from the district's schools to achieve the same outcome - whether outcomes are measured in Washington's uniform test scores, percent of high school graduates continuing on to higher education, SAT scores of high school seniors, or any other generally recognized measure of academic performance (Ward and Krueger, 1996). At the same time the District experiences these increased service requirements and incurs the cost increases of providing additional service to achieve constant school outcomes, its tax base is reduced because of the decline in relative land values caused by the Airport.

A similar pattern of causality exists between Sea-Tac International Airport's direct and indirect impacts and its induced impacts (as measured by their costs) on public safety, child care, senior centers and other types of community services.

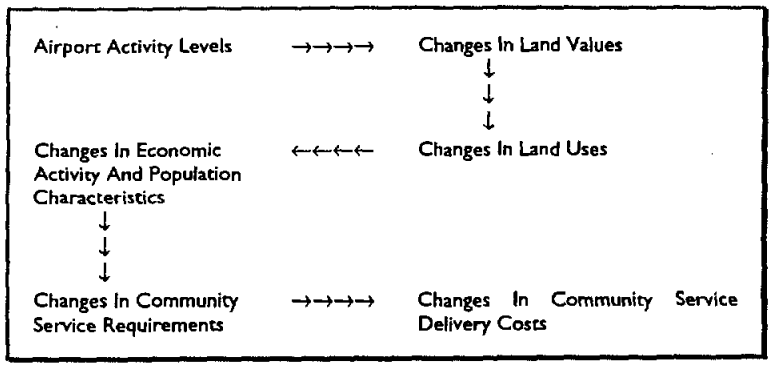
4.05 - TOTAL SOCIO-ECONOMIC ADVERSE IMPACTS

Sea-Tac International Airport's total socio-economic impacts are the sum of it direct, indirect and induced socio-economic impacts. This is true equally for the Airport's beneficial and adverse impacts. The requirement for mitigation of adverse socio-economic impacts occurs when the Airport's adverse impacts are greater than its beneficial impacts. In a global context, the relationship between Sea-Tac International Airport's total socio-economic beneficial impacts and adverse impacts is theoretically analogous to a socio-economic benefit/cost analysis.

Analyzing socio-economic mitigation requirements however, involves an analysis that is community specific. Sea-Tac International Airport's total benefits may exceed its total costs, but (as discussed in Appendix A) its benefits are widely distributed over the multi-county central Puget Sound region while its adverse impacts are concentrated in communities immediately surrounding the Airport. From the perspective of these communities, the Sea-Tac International Airport's adverse impacts far exceed its benefits; and the difference between the two represents the appropriate level of required socio-economic mitigation.

The sequence of causally linked steps that generate adverse socio-economic impacts for a community is illustrated in Figure 4.01.

Figure 4.01
Adverse Socio-Economic Causality



The relationship between direct, indirect and induced socio-economic beneficial and adverse impacts is shown in Table 4.01.

Table 4.01
Definition and Measurement of Airport Master Plan Update Impacts

Type of Impact	Adverse Impact		Beneficial Impact	
	Definition	Measurement	Definition	Measurement
Direct	Blighting of land values in the five cities in immediate proximity of Sea-Tac's approach/departure flight tracks	Decreases in value of residential land in the five cities immediately surrounding the airport over what it would have been if there was no airport	Economic activity occurring at Sea-Tac that would not occur in the absence of the airport's expansion and the time saving to travelers who use the new facilities	Number of jobs and amount of business and worker income generated at Sea-Tac as a result of the airport's expanded facilities
Indirect	Changes in land uses in the five cities immediately surrounding Sea-Tac	Down scaling of socio-economic characteristics of both businesses and population groups in the five impacted cities immediately surrounding Sea-Tac	Off-airport economic activity among companies that are users of, or closely linked to, aviation services that would not occur in the absence of the airport's expansion	Number of new jobs and amount of new business and worker income generated by companies that are users of or are closely linked to aviation transportation
Induced	Increase in community services (public safety, schools, nuisance abatement, community centers) needed to maintain constant quality of life in the five impacted cities immediately surrounding Sea-Tac	Cost of delivering the community services (public safety, schools, nuisance abatement, community centers) required to maintain constant quality of life in the five impacted cities immediately surrounding Sea-Tac	The multiplier affects of Sea-Tac's direct plus indirect impacts - i.e., increases in employment and income (over and above the combined direct plus indirect impacts) created by successive rounds of spending	Number of additional jobs and amount of additional business and worker income generated by multiplier affects from inter-industry linkages of directly and indirectly impacted companies and households

Source: FAA Document DOT/FAA/PP-92-6)

4.06 - BALANCING SOCIO-ECONOMIC COSTS AND BENEFITS

It is widely recognized that airports generate a range of socio-economic impacts. For example, FAA Advisory Circular AC 150/5020-1, Noise Control & Compatibility Planning for Airports, states on page 6 that:

> *"Many [environmental assessments] contain analysis of airport noise, compatible land use, social impacts, and induced socioeconomic impacts."*

In Section 6 - Analysis of Costs and Benefits and Selection of an Alternative (page 42), the FAA Advisory Circular states:

> *"Evaluation of the social costs and benefits of the alternatives is of equal importance with those of economics and the environment."*

Some costs adversely impact the quality of life in communities - primarily communities immediately surrounding the Airport which suffer the air pollution, visual pollution, noise pollution and surface traffic congestion produced by Airport operations. Others beneficially impact the quality of life of communities in the region - primarily communities where jobs, income and business activity are created and where local residents frequently use air transportation services.

Among researchers who have studied the decline of urban environments, the growth of airports is considered, along with facilities such as toxic waste dumps, an environmental hazard.

A recently published study by Rutgers University professors Michael Greenberg and Dana Schneider reports:

> *"Airports are associated with traffic jams, airplane crashes, and extraordinarily high levels of noise. When present, low-flying aircraft are an even more distressing source of noise than motor vehicles on highways. Jets, especially jumbo jets that cannot rise quickly, create an extremely high decibel level and a whining sound upon takeoff. Unlike a highway where the noise is relatively continuous and can often be masked by sound barriers and air conditioning, airport noise is discontinuous and is virtually impossible to mask. In addition to task interference and uncontrollable physiological changes observed in people living near highways, those residing near airports suffer from feelings of helplessness and lack of control."*

A modern growing economy appears to require the services of an international airport, but the provision of air transportation services produces adverse as well as beneficial impacts. As is true with all airports, Sea-Tac International Airport's socio-economic impacts are not distributed uniformly over the region, nor are its benefits and costs distributed proportionately among communities. An analysis of appropriate mitigation consequently requires a community by community assessment of the Airport's net socio-economic impacts.

4.07 - ANALYSIS OF EIS'S "NO ACTION" ASSUMPTION AND THE IDENTIFICATION OF AIRPORT ACTIVITY LEVELS LIKELY TO RESULT IN FUTURE LAND VALUE CHANGES

The *Airport Master Plan Update for Seattle-Tacoma International Airport* was completed in 1996 (P&D Aviation, January 1996) and its findings and forecasts are the basis for Sea-Tac International Airport's proposed expansion, including construction of the Third Runway. The *Airport Master Plan Update* forecasts are also the basis upon which the Airport's *Environmental Impact Statement* (EIS) estimated the impact of Sea-Tac International Airport's Third Runway and related improvements.

The *Airport Master Plan Update* forecasts were:

> *"Prepared as an element of the Airport Master Plan Update to be used to develop airport facilities requirements and to estimate the time frames when future improvements are needed."* (P&D Aviation, 20 August 1994)

The objective of the *Master Plan Update* forecasts was:

> *"To develop updated master plan forecasts which can account for a range of potential future airport scenarios and provide a sound basis for guiding the development of future facility improvements at the airport. Accordingly, the forecasts ... are planning level estimates and are not intended to be exact predictions."* (P&D Aviation, 20 August 1994)

The approach to, and purpose of, forecasting contained in the *Master Plan Update* is consistent with FAA guidelines, which state:

> *"The purpose of aviation forecasts is to indicate the relative timing for airport investments in a manner that minimizes forecast error costs. The idea is to forecast the different elements of aviation demand, compare that demand over time with the* ***capacity*** *[emphasis added] of an airport's various facilities, and to identify the time when new or expanded airport facilities may be necessary."* (Advisory Circular No. 150/5070-6A. US Department of Transportation, Federal Aviation Administration)

However, when using the *Airport Master Plan Update* forecasts that were the basis for recommended facilities expansions at the Airport, the Sea-Tac International Airport Master Plan Update Final EIS states in Volume 4, Appendix R (page R-5):

> *"If the proposed new runway and other* ***facility improvements*** *[emphasis added] are not constructed, the growth in demand for air travel would continue to occur as would the number of aircraft operations, because it is expected that the Region will continue to experience growth in population and income " ... and that it is reasonable to* ***assume for purposes of this environmental analysis*** *[emphasis added] that the same number of operations would occur with and without the proposed new runway."*

A disjunction exists consequently between the objective for which the Sea-Tac International Airport forecast was made and purpose to which it was put in the EIS.

The *Master Plan Update* generated a forecast, compared it with Sea-Tac International Airport's existing facilities and determined the Airport's facilities needed expansion. **The EIS used the same forecast and assumed it would occur without any facilities being expanded** at the Airport. The result of the EIS's assumption is that the Third Runway causes almost no socio-economic impacts since the same level of passenger enplanements, aircraft operations and cargo movements occurs whether or not facilities at the Airport are expanded.

As a result of this assumption, the *Sea-Tac Master Plan Update Final EIS* considers socio-economic impacts only from the perspective of residences and businesses that will be displaced by the Airport's expansion. The Final EIS (Section 6 - Social Impacts) reports that:

- 388 single family housing units, 260 condominiums/apartments, and 105 businesses will be displaced and will need to be acquired (assuming a 8,500-foot long Third Runway is built)
- All of the displaced housing units and businesses are located in the City of SeaTac, in the immediate periphery of the existing Airport.
- The Cities of Des Moines, Federal Way, Kent, SeaTac and other nearby communities contain adequate comparable housing, or developable land, to absorb the demand created by the housing displacements; although finding all of the replacement housing within the City of SeaTac is likely not possible.
- The Port of Seattle proposes to purchase avigation easements from commercial properties located within the Third Runway's runway protection zone (RPZ), unless they conflict with the FAA's RPZ safety guidelines - in which case they will be displaced and their properties acquired.
- Acquisition and displacement of existing residences would cause some disruption of community character, with disruption being greatest in the west City of SeaTac neighborhood between 12th Avenue South and SR 509,
- No minority, age, or income group will be disproportionately affected, and the intent of Executive Order 12898, "Environmental Justice" is therefore met,
- About 71% of the housing units and 91% of the apartments/condominiums to be acquired would be "affordable housing".
- And identified social impacts will be mitigated only by acquisition of properties at fair market value and payment of relocation benefits, as specified in the federal Uniform Relocation Assistance Act (US DOT, 49 CFR, Part 24).

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The Final EIS (Section 8 - Induced Socio-Economic Effects) considers the impact of property acquisitions and displacements on employment, payroll, business expenditures, and the tax receipts of affected cities. It reports the following findings:

- The total assessed value of the property to be acquired is $75.4 million, of which $54.1 million is residential property and $21.3 million is commercial property.
- As a result of property acquisitions, total annual reductions in property tax receipts would be $227,600 - $45,900 per year in the City of Burien and $181,700 per year in the City of SeaTac.
- As a result of business displacements, the total annual loss in taxabale retail sales would be $2.2 million - $0.6 million in the City of Burien and $1.6 million in the City of SeaTac [the Final EIS did not calculate or report the actual loss of retail sales tax receipts].
- Businesses located on properties to be acquired employ a total of 627 workers - 40 in the City of Burien and 587 workers in the City of SeaTac.
- Identified impacts will be mitigated only by acquisition of properties at fair market value and payment of relocation benefits, as specified in the Federal Uniform Relocation Assistance Act (US DOT, 49 CFR, Part 24).

EIS Section 8 also evaluates the reasonableness of the Final EIS's assumption that passenger enplanements, aircraft operations and cargo movements at Sea-Tac will be unaffected by whether or not any facilities - including the Third Runway - are expanded/constructed over the 25-year period, 1995 and 2020. It also evaluates the reasonableness of the Final EIS's description of the socio-economic impacts that will be caused by the proposed expansion of Sea-Tac. Finally, it proposes a more likely scenario of the relationship between facilities expansion and aviation activity at the Airport.

4.08 - THE MASTER PLAN UPDATE FORECAST

The final Sea-Tac *Airport Master Plan Update* forecast report (Volume 5) projects the demand for aircraft operations (landings and take-offs) to grow as shown in Table 4.02. The *Airport Master Plan Update* report also forecasts the mix of aircraft flying into Sea-Tac will contain larger aircraft than are in use today, as shown in Table 4.03.

The demand forecast for carrier/commuter operations and for the use of larger aircraft results from the following forecast of passenger enplanement demand, 96% of which comes from persons enplaning domestic air carriers flying in and out of Sea-Tac (Table 4.04).

Table 4.02
Aircraft Operations Forecast

Operation	1993 (actual)	2000	2010	2020	Change 1993-2020
Air Carriers	188,000	223,000	255,000	287,000	+99,000
Air Taxis/Commuters	127,000	127,000	118,000	117,000	-10,000
All-Cargo Carriers	16,000	20,000	23,000	27,000	+11,000
GA & Military	8,000	9,000	10,000	11,000	+3,000
Total	**339**	**379**	**406**	**442**	**103**

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996, Volume 5, Table 5-15)

Table 4.03
Forecast of Aircraft Mix Flying Into Sea-Tac

Operation	1993 (actual)	2000	2010	2020	Change 1993-2020
Average Seats Per Air Carrier Aircraft	155	169	189	209	+54
Average Seats Per Air Taxi/ Commuter Aircraft	28	31	36	36	+8
% of All-Cargo Carriers Over 60,000 Pounds	64%	69%	75%	80%	+16%

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996, Volume 5, Table 5-18)

Table 4.04
Forecast of Enplaning Passengers

Enplanement	1993 (actual)	2000	2010	2020	Change 1993-2020
Domestic Air Carriers	8,100,000	10,100,000	13,000,000	16,300,000	+8,200,000
Domestic Air Taxis/Commuters	600,000	700,000	800,000	900,000	+300,000
Enplanements to Canada	400,000	600,000	900,000	1,100,000	+700,000
Other International Enplanement	300,000	500,000	600,000	800,000	+500,000
Total	**9,400,000**	**11,900,000**	**15,300,000**	**19,100,000**	**+9,700,000**

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996, Volume 5, Table 5-8)

Based on these forecasts, the *Airport Master Plan Update* report proposes numerous facilities improvements, including the following:

- A new 8,500 foot runway (the so-called Third Runway, or runway 16X-34X).
- A mid-field overnight parking apron between runways 16R-34L and 16X-34X.
- Limited expansion of 4 to 6 gates on Concourse A and the Main Terminal, including expansion of the Central Parking Garage.
- Development of a new north unit terminal.
- Development of a cargo warehouse.
- Construction of a new Air Traffic Control Tower and TRACON (terminal radar control area).
- Installation of a CAT III ILS (category 3 instrument landing system) on runway 16L.
- Extension of duel parallel Taxiways A and B the full length of runway 16L-34R and a taxiway bridge over 188th Avenue South.
- Extension of runway 34R by 600 feet and relocation of the glideslope.

The *Airport Master Plan Update* report finds operations levels will reach the Airport's capacity about the Year 2000, and therefore recommends that the Third Runway and the expansion of the Main Terminal at Concourse A be completed between the Years 2001 and 2005, with additional facilities expansions occurring between 2005 and 2020.

4.09 - OTHER AVIATION FORECASTS OF SEA-TAC'S CAPACITY

A report titled, *Air Transportation Demand, Aviation Industry Trends, and Air Capacity in Washington Through 2020* (TRA Consulting, October 1992), was prepared for the Washington State Air Transportation Commission (AIRTRACT). It calculated the service capacity or annual service volume (ASV) of Washington airports and reported:

> *"With 1991 operations at 365,000, Sea-Tac is close to capacity. According to the base forecasts, the ASV calculation of 380,000 operations will be reached between 1992 and 1993."*

The Final Report of the Puget Sound Council of Government's (jointly with the Port of Seattle) Puget Sound Air Transportation Committee (January 1995) also placed Sea-Tac's annual operating capacity at 380,000 operations.

A study titled, *Phase I Forecasts: Flight Plan Study*, conducted by KPMG/Peat Marwick (July 1990) for the Port of Seattle and the Puget Sound Conference of Governments in 1990 found that its forecast of 427,000 operations for the Year 2000, assuming no changes in Sea-Tac's runways and facilities would mean that:

> *"Annual average aircraft delays would approximate 10 minutes per aircraft operation. Average delays on the order of 10 minutes are experienced at the most congested airports in the United States, such as Chicago O'Hare International Airport, LaGuardia Airport, and Washington National Airport."*

O'Hare, LaGuardia, and Washington National are referred to as "slot controlled" airports where the FAA limits any increase in total operations during each airport's peak hours.

On 19 May 1992, P&D Aviation (the same consulting organization that prepared the *Airport Master Plan Update* for Sea-Tac) wrote a "Working Paper" for the Port of Seattle titled, *Analysis of Maximum Passenger Limits at* Sea-Tac *Airport Under the No New Runway Alternative*. The report estimated that the maximum acceptable delay would be an average of 22 minutes per aircraft operation, and it analyzed both non-structural methods by which the Airport could increase capacity and the likely airline response to increased delays. It concluded that the Airport would reach capacity somewhere between 2010 and 2012, but also concluded:

> *"Obviously an average delay of 22 minutes per operation would be a significant increase in delay and would have a large impact on Airport operations as well as overall passenger service."*

The Civil Tiltrotor Development Advisory Committee's *Report to Congress* (delivered in December 1995) contains a map reference to the FAA's Office of Policy and Plans which shows airports actually congested in 1993 and which are expected to be congested by the Year 2000. Sea-Tac International Airport is shown on the map as actually congested in 1993.

Finally, the *Final EIS for the Proposed Master Plan Development Actions* discusses Port of Seattle studies about Sea-Tac's capacity limits and reports that:

> *"The inability of existing airfield facilities to accommodate traffic into the 21st century was first recognized in the mid-1980s when the Port completed the Comprehensive Planning Review & Airspace Update Study. The purpose of the study was to assess the validity of previous plans developed for Sea-Tac in light of air travel growth and other changing conditions at the Airport. While previous plans had not indicated a need for new runway capacity, this new study showed that the existing runway system would not be capable of serving the increased demand past the Year 2000."*

All past studies, including the *Master Plan Update* study, conclude Sea-Tac's existing facilities cannot accommodate the operations, enplanements and cargo demands forecast for the Year 2020. Construction of the Third Runway, and related Airport improvements, are a necessary condition for expansion of Airport activity to the 2020 forecast levels.

In the absence of the Third Runway, and related Airport improvements, the number of annual operations contained in the forecast will not be reached. Airlines will raise fares for flights originating/departing Sea-Tac, shift flights to other airports in the region, discontinue short haul commuter operations and concentrate on long haul flights into/out-of Sea-Tac, or take other actions compatible with delay reduction and higher profit margins. If the average time delay per arriving flight forecast without the Third Runway and related Airport improvements occurs, there will be some reduction in use initiated by airlines flying into Sea-Tac, passengers using the Airport, or both.

While a full, detailed investigation of the relationship between Airport expansions and the growth of Airport activity is beyond the scope of the current work effort, a review of available data on major airports in the United States indicates that there are no cases of a major airport more than doubling its number of operations and enplanements and growing continuously over a period of 45 years without having major expansions in its "airside" and "landside" facilities. With Sea-Tac's last major facility expansion completed in 1975, this is the scenario assumed in the EIS.

Additionally, the forecast equations contained in P&D's *Final Forecast Report* are not compatible with the assumptions made in the EIS. P&D's primary domestic forecast equation says that Sea-Tac's domestic enplanements are positively related to personal income in the Puget Sound Region and negatively related to domestic airfares (page 5-6, *Final Forecast Report*). When personal income in the region goes up, domestic enplanements rise; when domestic fares go up (in constant value dollars), domestic enplanements fall. P&D's primary international forecast equation says Sea-Tac's international enplanements are positively related to gross state product in the 3-state area–also in constant value dollars (page 5-11). When the 3-states' gross state product rises, international enplanements rise. The importance of these equations is that the two variables positively related to enplanements at Sea-Tac are also measures of economic growth and business activity in the Puget Sound Region and the 3-state Pacific Northwest area. Hence the P&D forecasting equations state that when business activity declines, activity at the Airport falls.

There is widespread agreement that Sea-Tac is an important contributor to economic and business growth in the Puget Sound Region and the Pacific Northwest. The implication of this position however is that if the Third Runway (and related facilities) are not built, future economic growth and business activity will be adversely affected; gross state products and regional personal income will decline; and enplanements and operations at Sea-Tac will fall.

The problem with the EIS is that it assumes that even if the Airport is not expanded, there will be no fall in Airport activity. Since the EIS is based on P&D's *Master Plan Update Study*, it has to accept the equations on which the study's forecast is predicated. The EIS consequently assumes implicitly that expansion of the Airport has no influence on future economic conditions in the Puget Sound Region or the Pacific Northwest.

Again, the EIS's assumption is difficult to maintain. First, there is a professional/technical consensus that the growth/expansion of major airports is associated with the economic health of metropolitan regions, and this is true whether one argues that airports are causal or responsive to economic activity. Second, if the expansion of the Airport has no relationship to business activity - as reflected in either personal income or gross state product - what is the rationale for undertaking the major costs and disruptions that will be required. If the behavior of the business community does not change and the non-business traveling public flies the same amount with or without the Third Runway, as the EIS also assumes, why build it? The answer, clearly, is that the business community will be adversely affected, and that airlines may be forced to raise fares at Sea-Tac if they are confronted with the delays indicated in the P&D forecast and analysis; and that both of these consequences will cause enplanements and operations at Sea-Tac to decline. Which is to say, the EIS's assumption is methodologically flawed. As a result it is not compatible with either public statements made by the Port that link Sea-Tac to the region's and area's economic growth or the analysis of socio-economic impacts developed as part of the Sea-Tac Impact Mitigation Study.

The EIS says one thing while the *Update* study equations say another. The socio-economic analysis contained in the Sea-Tac Impact Mitigation Study takes the position that the forecasting equations contained in the P&D analysis are appropriate and the Airport is positively associated with the rate of economic growth in the Puget Sound Region and Pacific Northwest. This leads to the conclusion that if the Third Runway is not built, business activity will be adversely affected, personal income and gross state product will not grow as fast as otherwise, and enplanements and operations will be consequently reduced.

Whether looked at analytically or empirically, consequently, the probability that there will be no reduction in Sea-Tac activity levels whether or not the Third Runway, and related facilities, are built is so low that it cannot be taken seriously.

4.10 - SEA-TAC'S LIKELY CAPACITY LIMITS

Airport capacity and airport delay are closely related concepts. As discussed by the FAA in Advisory Circular 150/5060-5 (23 September 1983), *Airport Capacity and Delay*:

> *"As demand approaches capacity, individual aircraft delay is increased. Successive hourly demands exceeding the hourly capacity result in unacceptable delays. When the hourly demand is less than the hourly capacity, aircraft delays will still occur if the demand within a portion of the time interval exceeds the capacity during that interval. Because the magnitude and scheduling of user demand is relatively unconstrained, reductions in aircraft delay can best be achieved through airport improvements which increase capacity."*

The concept of Airport Capacity is usually defined in technical literature to be the maximum number of aircraft operations that can be accommodated at an airport in an hour.

An airport's Annual Service Volume (ASV) is an estimate of the number of operations the airport can accommodate in a year. At any airport, the ASV is a function of the runway-use configuration, percent arrivals, percent touch-and-go's, taxiways, airspace limitations, runway instrumentation, and weather conditions. Most of the analyses referred to earlier in this chapter use standard, FAA recommended modeling procedures to estimate Sea-Tac's ASV at approximately 380,000 operations.

Annual operation levels will be effected by year-to-year weather fluctuation, changes in air traffic control (ATC) procedures that affect airspace limitations, and other factors. As the ASV level after which airport improvements are required if future demand levels are to be accommodated, 380,000 operations is Sea-Tac's consensus threshold. As shown in Table 4.05, Sea-Tac is forecast to reach 379,200 operations in the Year 2000, effectively bumping up against its threshold ASV of 380,000 operations.

As shown in Table 4.05, Sea-Tac is forecast to increase aircraft operations by 62,400 (16.5%) after the Year 2000. Passenger enplanements are forecast to increase by 7,700,000 (67.5%) after the Year 2000. Cargo movements are forecast to increase by 370.0 metric tons (72.5%) after the Year 2000. These increases occur after Sea-Tac reaches its current ASV, and they occur because the Airport accommodates its forecasted demand levels by building the Third Runway, and related airport improvements. These activity levels will not occur at Sea-Tac without construction of the Third Runway, and related improvements. The consequences of the growth of operations, enplanements and cargo movements after Sea-Tac reaches its threshold ASV of 380,000 in the Year 2020, are the socio-economic impacts that require mitigation.

Table 4.05
Forecast of Operations, Enplanements and Cargo

Operation	1993 (actual)	2000	2010	2020
Aircraft Operations	**339,500**	**379,200**	**405,800**	**441,600**
Change in Aircraft Operations	---	+39,700	+26,600	+35,800
Cumulative Change	---	+39,700	+66,300	+102,100
Cumulative Change after 2000	---	---	+26,600	+62,400
Enplaned Passengers	**9,400,000**	**11,400,000**	**15,300,000**	**19,100,000**
Change in Enplaned Passengers	---	+2,000,000	+3,900,000	+3,800,000
Cumulative Change	---	+2,000,000	+5,900,000	+9,700,000
Cumulative Change after 2000	---	---	+3,900,000	+7,700,000
Air Cargo Tons (metric tons)	**381,000**	**510,000**	**680,000**	**880,000**
Change in Air Cargo Tons	---	+129,000	+170,000	+200,000
Cumulative Change	---	+129,000	+299,000	+499,000
Cumulative Change after 2000	---	---	+170,000	+370,000

(Source: P&D Aviation, 20 August 1994, Tables 5-8, 5-11 and 5-15)

SECTION 5
AIRPORT MITIGATION CASE STUDIES

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AIRPORT MITIGATION CASE STUDIES

5.01 - AIRPORTS WITHIN THE UNITED STATES

Airports across the United States have found it necessary to reduce or mitigate the impacts of their aircraft operations on surrounding residents and businesses. Airport mitigation is generally accomplished under the requirements of Federal Aviation Regulations (FAR) Advisory Circular Part 150 (commonly referred to as Part 150).

In order to determine the type of mitigation measures typically used, the mitigation programs of six US airports were analyzed studied. These airports were selected because of similarities with Sea-Tac International Airport's proposed project or as examples of the most recent mitigation programs. These selected case studies represent airports of varying size, location, and operations. All airports contacted had developed (or were developing) mitigation and remediation programs as a result of airport expansion projects. Telephone and in-person interviews were conducted with representatives of the following airports:

- **Colorado Springs International Airport (Colorado Springs, Colorado)** - Colorado Springs has experienced rapid recent growth as a result of the new Denver International Airport (DIA). Some of this growth at Colorado Springs has been attributed to higher landing fees at DIA. Also, it is now a longer trip to DIA (north of Denver) than it was to Denver's former international airport (Stapleton), so the Colorado Springs airport (south of Denver) has become more "geographically attractive". At the time of the telephone interview, Colorado Springs was in the process of developing a mitigation plan in support of a new runway project to meet this increasing demand.

- **Dallas/Fort Worth International Airport (Dallas, Texas)** - One of the largest and busiest airports in the world, DFW began operation in 1974. The land occupied by DFW is located between the cities of Dallas and Fort Worth. At the time DFW was initially designed, it was presumed that this site would be large enough to contain the ultimate airport build-out plan and all the accompanying impacts. As DFW continued to grow over the years, so too did the area surrounding the airport property. Today, DFW is surrounded by development. In the late 1980s, DFW began the process of developing a plan to add two new runways. Due to the amount of surrounding development, DFW had to develop a mitigation program for its four neighboring communities.

- **Lambert Field/St. Louis International Airport (St. Louis, Missouri)** - Lambert Field is an older urban airport which serves the St. Louis metropolitan area. It has an on-going mitigation and remediation program for its established neighboring communities, including Bridgeton (a low-income community).

- **Minneapolis/St. Paul International Airport (Minneapolis, Minnesota)** - Rather than build a new airport away from the city, the Minneapolis/St. Paul Airport is planning for the expansion of its existing facility. The Airport is located between the two cities (southeast of Minneapolis) and is surrounded by established communities, such as Richfield and Bloomington.

- **San Diego International Airport (San Diego, California)** - San Diego Airport is located in downtown San Diego along the shoreline of San Diego Bay. At 474 acres and with a single runway, it is the smallest airport that was studied. The area surrounding the airport is mostly non-residential and the arrival and departure paths bring aircraft at low altitudes over downtown and some residential areas. The cost of real estate and the expansion of the San Diego metropolitan area make siting a new airport impractical. According to Airport staff, the best option is to acquire approximately 500 acres adjacent to the Airport which is currently owned by the US Navy.

- **San Francisco International Airport (San Francisco, California)** - San Francisco Airport is an older facility, but it is located in San Francisco County and adjacent to San Francisco Bay. Consequently, much of the arrivals and departures are made over water. The area surrounding the Airport has developed with mostly industrial uses, with some residential areas located to the north and west. Because of the expense associated with a new airport and due to the fact that land in the San Francisco area is not available, improvements are being made to the existing facility.

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Table 5.01 summarizes the general information on the airports studied.

Table 5.01
General Information on Case Study Airports

Information	Airport					
	Colorado Springs	Dallas/ Fort Worth	San Diego	Saint Louis	Minneapolis/ St. Paul	San Francisco
Size	7,200 acres	18,000 acres	474 acres	2,100 acres	3,100 acres	(a)
Annual Enplanements	2,500,000	57,000,000	13,000,000	(a)	27,000,000	(a)
Annual Operations	54,750	876,000	230,000	(a)	465,000	300,000
Airport Administered By	City of Colorado Springs	Dallas/ Fort Worth Airport Board	San Diego Unified Port District	City of St. Louis	Minnesota Airport Commission	Consolidated City/County of San Francisco
Cost of Mitigation Program	(a)	$150 million	$11 million (schools) $15 million (Phase 1)	(a)	(a)	(a)

(a) Information not available at time of survey

(Source: 1996 Airport Case Study Survey)

5.02 - AIRPORT/AIRCRAFT NOISE

Noise is the most common impact that is mitigated by US airports. However, how the noise mpacts are measured and assessed are at the heart of an ongoing debate between airports and airport communities. Noise is typically generated by the following airport activities::

- By aircraft on either arrival or departure (departures are much louder than arrivals).

- By aircraft on the ground when backing away from the gate under their own power ("power-backs").

- By aircraft on the ground when performing engine maintenance tests which require powering up the engines to almost full thrust ("maintenance run-ups").

Noise is considered to be both an aviation and an environmental impact, so both the FAA and he United States Environmental Protection Agency (USEPA) define the means by which noise s measured. The standard noise descriptor mandated by these Federal agencies is the Day-Night Average Sound Level (LDN).

LDN provides a numerical description of the weighted 24-hour cumulative noise energy level using the A-weighted decibel scale over one year, with nighttime aircraft operations being weighted heavier than daytime operations. The LDN formula weighs aircraft operations during "daytime" operations (7:00 AM to 7:00 PM) at a 1-to-1 ratio. "Nighttime" operations (7:00 PM to 7:00 AM) are weighted at a 10-to-1 ratio.

Because LDN is often referred to as an "average" noise level, it is not an accurate representation of individual noise events for a specific location. This is the core of an ongoing debate between airport-area communities and airports regarding this method of noise measurement. Airport-area communities feel that Single-Event Noise Levels (SELs) are the more accurate representation of noise associated with airports. As of January 1997, neither FAA nor USEPA recognize SELs as the accepted means to measure airport noise.

Aircraft are classified by "stages" which has a direct correlation to their noise output:

- Old Stage 1 aircraft are no longer allowed to operate in the United States.

- Operation of Stage 2 aircraft will be prohibited in the United States by the Year 2000.

- Stage 3 aircraft will be allowed to operate in the United States beyond the Year 2000. Stage 2 aircraft that have been retrofitted with new engines - "hush kits" - which meet Stage 3 standards also will be allowed to operate.

- Establishment of a new Stage 4 standard is being considered, but it is anticipated that it will result in a minimal additional noise reduction (approximately 3 dBA).

US airports rely on FAR Part 150 to define how noise will be measured and mitigated. Part 150 is also the basis for FAA funding for noise mitigation programs. Airports that exceed the Part 150 requirements may be eligible for additional FAA funding (on a case-by-case basis) or may fund the mitigation programs from other sources.

5.03 - NOISE MITIGATION - PURCHASE/RELOCATION

Residential, business, school, church, and other properties that are identified to be within excessive noise areas are purchased outright by the airport. Residents and businesses are also eligible for relocation payments under the Uniform Relocation Assistance Act (US Department of Transportation, 49 CFR, Part 24). In these cases, the purchased area usually becomes part of the airport property and is restricted from future development/redevelopment.

A variation on the purchase/relocation program is some form of sales assistance. The airport will either act as a broker or as a third-party agent to foster the sale of a property where the airport will not take title. Assistance programs that maintain residential neighborhoods do not remove the area's incompatibility potential. In some cases, assistance programs can be used to assemble land to replat and redevelop former residential areas as airport-oriented non-residential uses.

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DFW International Airport has developed the most comprehensive airport purchase program. Not only are homes within the 65 LDN contour purchased, but the purchase area is extended to encompass entire neighborhood areas, sometimes extending as far as the 62 LDN contour.

St. Louis has only purchased homes to the 70 LDN contour. The Minneapolis/St. Paul program is currently being developed, but will also likely purchase only to the 70 LDN contour.

The least comprehensive program is in San Francisco, where no homes are purchased. Residential areas are subjected to 70 and 75 LDN contours. Similarly, the areas surrounding San Diego's airport are non-residential and are not offered mitigation.

At the time of this report, Colorado Springs was evaluating the need for off-site noise mitigation, but no information was available from the airport.

5.04 - NOISE MITIGATION - SOUND INSULATION

Residential, business, school, church, and other properties that are identified - by the airport's interpretation - to be within noise areas that are not excessive enough to warrant purchase, are usually offered sound insulation programs.

These vary from airport to airport, but generally involve added attic insulation, triple-paned windows, and in some cases, central air conditioning. Sound insulation, however, does not adequately address mitigation of outdoor activities associated with homes, schools and parks.

In some cases, sound insulation of older, deteriorating homes can exceed that structure's value. When air conditioning is added, some residents, businesses, schools, or churches cannot afford the additional electric utility costs associated with keeping the system running.

Sound insulation is offered by all airports studied, but with variations in each program. For instance, DFW offered sound insulation to homes outside the 65 LDN "neighborhood" contour, in concert with an avigation easement (as discussed in Section 5.05).

St. Louis offers sound insulation as an option for homeowners in the 65 to 70 LDN contour (the other options being sales assistance or an avigation easement). In the poorer neighborhoods that surround St. Louis airport, the value of sound insulation exceeds the value of the structure. The airport considers sound insulation to be adequate compensation for the homeowner in these cases. San Francisco and Minneapolis have similar insulation programs for homes, businesses, schools and churches.

Title 21 of the California Noise Standards requires areas 65 CNEL and higher to be mitigated. CNEL (Community Noise Equivalent Levels) contours are very similar to LDN contours, except in the way aircraft operations are weighted (the LDN weighting approach described previously). The CNEL approach weighs operations in the following manner:

- 7:00 AM to 7:00 PM - 1-to-1 ratio.
- 7:00 PM to 10:00 PM - 3-to-1 ratio.
- 10:00 PM to 7:00 AM - 10-to-1 ratio.

The area surrounding San Diego's airport is mostly non-residential, but the airport has identified upwards of 750 homes that may require sound insulation under a Phase 1 mitigation program (still being developed). The airport has also almost completed an $11 million sound insulation of 6 schools.

Minneapolis offered sound insulation to area schools, but also required that the facilities stay in service for a specific period of time (20 years), so that improvements would not be made to an obsolete facility.

5.05 - NOISE MITIGATION - AVIGATION EASEMENTS

Residential, business, school, church, and other properties that are identified - by the airport's interpretation - to be impacted by aircraft activity also may be offered an "avigation easement". This instrument is similar to other property easements, except that it is permits passage through a property's air space, not on the ground like a utility easement.

Avigation easements are usually offered to property owners in exchange for a one-time payment and become a permanent attachment to the property deed. Payment may be a portion of the value of the property (sometimes as high as 25%) or may be offered in combination with a sound insulation program.

DFW once again had the most comprehensive avigation easement program. Easements were offered to homeowners in the 60 LDN contour at 25% of the fair market value of the home. However, DFW also learned that homeowners perceived the 25% payment as a beginning point for negotiation. Many turned down the easement in the hopes that a higher price would be offered (which was not).

DFW also acknowledged that the 25% payment was approximately equal to the reduction in property value as a result of aircraft activity. In theory, the avigation easement would give the owner of a $100,000 home a one-time cash payment of $25,000. The homeowner could then sell his/her home for as low as $75,000 and walk away from the transaction with no financial impact. The buyer would get a $100,000 home for a reasonable price and would be aware of the avigation easement at the time of purchase.

In other airports, the avigation easement was a requirement of accepting the sound insulation improvements. No cash payment was offered for the easement.

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5.06 - PERMANENT NOISE MONITORING

All the airports studied had some form of permanent noise monitoring program in place. San Francisco conducts quarterly noise monitoring tests, while others monitor it continuously. The number and location of the monitors varies with each airport. St. Louis, for instance, has 13 permanent and 10 temporary noise monitoring stations. Minneapolis has 24 permanent noise monitoring stations and integrates the data with their geographic information system (GIS) data. San Diego has been providing permanent noise monitoring since 1974, and now has 24 permanent monitoring stations, also integrated with their GIS system.

5.07 - TRAFFIC/TRANSPORTATION MITIGATION

When an airport's capacity is enhanced, the number of enplanements and operations also increases. This has an associated increase in ground traffic headed to and from the airport. Most airports contacted do not offer any mitigation for off-site access and circulation. The exceptions were DFW and San Diego.

DFW has been working with the Texas Department of Transportation to construct and east/west connector highway which links two regional freeways (SH 161 and SH 360) with the airport's south entrance. San Diego will be building a new $28 million access roadway to improve airport access, but the new roadway will still connect with surface streets, rather than regional freeways.

5.08 - CONSTRUCTION MITIGATION

Except for the mitigation required as part of obtaining various permit approvals,. none of the airports contacted offered a mitigation program during project construction,. DFW was able to utilize dirt removed for construction of an adjacent freeway (SH 161) to build the new east runway. The remaining construction spoils were contained totally on-site. Given DFW's size (18,000 acres), construction traffic and staging was contained totally within airport property. DFW is also accessible from several major regional freeways, so there was no traffic impacts on the few local streets adjacent to the airport.

San Francisco, too, relies on regional freeways for its primary airport access. While these freeways are also heavily traveled by non-airport traffic, there is no capacity-enhancing project currently underway at the airport.

Minneapolis representatives stated that they had not yet assessed the potential construction impacts. They projected that most impacts would be traffic related (construction vehicles) and that the system of regional freeways accessing the airport would be satisfactory to handle the increase in traffic.

5.09 - COMMUNITY MITIGATION

Of the airports contacted, none offered any mitigation measures to reduce the impact on neighboring community facilities and services. Beyond sound insulation of structures, no measures were developed to mitigate impacts to parks, public safety services, the tax base, or other community facilities and services.

Absence of these measures, however, does not diminish their need. The St. Louis airport does have close-in residential and is experiencing compatibility problems which are yet to be resolved. (The other airports studied are not located in as urbanized a setting as Sea-Tac is. Airports in Colorado Springs, Dallas/Fort Worth, and San Franscisco are located away from population centers. San Diego's airport, while close to downtown, is surrounded by industrial and non-residential uses.)

5.10 - NOISE ABATEMENT PROCEDURES

All of the airports contacted have in place some formal noise abatement program which regulates the operation of aircraft on the ground and aloft during certain hours. Airports near lakes, bays, or other bodies of water commonly require a "water approach" for arrivals and departures.

Others restrict the use of Stage 2 aircraft during certain hours, or require those aircraft to follow arrival/departure corridors which fly over non-residential areas. The most restrictive nighttime procedures are at San Diego, which prohibits all departures, except for emergencies, between the hours of 11:30 PM and 6:30 AM. This includes cargo and passenger service.

5.11 - MAINTENANCE RUN-UPS

It is common to restrict or prohibit maintenance run-ups in the evening and early morning hours. St. Louis allows no more than a 2-minute run-up at 90% power. San Francisco minimizes, but does not prohibit run-ups. Minneapolis restricts aircraft operations between 11:00 PM and 6:00 AM to Stage 3 aircraft whenever possible, and prohibits maintenance run-up during these hours. San Diego will be phasing out Stage 2 aircraft by 1999 (one year earlier than required) and prohibits maintenance run-ups between the hours of 11:30 PM and 6:30 AM, with a restriction on departures also during that time.

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5.12 - POWER BACKS

The way aircraft back away from the gate also can create noise. Aircraft can either back away from the gate under their own power - called "power backs" - or be pushed back using an airplane tug ("push backs"). Most airports now use push backs as a standard procedure. St. Louis even designed their aprons to slope slightly away from the gate to facilitate push backs.

San Diego and Minneapolis have no formal policy on power backs, but both say that push backs are more common.

5.13 - CASE STUDY SUMMARY

The airports contacted represent a cross-section of American airports in urbanized and urbanizing areas. They appear to "go by the book" when it comes to FAA-funded mitigation. Mitigation and remediation programs seem to be confined to noise abatement - through property acquisition, sales assistance, sound attenuation/insulation, avigation easements, and airport abatement procedures.

Most neighboring communities feel that the airports do not do enough to adequately compensate them for the "privilege" of having the airport as their neighbor. They routinely cite the inadequacy of LDN as a true measurement of noise impact, and promote the use of SEL contours instead.

Airport communities also have to live with reductions in the tax base, diminishing residential property values, increased traffic, and other community impacts, without any compensation or assistance from airports, the states, the FAA, the USEPA, or any other agency.

In summary, aside from noise, no other impacts were routinely mitigated at the case study airports.

SECTION 6
WASHINGTON STATE MITIGATION CASE STUDIES

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WASHINGTON STATE MITIGATION CASE STUDIES

6.01 - WASHINGTON STATE EXPERIENCE

The State of Washington has demonstrated its desire to go beyond "traditional" mitigation measures as defined by Federally-funded programs. Several members of the consulting team, as well as staff from the City of Burien, have been involved in some of these projects.

For the purposes of comparison, the following case studies have been summarized:

- Puyallup Indian Tribe Land Claim
- Boeing/Everett Facility Expansion
- Satsop Power Plant Site Mitigation Plan
- IH-90 Freeway Improvement Project

Each case study exhibits mitigation that exceeds traditional physical remediation to include socio-economic and cultural mitigation.

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6.02 - PUYALLUP INDIAN TRIBE LAND CLAIM

The Federal Government, the State of Washington, and various Pierce County local governments reached an agreement with the Puyallup Indian Tribe in August 1988 to relinquish tribal claims to land, tidelands, mineral claims, submerged lands, non-fisheries, and water rights. In return, the Tribe received 899 acres of land valued at $37.46 million, given on an "on-reservation" status.

The Tribe was also paid $24 million which was placed in an annuity fund. Each enrolled Tribe member 21 years old and older received a $20,000 cash payment. For remaining Tribe members under 21, a similar cash payment will be made upon their twenty-first birthday (by August 2009). Mitigation measures also included a $22 million trust fund to be used for housing, education and cultural preservation, supplemental health care, elderly care and day care centers, substance abuse, burial and cemetery maintenance. This trust fund would exist in perpetuity along with the Tribe.

The State and the Port of Tacoma jointly agreed to fund a $9.235 million fisheries enhancement program. The mitigation agreement required that the Tribe agree to specific projects to reduce conflicts between tribal fishing and commercial shipping. Job training was offered to 265 Tribe members, with 115 jobs offered in the private sector (valued at $2.5 million).

The agreement also granted $9.5 million to the Tribe for economic development of existing tribal lands, $2.0 million in business development funds for enterprises by Tribe members, and $2.5 million (the latter to be paid over a 20-year period) for the Tribe's participation in the Blair waterway project (widening and deepening of the channel to open it to foreign trade). In exchange, the Tribe agreed not to assert their taxation power for "non-trust" lands and to not exercise their authority over these lands and over "non-Indians" to protect the fisheries.

6.03 - BOEING/EVERETT FACILITY EXPANSION

This agreement involved the City of Everett, Washington and the Boeing Company which allows Boeing to expand their airplane manufacturing facility. The agreement was reached in September 1991, pursuant to the Washington State Environmental Protection Agency (SEPA) review and approval of the project.

The agreement lists specific Federal, State, and local requirements which Boeing must meet in order to mitigate identified impacts, including air, earth, surface water, plants, animals, wetlands, hazardous materials, and transportation. The Boeing expansion project would be denied if these conditions are not met. The agreement identified both on-site and off-site mitigation requirements.

On-site, Boeing must submit a revised site plan to the City of Everett which reflects the SEPA "decision document" and specifies construction requirements. Boeing must manage on-site environmentally-sensitive areas, landscaping, surface water, and transportation. The expansion project site was divided into five areas, with specific impacts and mitigation measures identified for each area.

Off-site, Boeing would provide $46.1 million for transportation mitigation, including purchasing 10 buses and 80 vans for ride-sharing purposes, and funding transportation system improvements and demand management strategies. Boeing would also fund a program ($3.9 million) to address company-related traffic through residential neighborhoods.

The project EIS projected that the expanded facility would attract 54,000 new workers to the area. Boeing agreed to invest $2.0 million in the "Local Initiative Support Coalition", seek new employees from the local impact area, and coordinate with local community colleges to develop vocational training in skills areas needed by Boeing. Boeing would also fund the necessary additions to the City's public safety personnel. At 1.9 firefighters and 1.4 security officers per 1,000 employees, that resulted in 102 new firefighters and 76 new security officers.

6.04 - SATSOP POWER PLANT SITE MITIGATION PLAN

This agreement involved the Washington Public Power Supply System (WPPSS) and the Washington State Department of Wildlife. involving proposed additions to the nuclear power plants operated by WPPSS. In return for project approval, WPPSS would replace and/or compensate for any fish and wildlife damage or loss resulting from the project. WPPSS also agreed to the State's measures to protect wildlife.

The agreement first required a habitat evaluation preservation analysis of the Satsop site, which determined the need for mitigation. The agreement ensured compliance, along with a site certification process.

Different areas on or near the construction site were identified which would require mitigation. In some cases, mitigation only consisted of preservation of the existing habitat. In other areas, mitigation involved limits to vehicular access, limits to thinning and tree removal, eliminating root rot, enhancing brush areas, maintenance of foraging fields, and preservation of ponds. The agreement also identified preservation zones in which no land management or wildlife enhancement activities would be conducted.

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6.05 - IH-90 FREEWAY IMPROVEMENT PROJECT

An agreement between the Washington State Highway Commission ("Commission"), Metro, King County, and the cities of Seattle, Mercer Island and Bellevue was reached regarding proposed IH-90 improvements (between IH-405 and IH-5).

The Commission's design for IH-90 would incorporate all of the provisions for community amenities and for the reduction of adverse environmental impacts. The Commission agreed to participate with the City of Seattle in a planning study which addressed redevelopment of areas adjacent to the project. Additionally, the Commission would transfer fee title of all State-purchased lands (outside the project right-of-way) to the local jurisdictions at the lowest cost possible. IH-90 would be operated in a manner that encourages growth and development in King County's urban areas, but not in undeveloped areas. A review team was established to monitor the project and advise the Commission on the development of IH-90. The Commission would also become responsible for the design and construction of the portion of IH-90 that can be funded with Federal interstate funds, as well as the other parties responsible for the design and construction of the remaining facilities.

This agreement ended more than 20 years of dispute between the local cities and the Commission.

SECTION 7
POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

SECTION 7
POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

7.01 - INTRODUCTION

In evaluating the potential environmental impacts of the proposed Third Runway project, measures that were utilized in other airport and/or public facility projects have been employed for the five impacted communities being studied. The following impact measures were utilized in this study and are discussed in more detail below:

- **Noise and Vibration**
  - LDN (average day/night noise level)
  - SEL (single-event noise level)
  - Threshold analysis
  - Vibration
- **Air Quality**
  - Air emissions (aircraft)
  - Carbon monoxide air emissions (vehicles)
  - Hydrocarbon air emissions (vehicles)
  - Air toxics
  - Fugitive emissions (dust)
  - Point sources
- **Surface Water Quality and Hydrology**
  - Runoff volume
  - Erosion and sediment
  - Spills
- **Ground Water Quality and Hydrology**
  - Aquifer recharge
  - Contamination
- **Wetlands**
  - Wetland destruction
- **Floodplains**
  - Encroachment
  - Reduced flood storage capacity
  - Increased flow rates and volumes

- **Aesthetics and Visual**
  - Ground shadow
  - Visibility of aircraft
  - Visibility of fill

- **Other Environmental Mitigation**
  - Special status species and habitats
  - Cultural resources
  - Coastal zones
  - DOT Section 4(f) resources

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Table 7.01
EIS Chapters Reviewed for Environmental Issues Mitigation Measures

Chapter	Section	Title
--	--	Executive Summary
III	--	Affected Environment
IV	2	Land Use
IV	7	Human Health
IV	9	Air Quality
IV	10	Water Quality and Hydrology
IV	11	Wetlands
IV	12	Floodplains
IV	19	Earth
IV	20	Solid Waste
IV	21	Hazardous Substances
IV	23	Construction Impacts
IV	24	Aesthetics and Urban Design
V	--	Probable, Unavoidable, Adverse Environmental Impacts and Mitigation Measures
Appendix C	--	Noise Impacts
Appendix D	--	Air Pollutant Methodology
Appendix N	--	Aesthetic Views and Photos
Appendix P	--	Natural Resource Mitigation Plan
Appendix Q	--	Water Studies
Appendix Q-A	--	Baseline Groundwater Study
Appendix Q-B	--	Preliminary Water Conservation Plan
Appendix Q-C	--	Concepts for Using a Constructed Aquifer to Manage Airport Stormwater
Appendix R	--	Responses to Public Comments

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996)

The discussion of mitigation measures for the environmental issues includes construction and operation (post-construction) of the facilities associated with Master Plan Update implementation. The discussion follows the same format of the topics discussed in the Environmental Issues evaluation. Although some topics may not be impacted by construction or operation of the proposed facilities.

The mitigation measures evaluation includes some discussion of the proposed mitigation measures in the Final EIS for the Sea-Tac International Airport Master Plan Update. These mitigation measures were discussed in the EIS Chapters shown in Table 7.01.

7.02 - NOISE AND VIBRATION - LDN MITIGATION

As part of the EIS, aircraft noise effects were evaluated for the existing conditions. Master Plan Update implementation during construction will not impact aircraft noise levels which are a part of Airport operations. However, there may be an interaction between aircraft noise and construction activities. This area of concern was not addressed in the EIS. Therefore, as part of the mitigation measures for noise, this evaluation should be conducted by the Port of Seattle to determine potential impacts on the areas to the northwest, west and the southwest of the Airport during construction. This evaluation should be done using an appropriate computer model, taking into consideration the models that were used in the EIS.

Average noise contours (LDN) are computer-generated by a software program (the Integrated Noise Model) to represent the impact of air traffic at various years and/or service levels. Figure 7.01 shows the projected noise contours for the Airport's "preferred alternative" in the Year 2020 as included in the Airport's EIS.

Previous research by FAA has determined that exposure to certain noise contours is incompatible with certain types of land uses. Recent airport noise mitigation programs - such as the program in place at Dallas/Fort Worth International Airport developed by Landrum & Brown, Inc. - have shown the importance of mitigating entire residential neighborhoods, rather than individual structures. In the Dallas/Fort Worth program, entire neighborhoods were mitigated which fell within the 65 LDN contour. This resulted in mitigation of individual structures which were below the projected 65 LDN contour line.

Two types of mitigation measures were projected to address LDN noise impacts.

Acquisition and Redevelopment

For the area surrounding Sea-Tac International Airport, neighborhoods which were impacted by the Airport's projected 65 LDN contour were considered to be exposed to excessive noise impacts which result in the reduction of property values, quality of life, and stability of the neighborhood.

(A neighborhood which was one-third or more within the 65 LDN contour was considered to be impacted.) In those cases, this study recommends that these neighborhoods be considered candidates for redevelopment as non-residential uses. Costs involved with acquiring and redeveloping a neighborhood will involve residential and business acquisition and relocation costs in accordance with the Uniform Relocation Assistance Act (US DOT, 49 CFR, Part 24). Also included is the removal of structures, improvement of the utility infrastructure, and packaging and marketing the land for redevelopment. It is estimated that these costs will average $760,000 per acre, exclusive of additional on-site improvements.

Table 7.02 details the neighborhoods, Highline schools, and Highline Community Hospital facilities that have been identified as candidates for acquisition and redevelopment.

Table 7.02
Neighborhoods Identified for Acquisition and Redevelopment

City	Area	Amount
Burien	**Neighborhoods (1)**	
	Northeast neighborhood	$537.0 million
	Schools (3)	
	Cedarhurst Elementary School	$ to be determined
	Sunnydale Elementary School	$ to be determined
	Marine Tech Lab School	$ to be determined
Des Moines	**Neighborhoods (4)**	
	West Central neighborhood	$364.0 million
	North Central neighborhood	$183.2 million
	East Central neighborhood	$475.8 million
	South Des Moines neighborhood	$373.9 million
	Subtotal - Neighborhoods	**$1,396.9 million**
	Schools (3)	
	Midway Elementary School	$ to be determined
	Pacific Middle School	$ to be determined
	Mount Rainier High School	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for acquisition and redevelopment.	
Normandy Park	No neighborhoods in Normandy Park have been identified for acquisition and redevelopment.	
Tukwila	No neighborhoods in Tukwila have been identified for acquisition and redevelopment.	
Other Highline School District Schools	**City of Seattle**	
	Southern Heights Elementary School	$ to be determined
	Unincorporated King County	
	Beverly Park Elementary School	$ to be determined
	Satellite Alternate High School	$ to be determined
Total Study Area		**$1,933.9 million (plus costs to be determined)**

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While acquisition and redevelopment is the most far-reaching mitigation measure, this study acknowledges that it is also the most invasive of the mitigation measures studied. While it fully addresses land use incompatibility, it also has several serious repercussions:

- Acquisition and redevelopment removes existing neighborhoods and tax base.
- Viable redevelopment of acquisition areas may take several years.
- Acquisition and redevelopment is the most costly mitigation measure. A detailed land use inventory of each neighborhood need to be completed in order to develop more focused cost-estimates and projections.
- Acquisition and redevelopment is not in accordance with each City's comprehensive plan. Plans will have to be modified and revised if this mitigation measure is pursued.
- Acquisition and redevelopment as described above is based upon neighborhood boundaries identified by City representatives. Further study is required to determine if these are the most acceptable boundaries, or if "sub-neighborhoods" can be identified to minimize the need for complete redevelopment as shown.

It is recommended that the neighborhoods and schools identified in Table 7.02 be considered as "potential candidates" for acquisition and redevelopment. However, before any acquisition or redevelopment is initiated, a study should be conducted to further consider each neighborhood and school to determine if there are other less disruptive alternatives to acquisition and redevelopment. This study should be completed prior to construction of the Third Runway.

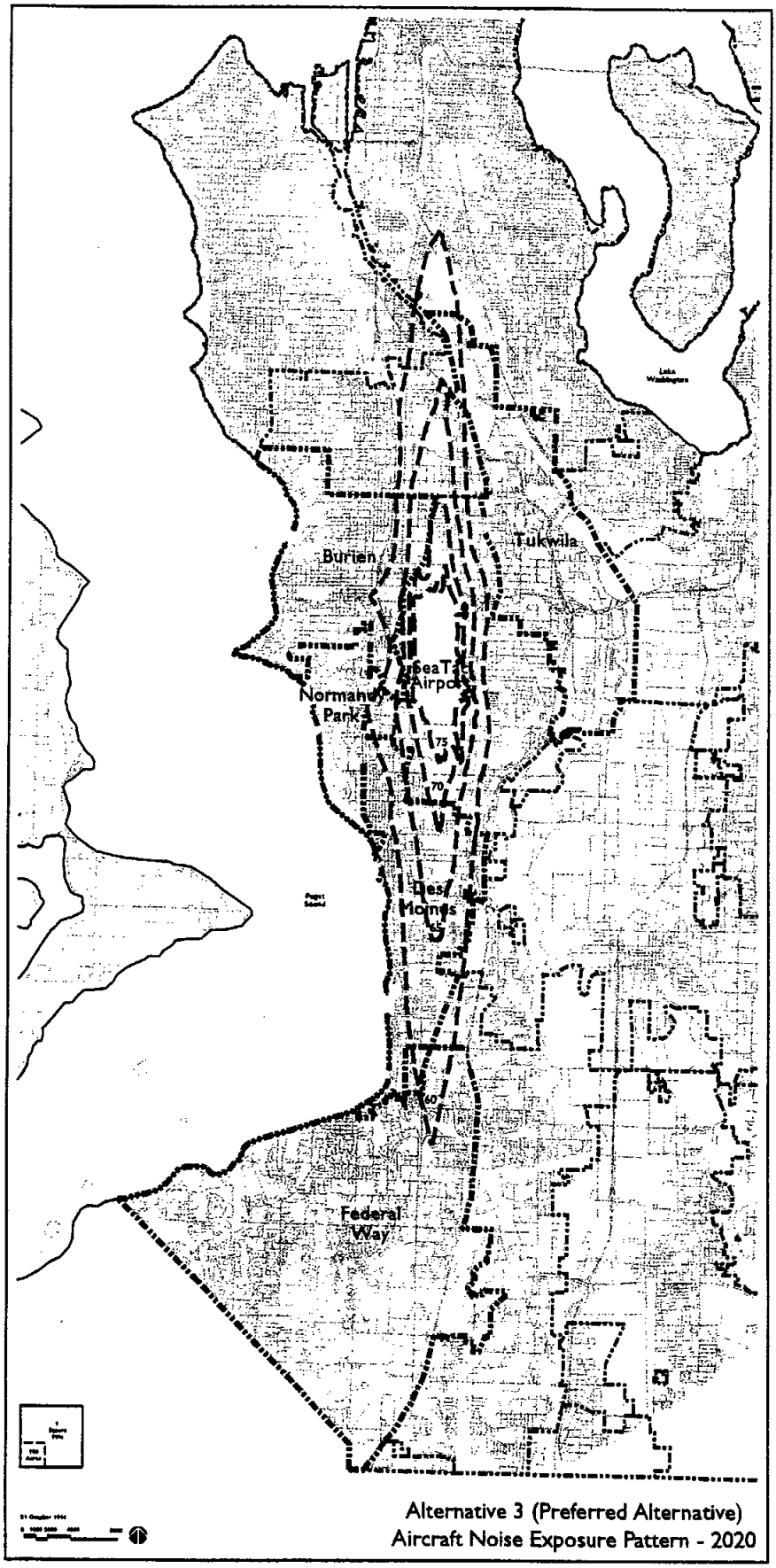
Sound Insulation and Avigation Easements

Neighborhoods where one-third or more of the area falls within the 60 to 65 LDN contour are subject to noise impacts that impact residents' ability to fully enjoy their properties, but does not threaten the stability of the neighborhood.

In these cases, this study recommends that these neighborhoods be considered candidates for sound abatement insulation and avigation easements. Costs will include attic and wall insulation, triple-glazed window systems, and air conditioning for older structures.

Avigation easements should be a function of property value. For example, Dallas/Fort Worth International Airport has offered avigation easements in the amount of 25% of the property value (value is figured as a comparable value unaffected by an airport).

It is estimated that these costs will average $37,500 per acre, and should vary according to density and age of development.



Alternative 3 (Preferred Alternative)
Aircraft Noise Exposure Pattern - 2020

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Table 7.03 details the neighborhoods, Highline schools, and Highline Community Hospital facilities that have been identified as candidates for acquisition and redevelopment.

Table 7.03
Neighborhoods Identified for LDN
Sound Insulation and Avigation Easements

City	Area	Amount
Burien	**Neighborhoods (4)**	
	East Central neighborhood	$23.4 million
	Southeast neighborhood	$10.0 million
	Gregory Heights neighborhood	$21.5 million
	Downtown neighborhood	$12.0 million
	Subtotal - Neighborhoods	**$66.9 million**
	Schools (7)	
	Gregory Heights Elementary School	$ to be determined
	Hazel Valley Elementary School	$ to be determined
	Salmon Creek Elementary School	$ to be determined
	Seahurst Elementary School	$ to be determined
	Shorewood Elementary School	$ to be determined
	Sylvester Middle School	$ to be determined
	Highline High School	$ to be determined
	Hospitals (1)	
	Highline Community Hospital	$ to be determined
Des Moines	**Neighborhoods (4)**	
	North Hill neighborhood	$23.4 million
	Zenith neighborhood	$20.6 million
	West Woodmont neighborhood	$16.1 million
	East Woodmont neighborhood	$11.5 million
	Subtotal - Neighborhoods	**$71.6 million**
	Schools (4)	
	Des Moines Elementary School	$ to be determined
	North Hill Elementary School	$ to be determined
	Olympic Elementary School	$ to be determined
	Parkside Elementary School	$ to be determined
Federal Way	**Neighborhoods (2)**	
	Star Lake neighborhood	$19.5 million
	Wildwood neighborhood	$20.7 million
	Subtotal - Neighborhoods	**$40.2 million**
Normandy Park	**Neighborhoods (1)**	
	East Central neighborhood	$3.4 million
	Schools (1)	
	Marvista Elementary School	$ to be determined
Tukwila	**Neighborhoods (1)**	
	M.I.C. neighborhood	$40.6 million

Table 7.03 (continued)

City	Area	Amount
Other Highline School District Schools	**City of SeaTac (7)**	
	Bow Lake Elementary School	$ to be determined
	Madrona Elementary School	$ to be determined
	McMicken Heights Elementary School	$ to be determined
	Valley View Elementary School	$ to be determined
	Chinook Middle School	$ to be determined
	Tyee High School	$ to be determined
	SeaTac Occupational Skills School	$ to be determined
	City of Seattle (5)	
	Hilltop Elementary School	$ to be determined
	Mount View Elementary School	$ to be determined
	Riverton Heights Elementary School	$ to be determined
	Cascade Middle School	$ to be determined
	Evergreen High School	$ to be determined
	Unincorporated King County (1)	
	White Center Heights Elem. School	$ to be determined
Total Study Area		**$222.7 million (plus costs to be determined)**

While insulation and avigation easements are less disruptive than acquisition and redevelopment, there is still the potential to change the character of the neighborhood.

It is recommended that the neighborhoods and schools identified in Table 7.03 be further studied to determine the full extent of the proposed insulation and easement program. This study should be completed prior to construction of the Third Runway.

7.03 - NOISE AND VIBRATION - SEL MITIGATION

Single-event noise levels (SEL's) are those associated with an individual aircraft, either on the ground or aloft. Airport neighbors across the country argue that this is a more appropriate measure of noise impact. Airports, the FAA, and USEPA counter with the fact that LDN is the only acceptable measure of noise. Rather than attempt to resolve this philosophical disagreement, this study will identify areas that are subject to SEL impacts and recommend mitigation measures that may or may not be implemented. In the Sea-Tac area, neighborhoods that are within the 400-foot topographic line and within 5 miles of the Airport are likely to experience SEL noise associated with ground and flight operations.

For these areas, the same sound abatement insulation and avigation easement program would be an appropriate response. In some cases, these neighborhoods will also be within 60, 65, or higher LDN contours, thus being eligible for other programs.

Table 7.04 identifies the neighborhoods and schools impacted by SEL noise.

Table 7.04
Neighborhoods Identified for SEL
Sound Insulation and Avigation Easements

City	Area	Amount
Burien	**Neighborhoods (2)**	
	North Central neighborhood	$18.3 million
	Central neighborhood	$5.8 million
	Total - Burien	**$24.1 million**
Des Moines	**Neighborhoods (2)**	
	Redondo neighborhood	$7.9 million
	Downtown neighborhood	$4.1 million
	Total - Des Moines	**$12.0 million**
Federal Way	No neighborhoods in Federal Way have been identified for SEL insulation and easements.	**$0.0 million**
Normandy Park	**Neighborhoods (2)**	
	Bonniewood neighborhood	$1.5 million
	North neighborhood	$13.0 million
	Total - Normandy Park	**$14.5 million**
Tukwila	**Neighborhoods (5)**	
	Allentown neighborhood	$13.0 million
	Cascade View neighborhood	$11.4 million
	Foster neighborhood	$18.2 million
	Thorndyke neighborhood	$15.7 million
	Riverton neighborhood	$10.3 million
	Total - Tukwila	**$68.6 million**
(No Highline School District or Highline Community Hospital facilities have been identified for SEL insulation and easements.)		
Total Study Area		**$119.2 million**

While insulation and avigation easements are less disruptive than acquisition and redevelopment, there is still the potential to change the character of the neighborhood.

It is recommended that the neighborhoods identified in Table 7.04 be further studied to determine the full extent of the proposed insulation and easement program. This study should be completed prior to construction of the Third Runway.

7.04 - NOISE AND VIBRATION - OVERFLIGHT MITIGATION

Neighborhoods that are subjected to direct overflights of arriving and departing aircraft often experience psycho-acoustic noise impacts (aircraft noise appears louder because the aircraft is visible). Departure operations are approximately three times as loud as arriving operations (depending on the specific aircraft), due to the different power requirements associated with climb-out. Figure 7.02 shows the projected arrival and departure flight-tracks that were included in the Airport's EIS.

Some neighborhoods impacted by overflights may already be mitigated by programs associated with LDN and SEL remediation. For those that are outside these areas, it is recommended that further sound abatement insulation and avigation easements be offered to the neighborhoods in question. An alternative method for mitigating these areas is for the flight tracks and arrival/departure procedures to be modified to avoid direct overflights of populated areas.

Table 7.05
Neighborhoods Identified for Overflight
Sound Insulation and Avigation Easements

City	Area	Amount
Burien	**Neighborhoods (1)**	
	Shorewood neighborhood	$22.5 million
	Total - Burien	**$22.5 million**
Des Moines	No neighborhoods in Des Moines have been identified for overflight insulation and easements.	**$0.0 million**

Figure 7.02
Future Flight Tracks

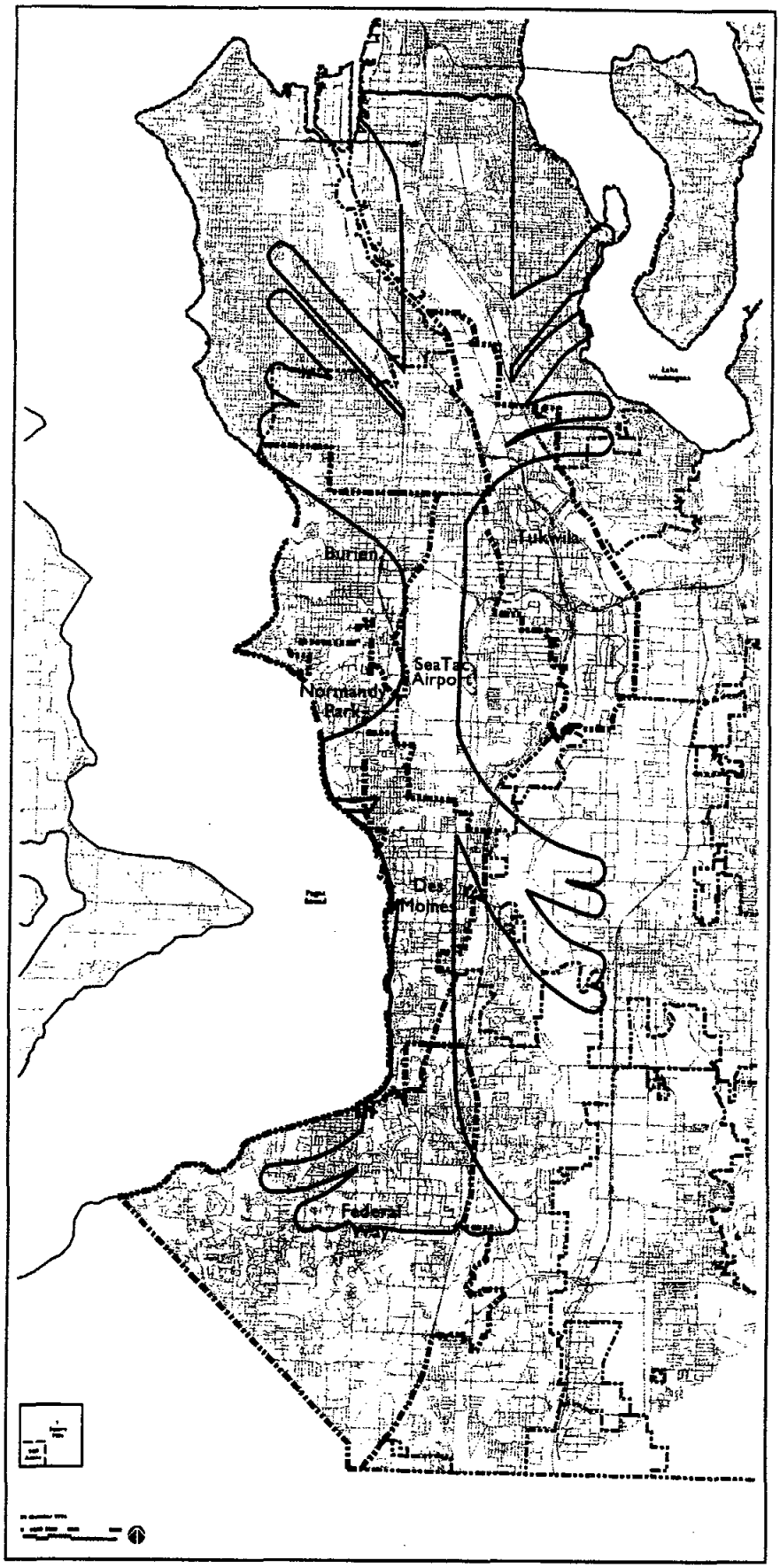

Table 7.05 (continued)

City	Area	Amount
Federal Way	Neighborhoods (12)	
	Marine Hills neighborhood	$19.8 million
	Easter Lake neighborhood	$27.3 million
	Steel Lake neighborhood	$13.0 million
	First Avenue neighborhood	$20.5 million
	Kitts Corner North neighborhood	$11.2 million
	City Center neighborhood	$16.1 million
	Mar-Cheri neighborhood	$0
	Dash Point neighborhood	$0
	Lakota neighborhood	$0
	Mirror Lake neighborhood	$0
	Twin Lakes neighborhood	$0
	West Campus neighborhood	$0
	Total - Federal Way	**$107.9 million**
Normandy Park	Neighborhoods (5)	
	Riviera neighborhood	$9.0 million
	East Central neighborhood	$9.3 million
	Normandy Province neighborhood	$1.5 million
	Arrow Lake neighborhood	$1.1 million
	South neighborhood	$17.0 million
	Total - Normandy Park	**$37.9 million**
Tukwila	Neighborhoods (1)	
	Ryan neighborhood	$4.3 million
	Total - Tukwila	**$4.3 million**
(No Highline School District or Highline Community Hospital facilities have been identified for overflight insulation and easements.)		
Total Study Area		**$172.6 million**

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Table 7.05 identifies the neighborhoods and schools that are projected to be impacted by overflight noise as a result of the projected new flight tracks. Neighborhoods identified with a "$0" cost of mitigation are areas that will only require flight track modifications (not insulation and easements).

It is recommended that the neighborhoods identified in Table 7.05 be completely insulated and granted avigation easements as noted prior to operation of the Third Runway.

7.05 - NOISE AND VIBRATION - VIBRATION IMPACTS

In addition to noise, low frequency vibration can affect both individuals and structures. The EIS did not adequately address the projected impacts of noise-induced vibration on the neighborhoods within the study area. Further measurement and modeling will be necessary to adequately address vibration impacts. For neighborhoods that are within the 60 LDN, 65 LDN or higher, other mitigation programs will address vibration impacts. Neighborhoods identified as candidates for acquisition/redevelopment or insulation/easement will also be simultaneously be mitigated for vibration impacts.

The EIS did not provide information on potential impacts of vibration from construction activities. This may be particularly relevant for residences in the vicinity of the earthwork activities. This information should be provided by the Port of Seattle prior to the start of construction of activities associated with Master Plan Update implementation.

7.06 - NOISE AND VIBRATION - ADDITIONAL MITIGATION

Cumulative Construction Noise and Vibration Impacts

A number of other projects are proposed for the Sea-Tac International Airport area. These projects may occur at the same time as Master Plan Update implementation. The EIS had a cursory evaluation of potential construction noise cumulative impacts. A more detailed noise cumulative impacts discussion should be provided by the Port of Seattle prior to the start of construction associated with Master Plan Update implementation. The discussion should include all known proposed projects for the Airport area and projects which could interact with the fill haul routes. Also, this should include appropriate modeling.

Aircraft Noise and Vibration Impacts (Operation)

- **Run Latest Version of INM** - Version 5.1 of the INM was released in late 1996. This is a Windows '95-based version and will has at least the following enhancements: ability to plot noise contours on a street map; and an expanded data base of aircraft including the Boeing 777 and MD90. At the time the EIS was done, noise data for a Boeing 767-200 with JJ-9-D was substituted for the Boeing 777 aircraft.

Because of at least the greater accuracy of the INM, Version 5.1; the ability to plot noise contours on a street map; and the expanded base of aircraft information, the noise model should be rerun by the Port of Seattle using this new version. This will allow confirmation of the data from INM, Version 4.11 and the most up-to-date information available on the newer aircraft noise characteristics.

- **SEL Data** - The EIS noise study did not have an extensive evaluation of sound exposure level (SEL). The INM was used to show the SEL contours for one approach to Runway 16R and one departure from Runway 16L for five aircraft types which dominate the current and future fleet mixes at the Airport. This information should be developed by the Port of Seattle prior to Master Plan Update implementation and should include the SEL contours relationship to health problems, in particular, sleep and speech interference. Thus, this should be done concurrent with re-evaluating the noise data using INM, Version 5.1.

- **55 LDN Contour** - The EIS for the Flight Plan Project (Puget Sound Regional Council and Port of Seattle, October 1992), included noise assessment information associated with the 55 LDN level and a SEL of 80 dBA. This SEL was selected because it is often used to supplement the LDN analysis and 80 dBA corresponds to the level at which sleep disturbance and speech interference start to occur. Similar information should be developed prior to Master Plan Update implementation by the Port of Seattle.

- **Permanent Noise Monitoring** - Currently there are eleven noise monitoring stations. The Port of Seattle is upgrading the noise monitoring system to approximately twenty-five stations. Some of these monitoring stations should be located along the EIS predicted noise contours and consideration should be given to the need for additional stations if the twenty-five stations are deemed inadequate.

- **Arrivals Only** - The need for the proposed Third Runway is based on flight delays during inclement weather for arrivals. Therefore, the Third Runway should be used only for landings. This will help control noise levels associated with departures.

- **Runway Use Restriction** - There should be no arrivals on the Third Runway, except for emergencies, between 9:00 PM and 7:00 AM.

- **Additional Reviews** - As part of all FAR Part 150 reviews, a working group/oversight commission should be allowed to participate with the FAA and other parties. Near-term reviews should include at least the following:

  - An evaluation of the actions needed to apply, monitor and enforce the North Flow Daytime Departure Duwamish/Elliott Bay Noise Abatement Procedures specified in the 1990 Noise Mediation Agreement. Investigate, and if possible, implement the use of this corridor during periods of lighter activity such as midmorning and mid-afternoon.

  - An evaluation of the feasibility of extending the "nighttime" hours of use for the North Flow Nighttime Departure Noise Abatement Procedures from 10:00 PM to 6:00 AM to the evening "shoulder" of 8:00 PM to 10:00 PM, and to the early morning "shoulder" of 6:00 AM to 7:00 AM.

  - A re-evaluation of the use of "minimum population exposure" flight tracks, in light of the increase in flight operations and the shift in the overall importance of arrival noise as Stage 2 aircraft are phased out.

  - An evaluation of the potential net benefits of preferential runway use during "low activity" periods (e.g., would more use of the east runway result in reduced overall population noise exposure?), coupled with an expanded residential insulation and acquisition program, as needed.

  - An evaluation of types of land uses and their compatibility with Airport operations in all areas affected by noise should be conducted based on noise contours at the 55, 60, 65, 70 and 75 LDN.

- **Additional Threshold Data** - The EIS also did not provide detailed information about the threshold above (TA) noise metric with respect to sensitive noise receptors such as schools, hospitals, etc. This information should be developed by the Port of Seattle as part of the re-evaluation of the noise data using the INM, Version 5.1.

- **Engine Run-Ups** - Permanent and/or portable "hush houses" should be used in conjunction with engine maintenance activities, in particular run-ups.

- **Noise Abatement** - The Port of Seattle should continue the following aircraft noise reduction/abatement programs including:

  - *Noise Budget Program* - The Airport will move toward an all Stage 3 aircraft fleet by limiting the amount of noise airlines are allowed to make each year; the goal agreed to in the Noise Mediation Agreement (Port of Seattle and Mestre Greve Associates, 31 March 1990) is to reduce noise by the Year 2001.

  - *Nighttime Limitations Program* - This program involves phasing out Stage 2 aircraft during nighttime hours; effective 1 October 1995, Stage 2 jet aircraft may not operate between 10:00 PM and 7:00 AM unless granted an exemption or variance (e.g., delays due to weather, air traffic control delays, etc.).

  - *Ground Noise Control Program* - Aircraft are not allowed to back away from gates using engine power, instead they must be pushed away by "tugs". Run-ups during the daytime are allowed only at designated locations on the north and south ends of the Airport (aircraft must face into the wind so that jet blast is directed back across the airfield); between 10:00 PM and 7:00 AM. Run-ups are allowed only under special circumstances such as for a departure.

  - *Overflight Noise Abatement Procedures* - Initial "straight-out" departure corridors are in a narrow flight path; Duwamish/Elliott Bay corridor for arriving and departing flights keep aircraft over water and industrial areas as much as possible; nighttime procedures to keep flights over Puget Sound waters as much as possible.

- *Flight Path Monitoring* - The Airport's Noise Abatement Office monitors jet flights in the noise abatement corridors.

- *Noise Monitoring* - Eleven station permanent noise monitoring system to record noise exposure levels in the Airport area should be used until the system has been expanded to at least 25 stations.

- *24-Hour Noise Information Line* - Provides information on noise issues or accepts noise complaints.

- **Nighttime Noise Budget** - In Appendix R of the EIS, it is indicated that the nighttime noise budget and limitations program is designed to address noise issues associated with aircraft categorized as having FAR Part 36 Stage 2 noise levels. Therefore, the program will expire with the completion of the scheduled phase out of these aircraft between 2000 and 2003. These two components are an integral part of the aircraft noise reduction/abatement programs and the Port of Seattle should continue the implementation of the nighttime limitations program beyond the Stage 2 phase out schedule. Depending on the status of the nighttime noise budget program in relation to Stage 3 aircraft, this program also should be continually evaluated and updated based on the different stages of aircraft.

- **Re-Run INM for Run-Ups** - INM Version 4.11 has the capability to compute noise levels due to airplane engine run-up operations. This is particularly useful for noise information around airplane maintenance facilities. Because concern has been expressed about noise levels associated with existing run-up and maintenance operations, and the proposed south aviation support area activities, a discussion of this feature and data for the Sea-Tac International Airport should be provided by the Port of Seattle for both the existing and future conditions.

- **INM Parameters** - A number of assumptions must be made which can affect the outcome of the INM. Sensitivity tests can be used to evaluate how much change in a key input value or assumption might affect the outcome. A similar approach would be useful in evaluating the assumptions used in the future noise modeling and the resultant data in the EIS. Thus, sensitivity tests should be conducted and evaluated by the Port of Seattle.

  Also, if possible, information on the range and standard deviations of the LDN and other data in the EIS should be presented. The range and standard deviations of the data could provide an indication of potential impacts beyond the noise contours shown in the EIS.

- **Noise Mediation Agreement** - The noise mediation agreement (Port of Seattle and Mestre Greve Associates, 31 March 1990) indicates that as technology with noise barriers develops, the Port of Seattle will evaluate their use. It is not clear if during the future conditions evaluation the use of noise barriers was included. This may be particularly useful in the vicinity of any new maintenance facilities in addition to the use of "hushing" equipment. Appendix R of the EIS also mentions the use of vegetation to help reduce noise. The EIS indicates in Chapter 1 that as part of the Master Plan Update objectives, Airport noise is to be attenuated through the use of berms and barriers (Port of Seattle, May 1994).

The Port of Seattle should provide information on the status of using noise barriers at Sea-Tac International Airport and if this was included in the EIS noise modeling.

- **Amend the Four-Post Plan** - The Port of Seattle should provide information on amending the FAA Four-Post Plan in order to minimize low-altitude overflights of residential areas as discussed in the Flight Plan Project EIS (Puget Sound Regional Council and Port of Seattle, October 1992).

- **New Technologies** - The Port of Seattle should provide information on the status of implementing new technologies such as Microwave Landing System (MLS) and Global Positioning Satellite System (GPS) as part of potentially reducing noise impacts to areas around the Airport.

- **Aircraft Operations** - Appendix C Noise impacts in the EIS indicates that existing aircraft operations were based on average daily operations. It is not completely clear how many operations per hour this equates to. The air quality analysis used an aircraft peak hour activity level of about 88 operations (43.9 arrivals and 43.9 departures). The relationship, if any, between the noise and air quality aircraft operations or activity levels should be explained better by the Port of Seattle taking into consideration the noise and air quality analyses used the August and June 1994 Official Airline Guide (OAG), respectively. Also, the discussion should include comments on the Airport being able to accommodate 60 arrivals per hour which was recently mentioned by the Port of Seattle (26 March 1996; 1 August 1996).

- **Reduced Noise Levels** - The Port of Seattle should provide information on the ability to maintain the Airport's reduced noise level goals. This discussion is particularly relevant because of the recent concerns about the Port not sufficiently reducing on-the-ground noise impacts by 1 April 1996 (Puget Sound Regional Council, 27 March 1996).

- **Low Frequency Noise and Vibration** - The Port of Seattle should investigate methods and provide a report for mitigating low frequency noise and vibration.

Run-Up, Departure Roll, Thrust Reverse, Taxi, Idle and Auxiliary Power Noise

Sea-Tac International Airport's Ground Noise Study Phase II (Mestre Greve Associates, 20 February 1994) provided information on findings concerning noise impacts from aircraft engine run-up, departure roll, thrust reverse, taxi, idle and auxiliary power. In addition, recommendations on these areas were made. However, more information should be provided by the Port of Seattle on the below listed recommendations in order to evaluate their status and the need for additional studies/measures to help reduce Airport noise impacts.

- **Run-Up Mitigation** - The use of monitoring data to identify aircraft run-up noise including placing monitoring stations near run-up locations and sending the noise data to the noise office for recording. Documentation of the number and type of run-ups and what role they play in the total ground noise impact. Information on technological advances in run-up noise control facilities and their implementation at the Airport.

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- **Departure Roll Noise Mitigation** - Information on the status of limiting operations of Stage 2 aircraft and their complete elimination during nighttime operations. Documentation that the noise insulation program takes into consideration mitigation of noise at lower frequencies to account for the lower frequency of Stage 3 aircraft.

- **Thrust Reverser Noise Mitigation** - Results of a taxiway use study; the development of a new taxiway system at the Airport; and a nighttime taxiway use plan to help reduce thrust reverser noise. Results of the Port of Seattle working with airlines to implement procedures that take advantage of the additional stopping distance to minimize the use of thrust reversers during the nighttime hours.

- **Taxi and Idle Noise Mitigation** - Measures to minimize the number of aircraft queuing at the runway ends during peak activity time periods (e.g., gate hold procedures and capacity enhancement measures). Use of a location at the north/south ends of the Airport for conducting pre-departure engine run-up so that noise is directed towards the buy-out areas, in particular at night. Study of various runway and taxiway designs on aircraft queuing and the resulting taxi and idle noise. Feasibility of constructing a noise berm at the west boundary of the Airport near the runway ends in order to help mitigate taxi and idle noise at the runway ends.

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- **Auxiliary Power Noise Mitigation** - Steps to install fixed power at gates, etc., to minimize the use of auxiliary power, in particular during the nighttime hours. Installation of fixed power systems that include preconditioned air. Identification of the source of long duration steady state noise in the north cargo area and its mitigation.

On-The-Ground Reduction of Nighttime Noise Impacts

- **North Flow Noise Abatement** - The Port of Seattle and Federal Aviation Administration should more aggressively enforce compliance with the North Flow Nighttime Departure Noise Abatement Procedures and provide evidence of this enforcement (e.g., copies of notices of violations to airlines).

- **Nighttime Restrictions** - The Port of Seattle should provide evidence of the continuing effort to minimize flights between 10:00 PM and 6:00 AM.

- **Limit Nighttime Variances** - The Port of Seattle should provide evidence of its efforts to minimize the number of variances issued for the Nighttime Limitations Program.

- **Stage 2 Aircraft** - The Port of Seattle should provide evidence of its working with owners/operators of Stage 2 aircraft (including those under 75,000 pounds) which are currently exempt from the Nighttime Limitations Program, to obtain their cooperation in minimizing or eliminating the use of these aircraft between 9:00 PM and 7:00 AM.

- **Stage 3 Aircraft** - The Port of Seattle should provide evidence of its efforts to ensure the use of Stage 3 aircraft by airlines, in particular foreign airlines.

- **Engine Run-Ups** - The Port of Seattle should provide evidence of its continuing to work with airlines to minimize nighttime engine run-up. This should include the use of hush houses.

Vibration

The EIS vibration analysis should be expanded by the Port of Seattle to include qualitative and quantitative information on at least the following items for residences, schools and hospitals in the Airport area - human whole body vibration, annoyance and interference to humans caused by building vibration, and building structural damage.

With respect to humans, the evaluation should look at impacts on working efficiency, health, safety and comfort. The evaluation should incorporate the information and methodology discussed by the International Organization for Standardization (ISO; International Organization for Standardization, 1985a and b; 1989).

Cumulative Impacts

Other area projects which may be in operation concurrent with Master Plan Update implementation were only briefly discussed in the EIS noise analysis. In order to more adequately address the relationship between these projects and the activities associated with Master Plan Update implementation, the cumulative impacts discussion should be re-evaluated by the Port of Seattle. This should include appropriate modeling. The evaluation also should include all known proposed projects in the Airport area.

7.07 - AIR QUALITY - AIRCRAFT EMISSIONS MITIGATION

Increased air emissions as a result of increased aircraft activity have not been adequately addressed in the Airport's EIS. The EIS showed air sample data from monitors located 5 miles away from the Airport. With prevailing winds and aircraft altitude, aircraft emissions pose a regional problem. **Indeed, the potential for air quality impacts exists in every neighborhood in the five impacted communities.**

To mitigate the impacts of aircraft emissions, a runway utilization program should be developed by the Airport to minimize on-ground operations and queuing for departures and for arrival gates. Acceleration of the introduction of Stage 3 aircraft (which are more fuel efficient and less polluting) will also positively effect air emissions.

Acceleration of Stage 3 aircraft is already being initiated by many airlines. This mitigation measure, therefore, has no costs associated with it that are attributable to the Port of Seattle or any public agency.

7.08 - AIR QUALITY - VEHICULAR CARBON MONOXIDE MITIGATION

Increased activity at Sea-Tac will result in increased vehicle-trips. This increased traffic has the potential to overload existing road-ways and intersections. Additional traffic demand studies will be necessary to allocate traffic to specific "magnets" (such as the Airport).

Intersection improvements may run $500,000 per intersection, plus $100,000 per city for traffic improvement studies. However, additional improvements to be made to reduce traffic noise (see Section 8) will also positively impact intersections and traffic-flow.

Therefore, to avoid "double-counting", all intersections identified in Section 8 for improvements associated with traffic noise improvements will simultaneously improve carbon monoxide "hot spots".

7.09 - AIR QUALITY - VEHICULAR HYDROCARBON MITIGATION

Increased activity at Sea-Tac will result in increased vehicle-trips. This increased traffic has the potential to increase hydrocarbon emissions, associated with high-volume, high-speed traffic. Additional traffic demand studies will be necessary to allocate traffic to specific "magnets" (such as the Airport). However, many traffic-related problems may be already resolved by improvements designed to address traffic noise/LEQ impacts (see Section 8). Therefore, to prevent "double-counting", all intersections identified in Section 8 for improvements associated with traffic noise improvements will simultaneously improve traffic-flow and hydrocarbon impacts.

7.10 - AIR QUALITY - AIR TOXICS MITIGATION

Neighborhoods located under or near flight tracks (Figure 7.02) may also experience pollution by air toxics associated with aircraft. With the exception of neighborhoods that are redeveloped, most of these areas cannot be protected from these impacts. The modification of flight tracks and acceleration of Stage 3 aircraft use will help to reduce the potential for these impacts.

As stated in Section 7.07, the introduction of newer, cleaner Stage 3 aircraft, combined with flight track modifications, will have the most positive impact in the study area. These improvements are either currently being made (as in the case of acquisition of new aircraft by airlines) or can be accommodated for virtually no cost (flight track modifications). However, this study also recommends a long-term investigation into the effects of air toxics on human health.

7.11 - AIR QUALITY - FUGITIVE EMISSIONS MITIGATION

Dust associated with the construction of the Third Runway will impact neighborhoods that are adjacent to the north, south, and west sides of the Airport., specifically:

- **Burien** - North East, East Central, and South East neighborhoods.
- **Des Moines** - North Hill, West Central, North Central, and East Central neighborhoods.

It is recommended that a Dust Control Plan be included in the contractor's permit to address these impacts. Measures should include wetting down of the construction area, wetting down and covering stockpiled fill material, and covering of haul trucks on and off-site. The requirement of a Dust Control Plan should be satisfied prior to construction of the Third Runway.

7.12 - AIR QUALITY - POINT SOURCE MITIGATION

On-Airport pollution associated with both the construction and operation of the Third Runway will impact neighborhoods that are adjacent to the north, south, and west sides of the Airport., specifically:

- **Burien** - North East, East Central, and South East neighborhoods.
- **Des Moines** - North Hill, West Central, North Central, and East Central neighborhoods.

Individual on-Airport sites may contribute to air pollution and has the potential to impact neighborhoods that are north, south, and west of the Airport. Fueling operations associated with aircraft, rental cars, and other motor pools should include vapor recovery systems and the use of oxygenated or alternative fuels (as appropriate). On-Airport pollution control equipment and air quality monitors should be installed as part of the rebuilding of Sea-Tac Airport.

7.13 - AIR QUALITY - ADDITIONAL MITIGATION

Re-Analysis

Once the sources of fill material are known and the haul routes have been identified and approved, the construction vehicle air quality analysis should be re-evaluated and the dispersion analysis should be re-done in order to better predict potential air quality impacts prior to the start of construction. The analysis should extend from the Airport area to the fill source areas.

Particulate Matter

As part of the re-evaluation of the construction vehicle air quality analysis, the Port of Seattle should work with appropriate regulatory agencies to obtain PM_{10} data which is more representative of the Puget Sound Region. This should entail the establishment of additional air quality monitoring stations, in particular in the vicinity of the Airport.

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Air Quality Monitoring

As part of construction activities, PM_{10} and CO should be monitored in the vicinity of the fill sources, along the haul routes and in the Airport construction area.

Fugitive Dust

During construction at least the following measures should be used to reduce fugitive dust emissions:

- Appropriate materials should be applied at the source fill areas and Airport construction areas to control fugitive dust emissions; if chemicals are used, Material Safety Data Sheets (MSDS) should be provided which show that the materials have a low adverse risk to humans and the environment.
- To reduce soil deposits on roads and subsequent fugitive dust, the Port of Seattle should implement procedures for minimizing tracking of soil on area roads at all construction areas including the source fill areas.
- The Port of Seattle should use gravel, paving and revegetation as appropriate to control fugitive emissions during construction.

Other Construction Requirements

- **Covered Trucks** - The Port of Seattle should ensure that all trucks hauling fill material should be covered to control fugitive dust emissions.

- **Emissions Control Devices** - All construction equipment should have appropriate emissions control devices and should comply with the vehicle inspection program.
- **Vehicle Maintenance** - All construction equipment should be well maintained to reduce emissions.
- **Vehicle Idling** - All construction vehicles should avoid prolonged periods of vehicle idling.
- **Batch Plants** - If concrete batch plants are used during construction, the Port of Seattle should provide documentation of their compliance with appropriate regulatory requirements.
- **Additional Study** - The Port of Seattle should provide a more detailed evaluation of cumulative impacts on air quality of construction associated with Master Plan Update implementation and other known proposed projects in the Airport area.

Air Quality Mitigation (Operation)

- **Clean Air Act Conformity** - The Port of Seattle should provide information on Master Plan Update implementation Clean Air Act Conformity. This should include at least the following - a copy of draft analysis/plan for review and comment; a copy of draft final analysis/plan for review and comment; and copies of the EPA, PSAPCA, DOE and any other approvals for the conformity analysis/plan.
- **Certification of Compliance with Air Quality Standards** - The Port of Seattle should provide at least the following information on the State of Washington's Certification of Compliance with Air Quality Standards - copy for review of documentation submitted to the Governor's Office and a copy of Governor's Air Quality Certificate.
- **Additional Air Monitoring** - The closest DOE and PSAPCA monitoring sites are approximately 5 miles from the Airport; there are no monitoring sites west, northwest and southwest of the Airport; CO and PM_{10}, are the most frequently monitored parameters; in order to make monitoring information such as this more useful; permanent monitoring stations should be established in and around the Airport area. Parameters monitored should include the AAQS parameters as well as toxic pollutants of concern such as 1,3 - butadiene, formaldehyde and benzene; quarterly monitoring reports should be provided which discusses the monitoring data with respect to AAQS and State of Washington ASILs.
- **Location of Air Monitors** - Air quality monitoring stations should be located in areas which have historically had complaints, even though the EIS screening analysis did not show violations of AAQS.
- **Area Dispersion Analysis** - After one year of baseline data has been collected at the new air quality monitoring sites, the area dispersion analysis should be re-evaluated by the Port of Seattle for both the existing and future conditions.

- **Mobile Sources** - The Port of Seattle should re-evaluate the existing and future roadway intersection analysis to confirm the accuracy of the evaluation in the EIS and to correct for the following inconsistencies discussed by EPA (6 June 1996):

  "The modeling results for air quality in the Sea-Tac International Airport Final EIS conflict with those from the draft EIS for the SR 509/South Access Road Corridor Project at two intersections (both EISs used the same models). The two EIS's model conflicting results for existing conditions and future action alternatives at South 188th and International Boulevard, and South 200th and International Boulevard for the average CO concentrations indicated on page 4-7 in the SR 509 EIS, as compared with the same analyses on page IV.9-11H in the Sea-Tac International Airport Final EIS. Both analyses model CO violations for existing conditions, but for future action alternatives the Sea-Tac International Airport analysis shows modeled CO violations where the SR 509 analysis does not."

  "Modeled air quality impacts at South 200th and International Boulevard are shown in the South Aviation Support Area Final EIS (pages 4-106 to 109 and 112), the 28/24th Street Arterial Final EIS (page 3.22) and the CTI Final EIS (page 4-7, 8). The results vary for each project ranging from 5.0 to 13.3 parts per million CO."

- **Port Vehicles** - All Port of Seattle and vehicles associated with Airport operations should comply with required vehicle emissions inspections and maintenance programs.

- **Air Toxics** - The Port of Seattle should provide information on the following or conduct the indicated studies related to air toxics:

  - Long-term air toxics data should be collected in the Airport area throughout different months of the year.

  - The Port of Seattle should conduct an evaluation of health problems in addition to cancer, in the Airport area; the study should include schools, hospitals, nursing homes and residences.

  - The Port of Seattle should conduct a study to determine the nature and extent of fuel odor problems in the Airport area; the study should include an evaluation of increased odors during inclement weather.

  - The Port of Seattle should collect appropriate data in order for a cancer risk assessment to be conducted in the Airport area.

  - The Port of Seattle should provide information on vapor recovery and regulatory compliance for all facilities associated with Airport operations including rental car and airline operations.

- **Queuing and Taxiing** - The Port of Seattle should conduct a study to determine if it is possible to reduce aircraft emissions by improving Airport operations associated with queuing and taxiing.

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- **Master Plan Update** - As Master Plan Update implementation proceeds, the air dispersion and roadway traffic analysis should be re-evaluated by the Port of Seattle in order to accurately monitor potential impacts.

Cumulative Impacts

The EIS contained a brief discussion of cumulative impacts associated with air quality issues. The Port of Seattle should provide a more detailed evaluation of cumulative impacts on air quality and should include the known projects planned for the Airport area during operation of the Master Plan Update activities.

7.14 - SURFACE WATER QUALITY AND HYDROLOGY - RUNOFF VOLUME MITIGATION

Upstream development will decrease the amount of permeable surface available to absorb stormwater runoff, thus increasing the runoff coefficient. A stormwater management plan will be necessary to avoid inundating downstream properties (retention or detention ponds may be a component of such a plan). Neighborhoods that have a stream, creek or river that conveys water from or through the Airport may be affected by the Third Runway.

Additional runoff volume may result from a decrease in permeable surface within the drainage-shed. Further studies should be conducted to determine the specific "floodprone" areas. Figure 7.03 shows the streams and creeks in the study area. Table 7.06 identifies the neighborhoods which are prone to stormwater runoff impacts.

Figure 7.03
Streams and Waterways

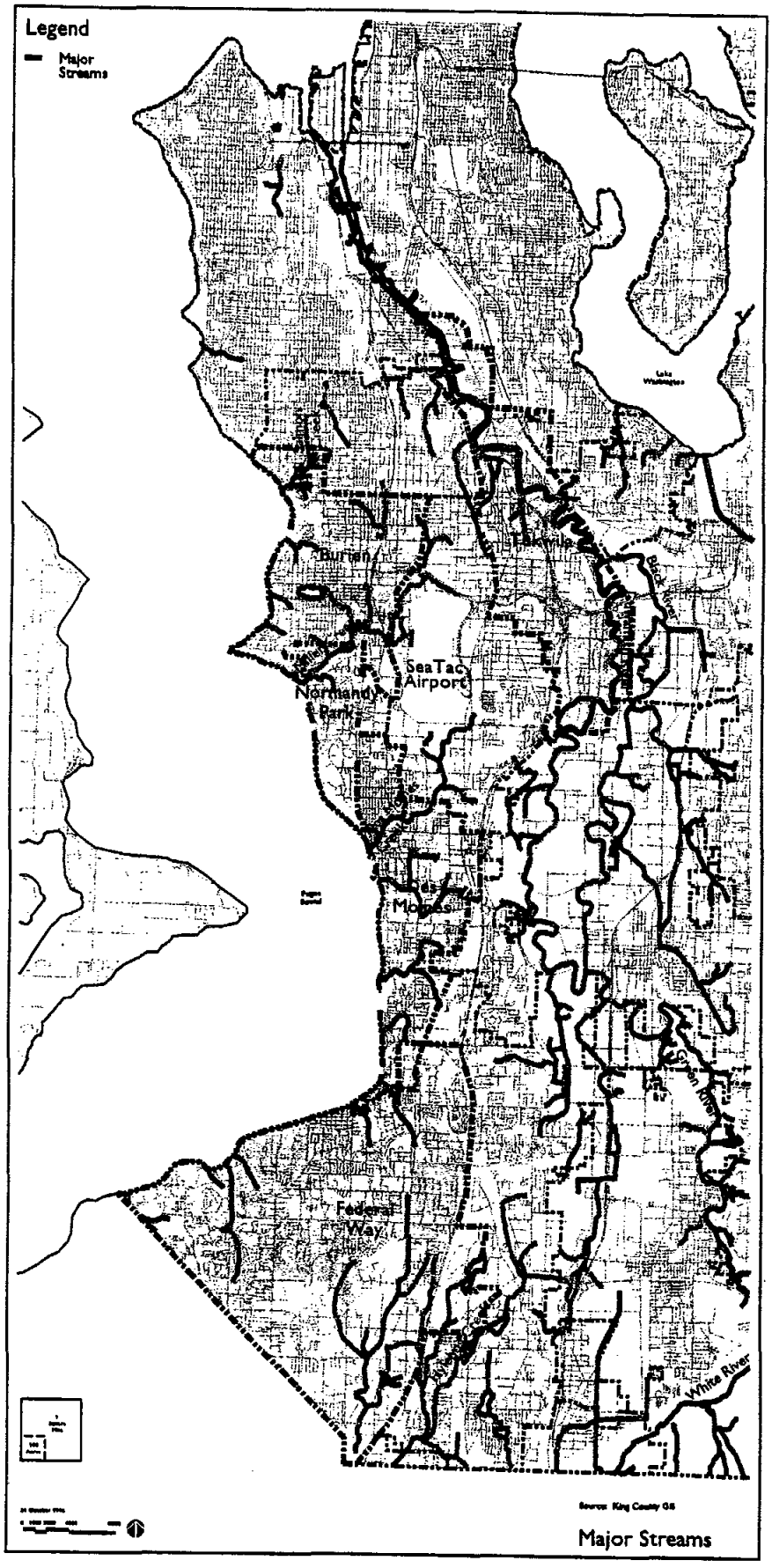

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Figure 7.04
Wetlands

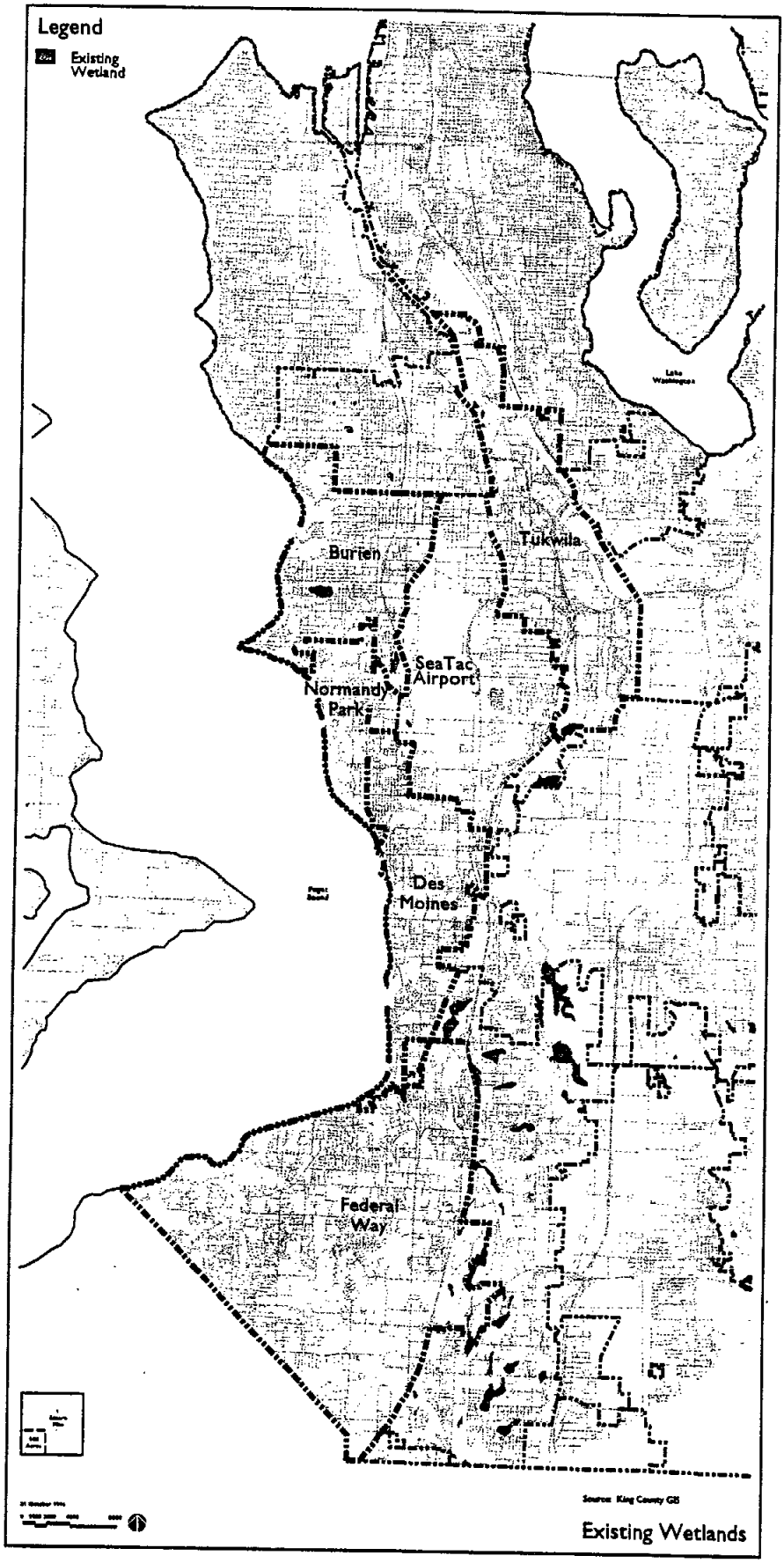

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Figure 7.05
100-Year Floodplains

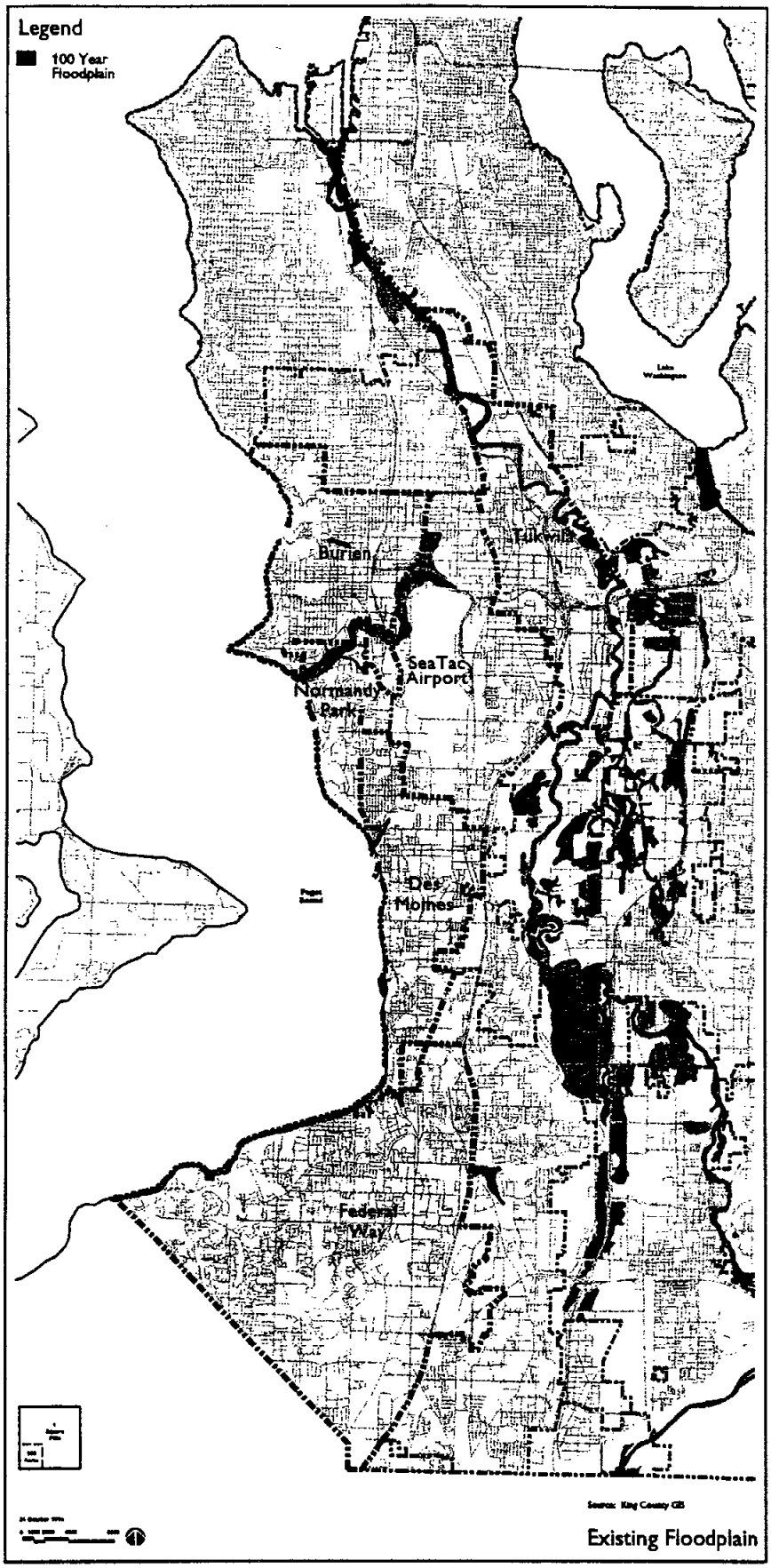

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Table 7.06
Neighborhoods Identified for Stormwater Runoff Mitigation

City	Area	Amount
Burien	**Neighborhoods (4)**	
	North East neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
	South East neighborhood	$ to be determined
Des Moines	**Neighborhoods (3)**	
	North Hill neighborhood	$ to be determined
	West Central neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for stormwater runoff mitigation.	$0.0 million
Normandy Park	**Neighborhoods (5)**	
	Bonniewood neighborhood	$ to be determined
	Highlands neighborhood	$ to be determined
	North neighborhood	$ to be determined
	Riviera neighborhood	$ to be determined
	South neighborhood	$ to be determined
Tukwila	No neighborhoods in Tukwila have been identified for stormwater runoff mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for stormwater runoff mitigation.)		
Total Study Area		**$ to be determined**

7.15 - SURFACE WATER QUALITY AND HYDROLOGY - EROSION AND SEDIMENT MITIGATION

Neighborhoods that have a stream, creek or river that conveys water from or through the Airport may be affected increased erosion and sediment as a result of the Third Runway project. As above, a stormwater management plan should address the impacts. Table 7.07 identifies the neighborhoods which are prone to stormwater runoff impacts.

Table 7.07
Neighborhoods Identified for Erosion and Sediment Mitigation

City	Area	Amount
Burien	**Neighborhoods (4)**	
	North East neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
	South East neighborhood	$ to be determined
Des Moines	**Neighborhoods (3)**	
	North Hill neighborhood	$ to be determined
	West Central neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for erosion and sediment mitigation.	$0.0 million
Normandy Park	**Neighborhoods (5)**	
	Bonniewood neighborhood	$ to be determined
	Highlands neighborhood	$ to be determined
	North neighborhood	$ to be determined
	Riviera neighborhood	$ to be determined
	South neighborhood	$ to be determined
Tukwila	No neighborhoods in Tukwila have been identified for erosion and sediment mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for erosion and sediment mitigation.)		
Total Study Area		**$ to be determined**

7.16 - SURFACE WATER QUALITY AND HYDROLOGY - SPILL MITIGATION

Neighborhoods that have a stream, creek or river that conveys water from or through the Airport may be affected by the Third Runway. These waterways may convey pollutants that are spilled on Airport property. The Airport should design an on-site containment system as part of the Third Runway to assure that all on-site spills are contained within the Airport. Additionally, operational controls for maintenance and fixed-base operators (FBOs) should be considered to further diminish the potential for contamination. Table 7.08 identifies the neighborhoods which could be impacted by on-Airport spills.

Table 7.08
Neighborhoods Identified for On-Airport Spill Mitigation

City	Area	Amount
Burien	**Neighborhoods (4)**	
	North East neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
	South East neighborhood	$ to be determined
Des Moines	**Neighborhoods (3)**	
	North Hill neighborhood	$ to be determined
	West Central neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for spill mitigation.	$0.0 million
Normandy Park	**Neighborhoods (5)**	
	Bonniewood neighborhood	$ to be determined
	Highlands neighborhood	$ to be determined
	North neighborhood	$ to be determined
	Riviera neighborhood	$ to be determined
	South neighborhood	$ to be determined
Tukwila	No neighborhoods in Tukwila have been identified for spill mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for spill mitigation.)		
Total Study Area		**$ to be determined**

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7.17 - GROUND WATER QUALITY AND HYDROLOGY - AQUIFER RECHARGE ZONE IMPACTS

The Airport's EIS addressed the Highline Aquifer and other aquifers, but did not delineate their total known limits. Additional studies should be undertaken to assure that the total recharge zone for these aquifers is protected. Any areas that are affected should be replaced. The previously-recommended stormwater management plan also will help control ground water pollution.

Table 7.09 identifies the neighborhoods which could be impacted by reduction of the Highline Aquifer recharge zone.

Table 7.09
Neighborhoods Identified for Highline Aquifer Mitigation

City	Area	Amount
Burien	**Neighborhoods (12)**	
	Shorewood neighborhood	$ to be determined
	North Central neighborhood	$ to be determined
	North East neighborhood	$ to be determined
	Seahurst Park neighborhood	$ to be determined
	Seahurst neighborhood	$ to be determined
	Central neighborhood	$ to be determined
	Lake Burien neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	South West neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
	South East neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Des Moines	**Neighborhoods (10)**	
	North Hill neighborhood	$ to be determined
	West Central neighborhood	$ to be determined
	North Central neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Zenith neighborhood	$ to be determined
	South Des Moines neighborhood	$ to be determined
	West Woodmont neighborhood	$ to be determined
	East Woodmont neighborhood	$ to be determined
	Redondo neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for Highline Aquifer mitigation.	$0.0 million
Normandy Park	**Neighborhoods (9)**	
	Bonniewood neighborhood	$ to be determined
	Highlands neighborhood	$ to be determined
	North neighborhood	$ to be determined
	Riviera neighborhood	$ to be determined
	Manhattan neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Normandy Province neighborhood	$ to be determined
	Arrow Lake neighborhood	$ to be determined
	South neighborhood	$ to be determined
Tukwila	No neighborhoods in Tukwila have been identified for Highline Aquifer mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for Highline Aquifer mitigation.)		
Total Study Area		**$ to be determined**

7.18 - GROUND WATER QUALITY AND HYDROLOGY - AQUIFER CONTAMINATION MITIGATION

As in Section 7.17, neighborhoods that rely upon the Highline Aquifer may experience an increased potential for contamination of the water supply. The pollution control measures outlined above would also serve to minimize or eliminate this potential hazard. The same neighborhoods identified in Table 7.08 may be at risk for contamination to the Highline Aquifer.

7.19 - ADDITIONAL SURFACE/GROUND WATER MITIGATION MEASURES

Geotechnical Engineer

The Port of Seattle should hire for the duration of construction of the Third Runway a geotechnical engineer to ensure that fill is placed appropriately including compaction and to help detect and remove seismically unstable soils, such as in fill sources.

Toxic-Free Fill

The Port of Seattle should provide evidence including appropriate certifications that all fill material is free of harmful levels of toxic and hazardous materials as defined by the then-current Federal and State regulations.

Plans for Review

At least 2 months prior to construction, the Port of Seattle should provide for review and approval the following:

- Construction Stormwater Pollution Prevention Plan and Erosion/Sediment Control Plan.
- Spill Prevention, Control and Countermeasure (SPCC) Plan.
- Construction Management Plan.
- Construction Waste Management Plan.
- Geotechnical report.
- Reclamation plan for proposed fill sources.
- Earthwork specifications and drawings, in particular for the Third Runway.
- A copy of the State of Washington Governor's Water Quality Certificate which indicates that there is reasonable assurance that the project will be designed, constructed and operated in compliance with applicable water quality standards.

Monitoring Program

Limited baseline surface and ground water data was provided in the EIS. Therefore, prior to the start of construction the Port of Seattle should establish permanent, long term surface and groundwater monitoring stations in the Airport area. The locations and number of these stations should be approved by a working group/oversight commission.

The locations of the sampling stations should take into consideration previous or on-going water quality studies in the area. This should include at least studies by King County Surface Water Management Division and the Ground Water Management Program (various studies associated with groundwater contamination at Sea-Tac International Airport and the Port of Seattle's Receiving Water Monitoring Study). The report on the latter study will be submitted to the Washington DOE on 30 June 1997. Washington DOE has indicated (Washington DOE, 27 November 1996) that in selecting groundwater monitoring well locations:

> *"It would not be environmentally prudent to drill wells into deep, drinking water aquifers below an area like Sea-Tac Airport with known and unknown areas of shallow soil and perched groundwater contamination at the near surface (particularly free product). Best drilling technology cannot always preclude the spread of surficial contamination to the aquifers at depth through the monitoring wells (sampling stations) themselves."*

The DOE further indicated that a better location for the wells might be at the outer boundaries of the wellhead protection zones. Once the stations have been established, quarterly sampling should be initiated during the months of February, May, August and November. The parameters sampled should include metals and organics such as those associated with Airport operations. The parameters sampled should be selected based upon discussions with appropriate State of Washington and King County regulatory agencies and a working group/oversight commission. Potential parameters to be considered for sampling are shown in Table 7.10 for surface and groundwater.

Highline Aquifer

There is evidence that when wells are pumping from the Highline Aquifer, drawdown can be observer in shallower aquifers (Greg Wingard, 22 July 1996, personal communications; Wingard and Smith, 19 June 1995). This is indicative of interconnection between the aquifers and a potential path for contaminated ground water to the Highline Aquifer. Therefore, ground water movement in the Airport area should be better defined prior to the start of construction by the Port of Seattle. According to the EIS, these additional studies are being conducted. When available, the studies should be reviewed for potential ground water contamination impacts on the Highline Aquifer and other area aquifers.

Table 7.10
Potential Water Sampling Parameters

General		Indicators of Airport, Industrial and Municipal Contaminants	
Surface Water	**Groundwater**	**Surface Water**	**Groundwater**
Water temperature[a]	Depth to groundwater	BOD, 5-day	Chloride
Specific conductance[a]	Water temperature	COD	Oil and grease
pH[a]	Specific conductance	Chloride	Sulfide
Dissolved oxygen[a]	pH	Cyanide	Coliform, total per 100 ml
Flow[a]	Dissolved oxygen	Oil and grease	Coliform, fecal per 100 ml
Acidity	Acidity	Sulfide	Aviation fuel contaminants
Alkalinity	Alkalinity	Coliform, total per 100 ml	Ethylene glycol
Bicarbonate	Bicarbonate	Coliform, fecal per 100 ml	Propylene glycol
Carbonate	Carbonate	Aviation fuel constituents	Gasoline
Calcium	Calcium	Ethylene glycol	
Hardness	Hardness	Propylene glycol	
Color	Color		
Turbidity	Dissolved solids (total)		
Dissolved solids (total)	Suspended solids (total)		
Suspended solids (total)	Fluoride		
Fluoride	Magnesium		
Magnesium	Potassium		
Potassium	Silica		
Silica	Sodium		
Sodium	Sulfate		
Sulfate			

Nutrients		Trace Elements	
Surface Water	**Groundwater**	**Surface Water**	**Groundwater**
Ammonia	Ammonia	Aluminum	Aluminum
Kjeldahl nitrogen	Kjeldahl nitrogen	Arsenic	Arsenic
Nitrate	Nitrate	Cadmium	Cadmium
Nitrite	Nitrite	Chromium (total)	Chromium (total)
Phosphorus (total)	Phosphorus (total)	Chromium (hexavalent)	Chromium (hexavalent)
Ortho-phosphorus	Ortho-phosphorus	Copper	Copper
		Iron	Iron
		Lead	Lead
		Manganese	Manganese
		Mercury	Mercury
		Silver	Silver
		Zinc	Zinc

a - In-situ field measurements.

Miller/Des Moines Creek Monitoring Studies

In the EIS it is indicated that the Port of Seattle was to have conducted a monitoring study of Miller and Des Moines Creeks the winter of 1995 to 1996, both upstream and downstream of Airport stormwater discharges. The purpose of this study is to help determine the toxicity of Airport stormwater runoff and surface water quality.

The results of this study should be provided by the Port of Seattle and reviewed by a working group/oversight commission prior to the start of construction.

Stormwater Detention

To minimize the potential impacts of the new impervious areas and drainage areas, new stormwater detention facilities are planned. If the preferred alternative is implemented the hydrologic analysis and stormwater management facilities should be re-evaluated to support final design by the Port of Seattle prior to the start of construction. This is required because the EIS indicates that the stormwater management facilities and discharge locations are conceptual layout. The re-evaluated hydrologic analysis should then be used as part of the baseline to monitor potential Alternative 3 impacts. During large storm events, the effect of possible overflow from the IWS on the receiving waters also should be addressed. The hydrologic analysis and stormwater information should be provided by the Port of Seattle to a working group/oversight commission for review at least 2 months prior to the start of construction.

Wet Vaults/Biofiltration Swales

Limited details on both the construction and operation of the wet vaults and biofiltration swales was provided in the EIS. There was a more lengthy explanation of the constructed aquifer, which the EIS indicates has not been used before to manage stormwater. More detailed design and operating information should be provided on the wet vaults and biofiltration swales by the Port of Seattle at least 2 months prior to the start of construction.

If additional consideration is given to the constructed aquifer, its potential use must be more strongly justified. The Sea-Tac International Airport area may not be the most suitable place to try this technology out; especially considering the controversy over disturbing the headwaters of the two watersheds. The King County Surface Water Management Division has suggested that surface water retention facilities are more innovative and effective. Therefore, they should be considered further before the use of wet vaults and/or the constructed aquifer. The surface water facilities to be considered for modification should include the Lake Reba facility.

Construction Fence

The Port of Seattle must place a construction fence at the outside limits of the construction area.

Fill Material Source

Prior to the start of construction, when the borrow source areas have been identified, the Port of Seattle should conduct baseline studies of any area surface waters and the ground water. This information should be used to describe the existing conditions and to help monitor potential changes after the earthwork activities are complete. Parameters which should be considered for evaluation should be the same as those listed in Table 7.10.

Miller Creek Relocation

Prior to the start of relocating any part of Miller Creek, the Port of Seattle should provide information on the potential impact on the relocation of litigation concerning King County agreeing not to channelize the Creek except in limited amounts in connection with retention facilities.

Water Quality and Hydrology

- **Expansion Storm Drain System Report** - At the time the EIS was issued, a hydraulic analysis with computer program (WATERWORKS) was modeling the proposed Airport expansion storm drain system. The Port of Seattle should provide a copy of the final report for review and comment.

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- **Surface/Groundwater Monitoring** - The Port of Seattle should continue the surface and groundwater monitoring which was initiated prior to the start of construction as discussed previously. The need to sample on a quarterly basis should be discussed and adjusted if it is deemed appropriate. Other aspects of the monitoring program which should be discussed should include the parameters being monitored and the number and locations of the monitoring stations. The discussion of the monitoring program components should be a continuous process in order to take advantage of the monitoring data and in order to reflect Airport operations/issues.

- **Borrow Site Hydrology** - The borrow site hydrology monitoring should be continued by the Port of Seattle until adequate information is obtained for comparison with the EIS existing or baseline conditions.

- **Operations Erosion and Sediment Control Plan** - At least 2 months prior to the completion of construction on the Third Runway, the Port of Seattle should provide an operations erosion and sediment control plan, and a stormwater pollution prevention plan.

- **Fuel Handling System** - The existing Airport aircraft fuel handling system has experienced some leaks, in particular in older parts of the system. As part of the Master Plan Update implementation, the Port of Seattle should upgrade and modernize the fuel handling system.

7.20 - WETLAND MITIGATION

Impacts from the proposed project may remove, pollute, reduce, or destroy wetlands. Figure 7.04 shows the wetlands as delineated in the EIS. A plan for the replacement of the wetlands within the same watershed should be completed to keep these natural areas within each City. The only neighborhoods in the study area known to be impacted are within the City of Burien (North East, East Central, and South East neighborhoods).

At least 2 months before the start of construction the Port of Seattle should provide additional justification for wetlands mitigation in the Green River Valley and not the Miller Creek Watershed. This should include evidence of further discussions concerning mitigation in the Miller Creek Watershed with State of Washington and King County regulatory agencies and an approved wetlands mitigation plan from appropriate regulatory agencies.

At least 2 months before the start of construction the Port of Seattle should provide more detailed information on what wetlands will be destroyed as part of Master Plan Update implementation and how other Airport area wetlands will be protected from construction activities.

The Port of Seattle should also initiate a wetlands monitoring program to provide at least yearly reports on the success of the wetlands mitigation plan.

7.21 - FLOODPLAINS - ENCROACHMENT MITIGATION

Neighborhoods within 100-year floodplains may experience a potential for increased flooding and increased contamination following construction of the Third Runway. Figure 7.05 shows the 100-year floodplains in the study area as delineated by the Federal Emergency Management Agency (FEMA). A stormwater retention/detention system will aid in flood control and pollution abatement that may be due to the Third Runway project. Table 7.11 identifies neighborhoods that may experience floodplain encroachment.

Table 7.11
Neighborhoods Identified for Floodplain Encroachment Mitigation

City	Area	Amount
Burien	Neighborhoods (4)	
	North East neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
	South East neighborhood	$ to be determined
Des Moines	Neighborhoods (3)	
	North Hill neighborhood	$ to be determined
	West Central neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for floodplain encroachment mitigation.	$0.0 million
Normandy Park	Neighborhoods (5)	
	Bonniewood neighborhood	$ to be determined
	Highlands neighborhood	$ to be determined
	North neighborhood	$ to be determined
	Riviera neighborhood	$ to be determined
	South neighborhood	$ to be determined
Tukwila	No neighborhoods in Tukwila have been identified for floodplain encroachment mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for floodplain encroachment mitigation.)		
Total Study Area		$ to be determined

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7.22 - FLOODPLAINS - REDUCED FLOOD STORAGE CAPACITY MITIGATION

Neighborhoods within 100-year floodplains may experience an increase in downstream runoff due to a decrease in upstream permeable surfaces, resulting in inadequate downstream storage capacity. The same neighborhoods identified in Table 7.11 above may experience reduced flood storage capacity as a result of the Third Runway project. A stormwater management plan will improve flood control due to increases in runoff.

7.23 - FLOODPLAINS - INCREASED FLOW RATE/VOLUME MITIGATION

Neighborhoods within a 100-year floodplain may be impacted by increased upstream runoff from the Airport. The same neighborhoods identified in Table 7.10 above may experience increased stormwater flow rates and volumes as a result of the Third Runway project. The same stormwater management plan previously mentioned would address these impacts.

7.24 - FLOODPLAINS - ADDITIONAL MITIGATION MEASURES

At least 2 months before the start of construction, the Port of Seattle should provide the following:

- Information on the relationship between the 100 and 500-year floodplains, recent storms in the Puget Sound region and the Master Plan Update implementation EIS analysis.
- A copy of the final monitoring plan for evaluating the effectiveness of the Miller Creek and Des Moines Creek relocations.
- Final design information for the Miller Creek and Des Moines Creek relocations including specifications and drawings.

Cumulative Impacts

In the EIS cumulative impacts on water resources during construction associated with Master Plan Update implementation and other projects are not discussed in detail. At least 2 months prior to the start of construction the Port of Seattle should provide for review/approval a more comprehensive cumulative impacts discussion.

7.25 - AESTHETICS AND VISUAL - GROUND SHADOW MITIGATION

Neighborhoods adjacent to the northern, southern, and western edges of the Airport property will be subjected to increased shadows as a result of the 20 MCY of fill material necessary for construction of the Third Runway. These neighborhoods include the East Central and South East neighborhoods (both within the City of Burien). Neighborhoods that are redeveloped also will be mitigated for this impact. Other neighborhoods may require additional remodeling to reduce these aesthetic impacts. A "visual inventory" should be conducted to fully project the extent of these impacts.

7.26 - AESTHETICS AND VISUAL - VISIBILITY OF AIRCRAFT

Neighborhoods underneath or adjacent to flight tracks will view arriving and departing aircraft. To mitigate these impacts, the Airport may modify flight tracks to re-route aircraft over non-residential areas. The measures associated with overflight mitigation and ground shadow mitigation will simultaneously mitigate these areas as well. No further mitigation measures are suggested for these areas.

7.27 - AESTHETICS AND VISUAL - VISIBILITY OF FILL

Neighborhoods adjacent to the western edge of the Airport property will be in the line-of-sight of the 20 MCY of fill material necessary for construction of the Third Runway. Table 7.12 identifies these neighborhoods within the study area.

Table 7.12
Neighborhoods Identified for Fill Visibility Mitigation

City	Area	Amount
Burien	**Neighborhoods (7)**	
	North Central neighborhood	$ to be determined
	North East neighborhood	$ to be determined
	Central neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
	South East neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Des Moines	**Neighborhoods (3)**	
	North Hill neighborhood	$ to be determined
	West Central neighborhood	$ to be determined
	North Central neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for fill visibility mitigation.	$0.0 million
Normandy Park	**Neighborhoods (2)**	
	Bonniewood neighborhood	$ to be determined
	North neighborhood	$ to be determined
Tukwila	No neighborhoods in Tukwila have been identified for fill visibility mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for fill visibility mitigation.)		
Total Study Area		**$ to be determined**

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Neighborhoods that are redeveloped also will be mitigated for the aesthetics and visual impact. Other neighborhoods may require additional measures to reduce these aesthetic impacts, including reforestation/re-landscaping or improvements to the Airport Landscape Plan.

7.28 - AESTHETICS AND VISUAL - ADDITIONAL MITIGATION MEASURES

Prior to the start of construction, the Port of Seattle should provide the following concerning aesthetic and visual resources.

Color Photographs

Color photographs of pictures taken from the EIS viewpoints and additional viewpoints which show the existing and future conditions. The additional viewpoints should be selected based on discussions with a working group/oversight commission. The selection of viewpoints should consider short-range, medium-range and long-range views. For example, to the west of the Airport the viewpoints might be as follows: short-range, 1/2 mile or less from the Third Runway; medium-range, 1/2 to 1 mile from the Third Runway; and long-range, 1 to 1.5 miles or more from the Third Runway.

Landscape Plans

Landscape plans for the borrow source areas and the Third Runway fill area. These plans should take into consideration the following:

- The City of SeaTac and other appropriate landscape requirements.
- Planting temporary vegetation or a cover crop as construction in various areas is completed or proceeds in order to minimize short term impacts, in particular from erosion and sedimentation.
- The final landscaping should include the use of a variety of native vegetation which require low maintenance; and has a mixture of seedlings and more mature plants in order to avoid a monoculture.

Other Visual Impacts

A cumulative impacts discussion and color photographs, if appropriate, of facilities associated with Master Plan Update implementation and other known proposed projects in the Airport area.

Following construction of the facilities associated with Master Plan Update implementation, the Port of Seattle should provide a landscape maintenance plan. The plan should include a description of the proposed uses of any pesticides such as herbicides and insecticides.

7.29 - OTHER ENVIRONMENTAL IMPACTS

Special Status Species/Habitat Mitigation

Neighborhoods with EIS-identified habitats should be further studied to determine the Third Runway's impact on endangered or threatened species. A preservation and protection plan should be developed for the neighborhoods identified in Table 7.13

Table 7.13
Neighborhoods Identified for Special Status Species/Habitat Mitigation

City	Area	Amount
Burien	**Neighborhoods (5)**	
	Shorewood neighborhood	$ to be determined
	Seahurst Park neighborhood	$ to be determined
	Seahurst neighborhood	$ to be determined
	Lake Burien neighborhood	$ to be determined
	South West neighborhood	$ to be determined
Des Moines	No neighborhoods in Des Moines have been identified for special status species/habitat mitigation.	$0.0 million
Federal Way	No neighborhoods in Federal Way have been identified for special status species/habitat mitigation.	$0.0 million
Normandy Park	No neighborhoods in Normandy Park have been identified for special status species/habitat mitigation.	$0.0 million
Tukwila	**Neighborhoods (1)**	
	Allentown neighborhood	$ to be determined
(No Highline School District or Highline Community Hospital facilities have been identified for special status species/habitat mitigation.)		
Total Study Area		**$ to be determined**

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Cultural Resource Mitigation

Neighborhoods with significant cultural resources (architectural, religious, ethnic, etc.) should be further studied to determine the Third Runway's potential impact on these resources. A preservation and protection plan should be developed for the neighborhoods identified in Table 7.14.

Table 7.14
Neighborhoods Identified for Cultural Resource Mitigation

City	Area	Amount
Burien	**Neighborhoods (7)**	
	North East neighborhood	$ to be determined
	Lake Burien neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	South West neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
	South East neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Des Moines	**Neighborhoods (3)**	
	West Central neighborhood	$ to be determined
	Redondo neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for cultural resource mitigation.	$0.0 million
Normandy Park	No neighborhoods in Normandy Park have been identified for cultural resource mitigation.	$0.0 million
Tukwila	No neighborhoods in Tukwila have been identified for cultural resource mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for cultural resource mitigation.)		
Total Study Area		**$ to be determined**

Coastal Zone Mitigation

Neighborhoods adjacent to Puget Sound may be impacted by coastal pollution associated with polluted stormwater runoff or increased sedimentation and erosion associated with the proposed barge/conveyor system. Potential point sources for pollutants should be identified and a pollution control management plan developed for the neighborhoods identified in Table 7.15.

Table 7.15
Neighborhoods Identified for Coastal Zone Mitigation

City	Area	Amount
Burien	**Neighborhoods (4)**	
	Shorewood neighborhood	$ to be determined
	Seahurst Park neighborhood	$ to be determined
	Seahurst neighborhood	$ to be determined
	South West neighborhood	$ to be determined
Des Moines	**Neighborhoods (4)**	
	Zenith neighborhood	$ to be determined
	West Woodmont neighborhood	$ to be determined
	Redondo neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	No neighborhoods in Federal Way have been identified for coastal zone mitigation.	$0.0 million
Normandy Park	**Neighborhoods (3)**	
	North neighborhood	$ to be determined
	Riviera neighborhood	$ to be determined
	South neighborhood	$ to be determined
Tukwila	No neighborhoods in Tukwila have been identified for coastal zone mitigation.	$0.0 million
(No Highline School District or Highline Community Hospital facilities have been identified for coastal zone mitigation.)		
Total Study Area		**$ to be determined**

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DOT Section 4(F) Resource Mitigation

Neighborhoods with significant open spaces, parks, and recreational areas may be impacted by increased traffic and congestion associated with increased demand at the Airport. These resources should be preserved and protected from potential impacts, or should be relocated and replaced if possible. Table 7.16 identifies the neighborhoods in the study with these resources.

Table 7.16
Neighborhoods Identified for Section 4(f) Mitigation

City	Area	Amount
Burien	**Neighborhoods (5)**	
	Shorewood neighborhood	$ to be determined
	North Central neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	South West neighborhood	$ to be determined
	Gregory Heights neighborhood	$ to be determined
Des Moines	**Neighborhoods (7)**	
	West Central neighborhood	$ to be determined
	North Central neighborhood	$ to be determined
	Zenith neighborhood	$ to be determined
	South Des Moines neighborhood	$ to be determined
	West Woodmont neighborhood	$ to be determined
	Redondo neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
Federal Way	**Neighborhoods (3)**	
	Wildwood neighborhood	$ to be determined
	Easter Lake neighborhood	$ to be determined
	Steel Lake neighborhood	$ to be determined
Normandy Park	**Neighborhoods (5)**	
	North neighborhood	$ to be determined
	Riviera neighborhood	$ to be determined
	East Central neighborhood	$ to be determined
	Arrow Lake neighborhood	$ to be determined
	South neighborhood	$ to be determined
Tukwila	**Neighborhoods (2)**	
	Foster neighborhood	$ to be determined
	McMicken neighborhood	$ to be determined
(No Highline School District or Highline Community Hospital facilities have been identified for Section 4(f) mitigation.)		
Total Study Area		**$ to be determined**

7.30 - OVERSIGHT COMMISSION

Previous references in this Section have mentioned a "working group" or oversight commission" which play a critical role in the mitigation process. Because of the extent of the mitigation measures discussed, a working group or oversight commission should be assembled to interact with the Port of Seattle during Master Plan Update implementation. The group should have permanent staff with technical expertise in airport construction and operation and should be supported by representatives of the various cities around the Airport and citizen groups.

The permanent staff positions should be funded as part of the mitigation agreement and should be separate from Port of Seattle staff.

The working group/oversight commission should be provided documentation related to the mitigation measures discussed here. The group will then evaluate this information, provide the Port of Seattle comments and finally approve the proposed mitigation measures. In order to avoid delays with the proposed activities associated with Master Plan Update implementation, the information should be provided for review at least 30 to 60 days before proceeding with the various activities. Work on the proposed activities cannot proceed without the group's approval of the mitigation measures and related information.

As part of the mitigation measures for the EIS environmental disciplines, the Port of Seattle should provide the working group/oversight commission prior to Master Plan Update implementation, a table of all of the engineering and environmental permits/approvals which are required for construction and operation. In addition, a schedule for obtaining these permits/approvals should be provided. Then, throughout the construction period and until all operating permits/approvals are obtained, monthly permits/approvals status reports will be provided. The mitigation measures specified here should not take the place of the measures discussed in the EIS. They should be used in conjunction with and should supplement the mitigation measures discussed in the EIS.

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7.31 - ENVIRONMENTAL IMPACT SUMMARIES

Plates 7.1 through 7.6 summarize the potential environmental impacts for each of the five impacted communities, plus the Highline School District and Highline Community Hospital. The impact, mitigation measure, and costs are identified for each neighborhood. The following conventions should be noted when reviewing these Plates:

- **"- - -"** - Indicates that there is no impact identified for this neighborhood.
- **"$ TBD"** - Indicates that the mitigation costs are yet to be determined. Not enough information was available during this study to determine these costs.
- **"$0.0 M"** - Indicates that there are no mitigation costs for this neighborhood.
- **"Mitigated by . . . measures"** - Indicates that other mitigation measures simultaneously mitigate this neighborhood for multiple impact types.
- **"See . . . matrix"** - (Appears only in the Public Facility matrix) Indicates that these impacts are addressed by measures delineated in another City/neighborhood matrix.
- **"Outside Study Area"** - (Appears only in the Public Facility matrix) Indicates that only impacts to the school/hospital building are delineated. Analysis of other impacts are outside the scope of this study.

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ENVIRONMENTAL IMPACT MATRIX - CITY OF BURIEN

PLATE 7.1

Neighborhood		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air Emissions (Aircraft)	CO Emissions (Vehicles)	HC Emissions (Vehicles)	Air Toxics	Fugitive Emissions	Point Source	Runoff Volume	Erosion & Sediment	Spills	Aquifer Recharge	Contamination	Destruction	Encroachment	Reduced Flood Storage Capacity	Increased Flow Rate & Volume	Ground Shadow	Visibility (Aircraft)	Visibility (Full)	Special Status Species/ Hab.	Cultural Res'ts.	Coast. Zone	DOT Sec. 4(f) Res.
Shorewood	Impact	---	---	Sound exposure	---	Air pollution	---	Mitigated by LOS measures	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated by TA measures	---	E/T loss	---	Pollution	Park loss
	Mitigation	---	---	Insulation/ easement	---	Op's and equipment	---		Op's and equip.	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---		---	Preservation	---	Control source	Avoid/ replace
(601 acres)	Cost	---	---	$22.5 M	---	$0.0 M	---		$6.6 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---		---	$ TBD	---	$ TBD	$ TBD
North Central	Impact	---	Topo. 400' w/in 5 mi.	Mitigated by SEL measures	Mitigated by SEL measures	Air pollution	Mitigated by LOS measures	Mitigated by LOS measures	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated by TA measures	Views of fill	---	---	---	Park loss
	Mitigation	---	Insulation/ easement			Op's and equipment			Op's and equip.	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---		Screening/ landscap.	---	---	---	Avoid/ replace
(488 acres)	Cost	---	$18.3 M			$0.0 M			$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---		$ TBD	---	---	---	$ TBD
North East	Impact	65 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	Air pollution	Mitigated by LOS measures	Mitigated by LOS measures	Air pollution	Dust	Pollution	Flooding	Slides	Spills	Contam./ destruc.	Pollution	Loss of wetlands	Flooding	Flooding	Flooding	---	Mitigated by TA measures	Views of fill	---	Loss	---	---
	Mitigation	Acquire/ redevelop				Op's and equipment			Op's and equip	Control plan	FBO control	Management plan	Management plan	On-site contain.	Management plan	Management plan	Relocate/ replace	Management plan	Management plan	Management plan	---		Screening/ landscap.	---	Avoid/ replace	---	---
(707 acres)	Cost	$537.0 M				$0.0 M			$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---		$ TBD	---	$ TBD	---	---
Seahurst Park	Impact	---	---	---	---	Air pollution	---	---	---	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	---	---	E/T loss	---	Pollution	---
	Mitigation	---	---	---	---	Op's and equipment	---	---	---	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---	---	---	Preservation	---	Control source	---
(166 acres)	Cost	---	---	---	---	$0.0 M	---	---	---	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	---	---	$ TBD	---	$ TBD	---
Seahurst	Impact	---	---	---	---	Air pollution	Mitigated by LOS measures	---	---	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	---	---	E/T loss	---	Pollution	---
	Mitigation	---	---	---	---	Op's and equipment		---	---	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---	---	---	Preservation	---	Control source	---
(393 acres)	Cost	---	---	---	---	$0.0 M		---	---	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	---	---	$ TBD	---	$ TBD	---
Central	Impact	---	Topo. 400' w/in 5 mi.	---	Mitigated by SEL measures	Air pollution	Mitigated by LOS measures	Mitigated by LOS measures	---	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated by TA measures	Views of fill	---	---	---	---
	Mitigation	---	Insulation/ easement	---		Op's and equipment			---	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---		Screening/ landscap.	---	---	---	---
(156 acres)	Cost	---	$5.8 M	---		$0.0 M			---	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---		$ TBD	---	---	---	---
Lake Burien	Impact	---	---	---	---	Air pollution	---	---	---	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	---	---	E/T loss	Loss	---	---
	Mitigation	---	---	---	---	Op's and equipment	---	---	---	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---	---	---	Preservation	Avoid/ replace	---	---
(162 acres)	Cost	---	---	---	---	$0.0 M	---	---	---	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	---	---	$ TBD	$ TBD	---	---
East Central	Impact	60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	Air pollution	Mitigated by LOS measures	Mitigated by LOS measures	Air pollution	Dust	Pollution	Flooding	Slides	Spills	Contam./ destruc.	Pollution	Loss of wetlands	Flooding	Flooding	Flooding	Fill shadow	Mitigated by TA measures	Mitigated by Ground Shadow measures	---	Loss	---	Park loss
	Mitigation	Insulation/ easement				Op's and equipment			Op's and equip.	Control plan	FBO control	Management plan	Management plan	On-site contain.	Management plan	Management plan	Relocate/ replace	Management plan	Management plan	Management plan	Screening/ landscap.			---	Avoid/ replace	---	Avoid/ replace
(254 acres)	Cost	$9.5 M				$0.0 M			$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD			---	$ TBD	---	$ TBD
South West	Impact	---	---	---	---	Air pollution	---	---	---	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	---	---	E/T loss	Loss	Pollution	Park loss
	Mitigation	---	---	---	---	Op's and equipment	---	---	---	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---	---	---	Preservation	Avoid/ replace	Control source	Avoid/ replace
(365 acres)	Cost	---	---	---	---	$0.0 M	---	---	---	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	---	---	$ TBD	$ TBD	$ TBD	$ TBD
Gregory Heights	Impact	---	Topo. 400' w/in 5 mi.	---	Mitigated by SEL measures	Air pollution	---	---	---	---	---	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	Mitigated by TA measures	Views of fill	---	Loss	---	Park loss
	Mitigation	---	Insulation/ easement	---		Op's and equipment	---	---	---	---	---	Management plan	Management plan	On-site contain.	Management plan	Management plan	---	Management plan	Management plan	Management plan	---		Screening/ landscap.	---	Avoid/ replace	---	Avoid/ replace
(574 acres)	Cost	---	$21.5 M	---		$0.0 M	---	---	---	---	---	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---		$ TBD	---	$ TBD	---	$ TBD
South East	Impact	60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	Air pollution	Mitigated by LOS measures	Mitigated by LOS measures	Air pollution	Dust	Pollution	Flooding	Slides	Spills	Contam./ destruc.	Pollution	Loss of wetlands	Flooding	Flooding	Flooding	Fill shadow	Mitigated by TA measures	Mitigated by Ground Shadow measures	---	Loss	---	---
	Mitigation	Insulation/ easement				Op's and equipment			Op's and equip.	Control plan	FBO control	Management plan	Management plan	On-site contain.	Management plan	Management plan	Relocate/ replace	Management plan	Management plan	Management plan	Screening/ landscap.			---	Avoid/ replace	---	---
(268 acres)	Cost	$10.8 M				$0.0 M			$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD			---	$ TBD	---	---
Downtown	Impact	60 contour	Mitigated by LDN measures	---	Mitigated by LDN measures	Air pollution	Mitigated by LOS measures	Mitigated by LOS measures	---	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated by TA measures	Views of fill	---	Loss	---	---
	Mitigation	Insulation/ easement				Op's and equipment			---	---	---	---	---	---	Management plan	Management plan	---	---	---	---	---		Screening/ landscap.	---	Avoid/ replace	---	---
(308 acres)	Cost	$12.0 M				$0.0 M			---	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---		$ TBD	---	$ TBD	---	---
Total (4,442 ac.)		$636.6 M plus TBD	$560.5 M	$45.6 M	$22.5 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD

ENVIRONMENTAL IMPACT MATRIX - CITY OF DES MOINES

PLATE 7.2

Neighborhood		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air Emissions (Aircraft)	CO Emissions (Vehicles)	HC Emissions (Vehicles)	Air Toxics	Fugitive Emissions	Point Source	Runoff Volume	Erosion & Sediment	Spills	Aquifer Recharge	Contam-ination	Destruc-tion	Encroach-ment	Reduced Flood Storage Capacity	Increased Flow Rate & Volume	Ground Shadow	Visibility (Aircraft)	Visibility (Fill)	Special Status Species/ Hab.	Cult-ural Res'ts.	Coast. Zone	DOT Sec. 4(f) Rel.
North Hill	Impact	60 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	Dust	Pollution	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	Mitigated	Views of fill	---	---	---	---
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	Dust con-trol plan	FBO controls	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	Manage-ment plan	Manage-ment plan	Manage-ment plan	---	by TA	Screening/ landscap.	---	---	---	---
(623 acres)	Cost	$23.4 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---	measures	$ TBD	---	---	---	---
West Central	Impact	65 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	Dust	Pollution	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	Mitigated	Views of fill	---	Loss	---	Park loss
	Mitigation	Acquire/ redevelop	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	Dust con-trol plan	FBO controls	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	Manage-ment plan	Manage-ment plan	Manage-ment plan	---	by TA	Screening/ landscap.	---	Avoid/ replace	---	Avoid/ replace
(479 acres)	Cost	$364.9 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---	measures	$ TBD	---	$ TBD	---	$ TBD
North Central	Impact	65 contour	Mitigated	Mitigated	Mitigated	Air pollution	---	Mitigated	Air pollution	Dust	Pollution	---	Slides	Spills	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	Views of fill	---	---	---	Park loss
	Mitigation	Acquire/ redevelop	by LDN	by LDN	by LDN	Op's and equipment	---	by LOS	Op's and equip.	Dust con-trol plan	FBO controls	---	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	Screening/ landscap.	---	---	---	Avoid/ replace
(241 acres)	Cost	$183.2 M	measures	measures	measures	$0.0 M	---	measures	$0.0 M	$0.0 M	$ TBD	---	$ TBD	$ TBD	$ TBD	$ TBD	---	---	---	---	---	measures	$ TBD	---	---	---	$ TBD
East Central	Impact	65 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	Dust	Pollution	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	Acquire/ redevelop	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	Dust con-trol plan	FBO controls	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	---	---
(626 acres)	Cost	$475.8 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	$0.0 M	$ TBD	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	---	---
Zenith	Impact	60 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	Pollu-tion	Park loss
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	Source control	Avoid/ replace
(550 acres)	Cost	$20.6 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	$ TBD	$ TBD
South Des Moines	Impact	65 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	---	Park loss
	Mitigation	Acquire/ redevelop	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	---	Avoid/ replace
(492 acres)	Cost	$373.9 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	---	$ TBD
West Woodmont	Impact	60 contour	Mitigated	Mitigated	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	Pollu-tion	Park loss
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	Source control	Avoid/ replace
(430 acres)	Cost	$16.1 M	measures	measures	measures	$0.0 M	---	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	$ TBD	$ TBD
East Woodmont	Impact	60 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	---	---
(306 acres)	Cost	$11.5 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	---	---
Redondo	Impact	---	Topo. 400' w/in 4 mi.	Mitigated	Mitigated	Air pollution	---	---	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	Loss	Pollu-tion	Park loss
	Mitigation	---	Insulation/ easement	by SEL	by SEL	Op's and equipment	---	---	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	Avoid/ replace	Source control	Avoid/ replace
(212 acres)	Cost	---	$7.9 M	measures	measures	$0.0 M	---	---	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	$ TBD	$ TBD	$ TBD
Downtown	Impact	---	Topo. 400' w/in 5 mi.	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	Dust	Pollution	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	Loss	Pollu-tion	Park loss
	Mitigation	---	Insulation/ easement	by SEL	by SEL	Op's and equipment	by LOS	by LOS	Op's and equip.	Dust con-trol plan	FBO controls	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	Avoid/ replace	Source control	Avoid/ replace
(108 acres)	Cost	---	$4.1 M	measures	measures	$0.0 M	measures	measures	$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	$ TBD	$ TBD	$ TBD
Total (4,067 ac.)	$1,481.4 M plus TBD	$1,469.4 M	$12.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$TBD	$TBD	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$0.0 M	$ TBD	$ 0.0 M	$ TBD	$ TBD	$ TBD

ENVIRONMENTAL IMPACT MATRIX - CITY OF FEDERAL WAY

PLATE 7.3

Neighborhood		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air emissions (aircraft)	CO emissions (vehicles)	HC emissions (vehicles)	Air toxics	Fugitive emissions	Point source	Runoff volume	Erosion & sediment	Spills	Aquifer recharge	Contamination	Destruction	Encroachment	Reduced flood storage capacity	Increased flow rate & volume	Ground shadow	Visibility (aircraft)	Visibility (fill)	Special status species/ hab.	Cultural res's.	Coast. zone	DOT Sec. 4(f) res.
Star Lake	*Impact*	60 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(531 acres)	*Cost*	$19.5 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Wildwood	*Impact*	60 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	Park loss
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	Avoid/ replace
(553 acres)	*Cost*	$20.7 M	measures	measures	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	$ TBD
Marine Hills	*Impact*	---	---	Sound exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(529 acres)	*Cost*	---	---	$19.8 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Mar-Cheri	*Impact*	---	---	Overflight exposure	Mitigated	Air pollution	---	---	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Modify flight track	by TA	Op's and equipment	---	---	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(311 acres)	*Cost*	---	---	$0.0 M	measures	$0.0 M	---	- -	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Dash Point	*Impact*	---	---	Overflight exposure	Mitigated	Air pollution	---	---	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Modify flight track	by TA	Op's and equipment	---	---	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(826 acres)	*Cost*	---	---	$ 0.0 M	measures	$0.0 M	---	---	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Lakota	*Impact*	---	---	Overflight exposure	Mitigated	Air pollution	Mitigated	---	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Modify flight track	by TA	Op's and equipment	by LOS	---	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(949 acres)	*Cost*	---	---	$0.0 M	measures	$0.0 M	measures	---	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Mirror Lake	*Impact*	---	---	Overflight exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Modify flight track	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(713 acres)	*Cost*	---	---	$0.0 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Easter Lake	*Impact*	---	---	Overflight exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	Park loss
	Mitigation	---	---	Modify flight track	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	Avoid/ replace
(729 acres)	*Cost*	---	---	$0.0 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	$ TBD
Steel Lake	*Impact*	---	---	Sound exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	Park loss
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	Avoid/ replace
(347 acres)	*Cost*	---	---	$13.0 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	$ TBD
Twin Lakes	*Impact*	---	---	Overflight exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Modify flight track	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(1,118 acres)	*Cost*	---	---	$0.0 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---

ENVIRONMENTAL IMPACT MATRIX - CITY OF FEDERAL WAY (continued)

PLATE 7.3 (continued)

Neighborhood		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air Emissions (Aircraft)	CO Emissions (Vehicles)	HC Emissions (Vehicles)	Air Toxics	Fugitive Emissions	Point Source	Runoff Volume	Erosion & Sediment	Spills	Aquifer Recharge	Contamination	Destruction	Encroachment	Reduced Flood Storage Capacity	Increased Flow Rate & Volume	Ground Shadow	Visibility (Aircraft)	Visibility (P.S.L.)	Special Status Species/ Hab.	Cult. Res's.	Coast. Zone	DOT Sec. 4(f) Res.
West Campus	Impact	---	---	Overflight exposures	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Modify flight track	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(848 acres)	Cost	---	---	$0.0 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
First Avenue	Impact	---	---	Sound exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(546 acres)	Cost	---	---	$20.5 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Kitts Corner North	Impact	---	---	Sound exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(299 acres)	Cost	---	---	$11.2 M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
City Center	Impact	---	---	Sound exposure	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(430 acres)	Cost	---	---	$16.1M	measures	$0.0 M	measures	measures	$0.0 M	---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
Total (8,719 ac.)	$148.1 M plus TBD	$40.2 M	$0.0 M	$107.9 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ 0.0 M	$ 0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$0.0 M	$ TBD	$ 0.0 M	$0.0 M	$0.0 M	$ TBD

ENVIRONMENTAL IMPACT MATRIX - CITY OF NORMANDY PARK

PLATE 7.4

Neighborhood		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air emissions (aircraft)	CO emissions (vehicles)	HC emissions (vehicles)	Air toxics	Fugitive emissions	Point source	Runoff volume	Erosion & sediment	Spills	Aquifer recharge	Contam-ination	Destruc-tion	Encroach-ment	Reduced flood storage capacity	Increased flow rate & volume	Ground shadow	Visibility (aircraft)	Visibility (fill)	Special status species/ hab.	Cult-ural res's.	Coast. zone	DOT Sec. 4(f) res.
Bonniewood	*Impact*	---	Topo. 400' w/in 5 mi.	---	Mitigated	Air pollution	---	Mitigated	---	---	---	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	---	Views of fill	---	---	---	---
	Mitigation	---	Insulation/ easement	---	by SEL	Op's and equipment	---	by LOS	---	---	---	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	Manage-ment plan	Manage-ment plan	Manage-ment plan	---	---	Screening/ landscap.	---	---	---	---
(41 acres)	*Cost*	---	$1.5 M	---	measures	$0.0 M	---	measures	---	---	---	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---	---	$ TBD	---	---	---	---
Highlands	*Impact*	---	---	---	---	Air pollution	---	---	---	---	---	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	---	---	---	---	---	---
	Mitigation	---	---	---	---	Op's and equipment	---	---	---	---	---	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	Manage-ment plan	Manage-ment plan	Manage-ment plan	---	---	---	---	---	---	---
(81 acres)	*Cost*	---	---	---	---	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---	---	---	---	---	---	---
North	*Impact*	---	Topo. 400' w/in 5 mi.	---	Mitigated	Air pollution	---	Mitigated	---	---	---	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	---	Views of fill	---	---	Pollu-tion	Park loss
	Mitigation	---	Insulation/ easement	---	by SEL	Op's and equipment	---	by LOS	---	---	---	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	Manage-ment plan	Manage-ment plan	Manage-ment plan	---	---	Screening/ landscap.	---	---	Control source	Avoid/ replace
(348 acres)	*Cost*	---	$13.0 M	---	measures	$0.0 M	---	measures	---	---	---	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---	---	$ TBD	---	---	$ TBD	$ TBD
Riviera	*Impact*	---	---	Sound exposure	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	Mitigated	---	---	---	Pollu-tion	Park loss
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	---	by LOS	Op's and equip.	---	---	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	Manage-ment plan	Manage-ment plan	Manage-ment plan	---	by TA	---	---	---	Control source	Avoid/ replace
(240 acres)	*Cost*	---	---	$9.0 M	measures	$0.0 M	---	measures	$0.0 M	---	---	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---	measures	---	---	---	$ TBD	$ TBD
Manhattan	*Impact*	60 contour	---	Mitigated	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	Insulation/ easement	---	by LDN	by LDN	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	---	---
(90 acres)	*Cost*	$3.4 M	---	measures	measures	$0.0 M	---	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	---	---
East Central	*Impact*	---	---	Sound exposure	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	---	Park loss
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	---	Avoid/ replace
(248 acres)	*Cost*	---	---	$9.3 M	measures	$0.0 M	---	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	---	$ TBD
Normandy Province	*Impact*	---	---	Sound exposure	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	---	---
(39 acres)	*Cost*	---	---	$1.5 M	measures	$0.0 M	---	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	---	---
Arrow Lake	*Impact*	---	---	Sound exposure	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	Contam./ destruc.	Pollution	---	---	---	---	---	Mitigated	---	---	---	---	Park loss
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	Manage-ment plan	Manage-ment plan	---	---	---	---	---	by TA	---	---	---	---	Avoid/ replace
(29 acres)	*Cost*	---	---	$1.1 M	measures	$0.0 M	---	measures	$0.0 M	---	---	---	---	---	$ TBD	$ TBD	---	---	---	---	---	measures	---	---	---	---	$ TBD
South	*Impact*	---	---	Sound exposure	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	Flooding	Slides	Spills	Contam./ destruc.	Pollution	---	Flooding	Flooding	Flooding	---	Mitigated	---	E/T loss	Loss	Pollu-tion	Park loss
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	---	by LOS	Op's and equip.	---	---	Manage-ment plan	Manage-ment plan	On-site contain.	Manage-ment plan	Manage-ment plan	---	Manage-ment plan	Manage-ment plan	Manage-ment plan	---	by TA	---	Preser-vation	Avoid/ replace	Control source	Avoid/ replace
(454 acres)	*Cost*	---	---	$17.0 M	measures	$0.0 M	---	measures	$0.0 M	---	---	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	---	$ TBD	$ TBD	$ TBD	---	measures	---	$ TBD	$ TBD	$ TBD	$ TBD
Total (1,570 ac.)	$55.8 M plus TBD	$3.4 M	$14.5 M	$37.9 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$0.0 M	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD

ENVIRONMENTAL IMPACT MATRIX - CITY OF TUKWILA

PLATE 7.5

Neighborhood		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air Emissions (Aircraft)	CO Emissions (Vehicles)	HC Emissions (Vehicles)	Air Toxics	Fugitive Emissions	Point Source	Runoff Volume	Erosion & Sediment	Spills	Aquifer Recharge	Contamination	Destruction	Encroachment	Reduced Flood Storage Capacity	Increased Flow Rate & Volume	Ground Shadow	Visibility (Aircraft)	Visibility (Fill)	Special Status Species/ Hab.	Cult. Natural Res's.	Coast. Zone	DOT Sec. 4(f) Res.
Ryan	Impact	---	---	Sound exposure	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	---	Insulation/ easement	by TA	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(114 acres)	Cost	---	---		measures		---	measures		---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
				$4.3 M		$0.0 M			$0.0 M																		
Allentown	Impact	---	Topo. 400' w/in 5 mi.	Mitigated	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	E/T loss	---	---	---
	Mitigation	---	Insulation/ easement	by SEL	by SEL	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	& by TA	---	Preser-vation	---	---	---
(346 acres)	Cost	---		measure	measures		---	measures		---	---	---	---	---	---	---	---	---	---	---	---	measures	---		---	---	---
			$13.8 M			$0.0 M			$0.0 M															$ TBD			
Cascade View	Impact	---	Topo. 400' w/in 5 mi.	---	Mitigated	Air pollution	---	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Mitigation	---	Insulation/ easement	---	by SEL	Op's and equipment	---	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
(303 acres)	Cost	---		---	measures		---	measures		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			$11.4 M			$0.0 M			$0.0 M																		
Foster	Impact	---	Topo. 400' w/in 5 mi.	---	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Park loss
	Mitigation	---	Insulation/ easement	---	by SEL	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Avoid/ replace
(485 acres)	Cost	---		---	measures		measures	measures		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
			$18.2 M			$0.0 M			$0.0 M																		$ TBD
Thorndyke	Impact	---	Topo. 400' w/in 5 mi.	---	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Mitigation	---	Insulation/ easement	---	by SEL	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
(420 acres)	Cost	---		---	measures		measures	measure		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
			$15.7 M			$0.0 M			$0.0 M																		
Tukwila Hill	Impact	---	---	---	---	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Mitigation	---	---	---	---	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
(857 acres)	Cost	---	---	---	---		measures	measures		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
						$0.0 M			$0.0 M																		
McMicken	Impact	---	---	---	---	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Park loss
	Mitigation	---	---	---	---	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Avoid/ replace
(461 acres)	Cost	---	---	---	---		measures	measures		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
						$0.0 M			$0.0 M																		$ TBD
M.I.C.	Impact	60 contour	Mitigated	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(1,083 ac.)	Cost		measures	measures	measures		measures	measures		---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
		$40.6 M				$0.0 M			$0.0 M																		
Riverton	Impact	---	Topo. 400' w/in 5 mi.	Mitigated	Mitigated	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	Mitigated	---	---	---	---	---
	Mitigation	---	Insulation/ easement	by SEL	by SEL	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	by TA	---	---	---	---	---
(176 acres)	Cost	---		measures	measures		measures	measures		---	---	---	---	---	---	---	---	---	---	---	---	measures	---	---	---	---	---
			$10.3 M			$0.0 M			$0.0 M																		
CBD	Impact	---	---	---	---	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
	Mitigation	---	---	---	---	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
(1,095 ac.)	Cost	---	---	---	---		measures	measures		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
						$0.0 M			$0.0 M																		
Tukwila Valley South	Impact	---	---	---	---	Air pollution	Mitigated	Mitigated	Air pollution	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Park loss
	Mitigation	---	---	---	---	Op's and equipment	by LOS	by LOS	Op's and equip.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Avoid/ replace
(367 acres)	Cost	---	---	---	---		measures	measures		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
						$0.0 M			$0.0 M																		$ TBD
Total (5,887 ac.)	$113.3 M plus TBD	$40.6 M	$68.6 M	$4.3 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$0.0 M	$0.0 M	$ TBD

ENVIRONMENTAL IMPACT MATRIX - PUBLIC FACILITIES

PLATE 7.6

Public Facility		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air Emissions (Aircraft)	CO Emissions (Vehicles)	HC Emissions (Vehicles)	Air Toxics	Fugitive Emissions	Point Source	Runoff Volume	Erosion & Sediment	Spills	Aquifer Recharge	Contamination	Destruction	Encroachment	Reduced Flood Storage Capacity	Increased Flow Rate & Volume	Ground Shadow	Visibility (Aircraft)	Visibility (Fill)	Special Status Species/ Hab.	Cultural Res's.	Coast. Zone	DOT Sec. 4(f) Res.
Highline School/Hospital Facilities in City of Burien																											
Highline Community Hospital (Gregory Heights)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See Gregory Heights (Plate 7.1)	---	---	---	---	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Greg. Heights (Plate 7.1)	---	See Greg. Heights (Plate 7.1)
	Mitigation	Insulation/ easement					---	---	---	---	---						---				---			---			
	Cost	$ TBD					---	---	---	---	---						---				---			---			
Gregory Heights Elementary School (Gregory Heights)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See Gregory Heights (Plate 7.1)	---	---	---	---	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Greg. Heights (Plate 7.1)	---	See Greg. Heights (Plate 7.1)
	Mitigation	Insulation/ easement					---	---	---	---	---						---				---			---			
	Cost	$ TBD					---	---	---	---	---						---				---			---			
Sylvester Middle School (Gregory Heights)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See Gregory Heights (Plate 7.1)	---	---	---	---	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Gregory Heights (Plate 7.1)	See Gregory Heights (Plate 7.1)	---	See Greg. Heights (Plate 7.1)	---	See Greg. Heights (Plate 7.1)
	Mitigation	Insulation/ easement					---	---	---	---	---						---				---			---			
	Cost	$ TBD					---	---	---	---	---						---				---			---			
Hazel Valley Elementary School (Downtown)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See Down-town (Plate 7.1)	See Down-town (Plate 7.1)	See Down-town (Plate 7.1)	---	---	---	---	---	---	See Down-town (Plate 7.1)	See Down-town (Plate 7.1)	---	---	---	---	---	See Down-town (Plate 7.1)	See Down-town (Plate 7.1)	---	See Down-town (Plate 7.1)	---	---
	Mitigation	Insulation/ easement							---	---	---	---	---	---			---				---			---			
	Cost	$ TBD							---	---	---	---	---	---			---				---			---			
Salmon Creek Elementary School (North Central)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See North Central (Plate 7.1)	See North Central (Plate 7.1)	See North Central (Plate 7.1)	See North Central (Plate 7.1)	---	---	---	---	---	See North Central (Plate 7.1)	See North Central (Plate 7.1)	---	---	---	---	---	See North Central (Plate 7.1)	See North Central (Plate 7.1)	---	---	---	See North Central (Plate 7.1)
	Mitigation	Insulation/ easement								---	---	---	---	---			---				---			---			
	Cost	$ TBD								---	---	---	---	---			---				---			---			
Seahurst Elementary School (Seahurst)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See Seahurst (Plate 7.1)	See Seahurst (Plate 7.1)	---	---	---	---	---	---	---	See Seahurst (Plate 7.1)	See Seahurst (Plate 7.1)	---	---	---	---	---	---	---	---	See Sea-hurst (Plate 7.1)	---	See Sea-hurst (Plate 7.1)
	Mitigation	Insulation/ easement						---	---	---	---	---	---	---			---				---			---			
	Cost	$ TBD						---	---	---	---	---	---	---			---				---			---			
Shorewood Elementary School (Shore-wood)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See Shore-wood (Plate 7.1)	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)	---	---	---	---	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)	---	---	---	---	---	See Shore-wood (Plate 7.1)	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)
	Mitigation	Insulation/ easement					---			---	---	---	---	---			---				---			---			
	Cost	$ TBD					---			---	---	---	---	---			---				---			---			
Marine Tech Lab. (Shore-wood)	Impact	55 to 60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See Shore-wood (Plate 7.1)	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)	---	---	---	---	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)	---	---	---	---	---	See Shore-wood (Plate 7.1)	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)	---	See Shore-wood (Plate 7.1)	See Shore-wood (Plate 7.1)
	Mitigation	Insulation/ easement					---			---	---	---	---	---			---				---			---			
	Cost	$ TBD					---			---	---	---	---	---			---				---			---			
Cedarhurst Elementary School (North East)	Impact	65 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	See North East (Plate 7.1)	---	See North East (Plate 7.1)	See North East (Plate 7.1)	---	See North East (Plate 7.1)	---	---
	Mitigation	Replace/ relocate																			---			---			
	Cost	$ TBD																			---			---			
Sunnydale Elementary School (East Central)	Impact	70 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	---	See East Central (Plate 7.1)	---	---
	Mitigation	Replace/ relocate																						---			
	Cost	$ TBD																						---			
Highline High School (East Central)	Impact	60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	See East Central (Plate 7.1)	---	See East Central (Plate 7.1)	---	See East Central (Plate 7.1)
	Mitigation	Insulation/ easement																						---			
	Cost	$ TBD																						---			
Highline School/Hospital Facilities in City of Des Moines																											
Des Moines Elementary School (West Central)	Impact	60 contour	Mitigated by LDN measures	Mitigated by LDN measures	Mitigated by LDN measures	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)
	Mitigation	Insulation/ easement																			---			---			
	Cost	$ TBD																			---			---			

ENVIRONMENTAL IMPACT MATRIX - PUBLIC FACILITIES (continued)

Public Facility		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air Emissions (Aircraft)	CO Emissions (Vehicles)	HC Emissions (Vehicles)	Air Toxics	Fugitive Emissions	Point Source	Runoff Volume	Erosion & Sediment	Spills	Aquifer Recharge	Contamination	Destruction	Encroachment	Reduced Flood Storage Capacity	Increased Flow Rate & Volume	Ground Shadow	Visibility (Aircraft)	Visibility (Fill)	Special Status Species Hab.	Cultural Res's.	Coast. Zone	DOT Sec. 4(f) Res.
Highline School/Hospital Facilities in City of Des Moines (continued)																											
Olympic Elementary School	Impact	60 contour	Mitigated	Mitigated	Mitigated	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)	See West Central (Plate 7.2)	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)	---	See West Central (Plate 7.2)
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN												---				---			---			
(West Central)	Cost	$ TBD	measures	measures	measures												---				---			---			
Midway Elementary School	Impact	65 contour	Mitigated	Mitigated	Mitigated	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	---	---	---	See East Central (Plate 7.2)	See East Central (Plate 7.2)	---	---	---	---	---	See East Central (Plate 7.2)	---	---	---	---	---
	Mitigation	Replace/ relocate	by LDN	by LDN	by LDN							---	---	---			---	---	---	---	---		---	---	---	---	---
(East Central)	Cost	$ TBD	measures	measures	measures							---	---	---			---	---	---	---	---		---	---	---	---	---
Pacific Middle School	Impact	65 contour	Mitigated	Mitigated	Mitigated	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	---	---	---	See East Central (Plate 7.2)	See East Central (Plate 7.2)	---	---	---	---	---	See East Central (Plate 7.2)	---	---	---	---	---
	Mitigation	Replace/ relocate	by LDN	by LDN	by LDN							---	---	---			---	---	---	---	---		---	---	---	---	---
(East Central)	Cost	$ TBD	measures	measures	measures							---	---	---			---	---	---	---	---		---	---	---	---	---
Mount Rainier High School	Impact	65 contour	Mitigated	Mitigated	Mitigated	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	See East Central (Plate 7.2)	---	---	---	See East Central (Plate 7.2)	See East Central (Plate 7.2)	---	---	---	---	---	See East Central (Plate 7.2)	---	---	---	---	---
	Mitigation	Replace/ relocate	by LDN	by LDN	by LDN							---	---	---			---	---	---	---	---		---	---	---	---	---
(East Central)	Cost	$ TBD	measures	measures	measures							---	---	---			---	---	---	---	---		---	---	---	---	---
North Hill Elementary School	Impact	60 contour	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	---	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	---	See North Hill (Plate 7.2)	See North Hill (Plate 7.2)	---	---	---	---
	Mitigation	Insulation/ easement															---				---			---	---	---	---
(North Hill)	Cost	$ TBD															---				---			---	---	---	---
Parkside Elementary School	Impact	60 contour	Mitigated	Mitigated	Mitigated	See South Des Moines (Plate 7.2)	See South Des Moines (Plate 7.2)	See South Des Moines (Plate 7.2)	See South D M (Plate 7.2)	---	---	---	---	---	See South Des Moines (Plate 7.2)	See South Des Moines (Plate 7.2)	---	---	---	---	---	See South Des Moines (Plate 7.2)	---	---	---	---	See South D M (Plate 7.2)
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN					---	---	---	---	---			---	---	---	---	---		---	---	---	---	
(South Des Moines)	Cost	$ TBD	measures	measures	measures					---	---	---	---	---			---	---	---	---	---		---	---	---	---	
Highline School/Hospital Facilities in City of Normandy Park																											
Marvista Elementary School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	See South	---	See South	See South	---	---	See South	See South	See South	See South	See South	---	See South	See South	See South	---	See South	---	See South	See South	See South	See South
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN		---			---	---						---				---		---				
(South)	Cost	$ TBD	measures	measures	measures	(Plate 7.4)	---	(Plate 7.4)	(Plate 7.4)	---	---	(Plate 7.4)	(Plate 7.4)	(Plate 7.4)	(Plate 7.4)	(Plate 7.4)	---	(Plate 7.4)	(Plate 7.4)	(Plate 7.4)	---	(Plate 7.4)	---	(Plate 7.4)	(Plate 7.4)	(Plate 7.4)	(Plate 7.4)
Highline School/Hospital Facilities in City of SeaTac (outside study area)																											
Bow Lake Elementary School	Impact	60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
(SeaTac)	Cost	$ TBD	measures	measures	measures																						
Madrona Elementary School	Impact	60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
(SeaTac)	Cost	$ TBD	measures	measures	measures																						
McMicken Heights Elementary School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
(SeaTac)	Cost	$ TBD	measures	measures	measures																						
Valley View Elementary School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
(SeaTac)	Cost	$ TBD	measures	measures	measures																						
Chinook Middle School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
(SeaTac)	Cost	$ TBD	measures	measures	measures																						

ENVIRONMENTAL IMPACT MATRIX - PUBLIC FACILITIES (continued)

PLATE 7.6 (continued)

Public Facility		Noise & Vibration				Air Quality						Surface Water Quality/Hydrology			Ground Water Quality/Hydrology		Wetlands	Floodplains			Aesthetics and Visual			Other			
Name	Measures	LDN	SEL	Over-Flights (TA)	Vibration	Air emissions (aircraft)	CO emissions (vehicles)	HC emissions (vehicles)	Air toxics	Fugitive emissions	Point source	Runoff volume	Erosion & sediment	Spills	Aquifer recharge	Contamination	Destruction	Encroachment	Reduced flood storage capacity	Increased flow rate & volume	Ground shadow	Visibility (aircraft)	Visibility (fill)	Special status species/ hab.	Cult. ural res's.	Coast. zone	DOT Sec. 4(f) res.
Highline School/Hospital Facilities in City of SeaTac (continued)																											
Tyee High School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(SeaTac)		$ TBD																									
Sea-Tac Occupational Skill	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(SeaTac)		$ TBD																									
Highline School/Hospital Facilities in City of Seattle (outside study area)																											
Hilltop Elementary School	Impact	60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(Seattle)		$ TBD																									
Mount View Elementary School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(Seattle)		$ TBD																									
Riverton Heights Elementary School	Impact	60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(Seattle)		$ TBD																									
Southern Heights Elementary School	Impact	65 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Replace/ relocate	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(Seattle)		$ TBD																									
Cascade Middle School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measure	measures	measures																						
(Seattle)		$ TBD																									
Evergreen High School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measure	measures	measures																						
(Seattle)		$ TBD																									
Highline School/Hospital Facilities in Unincorporated King County (outside study area)																											
Beverly Park Elementary School	Impact	65 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Replace/ relocate	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(County)		$ TBD																									
White Center Elementary School	Impact	55 to 60 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Insulation/ easement	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(County)		$ TBD																									
Satellite Alternate High School	Impact	65 contour	Mitigated	Mitigated	Mitigated	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area	Outside Study Area
	Mitigation	Replace/ relocate	by LDN	by LDN	by LDN																						
	Cost		measures	measures	measures																						
(County)		$ TBD																									
Total		$ TBD	$ TBD	$0.0 M	$0.0 M	$0.0 M																					

SECTION 8
POTENTIAL TRANSPORTATION IMPACTS AND MITIGATION

SECTION 8
POTENTIAL TRANSPORTATION IMPACTS AND MITIGATION

8.01 - INTRODUCTION

As a result of construction of the Third Runway, there are two general areas of impact to the existing roadway network in the study area:

- Congestion on the network; and,
- Physical damage to the network.

These will occur over two periods of time:

- During construction of the Third Runway, projected in the EIS to be from 1997 to 2000; and,

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- After construction of the Third Runway in the period from 2000 to 2020 when the full proposed Master Plan is implemented.

The transportation impacts and mitigation approach taken was to initially determine and list those measurable factors that would enable an impact analysis based upon a reasonable set of data as opposed to a qualitative approach which would be exposed to more opinion rather than reasonableness.

The second step was to assess each measurable factor against an established roadway network in the study area comprised of the freeways, principal arterials, and minor arterials. This functional system will carry the bulk of the Airport-related traffic and is shown in Figure 8.01.

The next step taken was to make a reasoned attempt to identify "types" of improvements to this network that would address the impact factors identified, but which could be implemented in a corridor or areawide approach that would address many impacts with a minimum of cost. The key component was the development of a unit-cost approach for each type of improvement that could be applied on a corridor basis.

Finally, the type of improvement needed to mitigate the identified impacts was determined, the unit-cost for the improvement was applied to the impacted network, and mitigation costs were summarized by City and neighborhood.

Of course, the full cost of mitigation of traffic and transportation impacts is not attributable to construction of the Third Runway or overall Airport operations. The equitable distribution or *pro rata* share of these costs has not yet been determined. A cost-allocation model must be developed to determine the *pro rata* share and should be based upon a comprehensive origin-destination study.

Since the EIS evaluated only those intersections immediately surrounding the Airport, it became necessary to establish a roadway network that potentially would be impacted within the study area. This network was developed using a functional system of roadways that would reasonably carry the bulk of the traffic during and after construction. These roadways were defined as the freeways and principal arterials. However, during the construction phase, if the "trucking only" alternative is selected for the haul of 20 MCY of fill material, significant diversion off the freeway system to the principal arterials is expected. Because these principal arterials are currently operating with high traffic volumes, further diversion to the local minor arterials is projected. therefore, the selected roadway network consists of the following functional classifications:

- Freeways;
- Principal arterials; and,
- Minor arterials.

The adopted Comprehensive Plans for the five impacted communities in the study area were referenced and the study area roadway network was proposed. This network was also previously shown on Figure 8.01. Table 8.01 describes this network by City and jurisdiction.

Table 8.01
Study Area Thoroughfare Network

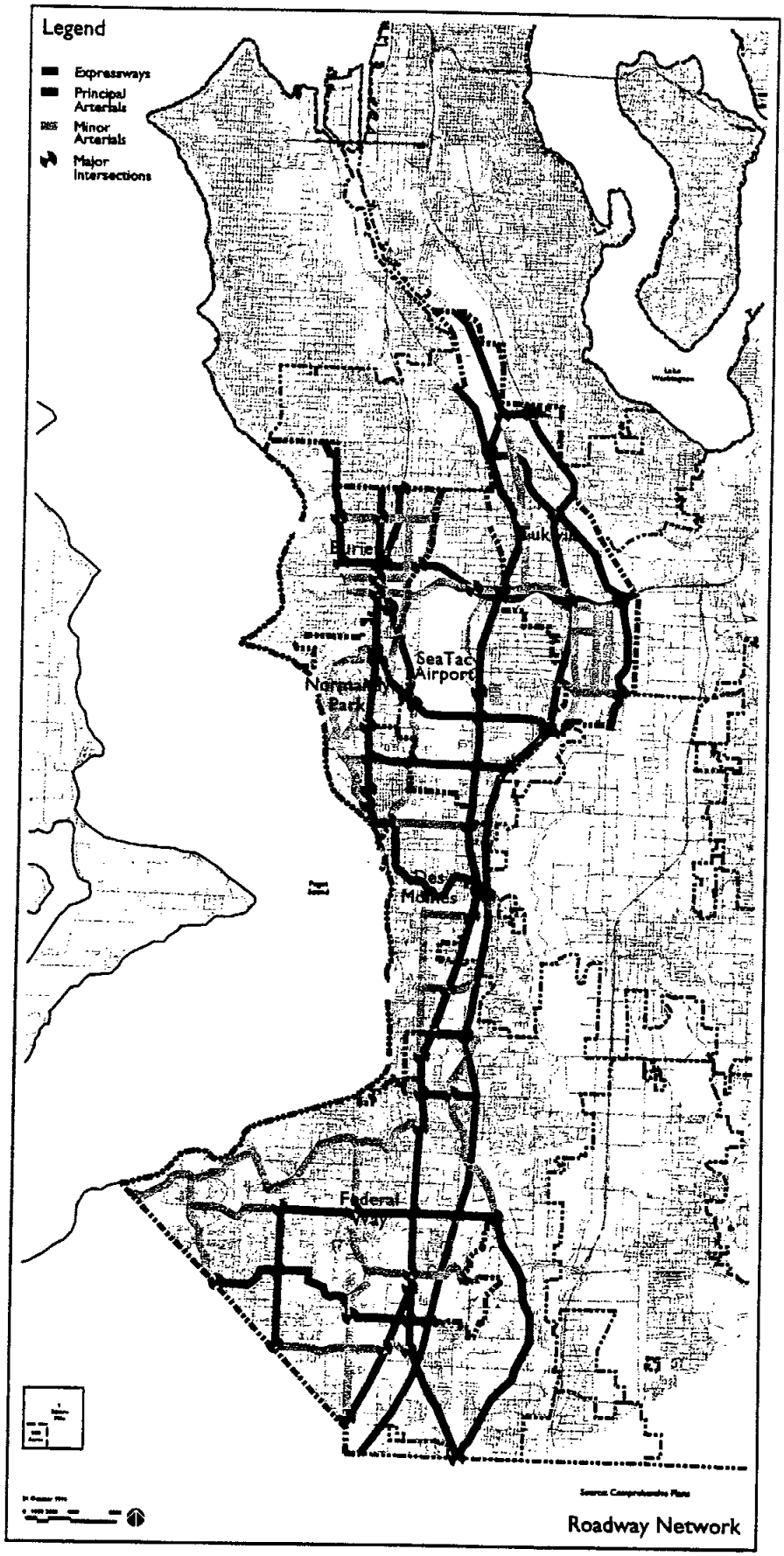
Functional Classification	Local					State
	Burien	Des Moines	Federal Way	Normandy Park	Tukwila	
State						
Freeways	---	---	---	---	---	31 miles
Principal arterials	---	---	---	---	---	6 miles
Local						
Principal arterials	5 miles	7 miles	19 miles	0 miles	9 miles	---
Minor arterials	9 miles	7 miles	21 miles	7 miles	11 miles	---
Number of major intersections	10	9	20	5	10	---

(Source: Draft and Adopted Comprehensive Plans for the Cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila)

The measurable factors (measures) for the following four areas of analysis used were:

- **Congestion**
  - Level of service
  - Accidents
  - School bus operations
  - Transit operations
  - Police and emergency operations
  - Parking and pedestrian circulation
  - Traffic noise (LEQ)

Figure 8.01
Thoroughfare Network



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- **Physical Damage**
  - Local street system
  - State street system
  - Bridge ratings and pavement condition
  - Increased maintenance and reconstruction

- **Construction Impacts**
  - Truck haul routes
  - Barge/rail/conveyor systems
  - Traffic diversion
  - Traffic control
  - Construction staging and phasing
  - Work-force traffic
  - Concurrent construction projects

- **Post-Construction Impacts**
  - Additional traffic
  - Increased operation and maintenance costs
  - Master plan implementation

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8.02 - TYPES OF IMPROVEMENTS

Reliable and current traffic data and a uniform set of forecasts for the Years 2000 and 2020 for the network of freeways, principal arterials and minor arterials surrounding the Airport was not available. Thus, an approach was taken in an attempt to quantify a level of mitigation for traffic and transportation impacts that would have the following attributes:

- Clear, reasonable and not overstated.
- Cost-effective in that a single mitigation item would address multiple impacts.
- Corridor-based and not spot-based improvements to enable an economy of scale and a comprehensive approach.
- Average unit-cost approach based upon actual program costs within the impacted communities.
- Program-based versus-project-based to enable the development of the project list when the detailed traffic study becomes available.

Two general types of improvements were developed into a mitigation program to address the issues of increased congestion and physical damage to the infrastructure - Increased Efficiency and Damage Reconstruction. These improvements are discussed below.

Increased Efficiency

The program of improvements developed to address congestion impacts are intended to be the minor Transportation System Management (TSM), or Congestion Management System (CMS), types of improvements applied on a corridor basis. They are not intended to be the heavy capital investment types of improvements. This approach was taken because it is recognized that not every roadway on the entire network is, or will be, in need of TSM/CMS type improvements as a result of the implementation of the Airport Master Plan. However, it is also recognized that there will be one major capital intensive project that will be identified as needed for mitigation. The objection is that the program "budget" for mitigation established on a TSM/CMS basis for the entire network will cover the actual expenditures when one route is not improved at all and another route needs a much greater investment than estimated using the unit cost approach. While the actual mitigation costs will not be fully known until contractor bids are opened, this approach appears to be the best basis of accuracy and reasonableness with the data available.

The type of TSM/CMS improvements considered include:

- Traffic signal interconnects.
- Re-timing of existing traffic signals.
- Upgrade signal controllers.
- New signal heads, masts, etc.
- New signalized intersections.
- Left/right turn lanes.
- Minor lane widening at intersections.
- Lane restriping
- Signage.
- Speed limitations
- Parking restrictions.
- Pedestrian signals and crosswalks.
- Sidewalks.
- Emergency vehicle signal pre-emption.

This program of TSM/CMS improvements does not provide any increases in the capacity of the existing network. It is intended to improve the flow of traffic with a minimum investment. If an increase in capacity of a particular route is identified as needed for mitigation, the TSM/CMS based program budgets should include the costs.

Damage Reconstruction

The second type of improvement investigated was directed at addressing the physical damage to the roadway network, primarily due to the "trucking-only" alternative for the haul of fill material during construction of the Third Runway, but also due to normal "wear and tear" on the system attributable to increased traffic. Normal deterioration is traditionally addressed by annualized resurfacing programs; however, a targeted mitigation program will be necessary to prevent excessive damage during the construction phase.

The primary focus during a truck-haul construction phases is damage to pavement and bridge decks caused by repeated heavy loads. This impact will be felt mostly on the State freeway network during the construction phase.

A major goal of this mitigation plan is to keep the haul trucks on the freeway network and construct a temporary connection from the freeway network directly into the Airport property and/or construction site without passing through the SR 509/SR 518 interchange which is reported to be the highest accident location in the region.

The first level of bridge repair is replacement of the deck, followed by rehabilitation of the bridge and in the most severe circumstance, replacement of the bridge at a very high cost. The mitigation program is based upon replacement of all the bridge decks within the study area, recognizing that not all decks will need to be replaced. The analysis further recognized that seismic retrofit of bridges in the study area may become a necessary element and added cost.

Aside from damage to the bridge decks, there is also the potential for damage to the pavement by the repeated heavy truck loads, particularly in areas where the pavement base may be weakened due to freeze-thaw activity or settlement around cross-pipes. The universally recognized pothole will become a constant maintenance issue during the haul activity.

The potential damage to the freeway pavement is focused on the heavy trucks during construction, while potential damage to the principal and minor arterials is primarily focused on increased general traffic loads which should be addressed by normal annualized resurfacing programs on the local streets. However, the frequency of scheduled repairs may increase due to increased traffic caused by the Airport Master Plan implementation.

The two types of improvements identified to mitigate physical damage impacts to the pavements on the State and local network is resurfacing, followed by the more expensive pavement reconstruction. Widening of roadways to increase capacity is not considered in the cost analysis.

The mitigation program for pavements is based upon a resurfacing (only) of the entire system every 5 years. This approach recognizes that not all routes need to be resurfaced every 5 years; however, some routes may need to be reconstructed once over the 25-year time-span of this analysis at three times the cost of a resurfacing.

Unit Costs

The unit costs developed for the mitigation of congestion and physical damage impacts were based upon the following sources:

- City of Burien Comprehensive Plan - GMA Transportation Element (The Transpo Group, Inc., 18 December 1995).

- City of Des Moines, Transportation Recommended Roadway Improvements (The Transpo Group, Inc., 18 October 1995).
- City of Federal Way Comprehensive Plan, Transportation Improvement Program (November 1995).
- City of SeaTac, 1997-2006 Transportation Improvement Program (7 June 1996).
- Puget Sound Regional Council, 1996-1998 Regional Transportation Improvement Program, King County Projects (28 September 1995).
- Washington State Department of Transportation, 1997-2016 State Highway System Plan, Northwest Region (March 1996).

The resultant average unit costs for the various types of mitigation obtained from the referenced transportation improvement programs were as follows:

• Signals and turn lanes	$500,000 per mile
• Corridor improvements	$1,400,000 per mile
• Bridge decks	$500,000 each
• Bridge rehabilitation	$600,000 each
• Bridge replacement	$1,800,000 each
• Bridge seismic retrofits	$1,000,000 each
• Roadway resurfacing	$400,000 per mile
• Roadway reconstruction	$1,300,000 per mile

These average unit costs were then applied to the roadway network as described previously for corridor-based congestion and physical damage impact mitigation program development. Within the study area the total network includes:

- 31 miles of freeways
- 36 miles of principal arterials
- 55 miles of minor arterials
- 54 major intersections

Bridges impacted were only on the State freeway system.

The resultant corridor-based, cost-effective program of TSM/CMS improvements, bridge repairs and resurfacing programs follows in Sections 8.03 through 8.25.

8.03 - CONGESTION - LEVEL OF SERVICE MITIGATION

Table 8.02 shows the acceptable Level of Service (LOS) established by each of the five impacted communities for its local streets. In most cases, the threshold is LOS "E". As traffic increases, local LOS may deteriorate, necessitating capital improvements to improve traffic flow. Further traffic studies will be necessary to determine where additional improvements are necessary to bring the LOS back up to "E".

Table 8.02
Acceptable LOS Levels in the Five Impacted Communities and King County

Area	LOS Criteria
Burien	Comprehensive Plan in development
Des Moines	D - residential
	E - commercial
	F - SR 99 corridor
Federal Way	E
Normandy Park	C
Tukwila	D - residential
	E - commercial
King County	E

An increase in traffic volumes will concurrently decrease the LOS of area thoroughfares. Each city has established acceptable performance levels - the average minimum LOS for each city is LOS "E". Table 8.03 projects study area neighborhoods in which the LOS deteriorates as a result of increased airport traffic. These LOS deteriorations may be addressed by the implementation of traffic system management projects which improve operations. An origin-destination survey, screen line analysis, or select-link analysis will be necessary to determine the amount of traffic impacts attributable to the proposed project.

It is recommended that the areas identified in Table 8.03 be mitigated prior to construction of the Third Runway. An origin-destination survey and a cost-allocation model should also be developed to determine the amount of impacts attributable to Airport traffic (see Section 8.24).

SEA-TAC INTERNATIONAL AIRPORT
IMPACT MITIGATION STUDY

Table 8.03
Neighborhoods Identified for Level of Service Mitigation

City	Area	Amount
Burien	Shorewood neighborhood	$1.2 million
	North Central neighborhood	$1.6 million
	North East neighborhood	$9.8 million
	Central neighborhood	$1.3 million
	East Central neighborhood	$9.8 million
	Downtown neighborhood	$2.7 million
	Total - Burien	**$26.4 million**
Des Moines	North Hill neighborhood	$3.5 million
	West Central neighborhood	$1.6 million
	East Central neighborhood	$5.2 million
	Zenith neighborhood	$1.2 million
	South Des Moines neighborhood	$2.3 million
	East Woodmont neighborhood	$2.3 million
	West Woodmont neighborhood	$0.8 million
	Total - Des Moines	**$16.9 million**
Federal Way	Star Lake neighborhood	$4.0 million
	Wildwood neighborhood	$4.6 million
	Easter Lake neighborhood	$2.0 million
	Steel Lake neighborhood	$3.3 million
	First Avenue neighborhood	$1.7 million
	Kitts Corner North neighborhood	$2.1 million
	City Center neighborhood	$3.1 million
	Total - Federal Way	**$20.8 million**
Normandy Park	Bonniewood neighborhood	$0.2 million
	North neighborhood	$1.3 million
	Manhattan neighborhood	$1.0 million
	East Central neighborhood	$1.7 million
	Normandy Province neighborhood	$0.2 million
	Arrow Lake neighborhood	$0.6 million
	South neighborhood	$4.8 million
	Total - Normandy Park	**$9.8 million**
Tukwila	Ryan neighborhood	$0.8 million
	Allentown neighborhood	$4.0 million
	Cascade View neighborhood	$1.1 million
	Foster neighborhood	$1.5 million
	Thorndyke neighborhood	$4.3 million
	Tukwila Hill neighborhood	$4.9 million
	McMicken neighborhood	$1.0 million
	M.I.C. neighborhood	$8.6 million
	Riverton neighborhood	$3.8 million
	CBD neighborhood	$11.1 million
	Tukwila Valley South neighborhood	$2.6 million
	Total - Tukwila	**$43.7 million**
Total Study Area		**$117.6 million**

8.04 - CONGESTION - ACCIDENT MITIGATION

Neighborhoods with major intersections may experience an increase in accidents as traffic increases. Intersection improvements will be necessary to reduce this potential.

An increase in traffic volumes will concurrently increase the potential for accidents. However, the improvements made in association with TSM and CMS with concurrently reduce the potential for accidents on these same roadways. Therefore, neighborhoods that are projected to experience an increase in vehicular accidents associated with the proposed project will be concurrently mitigated by intersection improvements (see Table 8.03 above).

Preliminary estimation of mitigation costs for transportation impacts within the City of Federal Way will be deferred until the Areawide Traffic Study has been completed. Therefore, cost estimates for mitigation of accident impacts are not shown at this time within the City of Federal Way.

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8.05 - CONGESTION - SCHOOL BUS OPERATION MITIGATION

Neighborhoods with school bus routes may experience increases in delays and schedule adjustments due to increased local and diversion traffic during project construction and operation. The Highline School District may need to develop alternate routes to prevent lengthening of travel time and to minimize the impacts of traffic congestion. In the study area, only the cities of Burien, Des Moines, and Normandy Park are served by the Highline School District (Federal Way and Tukwila are served by other districts which were not part of this study.) The Highline School District also serves neighborhoods within the Cities of SeaTac and Seattle. In these instances, the school impacts were part of the study scope, but remaining other neighborhood impacts were not included.

An increase in traffic volumes will increase potential delays for school buses. Additional equipment, drivers, and alternate routes may be necessary to address these delays. An origin-destination survey, screen line analysis, or select-link analysis will be necessary to determine the number of bus routes affected by increased traffic associated with the proposed project. However, neighborhoods that are projected to experience an increase in school bus delays should be concurrently mitigated by intersection improvements (see Table 8.03 above). Additional equipment and alternative routes also may be necessary for these neighborhoods, plus additional neighborhoods in the Cities of SeaTac and Seattle which are served by the Highline School District. (As indicated above, preliminary estimation of mitigation costs for transportation impacts within the City of Federal Way will be deferred until the Areawide Traffic Study has been completed. Therefore, cost estimates for mitigation of school bus impacts are not shown at this time within the City of Federal Way.)

SEA-TAC INTERNATIONAL AIRPORT
IMPACT MITIGATION STUDY

It is recommended that any additional mitigation for Highline School District school bus impacts be assessed and completed prior to commencement of construction of the Third Runway. Highline School District school bus mitigation may include re-routing/rescheduling, relocation of bus-stops, and/or additional buses and drivers.

8.06 - CONGESTION - TRANSIT BUS OPERATION MITIGATION

Neighborhoods with regularly-scheduled public transit service may experience decreases in service due to increased local and diversion traffic during project construction and operation. The Regional Transit Authority (RTA) may need to develop alternate routes to prevent lengthening of travel time and to minimize the impacts of traffic congestion and cost of operations.

An increase in traffic volumes will increase potential delays for transit buses. Additional equipment, drivers, and alternate routes may be necessary to address these delays. An origin-destination survey, screen line analysis, or select-link analysis will be necessary to determine the number of bus routes affected by increased traffic associated with the proposed project. However, neighborhoods that are projected to experience an increase in transit bus delays should be concurrently mitigated by intersection improvements (see Table 8.03 above). Additional equipment and alternative routes may also be necessary for these neighborhoods. (Preliminary estimation of mitigation costs for transportation impacts within the City of Federal Way will be deferred until the Areawide Traffic Study has been completed. Therefore, cost estimates for mitigation of transit bus impacts are not shown at this time within the City of Federal Way.)

It is recommended that any additional transit impact mitigation be assessed and completed prior to commencement of construction of the Third Runway. Transit mitigation may include re-routing/rescheduling, relocation of bus-stops, and/or additional buses and drivers.

8.07 - CONGESTION - POLICE AND EMERGENCY VEHICLE OPERATION MITIGATION

Increased local and diversion traffic during project construction and operation may hamper the ability of emergency vehicles to access all neighborhood areas. Additional equipment and personnel may be required to address the reduced response time. Additional public safety stations may be necessary to address response time problems.

An increase in traffic volumes will result in a decrease in the response time by emergency service personnel (police, fire, ambulance, etc.). Additional equipment, drivers, and new public safety sub-stations may be necessary to address these delays. An origin-destination survey, screen line analysis, or select-link analysis will be necessary to determine the number of emergency services affected by increased traffic associated with the proposed project. The neighborhoods that are projected to experience an decrease in response times should be concurrently mitigated by intersection improvements (see Table 8.03 above). Additional equipment, personnel, and station locations may eventually be necessary to address response time delays for these communities. (Preliminary estimation of mitigation costs for transportation impacts within the City of Federal Way will be deferred until the Areawide Traffic Study has been completed. Therefore, cost estimates for mitigation of emergency vehicle access impacts are not shown at this time within the City of Federal Way.)

It is recommended that public safety response times in the five impacted communities be continually monitored during the construction phase of the Third Runway. Reductions in response times should be addressed by additional equipment, personnel, or new station locations. The origin-destination survey and cost-allocation model (Section 8.24) should be used to determine the amount of response time decrease attributable to Airport traffic.

8.08 - CONGESTION - PARKING AND PEDESTRIAN ACCESS MITIGATION

Increased local and diversion traffic during project construction and operation may negatively impact parking access to local businesses, schools, churches, and stores. Increased traffic may also conflict with pedestrian circulation. Additional parking, circulation, and pedestrian linkage studies are necessary to further determine these impacts.

An increase in traffic volumes will result in potential conflicts with pedestrian and parking circulation patterns. Intersection improvements associated with level of service improvements will simultaneously address these impacts (see Table 8.03). Preliminary estimation of mitigation costs for transportation impacts within the City of Federal Way will be deferred until the Areawide Traffic Study has been completed. Therefore, cost estimates for mitigation of parking and pedestrian access impacts are not shown at this time within the City of Federal Way.

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8.09 - CONGESTION - TRAFFIC NOISE MITIGATION

Neighborhoods adjacent to high-volume roadways (including freeways and principal and minor arterials) will experience an accompanying increase in traffic noise as traffic increases. Improvements to the traffic management system will address both traffic flow and noise.

An increase in traffic volumes will concurrently increase associated traffic noise. Traffic noise may be addressed by the installation of sound abatement wall systems along grade-separated highways and by constructing intersection improvements to smooth out traffic flow. An origin-destination survey, screen line analysis, or select-link analysis will be necessary to determine the amount of traffic impacts attributable to the proposed project. Intersection improvements associated with level of service improvements will simultaneously address traffic noise impacts (see Table 8.03). Preliminary estimation of mitigation costs for transportation impacts within the City of Federal Way will be deferred until the Areawide Traffic Study has been completed. Therefore, cost estimates for mitigation of traffic noise impacts are not shown at this time within the City of Federal Way.

8.10 - PHYSICAL DAMAGE - LOCAL STREET SYSTEM MITIGATION

Neighborhoods that are subjected to increased traffic may experience decreases in the serviceability index (SI) of the roadways. Reconstruction of the local arterials will be necessary to improve the thoroughfares as the SI decreases. An origin-destination survey will be necessary to determine the extent to which this increase in traffic is attributable to the Airport. Table 8.04 delineates the neighborhoods projected to require mitigation for physical damage to the local street system.

It is recommended that the areas identified in Table 8.04 for local street mitigation be continually monitored for serviceability index decreases. Roadways where the SI decrease should be reconstructed as soon as possible. The cost-allocation model (Section 8.24) should determine the amount of damage attributable to Airport traffic.

Table 8.04
Neighborhoods Identified for Physical Damage Mitigation (Local System)

City	Area	Amount
Burien	Shorewood neighborhood	$1.2 million
	North Central neighborhood	$1.6 million
	North East neighborhood	$4.6 million
	Seahurst neighborhood	$0.7 million
	Central neighborhood	$1.3 million
	East Central neighborhood	$3.5 million
	Gregory Heights neighborhood	$0.6 million
	South East neighborhood	$2.0 million
	Downtown neighborhood	$1.4 million
	Total - Burien	**$16.9 million**
Des Moines	North Hill neighborhood	$1.4 million
	West Central neighborhood	$2.1 million
	North Central neighborhood	$2.1 million
	East Central neighborhood	$2.1 million
	Zenith neighborhood	$2.1 million
	South Des Moines neighborhood	$2.1 million
	West Woodmont neighborhood	$0.8 million
	East Woodmont neighborhood	$0.5 million
	Downtown neighborhood	$0.6 million
	Total - Des Moines	**$13.8 million**
Federal Way	Star Lake neighborhood	$1.4 million
	Wildwood neighborhood	$2.1 million
	Mirror Lake neighborhood	$0.8 million
	Easter Lake neighborhood	$0.5 million
	First Avenue neighborhood	$0.5 million
	City Center neighborhood	$1.1 million
	Total - Federal Way	**$6.4 million**
Normandy Park	Bonniewood neighborhood	$0.2 million
	North neighborhood	$1.3 million
	Riviera neighborhood	$1.9 million
	Manhattan neighborhood	$1.0 million
	East Central neighborhood	$1.7 million
	Normandy Province neighborhood	$0.2 million
	Arrow Lake neighborhood	$0.6 million
	South neighborhood	$4.8 million
	Total - Normandy Park	**$11.7 million**
Tukwila	Cascade View neighborhood	$1.1 million
	Foster neighborhood	$1.7 million
	Thorndyke neighborhood	$3.0 million
	Tukwila Hill neighborhood	$2.1 million
	McMicken neighborhood	$0.3 million
	M.I.C. neighborhood	$5.1 million
	Riverton neighborhood	$1.9 million
	CBD neighborhood	$10.0 million
	Tukwila Valley South neighborhood	$2.0 million
	Total - Tukwila	**$27.2 million**
Total Study Area		**$103.2 million**

8.11 - PHYSICAL DAMAGE - STATE STREET SYSTEM MITIGATION

Neighborhoods that are subjected to increased traffic may experience decreases in the SI of the State-jurisdiction roadways. Resurfacing and reconstruction of the State roads will be necessary to improve the highways as the SI decreases. An origin-destination survey will be necessary to determine the extent to which this increase in traffic is attributable to the Airport. Table 8.05 delineates the neighborhoods projected to require mitigation for physical damage to the State street system.

It is recommended that the areas identified in Table 8.05 for State street mitigation be continually monitored for serviceability index decreases. Roadways where the SI decrease should be reconstructed as soon as possible. The cost-allocation model (Section 8.24) should determine the amount of damage attributable to Airport traffic.

8.12 - PHYSICAL DAMAGE - BRIDGE RATINGS AND PAVEMENT CONDITION MITIGATION

Neighborhoods with bridges may experience a decrease in the load rating of the State-maintained bridge due to heavy truck loadings. Eventually, the bridge rating will decrease to the point that trucks may be diverted and reconstruction of the bridge will be required. An origin-destination survey will be necessary to determine the extent to which this loss in rating is attributable to the Airport. Table 8.06 indicates the neighborhoods which may become eligible for bridge deck replacement and mitigation.

Due to the high potential for damage to the State freeway system due to repeated heavy loads of maximum weight limit vehicles over an extended three-year period, an immediate survey of the conditions of the bridge decks and pavement condition is necessary to establish the baseline against which any damage claims can be assessed. Existing bridge ratings and pavement condition indices should be reviewed and updated and a continuous monitoring system established.

It is recommended that the Washington State Department of Transportation should establish the baseline conditions of the bridges and pavement on the freeway routes most likely to be used from the borrow pit locations to the construction site and establish a system of monitoring prior to any truck movements. The monitoring system should include weigh-in-motion, bridge deck instrumentation, mobile pavement condition survey vehicle(s), and selected closed-circuit television/video monitoring.

Table 8.05
Neighborhoods Identified for Physical Damage Mitigation (State System)

City	Area	Amount
Burien	North East neighborhood	$1.9 million
	East Central neighborhood	$1.2 million
	South East neighborhood	$0.9 million
	Total - Burien	**$4.0 million**
Des Moines	East Central neighborhood	$2.3 million
	South Des Moines neighborhood	$0.5 million
	East Woodmont neighborhood	$0.8 million
	Total - Des Moines	**$3.6 million**
Federal Way	Star Lake neighborhood	$2.0 million
	Wildwood neighborhood	$1.3 million
	Marine Hills neighborhood	$0.5 million
	Easter Lake neighborhood	$0.6 million
	Steel Lake neighborhood	$1.5 million
	First Avenue neighborhood	$0.5 million
	Kitts Corner North neighborhood	$1.1 million
	City Center neighborhood	$1.3 million
	Total - Federal Way	**$8.8 million**
Normandy Park	No neighborhoods in Normandy Park have been identified for physical damage mitigation (State system).	**$0.0 million**
Tukwila	Ryan neighborhood	$0.3 million
	Allentown neighborhood	$1.2 million
	Foster neighborhood	$1.3 million
	Thorndyke neighborhood	$1.5 million
	Tukwila Hill neighborhood	$2.0 million
	McMicken neighborhood	$1.5 million
	M.I.C. neighborhood	$1.5 million
	Riverton neighborhood	$0.7 million
	CBD neighborhood	$1.3 million
	Tukwila Valley South neighborhood	$0.3 million
	Total - Tukwila	**$11.6 million**
Total Study Area		**$28.0 million**

Table 8.06
Neighborhoods Identified for Bridge Mitigation

City	Area	Amount
Burien	North East neighborhood	$8.5 million
	East Central neighborhood	$10.2 million
	South East neighborhood	$5.1 million
	Total - Burien	**$23.8 million**
Des Moines	East Central neighborhood	$1.7 million
	Total - Des Moines	**$1.7 million**
Federal Way	Star Lake neighborhood	$1.7 million
	Wildwood neighborhood	$1.7 million
	Steel Lake neighborhood	$1.7 million
	Kitts Corner North neighborhood	$1.7 million
	Total - Federal Way	**$6.8 million**
Normandy Park	North neighborhood	$1.7 million
	Total - Normandy Park	**$1.7 million**
Tukwila	Foster neighborhood	$6.8 million
	Thorndyke neighborhood	$3.4 million
	Tukwila Hill neighborhood	$3.4 million
	M.I.C. neighborhood	$1.7 million
	CBD neighborhood	$3.4 million
	Tukwila Valley South neighborhood	$1.7 million
	Total - Tukwila	**$20.4 million**
Total Study Area		**$54.4 million**

8.13 - PHYSICAL DAMAGE - INCREASED MAINTENANCE AND RECONSTRUCTION MITIGATION

Neighborhoods in which the SI and maintenance cycle decreases due to increased traffic may experience increased frequency of resurfacing and maintenance due to the increased traffic volume. An origin-destination survey will be necessary to determine the extent to which this increase in traffic is attributable to the Airport. Table 8.07 indicates the neighborhoods which may be eligible for increased maintenance and reconstruction mitigation.

It is recommended that the areas identified in Table 8.07 for increased maintenance and reconstruction mitigation be continually monitored for serviceability index decreases. Roadways where the SI decrease should be reconstructed as soon as possible. The cost-allocation model (Section 8.24) should determine the amount of damage attributable to Airport traffic.

Table 8.07
Neighborhoods Identified for Maintenance/Reconstruction Mitigation

City	Area	Amount
Burien	Shorewood neighborhood	$0.5 million
	North Central neighborhood	$0.5 million
	North East neighborhood	$1.3 million
	Seahurst neighborhood	$0.2 million
	Central neighborhood	$0.4 million
	East Central neighborhood	$1.0 million
	Gregory Heights neighborhood	$0.2 million
	South East neighborhood	$0.6 million
	Downtown neighborhood	$0.4 million
	Total - Burien	**$5.1 million**
Des Moines	North Hill neighborhood	$1.0 million
	West Central neighborhood	$0.5 million
	East Central neighborhood	$0.5 million
	Zenith neighborhood	$0.3 million
	South Des Moines neighborhood	$0.8 million
	East Woodmont neighborhood	$0.4 million
	Downtown neighborhood	$0.1 million
	Total - Des Moines	**$3.6 million**
Federal Way	Star Lake neighborhood	$0.5 million
	Wildwood neighborhood	$0.5 million
	Marine Hills neighborhood	$0.3 million
	Mirror Lake neighborhood	$0.8 million
	Easter Lake neighborhood	$0.6 million
	Steel Lake neighborhood	$0.1 million
	First Avenue neighborhood	$0.6 million
	Kitts Corner North neighborhood	$0.1 million
	City Center neighborhood	$0.4 million
	Total - Federal Way	**$3.9 million**

Table 8.07 (continued)

City	Area	Amount
Normandy Park	Bonniewood neighborhood	$0.1 million
	North neighborhood	$0.5 million
	Riviera neighborhood	$0.7 million
	Manhattan neighborhood	$0.4 million
	East Central neighborhood	$0.6 million
	Normandy Province neighborhood	$0.1 million
	Arrow Lake neighborhood	$0.2 million
	South neighborhood	$1.7 million
	Total - Normandy Park	**$4.3 million**
Tukwila	Ryan neighborhood	$0.1 million
	Allentown neighborhood	$0.3 million
	Cascade View neighborhood	$0.3 million
	Foster neighborhood	$0.9 million
	Thorndyke neighborhood	$1.3 million
	Tukwila Hill neighborhood	$1.2 million
	McMicken neighborhood	$0.5 million
	M.I.C. neighborhood	$1.9 million
	Riverton neighborhood	$0.8 million
	CBD neighborhood	$3.2 million
	Tukwila Valley South neighborhood	$0.7 million
	Total - Tukwila	**$11.2 million**
Total Study Area		**$28.1 million**

8.14 - CONSTRUCTION IMPACTS - TRUCK HAUL ROUTES MITIGATION

Neighborhoods with principal and minor arterials may experience increased construction truck traffic. The EIS identifies 20 MCY of fill material that will be necessary for construction of the Third Runway. If this fill material is hauled by truck, it should be confined to State freeways. Traffic that would normally use these highways may divert to local roads to avoid the trucks. Individual cities may need to implement truck traffic controls and assign a traffic officer to control traffic and enforce truck haul routes. Table 8.08 indicates neighborhoods where traffic control officers may be necessary to address truck traffic associated with construction of the Third Runway.

Table 8.08
Neighborhoods Identified for Truck Haul Mitigation

City	Area	Amount
Burien	Shorewood neighborhood	$50,000/year/location
	North Central neighborhood	$50,000/year/location
	North East neighborhood	$50,000/year/location
	Seahurst neighborhood	$50,000/year/location
	Central neighborhood	$50,000/year/location
	East Central neighborhood	$50,000/year/location
	Gregory Heights neighborhood	$50,000/year/location
	South East neighborhood	$50,000/year/location
	Downtown neighborhood	$50,000/year/location
Des Moines	East Central neighborhood	$50,000/year/location
	South Des Moines neighborhood	$50,000/year/location
	East Woodmont neighborhood	$50,000/year/location
Federal Way	Star Lake neighborhood	$50,000/year/location
	Wildwood neighborhood	$50,000/year/location
	Easter Lake neighborhood	$50,000/year/location
	Kitts Corner North neighborhood	$50,000/year/location
	City Center neighborhood	$50,000/year/location
Normandy Park	No neighborhoods in Normandy Park have been identified for truck haul mitigation.	
Tukwila	Allentown neighborhood	$50,000/year/location
	Foster neighborhood	$50,000/year/location
	Thorndyke neighborhood	$50,000/year/location
	Tukwila Hill neighborhood	$50,000/year/location
	McMicken neighborhood	$50,000/year/location
	M.I.C. neighborhood	$50,000/year/location
	Riverton neighborhood	$50,000/year/location
	CBD neighborhood	$50,000/year/location
	Tukwila Valley South neighborhood	$50,000/year/location

Two general methods have been proposed to bring in the fill material - either by conventional truck or by barge on Puget Sound to a conveyor system. Each alternative has its "pros" and "cons". A separate study by HNTB, Inc., evaluated several alternatives and gave the barge/conveyor system a high rank. As of this study, it has not yet been determined which alternative will be selected.

The truck haul alternative requires more time to bring in the fill material and would impact area freeways with additional truck traffic, mostly dual-trailer dump trucks ("doubles") which will impact other vehicular traffic.

The barge/conveyor system will bring in the same amount of fill in approximately half the time, but has the potential to significantly impact the creek corridor and the barge/conveyor transfer point along the Puget Sound coast.

It is recommended that the Port of Seattle establish contingency plans for the various alternatives for bringing in the fill material. If the truck haul alternative is selected, the Port of Seattle should require the contractor to establish a truck haul route system that keeps haul traffic on State highways or intestates only. Haul traffic should not be allowed on local streets. Haul traffic should also have restricted hours of operation. The Port or its contractor should be financially responsible or provide traffic control officers at needed locations. The haul traffic should also have its own dedicated construction exit/entrance on the appropriate State or interstate highways.

It is further recommended that prior to the start of construction of any work associated with Master Plan Update implementation, the Port of Seattle should identify all borrow source areas and haul routes. Then, the Port of Seattle should re-evaluate the roadway noise analysis to reflect the actual haul routes.

8.15 - CONSTRUCTION IMPACTS - BARGE/RAIL/CONVEYOR SYSTEMS MITIGATION

An alternate to trucking is the use of a series of barges to bring the fill material in to a delivery point where it can be off-loaded onto a conveyor system. While physically twice as fast as the truck haul alternative, it may result in significant environmental damage to the chosen corridor and the nearby coastal areas. An environmental impact study of the barge/conveyor system seems warranted to assure the integrity of the chosen corridor. The plan should also include operational mitigation and corridor restoration upon completion. Table 8.09 indicates neighborhoods where mitigation of the barge/conveyor alternative may be required, if it is assumed that the conveyor is installed along Des Moines Creek.

It is recommended that the Port of Seattle establish contingency plans for the various alternatives for bringing in the fill material. If the barge/conveyor alternative is selected, an environmental assessment should be conducted of the delivery/transfer point, the selected creek corridor, and the coastal zone north and south of the delivery/transfer point to establish its baseline condition. After the material is delivered, these areas will then be restored to their baseline condition or better. The Port or its contractor should also prepare a plan that keeps non-authorized personnel out of the conveyor system, that minimizes noise impacts on adjacent residents, and that contains an emergency contingency plan that addresses pollution, spills, sedimentation, erosion, and other system failures.

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Table 8.09
Neighborhoods Identified for Barge/Conveyor Mitigation

City	Area	Amount
Burien	South East neighborhood	$ to be determined
	Total - Burien	**$ to be determined**
Des Moines	West Central neighborhood	$ to be determined
	North Central neighborhood	$ to be determined
	Downtown neighborhood	$ to be determined
	Total - Des Moines	**$ to be determined**
Federal Way	No neighborhoods in Federal Way have been identified for barge/conveyor mitigation.	
Normandy Park	South neighborhood	$ to be determined
	Total - Normandy Park	**$ to be determined**
Tukwila	No neighborhoods in Tukwila have been identified for barge/conveyor mitigation.	
Total Study Area		**$ to be determined**

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8.16 - CONSTRUCTION IMPACTS - TRAFFIC DIVERSION MITIGATION

An increase in traffic volumes on the freeways will divert a portion of the traffic onto local streets which are not designed for such volumes. This has a ripple effect where the traffic on the freeways divert to the principal arterials which divert to the minor arterials. Improvement to minor arterials may be necessary to accommodate this increase in traffic. An origin-destination survey will be necessary to determine the extent to which this increase in traffic is attributable to the Airport. However, neighborhoods that are projected to experience an increase in diverted traffic will be simultaneously mitigated by level of service improvements (see Table 8.03).

A computer model should be developed to project the amount of traffic diversion for various operations of heavy trucks on the freeways as well as congestion diversions due to the full Airport Master Plan implementation.

It is recommended that a diversion model be prepared for the project which includes the network as shown in Figure 8.01. Improvements to the arterial system as a result of diversion should be implemented prior to the start of the hauling activity on the freeways. An arterial improvement program should be implemented prior to the construction of the Third Runway.

8.17 - CONSTRUCTION IMPACTS - TRAFFIC CONTROL MITIGATION

Neighborhoods adjacent to the Airport that also have major intersections may experience increases in traffic congestion. Existing traffic signals should be modified or modernized as necessary. In some cases, uncontrolled intersections may require signalization. However, neighborhoods that are projected to experience an increase need for traffic control will be simultaneously mitigated by level of service improvements (see Table 8.03).

8.18 - CONSTRUCTION IMPACTS - CONSTRUCTION STAGING AND PHASING MITIGATION

Neighborhoods adjacent to the construction site may experience impacts as result of construction operations and traffic. Traffic management improvement implemented in the congestion measures should automatically address these concerns. All other staging and phasing issues should be limited to on-Airport locations. However, neighborhoods that are projected to experience an increase need for traffic control will be simultaneously mitigated by level of service improvements (see Table 8.03).

8.19 - CONSTRUCTION IMPACTS - WORK-FORCE TRAFFIC MITIGATION

The Port of Seattle estimates approximately 2,000 construction workers will be employed during construction of the proposed project. There may be some localized traffic congestion at staging and other areas. In these cases, it is projected that this traffic will be mitigated by improvements made to address level of service problems (see Table 8.03).

8.20 - CONSTRUCTION IMPACTS - CONCURRENT CONSTRUCTION PROJECTS MITIGATION

There is the potential for other major projects to be simultaneously under construction in southern and central King County at the same time the Third Runway is being built, including:

- Regional Transit Authority (RTA) improvements for light-rail and bus-lanes.
- Construction of the new Mariners Ballpark stadium.
- Relocation or reconstruction of the Kingdome.
- Improvements to IH-5.
- Construction of the SR 509 extension.
- Improvements to SR 518.
- Improvements to SH 99/International Boulevard.

Overlapping construction phases of these projects (and others) combined with construction of the Third Runway could have significant impacts on the region's ability to meet traffic demand.

If these projects are not managed concurrently, there is the potential to impact **every neighborhood in every city in the study area**. Therefore, it is urged that the various implementing agencies establish a dialogue as soon as possible to prevent this overlapping from occurring, or at least to minimize impacts associated with phases that must overlap.

All neighborhoods in all impacted communities are projected to be impacted by overlapping concurrent projects. Each City should estimate the need for another 25% to its average annual transportation budget to address the need for short-term projects and studies.

8.21 - POST-CONSTRUCTION IMPACTS - ADDITIONAL TRAFFIC MITIGATION

An increase in traffic is expected to occur after construction is completed and the Third Runway is operational, requiring additional improvements to intersections, signalization, and roadway capacity. Neighborhoods with principal arterials that are adjacent to the Airport may experience increased traffic as a result of increased Airport demand. Additional transportation improvement projects may be necessary to address this increase in traffic. As stated above, an origin-destination survey will be necessary to determine the extent to which traffic is attributable to the Airport. Table 8.10 lists those neighborhoods that may require additional traffic mitigation.

It is recommended that the areas identified in Table 8.10 be monitored for additional traffic impacts after the Third Runway is operational. If traffic impacts exceed EIS projections, the cost-allocation model (Section 8.24) should be used to determine the amount of mitigation required due to Airport-related traffic impacts.

Preliminary estimation of mitigation costs for transportation impacts within the City of Federal Way will be deferred until the Areawide Traffic Study has been completed. Therefore, cost estimates for mitigation of additional traffic impacts are not shown at this time within the City of Federal Way.

Table 8.10
Neighborhoods Identified for Additional Traffic Mitigation

City	Area	Amount
Burien	Shorewood neighborhood	$2.4 million
	North Central neighborhood	$3.2 million
	North East neighborhood	$12.0 million
	Seahurst neighborhood	$2.6 million
	Central neighborhood	$2.6 million
	East Central neighborhood	$9.2 million
	South East neighborhood	$3.2 million
	Downtown neighborhood	$5.4 million
	Total - Burien	**$40.6 million**
Des Moines	North Hill neighborhood	$7.0 million
	West Central neighborhood	$3.2 million
	East Central neighborhood	$10.4 million
	Zenith neighborhood	$2.4 million
	South Des Moines neighborhood	$4.6 million
	East Woodmont neighborhood	$4.6 million
	Downtown neighborhood	$1.0 million
	Total - Des Moines	**$33.2 million**
Federal Way	No neighborhoods in Federal Way have been identified for mitigation of additional traffic.	**$0.0 million**
Normandy Park	Bonniewood neighborhood	$0.4 million
	North neighborhood	$2.6 million
	Riviera neighborhood	$3.8 million
	Manhattan neighborhood	$2.0 million
	East Central neighborhood	$3.4 million
	Normandy Province neighborhood	$0.4 million
	Arrow Lake neighborhood	$1.2 million
	South neighborhood	$9.6 million
	Total - Normandy Park	**$23.4 million**
Tukwila	Ryan neighborhood	$0.6 million
	Allentown neighborhood	$2.4 million
	Cascade View neighborhood	$2.2 million
	Foster neighborhood	$6.0 million
	Thorndyke neighborhood	$9.0 million
	Tukwila Hill neighborhood	$8.2 million
	McMicken neighborhood	$3.6 million
	M.I.C. neighborhood	$13.2 million
	Riverton neighborhood	$5.2 million
	CBD neighborhood	$22.6 million
	Tukwila Valley South neighborhood	$4.6 million
	Total - Tukwila	**$90.8 million**
Total Study Area		**$188.0 million**

8.22 - POST-CONSTRUCTION IMPACTS - INCREASED OPERATION AND MAINTENANCE COSTS MITIGATION

Neighborhoods with principal arterials that are adjacent to the Airport may experience increased maintenance costs as a result of increased Airport demand. Additional maintenance improvement projects may be necessary to address this increase in maintenance frequency. As stated above, an origin-destination survey will be necessary to determine the extent to which traffic is attributable to the Airport. However, improvements made to address level of service improvements (see Table 8.03) should also simultaneously address the needs for increased operation and maintenance costs.

8.23 - POST-CONSTRUCTION IMPACTS - MASTER PLAN IMPLEMENTATION MITIGATION

As the Airport's Master Plan is implemented, additional traffic may be experienced as a result of more employees, more airline personnel, more travelers, and more support services. Additional transportation improvement projects may be necessary to address this increase in traffic. As stated above, an origin-destination survey will be necessary to determine the extent to which traffic is attributable to the Airport. However, improvements made to address level of service improvements (see Table 8.03) should also simultaneously address the additional demands as a result of the full Master Plan Update implementation.

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Like the existing conditions analysis, the future analysis should be evaluated again by the Port of Seattle in order to reflect more accurately the information available prior to the start of construction for Master Plan Update implementation. This, is in part, to reflect actual Airport area traffic information due to growth, changes in any traffic patterns, etc. The re-evaluation would benefit from the following:

- More accurate information on construction activities, in particular haul routes, so that construction traffic can be included in the roadway noise re-evaluation.
- More accurate information on vehicle classification and their use of the various roadways.
- The additional monitoring data obtained from the roadway noise monitoring sites.

8.24 - OTHER TRANSPORTATION MITIGATION MEASURES

Section 3 of this report analyzed the Airport's EIS and raised several concerns regarding the information presented on transportation issues. As a result, many of the projected transportation impacts and mitigation costs presented in this Section must be considered preliminary, at best, until the necessary studies are completed.

This study recommends that supplemental transportation studies be conducted **prior to Federal and State approval to proceed with the project.** While the Port of Seattle is the project sponsor, responsibility for these studies is expected to be the responsibility of various agencies and may involve at least the PSRC, the State of Washington Department of Transportation, the City of Seattle, King County, and the Port of Seattle.

The following supplemental transportation studies are suggested to be conducted prior to project approval.

Areawide Traffic Study

While the EIS performed an acceptable analysis of traffic at the 12 major intersections surrounding the Airport property, many issues regarding increased congestion and damage to streets will continue to be raised until hard data is available within the entire study area.

An areawide traffic study should be undertaken for the South King County area, including the Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila, to establish existing baseline conditions and forecast levels of service on the roadway network as shown in Figure 8.01. This study should, as best possible, forecast traffic for the following time-frames:

- 1994 - EIS baseline.
- 1997 - Current.
- 2000 - EIS completion of Third Runway.
- 2020 - EIS full Airport Master Plan implementation.

This study should:

- Build upon the existing transportation plans of the above cities.
- Establish common level of service criteria for mitigation of Airport impacts.
- Address the issue of concurrent construction projects in the forecasts.
- Be conducted on a corridor-basis.
- Provide for monitoring and updating.
- Determine the current and projected levels of service on the network and major intersections.

It is recommended that as the project sponsor, the Port of Seattle should expand the EIS traffic analysis to the entire network as shown in Figure 8.01.

Origin-Destination (O-D) Survey

One of the key questions raised in Section 3 of this report was the affect of increased traffic on the local and State thoroughfare networks. According to Airport projections, future demand will roughly double whether or not the Airport expands its facilities. During this same time-frame, it is logical to project that there will be **some** increase in regional traffic unrelated to Sea-Tac International Airport. But it has not yet been determined what percentage of future traffic will be attributable to the Airport and what percentage is attributable to non-Airport regional growth.

Development of an origin-destination survey (or select link analysis or screen-line analysis) will project these percentages on major local and State roadways. The O-D survey should be the basis for assigning financial responsibility for transportation improvements which benefit various land uses, including the Airport.

It is recommended that in its capacity as the region's metropolitan transportation planning agency, the Puget Sound Regional Council should conduct an origin-destination (O-D) survey to determine the amount of regional traffic attributable to Sea-Tac International Airport. This survey should use the most recent data available and may necessitate extensive data collection and sampling of motorists. The percentage of traffic attributable to the Airport should be projected to the year 2020 in 5-year increments and be used for projecting cost-sharing of various transportation projects that serve and benefit Sea-Tac International Airport. These projects include, but are not limited to:

- **Thoroughfare projects to reduce traffic noise and accidents and to improve level of service.**
- **Thoroughfare projects to improve school bus, transit bus, and emergency service operations.**
- **Thoroughfare projects to improve parking and pedestrian circulation.**
- **Repair/reconstruction/replacement of local streets and State roads and bridges.**
- **Increased frequency of maintenance and reconstruction of local and State roadways.**
- **Traffic control measures to manage construction and diverted traffic.**
- **Traffic control measures to manage future traffic of the full Airport Master Plan build-out.**

Cost Allocation Model

After completion of an updated O-D study, the calculation of a *pro rata* share of transportation impact costs attributable to construction of the Third Runway and implementation of the full Airport Master Plan becomes possible. This allocation model should be based upon the O-D results, negotiated with the impacted communities and be **part of an interlocal agreement before construction of the Third Runway begins.**

It is recommended that the estimated mitigation costs calculated in Section 8 of this report should be recalculated taking into consideration the O-D information recommended above. Costs for mitigation projects should be assigned to the Port of Seattle only if those impacts are attributable to traffic as a result of the Third Runway. Other transportation projects would be implemented by the appropriate local, county, State, and/or Federal agencies. Costs to be recalculated include:

- **Traffic noise abatement projects.**
- **Local/State street reconstruction and bridge replacement projects.**
- **Increased maintenance and reconstruction projects.**
- **Construction traffic control projects.**
- **Additional traffic impacts (for full Airport Master Plan build-out).**

Projects that have not been estimated in this study but will eventually require calculation include:

- **Level of service improvements.**
- **School bus and transit bus routes, scheduling, equipment, and staffing improvements.**
- **Police and emergency service routes, equipment, staffing, and response time improvements.**
- **Parking access and pedestrian circulation improvements.**

Incident Management Plan

With the expected increase of heavy haul trucks on the freeways during the construction phase of the Third Runway, there is a high likelihood that the type, frequency and severity of accidents currently experienced will change; possibly dramatically. To prepare for this haul period, a Freeway Incident Management Plan should be prepared prior to any hauling permits being issued and should include:

- Detection systems.
- Emergency services protocols.
- Control of the accident scene.
- Fast transport of injured.
- Traffic diversion points.
- Diversion/detour routes.
- Roles and responsibilities identified.
- Accident investigation sites.

This system would also respond to spills and should be based upon state-of-the-art telecommunications techniques.

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It is recommended that the Washington Department of Transportation develop a Freeway Incident Management Plan for the construction phase and also impose operational restrictions on the heavy trucks involved with the haul and consider:

- **Haul truck climbing lanes.**
- **Lane restrictions.**
- **Time-of-day restrictions.**
- **Weight/length restrictions.**
- **Permitting/fines system.**

Surface Transportation Noise Mitigation

- **Regulatory Compliance** - The Port of Seattle should comply with all appropriate Federal, State and local noise regulatory requirements for surface transportation of fill and other materials associated with Master Plan Update implementation.

- **Construction Time-Limits** - All construction operations, including heavy equipment and trucks hauling fill, should only operate between the hours of 7:00 AM and 9:00 PM Monday through Friday and 9:00 AM to 9:00 PM on Saturdays. No operations should be allowed on Sundays or holidays.

- **Noise Control Devices** - All construction equipment, including trucks hauling fill, should be equipped with noise control devices which should be at least as effective as those devices provided with the original equipment.

- **Complaint-Driven Requirements** - If noise complaints are received during construction, the Port of Seattle should at least implement one or more of the following:

  - Locate stationary construction equipment as far from nearby noise sensitive properties as possible.

  - Shut off idling equipment.

  - Re-schedule construction operations to avoid periods of noise annoyance.

  - Notify nearby residents whenever extremely noisy work will be occurring.

  - Install temporary or portable acoustic barriers around stationary construction noise sources.

  - Place material stockpiles between crushing or screening operations and the affected dwelling(s).

- **Remodeling** - Depending on when the Master Plan Update implementation is started, existing surface transportation noise should be remodeled by the Port of Seattle with the then-current version of STAMINA or the most accepted program. This will allow a comparison with the 1994 existing baseline conditions and the actual conditions at the start of construction. In order to plan for this re-evaluation, the following should be done:

  - Specific roadway noise monitoring sites should be established at key locations, possibly some of the sites identified as being noise impacted by the Federal Highway Administration noise sensitivity criterion; the locations of these sites should be coordinated with the establishment of additional aircraft noise monitoring sites; data collection from these noise monitoring sites should begin as soon as possible in order to provide up-to-date baseline information before Master Plan Update implementation construction starts.

  - More accurate traffic information should be obtained for the roads in the Airport area (e.g., vehicle categories and road use); the EIS indicates that relevant data was available only on I-5 and International Boulevard for surveys conducted on 3 August 1987; 8 July 1991; and 25 February 1992.

- **Clarify INM and Surface Traffic Noise** - The INM incorporated aircraft ground noise in its analysis. However, it was not clear if this included construction and other surface traffic, in particular traffic associated with hauling fill. This should be clarified by the Port of Seattle and if necessary the interaction between surface transportation and aircraft noise levels should be evaluated including the construction traffic.

8.25 - TRANSPORTATION IMPACT SUMMARIES

Plates 8.1 through 8.6 summarize the environmental impacts for each of the five impacted communities, plus the Highline School District and Highline Community Hospital. The impact, mitigation measure, and cost is identified for each neighborhood. The following conventions should be noted when reviewing these Plates:

- **"- - -"** - Indicates that there is no impact identified for this neighborhood.
- **"$ TBD"** - Indicates that the mitigation costs are yet to be determined. Not enough information was available during this study to determine these costs.
- **"$0.0 M"** - Indicates that there are no mitigation costs for this neighborhood.
- **"Mitigated by . . . measures"** - Indicates that other mitigation measures simultaneously mitigate this neighborhood for multiple impact types.
- **"See . . . matrix"** - (Appears only in the Public Facility matrix) Indicates that these impacts are addressed by measures delineated in another City/neighborhood matrix.
- **"Outside Study Area"** - (Appears only in the Public Facility matrix) Indicates that only impacts to the school/hospital building are delineated. Analysis of other impacts are outside the scope of the study.

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SEA-TAC INTERNATIONAL AIRPORT
IMPACT MITIGATION STUDY

TRANSPORTATION IMPACT MATRIX - CITY OF BURIEN

PLATE 8.1

Neighborhood		Congestion							Physical Damage				Construction Impacts							Post-Construction Impacts		
Name	Measures	Level of Service (LOS)	Accidents	School Bus Operations	Transit Bus Operations	Police & Emergency Vehicle Operations	Parking & Pedestrian Access	Traffic Noise (LEQ)	Local Streets	State Roads	State Bridges	Increased Maintenance/ Reconstruction	Truck Haul Routes	Barge/Rail Conveyor System	Traffic Diversion	Traffic Control	Construct. Staging/ Phasing	Work-Force Traffic	Concurrent Construct. Projects	Additional Traffic	Increased Operation/ Maintenance Costs	Master Plan Update
Shorewood	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(601 acres)	Cost	$1.2 M	measures	measures	measures	measures	measures	measures	$1.2 M	---	---	$0.5 M	$50,000 /year per location	---	measures	measures	measures	measures	$ TBD	$2.4 M	measures	measures
North Central	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(488 acres)	Cost	$1.6 M	measures	measures	measures	measures	measures	measures	$1.6 M	---	---	$0.5 M	$50,000 /year per location	---	measures	measures	measures	measures	$ TBD	$3.2 M	measures	measures
North East	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(707 acres)	Cost	$9.8 M	measures	measures	measures	measures	measures	measures	$4.6 M	$1.9 M	$8.5 M	$1.3 M	$50,000 /year per location	---	measures	measures	measures	measures	$ TBD	$12.0 M	measures	measures
Seahurst Park	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(166 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
Seahurst	Impact	---	---	---	---	---	---	---	Road damage	---	---	Pavement damage	Increased truck traffic	---	---	---	---	---	Regional traffic	Additional traffic	---	---
	Mitigation	---	---	---	---	---	---	---	Reconstruct roads	---	---	Increase maint.	Traffic control	---	---	---	---	---	Transp. manage. plan	Corridor improve's.	---	---
(393 acres)	Cost	---	---	---	---	---	---	---	$0.7 M	---	---	$0.2 M	$50,000 /year per location	---	---	---	---	---	$ TBD	$2.6 M	---	---
Central	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(156 acres)	Cost	$1.3 M	measures	measures	measures	measures	measures	measures	$1.3 M	---	---	$0.4 M	$50,000 /year per location	---	measures	measures	measures	measures	$ TBD	$2.6 M	measures	measures
Lake Burien	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(162 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
East Central	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(254 acres)	Cost	$9.8 M	measures	measures	measures	measures	measures	measures	$3.5 M	$1.2 M	$10.2 M	$1.0 M	$50,000 /year per location	---	measures	measures	measures	measures	$ TBD	$9.2 M	measures	measures
South West	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(365 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
Gregory Heights	Impact	---	---	---	---	---	---	---	Road damage	---	---	Pavement Damage	Increased truck traffic	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	Reconstruct roads	---	---	Increase maint.	Traffic control	---	---	---	---	---	Transp. manage. plan	---	---	---
(574 acres)	Cost	---	---	---	---	---	---	---	$0.6 M	---	---	$0.2 M	$50,000 /year per location	---	---	---	---	---	$ TBD	---	---	---
South East	Impact	---	---	---	---	---	---	---	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	Corridor damage	---	---	---	---	Regional traffic	Additional traffic	---	---
	Mitigation	---	---	---	---	---	---	---	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	Reconstruct corridor	---	---	---	---	Transp. manage. plan	Corridor improve's.	---	---
(268 acres)	Cost	---	---	---	---	---	---	---	$2.0 M	$0.9 M	$5.1	$0.6 M	$50,000 /year per location	$ TBD	---	---	---	---	$ TBD	$3.2 M	---	---
Downtown	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(308 acres)	Cost	$9.8 M	measures	measures	measures	measures	measures	measures	$1.4 M	---	---	$0.4 M	$50,000 /year per location	---	measures	measures	measures	measures	$ TBD	$5.4 M	measures	measures
Total (4,442 ac.)	$116.8 M plus TBD	$26.4 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$16.9 M	$4.0 M	$23.8 M	$5.1 M	$50,000 /year per location	$ TBD	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$40.6 M	$0.0 M	$0.0

TRANSPORTATION IMPACT MATRIX - CITY OF DES MOINES

PLATE 8.2

Neighborhood		Congestion							Physical Damage				Construction Impacts							Post-Construction Impacts		
Name	Measures	Level of Service (LOS)	Accidents	School Bus Operations	Transit Bus Operations	Police & Emergency Vehicle Access	Parking & Pedestrian Access	Traffic Noise (LEQ)	Local Streets	State Roads	State Bridges	Increased Maintenance/ Reconstruc.	Truck Haul Routes	Barge/Rail Conveyor System	Traffic Diversion	Traffic Control	Construct. Staging/ Phasing	Work-force Traffic	Concurrent Construc. Projects	Additional Traffic	Increased Operation/ Maintenance Costs	Master Plan Update
North Hill	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(123 acres)	Cost	$3.5 M	measures	measures	measures	measures	measures	measures	$1.4 M	---	---	$1.0 M	---	---	measures	measures	measures	measures	$ TBD	$7.0 M	measures	measures
West Central	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	Corridor damage	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	Reconstruct corridor	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(179 acres)	Cost	$1.6 M	measures	measures	measures	measures	measures	measures	$2.1 M	---	---	$0.5 M	---	$ TBD	measures	measures	measures	measures	$ TBD	$3.2 M	measures	measures
North Central	Impact	---	---	---	---	---	---	---	Road damage	---	---	---	---	Corridor damage	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	Reconstruct roads	---	---	---	---	Reconstruct corridor	---	---	---	---	Transp. manage. plan	---	---	---
(141 acres)	Cost	---	---	---	---	---	---	---	$2.1 M	---	---	---	---	$ TBD	---	---	---	---	$ TBD	---	---	---
East Central	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(126 acres)	Cost	$5.2 M	measures	measures	measures	measures	measures	measures	$2.1 M	$2.3 M	$1.7 M	$0.5 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$10.4 M	measures	measures
Wenith	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(50 acres)	Cost	$1.2 M	measures	measures	measures	measures	measures	measures	$2.1 M	---	---	$0.3 M	---	---	measures	measures	measures	measures	$ TBD	$2.4 M	measures	measures
South Des Moines	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(193 acres)	Cost	$2.3 M	measures	measures	measures	measures	measures	measures	$2.1 M	$0.5 M	---	$0.8 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$4.6 M	measures	measures
West Woodmont	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	---	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	---	Mitigated	Mitigated
	Mitigation	Insulation/ easement	by LOS	by LDN	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	---	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	---	by LOS	by LOS
(130 acres)	Cost	$2.3 M	measures	measures	measures	measures	measures	measures	$0.8 M	---	---	---	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	---	measures	measures
East Woodmont	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Insulation/ easement	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(106 acres)	Cost	$0.8 M	measures	measures	measures	measures	measures	measures	$0.5 M	$0.8 M	---	$0.4 M	---	---	measures	measures	measures	measures	$ TBD	$4.6 M	measures	measures
Hendondo	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(12 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
Downtown	Impact	---	---	---	---	---	---	---	Road damage	---	---	Pavement damage	---	Corridor damage	---	---	---	---	Regional traffic	Additional traffic	---	---
	Mitigation	---	---	---	---	---	---	---	Reconstruct roads	---	---	Increase maint.	---	Reconstruct corridor	---	---	---	---	Transp. manage. plan	Corridor improve's.	---	---
(108 acres)	Cost	---	---	---	---	---	---	---	$0.6 M	---	---	$0.1 M	---	$ TBD	---	---	---	---	$ TBD	$1.0 M	---	---
Total (1,067 ac.)	$72.8 M plus TBD	$16.9 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$13.8 M	$3.6 M	$1.7 M	$3.6 M	$50,000/year per location	$ TBD	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$33.2 M	$0.0 M	$0.0 M

TRANSPORTATION IMPACT MATRIX - CITY OF FEDERAL WAY

PLATE 8.3

Neighborhood		Congestion							Physical Damage				Construction Impacts							Post-Construction Impacts		
Name	Measures	Level of service (LOS)	Accidents	School bus operations	Transit bus operations	Police & emergency vehicle access	Parking & pedestrian access	Traffic noise (LEQ)	Local streets	State roads	State bridges	Increased mainten./ reconstruc.	Truck haul routes	Barge/rail conveyor system	Traffic diversion	Traffic control	Construct. staging/ phasing	Work-force traffic	Concurrent construc. projects	Additional traffic	Increased operation/ maintenance costs	Master plan update
Star Lake	Impact	Traffic congestion	---	---	---	---	---	---	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Regional traffic	---	Mitigated by LOS measures	Mitigated by LOS measures
	Mitigation	Corridor improve's.	---	---	---	---	---	---	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---					Transp. manage. plan	---		
(531 acres)	Cost	$4.0 M	---	---	---	---	---	---	$1.4 M	$2.0 M	$1.7 M	$0.5 M	$50,000/year per location	---					$ TBD	---		
Wildwood	Impact	Traffic congestion	---	---	---	---	---	---	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Regional traffic	---	Mitigated by LOS measures	Mitigated by LOS measures
	Mitigation	Corridor improve's.	---	---	---	---	---	---	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---					Transp. manage. plan	---		
(553 acres)	Cost	$4.6 M	---	---	---	---	---	---	$2.1 M	$1.3 M	$1.7 M	$0.5 M	$50,000/year per location	---					$ TBD	---		
Marine Hills	Impact	---	---	---	---	---	---	---	---	Road damage	---	Pavement damage	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	Reconstruct roads	---	Increase maint.	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(529 acres)	Cost	---	---	---	---	---	---	---	---	$0.5 M	---	$0.3 M	--	---	---	---	---	---	$ TBD	---	---	---
Mar-Cheri	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(311 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
Dash Point	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(826 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
Lakota	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(949 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
Mirror Lake	Impact	---	---	---	---	---	---	---	Road damage	---	---	Pavement damage	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	Reconstruct roads	---	---	Increase maint.	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(713 acres)	Cost	---	---	---	---	---	---	---	$0.8 M	---	---	$0.8 M	---	---	---	---	---	---	$ TBD	---	---	---
Easter Lake	Impact	Traffic congestion	---	---	---	---	---	---	Road damage	Road damage	---	Pavement damage	Increased truck traffic	---	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Regional traffic	---	Mitigated by LOS measures	Mitigated by LOS measures
	Mitigation	Corridor improve's.	---	---	---	---	---	---	Reconstruct roads	Reconstruct roads	---	Increase maint.	Traffic control	---					Transp. manage. plan	---		
(729 acres)	Cost	$2.0 M	---	---	---	---	---	---	$0.5 M	$0.6 M	---	$0.6 M	$50,000/year per location	---					$ TBD	---		
Steel Lake	Impact	Traffic congestion	---	---	---	---	---	---	---	Road damage	Bridge damage	Pavement damage	---	---	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Regional traffic	---	Mitigated by LOS measures	Mitigated by LOS measures
	Mitigation	Corridor improve's.	---	---	---	---	---	---	---	Reconstruct roads	Replace bridges	Increase maint.	---	---					Transp. manage. plan	---		
(347 acres)	Cost	$3.3 M	---	---	---	---	---	---	---	$1.5 M	$1.7 M	$0.1 M	---	---					$ TBD	---		
Twin Lakes	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(1,118 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---

TRANSPORTATION IMPACT MATRIX - CITY OF FEDERAL WAY (continued)

PLATE 8.3 (continued)

Neighborhood		Congestion							Physical Damage				Construction Impacts							Post-Construction Impacts		
Name	Measures	Level of Service (LOS)	Accidents	School Bus Operations	Transit Bus Operations	Police & Emergency Vehicle Access	Parking & Pedestrian Access	Traffic Noise (LEQ)	Local Streets	State Roads	State Bridges	Increased Maintenance/ Reconstruc.	Truck Haul Routes	Barge/Rail Conveyor System	Traffic Diversion	Traffic Control	Construct. Staging/ Phasing	Work-force Traffic	Concurrent Construc. Projects	Additional Traffic	Increased Operation/ Maintenance Costs	Master Plan Update
West Campus	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
(48 acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
Pet Avenue	Impact	Traffic congestion	---	---	---	---	---	---	Road damage	Road damage	---	Pavement damage	---	---	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Regional traffic	---	Mitigated by LOS measures	Mitigated by LOS measures
	Mitigation	Corridor improve's	---	---	---	---	---	---	Reconstruct roads	Reconstruct roads	---	Increase maint.	---	---					Transp. manage. plan	---		
(46 acres)	Cost	$1.7 M	---	---	---	---	---	---	$0.5 M	$0.5 M	---	$0.6 M	---	---					$ TBD	---		
Pacific Corner North	Impact	Traffic congestion	---	---	---	---	---	---	---	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Regional traffic	---	Mitigated by LOS measures	Mitigated by LOS measures
	Mitigation	Corridor improve's	---	---	---	---	---	---	---	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---					Transp. manage. plan	---		
(99 acres)	Cost	$3.1 M	---	---	---	---	---	---	---	$1.1 M	$1.7 M	$0.1 M	$50,000/year per location	---					$ TBD	---		
City Center	Impact	Traffic congestion	---	---	---	---	---	---	Road damage	Road damage	---	Pavement damage	Increased truck traffic	---	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Mitigated by LOS measures	Regional traffic	---	Mitigated by LOS measures	Mitigated by LOS measures
	Mitigation	Corridor improve's	---	---	---	---	---	---	Reconstruct roads	Reconstruct roads	---	Increase maint.	Traffic control	---					Transp. manage. plan	---		
(10 acres)	Cost	$3.1 M	---	---	---	---	---	---	$1.1 M	$1.3 M	---	$0.1 M	$50,000/year per location	---					$ TBD	---		
Total (759 ac.)		$46.7 M plus TBD	$20.8 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$6.4 M	$8.8 M	$6.8 M	$3.9 M	$50,000/year per location	$ 0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$0.0 M	$0.0 M	$0.0 M

TRANSPORTATION IMPACT MATRIX - CITY OF NORMANDY PARK

PLATE 8.4

Neighborhood		Congestion							Physical Damage				Construction Impacts							Post-Construction Impacts		
ame	Measures	Level of Service (LOS)	Accidents	School Bus Operations	Transit Bus Operations	Police & Emergency Vehicle Access	Parking & Pedestrian Access	Traffic Noise (LEQ)	Local Streets	State Roads	State Bridges	Increased Maintenance/ Reconstruc.	Truck Haul Routes	Barge/Rail Conveyor System	Traffic Diversion	Traffic Control	Construct. Staging/ Phasing	Work-force Traffic	Concurrent Construc. Projects	Additional Traffic	Increased Operation/ Maintenance Costs	Master Plan Update
nnlewood	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
acres)	Cost	$0.2 M	measures	measures	measures	measures	measures	measures	$0.2 M	---	---	$0.1 M	---	---	measures	measures	measures	measures	$ TBD	$0.4 M	measures	measures
ghlands	Impact	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Regional traffic	---	---	---
	Mitigation	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Transp. manage. plan	---	---	---
acres)	Cost	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	$ TBD	---	---	---
rth	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	Bridge damage	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	Replace bridges	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
8 acres)	Cost	$1.2 M	measures	measures	measures	measures	measures	measures	$9.3 M	---	$1.7 M	$0.5 M	---	---	measures	measures	measures	measures	$ TBD	$2.6 M	measures	measures
era	Impact	---	---	---	---	---	---	---	Road damage	---	---	Pavement damage	---	---	---	---	---	---	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	---	---	---	---	---	---	---	Reconstruct roads	---	---	Increase maint.	---	---	---	---	---	---	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
acres)	Cost	---	---	---	---	---	---	---	$1.9 M	---	---	$0.7 M	---	---	---	---	---	---	$ TBD	$3.8 M	measures	measures
hattan	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
acres)	Cost	$1.0 M	measures	measures	measures	measures	measures	measures	$1.0 M	---	---	$0.4 M	---	---	measures	measures	measures	measures	$ TBD	$2.0 M	measures	measures
ral	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
acres)	Cost	$1.7 M	measures	measures	measures	measures	measures	measures	$1.7 M	---	---	$0.6 M	---	---	measures	measures	measures	measures	$ TBD	$3.4 M	measures	measures
andy nce	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
res)	Cost	$0.2 M	measures	measures	measures	measures	measures	measures	$0.2 M	---	---	$0.1 M	---	---	measures	measures	measures	measures	$ TBD	$0.4 M	measures	measures
e	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
res)	Cost	$0.6 M	measures	measures	measures	measures	measures	measures	$0.6 M	---	---	$0.3 M	---	---	measures	measures	measures	measures	$ TBD	$1.2 M	measures	measures
	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	Corridor damage	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	Reconstruct corridor	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
cres)	Cost	$4.8 M	measures	measures	measures	measures	measures	measures	$4.8 M	---	---	$1.7 M	---	$ TBD	measures	measures	measures	measures	$ TBD	$9.6 M	measures	measures
ac.)	$56.9 M plus TBD	$9.8 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$11.7 M	$0.0 M	$1.7 M	$4.3 M	$0.0 M	$ TBD	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$ TBD	$23.4 M	$0.0 M	$0.0 M

TRANSPORTATION IMPACT MATRIX - CITY OF TUKWILA

PLATE 8.5

Neighborhood		Congestion							Physical Damage				Construction Impacts							Post-Construction Impacts		
Name	Measures	Level of Service (LOS)	Accidents	School Bus Operations	Transit Bus Operations	Police & Emergency Vehicle Access	Parking & Pedestrian Access	Traffic Noise	Local Streets	State Roads	State Bridges	Increased Maintenance/ Reconstruc.	Truck Haul Routes	Barge/Rail Conveyor System	Traffic Diversion	Traffic Control	Construct. Staging/ Phasing	Work-force Traffic	Concurrent Construc. Projects	Additional Traffic	Increased Operation/ Maintenance Costs	Master Plan Update
Ryan	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	---	Road damage	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	---	Reconstruct roads	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(114 acres)	Cost	$0.8 M	measures	measures	measures	measures	measures	measures	---	$0.3 M	---	$0.1 M	---	---	measures	measures	measures	measures	$ TBD	$0.6 M	measures	measures
Allentown	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	---	Road damage	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	---	Reconstruct roads	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(346 acres)	Cost	$4.0 M	measures	measures	measures	measures	measures	measures	---	$1.2 M	---	$0.3 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$2.4 M	measures	measures
Cascade View	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	---	---	Pavement damage	---	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	---	---	Increase maint.	---	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(303 acres)	Cost	$1.1 M	measures	measures	measures	measures	measures	measures	$1.1 M	---	---	$0.3 M	---	---	measures	measures	measures	measures	$ TBD	$2.2 M	measures	measures
Foster	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(485 acres)	Cost	$1.5 M	measures	measures	measures	measures	measures	measures	$1.7 M	$1.3 M	$6.0 M	$0.9 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$6.0 M	measures	measures
Thorndyke	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(420 acres)	Cost	$4.2 M	measures	measures	measures	measures	measures	measures	$3.0 M	$1.5 M	$3.4 M	$1.3 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$9.0 M	measures	measures
Tukwila Hill	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(857 acres)	Cost	$4.9 M	measures	measures	measures	measures	measures	measures	$2.1 M	$2.0 M	$3.4 M	$1.2 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$8.2 M	measures	measures
McMicken	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(461 acres)	Cost	$1.0 M	measures	measures	measures	measures	measures	measures	$0.3 M	$1.5 M	---	$0.5 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$3.6 M	measures	measures
M.I.C.	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(1,083 ac.)	Cost	$8.6 M	measures	measures	measures	measures	measures	measures	$5.1 M	$1.5 M	$1.7 M	$1.9 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$13.2 M	measures	measures
Riverton	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	---	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	---	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(276 acres)	Cost	$3.8 M	measures	measures	measures	measures	measures	measures	$1.9 M	$0.7 M	---	$0.8 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$5.2 M	measures	measures
SEQ	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(1,095 ac.)	Cost	$11.1 M	measures	measures	measures	measures	measures	measures	$10.1 M	$1.3 M	$3.4 M	$3.2 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$22.6 M	measures	measures
Tukwila Valley South	Impact	Traffic congestion	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Mitigated	Road damage	Road damage	Bridge damage	Pavement damage	Increased truck traffic	---	Mitigated	Mitigated	Mitigated	Mitigated	Regional traffic	Additional traffic	Mitigated	Mitigated
	Mitigation	Corridor improve's.	by LOS	by LOS	by LOS	by LOS	by LOS	by LOS	Reconstruct roads	Reconstruct roads	Replace bridges	Increase maint.	Traffic control	---	by LOS	by LOS	by LOS	by LOS	Transp. manage. plan	Corridor improve's.	by LOS	by LOS
(167 acres)	Cost	$2.6 M	measures	measures	measures	measures	measures	measures	$2.0 M	$0.3 M	$1.7 M	$0.7 M	$50,000/year per location	---	measures	measures	measures	measures	$ TBD	$4.6 M	measures	measures
Total (1,807 ac.)	$191.7 M plus TBD	$43.7 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$27.2 M	$11.6 M	$20.4 M	$11.2 M	$50,000/year per location	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$0.0 M	$77.6 M	$0.0 M	$0.0 M

TRANSPORTATION IMPACT MATRIX - PUBLIC FACILITIES

PLATE 8.6

SCHOOL/HOSPITAL (NEIGHBORHOOD)		CONGESTION							PHYSICAL DAMAGE				CONSTRUCTION IMPACTS							POST-CONSTRUCTION IMPACTS		
NAME	MEASURES	LEVEL OF SERVICE (LOS)	ACCIDENTS	SCHOOL BUS OPERATIONS	TRANSIT BUS OPERATIONS	POLICE & EMERGENCY VEHICLE ACCESS	PARKING & PEDESTRIAN ACCESS	TRAFFIC NOISE (LEQ)	LOCAL STREETS	STATE ROADS	STATE BRIDGES	INCREASED MAINTEN./ RECONSTRUC.	TRUCK HAUL ROUTES	BARGE/RAIL CONVEYOR SYSTEM	TRAFFIC DIVERSION	TRAFFIC CONTROL	CONSTRUCT. STAGING/ PHASING	WORK-FORCE TRAFFIC	CONCURRENT CONSTRUC. PROJECTS	ADDITIONAL TRAFFIC	INCREASED OPERATION/ MAINTENANCE COSTS	MASTER PLAN UPDATE
HIGHLINE SCHOOL/HOSPITAL FACILITIES IN CITY OF BURIEN																						
Highline Community Hospital (Gregory Heights)	Impact	---	---	---	---	---	---	---	See Gregory Heights (Plate 8.1)	---	---	See Gregory Heights (Plate 8.1)	See Gregory Heights (Plate 8.1)	---	---	---	---	---	See Gregory Heights (Plate 8.1)	---	---	---
	Mitigation	---	---	---	---	---	---	---		---	---			---	---	---	---	---		---	---	---
	Cost	---	---	---	---	---	---	---		---	---			---	---	---	---	---		---	---	---
Gregory Heights Elementary School (Gregory Heights)	Impact	---	---	---	---	---	---	---	See Gregory Heights (Plate 8.1)	---	---	See Gregory Heights (Plate 8.1)	See Gregory Heights (Plate 8.1)	---	---	---	---	---	See Gregory Heights (Plate 8.1)	---	---	---
	Mitigation	---	---	---	---	---	---	---		---	---			---	---	---	---	---		---	---	---
	Cost	---	---	---	---	---	---	---		---	---			---	---	---	---	---		---	---	---
Sylvester Middle School (Gregory Heights)	Impact	---	---	---	---	---	---	---	See Gregory Heights (Plate 8.1)	---	---	See Gregory Heights (Plate 8.1)	See Gregory Heights (Plate 8.1)	---	---	---	---	---	See Gregory Heights (Plate 8.1)	---	---	---
	Mitigation	---	---	---	---	---	---	---		---	---			---	---	---	---	---		---	---	---
	Cost	---	---	---	---	---	---	---		---	---			---	---	---	---	---		---	---	---
Hazel Valley Elementary School (Downtown)	Impact	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	---	---	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	---	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)	See Down-town (Plate 8.1)
	Mitigation									---	---			---								
	Cost									---	---			---								
Salmon Creek Elementary School (North Central)	Impact	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	---	---	See North Central (Plate 8.1)	See North Central (Plate 8.1)	---	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)	See North Central (Plate 8.1)
	Mitigation									---	---			---								
	Cost									---	---			---								
Seahurst Elementary School (Seahurst)	Impact	---	---	---	---	---	---	---	See Seahurst (Plate 8.1)	---	---	See Seahurst (Plate 8.1)	See Seahurst (Plate 8.1)	---	---	---	---	---	See Seahurst (Plate 8.1)	See Seahurst (Plate 8.1)	---	---
	Mitigation	---	---	---	---	---	---	---		---	---			---							---	---
	Cost	---	---	---	---	---	---	---		---	---			---							---	---
Shorewood Elementary School (Shore-wood)	Impact	See Shorewood (Plate 8.1)	See Shore-wood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	---	---	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	---	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)
	Mitigation									---	---			---								
	Cost									---	---			---								
Marine Tech Lab. (Shore-wood)	Impact	See Shorewood (Plate 8.1)	See Shore-wood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	---	---	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	---	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)	See Shorewood (Plate 8.1)
	Mitigation									---	---			---								
	Cost									---	---			---								
Cedarhurst Elementary School	Impact	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	---	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)	See North East (Plate 8.1)
	Mitigation													---								
	Cost													---								
Sunnydale Elementary School (East Central)	Impact	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	---	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)
	Mitigation													---								
	Cost													---								
Highline High School (East Central)	Impact	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	---	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)	See East Central (Plate 8.1)
	Mitigation													---								
	Cost													---								
HIGHLINE SCHOOL/HOSPITAL FACILITIES IN CITY OF DES MOINES																						
Des Moines Elementary School (West Central)	Impact	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	---	---	See West Central (Plate 8.2)	---	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)	See West Central (Plate 8.2)
	Mitigation									---	---		---									
	Cost									---	---		---									

TRANSPORTATION IMPACT MATRIX - PUBLIC FACILITIES (continued)

PLATE 8.6 (continued)

SCHOOL/HOSPITAL (NEIGHBORHOOD)		CONGESTION							PHYSICAL DAMAGE				CONSTRUCTION IMPACTS							POST-CONSTRUCTION IMPACTS		
NAME	MEASURES	LEVEL OF SERVICE (LOS)	ACCIDENTS	SCHOOL BUS OPERATIONS	TRANSIT BUS OPERATIONS	POLICE & EMERGENCY VEHICLE ACCESS	PARKING & PEDESTRIAN ACCESS	TRAFFIC NOISE (LEQ)	LOCAL STREETS	STATE ROADS	STATE BRIDGES	INCREASED MAINTEN./ RECONSTRUC.	TRUCK HAUL ROUTES	BARGE/RAIL CONVEYOR SYSTEM	TRAFFIC DIVERSION	TRAFFIC CONTROL	CONSTRUCT. STAGING/ PHASING	WORK-FORCE TRAFFIC	CONCURRENT CONSTRUC. PROJECTS	ADDITIONAL TRAFFIC	INCREASED OPERATION/ MAINTENANCE COSTS	MASTER PLAN UPDATE
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RANSPORTATION IMPACT MATRIX - PUBLIC FACILITIES (continued)

PLATE 8.6 (continued)

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SECTION 9
POTENTIAL SOCIO-ECONOMIC IMPACTS AND MITIGATION

SECTION 9
POTENTIAL SOCIO-ECONOMIC IMPACTS AND MITIGATION

9.01 - EXPECTED CHANGES IN LAND VALUES, LAND USES, HOME OWNERSHIP TENURE, LOCAL GOVERNMENT REVENUE AND SOCIAL SERVICE NEEDS RESULTING FROM CONSTRUCTION OF THE THIRD RUNWAY AND RELATED FACILITIES

Aircraft operations at Sea-Tac International Airport impact the value of close-by properties in two ways.

First, the Airport's operations depress property values below the level that real estate markets would produce if the Airport did not exist. If a single-family residential house located in, for example, Burien could be physically transported to an identical location on an identical lot in another part of King County, its value would be increased, and the amount of its increase is the depression in value caused by proximity to the Airport. Section 9.02 estimates the average loss in value of real estate locate in close proximity to Sea-Tac International Airport by comparing a large sample of comparable single-family housing units in Northwest and Southwest King County holding constant the non-Airport factors that also influence real estate values.

A second way in which Sea-Tac International Airport operations impact the value of real estate is in the variation in value among properties caused by their proximity to the flight paths of arriving and departing aircraft. Such changes are the "shadow" affects (noise pollution, visual pollution, possible air quality pollution, and a generally degraded environment for human habitat) caused by living under low-flying aircraft. Section 9.03 uses a statistical technique known as regression analysis to estimate Sea-Tac International Airport's shadow affects by measuring the difference in value of a property, holding other things the same, when it is located at different distances from directly under one of Sea-Tac International Airport's arrival/departure flight paths.

The remaining subsections provide information on the changes in land use produced by Airport-induced depressions in adjacent land values, and the alteration in the demographic profile of persons living in jurisdictions where depressed land values result in altered land uses.

It is important to remember that the following analysis addresses the issue of depressed but not declining land values. All parts of the Puget Sound Region have experienced population growth in the recent past, and the entire Puget Sound Region is expected to experience rates of population growth above the national average in the foreseeable future. This means that the Puget Sound Region is expected to have significant net in-migration. As a result, average real estate values in the region will undoubtedly rise. Real estate located in close proximity to the Airport will participate in these growth trends and will also experience rising land values.

Because of the Airport, however, the rate of appreciation in the value of close-by real estate is expected to be less than it otherwise would have been. The correct measure of the Airport-induced depression in land values, consequently, is the price difference between comparable properties located close too and distant from the Airport. Neither a simple calculation of whether or not property values have increased nor a comparison of properties inside or outside any specific LDN contour line provides an appropriate basis for comparison.

9.02 - AIRPORT IMPACTS ON AVERAGE PROPERTY VALUES

The impact of proximity to the Airport was evaluated using average property values for comparable housing units in ten Census Tracts in Southwest King County immediately around Sea-Tac International Airport and ten Census Tracts in Northwest King County - the area that generally conforms to the City of Shoreline.

Northwest King County was chosen for comparison based on the following criteria:

- The Census Tracts are all located in King County and are equally affected by County and State land use and development policies.
- The Census Tracts are all bordered by Puget Sound to the west and Lake Washington to the east.
- Both clusters of Census Tracts contain commercial areas bordering Highway 99, and both have a mix of residential areas ranging from low/moderate income to high/ upper income.
- Both clusters of Census Tracts contain racially and ethnically diverse populations.

The cluster of ten Census Tracts around the Airport contained 17,046 housing units in 1990, of which 11,526 (67.6%) were single-family. The cluster of ten Census Tracts in Northwest King County contained 19,523 housing units in 1990, of which 12,683 (65.0%) were single-family.

The following parameters were used to screen housing units in the two clusters of Census Tracts for comparability:

- Only units rated as being in "Very Good" condition by the King County Assessors office were included.
- All units with a "View" were excluded.
- All units were in "Single-Family ' zoned areas and were classified as single-family land uses.
- All units had an above ground structure of 1,000 square feet or more.

- All units were located on lots of between 10,000 and 14,999 square feet.
- All units had three or more bedrooms.
- All units had two or more bathrooms.

These screening criteria excluded the top and the bottom of the distribution of housing units in both areas and resulted in a total of 739 of the 11, 526 single-family properties (6.4%) in the ten Census Tracts around the Airport (Southwest King County) and 760 of the 12,683 single-family properties (6.0%) in ten Census Tracts in Northwest King County being used for comparison of real estate values. Summary statistics from the King County Assessors Office for these units are contained in Table 9.01.

Table 9.01
Comparison of Housing Units in Northwest and Southwest King County - 1993

	SW mean value	NW mean value	Difference (SW-NW)	Percent Difference
Size				
Lot size	11,914 sq. ft.	11,522 sq. ft.	+392 sq. ft.	3.3%
Above ground structure size	1,538 sq. ft.	1,507 sq. ft.	-31 sq. ft.	-2.0%
Rooms				
Number of bedrooms	3.6	3.6	0	-1.4%
Number of bathrooms	2.0	2.0	0	0.6%
Value				
Assessed value of land	$52,734	$60,181	-$7,447	-14.1%
Assessed value of structure	$88,703	$95,550	-$6,847	-7.7%
Total assessed value	$141,438	$155,731	-$14,294	-10.1%

(Source: King County Assessors Office)

The two groups of properties compared closely in terms of their physical attributes. The difference in average lot size between the Southwest and Northwest King County properties was 3.3%. The difference in size of structure was 2.0%, in number of bedrooms 1.4%, and in number of baths 0.6%. In terms of property values however the differences were more pronounced. Average assessed value of land was 14.1% higher in Northwest King County than it was in areas immediately surrounding the Airport, and assessed value of structures was 7.7% higher. The assessed value of land and structures combined was 10.1% higher.

Standardized for view, condition of structure, size of structure, lot size, number of bedrooms, number of baths, zoning, land use, county/state development policies, and similarity of neighborhoods, a housing unit selling for $141,400 in the immediate vicinity of the Airport would sell for $155,700, or $14,300 (10. I%) more, if it were located elsewhere.

The average difference of 10.1% in the assessed value of real estate (property plus structure) when all other factors are adjusted for is attributable to the impact of low flying aircraft in the immediate vicinity of Sea-Tac International Airport. The resulting depression of property values as of 1993, taking account of community differences is shown in Table 9.02.

Table 9.02
Estimated Average Depression in Single-Family Residential Property Values, by Community - 1993

Community	Actual Average Assessed Value of Housing Unit	Estimated Assessed Value Without Airport	Difference
Burien	$129,900	$143,000	-$13,100
Des Moines	$136,100	$149,800	-$13,700
Federal Way	$142,900	$157,300	-$14,400
Normandy Park	$173,600	$191,100	-$17,500
Tukwila	$122,400	$134,800	-$12,400

Between 1993 and the Year 2000, operations at Sea-Tac International Airport are forecast to increase by 39,700, or 11.7%. Between the Years 2000 and 2020, operations are forecast to increase by an additional 62,400, or 16.5%. Applying these same rates of change to the estimated 1993 difference in single-family residential property values caused by aircraft operation at Sea-Tac International Airport produces the depressed values shown in Table 9.03. The next to the last column of Table 9.03 contains the expected reduction of value for the average single-family residential housing unit between the Years 2000 and 2020. The last column shows the average difference in value experienced over the entire 20-year period 2000 through 2020.

There will be no reduction in property value attributable to the Sea-Tac International Airport expansion until the Year 2000. The decline will be small the first year since there will be few operations over the Airport's annual service volume (ASV). As operations over the ASV threshold increase, the relative decline in property value will increase, reaching, in the case of Burien, $36,356 in the Year 2020. Averaged over the entire 20-year period, the yearly decline is $13,179, as shown in the last column of Table 9.03.

This loss of value occurs after Sea-Tac International Airport would have reached its ASV capacity limit had the Third Runway and related facility improvements not been built.

Table 9.03
Forecast of Average Depression in Single-Family Residential Property Values Caused by Aircraft Operations at Sea-Tac

Community	1993	2000	2020	Change 2000 - 2020	Average Yearly Difference 2000-2020
Burien	-$13,100	-$29,831	-$56,187	-$26,356	-$13,179
Des Moines	-$13,700	-$31,227	-$58,835	-$27,609	-$13,804
Federal Way	-$14,400	-$32,804	-$61,795	-$28,891	-$14,496
Normandy Park	-$17,500	-$39,859	-$75,079	-$35,221	-$17,610
Tukwila	-$12,400	-$28,172	-$53,016	-$24,844	-$12,422

9.03 - FLIGHT TRACK IMPACTS ON AVERAGE PROPERTY VALUES

The impact on a parcel's value of its location under, or in close proximity to, the approach/ departure flight track of aircraft operating at Sea-Tac International Airport was estimated using the linear regression model:

$$y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10}$$

where:

- Y = assessed value of land and structures
- X_1 = lot size (sq. ft.)
- X_2 = structure size (sq. ft.)
- X_3 = number of bedrooms
- X_4 = number of baths
- X_5 = distance from center of a jet flight track (east of runway 16/34R or west of runway 16/34L), measured in tenths of a mile.
- X_6 = a binary variable representing the City of Des Moines
- X_7 = a binary variable representing the City of Normandy Park
- X_8 = a binary variable representing the City of SeaTac
- X_9 = a binary variable representing Unincorporated King County
- X_{10} = a binary variable representing the City of Tukwila

The model's parameters were estimated from Assessors data on 3,026 properties in ten Census Tracts in the immediate vicinity of the Airport. The regression coefficient (adjusted R^2) was 0.65.

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The model initially contained variables for the Cities of Federal Way and Kent, but these places had too few cases to be meaningful and were dropped from the final model. The distance from each parcel to the center of the Airport was also initially used as a variable but its coefficient was not statistically significant and it was also dropped from the final model. The following housing units were excluded in estimating the regression model - units with fewer than three bedrooms; units whose condition was less than "good" or "very good"; units with a view; and units not in single-family residential zoned areas. The ratio of the regression's standard error to the standard deviation of the dependent variable was 0.59. The log likelihood ratio was -35,379, and the F-statistic was 566. The Durbin-Watson statistic was 1.44.

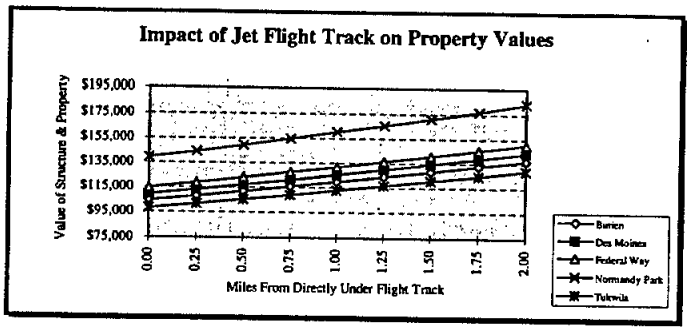
All of the independent variables in the model were statistically significant at the 90% level and seven were statistically significant at the 99% level. The variable measuring a property's distance from a flight track was significant at the 99% level.

The coefficient on the variable for distance from a jet aircraft flight track was 17,784, meaning that all other things remaining equal, the value of a house and lot increases by about 3.4% ($4,450 on the average valued house of $129,900) for every quarter of a mile the house is farther away from being directly underneath the flight track of departing/approaching jet aircraft. This relationship is shown in Table 9.04 and illustrated in Figure 9.01.

Table 9.04
Model Estimated Impact of Jet Flight Track on Average Property Values

Miles from flight track	Average Value Structure & Property, By Community				
	Burien	Des Moines	Federal Way	Normandy Park	Tukwila
0.00	$104,151	$109,122	$114,574	$139,189	$98,138
0.25	$107,843	$112,990	$118,636	$144,123	$101,617
0.50	$111,666	$116,996	$122,841	$149,232	$105,210
0.75	$115,625	$121,143	$127,196	$154,522	$108,949
1.00	$119,724	$125,438	$131,705	$160,000	$112,811
1.25	$123,822	$129,732	$136,214	$165,478	$116,673
1.50	$128,062	$134,174	$140,878	$171,143	$120,668
1.75	$132,446	$138,767	$145,701	$177,002	$124,799
2.00	$136,980	$143,518	$150,689	$183,062	$129,072

Figure 9.01



9.04 - OPERATIONS IMPACTS ON RESIDENTIAL PROPERTY TAX REVENUES

The *Sea-Tac Master Plan Update Final EIS*'s estimate of reduced residential property tax revenues caused by construction of the Third Runway and related facility improvements is shown in Table 9.05.

The only cause of reduced revenues identified in the Final EIS is the acquisition of property now on the tax tolls of the Cities of Burien and SeaTac. The EIS assumes there will be no impact on land located in the immediate vicinity of the Airport or under the flight track of the Airport's increased traffic volumes. In other words, the Final EIS assumes that unless land is acquired it will not be affected.

Table 9.05
EIS Estimate of Third Runway Induced Decline in Residential Property Tax Revenues

Jurisdiction	Property Tax Rate Per $1,000 Assessed Value	Reduction in Residential Property Tax Revenues
City of Burien	$3.00838	$45,867
City of SeaTac	$3.02811	$181,687
Total		**$227,554**

(Source: US Department of Transportation, Federal Aviation Administration, and Port of Seattle, February 1996, Final EIS, page IV.8-12)

As discussed earlier, construction of the Third Runway and related facilities improvements will allow aircraft operations at the Airport to increase after the Year 2000 - when it reaches its ASV capacity limit - by 62,400, or over 16%. A statistical analysis of comparable properties in King County demonstrates that these increased operations will:

- On average, depress all property values around the Airport below levels they would have had if the aircraft didn't expand; and,

- Specifically, cause a depression of value for properties directly under, and up to two miles on either side of, jet aircraft approach/departures tracks.

The depression of property values below the market levels that would otherwise occur also depresses the flow of property tax revenues to local, county, special purpose, and state governments.

The methodology used to estimate the reduction in single-family residential property tax revenues resulting from Airport impacts that depress property values is as follows. The number of single-family residential housing units in each impacted community was multiplied by the average loss (depression) of value per unit for each community between the Years 2000 and 2020 to estimate the aggregate loss of property value. Each city's total levy rate (regular and fire) was multiplied by its aggregate loss of property value to estimate the loss of single-family residential property taxes. The number of single-family housing units in each city was obtained from the Office of Financial Management's Forecasting Division. The average yearly increase in each city's single-family residential housing units between 1990 and 1995 was used to trend forward its stock of single-family housing.

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Levy rates for each city were obtained from the King County Assessors Office's Accounting Division. The estimated property value loss by community for the Years 2000, 2010 and 2020 and the cumulative property losses between 2000 and 2020 are shown in Table 9.06.

In the Year 2000, after which the increase in aircraft operations at Sea-Tac International Airport will be the result of construction of the Third Runway and related facilities improvements, the five impacted cities will experience depressed property values for single-family residential housing units estimated of approximately $1.7 million. As Sea-Tac International Airport operations increase, the depression of property values in the impacted communities will grow each year, reaching $2.2 million in the Year 2020. Over the 20-year period, 2000 through 2020, the cumulative loss of property tax revenues in the five impacted cities is estimated at approximately $38.8 million (expressed in constant value 1995 dollars), distributed among the cities as follows:

- Burien $14.2 million
- Des Moines $6.4 million
- Federal Way $11.6 million
- Normandy Park $2.8 million
- Tukwila $3.7 million

Table 9.06
Single-Family Residential Property Tax Revenue Losses by Housing Units in Five Impacted Cities in Immediate Proximity of the Airport

Community	Forecast Year 2000	2010	2020
Burien			
Number of impacted housing units	15,890 DU	17,890 DU	19,890 DU
Average loss of value per DU	-$13,179	-$13,179	-$13,179
Estimated total loss of value	-$209,411,749	-$235,769,426	-$262,127,104
City property tax levy rate	0.00300969	0.00300969	0.00300969
Yearly revenue loss	-$630,264	-$709,593	-$788,921
Cumulative revenue loss	-$630,264	-$6,699,287	-$14,191,858
Des Moines			
Number of impacted housing units	5,179 DU	6,179 DU	7,179 DU
Average loss of value per DU	-$13,804	-$13,804	-$13,804
Estimated total loss of value	-$71,492,950	-$85,297,343	-$99,101,736
City property tax levy rate	0.00374534	0.00374534	0.00374534
Yearly revenue loss	-$267,765	-$319,468	-$371,170
Cumulative revenue loss	-$267,765	-$2,936,165	-$6,389,351
Federal Way			
Number of impacted housing units	10,992 DU	12,392 DU	13,792 DU
Average loss of value per DU	-$14,496	-$14,496	-$14,496
Estimated total loss of value	-$159,334,980	-$179,628,737	-$199,922,493
City property tax levy rate	0.00323195	0.00323195	0.00323194
Yearly revenue loss	-$514,963	-$580,551	-$646,138
Cumulative revenue loss	-$514,963	$5,477,569	-$11,611,022
Normandy Park			
Number of impacted housing units	2,417 DU	2,577 DU	2,737 DU
Average loss of value per DU	-$17,610	-$17,610	-$17,610
Estimated total loss of value	-$42,564,077	-$45,381,724	-$48,199,371
City property tax levy rate	0.00310000	0.00310000	0.00310000
Yearly revenue loss	-$131,949	-$140,683	-$149,418
Cumulative revenue loss	-$131,949	-$1,363,160	-$2,813,667
Tukwila			
Number of impacted housing units	3,666 DU	4,866 DU	6,066 DU
Average loss of value per DU	-$12,422	-$12,422	-$12,422
Estimated total loss of value	-$45,539,453	-$60,445,984	-$75,352,516
City property tax levy rate	0.00310000	0.00310000	0.00310000
Yearly revenue loss	-$141,172	-$187,383	-$233,593
Cumulative revenue loss	-$141,172	-$1,642,774	-$3,747,651
Yearly Revenue Loss All Cities	**-$1,686,113**	**-$1,937,677**	**-$2,189,239**
Cumulative Revenue Loss All Cities	**-$1,686,113**	**-$18,118,955**	**-$38,753,549**

(Source: Office of Financial Management, King County Assessor's Office.)

9.05 - FLIGHT TRACK IMPACTS ON RESIDENTIAL PROPERTY TAX REVENUES

In addition to the loss of value resulting from aircraft operations that will affect all single housing units in immediate proximity to the Airport, single-family housing units that will be under the flight tack of approaching/departing aircraft using the proposed Third Runway will suffer additional value losses from having low flying aircraft pass directly overhead. The magnitude of these types of impacts were described and analyzed in Section 9.03, above. The methodology used to estimate the flight track impacts on the property tax revenues of the affected cities was as follows.

Approaches/departures using the Third Runway will create a flight track approximately half a mile to the west of the flight track on existing runway 16/34L. A new set of single-family housing units will lie directly under the flight track (defined as 1/8th of a mile on either side) and a new set of units will fall within the quarter mile and half mile bands to the west of the Third Runway s new flight track. To the south, the affected single-family housing units will be in Des Moines Federal Way and Normandy Park (only the half mile band will impact Normandy Park). To the North, the new Third Runway flight track will pass over the City of Burien. The City of Tukwila lies entirely to the east of the Airport and will not be impacted by the flight track generated by the Third Runway.

The linear north-south distance of the new flight track for the Third Runway was calculated for each of the impacted cities. Each flight track "impact band" used in the regression model (Section 9.03) was a quarter-mile wide.

The linear distance of the Third Runway's flight track over each impacted city multiplied by a quarter mile therefore generated an estimate of the area of each impact band within each city. The average lot size of single-family residential housing units used to calibrate the regression model was 12,950 square feet. Using this average lot size produces an estimate of 538 single-family housing units for each linear mile of the new flight track.

Multiplying this estimate by the dollar value of the average annual depression in single-family housing units for each city produced the estimated total value reduction in single-family residential housing units as a result of the Third Runway's value loss gradient. Multiplying the loss of value by each city's property tax levy rate produced the estimate of annual property tax revenue loss for each city. The results are summarized in Table 9.07

In the five impacted cities combined, tax collections from single-family residential units lying directly under or close to the Third Runway's jet flight tracks will be reduced by $294,260 a year, or $5.89 million (expressed in constant value 1995 dollars) over the 20-year period 2000 to 2020 as a result of depressed property values. The distribution of these cumulative 20-year revenue losses by city are as follows:

- Burien $0.97 million
- Des Moines $2.73 million
- Federal Way $1.78 million
- Normandy Park $0.41 million
- Tukwila $0.00 million

Table 9.07
Average Annual Single-Family Property Tax Revenue Losses Resulting from the Third Runway's Flight Track Gradient

	Burien	Des Moines	Federal Way	Normandy Park	Tukwila
Track Miles by Noise Gradient					
0.00 miles	1.28	2.77	1.99	0.00	0.00
0.25 miles	1.28	2.77	1.99	0.00	0.00
0.50 miles	1.28	2.77	1.99	1.14	0.00
SF DUs/Track Mile	538	538	538	538	538
New Noise Gradient Affected DU					
0.00 miles	688	1,491	1,070	---	---
0.25 miles	688	1,491	1,070	---	---
0.50 miles	688	1,491	1,070	612	---
Average Property Value Loss per DU					
0.00 miles	-$7,551	-$7,874	-$8,267	-$10,043	-$7,081
0.25 miles	-$7,782	-$8,153	-$8,560	-$10,399	-$7,332
0.50 miles	-$8,057	-$8,442	-$8,864	-$10,768	-$7,592
Total Value Loss from Gradient					
0.00 miles	-$5,170,645	-$11,737,775	-$8,848,167	---	---
0.25 miles	-$5,353,943	-$12,153,876	-$9,161,832	---	---
0.50 miles	-$5,543,738	-$12,584,727	-$9,486,616	-$6,585,531	---
Total	-$16,068,326	-$36,476,378	-$27,496,615	- $6,585,531	---
Property tax levy rate	0.00300969	0.00225795	-0.00155887	0.0017	0.00321043
Annual Loss of Property Tax Revenues					
0.00 miles	-$15,562	-$43,962	-$28,597	$0	$0
0.25 miles	-$16,114	-$45,520	-$29,611	$0	$0
0.50 miles	-$16,685	-$47,134	-$30,660	-$20,415	$0
Total	-$48,361	-$136,616	-$88,868	-$11,195	$0

9.06 - SUMMARY OF IMPACTS ON SINGLE FAMILY RESIDENTIAL PROPERTY TAX REVENUES

The total cumulative reduction in single-family property tax revenues during the Years 2000 through 2020 caused by construction and operation of the proposed Third Runway and related Airport facilities in the five impacted cities is shown in Table 9.08. In this table, the flight track-induced relative land value losses are deducted from the operations-induced relative land value losses to prevent double-counting.

Over the 20-year period 2000 through 2020, the five impacted communities will suffer a reduction in property tax revenues from single-family residential units of $39.9 million (expressed in constant value 1995 dollars) as a result of construction of the Third Runway and related Airport improvements. The average annual revenue reduction will be almost $2.0 million.

Table 9.08
Total Loss of Single-Family Residential Housing Property Tax Revenue Caused by Construction and Operation of the Third Runway, Years 2000 through 2020

Community	Total Revenue Losses	Land Acquisition-Induced Losses	Aircraft Operations-Induced Losses	Flight Track Gradient-Induced Losses
Burien	-$15,338,533	-$1,146,675	-$13,224,644	-$967,214
Des Moines	-$6,389,351	$0	-$3,657,022	-$2,732,329
Federal Way	-$11,611,022	$0	-$9,833,668	-$1,777,354
Normandy Park	-$2,813,667	$0	-$2,405,364	-$408,303
Tukwila	-$3,747,651	$0	-$3,747,651	$0
Combined Total Losses	**-$39,900,224**	**-$1,146,675**	**-$32,868,349**	**-$5,885,196**

The largest source of property tax losses (82.3%) will be depressions in property values caused by the increase in Sea-Tac International Airport's aircraft operations after the Year 2000, and made possible by construction of the Third Runway and related Airport improvements. A loss of $32.9 million in local government revenues (expressed in constant value 1995 dollars) over the 20-year period will result. The second largest source of property tax losses (14.8%) will come from the decline in single-family residential property values of units beneath the flight track of aircraft using the proposed Third Runway. These property value reductions will cause a loss of an additional $5.9 million in local government revenues over the 20-year period (again expressed in constant value 1995 dollars).

The smallest cause of local government property tax revenue losses will result from the acquisition of properties required for expansion of the Airport. These reduction (which are the only ones discussed in the Final EIS) will cause a cumulative loss of $1.1 million. The acquisition of properties as part of the Airport's Third Runway related expansion will begin in 1996. Cumulative revenue losses are for a 25-year period 1996 through 2020, inclusive. Looked at in terms of the impacted communities, Table 9.09 contains the percentage distribution of total property tax revenue losses among the impacted cities.

Table 9.09
Distribution of Property Tax Revenue Losses Among Impacted Cities

Community	Cumulative Loss of Property Tax Revenues	Percent of Total
Burien	-$15,338,533	38.4%
Des Moines	-$6,389,351	16.0%
Federal Way	-$11,611,022	29.1%
Normandy Park	-$2,813,667	7.1%
Tukwila	-$3,747,651	9.4%
5-City Combined Total	**-$39,900,224**	**100.0%**

9.07 - IMPACTS ON OWNERSHIP OF SINGLE-FAMILY RESIDENTIAL HOUSING UNITS

Economic theory argues that the relative change (reduction) in single-family residential land values discussed above will lead to tenure changes in the affected single-family housing units. The major expected tenure change is a shift from owner occupied to renter occupied housing as relative housing prices fall. Table 9.10 compares housing tenure in the Sea-Tac International Airport impacted communities with housing tenure in the comparison Census Tracts in Northwest King County.

Table 9.10
Owner and Renter Occupied Single-Family Housing Units
Sea-Tac Impacted and Northwest King County Comparison Communities

	Number	Percent
NW King County Comparison Communities		
Total single-family housing units	12,683	100.0%
Owner occupied units	12,254	96.6%
Renter-occupied units	429	3.4%
Sea-Tac Impacted Communities		
Total single-family housing units	11,526	100.0%
Owner occupied units	9,618	83.4%
Renter-occupied units	1,908	16.6%

(Source: 1990 Census, STF-3)

As the data show, the expectations from economic theory hold true. Renter occupied units in areas immediately surrounding the Airport were 16.6% of total single-family housing. In the comparison areas in Northwest King County, they were only 3.4%. If past trends continue, the percent of single-family housing units in the impacted communities occupied by renters will rise to 20.6% in the Year 2020. About two-thirds of the increase in renter's housing tenure percentage will occur after the Year 2000, and is attributable to construction of the proposed Third Runway and related facilities improvement's at Sea-Tac International Airport.

9.08 - IMPACTS ON COMMUNITY DEMOGRAPHIC PROFILES

In *Washington State Housing Needs and Market Trends: An Overview* (Joshi, et.al., 1989) it was stated that (page 44):

> *"Most low income households are renters...Sixty percent of all Washington households with annual incomes below [75% of state median income] were renters....The average renter is generally younger, more mobile, and has an income half that of the average homeowner."*

Table 9.11 compares the income distribution of owner and renter households.

Table 9.11
Income Distribution of Household Owners and Renters - Washington State

Household Income Status	Total	Owner	Renter
Below 50% State median income	26.3%	17.9%	42.4%
50% to 100% State median income	28.4%	25.1%	34.6%
100% to 165% State median income	23.5%	27.6%	15.7%
Over 165% State median income	21.8%	29.4%	7.3%
Total	**100.0%**	**100.0%**	**100.0%**

(Source: Washington State Housing Needs and Market Trends)

Among households that own their own home, 43% are below state median income and 18% are below half of the state's median income. Among households that rent their home, 76% are below state median income and 42% are below half the state's median income. Looked at from another perspective, renter households make up 66% of all households in the state but they account for only 17% of households with incomes below the State median.

A regression model developed by the consultant team that relates Washington State Department of Social and Health Services' (DSHS) "county use rates" by county to per capita personal income levels in 1994 indicates that the relationship between income levels and need for public services is statistically significant and has a negative sign - meaning that the need for public services goes up as household incomes (and hence, the percent of owners) fall.

"Use rates" are derived by dividing a county's total DSHS clients, for all types of DSHS services, by the county's total population. Counties where a high percentage of seasonal or transient residents receive DSHS services will have overstated use rates. (Washington State Department of Social and Human Services, Office of Research and Data Analysis, April 1996). The regression models adjusted R^2 was 0.15785, the T-statistic for the per capita personal income variable was 2.6335, the regression's F-statistic was 6.9361.

Although a detailed analysis of the relationship between different types of public service needs and the growth of aircraft operations at Sea-Tac International Airport is beyond the work scope of the current socio-economic analysis, it appears from preliminary analysis of available data that such a relationship exists; and that it is statistically meaningful.

9.09 - THE THIRD RUNWAY'S IMPACT UPON COMMUNITY FACILITIES AND SERVICES

The Third Runway and related Airport facilities, will affect the need for community facilities and services by impacting community demographic profiles in the areas immediately surrounding Sea-Tac International Airport. Many of these communities already have a higher need for community services than other communities in King County - reflecting, in part, past impacts of the Airport. One way to compare community service needs is by using "service use rates" calculated by the Washington State DSHS for ninety-nine largest cities in the state, including 18 cities located (at least in part) in King County.

DSHS provides a variety of services and grants to individuals and families with one or more of the following difficulties:

- Child neglect
- Dependent elderly status
- Alcohol/substance abuse
- Developmental disabilities
- Other long-lasting physical/mental disabilities
- Poverty
- Recent refugee status
- Juvenile criminal offenses

DSHS also provides the services in the following administrative categories to individuals and families having these difficulties:

- Aging & Adult Services Administration (AASA)
- Division of Alcohol & Substance Abuse (DASA)
- Division of Children & Family Services (DCFS)
- Division of Developmental Disabilities (DDD)
- Division of Vocational Rehabilitation (DVR)
- Economic Services Administration (ESA)
- Juvenile Rehabilitation Administration (JRA)
- Medical Assistance Administration (MSA)
- Mental Health Division (MHD)

Each fiscal year, DSHS calculates for each city for which it reports the number of clients served in each of its administrative service categories divided by the city's population. It calls these calculations "service use rates" The most recent rates calculated were for 1994 (Washington State Department of Social and Health Services, Office of Research and Data Analysis, May 1996). The total use rate and the programmatic rates for DCFS, DASA, JRA and ESA are presented in Figures 9.02- 9.06.

In terms of DSHS's rate for its total array of services, Normandy Park and Federal Way were below the average use rate for all DSHS cities in King County. The DSHS use rate for Burien, Des Moines and Tukwila was above the average.

Although Renton was below the county average and Lake Forest Part was above it, the general pattern was for cities in the south county to have rates above the average and cities in the north county to have use rates below the average Figure 9.02. In part, this likely reflects past impacts of the Airport on the quality of life, property values, and the resulting land uses and demographics of south King County communities.

Figure 9.02
DSHS Total Service Use Rate

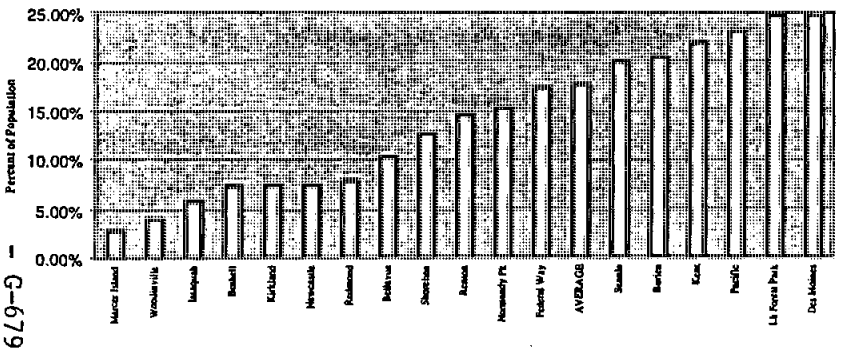
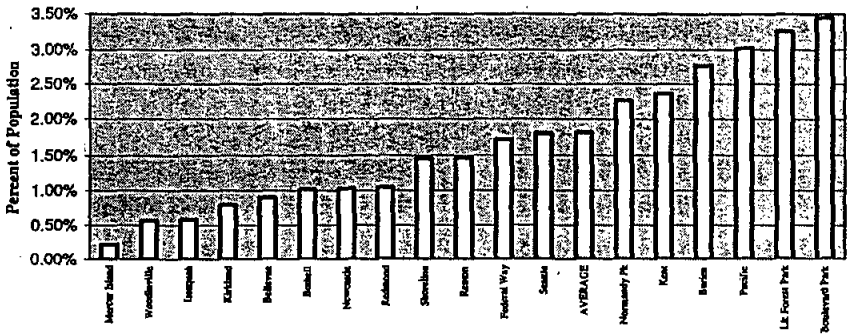


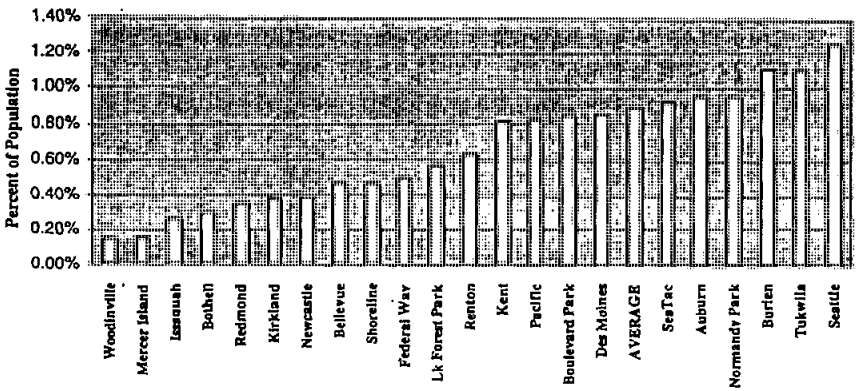
Figure 9.03 shows the use rate for children and family services among King County cities. Federal Way falls below the county average, while Burien, Des Moines, Normandy Park and Tukwila fall above the county's average use rate. Tukwila has the highest DCFS use rate in King County at 3.8%. (The county average was calculated by weighting each city by its population. The weighted total use rate average, for example, was 17.64% while the unweighted average was 16.19%.)

Figure 9.03
DSHS Child & Family Services Use Rates



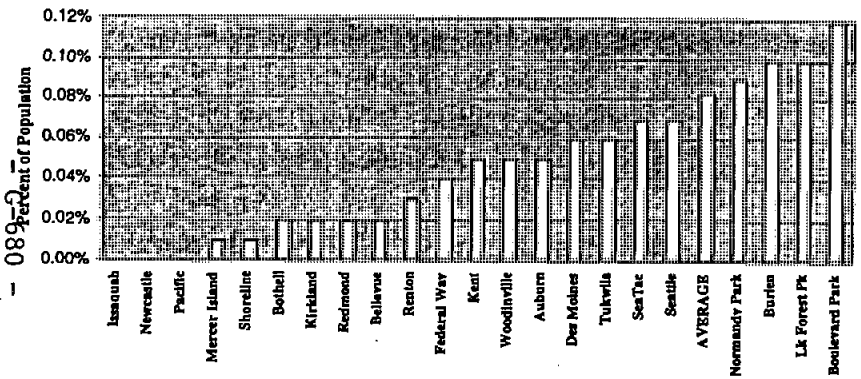
The city alcohol and substance abuse rates are shown in Figure 9.04. Federal Way and Des Moines have rates below the King County average, and Burien, Normandy Park and Tukwila have rates above the county average. To some extent, the DASA use rates reflect the location of alcohol and substance abuse rehabilitation facilities - which probably accounts for Seattle having the highest DASA rate in the county.

Figure 9.04
DSHS Alcohol & Substance Abuse Use Rates



The juvenile rehabilitation rate for King County cities is shown in Figure 9.05. Federal Way, Des Moines and Tukwila are all below the county average while Normandy Park and Burien are above it.

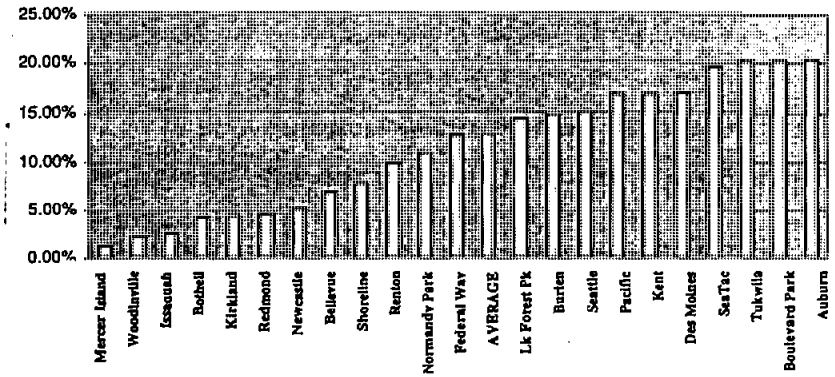
Figure 9.05
DSHS Juvenile Rehabilitation Service Use Rates



The economic security services use rate for county cities is shown in Figure 9.06. Normandy Park and Federal way have rates below the county average, and Burien, Des Moines and Tukwila have rates below the county average.

Overall, Normandy Park and Federal Way have the lowest use rates among the five cities covered by the Sea-Tac International Airport Impact Mitigation Study. This may reflect Federal Way's relatively greater distance from the Airport and both Federal Way's and Normandy Park's locations to the west of the Airport's flight tracks. Since the Third Runway will locate a flight tract to the west, these communities will likely have a greater impact from the Third Runway than they did from Sea-Tac International Airport's first or second runways. The highest social service use rates currently are in Tukwila and Des Moines.

Figure 9.06
DSHS Economic Sercurity Services Use Rates



The Third Runway and related Airport facilities will impact community services and facilities in numerous ways. Environmental and transportation impacts during construction will include the movement of construction vehicles over the road system contained within the District, and will likely affect the movement along, and possibly safety, of public streets and parking places. After construction, environmental impacts will mainly be generated by noise from the growth of aircraft operations from the Third Runway and related Airport facilities will allow Sea-Tac International Airport to exceed its ASV of 380,000 operations after the Year 2000. The impacts of noise on the ability of churches, hospitals, nursing homes, community centers and libraries to function normally is analyzed in the environmental impact sections of this Sea-Tac International Airport Impact Mitigation Study.

As discussed previously, the growth of operations at Sea-Tac International Airport after its 380,000 ASV capacity has been reached around the Year 2000, will mean that the value of residential properties surrounding the Airport will not appreciate as fast as they otherwise would have. The market adjustment to such a relative decline in residential property values will be an alteration in land uses away from owner occupied homes toward renter occupied homes. Since renters have a profile that is younger, more mobile and lower income than owners, communities experiencing the impacts of the Third Runway will have to offer expanded social services if they are to maintain the quality of life achieved in the past.

9.10 - COMMUNITY FACILITIES IMPACTED BY THE THIRD RUNWAY'S FLIGHT TRACK

Employing the DSHS use rates discussed earlier as a guide to the types of impacts the Third Runway and related Airport facilities development will have, the most likely impacts will be generated by the changes in the demographic profile of the population living to the west of the current Sea-Tac International Airport flight tracks. The proportion of renter occupied housing units will likely rise after the Year 2000, and will result in a population needing more child care services, community social services, counseling services and employment assistance services than is either true today or would be true if the Airport were not expanded. Existing facilities at local churches, community centers, schools and libraries will most likely be inadequate to cope with these increased needs and will have to be expanded.

Additional facilities required by Sea-Tac International Airport's Third Runway impacts can be calculated by applying current service use rates per 1,000 of the population, for specific services, to the forecast populations for the impacted cities and subtracting the derived service levels from service requirement levels independently forecast based on the cities' expected demographic shifts. This type of analysis should be reviewed for "reasonableness" by working professionals in both the functional service areas and the agencies/organizations now providing the services in the impacted cities.

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The most likely communities to suffer major facility impacts from the Third Runway and related Airport facilities development will be Burien, Des Moines, Normandy Park and Federal Way. Tukwila appears to have suffered the community facility and service need impacts from Sea-Tac International Airport's existing approach/departure flight tracks, but it is to the east of Sea-Tac International Airport and will likely not face the same magnitude of impacts from the approach/departure tracks of the proposed Third Runway. The growth of surface traffic on Pacific Highway South (SH 99) however could easily generate a business environment that gives rise to anti-social and criminal behavior and will require an expansion of Tukwila's public safety personnel and facilities.

No analysis of the community facility requirements was contained in the EIS for the Third Runway and related Airport facilities. The resources and time available under this Sea-Tac International Airport Master Impact Mitigation Study were not sufficient to allow such an analysis to be made using quantifiable research techniques. It is recommended that such a research based analysis be conducted.

Affects of the Third Runway's Flight Track

Community services and facilities in the five impacted communities will be affected by the Third Runway and related Airport facilities in different ways. These include demographic factors, economic factors and psychological factors. None of these factors was considered in the Port of Seattle's Master Plan Update EIS, as a result the information available about these factors only allows for informed speculation and analysis - based on judgments about likely impacts. Additional research should be conducted on each of these factors to determine its statistical significance and magnitude.

- **Demographic Factors** - These factors have already been discussed as an outcome of the land use changes resulting from the growth of operations after the Year 2000 when the Third Runway and related Airport facilities become operational. The increased proportion of rental housing units in the area will produce a resident population that is younger, more mobile and lower income than today's. Given the established correlation between income and the need for community services and facilities, it is likely that future populations in the impacted communities will require higher service levels per capita and more facilities per capita than does the current population.

- **Economic Factors** - The factors adversely impacting the impacted communities will primarily be the reduction in residential property values that will reduce city tax revenues below what they otherwise would have been.

  The decline in relative residential property values between 1995 and the Year 2000 due to the Airport is attributed to a growth of enplanements within the Airport's ASV capacity limit. But the relative property value declines that will reduce revenues after the Year 2000 are attributed to construction of the Third Runway and related Airport facilities.

  In addition to the revenue losses to the impacted communities, local home owners will face a relative decline in the value of their property. At the same time that the cities would be faced with a need to increase expenditures per thousand persons residing in the cities in order to maintain its quality life, it would face growing voter resistance to raising local tax rates. The resulting financial squeeze will be a major economic impact on the cities, and it will rival in importance the impact on home owners of the relative decline in the value of their properties.

  The calculation of quantitatively probable, rather than illustrative, economic impacts on the impacted communities requires a research effort not possible within the resources available under the current Sea-Tac International Airport Impact Mitigation Study. The entire topic of economic impacts of the Third Runway and related Airport facilities on the community facilities and services (a topic which was not addressed at all in the EIS) needs additional research.

- **Psychological Factors** - The factors impacting the cities' needs for community services and facilities as a result of the Third Runway could come from several sources. The interruption of normal family functioning at home by aircraft noise could increase stress on affected families. Also, parents and children unable to engage in normal outdoor activities such as playing games or sports, enjoying park lands, or having outdoor barbecues may suffer the psychological stress associated with the disruption of normal neighborhood-based activities. Additional psychological impacts may be the consequence of living in neighborhoods where household turnover is high and interpersonal relationships are unstable; or from living in households with only one parent and/or which is under severe economic and financial pressure.

The current study was not able to quantitatively investigate psychological factors, but the association of such factors with the types of demographic shifts that will be accentuated by construction of the Third Runway and related Airport facilities is highly probable and warrants further research and analysis.

Need for Additional Community Services/Facilities

The noise impacts on community facilities to the west of Sea-Tac International Airport caused by the increase in approaching/ departing aircraft after the Year 2000, and which are attributable to the Third Runway, related Airport facilities, and expansion of the Airport's ASV capacity, may require remodeling, rebuilding, or other structural alterations. The mitigation of these Third Runway impacts relate to the need to attenuate noise at existing facilities. These requirements are analyzed and their mitigation requirements presented in the environmental part of the Sea-Tac International Airport Impact Mitigation Study.

G-682 The impact of the increase in approaching/departing aircraft after the Year 2000 attributable to the Third Runway, related Airport facilities, and expansion of the Airport's ASV capacity on the value of residential properties surrounding the Airport - and as a result, the cities' needs to increase expenditures for community services and facilities - is addressed later in this Section where the mitigation of individual property value losses and community property tax reductions are discussed. Any action that mitigates property losses to individual homeowners or reduces the loss of property tax revenues to communities will also increase the city and School District tax base.

The optimum methods of providing community services as a way to mitigate the demographic shifts that will be caused by the increase in approaching/departing aircraft after the Year 2000 attributable to the Third Runway, related Airport facilities, and expansion of the Airport's ASV capacity will require additional analysis. First, quantitative research needs to be conducted on the affects of the population's shifting demographic profile on the community service needs of affected families. After which, appropriate mitigation policies need to be formulated by community service professionals within each of the impacted cities. Some of these policies will likely include increased community centers, increased child care, expanded levels of police and fire services, and creation of additional community facilities.

Regardless of which or how many of these types mitigation actions will be determined as both needed and appropriate, it is evident that the impacted cities will require additional resources to mitigate the socio-economic impacts of the Third Runway and related Airport facilities.

9.11 - THE IMPACT OF SEA-TAC'S EXPANSION ON PUBLIC SCHOOLS

The Third Runway and related Airport facilities will impact Highline School District's public schools in numerous ways. Environmental and transportation impacts during construction will include the movement of construction vehicles over the road system contained within the District, and will likely affect the movement, scheduling and possibly safety of school busses. After construction, environmental impacts will mainly be generated by noise from the growth of aircraft operations associated with the Third Runway and related Airport facilities which allow Sea-Tac International Airport to exceed its ASV of 380,000 operations.

The impacts of noise on the ability of teachers to teach and students to learn is documented in a variety of ways. A Highline School District study of noise impacts on classroom performance was conducted at Sunset Junior High School, located about six blocks from the end of one of Sea-Tac International Airport's runways, in 1973 (*Aircraft Noise Study: Remedial Construction/Schools*, Highline School District, 1973). Four classrooms were selected, two adjacent rooms on the junior high school's first floor and two on its second floor, where each of the classrooms was estimated to experience five or more minutes of high level aircraft noise per 50-minute classroom period.. One of the first floor rooms and one of the second floor rooms was insulated while the other two rooms were not. Students in all four classrooms were given a math test which evaluated their "concentration and attention-to-task." As shown in Table 9.12, the test scores of students in the insulated classrooms where aircraft noise had been attenuated appear to be significantly higher than the scores of students in the non-insulated classrooms. (The measured statistical significance of the difference in test scores between the insulated and non-insulated classrooms was not reported.)

Table 9.12
Math Test Scores of Students in Insulated and Non-Insulated Classrooms

Classrooms	Sound Proofed Rooms	Non-Sound Proofed Rooms
First-floor classrooms	75.6	64.2
Second-floor classrooms	75.9	57.6

Additional information on the importance of attenuating aircraft noise for learning comes from the experience of classroom teachers. The *Highline News* recently reported a teacher at Cedarhurst Elementary School as follows (Steffens, "No Peace for Students", 23 October 1996):

> *"I just stop class completely when there's a plane going over. Students just stop themselves and look at me and wait until the [aircraft] noise is gone."*

A *Seattle Times* supplement designed to be "a comprehensive guide to public and private high schools in the greater Seattle area" contained the following statement as part of its evaluation of the Highline School District ("Guide to High Schools", 20 November 1996):

> *"A perennial challenge to the District has been its proximity to Seattle-Tacoma International Airport. Some classrooms lie directly beneath the flight path of roaring jets, which disrupts classes, assemblies and outdoor physical education. ... Now, with plans for the Third Runway in the works, school officials worry about the problems worsening."*

As discussed previously, the growth of operations at Sea-Tac International Airport after its 380,000 ASV capacity has been reached around the Year 2000, will mean that the value of residential properties surrounding the Airport will not appreciate as fast as they otherwise would have. The market adjustment to such a relative decline in residential property values will be an alteration in land uses away from owner occupied homes toward renter occupied homes. Since renters have a profile that is younger, more mobile and lower income than owners, a higher proportion of students attending District schools will require enhanced educational services if the District is to maintain the educational outputs (graduation levels, Comprehensive Test of Basic Skills (CTBS) scores, SAT scores, college admission rates) that it achieved in the past.

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Whether measured by student test score, educational attainment, or post-school earnings, a wide spread professional consensus exists that the educational attainment of parents, the existence of single parent-headed households, female labor force participation, child poverty, and low household income are important influences on the quality of student outcome (Hanushek, 1996). Consequently, if the District is to maintain its historic quality of educational; outcomes, it will have to compensate for the demographic changes associated with increased renter-occupied housing by providing additional resources per student.

At the same time, the Highline School District will find itself under increased financial pressure as a result of construction of the Third Runway and related Airport facilities. Under Washington State law, State resources are distributed through funding formulas that, when combined with local and Federal resources, equalize educational opportunities throughout the State. Local property tax levies to support schools are determined by local School District needs and the resulting tax rates are submitted for approved to local District voters. The relative reduction in residential property values caused by the Third Runway and related Airport facilities will mean that higher tax rates will be required to generate the same level of resources; and the higher the rates, the more difficulty the District will have in obtaining voter approval.

Thus, at the same time the District's shifting demographic profile will require additional resources to prevent education outcomes from falling, declining relative property values will make it increasingly difficult to obtain voter approval for needed revenues. Both sides of the interaction between District needs for additional resources and voter resistance to approving school levies are traceable to the expansion of aircraft operations at Sea-Tac International Airport made possible by the Third Runway and related Airport facilities, and constitute the socio-economic impacts investigated in this Section.

Impacts on School Age Children Living Under the Third Runway's Approach/Departure Flight Tract

The Third Runway will be to the west of Sea-Tac International Airport's existing 16R/34L runway. The school children most affected consequently will live in areas served by the following elementary schools:

- Beverly Park at Glendale
- Cedarhurst
- Des Moines
- North Hill
- Olympic
- Southern Heights
- Sunnydale

The characteristics of students attending these schools are shown in Table 9.13. All of the Third Runway impacted elementary schools had a higher percentage of non-white students in 1993 than the District average, but they had few other similarities. Three of the seven schools (North Hill, Southern Heights, and Olympic) had a higher percentage of students enrolled in special education classes/programs. Three (Beverly Park, North Hill and Olympic) had a larger percentage enrolled in ESL classes. Four (Beverly Park, Sunnydale, Cedarhurst and Olympic) had a larger percentage than the District average receiving free/reduced cost lunches; but only two (Cedarhurst and Beverly Hills) were below the District average percent of students living in two-parent households.

In terms of their fourth grade Comprehensive Test of Basic Skills (CTBS) test scores compared to the entire District, the six impacted schools were mixed in their relative standings. (North Hill Elementary only has grades K through 3, and consequently does not report CTBS scores.) Beverly Park and Cedarhurst both had scores below the District average in all three test components: reading, math and language. Des Moines had test scores above the District average in all three test components. The remaining three elementary schools were above the District average in at least one of the components and below it in at least another.

In summary, children living in the elementary school service areas to the immediately west of Sea-Tac International Airport's existing boundaries will be the group most directly impacted by the westerly shift of the Airport's approach/departure flight tracks that results from construction of the Third Runway and related Airport facilities. As property values in these areas exhibit a relative decline caused by the growth of Airport operations and an increasing number of single-family residences shift from owner occupancy to renter occupancy, the number of students arriving at school with educational deficits will likely rise. To maintain the quality of educational outcome in the District, classrooms and curriculum will have to be enriched.

Highline High School lies immediately to the west of Sea-Tac International Airport's existing boundaries and it also will be significantly impacted by the Third Runway.

Table 9.13
Student Characteristics at Third Runway Impacted Elementary Schools

		Percent of Total Enrollment				
		Non-White Students	Special Education /Program Students	ESL Students	Free/ Reduced Lunch Students	Living With Two Parents Students
District Average	1990/1991	N/A	N/A	N/A	27.0%	65.0%
	1993	21.3%	8.9%	4,.1%	35.0%	57.0%
Cedarhurst	1990/1991	27.4%	8.0%	9.0%	21.0%	70.0%
	1993	37.3%	7.0%	10.0%	39.0%	56.0%
Beverly Park at Glendale	1990/1991	18.1%	10.0%	0.0%	28.0%	53.0%
	1993	26.4%	8.0%	0.0%	44.0%	51.0%
Des Moines	1990/1991	24.6%	5.0%	8.0%	23.0%	69.0%
	1993	24.5%	2.0%	0.0%	24.0%	58.0%
North Hill	1990/1991	23.4%	9.0%	16.0%	27.0%	70.0%
	1993	23.1%	10.0%	12.0%	34.0%	68.0%
Olympic	1990/1991	31.5%	14.0%	20.0%	40.0%	73.0%
	1993	28.4%	30.0%	16.0%	51.0%	64.0%
Southern Heights (1991)	1990	22.2%	7.0%	0.0%	27.0%	71.0%
	1993	24.4%	13.0%	0.0%	31.0%	63.0%
Sunnydale (1991)	1990	14.7%	3.0%	0.0%	19.0%	54.0%
	1993	33.5%	3.0%	0.0%	43.0%	61.0%

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Notes:
1) 1990 data = percent non-white, percent with free/reduced lunch, percent living with two parents. 1991 data = percent special education classes/programs, percent in ESL classes
2) North Hill has grades K-3 only; Olympic has grades 4-6.

(Source: Highline School District, 1993-94)

Table 9.14
Student Characteristics at Highline High School

Student Characteristic	Highline High School	District Average
Non-white students	25.8%	21.3%
Special education/program students	6.0%	8.9%
ESL students	6.0%	4.1%
Free/reduced lunch students	17.0%	35.0%
Living with two parents students	54.0%	57.0%

(Source: Highline School District, 1993-94)

Importance of Elementary School Impacted Children

The seven elementary schools which will be most impacted by the Third Runway had a combined enrollment in 1993 of 2,807 students, and represented almost one-third (29.5%) of the District's total elementary school enrolled children. Students from Des Moines and Olympic elementary schools matriculate to Pacific Middle School and go on to Rainier High School. Students at Sunnydale and Cedarhurst elementary schools matriculate to Sylvester Middle School and than go on to Highline High School. Students from Beverly Park and Southern Heights elementary schools matriculate to Cascade Middle School and than to Evergreen High School.

Thus, the socio-economic impact of the Third Runway on the demographic profile of enrolled students in elementary schools immediately to the west of the Airport's current boundary will be spread from the seven directly impacted schools to the entire District school system. (Only Chinook Middle School and Tyee High School, both located on the east side of the Airport, will likely not be affected by induced demographic shift attributable to the Third Runway and related Airport facilities.)

Affect of Increased Operations on School Children

The educational performance of children attending school in the Highline School District will be affected by the Third Runway and related Airport facilities in different ways. These include demographic factors, economic factors and psychological factors. None of these factors was considered in the Port of Seattle's Master Plan Update EIS, as a result the information available about these factors only allows for informed speculation and analysis-based judgments about likely impacts. Additional research should be conducted on each of these factors to determine its statistical significance and magnitude.

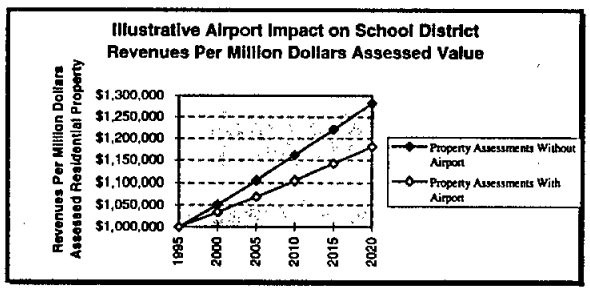
- **Demographic Factors** have already been discussed as an outcome of the land use changes resulting from the growth of operations after the Year 2000 when the Third Runway and related Airport facilities become operational. The increased proportion of rental housing units in the District will produce a resident population that is younger, more mobile and lower income than today's. Given the established correlation between income and educational attainment, it also is likely that the District's future population will have attained lower educational levels than today's population if the Third Runway and related Airport facilities are built.

- **Economic Factors** adversely impacting the Highline School District will primarily be the reduction in residential property values that will require higher special levy rates. For example, the District's most recent special levy rate was 3.015 cents per $1,000 of assessed value. Each million dollars of residential property therefore generates $3,015 of special levy revenue. Assume property values in equivalent areas in King County increase at a rate of 1% per year on average but as a result of increased Sea-Tac International Airport operation property values in the District's residential housing stock increase at only two-thirds of a percent per year. The results of this example are shown in Table 9.15 and Figure 9.07

Table 9.15
Illustrative Impact of Airport on Highline School District Revenues

Year	Property Assessments Without Airport (assumed 1.00% per year property value growth)	Property Assessments With Airport (assumed 0.67% per year property value growth)
1995	$1,000,000	$1,000,000
2000	$1,051,010	$1,033,781
2005	$1,104,622	$1,068,703
2010	$1,160,969	$1,104,804
2015	$1,220,190	$1,142,125
2020	$1,282,432	$1,180,707

Figure 9.07



In the above illustrative example, the decline in residential property values between 1995 and the Year 2000 are attributed to a growth of enplanements within the Airport's existing ASV capacity limit. The relative property value declines after the Year 2000, however, are attributed to construction of the Third Runway and related Airport facilities. In the illustrative example, the School District would have had to increase its levy rate in 2020 from $3.015 to $3.275 per $1,000 of assessed residential property value to equalize the two revenue streams.

Local home owners faced with a relative decline in the value of their property would be asked to approve higher special school levy rates than would otherwise be necessary, and the ability of the District to get voter approval would almost certainly become more difficult. At the same time, the District would be faced with a need to increase expenditures per student in order to maintain the quality of its educational outcomes, it would face growing voter resistance to raising levy rates.

The resulting financial squeeze will be a major economic impact on the School District that results from construction of the Third Runway and related Airport facilities.

The calculation of probable, rather than illustrative, economic impacts on the School District requires a research effort not possible within the resources available under the current Sea-Tac International Airport Impact Mitigation Study. The illustrative differential of one-third of a percent per year in the growth of residential property values with and without the Third Runway appears low on the basis of the property value finding reported previously, and the entire topic of economic impacts of the Third Runway and related Airport facilities on the School District (a topic which was not addressed at all in the EIS) needs additional research.

- **Psychological Factors** impacting the School District's children as a result of the Third Runway could come from several sources. The interruption of classroom teaching by aircraft noise could increase stress on students in affected classrooms. Also, student learning could be impaired in affected west-side elementary schools; and after matriculating to the middle schools in the District, these students may suffer the psychological stress associated with an inability to educationally perform with grade-level peers. Additional psychological impacts may be the consequence of living in neighborhoods where household turnover is high and interpersonal relationships are unstable; or from living in households with only one parent and/or which is under severe economic and financial pressure.

  The current study was not able to investigate the psychological factors, but the association of such factors with the types of demographic shifts that will be accentuated by construction of the Third Runway and related Airport facilities is highly probable and warrants further research and analysis.

The Need for Additional School Services/Facilities

The noise impacts on the seven elementary schools and high school immediately to the west of Sea-Tac International Airport caused by the increase in approaching/departing aircraft after the Year 2000, and which are attributable to the Third Runway, related Airport facilities, and expansion of the Airport's ASV capacity, will require remodeling, rebuilding, or other structural alterations.

The mitigation of the Third Runway impacts are over and above the structural requirements needed to attenuate noise at such schools as Hilltop, Riverton Heights, Midway and Parkside Elementary Schools, Pacific Middle School and Mount Rainier High School that were caused by the second runway and have still not been fully addressed (Highline School District, November, 1992; and Heigh, 24 August 1994). These noise induced structural impacts are analyzed and their mitigation requirements presented in the environmental part of this Sea-Tac International Airport Impact Mitigation Study.

The optimum methods of enriching the classroom learning experience as a way to mitigate the District's demographic shift caused by the increase in approaching/departing aircraft after the Year 2000 attributable to the Third Runway, related Airport facilities, and expansion of the Airport's ASV capacity will require additional analysis. Quantitative research needs to be conducted on the affects of the population's shifting demographic profile on students' classroom performance. After which, appropriate mitigation policies need to be formulated by educational professionals within the District. Some of these policies will likely include reduced student/teacher ratios, increased teacher support staff in classrooms, creation of enriched curricula, and use of additional teaching materials. Regardless of which or how many of these types of mitigated actions will be determined to be appropriate for maintaining the Highline School District's traditional quality of education outcomes, it is evident that the District will require additional resources to mitigate the socio-economic impacts of the Third Runway and related Airport facilities.

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9.12 - MITIGATION OF SEA-TAC'S ADVERSE IMPACTS

The expansion of Sea-Tac International Airport will produce adverse socio-economic impacts on both households and communities in its immediate environment. Section 9.12 discusses appropriate mitigation measures for both types of impacts in three categories of mitigation: mitigation based on tax base change, mitigation based on service level changes, and mitigation based on other changes. Mitigation measures are divided into the following types:

- **Tax Base Changes**
  - Depressed Property Values
  - Reduced School Revenues
  - Reduced Local Government Revenues
  - Land Use Changes

- **Service Level Changes**
  - Public Safety
  - Community Cultural Services
  - Community Social Services
  - Educational Services
  - Health Services

- **Other Socio-Economic Impacts**
  - Environmental Justice
  - Quality of Life
  - Economic Development

9.13 - TAX BASE CHANGES

Depressed Property Values

The primary impact on households will be the decline in the relative value of residential property caused by Sea-Tac International Airport's expanded operations after the Year 2000 - as will result from construction of the Third Runway and related Airport facilities. Table 9.16 reports the average relative decline in housing values for each of the five impacted cities for the Years 2000 to 2020. (the data in Table 9.16 are derived from Table 9.03.)

Between the Years 2000 and 2020, the average residential housing unit (land plus structure) in Burien is expected to experience a relative decline of $26,356 (expressed in constant value 1995 dollars). For the City of Des Moines the comparable number is $27,609; for Federal Way it is $28,891; for Normandy Park it is $35,221; and for Tukwila it is $24,844.

To make residents of the five impacted cities whole, each household would receive the equivalent of a 20-year annuity where the sum of the annuity's payments equals the relative loss of the property value. In Burien, for example, each affected household would receive an annual payment such that the sum of the payments from the Year 2000 to 2020 discounted for real time preference would equal $26,356.

Having the Port of Seattle contribute an amount equal to the above described annual annuity payment toward the payment of a householder's annual property taxes would have the same effect as giving each householder an annuity. It would have the additional benefit of attaching the mitigating action to the property that's being impacted rather than to the householders residing on the property. Further, market forces should increase the value of the property by the discounted present value of the annuity's payment stream (the Port's contribution to the property's tax obligations), and this increase in property values will increase revenues to the five impacted cities - thus mitigating the cities' revenue shortfalls at the same time.

As mitigation for the loss of relative residential property values by homeowners, it is recommended that the Port of Seattle make a partial payment of property taxes for homeowners in the five impacted cities, the amount of the partial payment equal to an annuity the present value of whose payments equals the property's loss of relative value caused by expansion of the Airport.

Table 9.16
Average Housing Unit's Relative Decline in Value Caused by Sea-Tac's Expansion

Year	Burien	Des Moines	Federal Way	Normandy Park	Tukwila
2000	---	---	---	---	---
2001	-$1,318	-$1,380	-$1,450	-$1,761	-$1,242
2002	-$2,636	-$2,761	-$2,899	-$3,522	-$2,484
2003	-$3,954	-$4,141	-$4,349	-$5,283	-$3,727
2004	-$5,271	-$5,522	-$5,798	-$7,044	-$4,969
2005	-$6,589	-$6,902	-$7,248	-$8,805	-$6,211
2006	-$7,907	-$8,283	-$8,697	-$10,566	-$7,453
2007	-$9,225	-$9,663	-$10,147	-$12,327	-$8,696
2008	-$10,543	-$11,044	-$11,596	-$14,088	-$9,938
2009	-$11,861	-$12,424	-$13,046	-$15,849	-$11,180
2010	-$13,179	-$13,804	-$14,496	-$17,610	-$12,422
2011	-$14,497	-$15,185	-$15,945	-$19,371	-$13,664
2012	-$15,815	-$16,565	-$17,395	-$21,132	-$14,907
2013	-$17,133	-$17,946	-$18,844	-$22,893	-$16,149
2014	-$18,450	-$19,326	-$20,294	-$24,654	-$17,391
2015	-$19,768	-$20,707	-$21,743	-$26,416	-$18,633
2016	-$21,086	-$22,087	-$23,193	-$28,177	-$19,875
2017	-$22,404	-$23,468	-$24,642	-$29,938	-$21,118
2018	-$23,722	-$24,848	-$26,092	-$31,699	-$22,360
2019	-$25,040	-$26,228	-$27,542	-$33,460	-$23,602
2020	-$26,356	-$27,609	-$28,891	-$35,221	-$24,844
Average	**-$13,179**	**-$13,804**	**-$14,496**	**-$17,610**	**-$12,422**

The approximate amount of such payments is show in Table 9.17, along with the estimated average annual cost to the Port. The numbers in Table 9.17 are a mitigation guideline and will have to be modified to account for differences between the average value of all housing units in a city and the actual value of specific properties and adjustment for inflation during the 20-year period between the Years 2000 and 2020. The table uses a real interest rate of 4% for its calculations. During 1995, the interest rate on a 30-year government bond was around 6.5% and the rate of inflation was around 2.5%, yielding a real rate of interest for long term assets of around 4%.

Table 9.17
Estimated Cost of Mitigating Residential Housing Unit Property Losses

Community	Contribution by Port to Average Residential Property's Tax Obligation	Average Number of Impacted Single-Family Housing Units	Total Cost to Port of Seattle
Burien	$885	17,890 DU	$15,832,650
Des Moines	$927	6,197 DU	$5,744,619
Federal Way	$973	12,392 DU	$12,057,416
Normandy Park	$1,182	2,577 DU	$3,046,014
Tukwila	$834	4,866 DU	$4,058,244
Total			**$40,738,943**

Reduced School Revenues

Reduced school revenues will result from the relative decline in residential property values caused by expansion of Sea-Tac International Airport after the Year 2000. If the Port of Seattle undertakes a program of making partial property tax payment for residential properties in the affected cities, market forces will bid up the price of these properties and off-set the relative declines that would otherwise occur. Consequently, there would be no reduction in school revenues (increases in levy rates) and no additional mitigation would be required.

If the Port of Seattle does not mitigate the relative decline in residential property values caused by the Third Runway and related Airport facilities, the Highline School District will experience revenue shortfalls, compared to what would have occurred had the Airport not expanded. The estimation of these revenue shortfalls is complex and needs to account for both the business personal property tax receipts generated by the Airport to the School District and Washington State's educational funding formulas. It was beyond the budget and scope of this study, but the full effects should be calculated.

It is recommended that a detailed analysis of the likely shortfall in Highline School District's property tax base that will result from construction of the Third Runway and related Airport facilities be conducted.

Reduced Local Government Revenues

Reduced local government revenues will result from the relative decline in residential property values caused by expansion of Sea-Tac International Airport after the Year 2000. If the Port of Seattle undertakes a program of making partial property tax payment for residential properties in the affected cities, market forces will bid up the price of these properties and off-set the relative declines that would otherwise occur. Consequently, there would be no reduction in local government revenues and no additional mitigation would be required.

If the Port of Seattle does not mitigate the relative decline in residential property values caused by the Third Runway and related Airport facilities, the city governments of Burien, Des Moines, Federal Way, Normandy Park and Tukwila will experience revenue shortfalls, compared to what would have occurred had the Airport not expanded. The cumulative revenue losses to all five impacted cities from all Third Runway related impacts will be $38.8 million (in constant value 1995 dollars), ranging from an annual revenue loss of $1.7 million during the first year after the Third Runway goes into operation to an annual revenue loss of $2.2 million in the Year 2020.

If the Port of Seattle does not take action to mitigate the decline in relative residential property values by making partial property tax payments to homeowners, it is recommended that the Port of Seattle make annual off-setting payments to each of the five impacted cities to compensate them for the relative declines in residential property values caused by construction of the Third Runway and related Airport facilities.

The magnitude of the off-setting payments should be determined by each city's revenue losses. Table 9.18 presents estimates of these revenue losses.

Table 9.18
Estimated Revenue Loss Off-Setting Mitigation Payments

Community	Total Revenue Losses from Relative Declines in Single-Family Property Values 2000-2020	Average Yearly Decline in Single-Family Property Values 2000-2020	Annual Tax Revenue Loss Off-Setting Mitigation Payments
Burien	-$14,191,858	-$709,592	$709,592
Des Moines	-$6,389,351	-$319,468	$319,468
Federal Way	-$11,611,022	-$580,551	$580,551
Normandy Park	-$2,813,667	-$140,683	$140,683
Tukwila	-$3,747,651	-$187,383	$187,383

Land Use Changes

Land use changes in the form of a shift from owner occupied to renter occupied residential properties will result from the relative decline in residential property values caused by expansion of Sea-Tac International Airport after the Year 2000. If the Port of Seattle undertakes a program of making partial property tax payments for residential properties in the affected cities, market forces will bid up the price of these properties and off-set the relative declines that would otherwise occur. Consequently, there would be no market pressure for shifts in land use patterns and no additional mitigation would be required.

If the Port of Seattle does not mitigate the relative decline in residential property values caused by the Third Runway and related Airport facilities, there will be a need to mitigate the affects of having more transient residents living in the five impacted cities.

It is recommended a revolving "Home Ownership Loan Fund" be established to facilitate the movement of persons living in Burien, Des Moines, Federal Way, Normandy Park and Tukwila from renter to owner housing tenure status.

Additional analysis will be required to determine the size of the loan fund, but a rough estimate of assistance provided to approximately 500 households a year in achieving home ownership status would indicate the size of the fund should be in the range of $15 million to $25 million. It is assumed that the home ownership program would operate through loan guarantees and the majority of the funding would be provided through private financial institutions.

9.14 - SERVICE LEVEL CHANGES

Expansion of Sea-Tac International Airport through construction of the Third Runway and related Airport facilities will increase the proportion of renters among residents of the five impacted cities. As a result, the cities will experience a shift in population toward younger, lower income and more mobile households. This shift will require an increase in community services if the cities are to retain the quality of life they had in the past.

Public Safety

Public safety requirements will increase for all five of the impacted cities. The Cities of Burien, Des Moines and Tukwila will have the greatest requirements for additional neighborhood patrolling by uniformed police officers. The growth of operations at Sea-Tac International Airport after the Year 2000 will particularly impact the City of Tukwila where Airport-induced neighborhood decline is already advanced on Pacific Highway South and will continue to worsen.

It is recommended that as part of the mitigation of the Third Runway and related Airport facilities at Sea-Tac International Airport there be a program whereby the Port of Seattle reimburses the Cities of Burien, Des Moines and Tukwila for the additional public safety requirements they will experience.

Community Cultural Services

Given the demographic shift expected to occur in the five impacted cities as a result of construction of the Third Runway and related Airport facilities, the continuance of their quality of life will require an enrichment of the cultural resources available to their residents. In particular, it will be important to expand the availability of central meeting places such as parks, libraries and community centers where new residents can meet their neighbors and become integrated into their communities. The greatest needs will occur in the Cities of Burien, Des Moines and Tukwila, although significant, but lesser, pressure for additional community cultural resources will be experienced in the cities of Federal Way and Normandy Park.

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It is recommended that each of the five impacted cities draw-up a cultural resources enhancement plan specifically directed toward meeting the quality of life challenge that the Third Runway and related Airport facilities, will impose, and that the actions identified as needed in each city's cultural resources enhancement plan be funded as part of the mitigation of the construction of the Third Runway and related Airport improvements.

Community Social Services

Community social services such as day care and after school care, elderly centers, family counseling services, work training and job search counseling will all be required in the five impacted cities that were the focus of the Sea-Tac International Airport Mitigation Impact Study. Over and above the needs for such services that a growing population will require, the demographic shift caused by the increase in Sea-Tac International Airport operations that will be made possible by expansion of the Third Runway and related Airport facilities, will cause an expanded growth in demand for social services. If the impacted cities are only able to provide increased social services in proportion to their population growth, and are not able to provide for the additional social services made necessary by construction of the Third Runway and related Airport facilities, their quality of life will be progressively diminished after the Year 2000.

It is recommended that the five impacted communities develop a southwest King County integrated community social service resource and delivery plan and that the plan, once developed, be funded as part of the mitigation of the Third Runway's impacts.

Educational Services

There will be a need to enrich classroom learning experiences in order to mitigate demographic shift among the Highline School District students that will be caused by the Third Runway and related Airport facilities. To determine the best mitigation measures, quantitative research needs to be conducted on the affects of shifting demographic profiles on student classroom performance. After which, appropriate mitigation policies need to be formulated by educational professionals within the District. Some of these policies will likely include reduced student/teacher ratios, increased teacher support staff in classrooms, creation of enriched curricula, and use of additional teaching materials. Regardless of which or how many of these types of mitigation actions will be determined as appropriate for the task of maintaining the Highline School District's traditional quality of education outcomes, it is evident that the District will require additional resources to mitigate the socio-economic impacts of the Third Runway and related Airport facilities.

It is recommended that additional research be undertaken to develop quantitative estimates of the relationship between demographic shifts in the Highline School District's student population, levels of student performance and appropriate mitigation measures to maintain the District's traditional quality of education outcomes; and that such measures be funded as part of the mitigation of the Third Runway's impacts.

Health Services

High levels of concern have been expressed by citizens and community leaders from the five impacted cities about the deleterious affects the Airport now has on the health of families living in its immediate environment. If such concerns are demonstrated as warranted, they would apply forcefully to the expansion of Airport operations that will occur as a result of building the Third Runway and related Airport facilities. A public health evaluation and assessment of the Airport was outside the scope and budget of this study.

It is recommended that the School of Public Health at the University be funded to conduct an Airport health impact assessment, and that if the assessment finds a positive correlation between adverse health impacts and levels of Airport operation, appropriate measures to mitigate these affects be funded.

9.15 - OTHER SOCIO-ECONOMIC IMPACTS

Environmental Justice

Parts of the City of Burien that are the home of an ethnically diverse population will be impacted by Sea-Tac International Airport's expansion that construction of the Third Runway and related facilities will allow.

It is recommended that a monitoring system by established and operated in the area to the north of the Airport which will be under the approach/departure flight track for the Third Runway to insure that the intent of federal Executive Order 12898, "Environmental Justice" are met.

Quality of Life

Most of the issues surrounding the socio-economic impact of the Third Runway and related Airport facilities, on neighboring communities involves their quality of life and the manner in which expansion of operations at the Airport will cause it to be degraded. The quality of life issue is central to understanding the socio-economic impacts of the Third Runway and developing effective mitigation strategies. This issue needs to be approached in a straight forward manner, and the development of prototype quality of life indicator systems, both nationally and in the Puget Sound Region, should make this possible.

It is recommended that a quality of life indicator model be created for the five impacted cities and for areas in Northwest King County which are appropriate as a comparison area; the indicator model be estimated for data at least as far back as 1960 for both the impacted and comparison cities; that it be used to identify changes in the impacted cities' relative quality of life over time, the major quality of life indicators which contributed to the decline; and the quality of life indicator model become the basis for identifying needed socio-economic mitigation measures for the Third Runway and related Airport facilities.

Economic Development

Many of the adverse impacts of the Third Runway and related Airport facilities have to do with the direct, indirect or induced relative declines in property values that occur when Airport operations increase. One strategy for mitigating these property value impacts is to direct to the maximum extent, feasible airport economic functions into the five impacted cities. For example, if Sea-Tac International Airport's proposed new hotel were located in Burien or Des Moines instead of on Airport lands there would be a positive (mitigating) result. Equally, if the Airport were to construct a haul road for all air cargo movements which exited on the west side of the Airport, it is highly likely that new warehousing and distribution facilities would spring-up; and the increased value of economic activity thus resulting would mitigate the Third Runway's otherwise adverse impacts. In many ways, a mitigation strategy which depends, at least in part, on economic development enhancing actions is preferable to alternative types of mitigation since it uses market forces rather than government spending or regulation as its implementing force.

It is recommended that an economic and engineering assessment of Airport operations be conducted to determine Airport functions which would have positive economic development benefits and could be shifted to the five impacted cities.

SECTION 10
SUMMARY OF FINDINGS

10.01 - INTRODUCTION

The consultant team was charged with the task of reviewing and evaluating the impacts of the proposed Third Runway project at Sea-Tac International Airport. Given the study's schedule and budget, the consultant team was directed to utilize existing data in reviewing the proposed project. In accomplishing this task, the consultant team relied principally on data, studies, reports, and documents supplied by:

- The Port of Seattle.
- The Cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila.
- The Puget Sound Regional Council.
- King County.
- The City of Seattle.
- Various regional departments and agencies.
- Various departments and agencies of the State of Washington.
- Various departments and agencies of the Federal government.

A technical reference bibliography appears in Appendix B of this report.

During 1996, various meetings were conducted in the study area and in the City of Olympia with representatives of the Port of Seattle, the five impacted communities, the general public, and various local, regional, State and Federal agencies. A list of project contacts made during this study appears in Appendix C of this report.

10.02 - EIS REVIEW

Sections 2 through 4 of this report presented an analysis of the Port of Seattle's Environmental Impact Statement and evaluated its findings with regards to potential general environmental impacts, transportation impacts and socio-economic impacts.

Environmental

Generally, the EIS did a good job of presenting potential environmental impacts. However, certain areas of improvement were noted, including but not limited to:

- Re-running the new Integrated Noise Model using the newest version and running the model to calculate the 55 LDN contour line.
- Addressing the issue of single-event noise levels and their associated impacts on surrounding residential and non-residential activity.
- Re-running the air quality model using re-sampled data which occurs within the study area rather than 5 miles away from the Airport.
- Further developing the visual impact analysis utilizing color photographs and additional viewing locations.
- Performing additional analyses on overflight and vibration impacts.
- Expanding the analysis of aquifer impacts to study all of the Highline Aquifer within the study area, as well as other aquifers.

These areas of concern - and others as identified in Section 2 - should be fully addressed prior to construction of the Third Runway.

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Transportation

As above, the EIS did a good job of presenting potential transportation impacts. However, certain areas of improvement were noted, including but not limited to:

- Expanding the analysis area of transportation impacts to include the surrounding impacted communities, rather than just looking at the "driveways" to the Airport property.
- Expanding the analysis of the haul alternatives and preparing detailed operational procedures for the proposed alternative.
- Improving the analysis of the impacts to the local street system and the State roadway network.
- Improving the analysis of projected load impacts to bridges on the State network.
- Addressing the impacts of construction and post-construction traffic on local traffic diversion, school/transit routes, and emergency vehicle access.

These areas of concern - and others as identified in Section 3 - should be fully addressed prior to construction of the Third Runway.

Socio-Economic

The Port of Seattle's EIS does not present an adequate discussion, analysis and mitigation of the socio-economic impacts associated with the proposed project. The consultant team did not question the overall benefit of an expanded Sea-Tac International Airport. However, as the analysis in Sections 4 and 9 shows, while the Airport's benefits are distributed regionally and Statewide, the costs and impacts are disproportionally distributed among the five impacted communities.

The EIS does not address the socio-economic impacts of the proposed project on local social and community services, such as public safety and education. It also does not address the depression of local property values (with respect to other similar King County areas that are not impacted by an airport).

The socio-economic analyses recommended in Sections 4 and 9 should be completed by the Port of Seattle prior to construction of the Third Runway.

10.03 - MITIGATION CASE STUDIES

Sections 5 and 6 of this report presented a summary of various other mitigation experiences at other US airports (Section 5) and other major projects in Washington State (Section 6).

Other airport projects - notably the addition of two new runways at Dallas/Fort Worth International Airport - proposed a more comprehensive mitigation approach which addressed the effects on whole neighborhoods, rather than just individual structures. The Washington State examples clearly demonstrated the precedent in Washington to extend mitigation programs beyond "traditional" physical remediation to also include social and economic mitigation.

It also does not appear that the proposed project follows the requirements of the State of Washington's *Growth Management Act* (Washington Administrative Code 197-11-060, 197-11-442, and 197-11-443). The GMA fundamentally changed the process of planning in the State. It affects all local jurisdictions, but most significantly, those within the 29 counties planning under the Act. The GMA establishes 13 goals, requires the development of countywide planning policies (including mufti-county countywide planning policies for the central Puget Sound region), local general purpose governmental comprehensive plans with mandatory elements and implementing development regulations. these plans and their implementing agencies must be internally consistent. They must also be consistent with adjacent jurisdictions.

A specific requirement of plans is that they contain a capital facilities plan element identifying those facilities necessary to support the plan and including how these facilities will be financed. The requirements for transportation components are more detailed including the requirement for regional and State consistency. State agencies are required to act consistently with these plans and regulations. Special districts' plans and facilities must also be in conformity.

Each local government in the study area has adjusted their initial comprehensive plan with the exception of Burien, which is in the process of developing its initial comprehensive plan under GMA. Incorporated in 1992, Burien has adopted policies under GMA to guide planning and development in the interim period. Each jurisdiction has developed their plan to accommodate projected future growth as determined by the Washington State Office of Financial Management and distributed by the King County Countywide Planning Policies. What, if any, impacts the implementation of the updated Airport Master Plan Update will have on these jurisdictions was not analyzed nor incorporated in the development of these plans.

GMA requires that there be consistency in three important ways:

- Local jurisdictions' comprehensive plans must be internally and externally (with adjacent communities) consistent. How these jurisdictions change their plan to accommodate the anticipated impacts of the Third Runway will open a window for a State challenge by citizens, other local governments, or the State.

- The State transportation plan, the regional transportation plan and local jurisdictions' transportation elements within their comprehensive plans are required to be consistent. In an interesting balancing of interests, no single plan dominates nor can any one dictate what must be done in another plan. As currently practiced, all parties must negotiate until there is "consistency".

- State agencies are required to comply with adopted local comprehensive plans and implementing development regulations including the expenditure of operational, grant, and capital facility funding.

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The GMA requires local jurisdictions to specifically identify in their comprehensive plans those capital facilities necessary to support future development at specific levels of service. The comprehensive plan must specifically identify how these facilities will be financed. If financing is not feasible, the plans must be revised until feasibility is achieved.

The GMA places the primary responsibility for planning for future growth in the hands of local elected officials. The overall result should be coordinated, consistent local plans which are financially feasible and work together within the region to support a broad vision for the future. State and local agencies are bound to support these plans in their actions.

Failure to meet responsibilities leaves jurisdictions vulnerable to challenges through the Growth Management Hearings Board or superior court. In the former, jurisdictions found out of compliance are potentially subject to loss of revenues, loss of grant funds, and loss of revenue authority. It appears that the proposed Third Runway project does not comply with the requirements of the State's Growth Management Act.

10.04 - RECOMMENDED ENVIRONMENTAL MITIGATION

Section 7 of this report presented the recommend environmental mitigation program to address the projected impacts of the proposed Third Runway.

In summary, prior to construction of the Third Runway, the following mitigation measures should be accomplished:

- Establish a working group/oversight commission to participate with the FAA and other parties in overseeing the application of mitigation measures and programs.

- Run the latest version of the INM to further refine the projected LDN and SEL noise contours and include the 55 LDN contour.

- Based on the INM results, relocate all eligible residents, businesses, schools, churches, and other uses incompatible with extended periods of high-volume aircraft noise. Relocation should be based on neighborhood boundaries.

- Based on the INM results, insulate all eligible residential, business, school, church, and other structures generally incompatible with extended periods of high-volume aircraft noise. Owners of these structures also should be paid for an avigation easement which stays with the property in perpetuity. Insulation and easements should be offered based on neighborhood boundaries.

- Establish additional threshold data which provides detailed information about the threshold above (TA) noise metric with respect to sensitive noise receptors such as schools, hospitals, etc. This information should be developed by the Port of Seattle as part of the re-evaluation of the noise data using the INM, Version 5.1 (or most recent available version).

- Establish a permanent noise monitoring program which locates monitoring stations along predicted noise contours. Additional stations beyond the 25 proposed by the Port of Seattle may be required.

- Utilize permanent and/or portable "hush houses" in conjunction with engine maintenance activities, in particular run-ups.

- Continue or establish noise programs such as a Noise Budget, a Nighttime Limitations Program, a Ground Noise Control Program, Overflight Noise Abatement Procedures, Flight Path Monitoring, and a 24-Hour Noise Information Line.

- Establish a noise mediation agreement which specifies how the Port will deal with exceedances and violations of noise programs.

- Amend the Four-Post Plan to minimize overflights over population areas.

- Require a Dust Control Plan as part of the contractor's permit to construction fugitive dust impacts.

After the Third Runway is operational, the following mitigation measures should be accomplished:

- Utilize the Third Runway for arrivals only during inclement weather in order to help control noise levels associated with departures. There should be no arrivals on the Third Runway, except for emergencies, between 9:00 PM and 7:00 AM.

- Utilize new technologies such as Microwave Landing System (MLS) and Global Positioning Satellite System (GPS) as part of potentially reducing noise impacts to areas around the Airport.

- Conduct a study to determine if it is possible to reduce aircraft emissions by improving Airport operations associated with queuing and taxiing.

The complete listing of mitigation recommendations may be found in Section 7. Environmental mitigation associated with the impacts as delineated in Section 7 as shown in Table 10.01.

Table 10.01
Environmental Mitigation

Environmental Mitigation	Community					Total
	Burien	Des Moines	Federal Way	Normandy Park	Tukwila	
Noise and vibration	$636.6 M	$1,481.4 M	$148.1 M	$55.8 M	$113.5 M	$2,435.4 M
Air quality	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Surface water	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Ground water	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Wetlands	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Floodplains	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Aesthetic/visual	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Other	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Total	**$636.6 M plus TBD**	**$1,481.4 M plus TBD**	**$148.1 M plus TBD**	**$55.8 M plus TBD**	**$113.5 M plus TBD**	**$2,435.4 M plus TBD**

As can be easily seen, most of the environmental mitigation costs are not yet identified. This is due to the amount of additional study still required. Of the approximately $2.4 billion in identified mitigation costs, approximately $2.0 billion (84%) is associated with potential relocation and redevelopment of neighborhoods within Burien and Des Moines. Should this option not be selected, mitigation costs should be significantly lower. All TBD (to be determined) costs should be reconciled prior to construction of the Third Runway.

10.05 - RECOMMENDED TRANSPORTATION MITIGATION

Section 8 of this report presented the recommended transportation mitigation program to address the projected impacts of the proposed Third Runway.

In summary, prior to construction of the Third Runway, the following mitigation measures should be accomplished:

- Perform an Origin-Destination Survey and develop a Cost Allocation Model to determine the amount of impacts attributable to Airport traffic.

- Perform an Areawide Traffic Study to determine region-wide traffic demands on the network surrounding the Airport.

- Develop an Incident Management Plan to respond to emergencies in the study area during and after construction.

- Implement Surface Transportation Noise Mitigation measures to minimize the impacts of freeway noise in the study area.

- Establish baseline conditions for State roads and bridges to measure further deterioration attributable to increased heavy haul truck traffic.

- Select the method of transporting fill material to the construction site (either truck hauling or barge/conveyor/rail) and develop a separate environmental assessment and an emergency contingency plan for the selected transport method.

- Mitigate all identified neighborhoods for corridor congestion impacts.

- Further study the projected traffic impacts on transit and Highline School District bus routes and develop mitigation measures including re-routing/rescheduling, relocation of bus-stops, and/or additional buses and drivers.

- Further study the projected traffic impacts on police and emergency vehicle response time in the five impacted communities and develop mitigation measures including additional equipment, additional personnel, and/or new station locations.

- Conduct monitoring of the serviceability index of local and State roads, and the condition/load rating of State-jurisdiction bridges and rehabilitate or reconstruct these facilities as needed.

During and after construction of the Third Runway, the following mitigation measures should be accomplished:

- Mitigate all identified neighborhoods for corridor congestion impacts.

- Each City should develop a transportation management plan as part of its ongoing transportation planning functions.

Table 10.02
Transportation Mitigation

Transportation Mitigation	Community					Total
	Burien	Des Moines	Federal Way	Normandy Park	Tukwila	
Congestion	$26.4 M	$16.9 M	$20.8 M	$9.8 M	$43.7 M	$117.6 M
Physical damage	$49.8	$22.7 M	$25.9 M	$17.7 M	$70.4 M	$186.5 M
Construction	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD	$ TBD
Post-construction	$40.6 M	$33.2 M	$0.0 M	$23.4 M	$77.6 M	$174.8 M
Total	**$116.8 M plus TBD**	**$72.8 M plus TBD**	**$46.7 M plus TBD**	**$50.9 M plus TBD**	**$191.7 M plus TBD**	**$478.9 M plus TBD**

(Source: Section 8, SeaTac Impact Mitigation Study)

Of the nearly $500 million in transportation mitigation identified, approximately 39% is to address the effects of physical damage to the roadway network. About 40% of the total transportation mitigation costs occur within the City of Tukwila, principally because of the high number of State-jurisdiction roads and bridges. Burien and Des Moines account for another 40% of the total costs due to their close proximity to the Airport and project site.

It is significant that most of the costs associated with construction impacts are not yet known and **should be fully identified prior to construction**. Costs for transportation mitigation have not been assigned to any particular funding agency, but it is likely that the Cities, the State of Washington, the Federal Highway Administration/US DOT, and the Port of Seattle will all participate in project funding at various levels.

10.06 - RECOMMENDED SOCIO-ECONOMIC MITIGATION

Section 9 of this report presented the recommended socio-economic mitigation program to address the projected impacts of the proposed Third Runway.

In summary, prior to construction of the Third Runway, the following mitigation measures should be accomplished:

- As mitigation for the loss of relative residential property values by homeowners, it is recommended that the Port of Seattle make a partial payment of property taxes for homeowners in the five impacted cities, the amount of the partial payment equal to an annuity the present value of whose payments equals the property's loss of relative value caused by expansion of the Airport.

- A detailed analysis should be prepared of the likely shortfall in Highline School District's property tax base that will result from construction of the Third Runway and related Airport facilities.

- The Port of Seattle should make annual off-setting payments to each of the five impacted cities to compensate them for the for the additional public safety requirements they will experience as a result of the Third Runway and related Airport facilities.

- The Port of Seattle should make off-setting payments to each of the five impacted cities to compensate them for the relative declines in residential property values caused by construction of the Third Runway and related Airport facilities.

- A revolving "Home Ownership Loan Fund" should be established to facilitate the movement of persons living in Burien, Des Moines, Federal Way, Normandy Park and Tukwila from renter to owner housing tenure status.

- Each of the five impacted cities should develop a cultural resources enhancement plan specifically directed toward meeting the quality of life challenge that the Third Runway and related Airport facilities will impose, and that the actions identified as needed in each city's cultural resources enhancement plan be funded as part of the mitigation of the construction of the Third Runway and related facilities.

- Each of the five impacted communities should develop a Southwest King County integrated community social service resource and delivery plan and that the plan, once developed, be funded as part of the mitigation of the Third Runway's impacts.

- Additional research should be undertaken to develop quantitative estimates of the relationship between demographic shifts in the Highline School District's student population, levels of student performance and appropriate mitigation measures to maintain the District's traditional quality of education outcomes; and that such measures be funded as part of the mitigation of the Third Runway's impacts.

- The School of Public Health at the University of Washington should be funded to conduct an Airport Health Impact Assessment, and that if the assessment finds a positive correlation between adverse health impacts and levels of Airport operation, appropriate measures to mitigate these affects should also be funded.

- A monitoring system should be established and operated in the area to the north of the Airport which will be under the approach/departure flight track for the Third Runway to insure that the intent of Federal Executive Order 12898, "Environmental Justice" is met.

- A Quality Of Life Indicator Model should be created for the five impacted cities and for areas in Northwest King County which are appropriate as a comparison area, to be used to identify changes in the impacted cities' relative quality of life over time and become the basis for identifying needed socio-economic mitigation measures for the Third Runway and related Airport facilities.

- An economic and engineering assessment of Airport operations should be conducted to determine Airport functions which would have positive economic development benefits and could be shifted to the five impacted cities.

Table 10.03
Socio-Economic Mitigation - 2000 to 2020

Socio-Economic Mitigation	Community					Total
	Burien	Des Moines	Federal Way	Normandy Park	Tukwila	
Total	$14.2 M	$6.4 M	$11.6 M	$2.8 M	$3.7 M	$38.7 M

10.07 - SUMMARY

A total of $2.95 billion in mitigation costs have been identified for the five impacted communities in the areas of environmental, transportation, and socio-economic impacts (see Table 10.04).

Table 10.04
Total Identified Mitigation Costs for the Five Impacted Communities

Community	Mitigation Costs			
	Environmental	Transportation	Socio-Economic	Total
Burien	$636.6 M	$116.8 M	$14.2 M	$767.6 M
Des Moines	$1,481.4 M	$72.8 M	$6.4 M	$1,560.6 M
Federal Way	$148.1 M	$46.7 M	$11.6 M	$206.4 M
Normandy Park	$55.8 M	$50.9 M	$2.8 M	$109.5 M
Tukwila	$113.5	$191.7 M	$3.7 M	$308.9 M
Total	**$2,435.4 M**	**$478.9 M**	**$38.7 M**	**$2,953.0 M**

It is not surprising that of the total **known** and **calculated** amount of $2.95 billion, approximately 79% ($2.3 billion) covers mitigation within the Cities of Burien and Des Moines. These are the two cities within the study area that immediately abut the project site. Most of the mitigation costs in Burien and Des Moines ($2.1 billion or approximately 72% of the total) account for the acquisition/relocation/redevelopment alternative described earlier.

As mentioned in this study, it is not recommended that these areas be totally acquired and redeveloped. This study has calculated a value of these areas at approximately $2.1 billion. Their future development should be further studied by Burien and Des Moines as part of each city's Comprehensive Plan and should be in conformance with the State's GMA requirements.

Tukwila's mitigation costs are third in line, primarily because of the extensive State roadway network within the City.

Federal Way's mitigation costs are primarily associated with sound in insulation and avigation easements for residences affected by SEL and overflight noise. Modification of the Four-Post Plan and the projected Third Runway flight tracks may also mitigate these areas for significantly lower costs. However, it has not yet been determined if there are available flight tracks which would not affect any resident in Southwest King County.

As the smallest community in size and population, Normandy Park's mitigation costs are the lowest of the five impacted communities. Mitigation in Normandy Park is almost evenly split between sound insulation/avigation easements and transportation impacts.

While it may appear to be a high figure, the $2.95 billion does not represent the total potential mitigation amount.

It is important to note that many costs have not yet been determined as part of this study. Primarily, the costs associated with relocating, insulating, and granting easements to select Highline School District facilities was not calculated. Also, costs associated with insulating the Highline Community Hospital were not calculated. Several additional significant environmental and transportation-related impacts should also be calculated prior to construction of the Third Runway.

It is the recommendation of this study that all known environmental, transportation, and socio-economic impacts as identified be mitigated prior to construction of the Third Runway. Multiple additional studies have been identified - mostly to be prepared by the Port of Seattle or its consultants - in order to further clarify the scope of various impacts. All of these studies *should be completed prior to the Record of Decision being granted.*

This study also recommends ongoing monitoring and mitigation to occur during and after construction, through at least the Year 2020. The five impacted communities should have a voice in this ongoing effort through the recommended "working group/oversight commission".

Finally, in accordance with the GMA, the development of a South King County Comprehensive Plan is strongly urged. This should also involve the City of SeaTac and should integrate all comprehensive planning for the cities, the County, and the Airport into a cohesive, sub-regional document.

APPENDICES

APPENDIX A
EQUITY ISSUES AND SOCIO-ECONOMIC IMPACTS

APPENDIX A
EQUITY ISSUES AND SOCIO-ECONOMIC IMPACTS

A.01 - INTRODUCTION

Equity issues related to the geographic distribution of Seattle-Tacoma International Airport's benefits and costs underpin the requirement for socio-economic impact mitigation. Although a source of contention, it is arguable that socio-economic benefits such as increased economic activity (jobs, income, and output) and social/cultural events (family visits, traveling performance companies and ease of recreational travel) generated by commercial aviation services taking place at Sea-Tac International Airport exceed the Airport's socio-economic costs (noise, traffic congestion, a degraded environment for human habitat, adversely affected educational and social services, and a reduced tax base). However, the benefits are distributed over western Washington and the Puget Sound Region while the costs are localized in a small number of communities immediately surrounding the Airport. Consequently, there is a need for mitigation that redirects some of the Airport's benefits back to the communities that disproportionately bare its costs.

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Appendix A looks at the geographic area adversely affected by Sea-Tac International Airport's impacts and compares it to the places of origin of persons initiating commercial air service travel at Sea-Tac International Airport. It also analyses the Airport's economic benefits and how they affect the five impacted communities that are the focus of this study.

The data base for the origin of enplaning passengers at Sea-Tac International Airport comes from a 1991 Origin/ Destination (O/D) study conducted by the Evans-McDonough Company (EMC) for the Port of Seattle (Butler and Kiernan, September 1992). Population estimates used to calculate per capita trip generation rates were from the Washington State Office of Financial Management. Different estimates of the Airport's geographic impact area are derived from studies of Sea-Tac International Airport noise and related impacts conducted for the Port of Seattle during the past decade.

A.02 - GEOGRAPHIC AREA OF SEA-TAC'S ADVERSE IMPACTS

Numerous communities throughout the central Puget Sound region have perceived themselves adversely impacted by some factor (usually noise) connected with Sea-Tac International Airport activity levels, and there is considerable elasticity to the delineation of the geographic area primarily affected. It is widely acknowledged however that the Airport's primary adverse impacts occur in the communities immediately surrounding the Airport.

A Sea-Tac International Airport noise exposure (Part 150) study conducted for the Port of Seattle in 1989 defined the Airport's land use impact area as a rectangle extending approximately 6.2 miles north, 7.0 miles south, 1.2 miles west and 1.6 miles east of the ends of runway 16L/34R (Martin O'Connell Associates, 31 May 1994). The defined area includes all or parts of what are currently the Cities of Burien, Des Moines, Federal Way, Normandy Park, SeaTac and Tukwila plus parts of South Seattle and parts of unincorporated King County.

A 1994 "Public Building Sound Insulation Project" conducted by the Port of Seattle sent questionnaires to public buildings that might have been adversely impacted by Sea-Tac International Airport's noise. Questionnaires were sent to public buildings located in the Cities of Bellevue, Burien, Des Moines, Federal Way, Kent, SeaTac and Tukwila plus parts of South Seattle and unincorporated King County (Thomas/Lane & Associates, June 1991).

The Port of Seattle's *Final Environmental Impact Statement*, issued February, 1996, defines the "general Study area" for analyzing impacts as a rectangle approximately 7.8 miles north and south and 1.3 miles east and west of the ends of runway 16L/34R. The area includes all or part of the Cities of Burien, Des Moines, Federal Way, Kent, Normandy Park, SeaTac and Tukwila plus parts of South Seattle and unincorporated King County.

The Airport Communities Coalition (ACC) consists of general and special purpose local governments that have organized in opposition to the proposed Sea-Tac International Airport expansion, and they see themselves, collectively, as the primary area affected by the Airport's adverse impacts. ACC members include the Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila plus the Highline School District.

The five Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila covered by this SeaTac Impact Mitigation Study are clearly within the area most adversely impacted by SeaTac International Airport's operations, and they (together with the Highline School District) constitute the focus of this socio-economic analysis.

A.03 - GEOGRAPHIC DISTRIBUTION OF PASSENGERS ORIGINATING TRIPS AT SEA-TAC

The O/D study conducted by EMC is 1991 contains responses from 3,278 originating passengers (Butler and Kiernan, September 1992). Respondents were not required to answer all questions contained in the survey. There were 3,170 responses on the data disk obtained from the Port of Seattle with usable information about trip purposes and trip origins. Respondents were asked the ZIP Code of the place where they spent the prior night (the *place of origin* of the trip). The ZIP Code locations were converted to city and town locations using a US Post Office ZIP Code manual. Table A.01 shows the distribution of respondents originating their trips at home, at a hotel/motel or at a business office.

Table A.01
Trip Origins of Survey Respondents

Place of Trip Origin	Number	Percent
Home	1,856	58.5%
Hotel/motel	830	26.2%
Business office	484	15.3%
Total Respondents	**3,170**	**100.0%**

(Source: Evans-McDonough Company)

The Central Puget Sound region accounted for almost three quarters (71.9%) of all trip respondents in the survey.

Passengers Originating Trips At Home

The majority (58.5%) of persons originating the air portion of their trips at Sea-Tac International Airport went to the airport directly from home. Almost two-thirds (61.2%) of travelers going to the Airport directly from home were traveling for pleasure while the remaining one-third (38.8%) were traveling for business. Table A.02 presents the geographic distribution of passengers who went to the airport directly from home and who originated the air portion of their trip at Sea-Tac International Airport.

Table A.02
Counties of Home Originating Travelers

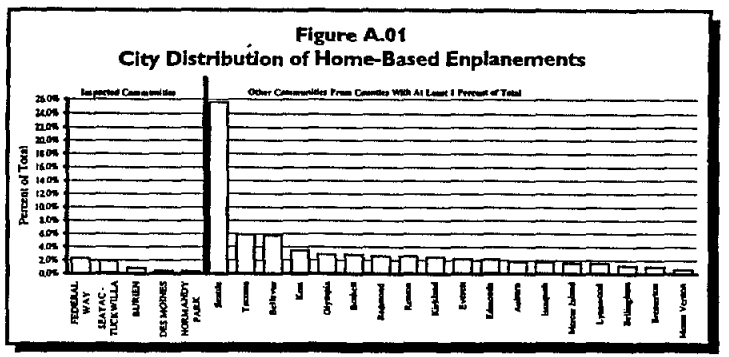
Area	Percent of Total Originating Enplanements
King County (excluding impacted communities)	57.2%
Pierce County	10.4%
Snohomish County	10.1%
Five Impacted Communities Combined	**5.9%**
Thurston County	3.1%
Kitsap County	3.1%
Rest of Washington State	10.2%

(Source: Evans-McDonough Company)

The five impacted cities immediately surrounding the airport that are the focus of this study accounted for 5.9% of these enplanements. King County (excluding the five impacted communities) accounted for 57.2%. Pierce County and Snohomish County accounted for 10.4% and 10.1%, respectively. In terms of large aggregates of places, King County (excluding the five impacted communities) plus Pierce, Snohomish, Thurston and Kitsap counties accounted for 83.9% of home originating enplanements; the rest of Washington State accounted for 10.2% and the five impacted communities combined accounted for 5.9%.

Figure A.01 compares the geographic distribution of home originating enplanements of the five impacted communities with other cities and towns located in Washington counties which generated at least 1.5% of total home originating enplanements. The Cities of Seattle (25.6%), Tacoma (5.9%), Bellevue (5.8%), Kent (3.5%), Olympia (2.9%), Bothell (2.9%), Redmond (2.6%), Renton (2.6%) and Kirkland (2.5%) all account for a larger percentage of total home originating enplanements than do *any* of the five impacted communities. Bellingham, located in Whatcom County and over 100 miles away from the airport generates a larger percentage of home originating enplanements than does Burien. Mount Vernon, located in Skagit County and approximately 75 miles from the Airport generates a larger proportion of home-based enplanements than do either Des Moines or Normandy Park.

Figure A.01
City Distribution of Home-Based Enplanements



Passengers Originating Trips At Hotels and Motels

Approximately a quarter (26.2%) of persons originating the air portion of their trips at Sea-Tac International Airport went to the Airport directly from a hotel or motel. Just over one-quarter (25.7%) of travelers going to the Airport directly from a hotel or motel were traveling for pleasure while three-quarters (74.3%) were traveling for businesses purposes.

Trip departures from hotels and motels are highly concentrated, reflecting the concentration of hotel and motel rooms in the region. King County (excluding the impacted communities) accounted for over half (55.9%) of all persons going to Sea-Tac International Airport directly from a hotel or motel. Within King County (excluding the five impacted communities), just over three-quarters (75.6%) of all trips originating at a hotel or motel were in the City of Seattle; and within Seattle, a single downtown ZIP Code (98101) accounted for almost half (49.0%) of the City's total hotel/motel originating trips.

The impacted communities immediately surrounding the airport accounted for an additional one-third (32.8%) of all persons going to Sea-Tac International Airport directly from a hotel or motel. Within the impacted communities, most of the trips to Sea-Tac International Airport (90.8%) originating at a hotel or motel came from the SeaTac/Tukwila area; and within the SeaTac-Tukwila area, a single ZIP code immediately to the east of the Airport along Pacific Highway South/International Boulevard (ZIP code 98188) accounted for almost three-quarters (72.5%) of the area's total hotel/motel originating trips.

Table A.03
Counties of Hotel and Motel Originating Travelers

Area	Percent of Total Originating Enplanements
King County (excluding impacted communities)	55.9%
Five Impacted Communities Combined	**32.8%**
Pierce County	2.9%
Snohomish County	2.5%
Kitsap County	1.1%
Thurston County	1.0%
Rest of Washington State	3.9%

(Source: Evans-McDonough Company)

Passengers Originating Trips At Business Offices

Almost one of six persons (15.3%) originating the air portion of their trip at Sea-Tac International Airport went to the Airport directly from a business office. Fewer than one in five travelers (17.5%) going to the Airport directly from a business office were traveling for pleasure while more than four of five (82.5%) were traveling for businesses purposes.

Enplanements originating at business offices are highly concentrated in King County (excluding the impacted communities), which accounts for just under two-thirds (66.1%) of the travelers. The impacted communities accounted for an additional 12.4%, and no other county accounted for over 10%.

Figure A.02
City Distribution of Hotel/Motel Based Enplanements

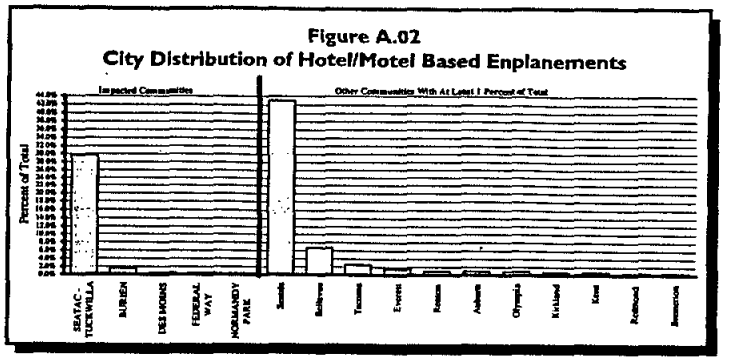


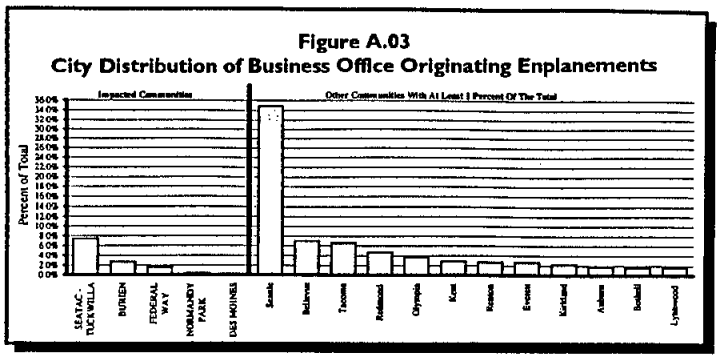
Table A.04
Counties of Business Office Originating Travelers

Area	Percent of Total Originating Enplanements
King County (excluding impacted communities)	66.1%
Five Impacted Communities Combined	**12.4%**
Pierce County	7.9%
Snohomish County	6.0%
Thurston County	3.7%
Kitsap County	0.6%
Rest of Washington State	3.3%

(Source: Evans-McDonough Company)

Within King County (excluding the impacted communities), the City of Seattle accounted for 58.0% of all enplanements originating at a business office, and a single downtown ZIP Code (98101) accounted for almost one-third (30.6%) of Seattle's business office originating enplanements. This pattern of concentrated business office originating enplanements was even more pronounced in the impacted communities. Over two-thirds (69.2%) of the business office originating enplanements generated within the impacted communities occurred in the SeaTac-Tukwila area, and a single ZIP Code (98188 - the same ZIP Code in which hotel/motel originating enplanements were concentrated) accounted for almost all (97.2%) of SeaTac-Tukwila's business office originating enplanements. The pattern of city concentration of business originating enplanements is shown in Figure A.03.

Figure A.03
City Distribution of Business Office Originating Enplanements



A.04 - GEOGRAPHIC DISTRIBUTION OF PER CAPITA ORIGINATING ENPLANEMENTS

Dividing the number of originating enplanements in a community by the community's population and multiplying by 10,000 gives the number of home-originating trips per 10,000 population by community. The 1991 survey of originating enplanement data were divided by the State of Washington's 1991 community population estimates for the analysis of per capita originating enplanements (Butler and Kiernan, September 1992).

Per Capital Home Originating Enplanements

King County (excluding the impacted communities) generated 7.7 originating enplanements per 10,000 population. The impacted communities (combined) generated 6.8 originating enplanements per 10,000 population. No other place in the state generated over 4.0 originating enplanements per 10,000 population.

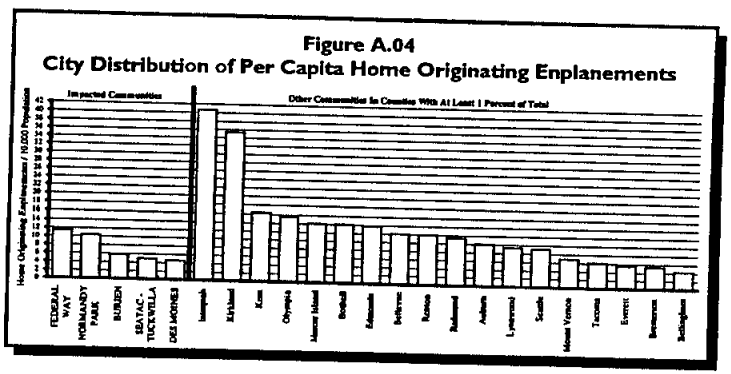
Figure A.03 shows the home trips per 10,000 population of cities and towns in counties which accounted for at least 1% of total statewide home originating enplanements. Among the impacted communities, the highest rate occurred in Federal Way at 11.5 home originating enplanements per 10,000 population. Higher rates occurred in Issaquah (40.7), Kirkland (35.4), Kent (16.4), Olympia (15.5), Mercer Island (14.2), Bothell (14.1), Edmonds (13.8), Bellevue (12.1) and Renton (12.1). The City of Mount Vernon, approximately 75 miles north of Sea-Tac International Airport, had a higher home originating enplanement rate per 10,000 population (6.9) than three of the five impacted communities.

Table A.05
Per Capita Home Originating Travelers

Area	Originating Enplanements Per 10,000 Population
King County (excluding five impacted communities)	7.7
Five Impacted Communities Combined	**6.8**
Snohomish County	3.9
Thurston County	3.5
Pierce County	3.2
Kitsap County	2.9

(Source: Evans-McDonough Company)

Figure A.04
City Distribution of Per Capita Home Originating Enplanements



A.05 - GEOGRAPHIC MISMATCH BETWEEN AIRPORT USER BENEFITS AND COSTS

Various delineation's of Sea-Tac International Airport's primary adverse impact area exist. However, they all identify the communities and unincorporated areas of southwest King County, immediately surrounding the Airport, as the one's which suffer the primary burden of Sea-Tac International Airport's adverse impacts. These communities are impacted by the Airport's non-market costs, such as noise pollution, visual degradation, surface traffic congestion and air quality decline.

Non-market costs refer to costs resulting from operation of the Airport which are not incorporated in the price Airport users have to pay for air transportation services. They represent a transfer of value *from* persons living in the immediate vicinity of the Airport *to* persons using the air transportation services provided at the Airport. If the same persons that suffer the Airport's primary non-market adverse impacts were either its primary users or the primary recipients of its non-market benefits, (Shapiro and Associates, April 1994), benefits and costs would be roughly in-line and no equity issue would exist.

However, an analysis of Airport users' residential and business locations reveals a "disconnect" between the Airport's benefits and costs. The five ACC communities plus the City of SeaTac, combined, account for only 5.9% of all Sea-Tac International Airport enplanements originating at the traveler's home. Cities such as Bellingham - located over 100 miles to the north of the Airport - generate a larger percentage of home originating enplanements than three of the impacted communities. The City of Seattle accounts for over four times the number of home originating enplanements than do all the impacted communities combined. In terms of per capita rates, the Cities of Issaquah, Kirkland, Kent, Olympia, Mercer Island, Bothell, Edmonds, Bellevue and Renton all generated more home originating enplanements per 10,000 population than did any of the impacted communities.

The City of Mount Vernon, approximately 75 miles to the north, had a higher home originating enplanement rate than three of the five impacted communities. The rate of home originating enplanements per 10,000 population for all the impacted communities combined was less than the rate for the rest of King County (6.8 compared to 7.7, respectively).

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In terms of persons who live in the region, the impacted communities represent a small fraction of enplanements and they generate a lower rate of participation in flying than does the rest of King County.

Turning to business benefits reflected by enplanements originating from hotels, motels and business offices, the area directly east of Sea-Tac International Airport along Pacific Highway South/International Boulevard generates the second largest concentration of hotel/motel originating enplanements in the region - after downtown Seattle. Even a casual inspection of the area shows these hotel/motel originating enplanements to be concentrated directly across from Sea-Tac International Airport's terminal.

Enplanements originating from business offices are disproportionately concentrated in King County (excluding the impacted communities) which accounts for almost two-thirds (66.1%) of such enplanements. The combined impacted communities account for only 12.4% of these types of enplanements. Again, most of the business enplanements originating from the impacted communities come from the area directly east of Sea-Tac International Airport along Pacific Highway South/International Boulevard.

In terms of business activity related to the Airport, the distribution of originating enplanements shows that the City of SeaTac gets some significant business activity (particularly guests at its motels), but the Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila receive little business related benefit from the Airport.

Overall, residents of the communities immediately surrounding the Airport get disproportionately small benefits (both in total and per capita terms) from their use of the Airport while suffering disproportionately large costs. Business activity generated by the Airport appear to produce significant benefit for the City of SeaTac but little benefit for the Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila.

Comparing geographic areas which receive the major benefits of Sea-Tac International Airport's air transportation services with those that suffer the primary costs (adverse impacts) leads to the inescapable conclusion that a large discrepancy exists between the costs suffered and benefits received by residents of Burien, Des Moines, Federal Way, Normandy Park and Tukwila. The discrepancy results in a lack of equity between residents of the region who primarily benefit from the Airport and residents who primarily suffer its socio-economic costs. It causes an imbalance between populations that benefit and that suffer the cost of Sea-Tac International Airport as a major aviation center. It is an imbalance that necessitates socio-economic mitigation by the Port of Seattle to redress.

A.06 - GEOGRAPHIC MISMATCH BETWEEN OTHER AIRPORT BENEFITS AND COSTS

An additional benefit attributable to Sea-Tac International Airport is the jobs (and income) it creates. Table A.06 shows the number of direct jobs created at Sea-Tac International Airport held by residents of the five impacted cities, and the percent of all jobs held by residents of the five impacted cities that they account for. Table A.07 shows the same information but for the indirect jobs created by the Airport in the City of SeaTac.

Table A.06
Direct Jobs Created at Sea-Tac International Airport Held by Residents of the Five Impacted Cities

City	Total Work-Trips to Airport	Total Resident Workers	Airport Work-Trips As Percent of Resident Workers
Federal Way	911	40,001	2.28%
Des Moines	436	14,576	2.99%
Burien	341	17,312	1.97%
Normandy Park	154	2,688	5.73%
Tukwila	125	7,652	1.63%

(Source: Census Transportation Planning Package)

Table A.07
Indirect Jobs Created at City of SeaTac Held by Residents of the Five Impacted Cities

City	Total Work-Trips to City of SeaTac	Total Resident Workers	SeaTac Work-Trips As Percent of Resident Workers
Federal Way	1,299	40,001	3.25%
Des Moines	756	14,576	5.19%
Burien	582	17,312	3.36%
Tukwila	232	7,652	3.03%
Normandy Park	193	2,688	7.18%

(Source: Census Transportation Planning Package)

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The analysis of Sea-Tac International Airport's direct and indirect job impacts was conducted on information provided by the Puget Sound Regional Council (PSRC) from two special data runs on the 1990 Census Transportation Planning Package (CTPP). One data run on the CTTP provided the number of work trips with origins in the Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila that had destinations at Sea-Tac International Airport (Traffic Analysis Zone 355). The second run provided the same information for work trips that had destinations in the 13 Traffic Analysis Zones (TAZs) that lie within the City of SeaTac.

As can be seen from Table A.06, the percentage of resident workers in the five impacted communities covered by this study with direct jobs at the Airport is low - ranging from 1.63% in Tukwila to 5.73% in Normandy Park. For the five cities combined, the percent of resident workers with jobs directly at the Airport is 2.39%. The percent of City of SeaTac residents with jobs in the Airport's TAZ is 3.29%.

Table A.07 presents similar information, only for residents of the five impacted cities whose work trips have destinations in the City of SeaTac. The data in Table A.07 are presented because the City of SeaTac contains the second largest concentration of hotel/motel rooms in the region where air travelers stay immediately before departing on their trip; and might be a significant source of indirect Airport jobs for residents of the five impacted cities. As Table A.07 shows, however, this is not the case. Even if all residents of the five impacted cities working in the City of SeaTac held indirect Airport jobs, the percent of residents affected would vary from a high of 7.18% in Normandy Park to a low of 3.03% in Tukwila. For the five impacted cities combined, the maximum percent of residents with Airport jobs is 3.72%.

More likely, the proportion is between half to three-quarters. Using the upper end of this range (0.75%), the combined direct plus indirect jobs generated by the Airport equals 5.18% of the combined resident workers in the five impacted communities.

The final way in which Sea-Tac International Airport might generate benefits to the five impacted cities is through their collection of property, sales and business and occupation (B&O) taxes. For the City of SeaTac, such taxes may be a large contribution to the city's fiscal health since it contains numerous hotels, motels and office buildings which likely would not be there if not for the Airport. Additionally, the city collects taxes for automobiles that park at Sea-Tac International Airport's parking garage. The Highline School District collects business personal property taxes from the commercial airlines that operate out of Sea-Tac International Airport. The five impacted cities studied in this report plus the Highline School District all experience reduced residential property tax collections as a result of the Airport (as is discussed previously in this report) and with the few jobs and income produced by the Airport that go to residents of the five impacted cities, it is highly likely that the net effect of the Airport on tax revenue collections in the five affected cities is negative. The question of Airport-generated tax revenues in the affected cities can only be roughly estimated since the topic was not addressed in the Master Plan Update EIS and there are not any readily available sources for making estimates. Based on available data describing the travel industry, direct job and indirect job impacts generated by the Airport, it does not appear likely that Sea-Tac International Airport produces significant tax benefits for the five impacted cities.

A.07 - SUMMARY OF AIRPORT GENERATED BENEFITS AND COSTS

The working assumption of this Sea-Tac International Airport Impact Mitigation Study is that the total benefits which will result from expansion of the Airport are greater than the total costs that will be incurred. Viewed from the perspective of the entire Puget Sound region or the State of Washington, there is justification for Sea-Tac International Airport's expansion. The benefits of the Airport's expansion however are spread over the entire state and region. Relatively few of these benefits go to residents of the five Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila. Whether benefits are measured in terms of time saving to the traveling public, direct and indirect jobs (and income) created, or tax revenues generated, the vast majority of benefits go to persons who do not reside in the five impacted cities that are the focus of this study.

On the other hand, there is evidence that the adverse socio-economic impacts (costs) of the Airport are concentrated in the five Cities of Burien, Des Moines, Federal Way, Normandy Park and Tukwila. From the perspective of these cities, the Airport's benefits are far less than its costs.

If Sea-Tac International Airport is to be expanded, consequently, equity demands that these cities be made whole by actions designed to mitigate the Airport's adverse socio-economic impacts and re-establish some balance between the benefits and costs which these cities will face. The fact that the Airport's total benefits exceed its total costs means that there is a margin available for such mitigation. What is required is public policy that both recognizes the magnitude of the equity issue and directs sufficient resources to restore a balance between benefits and costs facing the five impacted cities and the Highline School District.

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APPENDIX C
PROJECT CONTACTS

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City Council Members/Staff
City of Burien, Washington
City of Des Moines, Washington
City of Federal Way, Washington
City of Normandy Park, Washington
City of SeaTac, Washington
City of Tukwila, Washington

Colorado Springs International Airport
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David Masters

Lambert Field/St. Louis International Airport
Jerry Tinnea, Noise Abatement Officer

Miller Creek Management Coalition
Clark Dodge

Minneapolis/St. Paul International Airport
Nigel Finney, Deputy Executive Director/Planning & Environment

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SEA-TAC INTERNATIONAL AIRPORT
IMPACT MITIGATION STUDY

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Appendix C
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Other
Airport Impact Assistance Executive Committee
City of Burien Planning Commission
Highline School District
Regional Council on Airport Affairs

APPENDIX D
GLOSSARY OF TERMS

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GLOSSARY OF TERMS

A

AADT	Average annual daily traffic
AAQS	Ambient Air Quality Standards
AASA	Aging & Adult Services Administration
ACC	Airport Communities Coalition
AIRTRACT	Washington State Air Transportation Commission
ASIL	Acceptable Source Impact Level
ASV	Annual Service Volume
ATC	Air traffic control

B

(none)

C

CAA	Clean Air Act
CAL3QHC	Air quality computer model
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cm	Centimeter
CMS	Congestion Management System
CNEL	Community Noise Equivalent Level
CO	Carbon monoxide
COE	United States Army Corps of Engineers
CPS	Cycles per second (same as "Hertz")
CTBS	Comprehensive Test of Basic Skills
CTED	Washington Department of Community, Trade, and Economic Development
CTI	Cell Therapeutics Inc. campus (proposed)
CTPP	Census Transportation Planning Package

D

DASA	Division of Alcohol & Substance Abuse
dB	Decibel
dBA	A-weight decibel
DCFS	Division of Children & Family Services
DDD	Division of Developmental Disabilities
DEIS	Draft Environmental Impact Statement
DFW	Dallas/Fort Worth International Airport
DIA	Denver International Airport
DOE	Washington Department of Ecology
DSHS	Washington Department of Social and Health Services
DU	Dwelling unit
DVR	Division of Vocational Rehabilitation

E

EDMS	Emissions and Dispersion Modeling System
EIS	Environmental Impact Statement
ESA	Economic Services Administration
ESL	English as a Second Language

F

FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FHWA	Federal Highway Administration

G

GA	General aviation
GIS	Geographic information system
GMA	Growth Management Act
GPS	Global Positioning Satellite System

H

HC	Hydrocarbon
HOV	High-occupancy vehicles
Hz	Hertz (or cycles per second)

I

IH	Interstate Highway
ILS	Instrument landing system
INM	Integrated Noise Model
ISO	International Organization for Standardization
IWS	Industrial Waste System

J

JRA	Juvenile Rehabilitation Administration

K

(none)

L

LDN	Average Day/Night Sound Level (generally associated with aviation activity)
LEQ	Average Daily Sound Level (generally associated with surface transportation activity)
LOS	Level of Service

M

$\mu g/m^3$	Micrograms per cubic meter
MCY	Million cubic yards
MHD	Mental Health Division
MLS	Microwave Landing System
MOA	Memorandum of Understanding
MOBILESA	Mobile source emission program from US EPA
MSA	Medical Assistance Administration

N

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	Nitrogen dioxide
NOISEMAP	Aircraft noise model developed by the US Air Force
Northflow	Departure traffic to the north, arriving traffic from the south

O

O_3	Ozone
OAG	Official Airline Guide
O-D	Origin-destination survey
OFM	Office of Financial Management, King County Assessor's Office

P

$PM_{2.5}$	Particulate matter (2.5 microns or less)
PM_{10}	Particulate matter (10 microns or less)
PNA	Polynuclear aromatic
ppm	Parts per million
Port	Port of Seattle
POS	Port of Seattle
PSAPCA	Puget Sound Air Pollution Control Agency
PSRC	Puget Sound Regional Council

Q

(none)

R

ROD	Record of Decision
RPZ	Runway protection zone
RUSLE	Revised Universal Soil Loss Equation
RTA	Regional Transit Authority

S

Sea-Tac	Seattle-Tacoma International Airport
SEL	Single-Event Noise Levels
SEPA	Washington State Environmental Protection Agency and Washington State Environmental Policy Act
SASA	South Aviation Support Area
SAT	Scholastic Aptitude Test
STAMINA	Computer noise model for roadway noise
SDS	Storm Drain System
SH	State Highway
SI	Serviceability index
SIP	Statewide Implementation Program
SO_2	Sulfur dioxide
Southflow	Departure traffic to the south, arriving traffic from the north
SPCC	Spill Prevention, Control and Countermeasure Plan
SR	State Route

T

TA	Threshold Analysis (also referred to as Time Above)
TAZ	Traffic Analysis Zone
TRACON	Terminal radar control area
TRB	Transportation Research Board
TSM	Transportation System Management
TSS	Total suspended solids

SEA-TAC INTERNATIONAL AIRPORT
IMPACT MITIGATION STUDY

U

URAA	Uniform Relocation Assistance Act
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency

V

V/C	Volume/capacity ratio
VOC	Volatile organic compound

W

WAC	Washington Administrative Code
WATERWORKS	Hydraulic analysis computer program
WISHA	Washington Industrial and Safety Health Act
WPPSS	Washington Public Power Supply System

X

(none)

Y

(none)

Z

(none)

NOTES

BOUND SEPARATELY

ITEM NO. 6a

DATE OF MEETING 2-25-97

Commission Briefing: Third Runway Financing Plan

February 25, 1997

1

Introduction

- The purpose of today's briefing is to provide the Commission with:
  - a refined cost estimate for the third runway
  - a detailed financing plan as called for in Resolution No. 3212, As Amended
- The runway financing plan will also be presented in the context of the updated plan of finance for the entire airport

2

Introduction

- The cost of the runway as identified in the Master Plan Update was estimated at $455 million, in 1994 dollars
- The use of 1994 dollars was maintained to provide consistency given uncertainty regarding the start of the project and the construction schedule
  - construction is now projected to occur over eight years, from 1997 to 2004

3

Introduction

- Since completion of the Master Plan Update and approval of Resolution No. 3212, the construction cost estimate has been refined to reflect:
  - addition of construction contingency
  - adjustment for inflation based on annual spending over the construction period

4

Runway Cost Comparison

($Thousands)	Master Plan Update	Escalated Cost
Construction	208,235	260,155
Engineering	37,482	51,356
Design Contingency	41,647	50,100
Const. Contingency	0	15,000
Sub-Total	287,364	376,611
Land Acquisition	109,704	115,000
Radar/NAVAIDS	8,500	11,324
Potential Mitigation	50,000	52,100
Total Construction Cost	455,568	555,035
Sales Tax		32,327
Total Project Cost		587,362

5

Financing Plan

- Key elements and assumptions of the financing plan include:
  - receipt of a Letter of Intent (LOI) from the FAA to provide $260 million in federal funds over a ten-year period beginning in 1998
  - leveraging of Passenger Facility Charges (PFCs)
  - use of airport revenue bonds, with interest capitalized during construction
  - use of no local tax dollars; all costs are paid for or recovered through airport user fees

6

Federal Funding

- Consistent with funding plans developed over the past several years, the Port intends to request a $260 million LOI from the FAA for the third runway ($26 million per year for ten years)
- "LOI Bonds " will be issued to borrow against LOI funds received after the construction period

7

PFCs

- As part of the overall airport plan of finance, PFCs are expected to be leveraged beginning in 1998, providing up to $260 million in airport construction funding available in that year
- Approximately $100 million of the total runway cost will be funded through PFC bonds
- A new, long-term PFC authorization will be required from the FAA

8

Revenue Bonds

- $30 million of land acquisition costs will be funded through the upcoming 1997 revenue bond issuance
- Approximately $170 million of the total construction cost will be funded with revenue bonds issued in 2001; interest costs will be capitalized through project completion
- Airport revenue bonds will be repaid from airport user charges and fees

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Third Runway: Sources & Uses of Funds

($Thousands)

	1997-2006
Sources:	
Airport Development Fund	7,545
Federal Grant Receipts	109,000
LOI Bonds	164,061
PFC Bonds	104,333
1997 Revenue Bonds	30,000
2001 Revenue Bonds	172,423
Total Sources	587,362
Uses:	
Total Runway Costs	587,362

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Financing Plan

- The financing plan produces a projected maximum incremental Cost Per Enplanement (CPE) impact of only $1.66 as a result of the third runway
- An alternate scenario has been analyzed assuming a $130 million LOI:
  - the shortfall would be made up from additional revenue bonds and leveraged PFCs
  - maximum projected CPE impact: $2.33

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Airport Plan of Finance

Committed Projects: 1997-2006

($Thousands)	3rd Runway	Other
ADF	$ 7,545	$177,349
AIP -- pay as you go	109,000	28,800
LOI Bonds	164,061	0
PFCs	0	191,465
PFC Bonds	104,333	155,634
Existing Bond Proceeds	0	96,866
Revenue Bonds, 1997	30,000	90,330
Revenue Bonds, 2000	172,423	94,140
ADF & PFC Balances	0	40,598
TOTAL	$587,362	$875,182
AIRPORT TOTAL	$1,462,544	

Maximum projected CPE: $5.64 in 2000

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Next Steps

- Complete 1997 bond issue - Grand
- Submit formal LOI application to FAA - March
- Begin preparations for new PFC authorization
- Refine finance plan

Comparison of Other Proposed Runway Projects With Sea-Tac Third Runway Project[1/]

AIRPORT	RUNWAY LENGTH (feet)	RUNWAY TYPE	ESTIMATED COST	LIKELY COMPLETION DATE
Cleveland Hopkins	9,600	Dependent	$180 million	1999
Charlotte/Douglas International Airport	8,000	Independent	$70 million	1999
Dallas/Fort Worth	8,500	Independent	$300 million	1996
Denver	16,000	Dependent	$75 million	2000
Detroit Metropolitan Wayne County	9,500±	Dependent	$54.5 million	2001
El Paso	8,500±	Independent	$ 10.7 million	Unknown[1]
Ft. Meyers Southwest Florida Regional	9,100	Independent	$ 87 million	2000
Greater Rochester International Airport	7,500±	Dependent	$ 10 million	2002
Greer Greenville-Spartanburg	10,000	Independent	$ 50 million	2015
Houston	10,000±	Independent	$ 44 million	Unknown
Jacksonville	8,700±	Independent	$ 37 million	2000
Louisville	10,000	Independent	$ 59 million	1997
Memphis	9,000	Independent	$146.1 million	1996
Miami	8,600	Dependent	$149 million	1999
Minneapolis-St. Paul International Airport	7,500±	Dependent	$120 million	2000+
Nashville	10,000±	Undetermined	$ 38.6 million	2000

[1/] Source: Fed. Aviation Admin., Aviation Capacity Enhancement Plan, app. D (Dec. 1995). This table includes all airports in Appendix D planning to construct runways at least 7,000 feet long for which estimated costs were provided.

UPDATED MARCH 4, 1997

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AIRPORT	RUNWAY LENGTH (feet)	RUNWAY TYPE	ESTIMATED COST	LIKELY COMPLETION DATE
New Orleans	7,000±	Independent	$340 million	2005
Oklahoma City Will Rogers	9,000±	Dependent	$ 13 million	2004
Orlando	8,000±	Independent	$137 million	2002
Phoenix Sky Harbor	9,500	Dependent	$ 88 million	1996 (first 7,800 feet)
Salt Lake City	12,000	Independent	$120 million	Unknown
Savannah International Airport	9,000	Independent	$15.2 million	2005
Seattle-Tacoma	8,500	Dependent	$587 million[2]	2005
Spokane	8,800	Independent	$ 11 million	Unknown[1]
Syracuse Hancock (under consideration)	9,000	Independent	$ 55 million (phase I, 7,500 feet)	2000
Tampa (under consideration)	9,650	Dependent	$ 55 million	2000
Tucson (proposed)	10,500±	Dependent	$ 30 million	2005

Note: 1. Construction is expected to begin in 1999.

[2] Source: Port of Seattle, Commission Briefing: Third Runway Financing Plan (Feb. 25, 1997).

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ANM-610

March 31, 1997

VIA FACSIMILE

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
Airports Division
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Re: Comments of the Airport Communities Coalition on the FAA's Updated Draft Air Quality Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport

Dear Mr. Ossenkop:

On behalf of the cities of Burien, Des Moines, Federal Way, Normandy Park, and Tukwila, Washington and the Highline School District, individually and collectively as the Airport Communities Coalition (the "ACC"), we are submitting the following comments on the Federal Aviation Administration's revised draft general conformity determination for the proposed expansion of Seattle-Tacoma International Airport ("Sea-Tac" or the "Airport").[1] The communities which make up the ACC are located in the immediate vicinity of the Airport and suffer directly from the emission of air pollutants from airport-related operations and activities.

[1] Fed. Aviation Admin. and Port of Seattle, Draft Supplemental Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport ("DSEIS") (Feb. 1997), Appendix B - Updated Draft Air Quality Conformity Determination. In addition to these comments on the draft conformity determination, the ACC is submitting extensive comments on the overall DSEIS ("DSEIS Comments"). The ACC's DSEIS Comments and the expert reports appended thereto are incorporated by reference in this letter.

The FAA is obligated to undertake this conformity analysis under section 176 of the Clean Air Act.[2] An accurate evaluation of the potential impacts of the proposed expansion of Sea-Tac is critical given the importance of air quality to the health of residents in South King County.

The initial draft conformity determination was included in the Final Environmental Impact Statement ("FEIS"),[3] issued in February 1996. As a result of forecasting errors in the FEIS, the number of aircraft that would be using the expanded Airport in any given year was significantly underestimated, and the project's air quality impacts were discounted accordingly. Although the revised draft conformity determination ostensibly incorporates the corrected forecast in its analysis, it continues to significantly understate the level of emissions associated with the project, and fails to remedy most of the other flaws and omissions identified by the ACC in its comments on the previous draft conformity determination.[4]

A. The Revised Draft Conformity Determination Relies on an Innacurate Estimate of Total Emissions

The revised draft conformity determination concludes that the total direct and indirect emissions from the proposed project would not exceed the *de minimis* levels for the applicable criteria pollutants and their precursors: volatile organic compounds (VOC), oxides of nitrogen (NO_x) and carbon monoxide (CO).[5] This conclusion is suspect on several counts. Erroneous assumptions continue to infect the dispersion analysis for both aircraft and surface traffic, while construction-related emissions are still underestimated. Discrepancies between data used to support this conclusion and data reported elsewhere in the DSEIS indicate that the calculation of emissions is simply incorrect. Rectifying these errors would result in project emissions above the *de minimis* threshold for one or more criteria pollutants.[6]

[2] 42 U.S.C § 7506(c)

[3] Fed. Aviation Admin. and Port of Seattle, Final Environmental Impact Statement for Proposed Master Plan Development Actions at Seattle-Tacoma International Airport (Feb. 1996)

[4] The ACC's previous comments are incorporated by reference into this letter. See Letter from Perry Rosen to Dennis Ossenkop re: Comments of the Airport Communities Coalition ("ACC") on the FAA's Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport (Mar. 18, 1996); Letter from Thomas D. Roth to Dennis Ossenkop re: Additional Comments of the Airport Communities Coalition on the FAA's Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport (June 6, 1996) and reports appended thereto.

[5] DSEIS at B-6.

[6] See Memorandum from Michael G. Ruby, P.E., President and Director, Engineering, Envirometrics, Inc., to Cutler & Stanfield, L.L.P. (Mar. 27, 1997), DSEIS Comments, Appendix N.

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For example, the data contained in the revised draft conformity determination indicates that NO_x emissions would exceed 100 tons in the year 2000. Construction-related emissions for that year would include 70 tons of NO_x from fill transport and employee vehicle trips, and another 61 tons of NO_x associated with borrow source activity,[7] for a total increase in NO_x emissions of 131 tons. This increase would be offset by a reduction of 30 tons credited to landside improvements,[8] making the net NO_x emissions attributable to the overall project 101 tons – in excess of the *de minimis* threshold.[9]

Furthermore, in calculating the emissions attributable to the project, the revised draft conformity determination appears to take credit for decreased emissions associated with surface transportation projects which are slated to move forward independent of the proposed expansion of Sea-Tac. For example, both the public parking terminal expansion and the North employee parking lot are scheduled to begin construction in 1997.[10] Therefore, decreased emissions attributable to these projects cannot be used to offset increased emissions from the Airport expansion for purposes of determining whether net emissions exceed *de minimis* levels.

B. The Revised Draft Conformity Determination Fails to Analyze Emissions Associated with the Maximum Level of Operations

Based on the asserted *de minimis* emissions attributable to the project, the FAA takes the position that a formal conformity determination is not required by law, but the agency provides a conformity analysis "to address community and agency concerns regarding potential air quality impacts."[11] Not only does the FAA conclude that the project would conform to the State Implementation Plan ("SIP") if a conformity determination were necessary, but it congratulates itself that this conclusion "is especially strong given the conservative nature of the assumptions

[7] DSEIS at B-12.

[8] DSEIS at B-10.

[9] The table entitled "Change in Emissions Inventory", DSEIS, Figure A at B-8, shows a total of 118 tons of NO_x from construction, rather than the 131 produced by adding the numbers provided in the textual discussion of construction impacts. This table contains numerous errors (e.g., adding 14 to negative 410 and arriving at negative 346) and inconsistencies (in addition to the discrepancy in NO_x emissions described above, the table indicates a total of 99 tons of CO construction emissions when the breakdown given elsewhere adds up to 108). Therefore, the reliability of any information in this table is extremely questionable.

[10] See Laura T. Coffey, *Six airport projects to begin in '97*, Daily Journal of Commerce (Seattle), Mar. 26, 1997 at 1.

[11] DSEIS at B-6 to B-7.

used in the analysis, and the fact that "worst-case" assumptions were used, even though the conformity regulations do not specify this as a requirement."[12]

In fact, as noted below and described in greater detail in the ACC's DSEIS Comments,[13] the FAA and the Port have limited their analysis of air quality impacts to avoid a true "worst-case" analysis. Moreover, the analysis of air quality impacts does not comport with the requirement that emissions be calculated for the "year during which the total of direct and indirect emissions from the action is expected to be the greatest on an annual basis."[14] According to the DSEIS, the expanded Airport could handle a maximum of up to 630,000 annual operations,[15] yet the revised draft conformity analysis only considers emissions levels through the year 2010, when operations are projected to be just 474,000.[16]

C. Aircraft Emissions are Incorrectly Calculated and Reported

According to the revised draft conformity determination, the higher number of operations associated with the third runway alternative would result in NO_x levels which are identical to the No-Action levels. The data presented in Appendix B of the DSEIS indicates that NO_x emissions from aircraft would be less under the Preferred Alternative than under the No-Action scenario in 2005,[17] the first year of operation of the proposed new runway, even though the number of operations and the fleet mix are assumed by the FAA to be the same in 2005 under both the No-Action and Preferred Alternative. This differential cannot be explained by a reduction in delay and congestion associated with the new runway, since NO_x emissions are associated predominantly with take-off and climb-out, not with taxiing and idling.[18] Errors in inputting and reporting data appear to offer the only explanation for this anomalous result.[19]

G-724 -

[12] DSEIS at B-7.

[13] DSEIS Comments, § 4.1.

[14] 40 C.F.R. § 51.859(d)(2).

[15] DSEIS, Exhibit 2-7 at 2-26.

[16] DSEIS at 1-2.

[17] DSEIS, Figure B at B-9.

[18] See Energy and Environmental Analysis and K.T. Analytics, Inc., Air Pollution Mitigation Measures for Airports and Associated Activity 4 (California Air Resources Board, May 1994).

[19] See Memorandum from Michael G. Ruby, P.E., President and Director, Engineering, Envirometrics, Inc., to Cutler & Stanfield, L.L.P. (Mar. 27, 1997), DSEIS Comments, Appendix N.

The calculation of aircraft emissions of NO_x in 2010 presents an even greater paradox NO_x emissions are projected to be identical with or without the proposed project, despite 14,000 additional operations under the Preferred Alternative scenario.[20] Although not included in the revised draft conformity determination, data presented elsewhere in the DSEIS suggests that by 2020, the additional 72,000 operations associated with Preferred Alternative would produce lower levels of NO_x emissions than the no-action scenario.[21] The conclusion that these emissions would be lower despite increased operations is implausible and is unsupported by existing scientific evidence.

D. Estimates of Construction-Related Emissions are Unreliable

The draft conformity determination purports to quantify potential emissions associated with construction activity,[22] yet the DSEIS asserts that "it is not possible to identify the specific types of construction equipment and frequency of usage that could occur."[23] The estimate of equipment used to model emissions at the embankment construction site[24] is clearly inadequate for a project of this size and complexity.[25] Since emissions from heavy-duty construction equipment operating on paved and unpaved roads are potentially significant sources of NO_x, CO and VOC, even minor changes in the numbers, types and usage of this equipment could alter the results of the modeling.

Furthermore, the DSEIS seriously underestimates the number of trucks and truck trips required to transport the fill.[26] This underestimation in turn effects the consideration of impacts on air quality. Not only will more trucks be required, but the increased truck traffic will in turn add to the congestion on local roads, further increasing emissions from idling and slow-moving vehicles.

[20] DSEIS, Figure B at B-9, Table C-2-5 at C-2-17.

[21] DSEIS, Table D-2 at D-8.

[22] DSEIS, Appendix B at B-12.

[23] DSEIS at 5-4-1

[24] DSEIS at B-12.

[25] See Christopher Brown and Jimmie Hinze, Comments on the Analysis of Construction Impacts in the Draft SEIS for Seattle-Tacoma International Airport (Mar. 1997), DSEIS Comments, Appendix M.

[26] See DSEIS Comments, § 4.5.1

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E. Surface Traffic Emissions are Underestimated

The revised draft conformity determination fails to fully identify and disclose the surface traffic impacts attributable to this project by avoiding a true worst-case scenario, which would consider the impact of the expanded airport operating at full peak-hour capacity.[27] The DSEIS indicates that an expanded airfield would accommodate 6,300 peak hour enplanements in 2010.[28] Whereas the No-Action scenario assumes that the same number of passengers could be accommodated by spreading them out throughout the day, construction of the third runway would allow more of these passengers to fly during peak hours. As a consequence, many more people would be arriving and departing during these peak periods – a scenario which the revised draft conformity determination does not analyze.

Furthermore, while the greatest cumulative amount of traffic may occur during the evening commute, airport-related traffic is at its worst at midday, coinciding with the peak hour of arrivals and departures.[29] Therefore, traffic generated by this project is likely to be greatest during these airport peak hours, rather than during commute peak hours. The absence of any detailed analysis of midday traffic conditions results in a significant discounting of the emissions attributable to this project.

Finally, the air quality analysis for both the DSEIS and the revised draft conformity determination contains some unexplained discrepancies in its reported data which skew the comparison of With-Project to No-Action surface traffic. For instance, the DSEIS shows the same number of Airport employee and maintenance trips in each of the future years studied,[30] despite an increase in the number of operations associated with the Preferred Alternative. An expanded Airport sustaining an increased number of operations is likely to employ a greater number of people.

- G-725 -

[27] See Smith Engineering & Management, Traffic Analysis of Draft Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (Mar. 11, 1997), DSEIS Comments, Appendix O.

[28] DSEIS, Table 2-6 The DSEIS does not identify a theoretical maximum hourly capacity for the expanded airfield. See DSEIS at 2-25.

[29] Current flight schedules indicate that the Airport's weekday peak period occurs between 11:00 a.m. and 1:00 p.m. DSEIS at 5-1-2.

[30] DSEIS Table 5-1-1 at 5-1-10.

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F. A New Conformity Analysis is Required Before the FAA Can Approve this Project

For the foregoing reasons, the Clean Air Act requires the FAA to comprehensively review and revise the analysis of air quality impacts associated with the Sea-Tac Master Plan Update project. The ACC respectfully requests that the FAA refrain from granting approval for any element of the proposed expansion, or otherwise "supporting in any way" the Sea-Tac Master Plan Update project unless and until the FAA can make a positive conformity determination based on a revised air quality and traffic analysis that complies with Clean Air Act requirements, applicable federal law and accepted modeling protocols.

Sincerely,

Perry M. Rosen

Perry M. Rosen

cc: Ms. Barbara Hinkle, Port of Seattle
EPA (Region X)
Puget Sound Regional Council

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FAXED

CUTLER & STANFIELD, L.L.P.

700 Fourteenth Street, N.W.
Washington, D.C., 20005
Telephone: 202-624-8400
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Ref: 01093-2.5

FACSIMILE COVER SHEET

TO:	FAX NUMBER:	TELEPHONE:
Mr. Dennis Ossenkop	206 227 1600	206 227 2611
Ms. Barbara Hinkle	206 431 4458	206 439 6606
PSRC	206 587 4825	206 464 7094

FROM: Perry M. Rosen DATE: March 31, 1997

NUMBER OF PAGES (Including this cover sheet): 8

COMMENTS:

C-726

_____ Hard copy will follow via _____ regular _____ overnight _____ hand delivery.

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MAKERS
Architecture and Urban Design
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Seattle, Washington 98104
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MAKE (mak), v. 1. To bring into existence by shaping material, combining parts, etc. 2. To form in the mind, a judgement or plan. 3. To judge or infer as to the nature, meaning, etc. 4. To compose, form, as a design. 5: To constitute, to bring into a certain form or condition. 6. To cause, to construct.

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March 28, 1997

ANM-610

Mr. Dennis Ossenkop
N.W. Mountain Region FAA
1601 Lind Avenue SW
Renton, WA 98055-4056

re: Draft Supplemental Environmental Impact Statement Comments, SeaTac Airport for the Master Plan Update

Dear Mr. Ossenkop:

I'm a professional land use planner and architect who has been practicing in Seattle for the past 26 years and I think the above document and procedure are one of the most seriously flawed EIS processes I've seen in my entire career.

Issues:

- The Burien Study has documented $3 billion of impacts from the construction of the 3rd runway. The EIS does not even hint at impacts of this magnitude and thus is misleading and inaccurate.
- The EIS is too difficult for the average citizen to understand.
- The EIS arrived at libraries a month late and the 45-day comment period is too short.
- There are too few public meetings. Those meetings which have been held have tended to be held at the airport during rush hour in what can only be seen as a very cynical attempt of the Port to limit public exposure to the SEIS process.
- The SEIS does not adequately address alternatives to the 3rd runway. The Port has privately admitted that SeaTac will be operating at capacity within 10 years and that a new regional airport at another location will then be required to handle the air traffic demand. Why the SEIS didn't address the fact that the 3rd runway is only a short-term fix is unclear.
- The SEIS does not adequately address the cost-benefit issues of the 3rd runway, probably because this project is one of the most expensive runway projects in history and a life-cost analysis would show that the project can't be justified.
- The impacts on SeaTac operations on surface water flow and ground water contamination have not been adequately addressed in the SEIS. This is particularly true for the analysis of peak flows in Miller and Des Moines Creeks and the resultant flooding and scouring in these creeks.
- The impacts on Lake Reba are not adequately addressed.

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- The fact that aircraft fuel will continue to reach the area's drinking water supply through ground water migration has not been adequately addressed. Mitigation should address the Port's responsibility to provide safe drinking water for residents where the Port's fuel has contaminated the water supply.
- The SEIS is using higher highway speeds than the actual average of 28 mph which has been documented by the DOT.
- The study area for impacts in the SEIS should be enlarged to include surrounding communities which will be impacted by the Master Plan's planned expansions.
- The Master Plan proposes projects which will violate the Clean Air Act.
- The current levels of ozone precursors measured at SeaTac exceeds any other location in King County by a factor of 2. Why wasn't this addressed in the SEIS? How can the Port claim that no significant air pollution exists at SeaTac when other regional airports like O'Hare have significant air pollution due to operations (EPA Chicago)?

The combination of the above issues makes me profoundly skeptical of the adequacy of the SEIS.

Please demand answers to the questions which this flawed document raises and insist that the Port provide through and accurate information on the impacts it's projects will create.

Thank you for your attention to this matter.

Eric Anderson
Partner, MAKERS Architecture & Urban Design

- G-727 -

3RDRUNWY DOC - 3/29/97

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March, 1997

Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Avenue Southwest
Renton, WA 98055-4056

RE: Draft Supplemental Environmental Impact Statement Comments

Dear Mr. Ossenkop:

The public comment period is too short and there are too few public meetings. The EIS is difficult to understand. It arrived at the librarys almost a month late. Additional hearings at more convenient places and times than the airport during rush hour, should be held.

The process for this public review was flawed. 45 days was too short of a time period to review data that did not arrive on time.

Also, I would like to state, emphatically, that this proposed project becomes more a potential boondoggle with each bit of new information; the time line and costs have more than doubled, mitigation costs are far beyond the Port's estimates. I appeal to the FAA to put the money where it will have a positive effect on our local + regional growth!

over →

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I believe -
Smaller regional Airports are the
Answer to our futures transportation
needs. We can't Afford the time or money
it will take to build a third Runway -
A Cost Benefit Analysis will show
that this project is Already out
of control.

The Seis is not comprehensive -
Many issues Remain UNADDRESSED.
The study Area must be enlarged
to include All impact AREAS.
The ~~[illegible]~~ forecasts are far too low.
Dint info is incomplete.

By now, The FAA should be very skeptical
About this project. The Port of
Seattle has proven to be a big
hog at the trough Attempting to
get All the graw. It's time
for them to stop.

Sander Shea
18317 2nd Ave SW
Seattle WA 98166

- G-728 -

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Ben G. Stark
P.O. Box 98638
Seattle, WA 98198

March 29, 1997

REC'D ANM-610
PLAN, PGM, & CAP BR
APR - 1 1997
ANM-610

Mr. Dennis Ossenkop
Federal Aviation Administration
Airports Division ANM-611
1601 Lind Ave. S.W.
Renton, WA 98055-4056

In Re: Seattle Tacoma International Airport - Draft Supplemental Environmental Impact Statement (DSEIS)

Dear Mr. Ossenkop

This letter is to comment on some of the housing impacts in the DSEIS and to point out a few of the errors in the document.

Chapter 4.3 (B) (page 4-6) Local Land Use Actions City Of SeaTac. The 13 acres zoned multi-family east of SR509 are between S. 170th and S. 176th, not 160th and 170th. It remains to be determined if the 13 acres is in the acquisition area.

The Westside Citizens Ad Hoc Advisory Committee was formed in March 1995, not March 1996. The committee was sunsetted in 1996, not disbanded. The committee remains a group of concerned citizens and has issued a report dated January 15, 1997, covering its activity between March 1995 and October 1996 with recommendations to the SeaTac City Council and Planning Commission. The report states a plan with no third runway is appropriate now, and a third runway option should not be considered until the Port of Seattle (POS) actually buys whatever land they may eventually buy. The committee did not recommend "airport use" for property the POS buys, and stated "the use should be determined by the City through the City's land use change process after the POS purchases the property". (See enclosed pages 6 and 7 of the committees report, titled Third Runway Option Consideration and Conclusion.)

Chapter 4.4 (page 4-8) Cumulative Impacts last paragraph states, "In addition other development is anticipated to occur in the area in the future in accordance with the Comprehensive Plans of the individual jurisdictions. Until specific development proposals for these facilities are known it is not possible to predict the total cumulative impacts." This statement is an attempt hy the writers to avoid cumulative impacts.

No attempt has been made in the DSEIS to determine impacts to the community through loss of land use. (eg.) The 13 acres referred to above would provide over 600 units of senior housing and condominiums. The westside "so called acquisition area" contains over 100 acres of vacant or underdeveloped land suitable for multi-family, office and light commercial development, all of which would be lost to the third runway.

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Chapter 5 (pages 5-6-6 and 5-6-7) Acquisition in the Approach Transitional Area. This section is not clearly written, but it seems to say an additional 309 residential housing units (153 houses, 60 apartments and 96 mobil homes) may or may not be acquired for the transition areas, depending on the residents future input and questionable FAA funding. Input from residents is not needed. Availability of FAA funding is not the question. Experience from the first and second runways show us that if the third runway is built 1700 feet west of the second runway it will be necessary to widen the approach transitional area buyouts at least 1700 feet, creating a 1700 foot wider swath extending 5 1/2 miles from S. 128th to S. 216th. In fact it will need to be even wider, due to the higher elevation, on the hills west of Des Moines memorial Way in Burien, SeaTac and Des Moines.

Section 5-7, 2 (page 5-7-2) social Impacts. This section states 388 single family homes, 260 apartments and 105 businesses could be acquired to complete construction, to clear the runway protection zones (RPZs), and to mitigate adverse environmental impacts. Presumably this is in addition to the 153 houses, 60 apartments and 96 mobile homes previously mentioned in the approach transition arcas on page 5-6-6, and the POS would acquire a total of 541 houses, 320 apartments, 96 mobil homes and 105 businesses plus many more homes in the 5 1/2 mile long transitional area swath. All of these homes, apartments and mobile homes together with all the residential land in this swath would be lost for future residential use. These impacts and costs should have been clearly stated in the FEIS and DSEIS; they were not.

G-730-1

The purpose of the Growth Management Act is to control urban sprawl and encourage residential development within the urban area. SeaTac airport lies just south of the center of one of the most populated areas in King County, approximately half way between downtown Seattle and Federal Way. A quick study of an aerial photo, or any of the maps included with the DSEIS will show southwest King County is nearly 100% developed with platted streets covering the community in all directions.

This community is experiencing a housing shortage now. There are not enough homes available now. There is a shortage of residential land now. Existing housing is the only housing many people can even hope to afford. These homes and land are irreplaceable. If they are destroyed and the land bulldozed and fenced they will be gone forever. Their destruction and the loss of land will create a greater home shortage, driving up prices, forcing more people to live further out and put more traffic on the roads.

To confiscate and destroy hundreds of homes in this community for the enlargement of SeaTac Airport, while increasing noise, traffic and pollution on the remaining community would be indefensible and inconsistent with the goals and purpose of the Growth Management Act or any other kind of sensible land use planning.

Now is the time for our leaders to put their egos aside, stop this nonsense and look for a better solution.

Respectfully Submitted,

Ben G. Stark

enclosure
cc. SeaTac City Council

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Enclosure

Third Runway Option Consideration

Our committee spent many hours discussing "third runway visions" with Troy Brown, the Port of Seattle's ex-officio committee member. Mr. Brown provided us with a great deal of information about the Port's needs and plans. Mr. Brown told us the E.I.S. describes a "worst case scenario" in which the POS might buy the whole westside.

If the third runway is built along 12th Ave. S., as they envision it, the toe of the fill slope will extend westerly to about 10th Ave. S. at the south end and to 9th Place S. at the north end. It does not appear that the POS would need the property west of the toe of slope. However, the POS has stated it would probably buy it all because of the nuisance and dust the dirt hauling would create. It was not clear to the committee what authority the POS has to purchase property beyond that actually required for the third runway.

Recently the Port sent a mailing to westside residents stating "It appears that your property may be in the acquisition area, but receipt of this letter does not necessarily mean that your property will be acquired".

Also, as recently reported by Councilmember Hanson, it now appears that by taking advantage of developing Global Positioning System (GPS) technology the runway could be built 700 or 800 feet east of 12th Ave. S. on land the Port already owns, thereby eliminating the proposed fill and preserving much of the westside subarea.

As a result of this uncertainty regarding when, where or if the proposed third runway will be built, the committee concluded that a plan with no third runway is appropriate now, and a third runway option should not be considered until the POS actually buys whatever land they may eventually buy. Therefore, our committee finally and reluctantly agreed an overlay could be applied to our first (no-third-runway) planning map, along the toe-line of the proposed fill, but only if

Enclosure

and after the POS has actually purchased the property. Many westside citizens feel it would be unfair if the POS is allowed to condemn their property at residential prices and then lease or resell it at a big profit through a windfall rezone to the highest commercial or industrial use.

Our committee did not recommend *Airport Use* (AU) for the property east of the toe line since this should be determined by the City, through the City's land use change process, after the POS purchases the property. We have recommended that any single family property remaining west of the fill slope toe line be assigned the same land use as the adjacent use to the west of it.

Conclusion

The westside residents have been in a state of limbo following construction of the second runway and the SR-509 freeway. For decades property owners have been unable to develop their properties, under the old King County single family zoning, to the highest potential as would normally have been expected. Meanwhile, other areas with comparable amenities have prospered during this time. It wasn't too surprising then that property value impacts were rated the most important westside issue by nearly all survey respondents. Consequently, the westside subarea plan should provide all westside property owners with the opportunity to realize full potential value for their property through appropriate and compatible land use changes. We believe appropriate development in the underdeveloped areas of the westside with senior housing, multi-family, various office and commercial uses, in accordance with our recommended land use changes, can provide a positive and stabilizing influence for the entire westside subarea as well as enhancing values of the existing single family neighborhoods.
Further, we believe adoption and implementation of our plan will increase area employment, provide needed housing and increase the City's tax base.

- G-731 -

BURIEN

CITY OF BURIEN

415 Southwest 150th Street
Burien, Washington 98166-1973

Phone: (206) 241-4647
Fax: (206) 248-5539

March 31, 1997

REC'D ANM-610
PLAN, PGM, & CAP BR
APR - 1 1997
ANM-610

Mr. Dennis Ossenkop, Environmental Protection Specialist
Federal Aviation Administration (FAA); ANM-611
Northwest Mountain Region; Airport Division
1601 Lind Avenue SW
Renton, Washington 98055-4056

Dear Mr. Ossenkop:

Enclosed for your information is the City of Burien's initial assessment of the Seattle-Tacoma International Airport Proposed Third Runway and Master Plan Implementation. As you know, the report was funded by a grant from the State of Washington and contracted through the Washington State Department of Community, Trade and Economic Development.

Please accept the enclosed report as comments for the record on the Supplemental Environmental Impact Statement (SEIS). If you have any questions, regarding the enclosed report, please do not hesitate to contact me.

Sincerely,

CITY OF BURIEN, WASHINGTON

Frederick C. Stouder
City Manager

FCS/jry

r:\cm\airptmit\corr970331 transmit report as seis comments

CITY OF BURIEN

415 Southwest 150th Street
Burien, Washington 98166-1973

Phone: (206) 241-4647
Fax: (206) 248-5539

MEMORANDUM

TO: State of Washington Legislators
Washington State Department of Community, Trade and Economic Development
Honorable Mayor and Members of the Burien City Council
Associated Cities and Interested Parties

FROM: Frederick C. Stouder, City Manager, City of Burien, Washington

DATE: March 26, 1997

SUBJECT: Sea-Tac International Airport Impact and Mitigation Study Initial Assessment

INTRODUCTION:

Attached is the City of Burien's initial assessment of the Sea-Tac International Airport Proposed Third Runway and Master Plan implementation. This report, which has been transmitted to the State, was funded by a grant from the State of Washington and contracted through the State Department of Community, Trade and Economic Development. The City of Burien wishes to thank the State for its support and assistance during the preparation of the study. While many individuals and organizations provided advice and assistance, the study team and the City of Burien were responsible for the completion of the study.

SUMMARY EXAMPLE OF FINDINGS:

Our preliminary administrative review offers the following:

- ***The cities adjacent to the Sea-Tac International Airport proposed third runway are facing potential land use conversions that would completely change the character of their neighborhoods and quality of life.***

- ***Further detailed analysis and agreements should occur on many issues prior to the construction of the third runway, but a preliminary assessment suggests that environmental, transportation, and socio-economic impacts and potential redevelopment costs could total $2.95 billion over a 20-year period (1995 dollars).***

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- ***Total public and private investment or mitigation and development costs in the five cities (not including the City of SeaTac) due to noise and vibration impacts are estimated to be $2.4 billion.***

- ***Mitigation costs in five neighborhoods in just two cities, Des Moines and Burien, could total $1.9 billion or 80% of the total environmental impact costs if redevelopment is the only solution and other mitigation measures can not be reached.***

- ***If appropriate mitigation strategies can not be determined or financed, impacted communities could face dramatic increases in service costs particularly in public safety and transportation, while suffering residential and commercial decline (Burien's police costs, for example, could increase by a third while its tax base is declining).***

- ***Impact on residential housing property value losses could total $41 million dollars in the studied communities including an average of $13,179 in Burien for those affected.***

- ***Replacement or relocation of eight (8) schools, and noise abatement in twenty-six (26) others are recommended (costs to do so could total over $500 million and perhaps approach $1 billion). These costs or alternatives are not included in any of the study findings and need further analyses.***

- ***Traffic congestion, physical damage, and construction and post construction transportation impacts will cost $479 million to mitigate.***

- ***Burien and Des Moines will face $117 million and $73 million respectively to mitigate transportation impacts. Tukwila will need potentially $192 million for transportation improvements in accommodating the Master Plan's impact. This is the highest cost among the four cities for transportation mitigation.***

- ***Residents in Normandy Park and Tukwila will require $56 million and $114 million respectively to mitigate noise impacts through sound abatement insulation and aviation easements.***

- ***A South King County joint effort with State and area wide support would be required if a full understanding of impacts and potential mitigation is to be achieved. Mechanisms such as a South King County Mitigation Commission primarily composed of state and local elected officials, including school board members, the Port of Seattle, and others might be a body that could be considered.***

BACKGROUND:

In 1995, the Washington State Legislature granted the City of Burien $500,000 over a two year period "for analysis of the proposed Port of Seattle Third Runway including preparation of a Draft Environmental Impact Statement and other technical studies." The funds were administered through the Washington State Department of Community, Trade and Economic Development. The City of Burien with assistance from the Highline School District and the cities of Tukwila, Federal Way, Normandy Park and Des Moines assembled a team of planners, engineers, environmental scientists and economists to conduct the studies.

Among the assumptions serving as the basis for the studies were the following:

- Existing information from the Port of Seattle and Federal Aviation Agency draft environmental assessment and master planning process will be used, along with other materials from the Puget Sound Regional Council, U.S. Department of Commerce, and local governments.

- Issues will be identified that likely will require further mitigation or further analyses. Opportunities from the proposed development will also be sought that would enhance community quality of life and economic development.

- The analysis will begin at the point of the Draft Environmental Impact Statement. (The Environmental Impact Statement update completed in early 1997 was not further reviewed during the process of this study. However, the findings of this study will still be valid as part of the process to identify mitigation alternatives.)

An executive team composed of the city managers and community development and planning directors or their representatives were assembled by the City of Burien to help coordinate the studies. During the conduct of the studies, many federal, state, and local agencies and private individuals assisted, including the Port of Seattle, the Puget Sound Regional Council, and the Washington State Department of Community, Trade and Economic Development. However, the responsibility for the completion of the study was solely the City of Burien's and the actual study itself was prepared by an independent study team.

Joe Pobiner of Hellmuth, Obata & Kassabaum (HOK), Inc., Dallas, Texas managed the study team for environmental analysis, transportation, and land use and neighborhood impacts. Steve Dennis of Raytheon Infrastructure Services, Inc., was responsible for the environmental analysis, and Ron DeNadai also of Raytheon Infrastructure Services, Inc., conducted the transportation analysis. Ted Lane of Thomas/Lane Associates

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(TLA) completed the socio-economic analysis. Mike McCormick, an independent consultant, was also part of the study team to assist in the neighborhood planning approach and to help assure coordination with the state's Growth Management Act and other public agencies.

While the initial assessment had many objectives it wished to achieve, among those were the following:

- Achieving equity among individuals and communities receiving negative impacts and those benefiting from the proposed third runway.

- Reaching fair and just compensation for citizens, for property acquisition, and real costs to property values.

- Abating, mitigating and financing of community impacts.

- Creating further processes to proceed with further community planning and monitoring through an independent body governed by the jurisdictions, institutions, and other individuals facing the impacts.

This study is an INITIAL ASSESSMENT – not a complete or final impact analysis or comprehensive mitigation strategy or proposal. No specific program is proposed to mitigate all the impacts or to take advantage of the economic opportunities by the Port of Seattle's Master Plan Implementation including the third runway. This initial assessment, while both analyzing the Port of Seattle's Draft Environmental Impact Statement and proposing mitigation measures, also suggests other studies that should be completed. Those with responsibilities for the mitigation of the proposed developments will find steps in this assessment that should be pursued before any project is launched.

The jurisdictions immediately impacted by the proposed third runway including the City of SeaTac, the City of Burien and surrounding communities, also can pursue further analysis including a regional approach to mitigation. The State of Washington, King County, and the Puget Sound Regional Council, among others, can further assist these efforts.

In the following weeks, individuals and jurisdictions should review the findings and objectives and offer additional comments or proposals. A series of meetings will be conducted during the month of May to discuss this assessment and further measures that could be taken at this stage. Comments provided during this process will be collected and distributed along with other conclusions or proposals developed at that time.

State of Washington Legislators
Washington State Department of Community, Trade and Economic Development
Honorable Mayor and Members of the Burien City Council
Associated Cities and Interested Parties
March 26, 1997
Page 5

The City of Burien thanks the Washington State Legislature and the State of Washington Department of Community, Trade and Economic Development for the opportunity to conduct this assessment. While many questions have been raised and many remain unanswered, the information in this assessment further point to the issues that need to be addressed before individual and community impacts can be mitigated. Without the support of the Washington State Legislature and the Washington State Department of Community, Trade and Economic Development, this could not have been accomplished.

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CITY OF BURIEN, WASHINGTON
AIRPORT IMPACT MITIGATION PROJECT

PROJECT DIRECTORY

PROJECT TEAM

Hellmuth, Obata & Kassabaum, Inc. (HOK) 2001 Ross Avenue, Suite 2800, LB 106 Dallas, Texas 75201 214/720-6000 (phone) 214/720-6005 (fax)	*Project direction and mitigation strategies* Donal Simpson, AIA, AICP, ASLA-Principal-in-Charge Joseph A. Pobiner, AICP - Project Director Rick Leisner, ASLA, AICP Mark Bowers, ASLA
Thomas/Lane Associates, Inc. 2600 Harvard Avenue East Seattle, Washington 98102 206/329-2600 (phone) 206/329-2626 (fax)	*Socio-economic consultants* Ted Lane Cheryl Thomas
Mike McCormick, AICP 2420 Columbia SW Olympia, Washington 98501 360/754-2916 (phone) 360/754-3448 (fax)	Mike McCormick

SEA-TAC INTERNATIONAL AIRPORT IMPACT MITIGATION STUDY

INITIAL ASSESSMENT AND RECOMMENDATIONS

FEBRUARY 1997

PREPARED UNDER A GRANT FROM
THE STATE OF WASHINGTON FOR THE:

CITY OF BURIEN, WASHINGTON
CITY OF DES MOINES, WASHINGTON
CITY OF FEDERAL WAY, WASHINGTON
CITY OF NORMANDY PARK, WASHINGTON
CITY OF TUKWILA, WASHINGTON
HIGHLINE SCHOOL DISTRICT
HIGHLINE COMMUNITY HOSPITAL

PREPARED BY:
HELLMUTH, OBATA + KASSABAUM, INC. · DALLAS, TEXAS
RAYTHEON INFRASTRUCTURE SERVICES, INC. · DENVER AND PHILADELPHIA

IN ASSOCIATION WITH:
THOMAS/LANE & ASSOCIATES, INC. · SEATTLE, WASHINGTON
MICHAEL J. MCCORMICK, AICP · OLYMPIA, WASHINGTON

SEE REPORT

BEGINNING ON PAGES

G-542 through G-717

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325-97

Mr Dennis Ossenkop
Federal Aviation Administration.
Airports Division

REC'D ANM-610
PLAN, PGM, & CAP BR
APR - 1 1997
ANM-610

I am writing to oppose my opinion on the 3rd runway.

Why do they plan on meetings on short notice? 3-4-1997
Why do they hold meetings at the Airport, 2nd floor?
Why do they hold meetings at such a madness hour?
When the rush hr at the Airport is so heavy?
I asked question where the meeting was to be held.
Not even the speakers knew why? Where do these the way the Port of Seattle wants to confuse people, about the 3rd runway.
We need more time; much more time 45 days is not enough. to study the impact the 3rd runway is going to create Especially since it going to affect my Home,
City & her Mayor, work in patches bread & ~~butter~~ dig + patch. + 3rd runway

- G-736 -

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We do not need a 3rd runway.

Consider another route, look around,

We need more time to study the impact the Airport is going to have on my property

We need a place to meet Not a jam packed Airport to hold meetings

Not at the rush hour, Consider an other date + time. You should also take time to read, issues

Angelena
Des Moines

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March, 1997

ANM-610
CA 3R
1997

Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Avenue Southwest
Renton, WA 98055-4056

ANM-610

RE: Draft Supplemental Environmental Impact Statement Comments

Dear Mr. Ossenkop:

The public comment period is too short and there are too few public meetings. The EIS is difficult to understand. It arrived at the librarys almost a month late. Additional hearings at more convenient places and times than the airport during rush hour, should be held.

I G-737 I

Section 5-5 Page 1-11 Last paragraph providing wetlands 20 miles away to replace wetlands at the airport is rediculious. They have their wetlands we are loosing ours.

The airport should provide wetlands in our area, where they are removed not 20 miles away.

Table 1-2 Page 1-3
with project 2010 peak hours 99
Do nothing 2010 peak hours 82

The cost of the third runway is a way to much for 17 more operations per hour.

Graph page 2-9, 2-16, 2-26 fig. 2-7 Forcasts do not match FAA
We already have more pollution per acre than

We already have more pollution per acre than anywhere else in the county per EPA. and the airport wants to add more with increased flights and traffic.

Appendix B Attachment D
Comments are reduced so small they are not ledglble even with a magnifying glass.

Sincerely,

Warren R. Pugh
12119 25th Ave. S.W.
Burien, WA 98146

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March 30, 1997

Dennis Ossenkop
F.A.A. Northwest Mountain Region
1601 Lind Avenue S.W.
Renton, WA 98055-4056

Dear Mr. Ossenkop,

On behalf of the residents of the Rainier Valley and communities of southeast Seattle I offer the following comments to the Draft Supplemental EIS for the Sea-Tac 3rd Runway project:

1) The FAA has not provided for the inclusion of communities of southeast Seattle in the planning process for the 3rd runway project. Existing and future impacts have been dismissed or drastically down-played by the FAA.

2) Existing and future impacts from airport expansion(s) have not been adequately evaluated according to Executive Order #12898, the Environmental Justice order.

3) The FAA withheld vital information about current and projected numbers of arrivals/departures which overfly the communities of southeast Seattle. Such information might have altered the Puget Sound Regional Council vote to approve the 3rd runway project.

4) There is no mitigation plan offered to the communities of southeast Seattle to address the health and environmental impacts created by the 3rd runway project. One glaring omission is the absence of an insulation/mitigation program for the more than 20 public and private schools located in southeast Seattle.

5) The FAA has provided inadequate notification and outreach to non-english speaking residents of southeast Seattle for the Draft SEIS and the entire Draft EIS process.

6) Existing and future levels of aircraft exhaust emissions and particulate should be measured, evaluated and disclosed. On-site monitoring stations should be established in southeast Seattle communities. No permanent monitoring sites have been established to measure noise, air pollution, or other impacts in the Rainier Valley. Hundreds of Sea-Tac arrivals and departures now fly over our community without any 'recognized' impacts.

7) Existing and future health and environmental impacts from episodes of spillage of unburned fuel from aircraft overflights have not been measured or evaluated in southeast Seattle although these small spills are common from departures.

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8) The shift/expansion of flight tracks over southeast Seattle communities adds a disproportionate economic burden upon the residents according to a recently released study. Property values of low income and minority residents will be adversely affected.

9) The FAA should recognize the protected status of one community, Columbia City, a Landmark District listed on the National Historic Register. The FAA should halt current over-flights and prohibit future over-flights which pose a threat to the integrity of the historic buildings here.

10) Portions of southeast Seattle have been designated by the federal government as Economic Enterprise Zones. The economic status further reinforces the need for FAA to minimize impacts here, rather than the current plan to expand flight tracks and significantly increase the number of over-flights in the future.

11) Since 1994, the FAA has allowed new flight tracks (arriving & departing) to be established over the communities of southeast Seattle without benefit of an Environmental Assessment which is required. The real impacts of the existing over-flights by Sea-Tac air traffic are not known because there has not been effort to measure and evaluate the actual impacts (beyond the published computer models). Any and all current impacts are grossly under-represented by the Port of Seattle and the FAA.

12) The FAA is not addressing the cumulative impacts of over-flights and noise from Sea-Tac Airport, Boeing Field (KCIA), and Renton Airport. <u>All three airport facilities directly impact southeast Seattle</u> creating a disproportionate health, environmental, and economic burden on residents here.

13) The Duwamish-Elliott Bay corridor is under-utilized, according to the Port of Seattle during testimony to the Puget Sound Regional Council, particularly at night. All the while the number of nighttime operations at Sea-Tac Airport have increased dramatically. Nighttime awakenings and other sleep disturbances are common in southeast Seattle yet unrecognized by the FAA.

14) The FAA has failed to demonstrate a commitment to Environmental Justice as mandated by the federal government. To date, FAA has not provided evidence of an established policy or guidelines for responding to environmental justice issues. The EPA offers the following definition of Environmental Justice:

"Environmental Justice is the fair treatment of people of all races, cultures, and income with respect to the development, implementation and enforcement of environmental laws, regulations, and policies. Fair treatment means that no racial, ethnic or socioeconomic group should bear a disproportionate share of negative environmental consequences resulting from the operation of industrial municipal, and commercial enterprises and from the execution of federal, state, and local, and tribal programs and policies. Environmental Justice seeks to ensure that the communities,

- G-738 -

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private industry, local governments, states, tribes, federal government, grassroots organizations, and individuals act responsibly and ensure environmental protection to all communities."

Southeast Seattle is the largest minority and low-income community in the state of Washington. The largest populations of youth, the elderly, and disabled persons are also concentrated in this community. This community, more than any other community, deserves fair treatment and protection by the FAA.

Since 1994 the FAA has permitted significant and measurable changes in flight tracks to occur over southeast Seattle. The FAA has ignored the increasing protests of residents here. According to former United States Senator Cohen of Maine, it is a pattern at FAA to "deny, defend, and deflect" criticism.

Now a second airport facility, Boeing Field (KCIA), is planning a massive expansion project which will have devastating consequences on the communities of southeast Seattle. Both airport expansion projects fail to address the very real health, environmental, and economic impacts to residents here. The cumulative impacts of both airport expansion plans require careful scrutiny and in-depth study.

Therefore, I am requesting that the comment period be extended and that steps be taken to evaluate the cumulative effects of <u>both</u> proposed future expansion plans for Sea-Tac Airport and Boeing Field (KCIA) airport projects. To ignore these very real cumulative impacts is to invalidate the entire EIS process.

Thank you for the opportunity to comment on the Draft SEIS. Please add my remarks to the offical record.

Sincerely,

Ray Akers

Ray Akers
5222 37th Avenue S.
Seattle, WA 98118-6116
(206)723-2800
(206)723-6996 Fax

cc: Helen Robinson, US Dept. of Transportation,
Office of Inspector General
Burdena Pasenelli, Federal Bureau of Investigation
Sen. Patty Murray
Rep. Jim McDermott
Ron Sims, King County Executive & King County Councilmembers
Cynthia Stewart, King County International Airport
Regional Commission on Airport Affairs
Mike Rees, Chair, M.C.C. Committee on Aviation Noise
Al Furney

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March 28, 1997

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue Southwest
Renton, WA 98033-4056

RE: Draft Supplemental Environment Impact Statement Comments

The "TOTAL PROCESS" was a total disaster.

The mailman delivered my copy of "The Forum " on the day the hearing was being held.

Surely and clearly they must have aware the time was inadequate from the very beginning.

And must have been aware the data was not plentiful not in plentiful supply or readily available for public review.

The only public meetings scheduled were NOT readily accessible or TIMELY.

For the Port to expect the citizenry of the area to be sufficiently informed and to make comment on a extremely comprehensive plan such as the SEIS in such a short review period is outraqeous.

I do commend the libraries in the area - as it is my understanding - they did their best under impossible circumstances, short notice, insufficient funds etc. to accomplish the task required of them.

Clearly the cards were stacked against public comment

Your truly,
Margaret L. Springer
Margaret L. Springer
20618 7th Pl. So.
Des Moines, WA 98198

- G-739 -

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Ravenna-Bryant Community Association
6535 Ravenna Ave. N.E.
Seattle WA 98115

REC'D ANM-610
PLAN, PGM, ... BR
APR - 2 1997
ANM-610

March 31, 1997

Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue S.W.
Renton, WA 98055-4056

Re: Draft Supplemental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (Third Sea-Tac Runway)

Dear Mr. Ossenkop:

Thank you for sending to us your draft supplemental environmental impact statement on the Third Sea-Tac Runway ("DSEIS").

Our Task Force examined the DSEIS in light of the comment that the Ravenna-Bryant Community Association had submitted on the earlier draft environmental impact statement, published in Volume 5 of 7 Volumes, Appendix T, pages 134-168 of your Final Environmental Impact Statement. Our Task Force found that the Final Environmental Impact Statement was not responsive to the points made in our earlier comment; that your annotations and references in Volume IV, Appendix R to our comment do not answer or supply information which addresses the concerns we had expressed; and that your DSEIS does not respond to most of our concerns in that comment. For example, the DSEIS does not chart flight tracks, although the greater anticipated volumes and the relocated runway make this imperative.

We are therefore incorporating by this letter our earlier comment on the Final Environmental Impact Statement published in Volume 5, pages 134-168, as our comment on the DSEIS. We ask that you go over it afresh and respond to it as if each point were directed to the relevant portion of the DSEIS.

In our view, the DSEIS is slanted toward promoting a relocated Third Runway, rather than making an objective analysis. As an example, we cite the recitation of the Expert Arbitration Panel's findings at pages 4-1 and 4-2. The Panel found that a condition for construction stipulated by Resolution A-93-03 had not been met. The sentence quoted at page 4-2 in context replies to the Port's contention that the condition, which it had stipulated as controlling, was in retrospect impossible and, therefore, the

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Expert Arbitration Panel should not apply it. The sentence declares that the Port could have met the condition of no increase in aircraft noise on the ground had it taken specific actions in a timely manner. Later on, the majority made recommendations that, if adopted, would reduce noise on the ground and the environmental impacts of Sea-Tac on adjacent areas and communities subject to aircraft over-flights. The Port and the Executive Board of the Puget Sound Regional Council merely agreed to think about doing some of these actions at some unspecified time.

PSRC Resolution A-96-02 effectively subverted A-93-03 and the Expert Arbitration Panel's findings and recommendations. It substituted a political power play for a planning process. The middle word in the panel's name was "arbitration" - not "advisory" - and the nature of arbitration is that the parties agree to abide by the decision of the arbitrator. By declaring that "the FAA believes that the PSRC gave adequate consideration to the function of the Expert Panel," the FAA not only demeans the panel, but shows that it cannot distinguish between the function of arbitration and consultation.

Moreover, we question how the FAA and the Port of Seattle can proceed based on PSRC Resolution A-96-02, which was based on the Final Environmental Impact Statement. The DSEIS moves the Third Runway further west and increases the impact, and its projections of more over-flights show that the FEIS materially understated the true impact. Relying on A-96-02 to proceed puts the United States in the position of approving such a significant project on the basis of PSRC approval, which was secured with false information.

Moreover, the DSEIS ignores the obvious alternative: accelerating the development of the reliever airports contemplated by the Puget Sound Regional Air Transportation plan proposed by the Port's Flight Plan Project, rather than trying to concentrate all commercial aircraft operations at Sea-Tac. The DSEIS needs to explore that alternative fully.

Yours very truly,

Eileen Farley

Eileen Farley, President
Ravenna-Bryant Community Association

- G-740 -

COMMENT SHEET

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Public Hearing
March 4, 1997

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

I went to church last Sunday and I missed some of the serman because a jumbo jet went over head. When the third runway is put in, it will be even harder to hear than before to lissen. Not only the sound will get louder and more often but the air that we breath and live off of will get ~~unbreathable~~ ted too. I sertenly do not want to have to breath out of a sucaba tank every time I go out-side because of the

(*Please Print*) Name: Derek Brown
Address: 239 SW 189 PL.
City: Seattle WA Zip Code: 98166

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box as you leave the meeting.*

COMMENT SHEET

Public Hearing
March 4, 1997

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

pulution! So say "NO"
to the ~~Third~~ "Third Runway"
and save your children's
and my future from this
fate because the future
is not yet ritten.

~~Thank~~

~~You~~

- G-741 -

(*Please Print*) Name: Derek Brown
Address: 239 SW 189 PL
City: Seattle WA Zip Code: 98166

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

COMMENT SHEET

Public Hearing
March 4, 1997

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

After I had gone
up to speak and say
my feallings when I was
done I went to go get
a drink I ended up
spitting it out because
it tasted like dirt and
play soccer and I know
what dirt tasted like.

(*Please Print*) Name: Derek Brown
Address: 239 SW 189 PL
City: Seattle WA Zip Code: 98166

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

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COMMENT SHEET

Public Hearing
March 4, 1997

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

Num. 3.

I am NOT going to stand down so you better quit or I will even get my class or if passable my school.

RESPOND

(*Please Print*) Name: Derek Brown
Address: 234 SW 189 PL
City: Seattle WA Zip Code: 98166

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

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COMMENT SHEET

Public Hearing
March 4, 1997

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Draft *Supplemental* Environmental Impact Statement
for the Master Plan Update

The Third Runway AT Seatac is:
1 Cost is More Than [illegible] People can Pay. Value will Be Far Less Than Price To Produce To Everyone - The Supporters And The Non-Supporters
2 Damage To Health - Welfare OF All People is Huge AND Not Worth ANY Additional Runway There is No dessignated people - But Both Supporters And Non-Supporters (AIR Quality/etc)
3. NOT Well PLANNED AS A Wise - Future "THINKING" Panel would NOT WANT Their Name on it AS A Supporter

(*Please Print*) Name: Rosemarie McKeeman
Address: 430 SW 183 rd ST
City: Normandy Pk Zip Code: 98166

Do You Really WANT To CLAIM THIS FIASCO?

Please return comments by March 31, 1997 to: Mr. Dennis Ossenkop, Federal Aviation Adminsitration, Airports Division, ANM-611, 1601 Lind Ave SW, Renton, Washington 98055-4056 or *leave in the box* as you leave the meeting.

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DEPARTMENT OF HEALTH & HUMAN SERVICES — Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30333
March 31, 1997

REC'D ANM-610
PLAN, PGM, & CAP BR
APR - 4 1997
ANM-610

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave. S.W.
Renton, WA 98055-4056

Dear Mr. Ossenkop:

G-744

I We have completed our review of the Draft Supplemental Environmental Impact Statement (DSEIS) for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport. We are responding on behalf of the U.S. Public Health Service.

I We believe our potential public health concerns have been generally addressed in this draft supplemental document, and we have no specific comments to offer at this time. The adverse impacts commonly associated with airport expansion projects have been presented and appropriate mitigation measures appear to have been considered.

Thank you for the opportunity to review and comment on this DSEIS. We would appreciate receiving a copy of the Final SEIS, and any future environmental impact statements which may indicate potential public health impact and are developed under the National Environmental Policy Act (NEPA).

Sincerely,

Kenneth W. Holt

Kenneth W. Holt, M.S.E.H
Special Programs Group (F29)
National Center for Environmental Health

The Nation's Prevention Agency

CDC 50

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United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

REC'D ANM-1
APR 14 '97
ANM-1 13
ACTION: 600
INFO:

ER-97/85

APR 8 1997

Mr. Frederick M. Isaac
Director, Northwest Mountain Region
Federal Aviation Administration
Room 450
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

REC'D ANM-610
PLAN, PGM, & CAP BR
APR 15 1997
ANM-610

Dear Mr. Isaac:

This is in response to the request for the Department of the Interior's comments on the Draft Supplemental Environmental Impact Statement (DSEIS)/Section 4(f) Evaluation for the proposed Master Plan Update Development Actions at the Seattle-Tacoma International Airport, Washington.

Section 4(f) Evaluation Comments

We concur that there is no feasible and prudent alternative to the proposed project, if project objectives are to be met. We also concur with the proposed measures to minimize harm to Section 4(f) resources which may be affected by the proposed project.

Environmental Statement Comments

Our comments focus primarily on the proposed mitigation of the wetland fill not associated with Miller Creek. However, this focus should not be construed to mean the proposed project has fully minimized impacts to waters of the United States, including wetlands, and the associated fish and wildlife resources. The proposed project mitigation is off-site and within a different watershed. The 47-acre mitigation site is part of a larger 69-acre parcel within the City of Auburn, and includes approximately 4.3 acres of a reed-canary grass-dominated wetland as part of the 47-acre portion. The remaining 22 acres at the site are to be reserved for future use according to the Final Environmental Impact Statement (FEIS). Because the proposed project would likely require a permit under section 404 of the Clean Water Act, the U.S. Fish and Wildlife Service may provide additional comments when the permit application is reviewed.

The DSEIS does not propose adequate mitigation for wetlands and associated fish and wildlife resources. The project as currently proposed would result in the direct fill of 12.22 acres. This wetland loss is an increase from the 10.35 acres stated in the FEIS for the proposed project even though some wetlands would only be partially filled. The wetland vegetation types to be impacted consist of 7.34 acres of forested wetland, 2.00 acres of shrub-scrub, and 2.88 acres of emergent marsh. Although filling would result in the loss of 12.22 acres, additional impacts would occur as a result of the smaller size and closer proximity to human activities following project construction. The FSEIS needs to include mitigation for these wetland impacts.

The DSEIS states on-site mitigation or mitigation within the airport is not feasible as most lands surrounding the airport are developed and not enough available land exists for creating compensatory mitigation. In addition, the FAA has indicated "wildlife attractions" within 10,000 feet of the edge of an active runway are not recommended and wildlife control activities in wetlands near the airport would conflict with wetland habitat mitigation goals. We do not

recognize the potential risk of wildlife and human injury resulting from collisions between avian fauna and aircraft. However, creation or restoration of wetlands within 10,000 feet of the active runway would not increase "wildlife attractions" over existing levels but would replace the habitat destroyed by the proposed project within the same general area. Mitigation located outside the watershed would not benefit wildlife directly impacted by the project except for those species with large foraging areas and territories, such as bald eagles and waterfowl. Although on-site and off-site mitigation within the watershed may be limited and some mitigation may need to occur within another watershed, the FSEIS should provide mitigation options close to the impact site.

The compensation ratios stated in the DSEIS are: 2.0:1 for forested wetland; 1.0:1 for shrub wetland; and 1.5:1 for emergent marsh. The total compensation acreage is approximately 21 acres. However, the FEIS identifies a higher mitigation acreage (27.32 acres) for a project with fewer impacts than that currently proposed to compensate for higher mitigation ratios of forested and shrub-scrub wetlands. As the DSEIS does not justify the reduced mitigation ratios and acreage, this information should be provided in the FSEIS. In addition, the proposed mitigation would compensate for wetland values lost because the time delay for recovering the lost wildlife values is not sufficiently reflected in the proposed ratios and reed canary grass is dominant in the wetlands adjacent to the proposed mitigation site. Because reed canary grass is very invasive, it would likely become established in the newly created wetland and add further challenges for creating a wetland with diverse plant species and values. Thus, the FSEIS should provide for the high maintenance of the created wetland to ensure a wide range of wetland values for wildlife species.

Furthermore, the creation of wetlands at the proposed mitigation site would require experimental construction methods. The FEIS states a low permeability layer needs to be constructed to provide a perched water table. Bentonite would be utilized if sufficient low permeability materials are not available on-site. When artificial means are employed to create a wetland system, the risk for created wetlands to maintain themselves in perpetuity increases. Because of this increased risk, the FSEIS should provide mitigation acreage beyond that currently proposed, if this site would be used for mitigating anticipated impacts.

Summary Comments

The Department of the Interior has no objection to Section 4(f) approval of this project by the Department of Transportation.

We appreciate the opportunity to provide these comments.

Sincerely,

Willie R. Taylor
Director, Office of Environmental
Policy and Compliance

cc: Ms. Barbara Hinkle
Health, Safety and
Environmental Management
Port of Seattle
Post Office Box 68727
Seattle, Washington 98168

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