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 1 - Main Text and Appendices A through C-1

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

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

Date: May, 1997

AR 040519

FACT SHEET

Project Title:	Master Plan Update Development Actions at Seattle-Tacoma International Airport.
Description of Project:	The proposed Master Plan Update improvements at Sea-Tac Airport would reduce existing poor weather aircraft operating delay and accommodate forecast growth in passengers, cargo, and aircraft operations. Port of Seattle staff have recommended Alternative 3 - North Unit Terminal with a new 8,500 foot long parallel runway. Proposed airport improvements would include: • Third parallel runway with a length of up to 8,500 feet located about 2,500 feet west of existing Runway 16L/34R, and associated taxiways, safety areas, relocated utilities, and navigational aids • 600 foot extension southward of Runway 34R • Standard Runway Safety Areas for existing Runways 16R and 16L • Terminal improvements and expansion, including the development of a North Unit Terminal • Parking and access improvements and expansion • Development of the South Aviation Support Area • Relocation, redevelopment, and expansion of support facilities
Project Sponsor:	Port of Seattle
Lead Agencies:	The Federal Aviation Administration (FAA) and the Port of Seattle are joint lead agencies for the purpose of the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS). The Port of Seattle contact is: Ms. Barbara Hinkle, Health, Safety and Environmental Management Division, Port of Seattle, P.O. Box 68727, Seattle, Washington, 98168. The FAA responsible official is: Mr. Dennis Ossenkop, Northwest Mountain Region, Airports Division, Federal Aviation Administration, 1601 Lind Avenue, S.W., Renton, Washington 98055-4056.
Cooperating Agency:	The U.S. Army Corps of Engineers is a cooperating agency under NEPA.
Licenses, Permits and Other Approvals Potentially Required:	*Federal*: FAA Record of Decision, Air Quality Conformity Determination; DOT Section 4(f); and approval of the Airport Layout Plan; U.S. Army Corps of Engineers Section 404 permit; *State*: Department of Ecology Water Quality Certification and National Pollutant Discharge Elimination System Permit for Stormwater; Dam Safety Approval; Department of Fisheries and Wildlife Hydraulic Project Approval; Temporary Modification of Water Quality, Department of Natural Resources Forest Practices Permit and Surface Mining Reclamation Permit, Governors Clean Air and Water Certification; *Local*: Puget Sound Regional Council Review; Port of Seattle Commission project decisions; City of SeaTac comprehensive plan and zoning process, clearing and grading permits, floodplain filling permits, demolition permits, and others.
Principal Authors and Contributors to the Final Supplemental EIS:	This NEPA/SEPA Supplemental EIS was prepared under the direction of the Federal Aviation Administration and Port of Seattle. Technical analysis was provided by: Landrum & Brown, Incorporated Shapiro and Associates, Inc. INCA Engineers, Inc. Gambrell Urban, Inc. Parametrix, Inc. Synergy Consultants, Inc.

FACT SHEET (Continued)

Date of Issue:	May 13, 1997
Comment Period:	A public comment period is not being conducted on the Final Supplemental EIS. However, this report contains the Final Conformity Analysis, and a 30-day public and agency comment period is being conducted on this portion only of the report. Comments must be submitted by June 23, 1997 to Dennis Ossenkop. Federal Aviation Administration, Airports Regional Office, Room 540, 1610 Lind Avenue, SW, Renton, WA 98055-4056.
Public Meetings:	During preparation of the Draft and Final EIS, two scoping meetings were held and two public hearings. An additional public hearing was held on March 4, 1997 concerning the Draft Supplemental EIS. Copies of the hearing transcript and comments received on the Draft Supplemental EIS are provided in Appendix G; responses to applicable comments are provided in Appendix F.
Approximate Date of Final Action by Lead Agencies:	In accordance with the National Environmental Policy Act, the issuance of the Final Supplemental EIS followed by a 30-day cool down period, which will end on June 23, 1997. After compliance with applicable requirements, the FAA will then issue a Record of Decision. Similarly, the Port of Seattle action approving the Master Plan Update is expected in May 1997.
Approximate Date of Implementation:	Limited terminal development, cargo area expansion, development of an On-Airport hotel, expansion of employee and public parking, expansion of terminal facilities, and existing terminal entrance roadway improvements could be initiated as early as 1997. The new runway, and associated navigational aids and taxiway development, could be completed by 2005.
Availability of Copies:	Copies of the Final Supplemental EIS are available for inspection at:

Federal Aviation Administration, Airports Regional Office, Room 540, 1610 Lind Avenue, SW, Renton, WA

Port of Seattle, *Aviation Planning*, 3rd floor, Terminal Building, Sea-Tac Airport, and *Pier 69* Bid Office, 2711 Alaskan Way, Seattle

Puget Sound Regional Council, Information Center, 216-1st Avenue, Seattle

Beacon Hill Library, 2519 - 1st Avenue, South, Seattle

Boulevard Park Library, 12015 Roseberg South, Seattle

Seattle Public Library, 1000 - 4th Avenue, Seattle

Magnolia Library, 2801 - 34th Ave W, Seattle

Rainier Beach Library, 9125 Rainier Avenue S., Seattle

Bothell Regional Library, 9654 NE 182nd, Bothell

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 142nd, Tukwila

Kent Regional Library, 212 - 2nd Ave N, Kent

Vashon Ober Park, 17210 Vashon Highway, Vashon

Tacoma Public Library, 1102 Tacoma Ave S., Tacoma

University of Washington, Suzallo Library, Government Publications, Seattle

Valley View Library, 17850 Military Road South, SeaTac

West Seattle Library, 2306 - 42nd Ave SW, Seattle

Bellevue Regional Library, 1111 - 110th Ave NE, Bellevue

Columbia Library, 4721 Rainier Avenue S., Seattle

Holly Park Library, 6805 - 32nd Avenue South, Seattle

Douglas-Truth Library, 2300 E. Yessler Way, Seattle

To Purchase A Copy:	This document is available for public reproduction at Kinko's located at Kent-Des Moines Way and International Blvd./SR 99. Phone (206) 878-5043.
Locations of Other Documents:	The Flight Plan EIS issued in 1992, and the Draft and Final EIS for the Master Plan Update Development Actions, technical reports, background data, adopted documents, and material incorporated by reference in this Supplemental EIS are, unless otherwise stated in this EIS, located at:

Federal Aviation Administration, Airports Regional Office, Room 540, 1601 Lind Avenue, SW, Renton, WA

Port of Seattle, Aviation Planning, 3rd Floor, Terminal Building, Sea-Tac Airport

Puget Sound Regional Council, Information Center, 216-1st Avenue, Seattle

Federal Aviation Administration
Northwest Region
1601 Lind Ave, SW
Renton, Washington 98055

Port of Seattle
Seattle-Tacoma International Airport
P. O. Box 68727
Seattle, Washington 98168

May 13, 1997

Dear Reader:

Officials of the Central Puget Sound Region have been faced with developing a plan to meet the future transportation demands in the Region, that exist now and will continue to grow in the future. The Master Plan Update for Seattle-Tacoma International Airport has confirmed earlier studies which indicated that poor weather conditions currently produce significant delays and that the present airside, terminal, and landside facilities will no longer be able to efficiently accommodate air travel needs. The Master Plan Update identifies the need for a third runway at Sea-Tac Airport, in addition to numerous terminal and landside improvements necessary to accommodate the future growth in air travel in the region.

In April 1995, a Draft EIS for the proposed Master Plan Update improvements at Seattle Tacoma International Airport was prepared for these improvements. Public comments were received through August of 1995. The Final EIS, titled "*Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*" including the draft air quality conformity determination, was issued on February 9, 1996. The draft conformity determination document was available for public and agency review and comment through June 1996. This document is a supplement to the February, 1996 Final EIS.

A Draft Supplemental Environmental Impact Statement (Draft Supplemental EIS) was prepared as a result of the Federal Aviation Administration (FAA) and Port of Seattle (Port) review of recent growth in air travel demand at Sea-Tac Airport. During 1994, 1995, and 1996, air travel demand at Sea-Tac grew at a 7% annual growth rate, which is substantially greater than the national average. As a result, the 1996 annual aircraft operations levels at Sea-Tac Airport (395,200 operations) exceeded the Master Plan Update forecast for the year 2005. In addition, the FAA's fiscal years 1996 and 1997 Terminal Area Forecast (TAF) for Sea-Tac anticipates faster growth rates than were used in the Master Plan Update. As a result, the Port prepared a new forecast for Sea-Tac Airport that reflects current population and income growth in the Puget Sound Region, as well as the most recent forecast of how air travel ticket fares could change in the future. The new data indicates that demand at Sea-Tac by 2010 could be 17 percent higher than was forecast by the Master Plan Update.

This Supplemental EIS examines the impact of the new forecast and other data on:

- Project Purpose and Need
- Alternatives
- Affected Environment (noting changes that have occurred since issuance of the Final EIS)
- Environmental Consequences of the new data

This Environmental Impact Statement has been a joint effort between the Federal Aviation Administration (FAA) and the Port of Seattle, with the FAA taking the lead in preparation of the technical analysis and report production.

The Draft Supplemental EIS (DSEIS) and updated draft clean air act conformity analysis were released on February 14, 1997 with the announcement of a 45-day public and agency comment period. A public hearing was conducted on March 4, 1997 and the close of the public comment period occurred on March 31, 1997. Simultaneous with the 45-day comment period conducted in accord with the National Environmental Policy Act, a 30-day comment period was initiated on the conformity analysis. Based on public and agency comment, the air quality conformity comment period was extended until March 31, 1997.

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This Final Supplemental EIS reflects comments received at the hearing and during the comment period. Appendix F contains a summary of the comments received and detailed responses. As noted in that appendix, changes to Chapters 1 through 5 were made where appropriate. Based on public comments, an index was added as Chapter 6. Appendix G contains the public comments.

As is noted in Appendix F, the most notable changes made in preparing the Final Supplemental EIS relate to responding to issues and comments raised concerning the air quality analysis and revised draft air quality conformity analysis. While the emissions inventory has been corrected and amended in response to the comments, conformity with the State Implementation Plan has been demonstrated based on two analyses: the emissions inventory showing that project related impacts do not exceed the de-minimis levels; and the dispersion analysis showing that the project will not create new exceedances or exacerbate any actual or modeled exceedances. In response to the agency comments concerning the draft, a final conformity analysis has been prepared and a 30-day public comment period is being conducted on only this portion of the Final Supplemental EIS. Comments concerning this analysis are to be submitted by June 23, 1997 to Mr. Dennis Ossenkop, ANM-611, Federal Aviation Administration, Northwest Region, Room 540, 1601 Lind Ave, S.W., Renton, Washington 98055-4056

Federal Approval Declaration

After careful and thorough consideration of the facts contained herein, and following consideration of the views of those Federal agencies having jurisdiction by law or special expertise with respect to the environmental impacts described, the undersigned finds that the proposed Federal actions are consistent with existing national environmental policies and objectives as set forth in Section 101(a) of the National Environmental Policy Act of 1969.

Lowell H. Johnson — 5/13/97

Lowell H. Johnson
Manager
Northwest Mountain Region Airports Division

Date

**FINAL SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT**

PROPOSED MASTER PLAN UPDATE

Seattle-Tacoma International Airport

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CHAPTER 1

INTRODUCTION AND SUMMARY

1. INTRODUCTION

In the May of 1996, the Northwest Mountain Region Office of the FAA identified the availability of the fiscal year 1996 Terminal Area Forecast (TAF) for Seattle-Tacoma International Airport (Sea-Tac Airport), prepared by its headquarters Office of Policy and Plans. In December 1996, the FAA Office of Policy and Plans released the fiscal year 1997 TAF. The 1996 and 1997 TAFs show airport activity (passengers and operations) growing at a rate faster than predicted by the Master Plan Update. Aviation demand forecasting is often incorrectly perceived as a science, where all variables are predictable and known. However, as is shown by comparing any forecast to conditions that actually occur during the period that was forecast, forecasting is more an art than a science. As a result, precise forecasting for specific future years, particularly years more than 10 years in the future in the volatile air travel industry, is very difficult.

As airport master plans are conducted, forecasts are the foundation upon which a future plan is built. In the forecasting process, projected air travel demand is assigned to specific time periods. Due to the need to base these assumptions on a number of variables, airport master plan improvements are typically associated with a level of activity instead of a precise year, as was the approach taken in the Sea-Tac Airport Master Plan Update. The Final EIS recognized the difficulty in forecasting and presented three possible scenarios of how growth might differ from the Master Plan Update forecast. Appendix R of the Final EIS (located in Volume 4) identified the possible environmental impacts associated with the three scenarios, which included a slower growth scenario and two faster growth scenarios. The new forecast prepared by the Port of Seattle (hereafter referred to as "the Port") for the year 2010 are slightly higher than was examined for the faster growth scenarios (17.9 million enplanements versus 17.3 million enplanements) contained in the Final EIS.

As a consequence, the Port and FAA evaluated the FAA's TAF data: 1) to determine it's reliability and 2) to examine the impacts of demand growing faster than the Master Plan Update. Based on this review and the development of the new Port forecast, the FAA and the Port then agreed that additional environmental analysis was warranted to assess the impacts of the Master Plan Update improvements relative to the higher passenger and operations forecast.

The purpose of this report is to document the additional data that has arisen since publication of the Final EIS, including new aviation demand forecast information and to identify the resulting environmental impacts from this new data. This report contains the following chapters:

- Chapter 1 - this introduction and summary
- Chapter 2 - Impact on Project Definition and Purpose and Need
- Chapter 3 - Alternatives
- Chapter 4 - Affected Environment
- Chapter 5 - Environmental Consequences

The following sections of this chapter summarize the detailed information presented in Chapters 2 through 5.

The Draft Supplemental EIS was released for agency and public review in February 1997 with a 45-day comment period. Simultaneously, a 30-day comment period was initiated concerning the updated draft air quality conformity analysis; the air conformity comment period was extended until March 31, 1997 to coincide with the overall comment period. The Final Supplemental EIS was prepared reflecting the comments received. **Appendix F** contains a summary of the comments while **Appendix G** contains the comments. **Table F-2** (located in Appendix F) provides an index to the comments.

2. NEW FORECASTS AND IMPACT ON PURPOSE AND NEED

The analysis contained in this additional environmental analysis document reflects an updating by the Port of Seattle of the Master Plan Update forecast. The new Sea-Tac forecast prepared by the Port is 17% greater (in terms of both passengers and operations) than the forecast prepared for the Master Plan Update in 1994.[1/] These new forecasts are anticipated to exceed the operational capability of the existing airfield between 2005 and 2010. Therefore, a review of forecast issues and their relationship to the purpose and needs identified by the Master Plan Update was conducted.

TABLE 1-1

COMPARISON OF DEMAND FORECASTS
(Master Plan Update, FAA TAF, and new Port of Seattle forecast)

	Unconstrained Aviation Demand Forecast Comparison			
	1995	2000	2005	2010
Operations				
Master Plan Update	N/A	379,200	392,500	405,800
FAA 1997 TAF	386,536	433,470	478,050	528,200
New Port of Seattle	386,536	409,000	445,000	474,000
Enplaned Passengers				
Master Plan Update	N/A	11,900,000	13,600,000	15,300,000
FAA 1997 TAF	11,386,000	13,920,000	16,290,100	18,950,000
New Port of Seattle	11,386,000	13,700,000	15,700,000	17,900,000

N/A = Not available

Table 1-1 provides a comparison of the Master Plan Update forecast, the FAA's fiscal year 1997 Terminal Area Forecast, and the new Port of Seattle forecasts. For the year 2010, the FAA's TAF is approximately 10% greater than the Port's operations forecast and 17% greater than the Master Plan Update forecast. The TAF enplanement forecast is also 6% greater than the Port's forecast and 23% greater than the Master Plan Update forecast for the year 2010.

1/ Chapter II of this report acknowledges a difference between the new Port and fiscal year 1997 FAA TAF forecasts. The Port forecast was reviewed and accepted by the FAA regional office and deemed appropriate for use in planning at Sea-Tac.

A) Aviation Demand and Activity Forecast

In preparing the updated forecast for Sea-Tac Airport, two specific conditions were examined:

- Demand Forecast -- "With Project" forecast: this forecast represents an unconstrained level of demand for air travel within the Puget Sound Region. It represents the total passengers that wish to fly assuming that sufficient facilities are available to accommodate the demand. This level of activity is presumed to occur with the "With Project" alternative;
- Activity Forecast - Constrained "Do-Nothing" forecast -- this forecast represents the level of activity that the existing facilities at Sea-Tac Airport are capable of accommodating due to constraints in the airport system. These constraints could result in less than the total demand being satisfied, if demand exceeds the capability of the system.

In preparing the forecasts, first the demand for air travel was identified. The extent of the constraints associated with the existing airfield, terminal facilities, support facilities, and landside/roadway system were then identified. Then the passengers and resulting aircraft operations forecast were prepared based on the capabilities of the system to serve that level of activity. **Table 1-2** lists the Do-Nothing and "With Project" enplanement and operations forecast.

TABLE 1-2
COMPARISON OF THE NEW PORT OF SEATTLE FORECAST
"With Project" to Do-Nothing

	With Project			Do-Nothing		
Operations	2000	2005	2010	2000	2005	2010
Annual	409,000	445,000	474,000	409,000	445,000	460,000
Peak Month	38,600	41,800	44,000	38,600	41,500	42,100
Peak Month/Avg Day	1,246	1,352	1,423	1,246	1,341	1,360
Avg Annual Day	1,121	1,219	1,299	1,121	1,219	1,260
Peak Hour	78	94	99	78	82	82
Enplaned Passengers						
Annual	13,700,000	15,700,000	17,900,000	13,700,000	15,700,000	17,900,000
Peak Month	1,540,000	1,730,000	1,940,000	1,540,000	1,730,000	1,940,000
Peak Month/Avg Day	49,500	55,700	62,400	49,500	55,700	62,400
Avg Annual Day	37,534	43,014	49,041	37,534	43,014	49,041
Peak Hour	5,210	5,740	6,300	5,210	5,460	5,930

Source: P&D Aviation, December 1996.

Chapter 2 of this report contains a description of the FAA fiscal year 1997 Terminal Area Forecast and the new forecasts prepared by the Port. Because the Port forecasts are prepared at a level of detail that enables the analysis of environmental conditions, they were used to assess the environmental impacts that could result if demand grows as forecast. **Appendix D** identifies likely impacts in the year 2020 based on an extrapolation of activity and impacts in year 2010. The FAA's TAF does not provide the level of detail needed for environmental analysis such as noise impacts or surface transportation conditions. Because the Port's forecast reflects, where appropriate, Sea-Tac specific conditions, and was produced at a detailed level, with information such as the aircraft fleet mix and peak hour conditions, it was used for this Supplemental Environmental Impact Statement analysis.

Because demand would not exceed the maximum annual airfield capability of the Airport until around 2008, Sea-Tac would likely accommodate all of the forecast demand for air travel until that time. By 2005, 94 operations could be accommodated in the peak hour if additional airfield capability were available. Due to the existing constraints, it would likely not exceed 82 operations. In all years, there would likely be a slight difference in aircraft operations levels between what a constrained or unconstrained airfield could accommodate because of the hourly levels of activity. On a peak month average day (PMAD) basis, the constrained operations in 2010 would be about 5% less than the unconstrained (unconstrained at 1,423 operations and 1,360 constrained operations). However, due to an anticipated flattening of the peak, where the peak month average day will look more and more like an average day.

To accommodate the constrained level of activity, a number of congested and inefficient conditions would result:

- Gates would be used for an average of 5.0 to 5.5 flights a day. This type of gate usage would resemble today's PMAD. As is shown by this analysis, without implementation of the Master Plan Update improvements, the peak month is likely to represent a less distinct peak in the future (congested conditions would become more of an everyday condition);
- Some growth in the number of passengers per narrowbody equivalent gates[2/] per year would occur as a consequence of the expected growth in average aircraft size, average load factors, and the number of passengers per gate per day;
- Remote aircraft parking and passenger loading would occur, as is used at locations such as Los Angeles, Dulles, and (until the recent improvements were completed) at Pittsburgh or O'Hare; and
- Much of the terminal space (ticketing, gates, and baggage claims) would operate at levels-of-service F as measured by the International Civil Aviation Organization (where A is the most efficient/least congested and F is the most inefficient/congested). As conditions become constrained, passengers would avoid ticket check-in areas (through advance ticket purchases, and electronic ticketing, etc.), rely on carry-on baggage and/or would 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.

B) Purpose and Need

The following four purpose and need statements were defined in the February, 1996 Final Environmental Impact Statement:

(1) Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay;

[2/] Narrowbody equivalent gate is a measurement system used to account for the difference in sizes between gates that accommodate larger, widebody aircraft versus the smaller, narrowbody aircraft.

(2) Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim;

(3) Provide Runway Safety Areas (RSAs) that meet current FAA standards; and

(4) Provide efficient and flexible landside facilities to accommodate future aviation demand.

The only significant new purpose and need information that has been made available since publication of the Final EIS is the Port's initiation of correcting the Runway Safety Area for 34R (thus, the only remaining corrections are for 16L and 16R) and the new forecasts that show a potential need to accelerate, sooner in time, the terminal and landside facilities.

Relative to the proposed third runway, this analysis evaluated a longer construction schedule in contrast to the accelerated schedule presented in the Final EIS. Therefore, this Supplemental EIS evaluates the commissioning of the third runway in late 2004, with construction hauling occurring between 1997 and 2002.

Increased demand and/or the other new data would not affect the need to bring the runway safety areas up to standard, nor would it affect the proposed extension of Runway 34R.

The proposed Master Plan Update terminal and landside improvements were identified to address growth in passenger, cargo, and aircraft operations up to 19 million annual enplanements. As the updated forecasts now anticipate that 19 million enplanements would be reached soon after 2010 (instead of 2020), the timing of facilities could change, if the growth in activity continues as predicted by the new forecasts. As a result, the projects that were slated to be implemented by 2005, could be needed by 2000. Similarly, projects slated to occur by 2015 could be needed by 2005 and projects slated to occur between 2016-2020 could be needed by 2010.

Three changes in the proposed improvements have been identified. These changes, described in Chapter 2, reflect improvements in parking and surface transportation conditions to address issues associated with airport landside requirements.

3. ALTERNATIVES

The Final EIS examined the alternatives shown in **Table 1-3**. No new significant information has come to light concerning any alternative that has not already been discussed by this Supplemental EIS, such as timing of demand. The 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.

As a result of the faster growing air travel demand, and the resulting increased demand for parking at Sea-Tac, a re-examination of alternatives for public, rental car, and employee parking was conducted. This review showed that the parking locations identified by the Master Plan Update continued to represent the preferred location for parking. However, as was discussed earlier, the quantity of new parking in each construction phase would increase to accommodate the higher demand.

Concurrent with its approval of the third runway on August 1, 1996, the Port of Seattle Commission directed Port staff to give additional consideration to use of new technologies to satisfy poor weather operating needs. In response to this request, the Port convened a technology conference at the SeaTac Hilton on September 25, 1996. Speakers at the conference included the Federal Aviation Administration, NASA, Alaska Airlines, Airline Pilots Association, Boeing, Air Transport Association, consultants, and a company developing new technologies. This investigation concluded that technologies, based on the global positioning system (GPS) and flight management system (FMS), will provide aviation system capacity relief in the future. However, no technologies were identified that would alleviate the need for the new runway or change the viability of other closer spaced options due to the 2,500 foot spacing requirement between runways that is attributed to wake vortex conditions.

TABLE 1-3

SUMMARY OF ALTERNATIVES CONSIDERED

(1) Improve The Poor Weather Airfield Operating Capability In A Manner That Accommodates Aircraft Activity with an Acceptable Level of Aircraft Delay.

- Use of Other Modes of Transportation
- Use of Other Airports or Construction of a New Airport
- Activity/Demand Management
- Runway Development at Sea-Tac
- Use of Technology
- Delayed or Blended Alternative
- Do-Nothing/No-Build

(2) Provide Sufficient Runway Length to Accommodate Warm Weather Operations Without Restricting Passenger Load Factors or Payloads For Aircraft Types Operating to the Pacific Rim.

- Extension of Runway 16L/34R
- Extension of Runway 16R/34L
- Development of a new runway with a 12,500 foot length
- Delayed Alternative
- Do-Nothing/No-Build

(3) Provide Runway Safety Areas (RSAs) that Meet Current FAA Standards.

- Use of Declared Distances with displaced runway thresholds;
- Clearing, grading
- Delayed Alternative
- Do-Nothing/No-Build [3/]

(4) Provide Efficient and Flexible Landside Facilities to Accommodate Future Aviation Demand

- Use of Other Modes of Transportation
- Use of Other Airport/Development of A New Airport
- Activity/Demand Management
- Landside Development at Sea-Tac Airport
- Delayed or Blended Alternative
- Do-Nothing/No-Build

[3/] Technically, the literal Do-Nothing is not an option for addressing the RSA issues. The Port of Seattle has two options for addressing RSAs, both of which require some action: grade and develop the requisite distance off the ends of the runways or establish declared distance procedures. The Do-Nothing alternative presented in the EIS and this Supplemental EIS analysis reflects the non-development action (declared distances).

4. AFFECTED ENVIRONMENT

Since the issuance of the Final Environmental Impact Statement in early February 1996, a number of actions have been taken within the region related to Sea-Tac Airport. The purpose of Chapter 4 is to summarize these actions and identify if, or how, the actions affect the Master Plan Update improvements.

Key actions include:

- The final decision of the Expert Panel on Demand/System Management and Noise;
- The PSRC amendment to the Metropolitan Transportation Plan approving the third runway at Sea-Tac;
- The Port of Seattle Commission Approval of the Master Plan Update;
- Port and FAA approval and initiation of the Runway Safety Area for 34R corrections;
- Port of Seattle discussions with Seattle Water concerning the development of the employee lot north of SR 518; and
- Other actions, including local municipal land use actions.

In its final order of March 27, 1996, the majority (two members, with one dissenting opinion) of the Expert Panel on Demand/System Management and Noise concluded that "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 impacts sufficient to satisfy the noise reduction condition imposed by Resolution A-93-03." The Panel concluded "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." In conclusion, the Panel offered a list of recommended noise reduction measures to be considered.

At its April 25, 1996 meeting, the PSRC's Executive Board agreed to use the recommendations in the Panel's March 27, 1996 Final Decision on Noise Issues as the basis for deciding what additional noise reduction measures should be part of including a proposed third runway at Sea-Tac Airport as an amendment to the Metropolitan Transportation Plan (MTP). Resolution A-96-02, amending the Metropolitan Transportation Plan (MTP) to include a third runway at Sea-Tac Airport with specific noise reduction measures based upon the recommendations of the Expert Panel, was approved by the PSRC General Assembly on July 11, 1996.

A number of actions have been taken by the Port of Seattle since issuance of the Final EIS. Actions related to the Master Plan Update improvements include:

- Issuance of a Mitigated Determination of Non-Significance (MDNS) and Determinations of Non-Significance (DNS) - a MDNS was issued for the 34R RSA and a DNS was issued for the Federal Express facility expansion. Both projects will be completed in 1997.
- Passage of Resolution 3212 - On August 1, 1996 the Port of Seattle Commission approved a resolution that: 1) found the EIS is adequate and meets the requirements of SEPA; 2) adopted the Master Plan Update and Airport Layout Plan (ALP); 3) approved the third parallel runway

and associated improvements; 4) agreed to undertake the PSRC Resolution A-96-02 Section I mitigation; 5) authorized participation in a multi-agency air quality monitoring program and 6) directed staff to monitor and evaluate changes in airport activity and how the changes might affect environmental conditions and mitigation. In addition, the Commission instructed staff to evaluate new technologies to satisfy poor weather operating constraints.

Three primary actions have been undertaken by other parties:

- Hearing conducted by U.S. Congressional Aviation Subcommittee - On March 18, 1996 then Congressman Randy Tate, a member of the House Aviation Subcommittee of the Transportation and Infrastructure Committee, held a hearing at the Des Moines Field House on the proposed third parallel runway at Sea-Tac Airport. Testimony was provided by three panels, each consisting of three individuals. Congressional members of the subcommittee then questioned the panel members.
- Local Land Use Actions - Land use planning activities have continued to be undertaken within the jurisdictions in the immediate airport area. Most notably, the PSRC's MTP will require the local jurisdictions to amend or adopt transportation components of their comprehensive plans that are compatible with the Updated MTP.
- Lawsuits and SEPA Appeals - the Airport Communities Coalition brought a lawsuit against the Port and PSRC concerning the PSRC approval of the MTP. The Airport Communities Coalition and the City of SeaTac also filed appeals under the State Environmental Policy Act (SEPA) challenging the Port Commission approval on August 1, 1996.

5. IMPACT ON ENVIRONMENTAL CONSEQUENCES

Chapter 5 of the Supplemental EIS presents the impacts of the new forecasts and new information on key environmental characteristics that would be affected.

5-1 Surface Traffic Analysis

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. The surface transportation analysis, using the new forecast shows the following:

- Total Airport traffic is expected to increase from approximately 72,500 vehicles per day in 1994, to approximately 114,000 vehicles per day for the Do-Nothing Alternative (Alternative 1) or approximately 113,300 vehicles per day for the Preferred Alternative (Alternative 3) in the year 2010. The differences between the Do-Nothing and the Preferred Alternative traffic volumes relate to the availability of on-site parking available through each alternative an how the availability of parking affects vehicular access to the Airport.

- 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.

- The Preferred Alternative would generate an additional 95 PM peak hour trips in the year 2010 over the Do-Nothing Alternative.

- Impacts associated with Alternative 2 (Central Terminal) and Alternative 4 (South Unit Terminal) were also considered and showed that the surface transportation impacts of these alternatives would be the same as the Preferred Alternative.
- The transportation improvement project that would have the greatest impact on conditions in the Airport area is the construction of the State Route 509 Extension and South Access.

Appendix C-1 presents a detailed summary of the surface transportation analysis, and **Section 5-4** presents the construction related surface transportation impacts.

5-2 Air Quality

Like the Final EIS, this Supplemental EIS evaluated the air quality impacts associated with the Master Plan Update improvements through a review of:

- Aircraft emissions inventory in tons per year for comparison to the State Implementation Plan;
- Local areawide dispersion analysis of Airport and non-Airport sources for comparison to the Ambient Air Quality Standards (AAQS); and
- A local roadway intersection dispersion analysis for comparison to the AAQS.

This analysis confirmed the results of the Final EIS, which showed that even with a higher demand forecast, that aircraft emissions would be below the 1995 SIP levels regardless of whether the improvements are undertaken at Sea-Tac Airport. The dispersion analysis shows that even with the higher demand forecast that the predominant air pollution source in the Airport environs are surface transportation vehicles.

The intersection dispersion analysis was conducted to examine conditions in the Airport area that would be affected by the proposed improvements. This analysis shows that, with the worst case modeling assumptions, the AAQS for Carbon Monoxide could be exceeded regardless of whether improvements are completed at Sea-Tac Airport due to high volumes of surface traffic on International Boulevard (SR 99). With the higher air travel demand forecast and the changes in the proposed Master Plan Update improvements described in Chapter 2 of the Supplemental EIS, the intersection analysis shows that the improvements associated with any of the "With Project" alternatives would result in pollutant concentrations equal to or less than would occur in the Do-Nothing.

Because the demand forecast has increased and changes were made in the phasing and definition of the proposed improvements, a Final Conformity Analysis was prepared and is available in **Appendix B**. Included in **Appendix B (Attachment A)** are responses to comments concerning the draft air conformity analysis presented in the February, 1996 Final EIS. Comments concerning the February 1997 Updated Draft Conformity Analysis are summarized in **Appendix F**.

The analysis contained in this Final Supplemental EIS reflects responses to these comments and a thorough quality assurance review of the data input to the models. While some estimates of future air emissions have changed over the levels presented in the Draft Supplemental EIS, the conclusions of the Draft remain the same and are supported by the revised analysis contained in this Final Supplemental EIS.

5-3 Noise Exposure

Using the new forecasts, noise exposure contours were prepared for the Do-Nothing and Preferred Alternative to show areas impacted by aircraft noise of 60 DNL, 65 DNL, 70 DNL, and 75 DNL (Day-Night Average Sound Level). As was shown in the Final EIS, noise exposure impacts are expected to be less than current impacts, as follows:

	65 DNL and Greater Noise Exposure Impacts		
Year	Population	Housing	Area (sq. mi)
Existing (1994)	31,800	13,620	12.23
Do-Nothing Alternative (Alternative 1)			
2000	11,310	4,820	6.81
2005	10,450	4,450	6.61
2010	11,940	5,060	7.08

	65 DNL and Greater Noise Exposure Impacts		
Year	Population	Housing	Area (sq. mi)
"With Project" (Alternatives 2, 3, and 4)			
2000	11,310	4,820	6.81
2005	10,440	4,400	6.85
2010	13,220	5,520	7.69

Note - the area above includes all land, including airport property within the contours

The 65 DNL and greater noise exposure contours associated with the new forecast are about 12% greater than the noise contours prepared using the Master Plan Update forecast in the Final EIS. The new noise contours for the year 2010 would exceed the boundaries of the Port's existing Noise Remedy Program boundary by several blocks on the northwesterly edge of the Noise Remedy Program Boundary. In addition, a number of residential areas would experience a 1.5 DNL increase in noise (when comparing the "With Project" to the Do-Nothing) in year 2010. **Section 5-6 "Land Use Impacts"** describes the impact of the noise on noise sensitive land uses.

5-4 Construction Impacts

Since publication of the Final EIS, new information has arisen that has lead to construction related changes:

- Third parallel runway haul duration - the Final EIS analyzed a 3-year haul, with the runway being available for use in the year 2000. This Supplemental EIS analyzes a 5-year haul, with the runway available for use in late 2004. Under this new construction schedule, the peak of hauling would occur in year 2000, with the haul complete in 2002. While day-to-day truck traffic levels could vary, the lengthening of the haul duration could reduce the number of average daily truck trips;
- Additional haul routes have been identified - the Final EIS examined the primary haul routes that are anticipated to be used. Based on a further examination of barge/rail transfer opportunities, several additional routes were identified.
- Examination of two temporary interchanges - In addition to the identification of additional haul routes, two temporary, construction-only interchanges were identified: from SR 518 near 20th Avenue South and from SR 509 near South 176th Street.

No changes in the total quantity of fill material have been identified since publication of the Final EIS, yet this Supplemental EIS examines a greater quantity of fill excavated from On-Site Borrow Source 1 and no excavation from On-Site Borrow 5.

Based on the new construction schedule, the minimum use of on-site material option (that maximizes off-site material use and, thus, truck haul), would result in 66 one-way truck trips during the average hour adjusted for peaking, in contrast to the 109 trips examined by the Final EIS. This Supplemental EIS examined the impact of 109 one-way trips on I-5, SR 509, and SR 518 and 66 one-way trips on other possible haul routes. While the Final EIS identified several hours of operation constraints at various intersections along the arterial, this reduced level of truck trips could minimize these effects.

Section 5-4 "Construction Impacts" of this Supplemental EIS summaries the new construction impact evaluation and presents an updated/revised surface transportation analysis, noise, air quality, visual conditions, social impacts, and a detailed listing of overall possible construction best management practices.

5-5 Biotic Communities, Floodplains, and Wetlands

Chapter IV of the Final EIS (located in Volume I) presents the impacts of the Master Plan Update improvements relative to biotic communities (including creeks), wetlands, floodplains. Since the issuance of the Final EIS, information concerning two key areas has been produced:

- Submission of the wetland fill Joint Aquatic Resource Permit Application (JARPA) Section 404 permit application to the U.S. Army Corps of Engineers and further definition of wetland mitigation and Miller Creek relocation mitigation; and
- Survey of raptors in the area of the third runway.

Section 5-5 of this Supplemental EIS contains a discussion of the wetland impacts and a summary of the detailed mitigation plan.

In December 1996, the Port submitted a application to the Army Corps of Engineers for a permit to fill wetlands at Sea-Tac Airport associated with the Master Plan Update improvements in compliance with the Clean Water Act, Section 404. The 404 permit application submitted to the Corps of Engineers includes a completed Joint Aquatic Resources Project Application (JARPA) form, in a report entitled "JARPA Application for Proposed Improvements at Seattle-Tacoma International Airport" dated December 1996.

The Final EIS noted that about 10.4 acres of wetland would be filled in order to complete the proposed improvements. Since issuance of the Final EIS, the Port has refined its evaluation of the projects affecting wetlands, including identification of about 2 additional acres of wetland impacts, and documented its review of in-basin mitigation options, and further defined plans for development of a wetland mitigation site in Auburn.

Based on a refined evaluation of the wetlands, the following impacts were identified:

Project Element	New Data	Final EIS
Runway impacts		
Embankment	5.46	5.48
Borrow Source impacts	1.92	2.38
Runway Safety Areas 16L/R	2.34	Included above
Runway 34R Extension	0.00	0.00
Terminal/Landside		
N. Employee Parking lot	0.81	0.81
Development in SASA	1.70	1.70
Total	12.23	10.40

To mitigate for the unavoidable impacts to wetlands, the Port proposes to create new wetlands on a 47-acre site of an approximately 69-acre parcel located within the city limits of Auburn, Washington. Wetland mitigation at the Airport, within the watersheds where the impacts may occur, is not feasible for three reasons: (1) most of the area surrounding the Airport is developed, and not enough available land exists in the watershed to create compensatory mitigation wetlands without relocation of additional business and residences; (2) the FAA has indicated that "wildlife attractions" within 10,000 ft of the edge of any active runway is not recommended; and (3) wildlife control activities in wetlands near the airport would conflict with wetland habitat mitigation goals. However, the hydrologic functions the wetlands perform would be replaced at the airport site with the proposed storm water management facilities, and relocation of the drainage channels, and relocation of affected portions of Miller Creek.

In addition, the Port performed a follow-up review of the westside of the airfield to determine if raptors (such the red-tailed Hawk) were nesting in the area. This survey indicated that no nests are occurring, but that raptors forage in the airport area.

5-6 Land Use Impacts (Land Use Compatibility, DOT 4(f), Archaeological/Cultural/ Historic Sites)

As is indicated in **Section 5-3**, aircraft noise impacts are expected to be greater with the new (higher) forecasts for both the Do-Nothing and "With Project" alternatives. The greater noise exposure area would result in greater impacts to population, residences, and other noise sensitive facilities, including schools, nursing homes, hospitals, libraries, parks, churches, and historical sites.

As was noted earlier, a comparison of the "With Project" conditions to the Do-Nothing indicates that the Master Plan Update improvements would result in residential areas experiencing 1.5 DNL or greater increases in aircraft noise exposure. The areas that would experience 1.5 DNL or more increases are located in the west side acquisition area or directly under the north and south approach path to the runway for a distance of about 3 miles to the north and a mile and a half to the south of the third runway. Much of this area overlies the existing Noise Remedy Program boundary, where residences are currently in the process of being sound insulated. While impacts in all future years would be less than current exposure, upon commissioning of the third parallel runway, the contours are expected to lie within the boundaries of the existing Noise Remedy Program in 2004/2005. However, as demand for air travel grows, the noise contours would begin to increase in size. By 2010, residential areas outside the existing Noise Remedy Program boundary would be expected to be exposed to 65 DNL and greater noise levels, an increase of 1.5 DNL or greater than levels under the Do-Nothing condition. By 2010, this area would include about 170 residences.

In addition, about 10 noise sensitive facilities (four schools and three locally significant historic sites - one site is both a school and historic site) are within the 65 DNL noise contour and could experience a 1.5 DNL or more increases in noise when comparing the "With Project" to the Do-Nothing. The properties where the use may be incompatible with the forecast noise are:

1. Sea-Tac Occupational Skills Center (S102) would experience an increase of 4.41 DNL in 2010;
2. Woodside Elementary School (S105) would experience an increase of 3.1 DNL in 2010;
3. Sunny Terrace Elementary School (S106) would experience an increase of 5.2 DNL in 2010;

4. Sunnydale Elementary (S21/A16) would experience a 2.8 DNL increase in year 2010
5. Albert Paul House (A57) would experience an increase 3.9 DNL in 2010;
6. Coil House (N16) would experience an increase of 1.9 DNL in 2010; and
7. Bryan House (A29) would experience an increase of 5.0 DNL in 2010.

Section 5-6 presents a detailed description of the noise sensitive facilities. Future noise, with and without the proposed improvements would be less in the future at all of these sites with the exception of the Bryan House.

Because locally significant historic sites could be exposed to greater noise with the proposed improvements a DOT 4(f) evaluation (located in this Supplemental EIS beginning on Page 5-6-12) was performed, and provides a basis for determining that no 4(f) impacts would occur. Section 106 consultation is underway with the State Historic Preservation Officer (SHPO) to determine if these sites are eligible for inclusion in the National Register of Historic Places.

The following land use related mitigation is proposed:

<u>Mitigating Significant Noise Impacts on Public Facilities and Locally Significant Historic Sites</u> - Impacts on the residential and school/educational use facilities will be mitigated by acoustical insulation that would allow their uses to be compatible with increased noise levels. Two of the schools are currently not being used for educational uses, and future plans for these buildings need to be confirmed with the Highline School District. Port Commission Resolutions 3125 and 3212 and the 1993 Update to Sea-Tac's Part 150 Noise Compatibility Program contain Port intentions to expand the Airport's insulation programs for public buildings. The Port has been discussing school insulation with the Highline School District, and through Resolution 3212 has agreed to commit $50 million to the insulation of schools. Depending upon the District's designation of the long-term use of the two impacted schools and on the District's desire to have these buildings insulated, they would undergo insulation treatment as needed for compatibility independent of a formal school or public building insulation program. The residences would be addressed by the existing Noise Remedy insulation program if the owners agree. Because of their historic value, these facilities could require custom treatment to avoid significant alternation of the architectural style. In pursuing sound insulation of these structures, the Port's Noise Remedy Office will work with a historian to preserve such characteristics.

<u>Provide Directional Soundproofing</u>: Residences that were insulated prior to 1992 may need additional directional soundproofing to mitigate noise generated from a new flight path from the operation of the proposed new third runway. To mitigate noise caused by the proposed airport improvements, these facilities would be further insulated. The Port of Seattle estimates that some 60 to 70 houses were evaluated and/or insulated prior to 1992 and could require additional soundproofing at a cost of about $6,000 to $10,000 per residence. The additional sound insulation measures that could be required include new windows, new doors, and thicker walls.

<u>Acquisition in the Approach Transitional Area</u> - In recognition of the fact that the standard Runway Protection Zone (RPZ) dimensions do not always provide sufficient buffer to the satisfaction of nearby residents, the FAA has indicated that funding could be available to airport operators acquiring "up to 1,250 feet laterally from the runway centerline, and extending 5,000 feet beyond each end of the primary surface.[4] Based on the configuration of current airport land, local streets, and residential development patterns, the approach and

[4] FAA Memorandum, Action: Land Acquisition - eligible Runway Protection, Object Free Area and Approach and Transitional Zones, dated April 30, 1991.

transitional area selected for use as a potential mitigation area includes the standard Runway Protection Zone and a rectangular extension of the RPZ outward another 2,500 feet.

The acquisition of properties within the approach transitional areas north and south of the proposed runway may serve as a feasible and appropriate mitigation measure. This measure would 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 the south of the new runway ends. Commercial land uses, which make up most of the eligible area to the south, need not be acquired and may remain in place on both runway ends.

In the northern approach transitional area, 82 single-family residential parcels, 2 apartment buildings (with 28 units), and 2 mobile home parks, with 96 units, would be acquired. To the south, 71 single-family residential parcels and 6 apartment buildings (with 32 units) would be acquired. Based on the current assessed value of these 309 residential homes and multi-family buildings, it is estimated that the cost of acquisition and relocation would be approximately $35 million.

As was noted in the Final EIS, input from the affected residents is necessary to design and initiate an acceptable relocation program. Such input was solicited during the Draft EIS's 90-day public comment period and through display boards, which were created and used at the June 1, 1995 Public Hearing for the express purposes of soliciting feedback from the affected residents concerning this action. As is shown in Appendices R and T of the Final EIS, few comments concerning the program were received. Therefore, as the probable impact of low flying aircraft would not be experienced until the opening of the proposed new parallel runway, this option will receive further consideration during the forthcoming Sea-Tac Airport FAR Part 150 Update, which the Port anticipates undertaking during 1997. It is anticipated that during the Part 150 Update, the Port would further explore this action with the specific residents within the Approach Transition Area, and, if the residents so desire, establish a program including relocation objectives, timing and funding priorities.

Sound insulation of residences affected by 1.5 DNL or greater within 65 DNL noise exposure - Approximately 1,000 residents living in 460 housing units would be impacted by 65 DNL in 2010 as a result of the proposed improvements in comparison to the Do-Nothing alternative. About 170 of these homes within 65 DNL would be exposed to a 1.5 DNL higher noise levels as a result of the proposed improvements and are not already subject to the Port's existing Noise Remedy Program. No residential areas outside the existing Noise Remedy Program boundaries would experience 1.5 DNL increases in year 2005 as a result of the proposed improvements.

The Port will develop an implementation strategy to sound insulate these 170 additional homes within the 65 DNL noise contours as part of the Part 150 Noise Compatibility Plan study effort that will be initiated in 1997. The purpose of delegating finalization of the implementation approach for this action to determination during the Part 150 is to ensure that consideration is given to the proposed Approach Transition Area acquisition and the relationship of that area to the existing Noise Remedy Program boundary, as well as the westerly expansion of the Noise Remedy Program to accommodate this added insulation.

Port Resolution 3125 dated November 1992 states "Port staff is also directed to develop and implement an plan to insulate up to 5,000 eligible single family residences in the existing noise remedy program included on the waiting list as of December 31, 1993, before commencing construction of the proposed runway. The remaining eligible single family residences on the waiting list are to be insulated prior to operation of the proposed runway. In addition, the Port commits to complete insulation of all single-family residences that become eligible for insulation as a result of actions taken based on the site-specific EIS and are on the waiting list as of December 31, 1997, prior to commencing operations of said runway."

For the purpose of the Resolution, the term "eligible" is all single family properties located within the Noise Remedy Boundary, as established by the Port's 1985 Part 150 Study, with the exception of homes built after appropriate building codes were enacted after the Part 150 Study in 1985. As a result of this resolution and on-going implementation of the Part 150 Study, residents located in the Noise Remedy Boundary have come to expect the Port to complete the program, regardless of future airport facility improvements. Therefore, included as mitigation for implementing the third parallel runway, the Port agrees to insulate these single family residential areas regardless of the existing or future noise exposure.

5-7 Other Environmental Issues

Section 5-7 of the Supplemental EIS summarizes the environmental impacts associated with the remaining environmental issues. The new information, and the new forecasts, are not anticipated to result in a notable change in the impacts in the following areas. As a result, the findings in the Final EIS were summarized in this section.

1. Prime and Unique Farmland,
2. Social Impacts,
3. Human Health,
4. Induced Socio-Economic Impacts,
5. Water Quality,
6. Coastal Zone Management and Coastal Barriers,
7. Wild and Scenic Rivers,
8. Public Services and Utilities,
9. Earth,
10. Solid Waste,
11. Hazardous Waste and Materials,
12. Energy Supply and Natural Resources, and
13. Aesthetics and Urban Design.

Since publication of the Final EIS in February 1996 and the Draft Supplemental EIS in February 1997, two additional studies have been completed concerning water resources in the Airport vicinity. Section 5-7 of the Final Supplemental EIS summarizes the conclusions of these studies and the effects on the analysis presented in the Final EIS and Supplemental EIS.

Numerous appendices are included in this Supplemental EIS. **Appendix A** contains responses to comments on the February, 1996 Final EIS. **Appendix B** contains the final air conformity analysis. **Appendix C** contains a detailed presentation of the technical analysis presented in Chapter 5. **Appendix D** provides an evaluation of year 2020, based on conditions presented in Chapter 5.

As was noted previously, **Appendix F** contains a summary of the comments received on the Draft Supplemental EIS and responses to those comments. **Appendix G** contains the comments received concerning the Draft Supplemental EIS and updated draft air conformity analysis.

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CHAPTER 2

IMPACT ON PROJECT DEFINITION AND PURPOSE AND NEED

The need for airport master plan improvements are identified and scheduled based on the relationship of existing and future demand to the level of service afforded by the existing facility. Therefore, if activity levels grow slower than was forecast, facilities could be scheduled before they are needed. Conversely, if demand grows faster than anticipated, facilities could be needed sooner than the schedule indicates. The Master Plan Update improvements for Sea-Tac Airport were identified based on a forecast of aviation activity (enplaned passengers and aircraft operations), in which enplaned passengers were anticipated to grow at a rate of 2.4% per year and operations at a rate of 0.8% per year. Terminal and landside facilities were to be phased-in in a manner that would make facilities available in time to address the demand.

As is shown by the analysis presented in this chapter, aviation demand is forecast to increase above the levels predicted by the Master Plan Update. The new Port of Seattle forecast indicates that aircraft operations are anticipated to reach 474,000 annually by 2010, a level that is about 17 percent greater than the Master Plan Update forecast. Enplaned passengers are anticipated to reach 17,900,000 by 2010 or nearly 5-8 years sooner than was forecast by the Master Plan Update. These new forecasts are based on new information concerning air fares and Puget Sound Region per capita income. As these forecasts exceed the operating capability of the existing airfield, a Do-Nothing forecast of 460,000 annual operations was identified.[1/] These forecasts serve as the basis for evaluating the environmental issues presented in Chapter 5.

Based on the new forecast, the purposes and needs identified by the Master Plan Update were examined. As the Master Plan Update improvements were identified to address specific needs in specific timeframes, the primary effect of this accelerated demand is that terminal and landside facilities could be needed earlier than originally anticipated. The need for the third parallel runway would not be affected by the 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 (a condition that occurs 44% of the year).

This chapter presents:

- New Aviation Demand Forecasts
- Effects of New Aviation Demand Forecasts on Purpose and Need
- Impact of the Forecasts on the Master Plan Update Improvement Projects
- Long-Term Development Capability of Sea-Tac Airport

The environmental impacts of a demand forecast that is higher than predicted by the Master Plan Update is presented in Chapter 5 of this report.

[1/] The Flight Plan Study, referenced by the Master Plan Update Final EIS, identified a maximum operating capability of the existing airfield at 460,000 operations. This Supplemental EIS reaffirmed this constraint.

1. NEW AVIATION DEMAND FORECASTS

Aviation demand forecasting is often incorrectly perceived as a science, where all variables are predictable and known. However, as is shown by comparing any forecast to conditions that actually occur during the period that was forecast, forecasting is more an art than a science. As a result, precise forecasting for specific future years, particularly years more than 10 years in the future in the volatile air travel industry, is very difficult. It is not uncommon for forecasts to show more or less airport activity for a particular year than actually occurs. When forecasts turn out to be different than the subsequent actual experience, it is sometimes the amount of future growth which does not match reality, but much more often is the difficulty in forecasting the precise timeframe in which specified amounts of growth will occur. Although forecasts for near-term years may not match actual experience, typically those differences are relatively small. For more distant years, forecasting is much more uncertain. This uncertainty is inherent in the nature of forecasting and the nature of the air travel industry and cannot be cured by changing forecasting techniques. Multiple forecasts performed at the same time may reach different conclusions, but there is no reliable way of determining which is more likely to be correct than another. The FAA and the Port of Seattle have performed the most reliable forecasts they can, given this uncertainty. Several forecasts performed for different purposes have been compared and their conclusions are within a reasonable range.

This section summarizes the new forecasts that have been prepared since issuance of the Final EIS.

A. Revised Forecasts

In December 1996, the Federal Aviation Administration headquarters Office of Policy and Plans issued its fiscal year 1997 Terminal Area Forecast (TAF) for Seattle-Tacoma International Airport that showed that forecast demand could grow significantly faster than was predicted by the Master Plan Update. In response to these forecasts, and in an attempt to validate the work of the FAA, the Port of Seattle prepared a new (updated) demand forecast. **Table 2-1** contrasts the two demand forecasts. The Port's new forecast, while slightly lower than the FAA's forecast, shows that demand could grow faster than was previously identified, based on several new or updated information.

TABLE 2-1

COMPARISON OF DEMAND FORECASTS

(Master Plan Update, FAA TAF, and new Port of Seattle forecast)

Unconstrained ("With Project") Aviation Demand Forecast Comparison

	1995	2000	2005	2010
Operations				
Master Plan Update	N/A	379,200	392,500	405,800
FAA 1997 TAF	386,536	433,470	478,050	528,200
New Port of Seattle	386,536	409,000	445,000	474,000
Enplaned Passengers				
Master Plan Update	N/A	11,900,000	13,600,000	15,300,000
FAA 1997 TAF	11,386,000	13,920,000	16,290,100	18,950,000
New Port of Seattle	11,386,000	13,700,000	15,700,000	17,900,000

N/A = Not available

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The following subsections summarize the methodology and results of the new FAA and Port forecasts.

1) **FAA Terminal Area Forecasts**

Each year the FAA prepares a Terminal Area Forecast (TAF) for the busier airports in the country. These forecasts are prepared for FAA purposes, such as "developing its program plans and in assessing the level of resources needed to meet anticipated demand for its services."[2] While FAA also indicates that these forecasts could be used by local airport authorities in airport planning activities, the information is not prepared at a refined level (such as by fleet mix or peak periods) to enable their use in evaluating environmental impacts at a major air carrier airport. In addition, the FAA's TAF does not reflect existing facility constraints or proposed future airport improvements. **Table 2-2** lists the FAA's fiscal year 1997 TAF for Sea-Tac.

TABLE 2-2
FISCAL YEAR 1997
FAA TERMINAL AREA FORECAST

Federal Aviation Administration Terminal Area Forecast

Year	Annual Operations	Enplaned Passengers
1995	386,536	11,386,500
2000	433,474	13,920,000
2005	478,053	16,290,000
2010	528,205	18,950,000

Source: Federal Aviation Administration. December 1996.

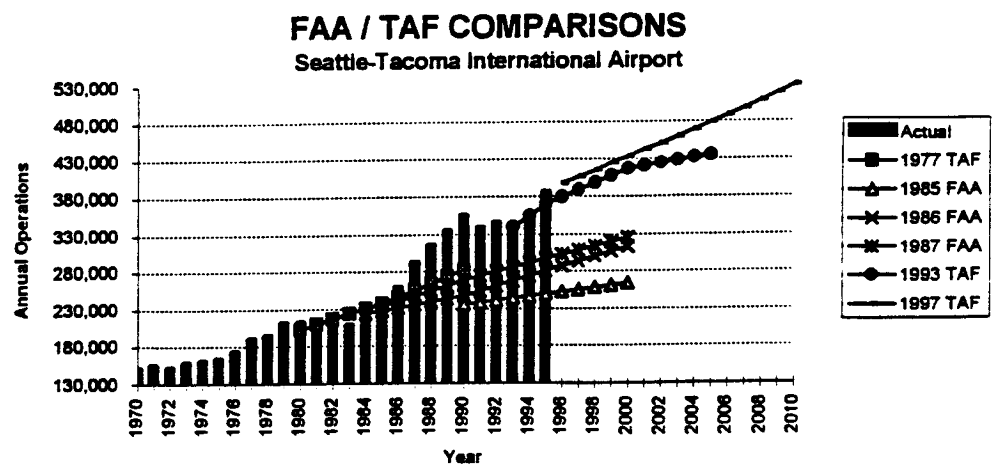
The TAF was prepared using a linear multiple regression technique based on actual data through the year 1995.[3] The fiscal year TAF for Sea-Tac is predicated on the following:

- Domestic air fares are anticipated to continue to decline at a rate of 1.2% while international airfares are anticipated to increase;
- Domestic air carrier passengers are anticipated to grow at an annual growth rate of 3.4% while international passengers are anticipated to grow at 0.6% per year;
- The domestic air carrier load factor (actual percentage of passenger occupying available seats) was assumed to remain constant at 65.3%;
- Air carrier seats per departure could increase from 153.4 in 1995 to 158.6 in 2010, based on recent year changes at Sea-Tac;
- Commuter passengers were forecast as a function of FAA's forecast of national trends in domestic enplanements;
- Commuter operations could increase at a rate of 3.8% per year, with an average seats per departure increasing from 30 in 1995 to 47.1 in 2010.

[2] *Terminal Area Forecasts - Fiscal Years 1992-2005*, FAA, July 1992, Preface page
[3] FAA internet file: http://api.hq.faa.gov/apo_pubs.htm - table of contents - page 3, Forecast Process

The FAA prepares a Terminal Area Forecast each year, based on the most recent information on how factors that affect the demand for air travel are changing. Thus, it is important to consider how accurate the FAA's TAF process has been in the past at predicting growth in air travel. **Exhibit 2-1** shows a comparison of past TAF forecasts to actual annual aircraft operations. As is shown, TAF forecasts for Sea-Tac during the mid 1980s significantly underestimated actual activity levels.

EXHIBIT 2-1



The graph above compares actual activity with forecasts that were prepared in earlier years. As this chart shows, the actual activity shows a greater deviation from the forecast further out in time, reflecting the inherent difficulties in forecasting.

2) Port of Seattle Updated Forecasts

In preparing updated forecasts for the Airport, the Port examined two specific conditions:

- Demand Forecast -- "With Project" forecast: this forecast represents an unconstrained level of demand for air travel within the Puget Sound Region. It represents the total passengers that wish to fly assuming that sufficient facilities are available to accommodate the demand. This level of activity is presumed to occur with the "With Project" alternative;
- Activity Forecast - Constrained "Do-Nothing" forecast -- this forecast represents the level of activity that the existing facilities at Sea-Tac Airport are capable of accommodating due to constraints in the airport system. These constraints could result in less than the total demand being satisfied, if demand exceeds the capability of the system.

In preparing the forecasts, first the demand for air travel was identified. The extent of the constraints associated with the existing airfield, terminal facilities, support facilities, and landside/roadway system were then identified. Then, the passengers and resulting aircraft operations forecast were prepared based on the capabilities of the system to serve that level of activity. At the point where demand exceeds the capability of a constrained system, a lesser amount of activity could be accommodated by the existing facilities (referred to as the Do-Nothing condition) versus after completion of the Master Plan Update improvements (referred to as the "With Project").

The forecasts analyzed by this Supplemental EIS reflect projected air travel demand of nearly 18 million enplaned passengers that is now predicted to occur by 2010. The Master Plan Update predicted air travel demand and identified terminal and landside improvements to address 19 million enplanements, which was predicted to occur in 2020. It is an important distinction to make that the Master Plan Update improvements were identified to accommodate a *demand*, that was once thought might occur in year 2020. Based on the new forecasts, demand could likely approach 19 million enplanements between 2010 and 2015 (about 7-8 years sooner). As this report demonstrates, greater degrees of uncertainty exist concerning the timing and amount of demand in the outlying years, as the aviation industry appears to be emerging from a decade of high volatility. Because of the uncertainty, this analysis addresses impacts through the year 2010. Appendix D presents an analysis of possible environmental impacts in 2020, based on an extrapolation of conditions in 2010.

A detailed discussion of the preparation of the new Port of Seattle Forecasts are discussed in *Working Paper 1 - Unconstrained Aviation Forecast Update* and *Working Paper 2, Constrained Aviation Forecast Update, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport*, prepared by P&D Aviation dated January 1997. This report is incorporated by reference and is available for public review during normal business hours at the FAA offices in Renton, Washington, and the Port of Seattle Offices at Sea-Tac Airport. The following summarizes the methodology and results of the two Port forecasts.

(a) <u>Demand Forecast -- With Project Forecast</u>

In updating the prediction of future aviation demand, the variables that affect demand were examined. The following primary characteristics were updated:

- passenger airfares,
- demographics of the Puget Sound Region, including population and per capita income was updated from 1992 PSRC data to 1994 PSRC data; and
- actual airport activity.

In preparing the new demand forecast for Sea-Tac Airport, the same forecast model that was used in the Master Plan Update was used. However, the Master Plan Update model was updated to reflect current activity and current growth tends. To estimate the largest component of passenger activity (domestic passengers), this model relies on two principal variables: personal income in the Puget Sound Region, and average domestic airfares.

The Master Plan Update forecast used projections of per capita income prepared by the Puget Sound Regional Council (PSRC) through the year 1992. In 1994, the PSRC updated the per capita income projection for the region, assuming that it would increase at a slightly slower rate than was previously anticipated. By itself, this new assumption would likely produce less demand for air travel.

During the Master Plan Update, many in the aviation industry anticipated that average air fares would begin to increase as a result of tremendous financial losses and airline consolidations that had been experienced during the late 1980s and early 1990s. However, the Port's new forecasts assume that airfares are likely to continue to decline. In the last several years, there has been an increase in new-entrant, low-cost airlines which has produced greater competition for passenger service. The FAA and other industry forecasters now expect the current trend toward declining airfares to continue. The Port's new forecast assumes that airfares would continue to decline at a

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rate of 1.2% annually through the year 2007. However, between 2005 and 2010, the Port anticipates that average airfares could decrease but at a slower rate. Based on published reports,[a] average Sea-Tac airfares per passenger mile have declined slightly faster than the average U.S. airfare due to competition created by Southwest Airlines and other low cost operators at Sea-Tac. Current airfares at Sea-Tac are about 17% less than the U.S. average. Thus, it is anticipated that this margin would shrink before 2010, as more eastern U.S. markets are penetrated further by low-cost carriers.

While a slightly slower per capita income assumption would result in slightly less passenger demand, the decreased air fare assumption produces an anticipated increase in demand for air travel. Thus, domestic enplanements are anticipated to increase from 10.6 million in 1995 to 15.7 million in 2010 – an annual growth rate of about 2.5%. **Table 2-3** summarizes the new "With Project" forecast.

TABLE 2-3

UPDATED DEMAND FORECAST
"With Project" Conditions

	Actual		Forecast	
	1995	2000	2005	2010
Enplaned Passengers:				
Domestic	10,600,000	12,400,000	14,000,000	15,700,000
International	800,000	1,300,000	1,700,000	2,200,000
Total Enplanements	11,400,000	13,700,000	15,700,000	17,900,000
Origin and Destination EPS	7,900,000	9,450,000	10,800,000	12,250,000
Aircraft Operations:				
Air Carrier	222,000	262,000	298,000	328,000
Air Taxi/Commuter	138,000	116,000	114,000	110,000
All-Cargo	16,000	20,000	22,000	25,000
Gen. Aviation/Military	11,000	11,000	11,000	11,000
Total Operations	387,000	409,000	445,000	474,000
Tons of Cargo	408,000	509,000	621,000	732,000
Average Day Operations	1,060	1,121	1,219	1,299
Peak Month/Average Day	1,198	1,246	1,352	1,423
Peak Hour Operations	75	78	94	99

EPS = Enplanements

Source: Port of Seattle and P&D Aviation. The Demand forecast represents the unconstrained demand seeking air travel from Sea-Tac. However, as the new parallel runway would not be completed until 2005, the year 2005 peak hour and peak month average day reflect constrained demand.

Because this projection represents an unconstrained level of activity, which could be accommodated efficiently with the proposed Master Plan Update improvements, it was used to assess the impacts of the "With Project" condition presented in Chapter 5.

[a] For example, the General Accounting Office GAO/RCED-96-79 "Airline Deregulation: Changes in Airfares, Service, and Safety at Small, Medium-sized, and Large Communities" April 1996.

(b) Activity Forecast -- Do-Nothing Forecast

The 1996 Final EIS indicated, based on the 1992 Flight Plan Study evaluation, that 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). Using the Master Plan Update forecasts, demand was not projected to be high enough to exceed this constraint [The Master Plan Update forecast 19 million annual enplanements carried on 441,000 operations in year 2010]. However, based on the unconstrained demand identified by the new forecasts, 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.

The review of activity constraints first focused on the individual capability of the airfield and the terminal/landside. As is shown in the following summary, the airfield has hourly operating constraints, which are higher than the constraints of the terminal and landside system. As a result, it is believed that passenger behavior would evolve as congestion mounts, without a loss in demand until the maximum airfield operating capacity is exceeded. Such an evolution would result in passengers incurring additional time accessing the Airport (either through congestion on the roadway system, difficulty in finding parking at the Airport, waiting in ticket check-in lines, etc.). This is the historical trend of busy, congested airports throughout the world. As a result, airfield capacity represents the greatest constraint in accommodating passenger demand.

This analysis identified an activity forecast that would likely occur if no improvements were made in the existing airport facilities, based on the following information concerning Sea-Tac Airport constraints:

Airfield Constraints - Based on the updated forecast, a review of the constraints of the existing airfield was performed.[3] This review considered: delay, airline scheduling flexibility, and passenger demand for air travel. Early studies conducted concerning Sea-Tac's existing capacity, identified 380,000 operations as the annual service volume of the Airport. This level of activity has been interpreted as an ultimate limit on the level of activity that could be accommodated by the two parallel runways. However, as is shown by current actual activity levels, demand for air travel at Sea-Tac produced nearly 387,000 operations in 1995 and 395,200 in 1996. The 380,000 annual service volume represents the threshold where inefficiencies in the airfield operating system become highly visible. As activity has exceeded the annual service volume, delay has increased.

During the FAA's 1995 Capacity Enhancement Update, delay during various operational modes was evaluated. That study confirmed the earlier capacity study, that found significant delays occur at Sea-Tac Airport during poor weather due to the close spacing between the existing parallel runways. **Table 2-4** lists projected delay associated with two forecast activity levels evaluated by the 1995 FAA Capacity Enhancement Update.

The 1992 Flight Plan Study Environmental Impact Statement found that the maximum theoretical capacity of the existing airfield is 460,000 operations, assuming that operations are extended into the late evening and early morning, and

[3] *Working Paper 2, Constrained Aviation Forecast Update, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport*, P&D Aviation, January 1997.

that greater levels of delay would be experienced. As the demand for air travel is now forecast to exceed this maximum capacity, the issue of maximum capacity was reconsidered as part of this Supplemental EIS. As is shown by the following paragraphs, the Flight Plan Study maximum capacity analysis was reaffirmed as 460,000 annual operations.

TABLE 2-4

AVERAGE ALL-WEATHER DELAY

Operations	Arrival	Departure	Estim. Taxi	Average Operation
	Average Delay (minutes) Existing Airfield			
345,000	7.7	1.3	0.1	4.5
425,000 *	22.2	2.6	0.2	12.4
525,000 *	63.7	11.6	0.4	37.7

ARRIVAL DELAY

Operations	VFR1	VFR2	IFR1	IFR2/3	IFR4	All-Weather
	Average Arrival Delay (minutes) Existing Airfield					
345,000	1.0	11.4	21.7	21.7	333.2	7.7
425,000 *	1.6	41.8	71.2	101.0	524.5	22.2
525,000 *	3.1	163.6	181.3	219.4	711.9	63.7

Source: FAA Capacity Enhancement Update, Data Package No. 12, June, 1995.
* Assumes full implementation of the 2.5 nautical mile separation.

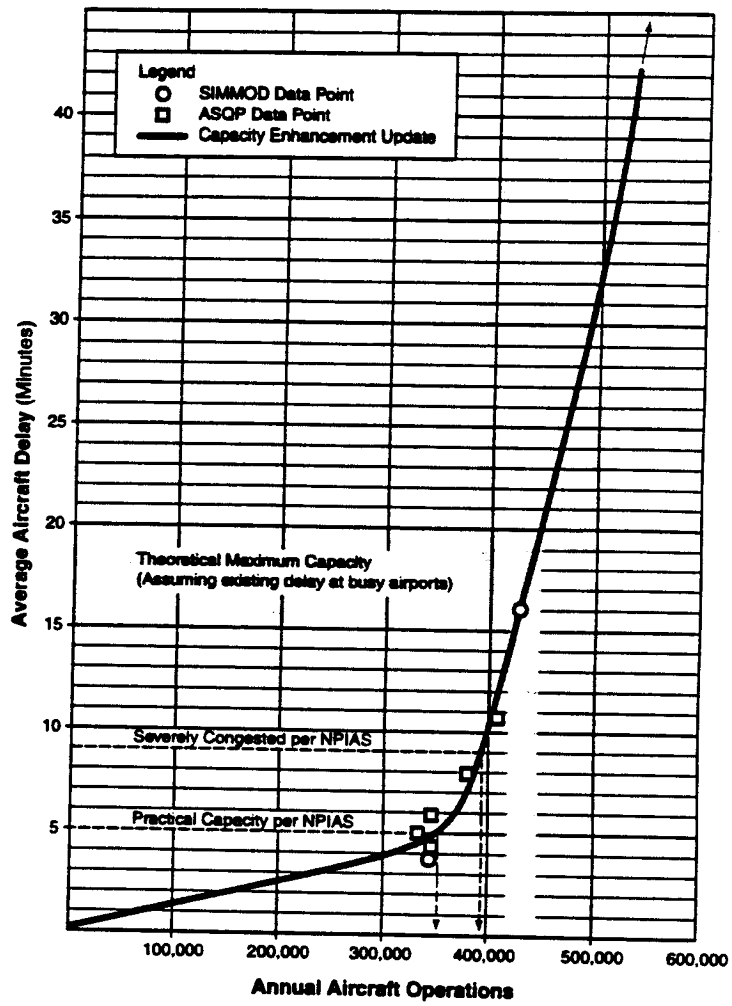
Exhibit 2-2 contrasts the results of the 1995 Capacity Enhancement Plan Update with actual current delay data, as reported by the FAA's Airline Service Quality Performance (ASQP) data. The ASQP is data collected by the airlines and reported to the FAA as a measure of the airline's on-time performance. As is shown, the computer model (SIMMOD) predicted levels of delay (identified by the curve) correspond to the actual delays reported by the ASQP data. Also shown on this chart are three ranges of activity-to-delay relationships, based on the existing fleet mix: 1) practical capacity as defined by the National Plan of Integrated Airports System (NPIAS) at 4-6 minutes of delay; 2) severely congested delay, as identified by the NPIAS at 9 minutes; and 3) a theoretical maximum capacity, assuming a constant fleet mix, based on delay actually that occurred at the busier airports.

To identify a more realistic maximum capacity level, delay at busier U.S. airports was examined. It is reasonable to assume that if delay could reach these extreme levels at other capacity constrained busier airports, that it could also reach those levels at Sea-Tac. Using the FAA's Airline Service Quality Performance (ASQP) data, the average total delay (in minutes) experienced at 10 of the busiest U.S. airports was considered. During the first eight months of 1996, the greatest levels of delay were experienced at two of the New York area airports (Newark and JFK) with 16.79 and 17.24 minutes of total average delay. The corresponding delay level at Sea-Tac was 10.72 minutes. As is evidenced by the New York airports, where demand exceeds capacity (and JFK where a Federally imposed rule caps peak hour activity), demand has grown; with the growth in activity, delay has increased. Assuming that airlines chose to satisfy the demand at Sea-Tac, delay would increase commensurably with the present airfield. Activity levels at Sea-Tac could range from 425,000 to 450,000 based on the existing fleet mix and demand profile, assuming that 15-20 minutes of delay experienced at these other U.S. airports.

Based on data produced during the FAA's Capacity Enhancement Plan, the average weather weighted level of hourly operations that could be accommodated by Sea-Tac's existing airfield was calculated as 82.5 operations (arrivals plus departures) per hour. This hourly capacity would be higher during VFR1 conditions and lower during VFR2 and IFR conditions. To calculate an extreme capacity of the existing airfield at Sea-Tac, this hourly capacity could be multiplied by the number of hours in a day, and days in the year. Theoretically, 481,800 operations would be accommodated, reflecting that air travel demand is typically concentrated into a 16 hour period (6 am to 9 p.m.) based on today's fleet mix and passenger demand profile.

EXHIBIT 2-2

Delay Curve for Existing Airfield



During Visual Flight Rule conditions, about 99 operations an hour can be accommodated on the existing airfield. However, when weather worsens to

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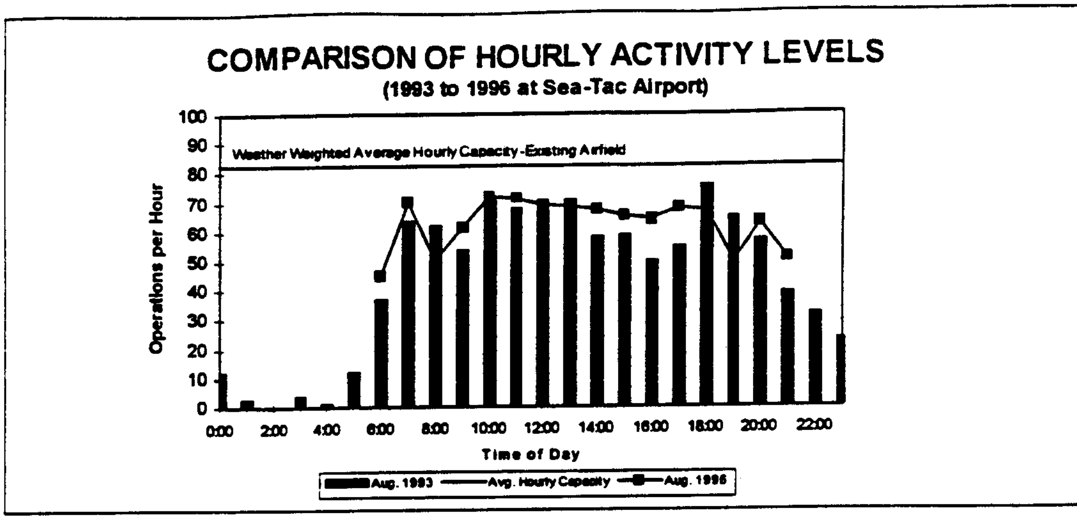
VFR2,[6] the operating capacity decreases 43% to 57 operations an hour. When weather further worsens to IFR 1/2 conditions, the hourly capacity decreases to about 50 operations (a decrease of 50% from VFR1). **Exhibit 2-3** shows the existing hourly activity levels relative to the all-weather existing hourly capability.

EXHIBIT 2-3



The unconstrained forecast indicates that over the next 10-15 years the average seat size of aircraft operating at Sea-Tac would increase from 155 seats in 1993 to 161, 166, and 170 seats per aircraft in 2000, 2005, and 2010, respectively. The percentage of aircraft with 170 seats or more is anticipated to increase from 32.2% in 1993 to 42% by 2010. Because there would be more larger aircraft in the fleet in the future, requiring greater separation, capacity would be reduced. Based on the 481,800 maximum capacity, the greater separation requirements of larger aircraft would likely result in a three to four percent reduction in capacity. The reduced separation standard, due to B757 wake vortex issues, was enacted in mid 1996,[7] and is not reflected in the hourly capacity of 82.5 operations per hour. FAA anticipates that this rule would reduce existing hourly capacity by about two percent.

Adjusting the maximum hourly operations capacity at Sea-Tac for fleet mix and traffic separation requirements, places the hourly weighted operations capacity between 456,000 and 464,000. Therefore, the mid-point of 460,000 reflects a revalidated maximum existing airfield capacity. This level of aircraft operations would translate to about 17.8 million enplanements. The ability to accommodate more than 460,000 annual operations with the existing airfield is limited by the traveling public's desire to fly at certain times. These phenomenon are discussed in detail in Appendix R of the Final EIS.

<u>Terminal/Landside Constraints</u> - As was noted in the Final EIS, the terminal and landside facilities represent less of a constraint than the existing airfield. Terminal and landside facilities, similar to the airfield, can deteriorate with lower levels of service, and still service the traveling public. Passenger trip behavior would

[6] VFR2 or worse weather (IFR) occurs 44 percent of the year. Source of hourly operating capacity, FAA Capacity Enhancement Study

[7] "Wake Vortex Analysis Preliminary Results (Annotated Slides)" CAASD by Mitre Corporation, July 1996.

evolve, as has occurred in the past at other busy airports, where efficient terminal and landside facilities are not available.

In evaluating the terminal/landside constraints at Sea-Tac, focus was placed on several components: gate usage, passenger check-in/ticket space, baggage claim, terminal drives, and parking. In 1995, Sea-Tac's 75 gates served an average of 253,330 passengers per narrow body equivalent gate (NBEG).[1] In comparison, Los Angeles International Airport (LAX) accommodated 358,170 passengers per gate and San Diego accommodated 366,970 passengers per gate. Other airports, such as Pittsburgh and O'Hare, before their current/most recent improvements, processed passengers per gate significantly higher than theses rates, closer to 430,000 - 450,000 passengers per NBEG. In addition, airports achieve these levels through the use of remote aircraft parking or hardstands, such that passengers are bussed from a central terminal to a remote aircraft parking location, using existing pavement. When air travel demand at Sea-Tac reaches 19 million enplanements (now forecast to occur after the year 2010), the average NBEG would reach 422,200 passengers/NBEG. Clearly, by comparing Sea-Tac to conditions at other airports prior to recent expansion programs is an indication that severely congested gate and terminal conditions are not sustainable over a long period. Thus, constraints at the gates and terminal would likely prevent this level from being reached. With remote hardstanding (a paved aircraft parking area where passengers are bussed from the terminal to the aircraft) of aircraft, it is assumed that 398,000 passengers per NBEG would be served at Sea-Tac. This would correspond to about 17.9 million enplanements.

The capacity of the terminal is also a function of the passenger ticketing or check-in areas. Variability in passenger check-in space is a function of check-ins that occur at the terminal curbside, check-in at the gates and airline clubs, security requirements on check-in, as well as the most recent inauguration of electronic ticketing. In 1995, about 4,600 peak hour enplanements, with 3,200 originating passengers, occurred at Sea-Tac and were served in about 29,000 square feet of lobby space. This would translate to 13 square feet per originating passenger. This equates to a level-of-service of D (adequate level of service, condition of unstable flow, unacceptable delay for short periods; adequate level of comfort),[2] based on International Civil Aviation Organization terminal guidelines. When Sea-Tac reaches 17.9 million enplanements, about 6,300 peak hour enplanements or 4,410 originating enplanements, are expected to occur. This would translate into 6.6 square feet per passenger -- or LOS F (inadequate level of service, severe congestion). As a likely result, increased pressure would occur for passengers to check-in at locations other than the terminal lobby, such as at the gate locations. While the use of other existing check-in locations would increase the passenger per square footage of lobby space, the conditions would likely still produce a LOS F. As a consequence, the delays and length in the ticket counter queues would increase such that the total travel time (time the passengers leave their home/hotel/office until they board a flight) would increase, resulting in passengers having to plan to arrive earlier at Sea-Tac in order to avoid missing their flights. This would not produce significant changes in travel behavior, but would continue to flatten the peaking characteristics of passenger access to Sea-Tac. Baggage claim space requirements are typically less of a constraint to capacity as delays in obtaining baggage do not result in passengers missing flights. However, like the ticket check-in process, passenger total travel time would increase as they await

[1] The NBEG is a measure of gates which normalizes the number of gates reflecting the differences in sizes between a widebody gate and a narrowbody gate, using a 150 seat aircraft as a reference.

[2] The scale of level-of-service ranges from LOS A, which is the most efficient/least congested, to LOS F, which is most congested/least efficient.

baggage on return trips. In turn, passengers using Sea-Tac would be more likely to carry bags on-board flights rather than wait in line to check bags.

In the future, the regional roadway system is anticipated to continue being congested regardless of the improvements at Sea-Tac Airport, as was shown in the Final Environmental Impact Statement. The Airport and regional roadway system are already operating at congested levels of service during peak operating periods. The Airport's existing curbside roadway system would reach critical capacity between noon and 1 p.m. when Sea-Tac reaches 14 million enplanements (around the year 2000), with the upper roadway system being at capacity first. When the Airport's curbside reaches capacity, passenger behavior would likely change. This could include: passengers and visitors arriving earlier for flights; passengers driving directly to the parking garage, instead of being dropped-off at the curbfront; checking-in passengers may have visitors drop them off at the deplanement level (lower level) curbfront; passengers would use off-site parking facilities and drop-off features; and visitors may not accompany passengers to the Airport.

As a result, passengers would be likely to spend an even greater quantity of time in the airport system, as roadway and parking travel time uncertainty increases. The landside modeling assumed that existing mean arrival and departure times for Sea-Tac passengers and visitors is about 30 minutes. With increased congestion in the terminal and landside system, this was assumed to increase to 45 minutes. More simply stated, to ensure that passengers do not miss their flights, they would be likely to leave their origination location earlier to assure that time is allowed in the roadway system and that sufficient time exists to park and get to the gate.

One question raised by the increasing level of terminal/landside congestion and lower level of service, is how this might affect passenger desires to drive versus fly. As is shown in the Final EIS (Page II-1 through II-5), other modes of transportation are not a feasible alternative, even with increasing roadway congestion, because less than 5% of passengers are traveling to locations within a reasonable driving distance. In addition, the amount of delay incurred on the regional roadway system would not likely be offset by the difference in the overall travel time of driving versus flying.

The passenger forecast noted in this analysis represents the number of people who are seeking air travel. As this forecast represents the demand for travel, passengers would likely increase their ground trip travel time by 15 minutes or less because of a less efficient airport system in the Do-Nothing condition. This would reduce the peak hour number of passengers accessing the Airport, from 6.300 in an unconstrained demand to 5,930 passengers with facility constraints.

Based on these constraints, a Do-Nothing forecast was prepared, as shown in **Table 2-5.**

As is found when comparing the unconstrained forecast ("With Project") to the constrained forecast (Do-Nothing), Sea-Tac is anticipated to accommodate the entire annual passenger demand for air travel assuming the levels of activity currently forecast to occur through the year 2010. While the annual demand for air travel would be accommodated, because demand would exceed the operating capabilities of the Airport system, peak hours of aircraft operations would begin to flatten and during peak hours, the hourly demand would not be satisfied. Instead, slight shifting of flights and passengers would occur, especially as demand approaches the airfield constraint of 460,000. **Table 2-6** presents the comparison of the Unconstrained ("With Project") demand to the Constrained (Do-Nothing) activity levels for the peak hour, peak month/average day (PMAD), peak month, and for the year.

Because air travel demand would not exceed the maximum annual capacity until around 2008, Sea-Tac would likely accommodate all of the forecast demand for air travel until that time. It is important to note that the peak hour of demand is being affected today by the constraints of the existing airfield. As is shown in **Table 2-6**, 88 operations could be accommodated during the peak hour if additional airfield capability were available. However, due to the constraints, it would likely not exceed 78 operations. In all years, there would likely be a slight difference in the aircraft operations levels during the peak month between what a constrained or unconstrained airfield could accommodate, because of the hourly levels of activity. Peak hour operations, if unconstrained by facilities, could reach 99 operations an hour by 2010. However, if constrained by airport facilities, peak hour operations would not exceed the present airfield capability of 82 operations per hour. On a peak month average day (PMAD) basis, constrained operations in 2010 would be about 5% less than the unconstrained (unconstrained at 1,423 operations and 1,360 constrained operations). Based on the estimated spreading of operations during the PMAD, peak hour enplanements in 2010 are projected to decrease from 10.1% of PMAD enplanements to 9.5%.

TABLE 2-5

UPDATED ACTIVITY FORECAST
"Do-Nothing" Conditions

	Actual	Forecast		
	1995	2000	2005	2010
Enplaned Passengers:				
Domestic	10,600,000	12,400,000	14,000,000	15,700,000
International	800,000	1,300,000	1,700,000	2,200,000
Total Enplanements	11,400,000	13,700,000	15,700,000	17,900,000
Origin and Destination EPS	7,900,000	9,450,000	10,800,000	12,250,000
Aircraft Operations:				
Air Carrier	222,000	262,000	298,000	320,000
Air Taxi/Commuter	138,000	116,000	114,000	104,000
All-Cargo	16,000	20,000	22,000	25,000
Gen. Aviation/Military	11,000	11,000	11,000	11,000
Total Operations	387,000	409,000	445,000	460,000
Tons of Cargo	408,000	509,000	621,000	732,000
Average Day Operations	1,060	1,121	1,219	1,260
Peak Month/Average Day	1,198	1,246	1,341	1,360
Peak Hour Operations	75	78	82	82

Source: Port of Seattle & P&D Aviation. This forecast represents the demand that could be accommodated by the current airport facilities - which, due to the constraint, is less than the total demand.
EPS = Enplanements

To accommodate the constrained level of activity, a number of congested and inefficient conditions would result:

- Gates would be used for an average of 5.0 to 5.5 flights a day. This type of gate usage would resemble today's peak hour, which would be expected to occur more frequently, as more hours of the day approach the current peak conditions;

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- Some growth in passengers processed by each narrowbody equivalent gates per year would occur as a consequence of the expected growth in average aircraft size, average load factors, and increased number of departures per gate per day;
- Remote aircraft parking and passenger loading would occur, as is used at locations such as Los Angeles, Dulles and (until the recent improvements were completed) at Pittsburgh or O'Hare.
- Much of the terminal space (ticketing, gates and baggage claims) would operate at levels-of-service F. As conditions become constrained, passengers would avoid ticketing, through advance ticket purchases, electronic ticketing, rely on carry-on baggage and/or would 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.

The Northwest Mountain Region Office of the FAA has reviewed the new Port forecasts and underlying assumptions and accepted them for use in local planning activities, such as this additional environmental analysis. Because the Port forecasts were prepared at a detailed level (peak period, peak hour, fleet mix, etc.), these forecasts were used to assess the environmental impacts associated with the higher level of aviation demand.

TABLE 2-6

COMPARISON OF DO-NOTHING TO "WITH PROJECT" ACTIVITY LEVELS

	With Project			Do-Nothing		
Operations	**2000**	**2005**	**2010**	**2000**	**2005**	**2010**
Peak Hour	78	94	99	78	82	82
Peak Month/Avg Day	1,246	1,352	1,423	1,246	1,341	1,360
Peak Month	38,600	41,800	44,000	38,600	41,500	42,100
Annual	409,000	445,000	474,000	409,000	445,000	460,000
Avg Annual Day	1,121	1,219	1,299	1,121	1,219	1,260
Enplaned Passengers						
Peak Hour	5,210	5,740	6,300	5,210	5,460	5,930
Peak Month/Avg Day	49,500	55,700	62,400	49,500	55,700	62,400
Peak Month	1,540,000	1,730,000	1,940,000	1,540,000	1,730,000	1,940,000
Annual	13,700,000	15,700,000	17,900,000	13,700,000	15,700,000	17,900,000
Avg Annual Day	37,534	43,014	49,041	37,534	43,014	49,041

Source: P&D Aviation, Working Papers #1 and #2, January, 1997.

Year 2000 "With Project" reflects the Do-Nothing activity levels, as the third parallel runway would not be available.

It is important to note that airport master plans are typically undertaken every 7-10 years; for airports with faster than average growth, master plans are often undertaken every 3-5 years. Therefore, it is anticipated that the Port of Seattle would likely undertake a new master plan for Sea-Tac near the year 2000. Because the Master Plan Update did not identify demand greater than 38 million annual passengers (MAP), facilities to accommodate a greater level of demand were not identified. However, to visualize how the proposed facilities could accommodate a greater level of demand, the final section of this report discusses the longer-term development capability of Sea-Tac. Included in this discussion are the likely constraints of the Master Plan Update improvements on future demand. **Appendix D** contains an evaluation of impacts in year 2020, based on an extrapolation of conditions in 2010.

B. Comparison of Forecasts

As this chapter describes, a number of forecasts have been prepared to date for Sea-Tac Airport. **Table 2-1** contrasts the 1996 and 1997 TAF, the Master Plan Update forecast and the new Port of Seattle forecasts. Comparison of the results and methodologies used in developing the forecasts shows that key assumptions concerning per capita income, air fares, and the costs associated with air fares, such as fuel prices have a dramatic effect on demand for air travel. If ticket prices were to increase, demand would not grow as quickly as now predicted and the forecasts prepared by the Master Plan Update would likely be more representative of that condition. However, more recently, aviation forecasters anticipate that competition would likely keep airfares low over the foreseeable future. Assuming consistent assumptions regarding per capita income, lower air fares would generate greater demands for air travel, making the forecasts prepared for this analysis probable.

To facilitate a review of the forecasts prepared for this analysis, a detailed comparison of the new forecasts was made relative to the FAA's 1997 Terminal Area Forecast and to the forecasts prepared for the Master Plan Update.

Exhibits 2-4 and 2-5 compare the Master Plan Update forecasts with the new Port forecasts and to the FAA's 1997 Terminal Area Forecast. For the year 2010, the FAA's TAF is approximately 10% greater than the Port's unconstrained operations forecast and 17% greater than the Master Plan Update forecast. The TAF enplanement forecast is also 6% greater than the Port's unconstrained forecast and 23% greater than the Master Plan Update for year 2010.

The primary differences between these forecast are:

- Differences between the Master Plan Update and the new Port of Seattle forecasts are:
  1. Personal income, as forecast by the Puget Sound Regional Council (PSRC) is now expected to be about 1.8% less than was forecast at the time the Master Plan projections were prepared for the year 2010.
  2. Domestic airfare per passenger mile was assumed by the Master Plan Update to increase from 12.27 cents (1993) to 14.28 cents by 2010. The new Port forecasts, based on FAA and industry assumptions, is anticipated to decrease from 10.34 (1995) to 9.63 cents per passenger mile by 2010.
  3. The Master Plan Update forecasts were prepared in 1994, based on actual activity levels through 1993. The new Port forecast reflects activity through mid-1996. From 1993 to 1995, annual activity at Sea-Tac increased 21% as measured by enplanements, or 14% as measured by aircraft operations. In 1996, activity continued to increase at the same rate.

EXHIBIT 2-4
OPERATIONS FORECAST COMPARISON

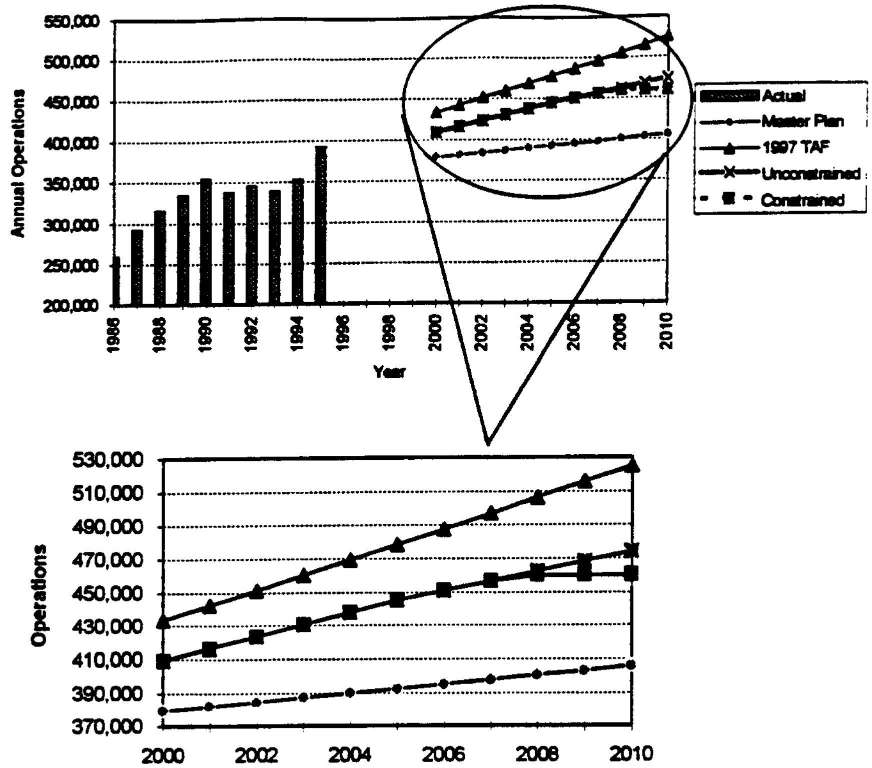
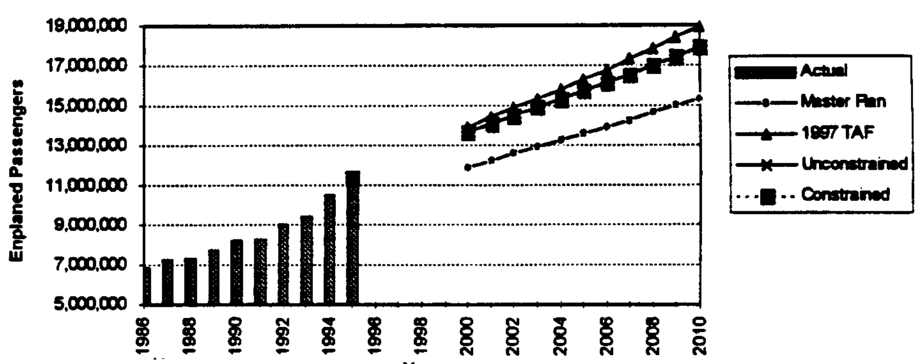


EXHIBIT 2-5
ENPLANEMENT FORECAST COMPARISON



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4. These forecast assumptions result in an increase in passenger demand forecasts from 11.9 million in 2000 to 13.7 million enplanements and from 15.3 million to 17.8 million enplanements by 2010. Aircraft operations were forecast by the Master Plan Update to reach 379,200 operations by 2000 and 405,800 by 2010. The updated forecast are 8% greater (409,000) than the Master Plan for 2000 and 17% greater (474,000) for the year 2010.

- Differences between the new Port forecast and the FAA TAF are:

  1. The FAA TAF assumes that domestic air fares nationwide would continue to decline at a rate of 1.2% while international airfares are anticipated to increase. While the new forecasts assume that airfares are going to continue to decline, research shows that Sea-Tac airfares have been declining faster than the US average. The Master Plan Update assumed that because Sea-Tac's fares had already been affected by the lower cost operators, that the decrease would not be as great between 2005 and 2010 as the US average.
  2. Consistent information was used concerning per capita income of the region.
  3. As was indicated earlier, the FAA TAF for 2010 is 10% greater than the new Port forecast for operations and 6% greater for enplanements. The Port's forecast reflects a greater growth in air carrier seats per departure than the FAA's TAF, accounting for the primary difference between the two forecasts of aircraft operations. The Port's forecast uses 1 seat per departure increase per year, whereas the FAA's uses 0.35 seats per departure. The Port's seat per departure forecast reflects a review of airline acquisitions/order information for the airlines using Sea-Tac, FAA national forecast assumptions, as well as forecasts prepared by McDonnell Douglas.
  4. The FAA TAF assumed that the air carrier load factors would remain at 65.3%, while the Port forecast assumed that the load factor would increase from 65% to 66% by 2010.
  5. The FAA TAF assumed that commuter seats would increase from 30 seats per departure to 47.1 seats by 2010. The FAA TAF commuter forecast reflects national assumptions concerning commuter activity. Based on discussions with Horizon and United Express, the Port's new forecast assumes that commuter seats would grow from 30 to 39 by 2010. The Port's forecast reflects Horizon's orders for aircraft that would be classified as air carrier, and thus would exceed the seat classification used for the commuter designation. As a result, these larger Horizon aircraft would contribute to the seat assumptions for domestic air carriers, which operate aircraft with 60 seats or more. This commuter assumption difference results in a greater number of aircraft operations in the TAF relative to the number of enplaned passengers.

Despite these differences, the FAA Northwest Mountain Region has reviewed and accepted the Port's new forecast for local planning purposes.

2. PROJECT PURPOSE AND NEED

The following four purpose and need statements were defined in the Final Environmental Impact Statement:

(1) Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay;

(2) Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim;

(3) Provide Runway Safety Areas (RSAs) that meet current FAA standards; and

(4) Provide efficient and flexible landside facilities to accommodate future aviation demand.

Each of these purpose and need statements were formed based on particular issues that were identified by the Master Plan Update. Upon examination, each of these needs were found to have separate utilities -- as the needs were separate and distinct.

Relative to the new forecasts and any new information that has come to light since the publication of the Final EIS, the purpose and need was reviewed and are discussed in the following sections.

A. <u>Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay</u>.

No new information concerning weather conditions has arisen since the Final EIS was published. Sea-Tac Airport continues to operate in an inefficient manner during poor weather conditions, defined as VFR2 (Visual Flight Rule Conditions, where ceiling is between 2,500 feet and 4,999 feet and visibility is more than 3 miles) and IFR (Instrument Flight Rule conditions - where ceiling is less than 2,500 feet or visibility is less than 3 miles). Poor weather occurs 44 percent of the year, reducing the arrival acceptance rate from 60 arrivals in good weather to 48 arrivals in VFR2 or 24 arrivals in IFR2, 3 or 4.

The Final EIS presented eight actions that had been undertaken by the FAA to reduce delay between 1989 and 1996. Thus, the preferred alternative is the development of a new 8,500-foot long runway, located about 2,500 feet west of existing Runway 16L/34R. As described in the Final EIS, a number of ways exist to quantify delay, based on the purpose of the quantification. One measure identified in the EIS, is the FAA's Air Traffic Operations Measurement System (ATOMS). This measurement quantifies the number of aircraft operations that experience 15 minutes or more of delay in any one of the four air traffic operating segments. For Sea-Tac, data through August 1996, confirms that ATOMS measured delay has substantially decreased since 1989 and has stabilized. As is described in on Pages II-12 through II-17 of the Final EIS, delay has been reduced as far as it can through other non-development actions.

The airlines also measure the efficiency of their operation at various airports by an on-time performance, and is referred to as the Airline Service Quality Performance (ASQP) measure. For Sea-Tac, while the number of aircraft operations delayed over 15 minutes have declined over the 7 year period, the airlines average on-time performance record has continued to worsen. ASQP data for Sea-Tac between 1994 and 1996 shows a steady degradation in the on-time performance by the reporting airlines. In 1994, over 80% of the arrivals to Sea-Tac were on time. By 1996 (January-September), average on-time performance had declined to about 69%. The ASQP data, while it does not identify the cause of the delay, is consistent with the FAA's evaluation during the Capacity Enhancement Update, which projected delay to continue to increase as aircraft operations increase.

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.

No new information concerning the length of runway needed to serve the Pacific Rim during warm weather periods has arisen. Based on the projected demand, the runway extension would be needed after 2010. For evaluation purposes, this project was assumed to be available in year 2010.

C. Provide Runway Safety Areas (RSAs) that meet current FAA standards.

Since the issuance of the Final EIS, the FAA has issued a record of decision for correcting the runway safety area for Runway end 34R. Upon approval, construction was initiated during the summer of 1996 and the embankment will be completed in August 1997.

Because of the need to relocate 154/156th Street South around the end of these runway safety areas and because the westerly alignment of the road would depend upon approval of the third parallel runway, the alignment of the road was evaluated in several manners:

- RSA Option 1: Alignment shown in the Final EIS (relocated around 16L, 16R and new runway 16X)
- RSA Option 2: Alignment just around 16L and 16R, and connecting back to the present alignment as soon as operationally feasible

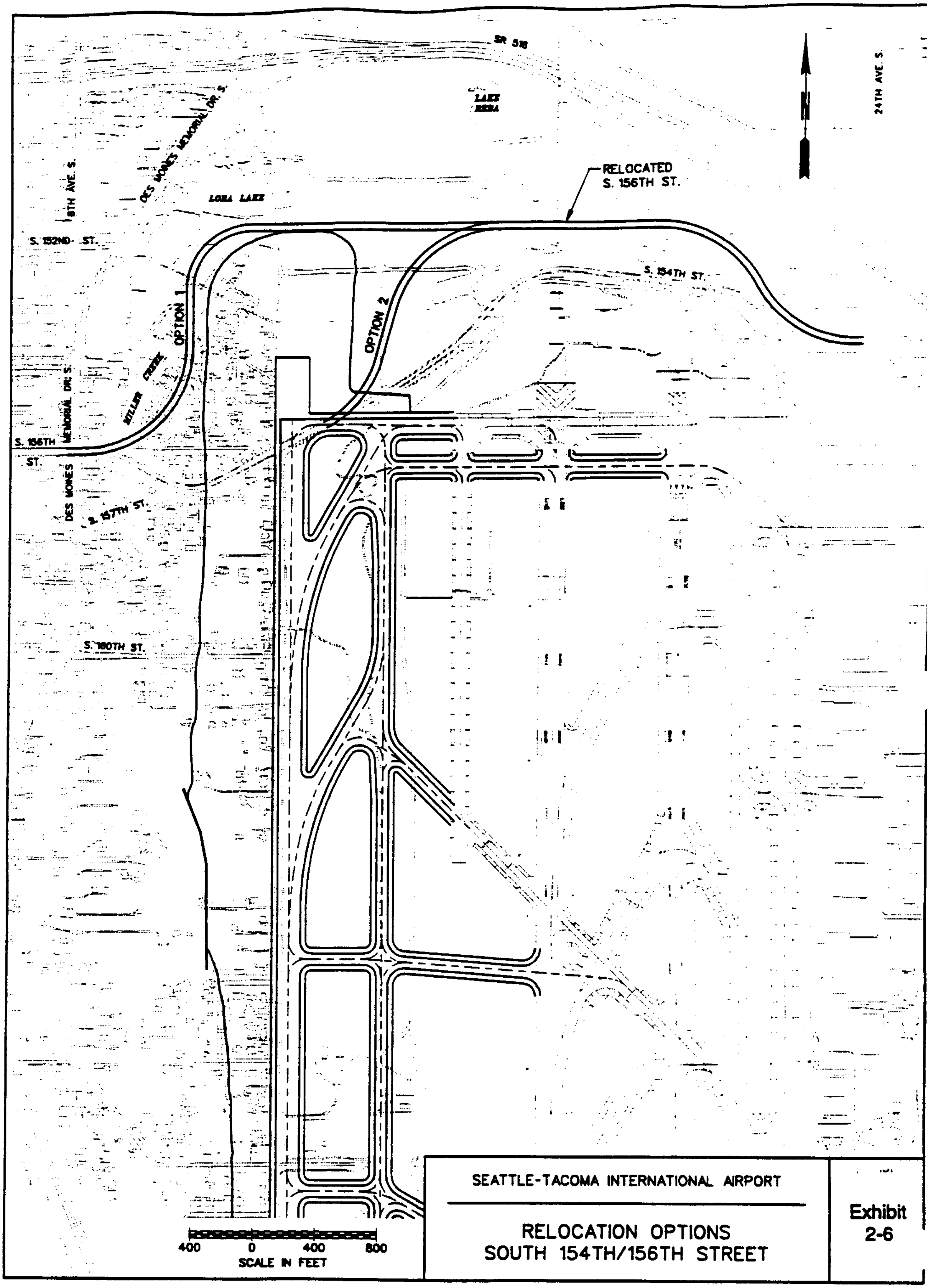
Exhibit 2-6 shows the alignments of these options. Option 1 would serve as an interim alignment until the third parallel runway is undertaken. Chapter 5 of this report summarizes the environmental consequences of these alternatives.

D. Provide efficient and flexible landside facilities to accommodate future aviation demand.

No new significant information concerning the terminal and landside facilities needed to accommodate the forecast growth in air travel was identified, with the exception of additional parking needs in the later phases of the Master Plan Update. One of the assumptions of the Master Plan Update is that facilities would be built just-in-time to accommodate growth that occurs. As a result, the timing in which several facilities would occur would be altered, which is described in the following section.

3. IMPACT OF NEW FORECAST ON THE MASTER PLAN UPDATE

During the Master Plan Update, the construction of new or expanded facilities were identified to address specific needs. The third parallel runway is proposed to address an existing operational constraint that exists during poor weather -- the limitation to a single arrival stream during poor weather. Likewise, the upgrades in the Runway Safety Areas (RSAs) are proposed to bring these areas up to current FAA safety standards. The 600 foot extension of Runway 34R and the proposed terminal and landside improvements were proposed to address growing air travel


SR 518
LAKE REBA
24TH AVE. S.
DES MONES MEMORIAL DR. S.
8TH AVE. S.
LORA LAKE
RELOCATED S. 156TH ST.
S. 152ND ST.
S. 154TH ST.
OPTION 1
OPTION 2
MILLER CREEK
MEMORIAL DR. S.
S. 156TH ST.
DES MONES
S. 157TH ST.
S. 160TH ST.
400 0 400 800
SCALE IN FEET
SEATTLE-TACOMA INTERNATIONAL AIRPORT
RELOCATION OPTIONS
SOUTH 154TH/156TH STREET
Exhibit 2-6

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demand. As a result, if demand were to grow faster than forecast by the Master Plan, or an updated forecast, additional terminal and landside facilities could be needed sooner.

Table 2-7 lists the individual elements of the Master Plan Update, by purpose and need, as they were assessed in the Final Environmental Impact Statement and indicates the assumptions of this additional analysis.[19] The additional environmental analysis, while primarily focusing on how the higher levels of aircraft and passenger traffic affect environmental conditions, also must reflect the following:

- Changes in the timing in which the Master Plan Update improvements would be needed, based on faster growing demand; and
- Changes in the projects, reflecting refinements in the proposed improvements.

The following section summarizes these effects.

A. Changes in the Phasing/Timing of Facilities

As was noted in the Final Environmental Impact Statement, projects were identified to address the purpose and need. Similarly, the discussion of purpose and need also identified the timing of the need being addressed.

- Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay. As was identified in Chapter I of the Final EIS, the disparity between good weather operating capability and poor weather operating currently occurs. The Final EIS identified that the third runway could be operational in 2000. This operational schedule was predicated on a 2.5 year construction haul to place the 17 million cubic yards of fill, with a 4 year embankment construction. Upon re-examination, Port staff now recommend that the third runway be operational by 2005. This schedule reflects a 1 year initiation of acquisition, hauling of fill for 5 years, a 1 year for the fill to settle, and 1 year to construct the runway.

  Reconsideration of the completion date of the new runway is a reflection of the examination of financial resources in light of accelerated need for terminal/landside facilities in addition to the runway. As this document identifies, as passenger demand increases, terminal and landside improvements will be necessary at Sea-Tac. For most passengers, their first experience with the airport system, is in the terminal and landside portions of the system. Whereas today, inefficiencies occur due to the poor weather related airfield system, in the future it would be the entire passenger system and sooner than was predicted by the Master Plan Update. Recognizing the terminal and landside needs, and the competition that could exist between funding for the runway and these other improvements, a slower runway construction schedule was examined. Based on these issues, Port of Seattle staff developed construction phasing plans that balance the terminal/landside facility requirements and funding issues, with the timing of completion of the runway.

  The five-year delay in the commissioning of the third parallel runway would cause significant inconvenience to the traveling public and additional costs to airport users. As described in the February, 1996 Final EIS, poor weather delay costs travelers time and aircraft operators incur additional operational costs. Delay at Sea-Tac in 1993 resulted in

[19] All "With Project" alternatives would require the Phase 1 development shown in Table 2-7. All differences in later phases would depend on the terminal configuration (i.e., North Unit Terminal, South Unit Terminal).

TABLE 2-7
Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

MASTER PLAN UPDATE IMPROVEMENTS - PHASING

Project	Changes in Phasing or Projects Definition
New Parallel Runway and associated operational procedures and taxiways	
Acquisition of land for the new parallel runway	*1996-2000 As the runway moves to the 2nd phase, acquisition is now separately identified*
Relocation of ASR and ASDE	*1996-2000*
Relocation of S.154/156th around 16X end	*1996-2000 Not previously separately identified*
Temporary construction interchange off SR-509 and SR-518	*Previously assumed Not previously separately identified*
Construction of the new parallel runway	*1997-2004 First year of operation 2005*
Extension of Runway 34R by 600 feet	*2010*
Clearing and Grading For the Runway Safety Areas	
Development of the RSA embankments	*1996-2000*
Relocation of S.154/156th around 16L and 16R RSAs	*1996-2000 Not previously separately identified*
Terminal and Landside Improvements **1996-2000 (Phase I)**	
Expansion of Concourse A, *including expansion of Main Terminal at A*	No Change - *clarification of action*
Improvements to the Main Terminal roadway and recirculation roads, *including a partial connection to the South Access Roadway and a ramp roadway from the upper level roadway to the airport exit*	No Change - *clarification of action*
Overhaul and/or replacement of the STS	No Change
Expansion of the main parking garage to the South,. *North and East*	*Phase II and III expansion of the main garage was moved to this phase.*
Construct first phase parking lot north of SR 518 for employee use (3500 stalls).	*Moved from Phase III (2006-2010) to Phase 1 (1996-2000*
Construction of the overnight aircraft parking apron	*Not previously separately identified*
Construction of the new air traffic control tower/TRACON	No Change
Removal of the displaced threshold on Runway 16L	*Not previously separately identified*
Relocation of Airborne Cargo due to new Control Tower	No Change
Expansion or redevelopment of the cargo facilities in the north cargo complex	No Change
Development of a new snow equipment storage facility between RPZ and 34L and 34X	No Change
Site preparation at SASA site for displaced facilities	No Change
Removal of the Northwest Hangar - replacement in SASA	No Change
Development of a ground support equipment location at SASA	*Previously assumed, but not separately listed*
Development of GA/Corporate aviation facilities in SASA or north airfield location	*Previously listed as 2001-2005*
Development of a new airport maintenance building *and demolition of existing facility*	*Moved from Phase II (2001-2005) to Phase 1 (1996-2000)*
Development of on-airport hotel	No Change
Development of the Des Moines Creek Technology Campus	No Change

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TABLE 2-7

Sea-Tac International Airport
Supplemental Environmental Impact Statement

MASTER PLAN UPDATE IMPROVEMENTS PHASING

2001-2005 (Phase II)	
Dual taxiway 34R	No Change
Improved access and circulation roadway improvements at the Main Terminal, *provide upper roadway transit plaza at Main Terminal*	No Change *Plaza moved from Phase III (2006-2010) to Phase II (2001-2005)*
Additional expansion of the main parking garage	No Change
Expansion of the north employee parking lot (North of SR518) to 6,000 stalls *including improvements to the intersection of S. 154th/24th Ave. S.*	*Added intersections improvements to address this lot and the ramps associated with the North Unit Terminal at 24th Ave. S. at SR 518*
Construction of second phase of overnight apron	*Was assumed completed in Phase I*
Development of the first phase of the North Unit Terminal (south Pier), *development of the ramps off SR-518 near 20th Ave. S. and intersection improvements to S. 160th St. to address surface transportation issues associated with the closure of S. 170th Street to through traffic.*	*Moved from Phase III (2006-2010) to Phase II (2001-2005, identified the ramps separately, and added surface transportation improvements at S. 160th Street/International Blvd.*
Construct first phase of the North Unit Terminal parking structure for public and rental cars	*Moved from Phase I (1996-2000) to Phase II (2001-2005)*
Development of the North Unit Terminal Roadways	*Moved from Phase III (2006-2010) to Phase II (2001-2005)*
Interchange near 20th/SR-518 for access to cargo complex	*Previously included in the project above, now for clarity, separately identified*
Relocate ARFF facility to north of the North Unit Terminal	*Moved from Phase III (2006-2010) to Phase II (2001-2005)*
Additional improvements to the South Access Roadway connector	*Moved from Phase III (2006-2010) to Phase II (2001-2005)*
Relocation of the United Maintenance complex to SASA	*Not previously separately listed*
Continued expansion of the north cargo facilities	No Change
2006-2010 (Phase III)	
Expansion of North Unit Terminal (North Pier)	*First phase is now in Phase II*
Additional taxiway exists on 16L/34R	*Moved from Phase IV(2011-2020) to Phase III (2006-2010)*
Complete connectors to South Access Roadway (to eventual SR 509 Extension and South Access)	*Now separately identified*
Additional expansion of main parking garage	*New Project*
Additional Expansion of north employee lot to 6,700 stalls	No Change
Further expansion or redevelopment of north cargo complex	No Change
Expand North Unit Terminal parking structure for public parking	No Change
2011-2020 (Phase IV)	
Development as needed to accommodate growth in demand	No change
SR 509 Extension/South Access	*Not previously listed / part of Do-Nothing and With Project*

nearly 26,000 hours of delay, with a cost of $42 million. As activity levels have increased nearly 16% between 1993 and 1996, continuing the increase in passenger inconveniences and delay.

Poor weather related arrival delay would not be resolved and as activity levels grow, delay levels would be expected to increase. The Final EIS and Table 2-4 summarize the delay conditions that will occur as demand increases. By 2000, when activity is now anticipated to reach 409,000 annual operations, average all weather delay levels will have increased to about 11 minutes. By 2004, activity would reach 437,000 operations annual which would result in average all weather delay levels of over 23 minutes. Thus, the during the period in which the runway is not available, the growth in air travel demand is expected to result in an increase in total average all weather delay by about 155%.

However, as a practical matter, the third parallel runway cannot be completed much sooner than 2004. Obstacles exist to fast-track development of the third runway including: limitations on financial resources and the short time available to acquire and relocate residences and businesses. Thus, the new phasing plan represents a compromise, which among other things, will sacrifice considerable bad-weather airfield reliability and service for several years.

The year 2005 could be the first full year of operation of the third parallel runway. The differences between the shorter construction period presented in the Final EIS, and the construction phasing of this additional analysis bracket the likely conditions that could occur in building the runway.

- <u>Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim.</u> The extension of 34R was identified as needed between 2015 and 2020. Based on the updated forecasts, the same levels of activity are now likely to occur by 2010.

- <u>Provide Runway Safety Areas (RSAs) that meet current FAA standards</u>. As was identified in the Final EIS, the Port has entered into grant assurances that require it to bring these RSA's into compliance. To date, only 16L and 16R require action to bring these runway ends up to meeting the current RSA standard. Thus, upon environmental approval, these improvements would be anticipated. As a result, they would remain in the first phase (1996-2000) as was identified in the Final EIS.

- <u>Provide efficient and flexible landside facilities to accommodate future aviation demand</u>. The proposed terminal and landside improvements were identified to address growth in passenger, cargo, and aircraft operations up to 19 million annual enplanements. As the updated forecasts now anticipate that 19 million enplanements could be reached soon after the year 2010 (instead of 2020), the timing of facilities was altered. As a result, the projects that were slated to be implemented by 2005, have now been scheduled to occur by 2000. Similarly, projects slated to occur by 2015 were accelerated in the schedule to occur by 2005 and projects slated to occur between 2016-2020 were accelerated to 2010.

B. <u>Changes in the Project Definition/Location</u>

The following refinements were made in the Master Plan Update improvements:

- <u>Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay</u>. No changes were made in the third runway project. However, to clarify the various elements of this project that were assessed in the Final EIS, the relocation of S. 154th/S. 156th has now been separately identified, as well as the relocation of the navigation aids, and the possible construction of a temporary interchange off SR-509 and SR-518 to enable haul vehicles to directly exit these roads onto airport property.

- Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim. No changes were made in this project.

- Provide Runway Safety Areas (RSAs) that meet current FAA standards. No changes were made in the RSA projects. However, to clarify the various elements of the 16L and 16R RSA projects that were assessed in the Final EIS, the relocation of S. 154th/S. 156th has now been separately identified.

- Provide efficient and flexible landside facilities to accommodate future aviation demand. The majority of changes in the terminal and landside related to earlier timeframes for these projects. To clarify projects that were assessed in the Final EIS, several other terminal and landside projects were separated from a larger project and are now listed individually in the table (e.g., overnight parking apron, development of a ground support equipment facility, etc.). Several changes in the project definition are reflected in the table. First, additional expansion of the Main Parking Garage would occur in the 2006-2010 timeframe over what was examined in the Final EIS, which reflects additional flexibility in how parking demand could be satisfied. Second, in expanding the North Employee Parking Lot (North of SR 518) between 2001-2005, improvement to the intersection of S. 154^{th}/ 24^{th} Avenue S would be needed. These improvements would include construction of dual northbound left-turn lanes, an additional westbound departure lane, construction of a southbound right-turn lane and construction of a right turn lane, as well as changes in the signalization. Finally, the development of the North Unit Terminal (in Phase II 2001-2005) at S. 170^{th} Street would cut off access through Airport property from eastern SeaTac to western SeaTac, as public traffic uses S. 170^{th} Street/Air Cargo Road/S. 154^{th} Street. As a result, the completion of the North Unit Terminal would include improvements to S. 160^{th} Street to address additional traffic through this intersection that would have used S. 170^{th} Street. Improvements include: construction of dual northbound turn lanes, construction of a high capacity eastbound right-turn lane, and signalization changes. Such improvements at S. 154^{th}/24^{th} Avenue South and International Blvd./S. 160^{th} Street are reflected in the City of SeaTac Transportation Improvement Plan.

The changes in the timing of proposed improvements, in accordance with changes in forecast demand, as well as the refinements in the projects, were reflected in the additional environmental analysis documented in Chapter 5.

4. LONG-TERM DEVELOPMENT CAPABILITY

One of the predominant comments made by opponents of the proposed runway and Master Plan Update improvements is that the improvements have a short life; that a new airport would be needed in the future to serve the air travel demand of the Region. The Master Plan Update improvements were developed to accommodate a forecast demand for air travel of 19 million enplanements or 38 million annual passengers (enplanements and deplanements). Therefore, the capabilities of the future airport facilities were examined relative to their longer-term capability; key elements of airport facilities were examined to determine how many passenger and/or aircraft operations could be served.

(A) Airfield Capability With A Third Parallel Runway

Based on the same evaluation methodology used in assessing the operating constraint associated with the existing airfield, the operating capability of a third runway airfield was assessed. The 1995 FAA Capacity Enhancement Plan Update did not identify a weighted hourly operations for a third runway airfield. Therefore, no extrapolations can be prepared using that methodology. Instead, the following three conditions were considered: 1) practical capacity as defined by the National Plan of Integrated Airports System (NPIAS) at 4-6 minutes of delay; 2) severely congested delay, as identified by the NPIAS at 9 minutes; and 3) a Theoretical Maximum Capacity, assuming a constant fleet mix, based on delay at the busier airports.[11]

Exhibit 2-7 contrasts the delay curve of the existing airfield with comparable delays if a third runway were available. Also shown on the exhibit are the three delay conditions. As is shown, with a third runway, Sea-Tac would reach its theoretical maximum capacity at 600,000 to 630,000 annual operations. Using a linear extension of the updated forecasts, this would likely occur after the year 2030. With improvements in technology (air traffic technology and video conferencing) that are anticipated to occur around the year 2020, this could likely extend the operating capability of Sea-Tac well beyond 2030.

(B) Terminal Capability With the Master Plan Update Improvements

As is described in Master Plan Technical Report 7A, the Master Plan Update terminal facilities were anticipated to accommodate a forecast of 19 million enplanements or 38 million annual passengers. With the proposed terminal facilities identified by the Master Plan Update, the airport's narrowbody equivalent gates (NBEG) would increase from 90 to about 120 NBEG. The gate use per passengers would reach 317,000 passengers per NBEG which is greater than today's gate usage. As activity levels grow beyond 19 million enplanements, levels of service would decline. Beyond 19 million enplanements, either additional gates could be necessary or remote parking locations would be needed to accommodate passengers during peak periods. To achieve the gate use assumed by the Do-Nothing/constrained forecast (396,000 passengers/NBEG), enplanements would reach 23.7 million (48.4 MAP). Assuming a linear extension of the new Port forecasts, this could occur by 2024. However, to maintain an efficient terminal/landside operation, it would not be preferable to allow the level-of-service to deteriorate.

As a consequence, it would be anticipated that additional terminal and landside facilities could be necessary between 2010 and 2020, well before additional airfield capability would be needed, if demand were to continue to grow at the current rate. In examining terminal options, several issues became apparent. First, the preferred concept (the North Unit Terminal), could be expanded beyond the footprint identified by the Master Plan Update. This expansion would come at the cost of displacing adjoining cargo and support facilities currently located along Cargo Drive. Expansion in this fashion could result in the addition of one or more pier like concourses in a northerly direction from the new terminal. If this were not desirable, the option of pursuing continued expansion from the Main Terminal in a southerly direction, similar to the Master Plan Update's South Unit Terminal expansion might be possible. A future Master Plan for Sea-Tac would be expected to examine and identify any terminal improvements to accommodate more than 19 million enplanements.

(C) Landside Capability With the Master Plan Update Improvements

As is described in the Master Plan Update and Final Environmental Impact Statement, the roadway system in the immediate airport vicinity currently operates at a very low level of

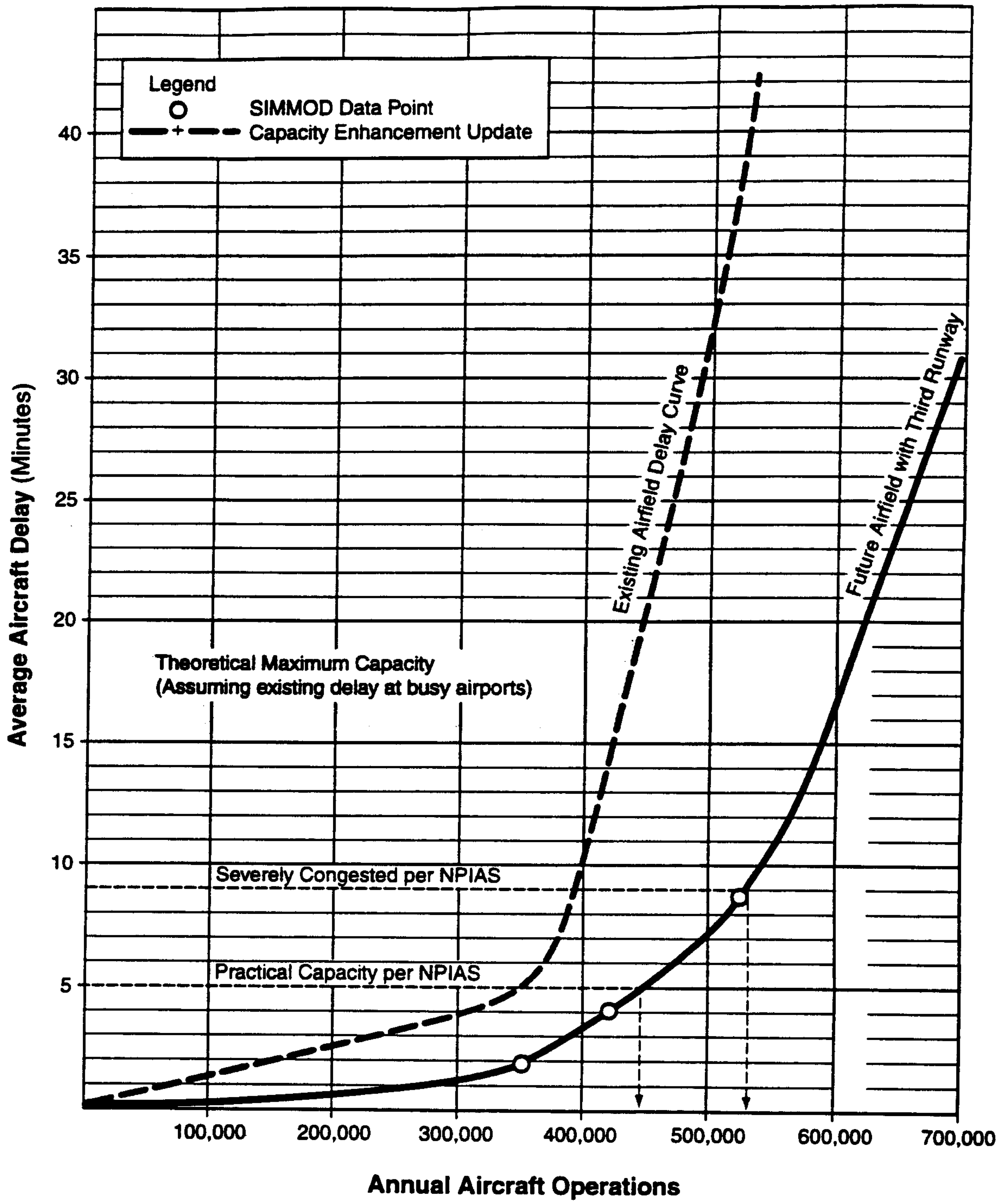
[11] *Working Paper 1, Unconstrained Aviation Forecast Update, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport*, P&D Aviation, January 1997.

service and is expected to continue to operate at a low level of service. As airport activity is anticipated to grow in proportion to the growth in population and per capita income, a similar or greater growth is anticipated in use of regional roadways by non-airport related traffic. By 2020, the Final EIS (and this Supplemental EIS as well as regional planning documents) anticipate that most of the intersections along International Blvd. (SR 99) in the immediate airport vicinity would operate at Levels of Service D or F, regardless of whether improvements are undertaken at Sea-Tac. As the region continues to grow, and greater demands are placed on the conventional roadway travel system, greater and greater roadway related delays would be anticipated. Therefore, in the long-run, surface transportation is likely to serve as the greatest constraint to the long-term development of Sea-Tac Airport.

Recognizing the significance of congestion on the regional roadway system, the region has had under consideration various initiatives, such as the Regional Transit Authority (RTA) plan. Additional surface travel relief would be anticipated as a result of the Region's approval of the RTA plan to develop a light rail system. Current plans for the light rail would connect Sea-Tac Airport with downtown Seattle and portions of north Seattle. The RTA plan was included in the 1995 Metropolitan Transportation Plan for the Puget Sound Region and is anticipated to be complete by 2010. As a result, it was reflected in the Final EIS as well as this additional environmental analysis. Such a system could serve passengers and employees using the Airport. It is anticipated that the RTA's availability between 2010 and 2020 would reduce the pressures on the regional and airport roadway network.

EXHIBIT 2-7

Delay Curve for Future Airfield



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CHAPTER 3

ALTERNATIVES

The February, 1996 Final EIS contains a detailed presentation of the alternatives available to address the Master Plan Update needs and purpose. The EIS identified five to seven categories of options (alternatives for each individual need discussed in Chapter 2), as shown in **Table 3-1**. As the airport functions as a system, options that would satisfy the need were then examined relative to the overall airport system; individual options were grouped into alternatives. The following alternatives (and their key facets) were found to address the underlying need:

- Alternative 1 - Do-Nothing/No-Build (while this alternative would not satisfy the needs, it is an alternative required by the State and National Environmental Policy Act);
- Alternative 2 - Central Terminal Development with a third runway having a length up to 8,500 feet;
- Alternative 3 (Preferred Alternative) - North Unit Terminal with a third runway having a length up to 8,500 feet; and
- Alternative 4 - South Unit Terminal with a third runway having a length up to 8,500 feet.

Exhibits 3-1 through 3-4, located at the end of this chapter, show these alternatives.

The following sections summarize the alternatives and show that no new significant information has arisen that would alter the finding associated with the alternatives.

1. Improve The Poor Weather Airfield Operating Capability In A Manner That Accommodates Aircraft Activity with an Acceptable Level of Aircraft Delay.

Seven option categories were identified to address this airfield need. As is shown in the following sections, two changes in the information underlying these alternatives have occurred due to the new forecasts and additional information. However, this information does not alter the conclusions concerning the reasonableness or feasibility of any alternative.

(A) Use of Other Modes of Transportation Alternatives

Alternative modes of transportation were evaluated in terms of their capability to divert passengers and cargo from Sea-Tac by offering alternative modes of transport. Of critical importance to the evaluation are such factors as trip characteristics and travel needs of freight shippers and air passengers and the feasibility of using alternative modes. While demand is growing faster than predicted, the relative levels of activity generated by cities that could be served by these other modes has not altered (i.e., less than 5% of passengers are demanding air service to locations which could be served by alternative modes).

- **Bus and Automobile Modes** - A review of the trip characteristics of air travelers who utilize the Airport indicates that a majority (95%) begin or end their trip at a point more than 500 miles from the Puget Sound Region. Beyond 250 air miles or 500 roadway

TABLE 3-1

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Seattle-Tacoma International Airport
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SUMMARY OF ALTERNATIVES CONSIDERED

(1) Improve The Poor Weather Airfield Operating Capability In A Manner That Accommodates Aircraft Activity With An Acceptable Level of Aircraft Delay

Alternative	Evaluation
A. Use of Other Modes of Transportation	Not considered further, as this alternative would not address the poor weather operating issues at Sea-Tac. Less than 5% of passengers using Sea-Tac are traveling to distances where surface transportation is efficient and cost effective.
B. Use of Other Airports or Construction of a New Airport	Not considered further. Regional consensus has been established through PSRC EB-94-01 as: 1) there is no sponsor or funding for a new airport; 2) Extensive studies of these alternatives indicate that there are no feasible sites. The FAA and Port have independently concluded that a new airport would not satisfy the needs addressed by the Master Plan Update EIS and this additional environmental evaluation.
C. Activity/Demand Management	Not considered further, as these actions would not eliminate Sea-Tac Airport's poor weather operating needs.
D. Runway Development at Sea-Tac	To be considered further: Runway lengths from 7,000 feet to 8,500 feet (the preferred alternative is an 8,500 foot long runway located 2,500 west of 16L/34R) were considered.
E. Use of Technology	Not considered further. No technologies currently exist, or are planned, to address the poor weather operating constraint at Sea-Tac.
F. Delayed or Blended Alternative (Combination of other modes, use of existing airports, and activity/ demand management)	The net result of this alternative would be a delay in the implementation of the Master Plan Update alternatives. As is shown by this analysis, the Port staff recommends a balance between the needs of the airport with available financing. As a result, the analysis addressed by this Supplemental EIS reflects a delayed opening of the runway and a slower construction schedule.
G. Do-Nothing/No-Build	Was considered in detail by the EIS and this additional environmental analysis.

(2) Provide Sufficient Runway Length to Accommodate Warm Weather Operations Without Restricting Passenger Load Factors or Payloads For Aircraft Types Operating to the Pacific Rim

Alternative	Evaluation
A. Extension of Runway 16L/34R to 12,500 feet	Was considered in detail by the EIS and this additional environmental analysis, as this is presently the longest runway.
B. Extension of Runway 16R/34L to 12,500 feet	Not considered further due to the cost of addressing impacts to S. 188th Street.
C. Development of a new 12,500 ft long runway	Not considered further due to substantial community disruption and unnecessary cost that would result.
D. Delayed Alternative	Not considered further, as it would not address the needs of Sea-Tac
E. Do-Nothing/No-Build	Was considered in detail by the EIS and this additional environmental analysis.

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Seattle-Tacoma International Airport
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SUMMARY OF ALTERNATIVES CONSIDERED

(3) Provide Runway Safety Areas (RSAs) that Meet Current FAA Standards

Alternative	Evaluation
A. Displaced Threshold/Declared Distance Procedures	Considered as the Do-Nothing/No-Build in detail by the EIS and this additional environmental analysis.
B. Clearing, grading and development of areas for 1,000 feet beyond the existing pavement	Was considered in detail by the EIS and this additional environmental analysis. This additional analysis clarifies the independent issues associated with relocating S. 154th/156th.
C. Clearing, grading for 1,000 feet including the 600 ft extension to 34R	Was considered in detail by the EIS and this additional environmental analysis.
D. Delayed Alternative	Not considered further, as it would not address the RSA requirements. However, this would be the same as the Do-Nothing.
E. Do-Nothing/No-Build	Was considered in detail by the EIS and this additional environmental analysis. It reflects the declared distances option.

(4) Provide Efficient and Flexible Landside Facilities to Accommodate Future Aviation Demand

Alternative	Evaluation
A. Use of Other Modes of Transportation	Not considered further. as less than 5% of the future passengers using Sea-Tac are traveling to distances where surface transportation is efficient and cost effective and likely to be used.
B. Use of Other Airports or Construction of a New Airport	Not considered further. Regional consensus has been established through PSRC EB-94-01 as: 1) there is no sponsor or funding for a new airport; 2) Extensive studies of these alternatives indicate that there are no feasible sites.
C. Activity/Demand Management	Not considered further, as these actions would not reduce demand.
D. Landside Development at Sea-Tac	Was considered in detail by the EIS and this additional environmental analysis. Three primary alternatives to be considered further: Central Terminal Development, North Unit Terminal Development and South Unit Terminal Development.
E. Delayed or Blended Alternative (Combination of other modes, use of existing airports, and activity/demand management)	The net result of this alternative would be a delay in the implementation of the Master Plan Update terminal and landside development. Because there is no commitment to any individual or combination of other alternatives and because aviation activity levels are currently growing at a rate higher than forecast by the Master Plan Update, this alternative was not considered further.
F. Do-Nothing/No-Build	Was considered in detail by the EIS and this additional environmental analysis.

Source: Landrum & Brown and Synergy Consultants, Inc.

miles, alternative modes of transportation become less desirable. Further making this alternative less desirable is the winter road conditions which can make road access between eastern-western Washington cities undependable because of snow in the mountains. Thus, it can be concluded that bus and automobile modes are not a feasible alternative to accommodating forecast air traffic demand or in addressing the existing poor weather operating needs at Sea-Tac.

- **Rail Technology** - The feasibility of rail as an alternative is contingent upon the ability of rail service to successfully compete with air transportation in markets within 500 miles of Sea-Tac. Three rail alternatives offering different levels of service were reviewed and evaluated: (1) High Speed Rail Service, with speeds over 150 mph; (2) Conventional Rail Service, with maximum speeds of 125 mph; and (3) Current Rail Service, with maximum speeds of 79 mph. Based upon the review and evaluation performed for the Final EIS and the activities of the 1996 PSRC Expert Panel on Demand/System Management and Noise, it was concluded that rail service improvements would not have a substantial effect on the level of operations at Sea-Tac International Airport before 2020. Factors leading to this determination include: (1) air passengers traveling to markets within 500 miles of the Airport comprise less than 5% of all passengers at Sea-Tac, so the potential impact of diversions is limited; (2) the potential for current or improved conventional rail service to divert a significant number of passengers from air is low, since travel times and frequency of service are not competitive with air travel; (3) true high speed rail service that could compete with air transportation will not be implemented until after 2020; (4) increases in rail ridership are projected to continue to come from the pleasure and discretionary travel markets; and (5) funding for needed rail improvements is not committed beyond the two year appropriation by the State. The accelerated demand at Sea-Tac would not be expected to alter the scheduling of investments or reverse this conclusion.

- **Telecommunications and Video Conferencing** - Video technology has been around for almost 30 years, and offers (with service improvements) the potential to serve a portion of the air travel market throughout the country. With technology that has been developed but available in limited quantities, video conferencing and collaborative computing could serve as an alternative mode of satisfying the need for air travel.

  Applying the findings of telecommunication studies to the situation at Sea-Tac, less than 5% of air travel demand could be satisfied by communication technologies by the year 2010 (when data and video-conferencing is expected to be available on a limited basis within most companies). By 2020, when such technology is expected to be widespread (on most desks - similar to the availability of desktop computers today), it would reduce air travel by less than 9%. The accelerated demand at Sea-Tac would not likely alter the timing of nationwide development and use of innovative technology.

(B) Use of Other Airports or Construction of a New Airport Alternatives

The development of a new airport (either a replacement or a supplemental airport) would not address the poor weather conditions at Sea-Tac or serve the demand for air travel in the Puget Sound Region for the following key reasons:

1. There is no sponsor, identified source of funds, or acceptable site for a new airport;
2. Extensive study of this issue resulted in the consideration of all alternatives for addressing air transportation capacity issues in this Region. Based on this process, the Puget Sound Regional Council (PSRC) adopted Resolution A-93-03 and EB-94-01 confirming that no feasible sites exist. The Port of Seattle and the FAA have reviewed the regional planning studies and have independently concluded that a supplemental airport would not satisfy the needs addressed by the Final EIS and this additional environmental analysis; and

3. Neither the lack of a sponsor, nor the conclusion of the PSRC process appears to depend on the level of anticipated demand for air travel in the region; and

4. If a supplemental airport site could be identified, market forces would not enable it to successfully compete with Sea-Tac until regional origin and destination air travel demand exceeds 10 million enplanements annually. Using the new forecasts, Sea-Tac is anticipated to accommodate 10 million origin & destination annual enplanements around the year 2005, about 5 years earlier than identified in the Final EIS due to the accelerated demand. As is noted in the Final EIS, air carriers typically find that to initiate operations at a new facility requires demand for 20-30 operations per day. This would amount to about 1 million enplanements a year or 10% of Sea-Tac's enplaned passengers. As described on Page II-10 of the Final EIS, when origin & destination enplanements are less at one competing facility, competition entices traffic to stay at the facility with the greater level of service. As a result, a supplemental airport site would not off load sufficient demand to address the current poor weather operating constraints at Sea-Tac. Therefore, the increased demand would not alter the conclusions concerning this alternative.

(C) Activity or Demand Management Alternatives

The primary objective of activity management alternatives is to increase airport efficiency by the airport operator's establishment of pricing or regulatory actions, thereby delaying or eliminating the need for future airport development. The Flight Plan Study concluded that "... demand management measures will at best delay for a few years the need for capacity improvements. For purposes of this analysis, therefore, it was assumed the maximum demand management set of measures will delay capacity improvements for five years." This conclusion has been supported by the PSRC Expert Panel on Noise and Demand/System Management in their December 8, 1995 final order on system/demand management. The updated forecast shows that demand is growing faster and as a result a higher level of demand for air travel would not be expected to reverse their finding.

(D) New Runway Development Alternatives At Sea-Tac Airport

This category of alternatives was determined in the Final EIS to be the only reasonable and feasible alternative. Chapter 2 of this Supplemental EIS contains a detailed description of how the new forecasts affect the need to address poor weather operating constraints at Sea-Tac. None of the runway alternatives were rejected for activity level reasons, rather they were rejected for not addressing the need or due to infeasibility. As a result, the higher demand levels now forecast would not alter the conclusions concerning the feasibility of alternative airfield options.

(E) Use of Technology Alternatives

A number of technology opportunities exist to reduce delay during poor weather. However, as was shown in the Final EIS, none of these issues would address the entire poor weather operating constraint at Sea-Tac. Alternatives considered include:

- Airport Surface Capacity Technology
- Terminal Airspace Capacity Technology
  - Terminal Air Traffic Control Automation
  - Precision Runway Monitor
  - Microwave Landing System (MLS)
  - Traffic Alert and Collision Avoidance System (TCAS) Applications

- Wake Vortex Avoidance/Advisory System
- Localizer Directional Aid (LDA) Approaches
- Global Positioning System (GPS)
- Flight Management Systems (FMS)

- Enroute Airspace Capacity Technology
- System Planning, Integration and Control Technology
- Vertical Flight Performance

Of the technology listed above, the Precision Runway Monitors (PRM) and Wake Vortex Avoidance/Advisory System have application to addressing the poor weather issues at Sea-Tac. It is expected the PRM will be used at Sea-Tac if the runway lateral separation testing shows that such technology could be applicable to runways with a separation of 2,500 feet or less. However, the primary issue that would remain is the wake-vortex condition. The FAA continues to evaluate wake vortex conditions. However, there are no plans or technological developments underway or envisioned to reduce the wake vortex standards or to reduce below 2,500 feet the separation between parallel runways.

In its August 1, 1996, approval of the Master Plan Update, the Port of Seattle Commission directed Port staff to give additional consideration to use of new technologies to satisfy poor weather operating needs. This review concluded that technologies, based on the global positioning system (GPS) and flight management system (FMS), will provide aviation system capacity relief in the future. However, no technologies were identified that would alleviate all of the poor weather constraint because no technologies exist to address the 2,500 foot spacing requirement between runways that is attributed to wake vortex conditions.

One of the findings of the technology conference is that sometime in the future, the runway spacing requirements to enable independent parallel approaches may be reduced from 3,400 feet to 2,500 feet. As a result, with the preferred alternative location of the third parallel runway at Sea-Tac, airport users may be able to take advantage of future technology to enhance the operating capability of the airfield and extend the long-term operating capability of a third runway airfield.

(F) <u>Blended or Delayed Alternative</u>

WAC 197-11-440 (5)(vii) states that an EIS must:

> "Discuss the benefits and disadvantages of reserving for some future time the implementation of the proposal, as compared with possible approval at this time. The agency perspective should be that each generation is, in effect, a trustee of the environment for succeeding generations. Particular attention should be given to the possibility of foreclosing future options by implementing the proposal."

If other alternatives (non-construction actions), independently or in combination, were implemented and used, the needs would not arise as quickly at Sea-Tac, and thus, implementation of the proposed Master Plan Update improvements could be delayed.

None of the non-construction actions individually would satisfy the need for the proposed airport improvements. In addition, no actions exist to address the poor weather constraint that exists at Sea-Tac other than the development of a new parallel runway with a separation of 2,500 feet or more. Thus, if a blend of non-development related actions were used to satisfy the poor weather needs at Sea-Tac, the Do-Nothing alternative as presented in the EIS and additional environmental analysis would result.

As a result, the Port of Seattle staff recommended refinements in the implementation of the Master Plan Update improvements which would: (1) balance airside and terminal and landside improvement needs, and (2) better manage the availability of financial resources. This Supplemental EIS reflects a longer construction process for the third parallel runway, resulting in it being available for use by 2005 versus the year 2000, as examined in the Final EIS. Therefore, this alternative (delaying the commissioning of the runway and extending the construction period) is recommended by the Port of Seattle staff.

The five-year delay in the commissioning of the third parallel runway would cause significant inconvenience to the traveling public and additional costs to airport users. As described in the February 1996 Final EIS, poor weather delay costs travelers time and aircraft operators incur additional operational costs. Delay at Sea-Tac in 1993 resulted in nearly 26,000 hours of delay with a cost of $42 million. As activity levels have increased nearly 16% between 1993 and 1996, and as a result, delay and delay cost have increased. A new parallel runway would have saved the airlines $24 million annually if it had been available for use in 1994. Based on Capacity Enhancement Update data, the Final EIS found that delay saving were expected to grow to around $59 million per year when aircraft operations reached 370,200 (which occurred in 1995), and $146 million annually when activity reaches 425,000 operations (now forecast to occur around 2002). Thus, each year that the runway is expected to be delayed beyond completion in late 2004, would cost airport tenants in excess of $150 million annually.

However, as a practical matter, the third parallel runway cannot be completed much sooner than 2004. Limitations on financial resources, time associated with acquisition and relocation, and the environmental impacts of concentrating an over-the-road haul in a short time period are major obstacles to fast-track development of the third parallel runway. Thus, the new phasing plan represents a compromise, which among other things, will sacrifice considerable bad-weather airfield reliability and service for several years.

(G)<u>Do-Nothing/No-Build Alternatives</u>

The Do-Nothing alternative would result in Sea-Tac Airport remaining as it is today. Although this alternative may not be prudent, it is feasible, and therefore, is one of the alternatives considered throughout the Environmental Impact Statement and by this Supplemental EIS.

2. <u>PROVIDE SUFFICIENT RUNWAY LENGTH TO ACCOMMODATE WARM WEATHER OPERATIONS WITHOUT RESTRICTING PASSENGER LOAD FACTORS OR PAYLOADS FOR AIRCRAFT TYPES OPERATING TO THE PACIFIC RIM.</u>

As is described earlier in this chapter, future aviation needs at Sea-Tac include a 12,500-foot long runway to enable service to Hong Kong, the primary economic and trade hub of the Pacific Rim. The following alternatives were considered:

- Extension of Runway 16L/34R
- Extension of Runway 16R/34L

- Development of a new runway with a 12,500 foot length
- Delayed Alternative
- Do-Nothing/No-Build

Since the issuance of the Final EIS, no new information has arisen that would result in new alternatives to this need, nor would it affect the issues leading to the identification of the extension of 34R as the preferred alternative.

3. PROVIDE RUNWAY SAFETY AREAS (RSAS) THAT MEET CURRENT FAA STANDARDS.

Since publication of the Final EIS, the Port of Seattle has completed the grading for the Runway End 34L RSA and will complete the 34R RSA corrections in 1997, per the issuance of SEPA Determinations of Non-Significance and NEPA Categorical Exclusions. Therefore, 16L and 16R are the runway ends where the RSA's do not meet FAA standards. The following alternatives exist to address this need:

- Declared Distances/Displace the runway threshold
- Clearance, grading, filling and development of the requisite areas for 1,000 feet beyond the existing pavement end
- Clearance, grading, filling, and development of the requisite area including the 600-foot extension of Runway 34R
- Delayed Alternative
- Do-Nothing/No-Build [1/]

The correction of the RSA's for 16L and 16R would require the relocation of S. 154th/S. 156th, which was assessed in detail in the Final EIS. However, this additional analysis presented a clarification of the impact of the relocation of this road to identify the independent issues associated with the RSA's versus those of the third runway, or other elements of the Master Plan Update improvements. The alignment of the road was evaluated in several manners:

- RSA Option 1: Alignment shown in the Final EIS (relocated around 16L, 16R and new runway 16X) reflecting the alignment addressing the RSA compliance and the new runway;
- RSA Option 2: Alignment just around 16L and 16R, and connecting back to the present alignment as soon as operationally feasible. This alignment would occur if the new runway was not built;

Exhibit 3-6 shows the alignments of these options. This additional environmental analysis identifies these impacts.

1/ Technically, the literal Do-Nothing is not an option for addressing the RSA issues. The Port of Seattle has two options for addressing RSAs, both of which require some action. The Do-Nothing alternative presented in the Final EIS, and this additional environmental analysis, reflects the non-development action (declared distances).

4. **PROVIDE EFFICIENT AND FLEXIBLE LANDSIDE FACILITIES TO ACCOMMODATE FUTURE AVIATION DEMAND**

The following summarizes the issues associated with each of the alternatives to terminal and landside facility improvements.

(A) Use of Other Modes of Transportation Alternatives

No new information, other than discussed on page 3-1 and 3-2 of this report have arisen concerning alternative modes of transportation. This category of alternatives would not satisfy the need for terminal and landside improvements at Sea-Tac.

(B) Use of Other Airports or Development of a New Airport Alternatives

As was described beginning on page 3-2, an extensive study of the development of a replacement or supplemental airport was conducted by the Puget Sound Regional Council. This study found: "The Executive Board concludes that there are no feasible sites for a major supplemental airport within the four-county region and that continued examination of any local sites will prolong community anxiety while eroding the credibility of regional governance."[2] While O&D demand is anticipated to grow faster, possibly making a supplemental airport competitive with Sea-Tac in the 2005 timeframe (instead of in 2010 as predicted by the Final EIS), the consensus of the region is that this alternative is not viable. Neither the lack of a sponsor, nor the conclusion of the PSRC process appears to depend on the level of anticipated demand for air travel in the region

(C) Activity/Demand Alternatives

As was described in a preceding section (starting on page 3-3), activity alternatives would not reduce demand such as to prevent the need for improvements at Sea-Tac Airport. No new information has arisen that would alter this conclusion.

(D) Landside Development at Sea-Tac Airport Alternatives

This category of alternatives was identified in the Final EIS to be the only reasonable and feasible alternative. Chapter 2 of this document contains a detailed description of how the new forecasts affect the terminal and landside improvements. As is shown in Chapter 2, the primary effect of accelerated demand would be the need to accelerate the time in which these facilities would be available.

As is discussed in Chapters 1 and 2, the accelerated demand for air travel would produce accelerated uses of and need for parking facilities at Sea-Tac. Because of these constraints, additional consideration was given to other alternative sites for parking, yet no changes in location were identified over the sites presented in the Final EIS. In all cases, parking facility locations were identified using residual lands available after satisfying the requirements for passenger terminal, airfield accessible needs for functions supporting aircraft operations, and

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[2] PSRC Executive Board Resolution EB-94-01.

cargo and key support facilities. Alternatives for public parking, rental car parking, and employee parking include:

1. **Public Parking**

Currently, the primary on-airport public parking facility is the Main Parking Garage, with additional long-term parking provided at the Doug Fox Parking lot, located off S. 170th Street west of International Blvd. As was identified by the Master Plan Update, additional passenger demand is anticipated to require 5,000 additional stalls for public parking. The primary criteria for siting public parking is close proximity to ticket check-in locations and convenient accessibility. Alternative sites for public parking include:

- *Expansion of the Main Parking Garage* - The existing main parking garage could be expanded in nearly all directions to provide about 7,600 additional stalls. Eight floors could be added to the north (section AA, adding about 1,800 stalls), to the south (section E adding about 3,000 stalls) and to the east (adding about 1,900 stalls) and three floors could be added to section D (about 1,200 stalls). No impacts to natural resources (i.e., wetlands, floodplains, sensitive biotic communities) would occur to expand the Main Parking Garage. However, expansion of the garage would affect the adjoining employee surface lot to the south, and displace the rental car quick-turn-around facilities to the north. This option represents the preferred location for public parking, in addition to the development of parking to support the North Unit Terminal, as it provides the greatest level of service to the traveling public.
- *Development of a parking structure at the Doug Fox Lot* - this site could be developed to accommodate all of the long-term parking needs. However, the Master Plan Update calls for development of the new North Unit Terminal on portions of this site because it is airfield accessible. Included in the North Unit Terminal development would be a supporting parking garage with about 4,000 stalls of parking. Development of parking beyond that required to support the new terminal would create an imbalance and produce additional unnecessary vehicular travel of the airport roadway system, transporting passengers between the new terminal/garage and the existing main terminal. No natural resource impacts would occur, as the site is presently owned by the Port and is used as airport parking under a lease to Doug Fox. To prevent an imbalance, the preferred alternative calls for the development of supporting public parking with the North Unit Terminal at this site.
- *Move rental cars out of the Main Parking Garage to free space for public use* - Currently, two floors of the Main Parking Garage are used by rental cars. Relocation of the rental car function to another location at the Airport would enable about 1,350 parking stalls for public use. While no natural resource impacts could occur for the public use stalls, the development of replacement rental car stalls could result in such impacts; rental car alternatives are discussed in the next section. Relocation of the rental car functions would decrease the level of service afforded to the traveling public, as shuttle busses for rental car users would likely be required. This alternative was not considered further at this time due to the desire to afford the highest level of service to the air passenger.
- *Convert S. 160th Street employee lot to public use* - Currently, about 1,150 stalls are provided at the S. 160th street employee lot, located west of International Blvd. This parking lot could be converted to public use, with employees displaced to alternative locations discussed in a following section. Public parking users would be bussed from this site to the terminal. No natural resource impacts would occur for the public use stalls, but the replacement employee lot could result in such impacts. Currently, the S. 160th/SR 99 intersection operates at LOS C (congestion during peak periods) today and by 2000 at LOS D. It is expected to degrade to LOS F (severe traffic congestion) by year 2010. It is presumed that access to this site would be from SR 518 to

International Blvd (SR 99) to S. 160th. Presently, the eastbound freeway ramp at SR 518/SR 99 operates at LOS D and the westbound SR518/SR 99/S. 154th operates at LOS B. The addition of the employee parking traffic through these roadways would likely require development of additional turn-lanes and possibly an additional freeway ramp. Because this alternative would produce a lower level of service for public parking needs because of the bussing, it was not considered further.

- *Development of land west of the third parallel runway for parking* - As was shown in the Final EIS, land is proposed for acquisition as mitigation for construction impacts associated with the third parallel runway. Some of this land, paralleling Des Moines Memorial Drive, is not proposed for development as part of the Master Plan Update, but would likely be developed in the long-term for airport compatible uses. The construction of the third parallel runway embankment would require the filling of about 6 acres of wetland (not including the borrow source wetland impacts). The impacts associated with the runway do not include other wetlands in this area that would be affected by airport compatible uses. Therefore, development of public parking west of the third runway would likely result in natural resource impacts, including disruption of vegetative cover and additional filling of wetlands. Access to a parking lot is this general area could be provided off SR 509 (from an existing interchange at S. 160th Street or a new interchange) or from SR 518 to Des Moines Memorial Drive. Passengers would be required to be bussed from the remote location to the passenger terminal, creating added inconvenience. Because of the low level of service due to the bussing and impacts from this alternative, it was not considered prudent at this time.
- *Development of land north of SR 518 for public parking* - During the 1980s and early 1990s, the Port purchased noise impacted residential property north of SR 518. This land, located under the approach path to the existing runways, could be used for airport parking. A surface lot accommodating about 6,000 stalls could be developed or a garage accommodating a greater number of stalls could be developed. Development of public parking north of SR 518 would result in natural resource impacts, including disruption of vegetative cover and filling of wetlands (about 1 acre). Access to a parking lot is this general area could be provided off SR 518 through new interchange/ramps or from SR99 to S. 154th/24th Avenue. Passengers would be required to be transported (bussed) from the remote location to the passenger terminal, creating added inconvenience. Because of the low level of service and impacts from this alternative, it was not considered prudent at this time.
- *Purchase additional land for public parking* - A substantial quantity of off-site parking exists in the City of SeaTac. Existing parking facilities could be acquired by the Port or other land could be purchased and new parking developed. Passengers would be required to be transported (most likely bussed) from the remote location to the passenger terminal, creating added inconvenience and offering a lower level of service. If an existing lot was acquired that commercial enterprise would likely be displaced and would result in its replacement in the general airport vicinity. Such facilities would likely result in other business and/or residential relocation and potential impacts to natural resources. Because of the low level of service and impacts from this alternative, it was not considered prudent at this time.

As was noted in the Final EIS, the Preferred Alternative for public parking needs at Sea-Tac Airport would result in the development of all public parking facilities being constructed in close walking distance to the passenger terminal(s). This would include the development of about 3,000 public parking stalls through the expansion of the Main Parking Garage and the development of about 2,190 stalls at the North Unit Terminal location.

2. Rental Car Parking

As was noted in the previous section, rental car operations occupy two floors of the Main Parking Garage, and provide about 1,000 rental car stalls in addition to support facilities. Within the next five years, space requirements to accommodate rental car (RAC) functions is needed to nearly double, and by year 2010, nearly double again. As a result, a long-term rental car site located outside the parking garage is needed. Similar to public private vehicle parking criteria, siting criteria for rental cars focused on close proximity to the terminal or ease in air traveler access for remote locations. The following alternatives were identified:

- *Conversion/expansion of the South 160th Street employee lot for RAC usage* - Much of the environmental impacts associated with this option would be dependent upon where the employee functions are relocated. However, impacts of the rental cars would be primarily surface transportation issues and associated air quality impacts. Currently, the South 160th/SR 99 intersection operates at LOS C today and by 2000, at LOS D. It is expected to degrade to LOS F by year 2010. It is presumed that access to this site would be from SR 518 to International Blvd (SR 99) to S. 160th. Presently, the eastbound freeway ramp at SR 518/SR 99 operates at LOS D and the westbound SR518/SR 99/South 154th Street operates at LOS B. The addition of the rental car activities on these roadways would likely require development of additional turn-lanes and possibly an additional freeway ramp. Coupled with commercial development, which is the use identified in the City of SeaTac's Comprehensive Plan, this site could feasibly address airport parking needs as well as address the city's desired International Blvd interface. However, no specific commercial development options have been identified. Because of these constraints, this site was not considered further.
- *Conversion/Re-development of commercially developed land at 16th Avenue South, south of South 188th Street* - This area would fall within the FAA's Runway Protection Zone (RPZ) for the third parallel runway. The RPZ area consists of 88 commercially developed (primarily warehouses) and 3 vacant commercial properties. Acquisition of this area and relocation of the commercial properties could result in a loss of tax revenue to the City of SeaTac. The Master Plan Update EIS found that if these businesses were removed, that the City of SeaTac could loose an estimated $180,000 annually in real property tax receipts. An additional $457,000 in sales taxes would be lost along with the 577 jobs provided by these businesses. If they were relocated to other areas within the City, no impacts would occur and it is possible that tax revenue in the City would also increase due to the rental car activities. The Final EIS assessed these impacts assuming that full acquisition and relocation of these businesses occurred. Subsequent relocation planning has indicated that few of the businesses desire relocation and few require relocation due to incompatibilities with aircraft overflight. As a result, the Port of Seattle staff recommends the pursuit of easements from these property owners. To enable rental car use, acquisition and relocation of these businesses would be necessary, at a cost of about $24 million. In addition, the rental car business activity would be expected to replace the lost economic impacts caused by removal of the existing businesses.

  This general area contains a few wetlands associated with the west branch of Des Moines Creek that, depending upon the location and layout of a rental car complex, might require mitigation. Development of a rental car facility at this location would likely fill some of these wetland. As the site is commercially developed, it is possible that some hazardous materials could be found in removing the facilities, ranging from asbestos to contaminated earth/soils.

Like all other sites, surface transportation issues and air quality impacts could be expected. Assuming public access to the site was focused on SR 509, impacts to the South 188th/International Blvd intersection (currently at LOS F) would likely be minimized. Returns to the terminal are assumed to follow the current bus route at 28th Avenue/South 188th Street which operates at LOS B (if International Blvd./South 188th Street were used significant impacts and mitigation would be expected). A westbound left turn lane on South 188th Street at 28th would likely be required. Because of traffic congestion as well as cost to acquire the businesses, this site was not considered further.

- *Use of SASA site lands* - The Master Plan Update calls for the replacement of displaced maintenance/support and cargo facilities in the area known as the South Aviation Support Area (SASA). As an interim alternative, the Port could develop portions of the site for rental car use. Impacts at this site would be similar to the commercially developed 16th Street South site. Development of the SASA properties would require filling of about 2 acres of wetlands. Assuming access were to occur like that discussed for the commercially developed South 16th site, the same impacts would be expected. However, this site would seem to make S. 188th Street a more probable access point, increasing the need to address the LOS F issues at this intersection and the likely air quality impacts. Because of other site development needs and the resulting impacts, this alternative was not considered further.
- *Doug Fox lot* - The Master Plan Update preferred alternative includes the development of a parking garage at this site for as many as 4,000 vehicles to support the new terminal. Included in this site, as the preferred alternative, is the assumption that additional rental car facilities would be developed to accommodate the rental requirements (about 885 stalls of the 4,000 at Doug Fox would be used for RAC, with an 2,190 stalls would be available for RAC in the expanded main garage). Access would continue from South 170th Street, as it exists today until some future period when the North Unit Terminal is developed. Development of a rental car parking facility only at the Doug Fox lot could be undertaken, or a shared facility, as identified by the Master Plan, could occur. Because a dedicated rental car facility at this site would create unnecessary vehicular travel on the airport roadway system to transport passengers to the Main Terminal, it was not considered further.
- *Borrow Source Area 3 (16th Avenue South/South of 200th Street)* - This area consists of about 60 acres of land that was residential, but was acquired by the Port as part of the Noise Remedy Program. Moderate to steep slopes exist in the south-central portions of this area. To construct the proposed third parallel runway, as much as 2.9 million cubic yards of fill may be excavated from this site. Upon excavation, the site could be developed for rental car facility development. If excavation did not occur for fill for the runway, the site could also be developed, but some site preparation would be require to provide the necessary grades for parking uses. The site contains about 1.25 acres of wetland that are identified for filling to enable excavation of fill for the runway, if on-site borrow source use is maximized.

  Access to the site for rental car use is uncertain. With current roadway structures, access from International Blvd at South 200th Street would seem most likely until the completion of the SR 509 Extension/South Access. The International Blvd/South 200th Street intersection presently operates at LOS D while the I-5 exit at South 200th/Military operates at LOS B. By year 2000, these intersections are both anticipated to operate at LOS F and D, respectively. With the addition of rental car traffic through these intersections surface transportation conditions would worsen and air pollution increase. In addition, the development of the SR 509 Extension/South Access could affect, both positively and negatively the long-term development of the site for rental cars. As a result, this alternative was not considered further.

AR 040585

- *Development of land north of SR 518 for rental car user* - During the 1980s and early 1990s, the Port purchased noise impacted residential property north of SR 518. This land, located under the approach path to the existing runways, could be used for airport parking. A surface lot accommodating about 6,000 stalls could be developed or a garage accommodating a greater number of stalls could be developed. A surface lot would not be sufficient to accommodate the long-term rental car requirements. Development of rental car parking north of SR 518 would result in natural resource impacts, including disruption of vegetative cover and filling of wetlands (about 1 acre). Access to a parking lot is this general area could be provided off SR 518 through new interchange/ramps or from SR99 to South 154th/24th Avenue. Passengers using rental cars would be required to be bussed from the remote location to the passenger terminal, creating added inconvenience. Because of the low level of service and impacts from this alternative, it was not considered prudent at this time.

- *Development of land west of the third parallel runway for rental car use* - As was shown in the Final EIS, land is proposed for acquisition as mitigation for construction impacts associated with the third parallel runway. Some of the acquired land, paralleling Des Moines Memorial Drive, is not proposed for development as part of the Master Plan Update, but would likely be developed in the long-term for airport compatible uses. The construction of the third parallel runway embankment would require the filling of about 6 acres of wetland (not including the borrow source wetland impacts). Additional filling of wetlands could occur to accommodate development on the construction mitigation land. Access to area could be provided off SR 509 (from an existing interchange at South 160th Street or a new interchange) or from SR 518 to Des Moines Memorial Drive. Passengers using rental cars would be required to be bussed from the remote location to the passenger terminal, creating added inconvenience. Because of the low level of service and impacts from this alternative, it was not considered prudent at this time.

- *Purchase additional land for rental car use* - A substantial quantity of off-site parking exists in the City of SeaTac. Existing parking facilities could be acquired by the Port or other land could be purchased and new parking developed. Because passengers would be required to be bussed from the remote rental car location to the passenger terminal, creating added inconvenience and offering a lower level of service. If an existing lot was acquired that commercial enterprise would likely be displaced and would result in its replacement in the general airport vicinity. Such facility could result in business, or residential relocation and potential impacts to natural resources. Because of the low level of service and impacts from this alternative, it was not considered prudent at this time.

A permanent, consolidated location for rental car functions is desired, but is not currently available. None of the alternatives that has been determined feasible would minimize passenger disruption/maximize convenience. Because the need can not be met in a consolidated public rental car facility, either on or off airport, the preferred option would result in two on-airport rental car locations in the passenger terminal garages. Rental car functions would be satisfied by an expansion of the Main Garage to provide rental car space for a total of 2,190 cars, and the development of 885 stalls at the North Unit Terminal parking garage.

3. Employee Parking

The preferred alternative would displace existing employee parking due to support facility development (such as development in the area known as SASA and cargo expansion) and expansion of public and rental car parking. As a result, about 6,000 stalls for employee parking would be required to compensate for displaced existing stalls and increased employment related requirements. Alternatives for employee parking are the same as noted for the public and rental car parking. The Preferred Alternative provides for consolidated employee parking at one large lot north of SR 518. Such consolidation would reduce operating costs and in general improve overall employee parking services. While some employees would have lower levels of service, particularly those currently parking in the Main Garage and in Lot 5 (south of the garage), the average employee would experience increased levels of service due to frequent bus service to a consolidated location.

Of the alternatives considered for public and rental car use, the expansion of the Main Garage and Doug Fox lots would not be available, as these are the preferred sites for the public and rental car uses. Thus the following locations would be alternatives:

- Expansion of South 160th Street Employee Lot - issues associated with this lot are discussed in the preceding section.
- Expansion of the existing South Employee Lot - this site is presently on the site of the proposed airfield accessible support facilities in the area known as the South Aviation Support Area. As a result, the existing lot will be displaced upon the site preparation of this area.
- Development of land west of the third parallel runway - issues associated with this lot are discussed in the preceding section. About 6 acres of wetlands would be filled in this area.
- Development of land north of SR 518 - issues associated with this lot are discussed in the preceding section. About 0.81 acres of wetland would be filled by a lot in this area.
- Purchase of additional land for employee parking - issues associated with this lot are discussed in the preceding section.
- Use of the Borrow Source Area 3 - issues associated with this lot are discussed in the preceding section. About 1.25 acres of wetlands would be filled by the development of parking in this location.

Because the majority of the existing employee parking is located north of the existing Main Terminal, and already uses bussing to transport employees, the preferred operational mode would consolidate the bussing activity. Therefore, two options exist: expansion of South 160th Street lot and development of the lot north of SR-518. Because of congestion along International Boulevard and because employee parking lots typically have high entry/exit during shift changes (versus a more even usage as public or rental car use), the South 160th Street lot expansion was identified as likely to result in significant surface transportation issues and resulting air quality impacts, making it undesirable. Therefore, the preferred alternative for employee parking is the development of a large employee lot north of SR 518.

(E) Delayed/Blended Alternative

As was discussed earlier, the only new significant information that has arisen concerning the terminal and landside is the time frame in which the facilities would be needed. Because demand is anticipated to increase faster (Master Plan Update improvements could be needed sooner), terminal and landside facilities could be needed sooner. Therefore, the Delayed or Blended alternative would result in a Do-Nothing condition resulting until the time in which the facility development was initiated. As a result, the increases in demand would not make this a reasonable alternative.

(F) Do-Nothing/No-Build Alternative

The Do-Nothing alternative would result in the Airport remaining as it is today. This alternative was continued throughout the additional environmental evaluation to facilitate the comparison of the "With Project" alternative.

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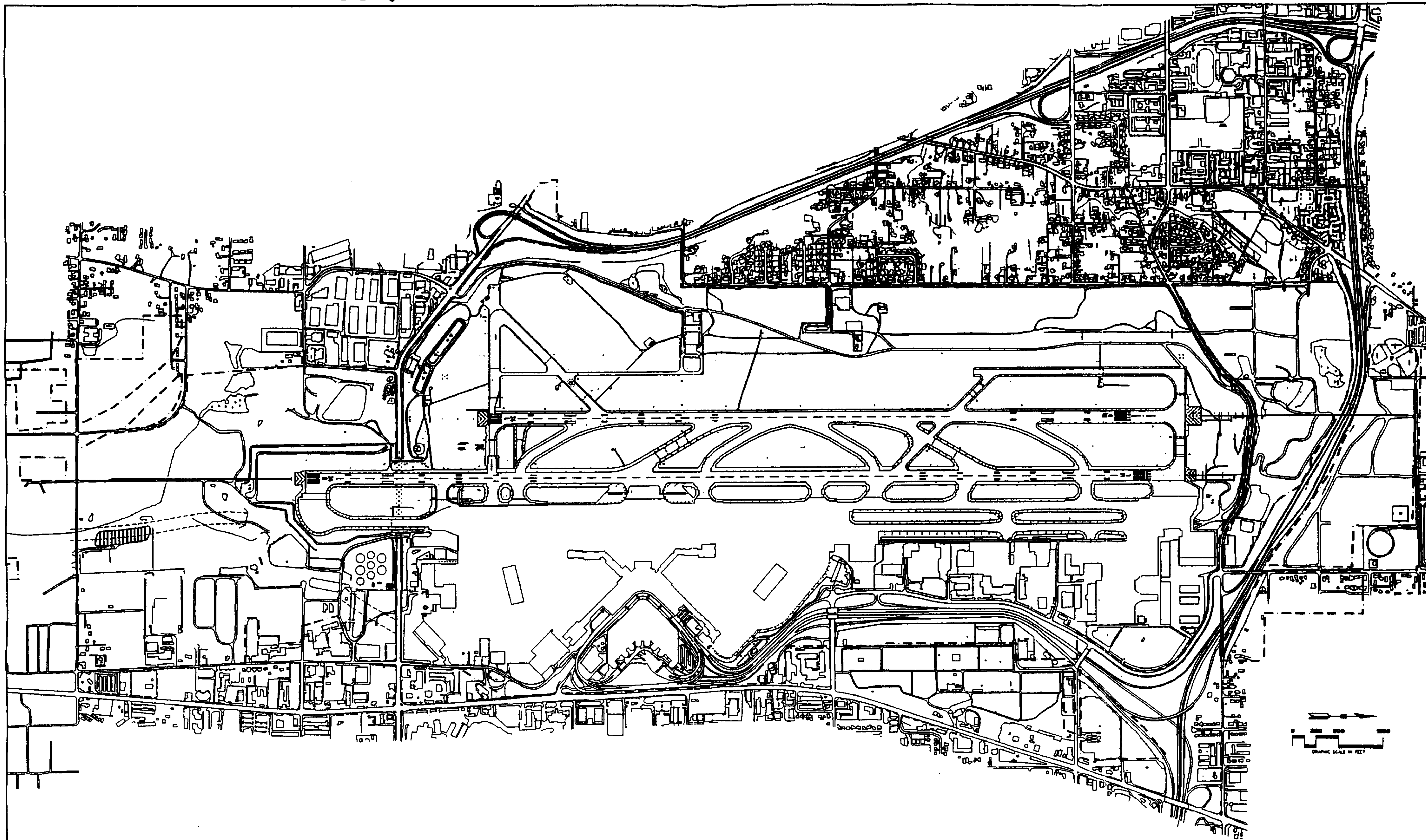

Seattle-Tacoma International Airport

Alternative 1 - Do Nothing

EXHIBIT: 3-1

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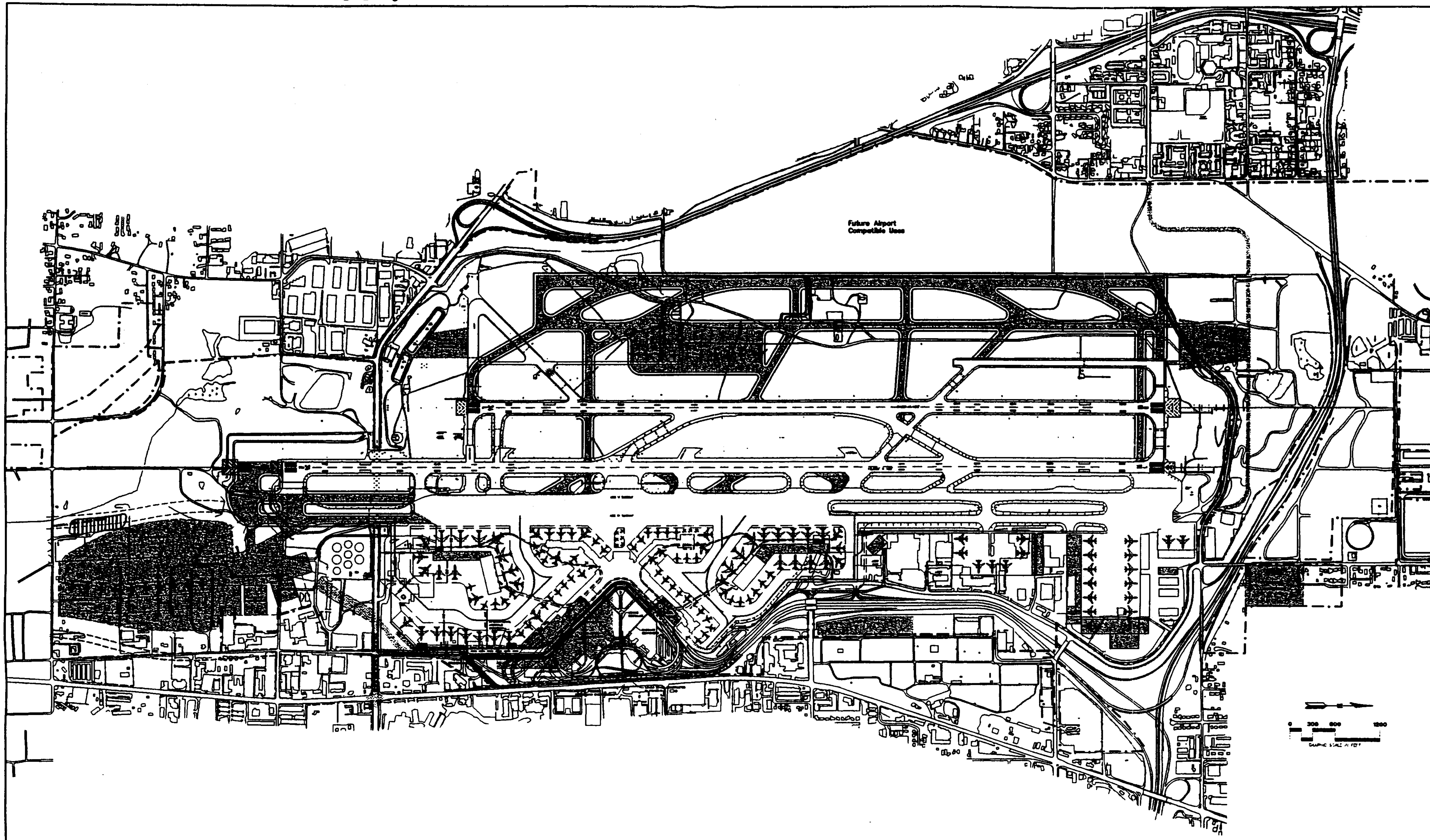
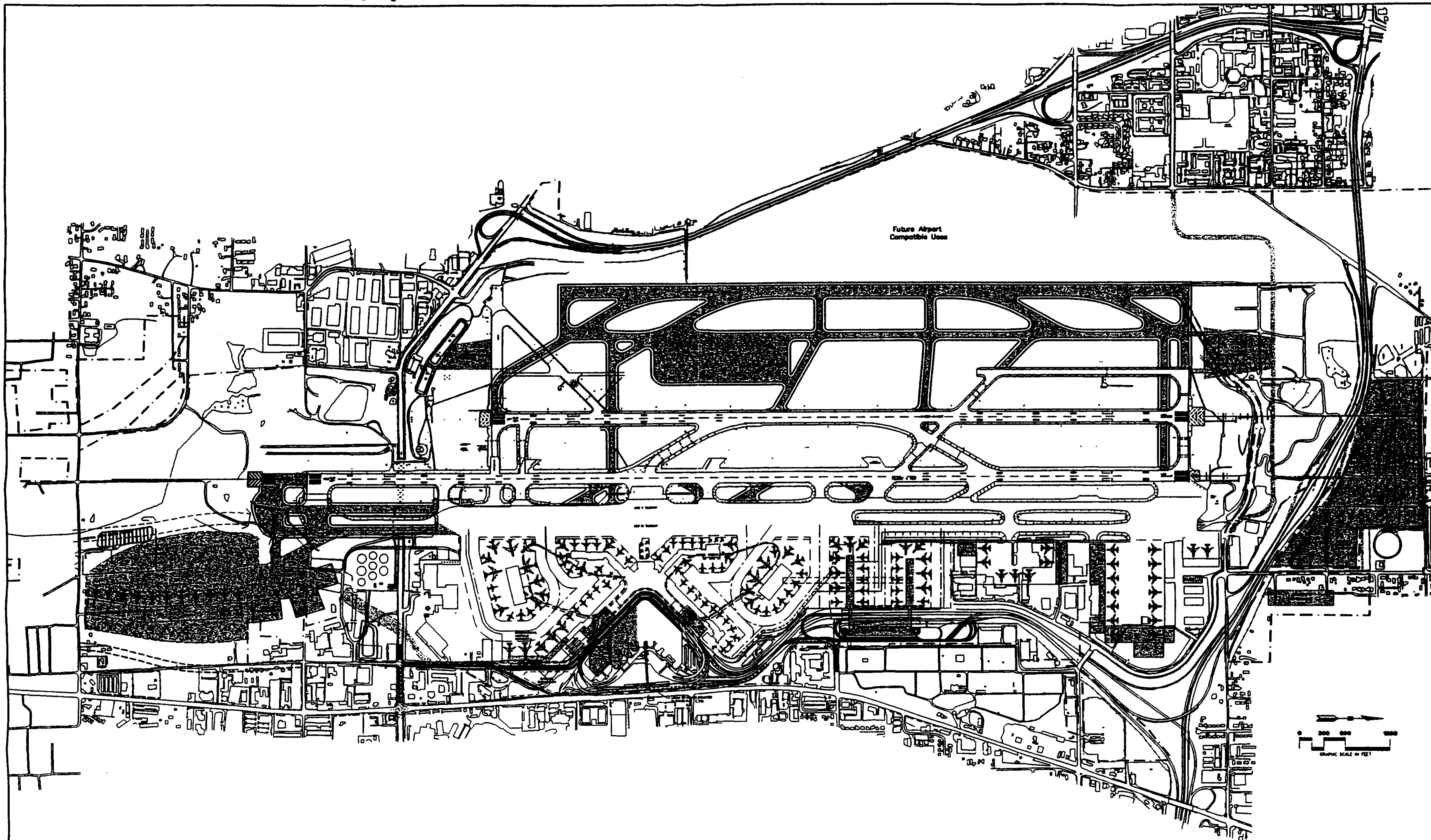


Seattle-Tacoma International Airport

Alternative 2 (Central Terminal)

EXHIBIT: 3-2

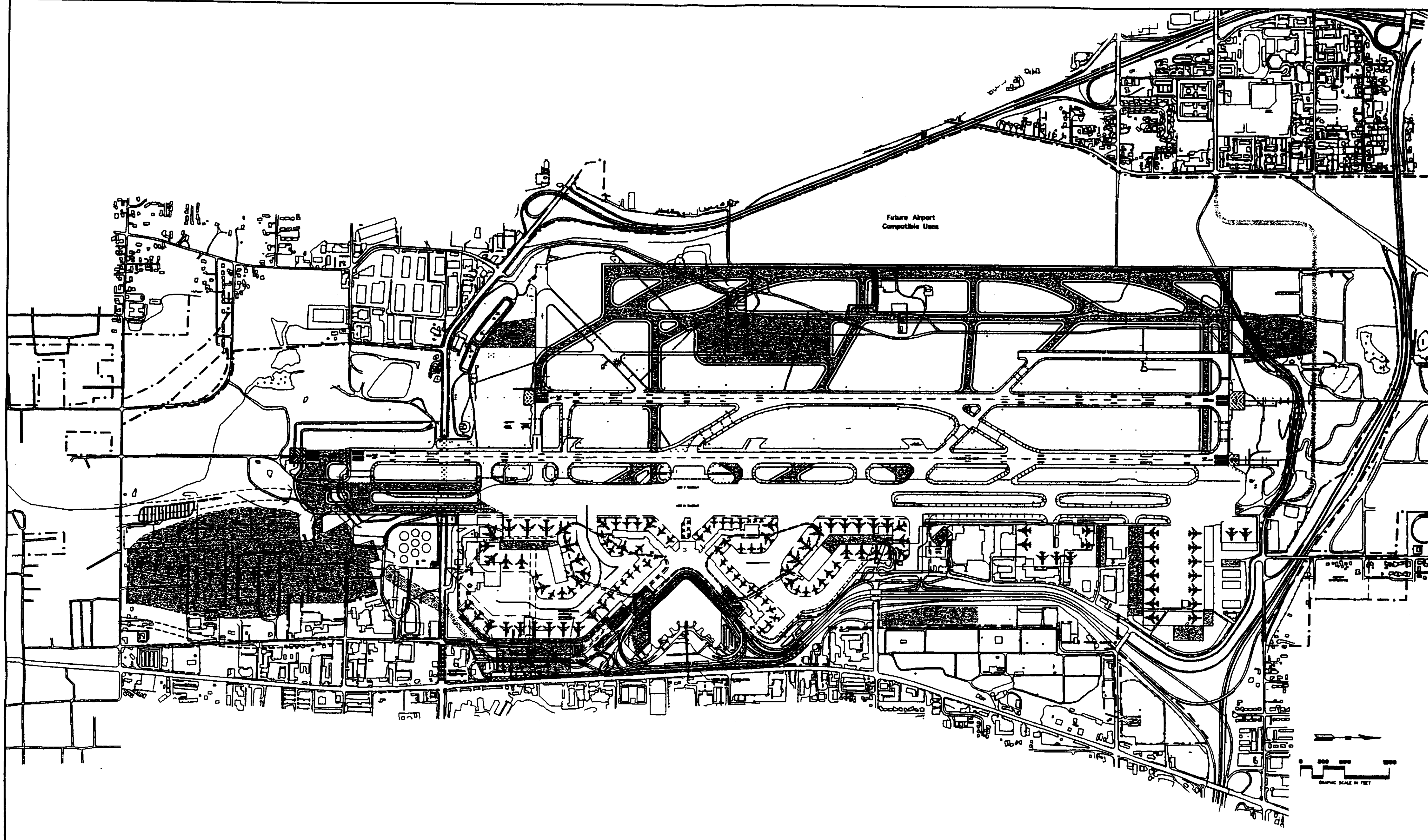
AR 040590



Seattle-Tacoma International Airport

Alternative 3 Preferred Alternative (North Unit Terminal)

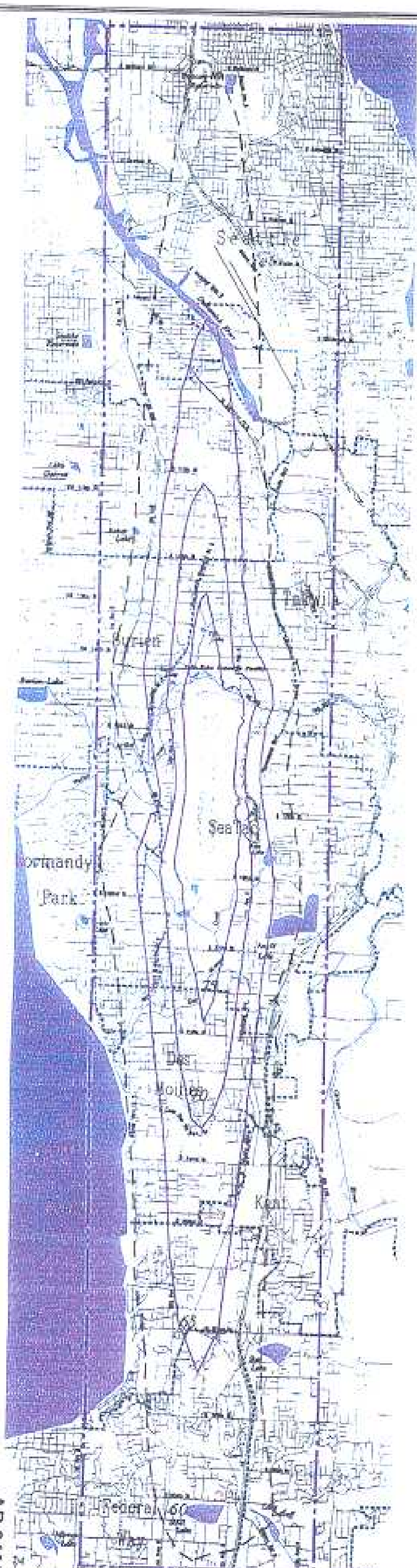
EXHIBIT: 3-3



Seattle-Tacoma International Airport

Alternative 4 (South Unit Terminal)

EXHIBIT: 3-4



Seattle-Tacoma International Airport
Environmental Impact Statement
for the Master Plan Update

Exhibit 5-3-1

1994 Noise Exposure Pattern

File SEA36

Jurisdictional Boundary

Generalized Study Area

Noise Contours of 65 DNL and Above

60 DNL Noise Contour

Source: Gambrell Urban, Inc. and Landrum & Brown, 1995

Scale 1" = 6,000'

0 6000 12000 18000

SCALE IN FEET

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

April 06, 1996

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement
for the Master Plan Update

Exhibit 5-3-2

Aircraft Noise Exposure Pattern - 2000
Alternative 1 (Do Nothing)

Jurisdictional Boundary

Generalized Study Area

Noise Contours of 65 DNL and Above

60 DNL Noise Contour

Source: Gambrell Urban, Inc. and Landrum & Brown, 1996

File SEAX110

Scale 1" = 6,000'

0 6000 12000 18000

Scale of Feet

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

December 27, 1996

5-3-12

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement
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Exhibit 5-3-3

Aircraft Noise Exposure Pattern - 2005
Alternative 1 (Do Nothing)

- Jurisdictional Boundary
- Generalized Study Area
- Noise Contours of 65 DNL and Above
- 60 DNL Noise Contour

Source: Gambrell Urban, Inc. and Landrum & Brown, 1996

File SEAX111

Scale 1" = 6,000'

0 6000 12000 18000

Scale of Feet

Projection: Lambert Conformal Conic

Coordinate System: State Plane NAD27

December 27, 1996

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement
for the Master Plan Update

Exhibit 5-3-4

Aircraft Noise Exposure Pattern - 2010
Alternative 1 (Do Nothing)

Jurisdictional Boundary

Generalized Study Area

Noise Contours of 65 DNL and Above

60 DNL Noise Contour

Source: Gambrell Urban, Inc. and Landrum & Brown, 1996
File SEAX112

Scale 1" = 6,000'

0 6000 12000 18000

Scale of Feet

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

December 27, 1996

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement
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Exhibit 5-3-5

Aircraft Noise Exposure Pattern - 2000
Alternative 3 (Preferred Alternative)

- Jurisdictional Boundary
- Generalized Study Area
- Noise Contours of 65 DNL and Above
- 60 DNL Noise Contour

Source: Gambrell Urban, Inc. and Landrum & Brown, 1996

File SEAX113

Scale 1" = 6,000'

0 6000 12000 18000

Scale of Feet

Projection: Lambert Conformal Conic

Coordinate System: State Plane NAD27

December 27, 1996

5-3-15

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement
for the Master Plan Update

Exhibit 5-3-6

Aircraft Noise Exposure Pattern - 2005
Alternative 3 (Preferred Alternative)

Jurisdictional Boundary

Generalized Study Area

Noise Contours of 65 DNL and Above

60 DNL Noise Contour

Source: Gambrell Urban, Inc. and Landrum & Brown, 1996

File SEAX114

Scale 1" = 6,000'

0 6000 12000 18000

Scale of Feet

Projection: Lambert Conformal Conic

Coordinate System: State Plane NAD27

December 27, 1996

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement
for the Master Plan Update

Exhibit 5-3-7

Aircraft Noise Exposure Pattern - 2010
Alternative 3 (Preferred Alternative)

Jurisdictional Boundary

Generalized Study Area

Noise Contours of 65 DNL and Above

60 DNL Noise Contour

Source: Gambrell Urban, Inc. and Landrum & Brown, 1996

File SEAX115

Scale 1" = 6,000'

0 6000 12000 18000

Scale of Feet

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

December 27, 1996

5-3-17

CHAPTER 4

AFFECTED ENVIRONMENT ISSUES

Since the issuance of the Final Environmental Impact Statement in early February 1996, a number of actions have been taken within the region related to Sea-Tac Airport. The purpose of this chapter is to summarize these actions and identify if or how the actions affect the Master Plan Update improvements.

Key actions include:

- The final decision of the Expert Panel on Demand/System Management and Noise
- The PSRC amendment to the Metropolitan Transportation Plan approving the third runway at Sea-Tac
- The Port of Seattle Commission Approval of the Master Plan Update
- Port and FAA approval and initiating of correcting the Runway Safety Area for 34R
- Port of Seattle discussions with Seattle Water concerning the development of the employee lot north of SR 518
- Congressional Field Hearing - then Representative Randy Tate, a member of the House Aviation Subcommittee, sponsored a hearing on March 18, 1996 concerning the third runway

The following summarize these actions and their relationship to the Master Plan Update.

1. PUGET SOUND REGIONAL COUNCIL AND RELATED ACTIONS

In April of 1993, the Regional Council General Assembly adopted Resolution A-93-03, which called for the region to pursue both a major supplemental airport[1/] and, subject to conditions, a third runway at Sea-Tac International Airport. "These conditions were: (1) the feasibility of a major supplemental airport and whether it could be put into service in time to eliminate the need for a third runway; and (2) implementation of noise reduction objectives; and (3) feasible demand and system management actions." The noise reduction objectives and demand and system management actions were to be independently evaluated. A determination of whether these conditions were satisfied was to be made no later than April 1, 1996.

Resolution A-93-03 was followed by PSRC Executive Board action adopting specific Implementation Steps for carrying out the resolution's requirements. Among the provisions of the Implementation Steps was the establishment of expert panel(s) to perform the independent evaluations of demand/system management and noise issues. The noise issues to be analyzed were limited to impacts associated with the existing facilities at Sea-Tac and did not include any analysis of noise impacts related to a possible third runway.

1/ In October of 1994, the Regional Council Executive Board adopted Resolution EB-94-01 which concluded that no feasible sites for a major supplemental airport could be found in the four-county region.

An Expert Arbitration Panel was appointed in June 1994 by the Secretary of the Washington State Department of Transportation (WSDOT) to make findings on the satisfaction of the Demand/System Management and Noise conditions. The panel consisted of three members residing outside the State of Washington: an attorney, an economist and an engineering professor.

In a series of written orders on Demand System Management Issues, concluding with its final order in December of 1995, the Expert Panel found that congestion pricing, gate controls, high-speed rail and more readily achievable improvements in existing rail service could not reasonably be relied upon as a justification for obviating or deferring the construction of the new runway at Sea-Tac.

In its final order of March 27, 1996, the majority of the Panel (two members, with one dissenting opinion) concluded that "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 impacts sufficient to satisfy the noise reduction condition imposed by Resolution A-93-03." The Panel concluded "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." In conclusion, the Panel offered a list of recommended noise reduction measures to be considered.

As a result of the Expert Panel's findings, the PSRC Executive Board met several times to consider possible directions. After a series of deliberations, the Executive Board determined that recommendations of the Panel could be incorporated into the amendment to the MTP, and with the noise mitigation recommendations that the intent Resolution A-93-03 would be satisfied. At its April 25, 1996 meeting, the PSRC's Executive Board endorsed use of the recommendations in the Panel's March 27, 1996 Final Decision on Noise Issues as the basis for deciding what additional noise reduction measures should be part of including a proposed third runway at Sea-Tac Airport as an amendment to the Metropolitan Transportation Plan (MTP). The Board directed staff to initiate the process to include a third runway at Sea-Tac and "...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 of Seattle for implementation of such plan..."

Resolution A-96-02, amending the Metropolitan Transportation Plan (MTP) to include a third runway at Sea-Tac Airport with specific noise reduction measures based upon the recommendations of the Expert Panel, was approved by the PSRC General Assembly on July 11, 1996. **Table 4-1** lists the noise mitigation measures included in the resolution. Thus, considering the purpose of 49 USC 74106(a)(1), the FAA believes that the PSRC gave adequate consideration to the function of the Expert Panel, its findings, and reasonable ways of addressing the issues raised by the Expert Panel.

2. PORT OF SEATTLE ACTIONS

A number of actions have been taken by the Port of Seattle since issuance of the Final EIS. Actions related to the Master Plan Update improvements include:

- Issuance of a Mitigated Determination of Non-Significance (MDNS) and Determinations of Non-Significance (DNS)[2]
- Passage of Resolution 3212

Several determinations under the Washington State Environmental Policy Act (SEPA) have been made by the Port since issuance of the Final EIS. The Port of Seattle issued a Mitigated Determination of Significance (MDNS) for the correction of the 34R runway safety area (RSA) on April 11, 1996.[3] In early spring, the Port selected a contractor to build the embankment for the 34R RSA, which is anticipated to be completed in 1997. Also on November 25, 1996, the Port issued a Determination of Non-Significance (DNS) for the expansion of the Federal Express building located in the north cargo complex. Construction is expected to begin in January 1997 and be completed before the end of the year. In August 1996, the Port issued a DNS for the excavation and removal of gasoline affected soils located at the site of a former underground storage tank associated with the localizer for Runway 16R. This project was completed in 1996. All of these projects, if considered separately under the National Environmental Policy Act, are categorically excluded from environmental analysis (or NEPA was determined by the FAA as to not apply). Their cumulative impacts are described in the Final EIS and this Supplemental EIS.

Following the PSRC approval of the MTP with the third runway, the Port of Seattle approved Resolution 3212 on August 1, 1996. In resolution 3212, the Commission:

1. Found that the EIS for the proposed Master Plan Update development actions, including the PSRC issued EIS addendum, is adequate and meets the requirements of SEPA;
2. Adopted the Airport Master Plan Update, as documented Technical Reports 1 through 8, and the Airport Layout Plan;
3. Approved the development of a new 8,500-foot dependent air carrier runway with its centerline located no further than 2,500 feet west of the centerline of runway 16L/34R and development of taxiways, navigational aides, and other associated facilities;
4. Agreed to undertake the additional noise reduction measures called for by PSRC Resolution A-96-02 Appendix G, Section I (as shown in **Table 4-1**);
5. Authorized participation in the air pollutant monitoring program with the Department of Ecology, US Environmental Protection Agency, and Puget Sound Air Pollution Control Agency; and
6. Directed staff to monitor and evaluate changes in airport activity, and how the changes in airport activity might affect environmental conditions and the need for mitigation.

This additional analysis has been completed in keeping with the Port Commission's direction noted above.

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[2] FAA issued a categorical exclusion for 34R and 34L RSA corrections.

[3] "Mitigated Determination of Non-Significance (MDNS) for Seattle Tacoma International Airport Runway 34R Safety Area Improvements", Port of Seattle, April 11, 1996.

Appendix F, response to comment 4-B, of the Supplemental EIS provides a summary of the status of the Port's implementation of its commitments to additional noise mitigation in response to the PSRC and Expert Panel.

Concurrent with its approval of the third runway on August 1, 1996, the Port of Seattle Commission directed Port staff to give additional consideration to use of new technologies to satisfy poor weather operating needs. In response to this request, the Port convened a technology conference at the SeaTac Hilton on September 25, 1996. Speakers at the conference included the Federal Aviation Administration, NASA, Alaska Airlines, Airline Pilots Association, Boeing, Air Transport Association, consultants, and a company developing new technologies. This investigation concluded that technologies, based on the global positioning system (GPS) and flight management system (FMS) or other technologies, will provide aviation system capacity relief in the future. However, no technologies were identified that would alleviate the need for the new runway or change the viability of other closer spaced options due to the 2,500 foot spacing requirement between runways that is attributed to wake vortex conditions.

3. ACTIONS BY OTHERS

Three primary actions have been undertaken by other parties:

- Hearing conducted by U.S. Congress Aviation Subcommittee
- Local Land Use Actions
- Lawsuits and SEPA Appeals

The following sections summarize these actions.

(A) Aviation Subcommittee Hearing March 1996

On March 18, 1996 then Congressman Randy Tate, a member of the House Aviation Subcommittee of the Transportation and Infrastructure Committee, held a hearing at the Des Moines Field House. Chaired by Congressman Duncan (Tennessee), other Congressional attendees included: Rep. Jack Metcalf (Washington), Rep. William Clinger (Pennsylvania), Rep, Tim Hutchinson (Arkansas), Rep,. Andrea Seastrand (California), Rep. Rick White (Washington), Rep. Robert Cramer (Alabama) and Rep. Randy Tate (Washington). Testimony was provided by Mayor Skip Priest (Federal Way), Steve Hockaday (consultant to the Airports Communities Council), Dr. Lynn Micheaus (Economist living in the airport area), Gina Marie Lindsey (Port Aviation Director), Robert Wallace (Greater Seattle Chamber of Commerce), Ed Merlis (Air Transport Association), Jane Rees (Washington Alliance of Taxpayers and Travelers), Robert Drewel (Snohomish County Executive and PSRC President), and Kathy Parker (Regional Commission on Airport Affairs).

The hearing was attended by approximately 200 residents from throughout four county region, elected officials from the region, community leaders, and interested parties. Because the room was small, about 50 to 75 area residents gathered outside to hear testimony that was carried over a loudspeaker.

The 70 DNL contour reaches to between South 112th and 116th Streets at the Rainier Golf Club on the north and nearly to Kent-Des Moines Road on the south. It extends from 12th Avenue on the west to the passenger terminal complex to the east. The shape characteristics demonstrated by the 70 DNL generally repeat those of the 65 DNL, although over a smaller area. The area between 70 and 75 DNL contour covers 3.02 square miles, including Airport property.

The 75 DNL contour remains over Airport property or public right-of-way to the east, west, and south. To the north, the 75 DNL extends into a residential area just north of 136th Street along the centerline approach to Runway 16R and reaches 215th Street South along the centerline approach to Runway 34R. The effect of noise generated by aircraft taxiing on taxiways is evident in the small protrusions of the east side of the 75 DNL contour over the terminal complex. Elsewhere, the noise levels from aircraft-related ground activity are masked by overflight noise levels.

3. FUTURE CONDITIONS WITH THE NEW FORECAST

The following sections summarize the noise exposure pattern of the alternatives in years 2000, 2005, and 2010. FAA Order 5050.4A, Chapter 5, Paragraph 47e (1)(d)2 states: "FAA's threshold of significance has been determined to be a 1.5 Ldn increase in noise over any noise sensitive area located within the 65 Ldn contour". The following sections summarize the changes in the noise exposure contours and identifies 1.5 DNL (Ldn) or greater changes in aircraft noise within the 65 DNL noise exposure contours.

(A) Alternative 1 (Do-Nothing)

The revised Do-Nothing noise exposure patterns for all three years are of similar shape and extent. The land area exposed to various sound levels for each future year are presented on **Table 5-3-1**. For the year 2000, the 65 DNL contour includes 6.81 square miles (including Airport property) and extends from West Marginal Way on the north to 244th Street South on the south, and from just west of Pacific Coast Highway on the east to 12th Avenue on the west. Its greatest width is approximately 5,900 feet at South 188th Street. The 70 DNL contour reaches from just north of 128th Street South at the northern end to just south of 216th Street at its south end. Directly east and west of the Airport, the contour remains over the Airport or compatibly-used properties. The 75 DNL contour extends from 146th Street South southerly to South 200th Street, and remains entirely over Airport property or public right-of-way.

By the year 2005, the 65 DNL contour area decreases to 6.61 square miles or by 3 percent from the year 2000 Do-Nothing. While the total number of aircraft operations increases from 1,121 in 2000 to 1,219 in the year 2005 (a 9 percent increase), the year 2000 fleet mix includes 32 operations by noisy aircraft (B-727) aircraft which are assumed to be replaced by quieter Stage 3 aircraft by 2005. By the year 2010, the 65 DNL contour would include 7.08 square miles and be 4% larger than the year 2000 contour and 7% larger than the year 2005 contour. Between 2000 and 2010, the north end of the 65 DNL contour broadens and extends northward by approximately 300 feet and the south end will grow by a similar amount. The 70 and 75 DNL contours would exhibit similar small fluctuations in their locations over the ten year period between 2000 and 2010.

In each future year Do-Nothing case, the presence of aircraft ground activity is noticeable in the shape of the 75 and 70 DNL contours in the vicinity of the various terminal facilities, but ground noise energy would generally be masked by flight noise in the 60 and 65 DNL contours. The noise exposure pattern for Alternative 1 (Do-Nothing) with the new forecast are presented in **Exhibits 5-3-2 through 5-3-4** for the years 2000, 2005, and 2010 respectively.

(B) <u>Alternative 3 (North Unit Terminal - Preferred Alternative)</u>

The noise exposure patterns for Alternative 3 are presented on **Exhibits 5-3-5 through 5-3-7** for the years 2000, 2005 and 2010 respectively. For noise modeling purposes, this alternative assumes the presence of a new runway (16X/34X) with a length up to 8,500 feet located 2,500 feet west of Runway 16L/34R, the extension of Runway 16L/34R by 600 feet to the south, and taxiway development to accommodate these runway improvements, as well as airside improvements to the terminal complex discussed in the alternatives section of this document.

A comparison of the noise contours associated with the Preferred Alternative and those of the Do-Nothing alternative provides insight into the effects related to the operation of the proposed new Runway 16X/34X. Adjustments to the way the Airport would be used are reflected in the changes between the two contour sets. After construction/commission, the third parallel runway would be used as one of two principal approach runways for the Airport. By 2005, approximately 20% of all approaches are forecast to use the new runway, and about 4% of all departures would use the runway. As a result, the noise exposure contour would widen to the west, yet because operations would occur on three runways versus the existing two, the length of the contour would shorten, in comparison to the Do-Nothing. By 2010, about 44% of arrivals would be expected to use the new runway. The effects of the greater usage of the contours would create further widening of the contour to the west, and shorten the length of the contours. **Table 5-3-1** also presents the areas within each noise level for the "With Project" alternatives.

The noise pattern for the year 2000 Preferred Alternative (Alternative 3) is largely unchanged from that of the Do-Nothing alternative, since the principal new facilities that affect aircraft noise (the airfield) would not be altered substantially until the 2004/2005 time frame. Consequently, the noise contour for the Do-Nothing and "With Project" alternatives would be virtually the same.

In contrast, the Alternative 3 noise patterns for the years 2005 and 2010 reflect the presence of the new airfield improvements. While the presence of a new runway would cause the shape of the contour for each noise level to shorten, it would also result in a broadening of the shape, particularly adjacent to the Airport, but also along the approach and departure corridors. For the year 2005, the effects on the noise contour pattern associated with the construction of the proposed new runway would be as follows:

- The area exposed to noise above 65 DNL would be greater to the west than for the Do-Nothing alternative, particularly in close proximity to the new runway, but also along the western edge of the contour to the north and south of the Airport.
- The length of each contour is expected to be slightly reduced from the Do-Nothing alternative (by as much as 1,000 to 2,000 feet at the north and south end of the 65 DNL contour), owing to a reassignment of operations to the new runway from the existing runways, hence reducing noise under the existing runway paths.

The development of passenger and cargo facilities on the Airport would also result in minor shifts of ground noise patterns along the east side of the noise contours, immediately east of the runways, within Airport property. Development of facilities in the area known as the South Aviation Support Area (SASA) is reflected in the 75 DNL contour of the 2000 pattern by the presence of a hook extending from the south end of the east parallel runway toward the

Representative John Duncan called the meeting to order and indicated that the Subcommittee was responding to Representative Tate's request to review issues surrounding the proposed third runway. He then introduced Representative Tate (Washington) who provided a presentation concerning issues he has with the proposed runway: need for the runway, and concerns with costs and funding sources, etc. Representative Duncan noted that three panels of speakers would provide testimony, and that each speaker would be limited to five minutes of testimony. Follow-up questions would then occur after all of the panels were heard. He urged anyone else to submit their comments in writing for consideration by the Subcommittee.

The first panel consisted of Skip Priest, Steve Hockaday, and Dr. Lynn Micheaus. Mayor Priest noted that the proposed runway would be disruptive and that the rights of the minority must be balanced against the greater good. He indicated that the proposed runway has little value, a large cost of $3.3 billion and will result in great loss in property values to area residents. Dr. Steve Hockaday indicated that the project fails to meet its intended need. He cited three reasons: 1) Poor weather is less frequent than reported by the Port; 2) Increased costs at Sea-Tac will divert operations to Paine Field; 3) Airspace constraints between Sea-Tac and Boeing Field with the third runway will divert general aviation traffic to Sea-Tac. Mr. Hockaday indicated that the Localizer Directional Aid (LDA) would address the need through the year 2020 and he expressed safety concerns with the third runway due to runway incursions. Dr. Lynn Micheaus indicated that the issue is one of pricing. He indicated that airport facilities are not properly priced to address demand and do not reflect the real costs. He calculated that the return on the investment of the third runway would be less than 1 percent, making it an unwise investment. He also noted that federal funds should not be used to address a need identified at a local level -- that local funds should be used.

The second panel consisted of Gina Marie Lindsay, Robert Wallace, and Ed Merlis. Ms. Lindsay summarized the operational needs for a third runway, the cost of the new runway at $405 million plus $50 million in mitigation, and the cumulative work and moneys that the Port has already spent on noise mitigation. Mr. Wallace reported that the proposed runway is the best and most cost effective solution. He also noted the importance of Sea-Tac in the infrastructure of the region. Mr. Merlis commented on the cost of the project, the cost of delay to the airlines, the availability of federal funds. He indicated that the airlines are concerned with the cost.

The third panel consisted of Jane Rees, Robert Drewel, Kathy Parker. Ms. Rees, a Magnolia resident, indicated her concern with the financing of the project and the possibility of taxes being raised. Mr. Drewel summarized the background leading to the PSRC General Assembly decision. He noted that 88% of the elected officials of the region supported the selected approach. Ms. Parker, a resident of Burien, cited Sydney Australia as an example where the public has grounds to oppose a project because the EIS did not adequately consider impacts. She expressed similar concerns with aircraft noise, and impacts that would be experienced during construction of a new runway at Sea-Tac.

Representative Duncan then initiated the questions. Questions from all members of Congress were offered to each panel. Questions of the first panel consisted of how a multiple airport system would work, if there was confidence in the mitigation cost estimates and the overall cost estimates. Mayor Priest indicated that he felt that the mitigation costs were too low. Mr. Hockaday indicated that the LDA would be $1 million. He also noted the Colorado Springs Effect of the new Denver airport. He reported that as the cost to operate at Denver grew, airlines transferred their operations to Colorado Springs. Representative Tate cited the Master Plan Update report which indicated that the Port has an option of raising property taxes to fund development at Sea-Tac. Questions of panel 2 consisted of financial feasibility and the possibility of a tax increase. Representative Tate requested that the Port commit to not raising tax rates to fund the proposed project. He requested that if a tax increase were to be needed that a public vote should be necessary before the Port proceed. Questions of panel 3 focused on the public process. Ms. Rees and Ms. Parker indicated that the public process was not inclusive, that the Port undermined the process or "rolled over" the public desire.

(B) Local Land Use Actions

Chapter IV, Section 2 "Land Use Impacts" of the Final EIS for the Master Plan Update improvements presents a detailed assessment of the impact of the the proposed improvements on local land use and summarizes the compatibility of the alternatives with relevant local and regional land use plans available through December 1, 1995. Discussed are: City of SeaTac Comprehensive Plan; adopted and interim comprehensive plans, elements and code amendments for Des Moines, Normandy Park and Burien; the Tukwila Comprehensive Plan; The King County Comprehensive Plan; The King County Countywide Planning Policies; VISION 2020: Growth and Transportation Strategy for the Central Puget Sound Region, Puget Sound Council of Governments (1990); and the 1995 Update of VISION 2020 and 1995 Metropolitan Transportation Plan; applicable resolutions of the PSRC[4] including the PSRC's Multi-County Framework Policies under GMA. The following summarize the status of these plans as of December 31, 1996.

PSRC Vision 2020 Plan and Metropolitan Transportation Plan - In May 1995, the Puget Sound Regional Council adopted the Vision 2020 Update, which has not been amended since. However, as is noted earlier, the PSRC adopted Resolution A-96-02 in July, 1996, to amend the Metropolitan Transportation Plan (MTP) to include a third runway at Sea-Tac Airport with additional noise reduction measures. The PSRC sent a letter to the local jurisdictions alerting them to the amendment and to the need to assure, effective August 2, 1996 (the date that the resolution became effective), that their comprehensive plans are consistent with the MTP as amended. Specifically, "transportation strategies should reflect the need to provide for safe and efficient access and connections to the Sea-Tac Airport as its role as a regionally significant transportation facility continues to increase".

Prior to this requirement, PSRC had certified that the transportation elements of the Comprehensive Plans for SeaTac, Des Moines, Normandy Park, and Federal Way were consistent with the MTP. The Tukwila transportation plan element is scheduled for consistency review in January 1997. The Tukwila plan, as well as other amendments by local jurisdictions, will be required to be consistent with the Updated MTP.

King County Comprehensive Plan and Countywide Planning Policies - The King County Comprehensive Plan was amended in November 1996. The amendments passed since issuance of the February 1996 Final EIS address land use issues in rural King County.

City of SeaTac - The City of SeaTac's Comprehensive Plan was adopted in December 1994 and amendments to the plan occurred in December 1995, and December 1996. One of these amendments was the redesignation of about 13 acres of land on the west side of Sea-Tac Airport (in the acquisition area for the third runway) from single-family to multi-family use. These properties, located east of SR 509 - between South 170th and 176th Streets, are currently affected by 65 DNL and greater sound levels. In October 1996, the City Council voted to rezone these properties as multi-family.

In March 1995, the City formed an ad-hoc group called the Westside Ad-Hoc Citizens Advisory Committee for the purpose of developing land use options for the "with" and "without" runway scenarios. The Committee, which was sunset in October 1996, recommended a single plan for both scenarios that included a mix of single family

[4] See Appendix A for copies of PSRC resolutions A-93-03 and EB 94-01.

residential, multi-family residential, medium and high-density commercial mixed use, and open space. It is anticipated that the area where the runway would be developed would be redesignated as "airport use" once the runway was undertaken (i.e., once the Port has acquired the land). In sunseting the group, the planning effort was placed on hold, but the City Council is scheduled to discuss the Westside Plan in early 1997. SEPA review of the Westside Plan is expected to occur in early 1997. No amendments have occurred to bring about transportation compatibility with the Airport, as directed by the Updated MTP.

City of Des Moines - In December 1995, the comprehensive plan for Des Moines was adopted. Amendments considered in 1996 include preferred land use maps for Woodmont and Redondo, predominately residential neighborhoods located on the southside of the city, that are slated for annexation in January 1997. Several other minor land use changes are also slated for various parts of the City. No amendments have occurred to bring about transportation compatibility with the Airport, as directed by the Updated MTP.

City of Normandy Park - Since adoption of their plan in December 1995, no amendments have been adopted or scheduled and no amendments have occurred to bring about transportation compatibility with the Airport, as directed by the Updated MTP.

City of Burien - In April 1995, an interim plan was adopted while the city prepares its comprehensive plan. A public discussion draft comprehensive plan has been circulated, with hearings scheduled for spring 1997 after an official draft has been prepared and released. No amendments have occurred to bring about transportation compatibility with the Airport, as directed by the Updated MTP.

City of Federal Way - Since adoption of their plan in November 1995, no amendments have been adopted. Thus, no amendments have occurred to bring about transportation compatibility with the Airport, as directed by the Updated MTP.

City of Tukwila - Since adoption of their plan in December 1995, no amendments have been adopted. No amendments have occurred to bring about transportation compatibility with the Airport, as directed by the Updated MTP.

(C) Lawsuits and SEPA Appeals

Several legal actions have occurred since the issuance of the Final EIS in February 1996 and are on-going. This section summaries these activities.

In August 1996, the Airport Communities Coalition and its member municipalities filed a suit in King County Superior Court against the PSRC and the Port for "violations of the Growth Management Act (GMA), the State Environmental Policy Act (SEPA) and other laws governing governmental decision-making within the state of Washington". Activities related to this lawsuit are currently underway, including discovery requests and consideration of motions for partial summary judgment filed by the parties.

The Airport Communities Coalition, the City of SeaTac, and two individuals filed administrative appeals with the Port of Seattle's Hearing Examiner challenging the Port's compliance with the Washington State Environmental Policy Act. At the request of certain parties, the Port's Hearing Examiner recused herself from hearing the appeals. The Port has since selected a new hearing examiner.

The applicability of the City of SeaTac regulations to Port development activities at Sea-Tac Airport continues to be subject of negotiation through an interlocal process between the Port and the City of SeaTac. The declaratory judgment lawsuit in King County Superior Court between the Port and City is currently on hold pending these negotiations.

In February 1997, the Port of Seattle brought a petition for review before the Central Puget Sound Growth Management Hearing Board which alleges that the City of Des Moines' Comprehensive Plan amendment in December, 1996 fails to reflect the necessary changes required under Resolution A96-02.

4. CUMULATIVE IMPACTS

One of the primary questions that surfaced in preparing the Draft and Final EIS were requests to clarify how the document treated other non-airport improvements in the area. All of the environmental analysis presented in the Draft and Final EIS reflects a cumulative impact evaluation of the Master Plan Update and several non-aviation related improvements, including:

- *On-Airport Hotel*
- *Des Moines Creek Technology Campus* (DMCTC) with CTI development - during the preparation of this additional environmental analysis, the City of Des Moines and the Port of Seattle discontinued discussions of the DMCTC project. No changes were made in the assumptions associated with development of this site, as it is anticipated that commercial development will occur on the site at some time in the future.
- *City of SeaTac Airport Business Center*
- *Federal Detention Center* is the facility that has been under construction along S. 200th Street, south of Sea-Tac.
- *South Aviation Support Area development* (the Do-Nothing assumes that the site known as SASA is developed for maintenance functions as discussed in the 1994 Final EIS for that project. The Master Plan Update Final EIS and this additional analysis reflects development of this area to support displaced and/or growth in cargo and maintenance facilities.
- *Roadway projects* included in the Transportation Improvement Plan, such as widening International Boulevard, 28th/24th Avenue South improvements, etc.
- *Regional roadway projects*, such as SR 509 Extension and Southern Airport Expressway

In addition, other development is anticipated to occur in the airport area in the future in accordance with the Comprehensive Plans of the individual jurisdictions. Until specific development proposal for these facilities are known, it is not possible to predict the total cumulative impacts.

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Appendix G - Air Transportation Noise Reduction Measures and Implementing and Monitoring Steps

The responsible parties as indicated will agree to pursue additional aircraft noise mitigation for communities surrounding Sea-Tac Airport by implementing the following package of noise reduction measures:

I. <u>THE PORT OF SEATTLE</u>

The Port of Seattle will pass a Port Commission resolution affirming that it agrees to:

A. Evaluate and upgrade its existing noise monitoring system to include the use of approximately 25 noise monitors, develop a schedule for completion by the end of 1998, and thereafter disseminate regular reports to the public using data from the new noise monitoring system to include DNL, SEL and Time Above metrics.

B. Work with the FAA and/or airlines to:
   1. Analyze the potential for reducing the use of thrust.
   2. Voluntarily minimize the number of flights in the middle of the night (1:30-5:30 am.).
   3. Continue to enforce Airport Rules and Regulations to minimize the number of variances for the Nighttime Limitations Program.
   4. Work with foreign air carriers to gain cooperation in ensuring that Stage 3 aircraft continue to be used for nighttime international flights.
   5. Work with the owners/operators of Stage 2 aircraft under 75,000 pounds to voluntarily limit or eliminate their use.
   6. Continue to work to enforce Airport Rules and Regulations to minimize nighttime engine run-ups.

C. Modify its existing contract with noise experts to specifically include the need to review methods of mitigating the impacts of low frequency noise and vibration, and to supply such information to the Port.

D. Design and implement a noise compatible land use plan for Port properties within its current acquisition zone.

E. Complete the "sensitive use" public buildings insulation pilot studies.

F. Seek a public commitment from FAA to evaluate actions needed to prevent apparent violations of the North Flow Nighttime Departure Noise Abatement Procedures to the extent that safety and efficiency allow.

G. In carrying out the Part 150 Study:
   1. The Port of Seattle will invite the Regional Council, the FAA, and affected patties to participate, and ensure that they are able to participate actively and constructively, in the Port's upcoming Part 150 study, which will commence in the fall of 1996 and is expected to take two to three years.
   2. Part 150 Study participants will be invited to take part in developing the scope of the study, consultant selection, and in all other milestones and products of the project, such as development of noise exposure maps; development of noise reduction and land use compatibility measures; and Port consideration and approval of the program.
   3. Items to be considered in developing the scope of the Part 130 Study will include but not necessarily be limited to:
      a. Relocation of run-up areas where daytime engine run-ups occur, to reduce ground-related noise.

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b. Evaluating the potential net benefits of preferential runway use during low activity periods.

c. Evaluating benefits and impacts of changes to departure climb profiles.

d. Analysis of need to adjust Noise Remedy Program boundaries to include those in 65 DNL by the year 2000, provided that the Port will not reduce its established Noise Remedy Program boundaries for currently eligible properties.

e. Evaluating scope, boundaries and funding for public use and multi-family buildings.

4. If, as a result of the Part 150 Study, a proposed noise reduction strategy results in a net improvement but causes a transfer of noise impacts to other communities, the Port of Seattle, Regional Council, FAA and communities affected by airport noise will seek agreement on guidelines or other equitable procedures for dealing fairly with conflicting views and needs of different communities.

5. The Port of Seattle will ask the FAA to include within its Record of Decision on the Master Plan Update Final Environmental impact Statement the requirement to conduct a Part 130 Study with the goal of assessing needed additional noise abatement and mitigation.

H. School Insulation

1. The Port of Seattle will commit up to $50 million for school insulation.

2. The Port of Seattle will meet with the Highline School District to try to reach agreement on a plan for insulating the District's schools. If direct talks between the District and Port fail to produce agreement on a noise insulation program for the District's schools, the Port may request that the PSRC assist the parties in selecting an independent mediator.

3. The Port will initiate the Highline School District school insulation program consistent with an agreement reached by the District and Port.

4. Once the Port of Seattle completes the sound insulation program for schools affected by aircraft noise exposure of 65 DNL from Sea-Tac International Airport, it will investigate feasibility and funding for insulating schools affected by then current 60-65 DNL aircraft noise exposure from Sea-Tac. Sound insulation must comply with FAA eligibility criteria to achieve measurable noise benefit.

I. Deliver to the Regional Council on or before September 5, 1996, a detailed timetable for carrying out the steps specified in subsections A through H of this section, including (a) defined milestones against which the Port's progress toward completion of those steps may be measured, and (b) a schedule for progression planning, design, and construction of a third runway at Sea-Tac Airport.

II. HIGHLINE SCHOOL DISTRICT-

The Highline School District will:

A. Meet with the Port of Seattle to try to reach agreement on a plan for insulating the District's schools. If direct talks between the District and the Port fail to produce agreement on a noise insulation program for the District's schools, the District may request that the PSRC assist the parties in selecting an independent mediator.

B. Initiate its school insulation program, consistent with an agreement reached with the Port of Seattle.

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III. PUGET SOUND REGIONAL COUNCIL

The Puget Sound Regional Council will:

A. Seek financing to (a) actively participate in the Port's upcoming Part 150 study; (b)undertake a study to evaluate a financing mechanism for the acquisition of incompatible uses as noted in 111-0, below; and conduct surveys as noted in the studies.

B. As part of its Policy and Plan Review process, the PSRC will:
   1. Conduct an initial review of land use plans for areas that are within the 65 Ldn contour, and provide annual review of future changes;
   2. Offer assistance to jurisdictions in finding ways to minimize the introduction of incompatible land uses;
   3. Provide facilitation services, if requested by the Port of Seattle and jurisdictions in the vicinity of Sea-Tac Airport, to reach agreement on ways to redevelop currently incompatible land uses.

C. Upon receipt of a Resolution approved by the Port of Seattle that contains all the items under Port of Seattle Resolution, above, the Executive Director of the PSRC will notify the Executive Board that the Metropolitan Transportation Plan amendment including a third runway at Sea-Tac Airport has taken effect.

D. Encourage King County to continue its efforts to eliminate the two nighttime Alaska Airlines Stage 2 flights from Boeing Field.

E. Seek support for state legislation for state policies regarding land use compatibility around commercial airports, and will seek support for federal legislation to allow use of federally approved funding for insulation and acquisition programs beyond the current federal constraints.

F. Annually convene representatives of the Port of Seattle, FAA, communities affected by airport noise, and other interested parties, to coordinate efforts by all parties to alleviate issues that are undercutting the effectiveness of current noise reduction efforts and eliminate roadblocks to resolving issues, then report on progress to the Executive Board.

G. Undertake a study which evaluates use of a state-financed revolving fund, or other financing mechanism (such as a public/private partnership) for the acquisition of incompatible uses within the 65 DNL to the 75 DNL contour, for conversion to noise compatible non-residential uses. Any such funding mechanism must demonstrate a balance between long-term costs and revenues. The results of the study should he presented to the Executive Board by June 30, 1997.

H. The Regional Council will conduct statistically valid surveys, during and after construction of the third runway, to assess Sea-Tac Airport's effects on such items as noise, transportation/circulation, and land uses in the surrounding communities.

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IV. WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND TRANSPORTATION COMMISSION

The Washington State Department of Transportation and Transportation Commission will:

A. Seek funding for acceleration of efforts to provide improved higher speed rail service in the I-5 Corridor.

B. Seek legislation similar to-what was approved for general aviation airports during the 1996 session, to provide state policies for land use compatibility around commercial airports.

C. Recommend that the State, in cooperation with appropriate local jurisdictions and regional transportation planing organizations, implement a comprehensive process for evaluating all options to meet the State of Washington's long term air travel and inter-regional ground transportation needs, including high speed rail.

V. MONITORING COMPLIANCE

To ensure that measures contained in this Appendix G to the 1993 Metropolitan Transportation Plan are implemented as described, several mechanisms for tracking success and assuring accountability will be implemented. They include:

A. The Port of Seattle will report to the Regional Council twice yearly on progress toward all the efforts encompassed in this action, and

B. King County will report to the Regional Council Executive Board every six months on progress toward eliminating nighttime Stage 2 flights at King County International Airport, and

C. Regional Council staff will report annually to the Executive Board on its participation in the Part 150 Study and, based on its Policy and Plan Review Process, on progress toward minimizing the introduction of incompatible land uses within the 65 Ldn contour.

Source: Puget Sound Regional Council, Resolution A-96-02

CHAPTER 5

ENVIRONMENTAL CONSEQUENCES

This chapter presents an assessment of the environmental impacts of the proposed Master Plan Update improvements using the new forecast prepared by the Port of Seattle, as well as other new data that has become available since publication of the Final EIS in February, 1996. As required by FAA Orders 1050.1D and 5050.4A and the Washington State Environmental Policy Act, the following environmental factors were assessed:

5-1 **Surface Traffic Analysis**

5-2 **Air Quality Impacts**

5-3 **Noise Impacts**

5-4 **Construction Impacts**

5-5 **Biotic Communities, Wetlands, and Floodplains**

5-6 **Land Use Impacts** (Land Use Compatibility, DOT Section 4(f), Archaeological/Cultural and Historical Resources)

5-7 **All Other Impacts** (Prime and Unique Farmland, Social Impacts, Human Health, Induced Socio-Economic Impacts, Water Quality, Coastal Zone Management and Coastal Barriers, Wild and Scenic Rivers, Public Services and Utilities, Earth, Solid Waste, Hazardous Waste and Materials, Energy Supply and Natural Resources, Aesthetics and Urban Design)

The impacts of the alternatives on the environmental factors above were assessed relative to the existing conditions (1993 or 1994 if available) and future years 2000, 2005, and 2010. The Final EIS contains a detailed presentation of the methodology, and resulting analysis prepared based on the Master Plan Update forecast. The Final EIS is hereby incorporated by reference. **Appendix D** of this Supplemental EIS contains an evaluation of possible conditions in year 2020, based on an extrapolation from impacts presented in this chapter. As was noted earlier, projections beyond year 2010 are not reasonably foreseeable in light of the high volatility that has existed in the last few years relative to demand for air travel at Sea-Tac Airport.

Sections of this chapter were revised in preparing the Final Supplemental EIS based on agency and public comments. **Appendix F** contains a summary of the comments received while **Appendix G** contains the comments. The primary changes made to these sections affect Section 5-2 "Air Quality" and Section 5-7 "Other Impacts".

The Final EIS presents a detailed examination of the environmental impacts associated with the Do-Nothing (Alternative 1) and "With Project" alternatives (Alternatives 2 through 4). This Supplemental EIS presents the detailed impacts associated with Alternative 1 (Do-Nothing) and Alternative 3 (Preferred Alternative). As was shown in the Final EIS, very small differences in environmental impacts would occur among the "With Project" alternatives. Impacts associated with Alternative 2 and Alternative 4 were extrapolated based on the material presented in the Final EIS as well as this Supplemental EIS.

A number of reasons were used to identify the Preferred Alternative, as cited in the February 1996 Final EIS (Volume 1, Page II-41):

- Reduces the existing and future disparity between the poor weather and good weather operating capability, enabling dependent parallel arrival streams during poor weather conditions.
- Provides the greatest delay reduction of all alternatives considered. The reduced operating times associated with the implementation of a third parallel runway would result in a substantial cost savings to the airlines. A new parallel runway would have saved the airlines $24 million annually if it had been available for use in 1994. The delays saving is expected to grow to around $59 million per year in 2000 (when aircraft operations were anticipated to be 379,200 operations, which occurred in 1995), and $146 million annually when activity reaches 425,000 operations (which was forecast by the Master Plan to occur near the year 2013 – the new forecasts indicate that this level could now be reached by 2002). As a result, if the runway were available for use in year 2002, the delay savings would compensate for the cost of construction in a 5 year period. If completed later, the pay-back period would be sooner than 5 years.
- The proposed new runway would accommodate 99% of the possible aircraft types for landing which currently use or are anticipated to be operating at Sea-Tac.
- Enables unrestricted departure weights for aircraft departing to the Pacific Rim countries during warm summer weather.
- Provides efficient and flexible landside facilities to accommodate future aviation demand providing the greatest levels of service to air passengers by improving curb-to-terminal and curb-to-gate access, decreased walking distances, and the lowest cost per new aircraft gate
- Relieves the surface vehicle congestion on the existing terminal drive system.
- Minimizes disruption of commercial development along International Boulevard.
- Enables future expansion of terminal and support facilities in an incremental fashion to accommodate air travel demand as growth occurs.
- Minimizes the disruption to existing airport facilities during the implementation of the proposed improvements.
- Minimizes aircraft push-back and taxiing conflicts as flights enter and exit the terminal area.

None of the reasons for selecting the Preferred Alternative relate to forecast sensitive environmental conditions that differentiated the "With Project" alternatives and the new data would not lead to a different conclusion.

SECTION 5-1

SURFACE TRANSPORTATION

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. This section presents a summary of the detailed surface transportation analysis provided in **Appendix C-1**. Section 5-4 of this chapter of the Supplemental EIS summarizes the construction-related surface transportation impacts.

The surface transportation analysis, using the new forecast shows the following:

- Total Airport traffic is expected to increase from approximately 72,500 vehicles per day in 1994, to approximately 114,000 vehicles per day for the Do-Nothing Alternative (Alternative 1) or approximately 113,300 vehicles per day for the "With Project" in the year 2010. The differences between the Do-Nothing and the "With Project" traffic volumes are primarily associated with the amount of on-airport parking available through each alternative, and how the availability of parking affects vehicular access to the Airport, as listed in **Table 5-1-2**.
- Based on forecast demand, approximately $39.2 million in parking tax revenue will be generated by on-airport parking in Port of Seattle parking facilities by the City of SeaTac parking tax. This tax revenue is programmed in the City's Transportation Improvement Program for improvements necessary to accommodate the Do-Nothing (Alternative 1) traffic levels.
- 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.
- The Preferred Alternative includes transportation improvement projects to reduce impacts associated with the Master Plan Update improvements. These include intersection improvements at 24th Avenue South/South 154th Street, intersection improvements at International Blvd/South 160th Street.
- The Preferred Alternative would generate an additional 95 PM peak hour trips in the year 2010 over the Do-Nothing Alternative.
- The transportation improvement project that would have the greatest impact on conditions in the Airport area is the construction of the State Route 509 Extension and South Access. Numerous alternatives have been developed and evaluated that range from building a limited access expressway, to using the proposed 24th/28th Avenue South arterial.

(1) METHODOLOGY

The surface transportation analysis is based on detailed level of service calculations at intersections and freeway ramp junctions in the Airport vicinity. These calculations were performed for existing 1994 conditions and for future year conditions, including the years 2000, 2005, and 2010 for the Do-Nothing (Alternative 1) and Preferred Alternatives (Alternative 3). Impacts associated with Alternatives 2 (Central Terminal) and 4 (South Unit Terminal) were extrapolated based on the analysis prepared for the Draft and Final EIS.

For each future year, the level of service results of the Do-Nothing Alternative were separately compared to the level of service results of the "With Project" to identify adverse impacts. An adverse impact is defined as a significant degradation in level of service (defined as a reduction in at least one LOS category) when the "With Project" is compared to the Do-Nothing Alternative.

(A) Level of Service (LOS)

Level of service (LOS) is used to describe the operating conditions at intersections, freeway ramp junctions, or along roadway segments. The level of service is described by the letters ranging from "A" through "F". The highest or most efficient operation is LOS A, which indicates little or no congestion, while LOS F indicates severely congested traffic flow conditions.

The level of service calculations for the Final EIS analysis were performed according to the methodologies presented in the Transportation Research Board's 1985 Highway Capacity Manual for signalized and two-way stop controlled intersections, according to Circular #373 for all-way stop controlled intersections, and according to the methodologies presented in the Transportation Research Board's 1994 Highway Capacity Manual for freeway ramp junctions. The level of service calculations for this revised analysis were performed according to the methodologies presented in the Transportation Research Board's 1994 Highway Capacity Manual for signalized intersections, two-way stop controlled intersections, all-way stop controlled intersections, and freeway ramp junctions. Level of service calculations were performed for peak hour conditions at all relevant intersections and freeway ramp junctions in the Airport vicinity.

Current flight schedules indicate that the Airport's weekday peak period occurs between 11:00 a.m. and 1:00 p.m.[1/] Surface transportation patterns in the vicinity of the Airport peak between 11:00 a.m. and 1:00 p.m., and between 3:00 PM and 6:00 PM.[2/] The afternoon peak reflects the heaviest traffic conditions of the day and the period of peak congestion for the surface transportation system. The hour between 5:00 p.m. and 6:00 p.m. represents the hour of peak congestion for the surface transportation system. Therefore, the level of service calculations were performed for peak hour conditions that occurred between 5:00 p.m. and 6:00 p.m.

(B) Future Traffic Volume Forecasts

The Puget Sound Regional Council (PSRC) is the Metropolitan Planning Organization for the Puget Sound area. The PSRC adopted the 1995 Metropolitan Transportation Plan (MTP), which represents the transportation plan for the entire Puget Sound area. Growth trends are based upon year 1990, 2000, and 2010 traffic forecasts obtained from the PSRC MTP. Airport related traffic used in the analysis presented in this Supplemental EIS is based on the forecasts presented in Chapter 2.

(C) Airport Trip Generation and Travel Patterns

The Airport is a sizable regional traffic generator with an estimated 72,500 annual average vehicle trips per day in 1994. Eight categories of Airport traffic were quantified and described as follows:

1/ *Technical Report No. 4: Facilities Inventory*, p. 5-4, P&D Aviation, Revised August 1994.

2/ *Historical Average Daily Traffic Counts*, City of SeaTac Department of Public Works, 1994.

- Passenger - Traffic on the terminal drive system consisting of short-term and long-term garage parking, passenger drop-offs and pick-ups, courtesy vehicles, shuttles, car rentals, taxis, and transit.
- Passenger Off-Site Parking - Traffic generated by passengers using the off-site parking facilities but not including the courtesy vehicles.
- Airport Employee - Traffic generated by Port of Seattle employees, airline employees, tenants and the remote parking lot shuttle bus.
- Air Cargo - Traffic generated by the air cargo facilities and associated employees.
- Airfield Operations Area (AOA) - Traffic generated by activities within the Airfield Operations Area, including the off-site flight kitchens.
- General Aviation - Traffic generated by general aviation activities and associated employees.
- Aircraft Maintenance - Traffic generated by the Aircraft Maintenance facilities and associated employees.
- Other - Traffic generated by miscellaneous activities such as deliveries to the Airport (non air cargo related).

The trip characteristics of these eight categories of Airport traffic were used to allocate Airport traffic to the various activity centers off-Airport. **Table 5-1-1** summarizes Airport traffic by each category for each year evaluated for both the Final EIS and Supplemental EIS. **Table 5-1-2** summarizes the mode choice patterns of passenger related Airport traffic. **Exhibit 5-1-1** summarizes the regional origin-destination patterns of all Airport related traffic. Further discussion of Airport related trip generation and travel patterns can be found in **Appendix C-1**.

(2) EXISTING CONDITIONS

The following sections summarize the existing surface transportation system and the level of service presently afforded by this system.

(A) Surface Transportation System

The surface transportation system is illustrated in **Exhibit 5-1-3** and further defined in **Appendix C-1**. The 1994 traffic levels represent a combination of data from various sources. Existing 1994 traffic volumes were provided by the City of SeaTac, Washington State Department of Transportation (WSDOT), and collected by field observations. These traffic volumes were then seasonally adjusted to reflect annual average daily traffic (AADT) conditions. WSDOT seasonal adjustment factors were used to adjust these volumes. The 1994 AADT volumes were then compared to the City of SeaTac 1991-1992 traffic volumes,[3] WSDOT 1992 traffic volumes,[4] and the MTP base 1990 traffic volumes to ensure data consistency. The 1994 volumes are shown in **Exhibit 5-1-3**.

(B) Level of Service

Detailed level of service calculations were performed at intersections and freeway ramp junctions in the Airport vicinity. The intersection level of service results are summarized in **Table 5-1-3**, and shown in **Exhibit 5-1-2**. The freeway ramp junction level of service results are summarized in **Appendix C-1**.

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[3] *Comprehensive Transportation Plan Summary Report*, City of SeaTac Department of Public Works and the TRANSPO Group, Inc., 1991.

[4] *1992 Annual Traffic Report*, Washington State Department of Transportation.

According to the City of SeaTac adopted level of service standard,[5] none of the evaluated intersections are currently functioning at an unacceptable level of service. The intersection of International Boulevard/State Route 99 and South 188th Street is functioning at an unacceptable level of service, however, the level of service standard specifically grants an exception at this intersection location.

The surface transportation system has significant peak hour congestion, particularly on the freeway system, mainly due to regional, non-Airport related traffic.

(3) FUTURE CONDITIONS USING THE NEW FORECAST

Using the new forecast described in Chapter 2, the impacts on surface transportation conditions were considered. Several non-airport related transportation improvement projects are planned within the vicinity of the Airport which would impact surface transportation conditions. These improvement projects are shown in **Exhibits 5-1-4 through 5-1-6**, and are described in detail in **Appendix C-1**. These improvements were included in both the Do-Nothing and "With Project" alternatives.

(A) Alternative 1 (Do-Nothing)

Traffic forecasts were performed according to the growth trends obtained from the PSRC MTP and verified against the City of SeaTac's Comprehensive Plan. The forecast AADT volumes are shown in **Exhibit 5-1-3**. Level of service calculations were performed at relevant intersections and freeway ramp junctions in the Airport vicinity.

The intersection level of service results are summarized in **Table 5-1-3**, and shown in **Exhibit 5-1-2**. According to the adopted City of SeaTac level of service standard, a total of three (3) intersections would be functioning at an unacceptable level of service in the year 2000, a total of eight (8) intersections in the year 2005, and a total of nine (9) intersections in the year 2010. The intersections of International Boulevard (also known as SR99) and South 200th Street, International Boulevard and South 188th Street, and Southbound I-5 ramps at South 188th Street were specifically excluded from the City of SeaTac adopted level of service standard.

The freeway ramp junction level of service results are described in detail in **Appendix C-1**.

(B) Alternative 3 (Preferred Alternative - North Unit Terminal)

Chapter 2 provides a detailed description of the actions included in the Preferred Alternative, and the differences between these actions and the Final EIS actions. Traffic forecasts were performed according to the growth trends obtained from the PSRC MTP and verified against the City of SeaTac's Comprehensive Plan. The forecast AADT volumes are shown in **Exhibit 5-1-8**. Level of service calculations were performed at relevant intersections and freeway ramp junctions in the Airport vicinity.

The intersection level of service results are summarized in **Table 5-1-4**, and shown in **Exhibit 5-1-7**. According to the adopted City of SeaTac level of service standard a total of two (2) intersections would be functioning at an unacceptable level of service in the year 2000, a total of four (4) intersections in the year 2005, and a total of seven (7) intersections in the year 2010.

5/ *City of SeaTac Comprehensive Plan*, City of SeaTac, December 1995, Page 3-5

In comparison to the Do-Nothing alternative, the proposed Master Plan Update improvements would improve the level of service at several intersections. These improvements would occur at: five (5) intersections in the year 2000, eight (8) intersections in the year 2005, and at three (3) intersections in year 2010. These improvements would occur for several reasons, including: more long-term passenger parking can be accommodated on-airport under the Preferred Alternative (thus reducing trips off-airport); and the construction of the North Unit Terminal and the South 170th Street access will relieve some of the pressure at the existing South 180th Street access.

The freeway ramp junction level of service results are described in detail in **Appendix C-1**.

(C) **Alternative 2 (Central Terminal) and Alternative 4 (South Unit Terminal)**

As described previously in Chapter 2, the aviation activity forecasts and the phasing of the proposed improvements have changed since the completion of the Final EIS. The new aviation activity forecasts has essentially accelerated the demand levels at the Airport by five to ten years, which in turn would accelerate the need for development of expanded terminal and landside facilities. As was discussed in the Final EIS, the initial phases of the Master Plan Update improvements are virtually the same under each of the three "With Project" alternatives. As passenger traffic grows, soon after the year 2000 the Port would be required to decide how to accommodate terminal development requirements. The Preferred Alternative would result in the development of a North Unit Terminal, while Alternative 2 would develop a Centralized Terminal or Alternative 4 would call for a South Unit Terminal. The same level of demand would be associated with each terminal concept. The improvements shown in **Exhibits 3-2 and 3-4** constitute these alternatives.

The Final EIS presents a detailed examination of the surface transportation conditions associated with these alternatives. As was shown in Table IV.15-3 of the Final EIS, very small differences in the level of service performance of the intersections would occur between the alternatives, yet the level of delay experienced at various locations would differ. However, as was noted in Chapter 2 of this Supplemental EIS, changes were made to the Preferred Alternative (Alternative 3) as a result of accelerated demand and changes in construction phasing, as well as changes to address surface transportation conditions that could occur at South 24th Ave./South 154th Street and International Blvd/South 160th Street. Similar changes could be made to these other "With Project" alternatives that would eliminate the adverse level of service impacts presented in the Final EIS. As is described in Page II-41 of the Final EIS, a number of reasons lead the Port of Seattle to recommend Alternative 3 as the Preferred Alternative. None of the reasons for identifying the Preferred Alternative relate to off-airport surface transportation conditions that differentiated the "With Project" alternatives.

(4) COMPARISON TO THE MASTER PLAN FORECAST IMPACTS

The primary differences associated with surface traffic conditions, when comparing the analysis in the preceding section to the analysis in the Final EIS, is associated with the aviation activity forecast and the resulting surface traffic levels. When comparing the "With Project" alternatives from the Final EIS to this evaluation, the phasing associated with the proposed improvements is also different, as discussed in Chapter 2. The following sections compare the resulting level of service analysis.

(A) Transportation Improvement Projects

Each year, the transportation agencies must update their transportation improvement project list. These updates can modify existing projects and add new projects. As a result, since publication of the Final EIS, several new or revised transportation improvement projects have been identified to occur in the Airport vicinity. The transportation improvement projects included in the surface transportation analysis are described in detail in **Appendix C- 1**.

(B) Airport Travel Patterns

As described previously in Chapter 2, the new aviation activity forecasts and the phasing of the proposed improvements have changed since the completion of the Final EIS. In addition, more information became available describing the trip generation and distribution patterns of Airport related traffic since publication of the Final EIS. Several types of airport traffic were affected by these changes: passenger off-site parking traffic decreased since better passenger forecast data is available; airport employee traffic decreased since better parking data was available; air cargo traffic decreased due to a corrected error in the trip generation calculations; airfield operations area traffic increased based on new information concerning flight kitchen traffic; and other Airport traffic increased since new traffic data was developed.

(C) Level of Service Analysis

Previously in the Final EIS, the level of service analysis was performed using the 1985 Highway Capacity Manual for signalized and two-way stop controlled intersections, Circular #373 for all-way stop intersections, and the 1994 Highway Capacity Manual for freeway ramp junctions. The level of service analysis contained in this Supplemental Environmental Impact Statement analysis was performed using the 1994 Highway Capacity Manual for signalized, two-way stop controlled, and all-way stop controlled intersection, and freeway ramp junctions. The differences between the methodologies could produce significant changes in the level of service analysis, especially for two-way stop controlled intersections. While the 1994 Highway Capacity Manual was available for the Final EIS, the then newly published manual was not used, as local jurisdictions had not accepted the manual. As is has since been accepted, the methodology was updated to the new manual.

(D) Proposed Improvements

As is discussed in Chapter 2, the accelerated demand could require facilities to be available five to ten years sooner than was identified in the Final EIS. As a result, the analysis presented in this Supplemental EIS shows the impact of the facilities being completed sooner than addressed by the Final EIS. Also, recognizing the impact of accelerated activity levels and projects at certain areas, the two terminal/landside projects were modified to address roadway conditions. First, the completion of the North Employee Lot north of SR 518 would alter surface travel through the intersection of South 154th/24th Avenue South. Therefore, the analysis presented in this document reflects improvements at this intersection to address turning movements and signalization. The development of the North Unit Terminal would close South 170th Street to traffic transiting from eastern SeaTac to western SeaTac. As a result, the Master Plan Update improvement was modified to reflect the additional traffic that would occur through the International Blvd/S. 160th Street intersection, by adding turning lanes and modifying signalization, as noted in Chapter 2. Improvements are noted in the City of SeaTac Transportation Improvement Program for these intersections.

In addition, as the analysis discussed in this Supplemental EIS is through the year 2010, the impacts of the SR 509 Extension and South Airport Access are not presented, as this project is slated to occur after this timeframe.

(5) CUMULATIVE IMPACTS

As is identified in Chapter 4 "Affected Environment" a number of non-Airport related developments are anticipated in the Airport vicinity. These actions are likely to affect surface transportation volumes in the Airport area. As additional surface traffic would occur, increased congestion beyond those forecast by this analysis may result. However, until specific projects are proposed for these developments, the total cumulative impacts can not be identified. The roadway project that is likely to have the greatest impact on conditions in the Airport area is the construction of the State Route 509 Extension and Southern Airport Expressway. This roadway is not likely to be completed until after the year 2010, and therefore was not included in this revised analysis. In addition, other regional and local initiatives are under study to increase vehicle occupancy. These initiatives should assist in reducing roadway congestion.

(5) MITIGATION

Mitigation is proposed for each adverse impact that would occur with the Preferred Alternative. An adverse impact is defined as a significant degradation in level of service (reducing the level of service by one or more LOS categories) when compared to the Do-Nothing alternative.

(A) Do-Nothing Alternative

There are a number of commercial parking lots located within the City of SeaTac that primarily serve passengers using the Airport. This includes the privately owned commercial parking lots located along the International Boulevard/State Route 99 corridor, as well as the commercial parking lots operated by the Port of Seattle on-airport. The City of SeaTac has adopted a parking tax which collects revenues from these commercial parking lots. This parking tax contributes towards the programmed transportation improvements necessary to accommodate the continued growth of the Airport-related traffic.

The City of SeaTac collected approximately $2.3 million in parking tax revenue in 1996; approximately $2.0 million from the Port of Seattle, and approximately $0.3 million from the commercial parking lots along the International Boulevard. Between 1994 and the year 2010 it is anticipated that the City of SeaTac will collect approximately $45.0 million in parking tax revenue; approximately $39.2 million from the Port of Seattle, and approximately $5.8 million from the commercial parking lots. The Port of Seattle's $39.2 million contribution provides mitigation for the impacts associated with the continued growth of the Airport, as defined by the Do-Nothing Alternative.

(B) Preferred Alternative

No significant adverse changes in LOS were identified as a result of the Preferred Alternative for any of the evaluated intersections and freeway ramp junctions in the Airport vicinity for the year 2000, 2005, and 2010 conditions. A detailed discussion of the impact analysis is included in **Appendix C-1**.

(C) Transportation Impact Fees

The City of SeaTac has adopted a developer impact fee to offset the cost of transportation improvement projects necessary to accommodate the growth of new developments. Since the Preferred Alternative would enable the Airport to accommodate levels of passenger and aircraft operations above the capacity of the existing system, the Preferred Alternative could

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be subject to the developer impact fees, depending upon the outcome of jurisdictional negotiations currently underway between the City of SeaTac and the Port of Seattle. The current City of SeaTac developer impact fee is defined as $773 per additional PM peak hour trip. The difference in PM peak hour trips between the Preferred and Do-Nothing Alternatives would be considered additional PM peak hour trips. However, 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 Expressway would not be considered for the developer impact fee. The total PM peak hour trips generated by the Airport is summarized in **Table 5-1-5**, in addition to type of Airport traffic, and access route for the future year 2010 condition. The Preferred Alternative would generate less total traffic in the year 2010 but generate more trips on City of SeaTac roadway facilities. These additional 95 PM peak hour trips could equate to developer impact fees of $73,435.00.

(D) Transportation Demand Management

The purpose of Transportation Demand Management (TDM) strategies is to reduce the travel demand by either encouraging the use of high occupancy vehicles (i.e. transit and carpools), or discouraging single-occupant vehicle trips. TDM strategies typically target such groups as employees, or an urban area. The Port of Seattle is currently considering the use of several TDM strategies described in P&D Aviation's International Boulevard Access Study and Travel Demand Management Mitigation Policies Report. Two general types of TDM strategies were discussed in this report and are described as follows:

- Employee Based TDM Strategies - These TDM strategies aim to reduce peak hour traffic by reducing peak hour employee commute trips. These strategies can be implemented voluntarily or as part of the mandated Commute Trip Reduction program.
- Regional or Areawide TDM Strategies - These TDM strategies aim to reduce the number of single-occupant vehicle passenger trips within the Terminal area. These strategies have the most potential benefit since passenger traffic represents approximately 80 percent of the total Airport traffic.

Specific TDM measures are not included in the proposed Master Plan Update for either employee or passenger demand volumes. The Port of Seattle is currently participating in the Commute Trip Reduction Program as an employee TDM measure; and has received an award from the State of Washington for its success for the last two consecutive years. The Port of Seattle supports the proposed RTA system as a regional TDM measure, and is currently coordinating with the RTA board and the City of SeaTac to determine the location of the Airport light-rail station. The Port of Seattle is also coordinating with the City of SeaTac to determine the feasibility of the City's proposed Personal Rapid Transit (PRT) system. While the proposed improvements are not anticipated to have a significant impacts on the regional surface transportation system, it is anticipated that the Port of Seattle would continue to aggressively pursue TDM policies to reduce travel demand at the Airport.

(E) State Route 509 and South Access

Issues surrounding the State Route 509 extension project and an Airport South Access have been discussed among the Port of Seattle and the surrounding southwestern King County communities for quite some time. State Route 509 was originally adopted by the Washington State Transportation Commission in 1957 as a limited-access highway between Seattle and Tacoma. Construction from the northern terminus began in the 1960s in South Seattle, and ended in the 1970s at South 188th Street. WSDOT did not finish the construction of the proposed highway due to rising costs, limited federal and state highway construction funds, and local government opposition to the project.

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In 1992 the WSDOT took the lead for several local agencies (Cities of SeaTac, Des Moines, King County, and the Port of Seattle) to begin the State Route 509 Extension/South Access Road Corridor Environmental Impact Study.[6] A technical Steering Committee, composed of representatives from member agencies, was organized to direct the EIS consultant team. An Executive Committee, composed of elected and appointed officials from member agencies, provided direction on policy decisions and would select the preferred corridor alignment. The Federal Highway Association (FHWA) must approve and the Washington Transportation Commission must adopt the preferred corridor alternative before a more in-depth project-level analysis can be completed. The corridor programmatic Draft EIS has been completed and was issued in December, 1995. Each of the "build" alternatives analyzed in that Draft EIS include the extension of State Route 509 to Interstate 5, and the construction of the South Access roadway as a limited access expressway that connects the Airport's terminal drive system with State Route 509. A project level EIS is planned to be completed in early 1998.

Over the past few years the Puget Sound Regional Council has been updating the Metropolitan Transportation Plan (MTP).[7] The adopted 1995 MTP includes both the State Route 509 extension and South Access roadway projects to be completed by the year 2020.

All of these plans and studies were based on two general developments assumptions: the forecast passenger activity levels at the Airport; and the proposed urban development south of the Airport along the 28th/24th Avenue South corridor. These development assumptions are summarized by plan or study as follows:

- **SeaTac Area Update (1989)** - This plan forecast a 190 acre business park along the 28th/26th Avenue South corridor which would generate approximately 30,000 to 50,000 average weekday trips. It was also assumed that 40 percent of Airport traffic would utilize the South Access roadway.

- **South Access Roadway Study (1990)** - This plan forecast a 6 million gross square foot (gsf) business park along the 28th/24th Avenue South corridor which would generate approximately 60,000 to 80,000 average weekday trips. Airport activity levels were also forecast at 38 million annual passengers by the year 2010. According to that report 149,000 average weekday trips, of which approximately 40 percent, or 59,600 average weekday trips, would utilize the South Access roadway.

- **City of SeaTac Comprehensive Transportation Plan (1994)** - This plan forecast a 2-3 million gsf combined commercial/industrial/retail development along the 28th/24th Avenue South corridor which would generate approximately 34,000 average weekday trips.

- **Seattle-Tacoma International Airport Master Plan Update (1996)** - The Master Plan Update[8] forecast 23.8 Million Annual Passengers (MAP) by the year 2000 (11.9 million enplaned passengers), 27.2 MAP (13.6 million enplaned passengers) by the year 2005, and 30.6 MAP (15.3 million enplanements) by the year 2010. The new forecast indicates that demand for air travel could reach 27.4 MAP by 2000, 31.4 MAP by 2005, and 35.8 MAP by 2010. This level of activity would generate approximately 88,700 annual average weekday vehicle trips within the terminal area by the year 2010.

Differences between these development assumptions have led to several different proposed alignments and configurations for the South Access roadway. These development assumptions will also continue to evolve with land use decisions concerning the South

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6/ *State Route 509 Extension/South Access Road Corridor Study*, King County, SeaTac, Des Moines, Kent, December 1995.

7/ *1995 Metropolitan Transportation Plan: The Transportation Element of VISION 2020, the Region's Adopted Growth and Transportation Strategy*, , Puget Sound Regional Council, May 25 1995.

8/ *Technical Report No.2: Preliminary Forecast Report*, Port of Seattle, 1994.

Aviation Support Area,[9] the Des Moines Creek Technology Campus,[10] and other local development. However, there are two alternate options for the South Access roadway described as follows:

- The construction of two separate roadway facilities: the construction of a principal arterial along the 24th/28th Avenue South corridor to accommodate the forecast urban development; and the construction of a separate limited access expressway for the Airport to accommodate forecast Airport passenger activity.
- The construction of a combined facility along the 24th/28th Avenue South corridor to accommodate both the forecast urban development, and the forecast Airport passenger activity.

Until the Federal Highway Administration and the Washington Transportation Commission approve and adopt a preferred alignment for the SR 509 Extension/South Access, the exact alignment and configuration would not be known.

9/ *South Aviation Support Area Final Environmental Impact Statement*, Port of Seattle, March 1994.

10/ *Des Moines Creek Technology Campus Final Environmental Impact Statement*, CH2M Hill, May 1995.

TABLE 5-1-1

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

AIRPORT TRAFFIC SUMMARY

WITH THE NEW FORECAST (Supplemental EIS)

Airport Traffic Description	1994 Existing (AADT)	Do-Nothing Alternative			Preferred Alternative		
		2000 (AADT)	2005 (AADT)	2010 (AADT)	2000 (AADT)	2005 (AADT)	2010 (AADT)
Passenger	58,200	69,000	77,000	85,600	69,000	77,100	88,700
Passenger Off-Site Parking	880	2,100	3,540	5,280	1,040	1,180	1,320
Airport Employee	4,310	5,440	6,150	7,200	5,440	6,150	7,200
Air Cargo	4,170	5,200	6,340	7,490	5,200	6,340	7,490
Airfield Operations Area	1,460	1,690	1,840	1,900	1,690	1,840	2,010
General Aviation	100	100	100	100	100	100	100
Maintenance	3,190	6,080	6,270	6,270	3,190	4,730	6,270
Other	200	200	200	200	200	200	200
Totals	**72,510**	**89,810**	**101,440**	**114,040**	**85,860**	**97,640**	**113,290**

WITH THE MASTER PLAN UPDATE FORECAST (Final EIS)

Airport Traffic Description	1994 Existing (AADT)	Do-Nothing Alternative			Preferred Alternative		
		2000 (AADT)	2005 (AADT)	2010 (AADT)	2000 (AADT)	2005 (AADT)	2010 (AADT)
Passenger	58,200	64,200	N/A	79,300	64,200	N/A	80,300
Passenger Off-Site Parking	1,160	2,570	N/A	6,740	1,290	N/A	1,670
Airport Employee	6,410	7,140	N/A	8,540	7,140	N/A	8,540
Air Cargo	4,450	6,000	N/A	7,930	6,000	N/A	7,930
Airfield Operations Area	1,460	1,630	N/A	1,740	1,630	N/A	1,740
General Aviation	60	65	N/A	70	65	N/A	70
Maintenance	3,190	4,730	N/A	6,270	3,190	N/A	4,730
Other	100	130	N/A	160	130	N/A	160
Totals	**75,030**	**86,465**	N/A	**110,750**	**83,645**	N/A	**105,140**

- Passenger - Traffic on the terminal drive system consisting of short-term and long-term garage parking, passenger drop-offs and pick-ups, courtesy vehicles, shuttles, car rentals, taxis, and transit.
- Passenger Off-Site Parking - Traffic generated by passengers using the off-site parking facilities but not including the courtesy vehicles.
- Airport Employee - Traffic generated by Port employees, airline employees, tenants and the remote parking lot shuttle bus.
- Air Cargo - Traffic generated by the air cargo facilities and associated employees.
- Airfield Operations Area (AOA) - Traffic generated by activities within the AOA, including the off-site flight kitchens.
- General Aviation - Traffic generated by general aviation activities and associated employees.
- Maintenance - Traffic generated by the Aircraft Maintenance facilities and associated employees.
- Other - Traffic generated by miscellaneous activities such as deliveries to the Airport (non air cargo related).

Source: P&D Aviation and INCA Engineers, Inc.,Final EIS, Appendix O, Table O-B-1 and Appendix C-1, January 1997

AADT = Average Annual Daily Traffic

TABLE 5-1-2

Seattle-Tacoma International Airport
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PASSENGER MODE CHOICE PATTERNS

Passenger Mode of Access		1994 Existing	Do-Nothing Alternative			Preferred Alternative		
			2000	2005	2010	2000	2005	2010
Curb Side (Drop-Off/Pick-Up)	Arriving	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%
	Departing	33.0%	33.0%	33.0%	30.0%	33.0%	33.0%	30.8%
Courtesy Buses	Arriving	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
	Departing	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Taxis	Arriving	4.7%	4.7%	4.7%	4.7%	4.35%	4.35%	4.35%
	Departing	4.7%	4.7%	4.7%	4.7%	4.35%	4.35%	4.35%
For-Hire Vans	Arriving	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	Departing	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
METRO Transit	Arriving	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
	Departing	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
RTA	Arriving	None	None	None	None	None	None	None
	Departing	None	None	None	None	None	None	None
Scheduled Buses	Arriving	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
	Departing	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
Short-Term Parking	Arriving	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
	Departing	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Long-Term Parking	Arriving	19.0%	16.0%	15.0%	14.0%	18.35%	18.35%	18.35%
	Departing	19.0%	16.0%	15.0%	14.0%	18.35%	18.35%	18.35%
Car Rentals	Arriving	17.1%	17.1%	16.1%	15.1%	17.1%	17.1%	17.1%
	Departing	17.1%	17.1%	16.1%	15.1%	17.1%	17.1%	17.1%
Off-Site Parking	Arriving	2.0%	4.0%	6.0%	8.0%	2.0%	2.0%	2.0%
	Departing	2.0%	4.0%	6.0%	8.0%	2.0%	2.0%	2.0%
Charter Buses	Arriving	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
	Departing	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
Other Buses	Arriving	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
	Departing	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Total Forecast Passengers *	**Arriving**	**22,100**	**26,200**	**29,500**	**33,000**	**26,200**	**29,500**	**33,000**
	Departing	**21,900**	**26,200**	**29,500**	**33,000**	**26,200**	**29,500**	**33,000**
	Total	**44,000**	**52,400**	**59,000**	**66,000**	**52,400**	**59,000**	**66,000**

Source: P&D Aviation and INCA Engineers, Inc., January 1997.

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TABLE 5-1-3

Seattle-Tacoma International Airport
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DO-NOTHING ALTERNATIVE
INTERSECTION LEVEL OF SERVICE SUMMARY

Evaluated Intersection	1994 Exist.	Do-Nothing (Alternative 1)					
		New Forecast			Master Plan Forecast		
		2000	2005	2010	2000	2005	2010
24th Ave S. / Perimeter Rd & S. 154th St	B	C	C	D	C	n/a	D
28th Avenue S. & S. 188th St.	B	C	C	D	B	n/a	F
28th Avenue S. & S. 192nd St.	A	B	B	B	B	n/a	B
28th Avenue S. & S. 200th St.	A	F	C	C	C	n/a	F
Air Cargo Rd & S.160th St.	A	B	B	B	B	n/a	B
Air Cargo Road & S. 170th St.	C	D	F	F	D	n/a	F
Air Cargo Road & SB Airport Expressway Ramps	B	B	B	B	E	n/a	B
Des Moines Memorial Dr S. & Marine View Dr	B	B	B	B	B	n/a	B
Des Moines Memorial Dr S. & S. 156th St	B	B	C	C	C	n/a	C
Des Moines Memorial Dr S. & S. 160th St.	B	B	B	B	B	n/a	B
Des Moines Memorial Dr S. & S. 188th St.	C	C	B	C	B	n/a	B
Des Moines Memorial Dr S. & S. 200th St.	B	D	D	D	B	n/a	B
International Blvd & Kent-Des Moines Rd.	D	E	F	F	D	n/a	F
International Boulevard & S. 180th St.	C	C	D	E	C	n/a	D
International Boulevard & S. 154th St.	D	D	F	F	D	n/a	F
International Boulevard & S. 160th St.	C	D	E	F	D	n/a	E
International Boulevard & S. 170th St.	E	F	F	F	F	n/a	F
International Boulevard & S. 176th St.	C	C	C	C	C	n/a	C
International Boulevard & S. 188th St.	F	F	F	F	F	n/a	F
International Boulevard & S. 192nd St.	B	D	D	E	C	n/a	D
International Boulevard & S. 200th St.	D	F	F	F	E	n/a	F
Military Road S & S 200th St. / SB I-5 Ramps	B	D	F	F	E	n/a	F
Military Road S. & NB Interstate 5 Ramps	A	B	D	E	B	n/a	E
Military Road S. & S. 188th St.	D	D	F	F	D	n/a	F
NB Airport Expressway Ramps & S. 170th St	A	A	A	B	D	n/a	B
NB Interstate 5 Ramps & S. 188th St.	C	D	F	F	D	n/a	F
NB SR 509 Ramps / 5th Pl. S & S 160th St	A	A	A	B	n/a	n/a	n/a
NB State Route 509 Ramps & State Route 518	A	A	A	A	A	n/a	A
SB I-5 Ramps & Kent-Des Moines Rd./SR 516	D	F	F	F	E	n/a	F
SB Interstate 5 Ramps & S. 188th St.	C	C	D	F	C	n/a	E
SB SR 509 Ramps & S. 160th St.	A	A	A	A	D	n/a	E
SB State Route 509 Off-Ramp & S. 188th St.	A	A	A	A	B	n/a	C
SB State Route 509 Ramps & State Route 518	B	B	C	C	B	n/a	C

SB = Southbound, NB = Northbound, WB = Westbound, EB = EastBound, SR = State Route, n/a = Not Evaluated.

Source: INCA Engineers, Inc., January 1997.

TABLE 5-1-4

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

**PREFERRED ALTERNATIVE
INTERSECTION LEVEL OF SERVICE SUMMARY**

Evaluated Intersection	1994 Exist.	Preferred Alternative (Alternative 3)					
		New Forecast			Master Plan Forecast		
		2000	2005	2010	2000	2005	2010
20th Ave S. & EB SR 518 Ramps	N/C	N/C	B	B	n/a	n/a	B
20th Ave S. & S. 154th/156th St.	N/C	N/C	B	B	n/a	n/a	B
20th Ave S. & WB SR 518 Ramps	N/C	N/C	B	B	n/a	n/a	B
24th Ave S. / Perimeter Rd & S. 154th St.	B	C	C	C	C	n/a	D
28th Ave S. & S. 188th St.	B	B	C	D	B	n/a	D
28th Ave S. & S. 192nd St.	A	A	B	B	B	n/a	B
28th Ave S. & S. 200th St.	A	B	B	C	C	n/a	F
Air Cargo Rd & S. 160th St.	A	B	B	B	B	n/a	B
Air Cargo Rd & S. 170th St.	C	D	N/C	N/C	D	n/a	N/C
Air Cargo Rd & SB Airport Expressway Ramps	B	B	N/C	N/C	E	n/a	N/C
Des Moines Mem. Dr S. & Marine View Dr	B	B	B	B	B	n/a	B
Des Moines Memorial Dr S. & S. 200th St.	B	D	C	D	B	n/a	B
Des Moines Memorial Drive S. & S. 156th St.	B	B	C	C	B	n/a	B
Des Moines Memorial Drive S. & S. 160th St.	B	B	B	B	B	n/a	B
Des Moines Memorial Drive S. & S. 188th St.	C	C	B	C	B	n/a	B
International Blvd & Kent-Des Moines Rd.	D	E	E	F	D	n/a	F
International Blvd / SR 99 & S. 154th St.	D	D	E	F	D	n/a	D
International Blvd / SR 99 & S. 160th St.	C	D	C	D	C	n/a	F
International Blvd / SR 99 & S. 170th St.	E	F	F	F	F	n/a	F
International Blvd / SR 99 & S. 176th St.	C	C	C	C	C	n/a	C
International Blvd / SR 99 & S. 180th St.	C	C	B	B	C	n/a	A
International Blvd / SR 99 & S. 188th St.	F	F	F	F	F	n/a	F
International Blvd / SR 99 & S. 192nd St.	B	C	D	D	C	n/a	C
International Blvd / SR 99 & S. 200th St.	D	F	F	F	E	n/a	F
Military Road S & S 200th St. / SB I-5 Ramps	B	D	F	F	D	n/a	F
Military Road S. & NB Interstate 5 Ramps	A	B	C	E	B	n/a	E
Military Road S. & S. 188th St.	D	D	E	F	D	n/a	F
NB Airport Expressway Ramps & S. 170th St.	A	A	N/C	N/C	D	n/a	N/C
NB Interstate 5 Ramps & S. 188th St.	C	D	F	F	D	n/a	F
NB SR 509 Ramps & SR 518	A	A	A	A	A	n/a	A
NB SR 509 Ramps / 5th Place S & S 160th St.	A	A	A	B	D	n/a	D
SB I-5 Ramps & Kent-Des Moines Rd.	D	F	F	F	E	n/a	F
SB Interstate 5 Ramps & S. 188th St.	C	B	D	F	C	n/a	E
SB SR 509 Off-Ramp & S. 188th St.	A	A	A	A	B	n/a	C
SB SR 509 Ramps & S. 160th St.	A	A	A	A	E	n/a	E
SB SR 509 Ramps & SR518	B	B	C	C	B	n/a	C

n/a - not evaluated

SB = Southbound, NB = Northbound, WB = Westbound, EB = EastBound, SR = State Route, N/C - Not Constructed

Source: INCA Engineers, Inc., January 1997.

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TABLE 5-1-5

Seattle-Tacoma International Airport
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**YEAR 2010 PM PEAK HOUR
AIRPORT TRAFFIC SUMMARY**

Airport Traffic	Do-Nothing Alternative			Preferred Alternative		
	Airport Expressway	Other Route	Total	Airport Expressway	Other Route	Total
Passenger	3,262	1,301	4,563	2,699	1,667	4,366
Off-Site Parking	N/A	374	374	N/A	92	92
Airport Employee	N/A	279	279	N/A	279	279
Air Cargo	N/A	521	521	N/A	521	521
Airfield Operations Area	N/A	190	190	N/A	201	201
General Aviation	N/A	17	17	N/A	17	17
Aircraft Maintenance	N/A	273	273	N/A	273	273
Other	N/A	20	20	N/A	20	20
Totals	**3,262**	**2,975**	**6,237**	**2,699**	**3,070**	**5,769**

Source: INCA Engineers, Inc., January 1997.

TABLE 5-1-6

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

COMPARISON OF DO-NOTHING TO PREFERRED ALTERNATIVE INTERSECTION LEVEL OF SERVICE SUMMARY

Evaluated Intersection	NEW FORECAST					
	Do-Nothing			Preferred Alternative		
	2000	2005	2010	2000	2005	2010
20th Ave S. & EB SR 518 Ramps	N/C	N/C	N/C	N/C	B	B
20th Ave S. & S. 154th/156th St.	N/C	N/C	N/C	N/C	B	B
20th Ave S. & WB SR 518 Ramps	N/C	N/C	N/C	N/C	B	B
24th Ave S. / Perimeter Rd & S. 154th St	C	C	D	C	C	C
28th Avenue S. & S. 188th St.	C	C	D	B	C	D
28th Avenue S. & S. 192nd St.	B	B	B	A	B	B
28th Avenue S. & S. 200th St.	F	C	C	B	B	C
Air Cargo Rd & S.160th St.	B	B	B	B	B	B
Air Cargo Road & S. 170th St.	D	F	F	D	N/C	N/C
Air Cargo Road & SB Airport Expressway Ramps	B	B	B	B	N/C	N/C
Des Moines Memorial Dr S. & Marine View Dr	B	B	B	B	B	B
Des Moines Memorial Dr S. & S. 156th St	B	C	C	B	C	C
Des Moines Memorial Dr S. & S. 160th St.	B	B	B	B	B	B
Des Moines Memorial Dr S. & S. 188th St.	C	B	C	C	B	C
Des Moines Memorial Dr S. & S. 200th St.	D	D	D	D	C	D
International Blvd & Kent-Des Moines Rd.	E	F	F	E	E	F
International Boulevard & S. 180th St.	C	D	E	C	B	B
International Boulevard & S. 154th St.	D	F	F	D	E	F
International Boulevard & S. 160th St.	D	E	F	D	C	D
International Boulevard & S. 170th St.	F	F	F	F	F	F
International Boulevard & S. 176th St.	C	C	C	C	C	C
International Boulevard & S. 188th St.	F	F	F	F	F	F
International Boulevard & S. 192nd St.	D	D	E	C	D	D
International Boulevard & S. 200th St.	F	F	F	F	F	F
Military Road S & S 200th St. / SB I-5 Ramps	D	F	F	D	F	F
Military Road S. & NB Interstate 5 Ramps	B	D	E	B	C	E
Military Road S. & S. 188th St.	D	F	F	D	E	F
NB Airport Expressway Ramps & S. 170th St	A	A	B	A	N/C	N/C
NB Interstate 5 Ramps & S. 188th St.	D	F	F	D	F	F
NB SR 509 Ramps / 5th Pl. S & S 160th St	A	A	B	A	A	A
NB State Route 509 Ramps & State Route 518	A	A	A	A	A	B
SB I-5 Ramps & Kent-Des Moines Rd./SR 516	F	F	F	F	F	F
SB Interstate 5 Ramps & S. 188th St.	C	D	F	B	D	F
SB SR 509 Ramps & S. 160th St.	A	A	A	A	A	A
SB State Route 509 Off-Ramp & S. 188th St.	A	A	A	A	A	A
SB State Route 509 Ramps & State Route 518	B	C	C	B	C	C

SB = Southbound, NB = Northbound, WB = Westbound, EB = EastBound, SR = State Route, N/C = Not Constructed.

Source: INCA Engineers, Inc., January 1997.

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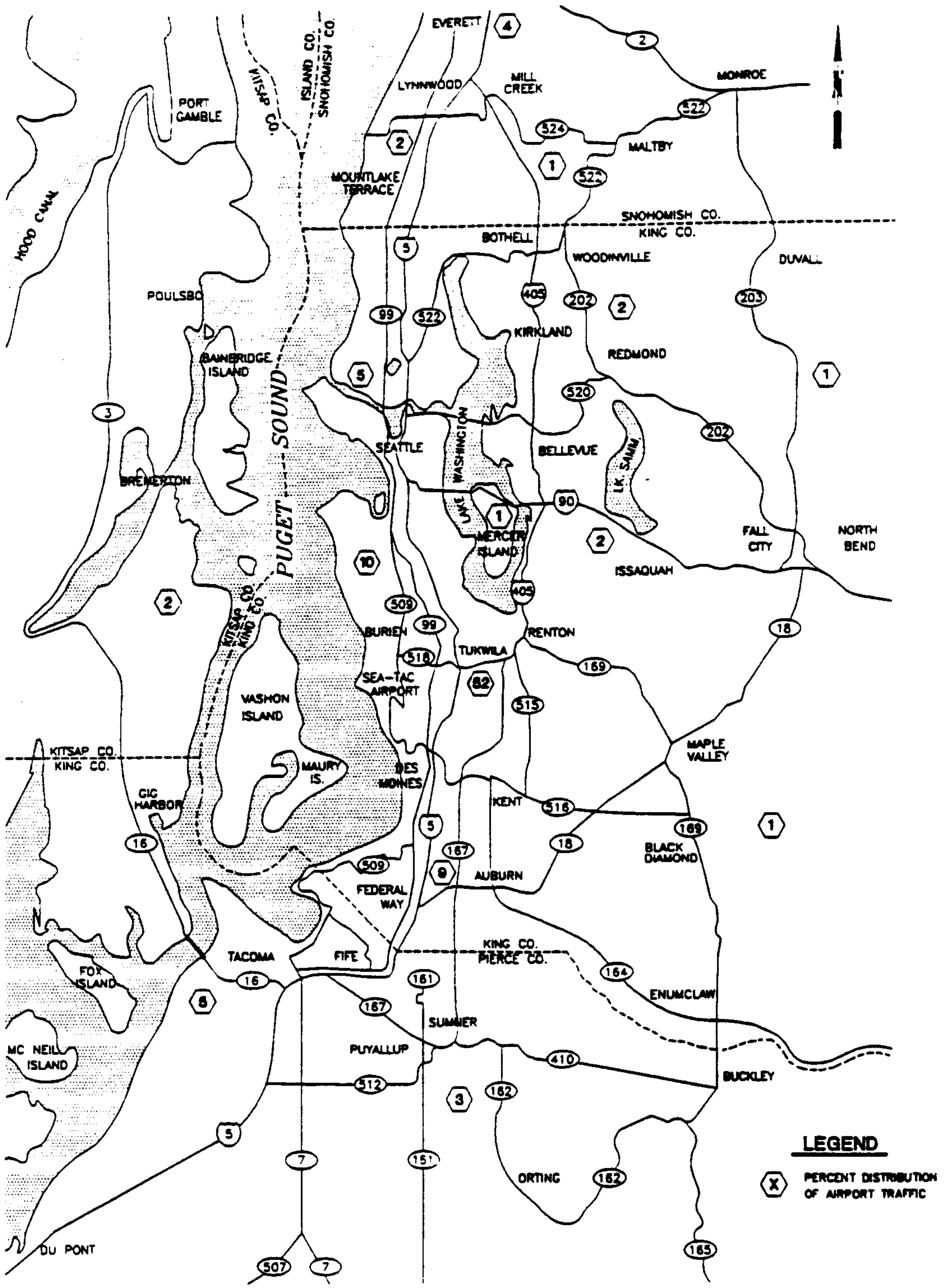
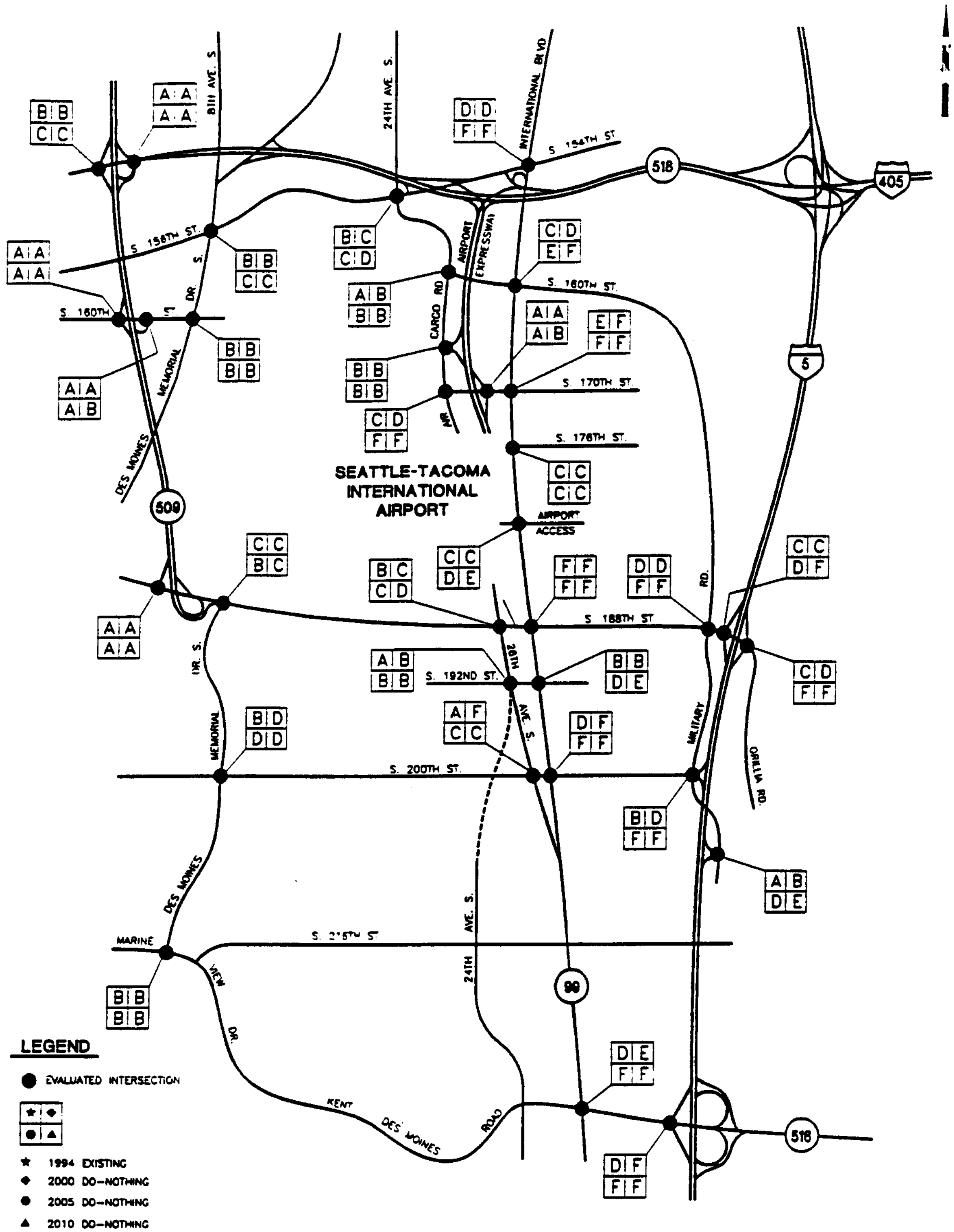
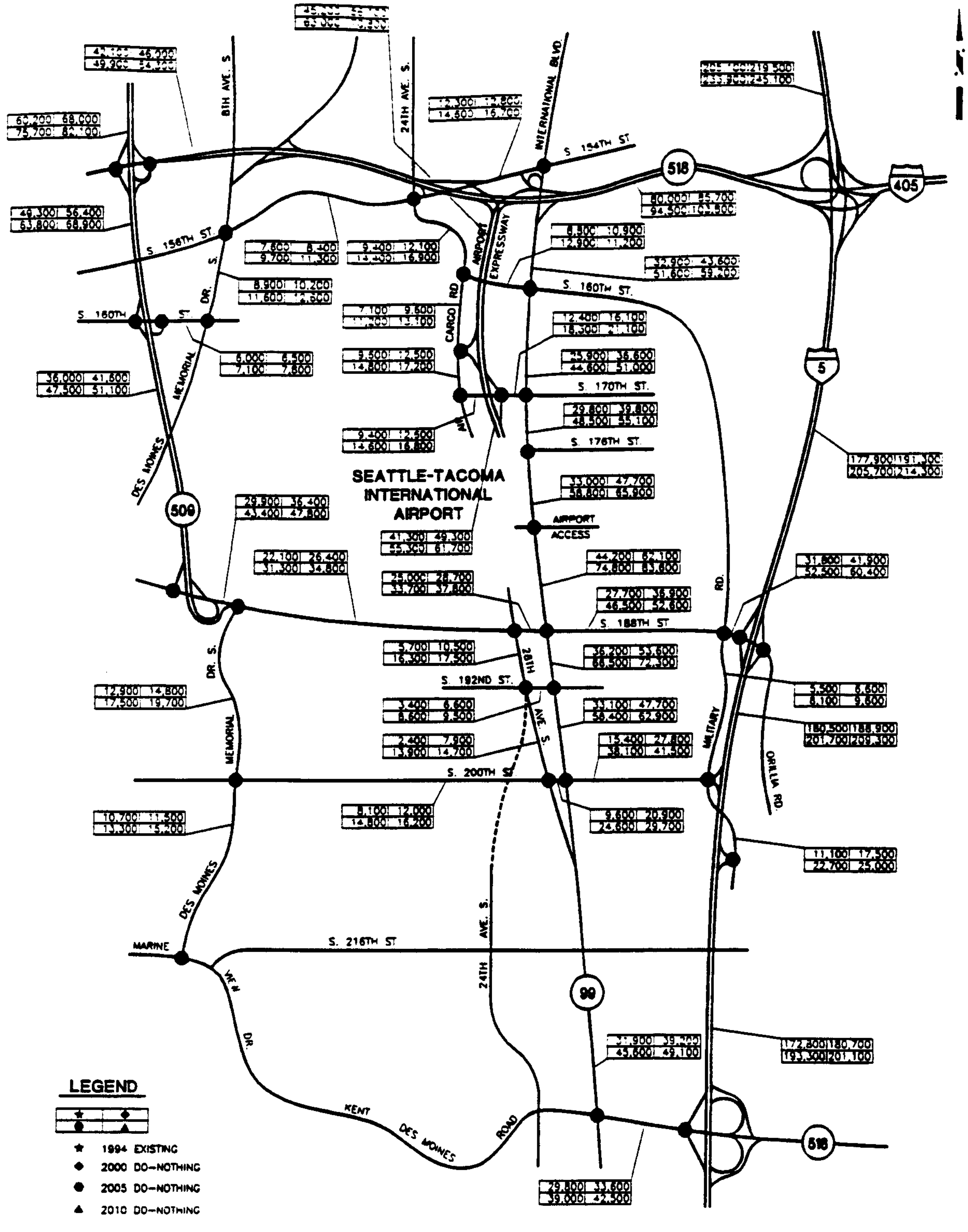


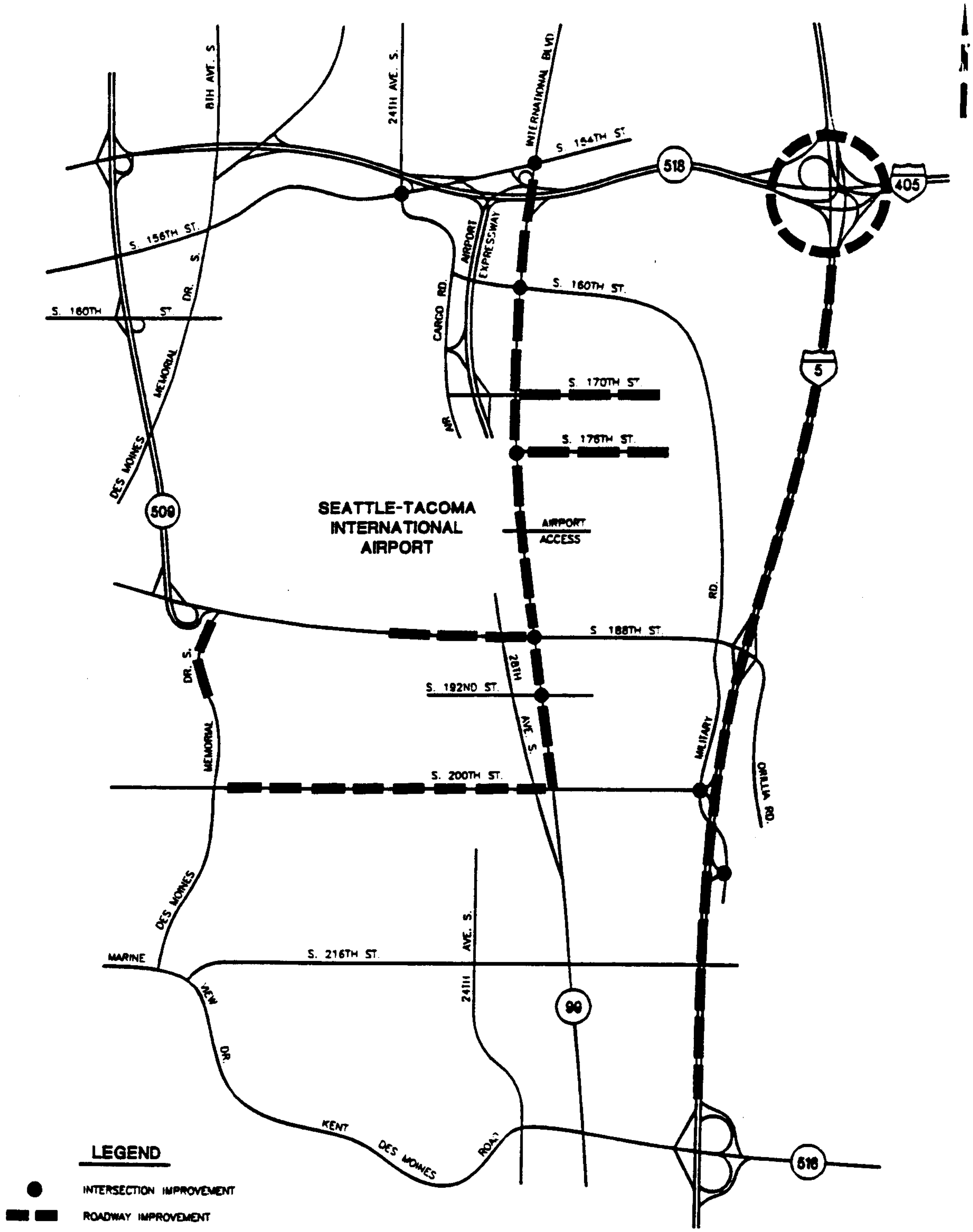
Seattle-Tacoma International Airport	REGIONAL ORIGIN DESTINATION PATTERNS	EXHIBIT: 5-1-1



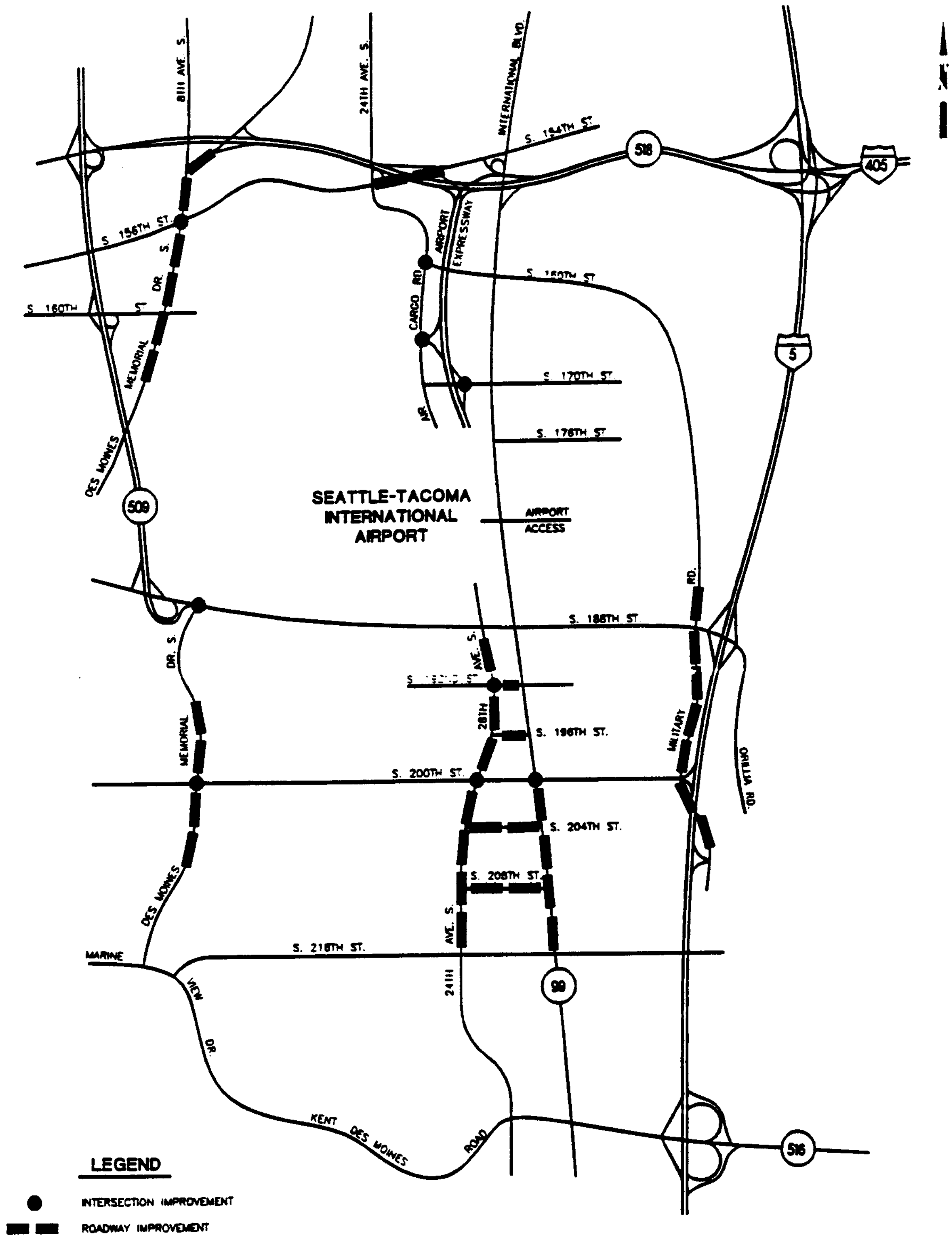
Seattle-Tacoma International Airport	DO-NOTHING ALTERNATIVE INTERSECTION LEVEL OF SERVICE	EXHIBIT: 5-1-2



Seattle-Tacoma International Airport	DO-NOTHING ALTERNATIVE ANNUAL AVERAGE DAILY TRAFFIC VOLUMES	EXHIBIT: 5-1-3



Seattle-Tacoma International Airport	YEAR 2000 TRANSPORTATION IMPROVEMENT PROJECTS	EXHIBIT: 5-1-4



Seattle-Tacoma International Airport	YEAR 2005 TRANSPORTATION IMPROVEMENT PROJECTS	EXHIBIT: 5-1-5

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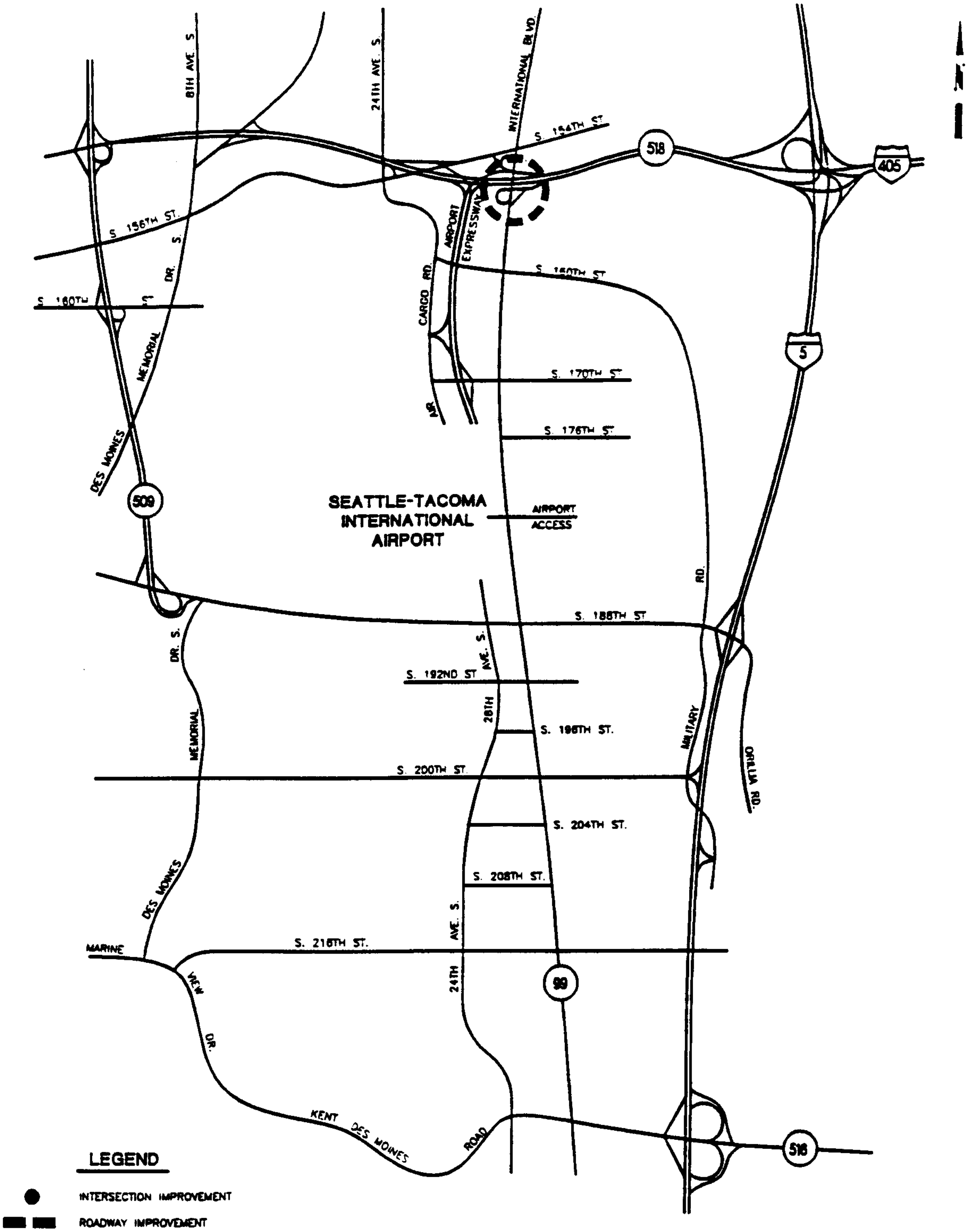
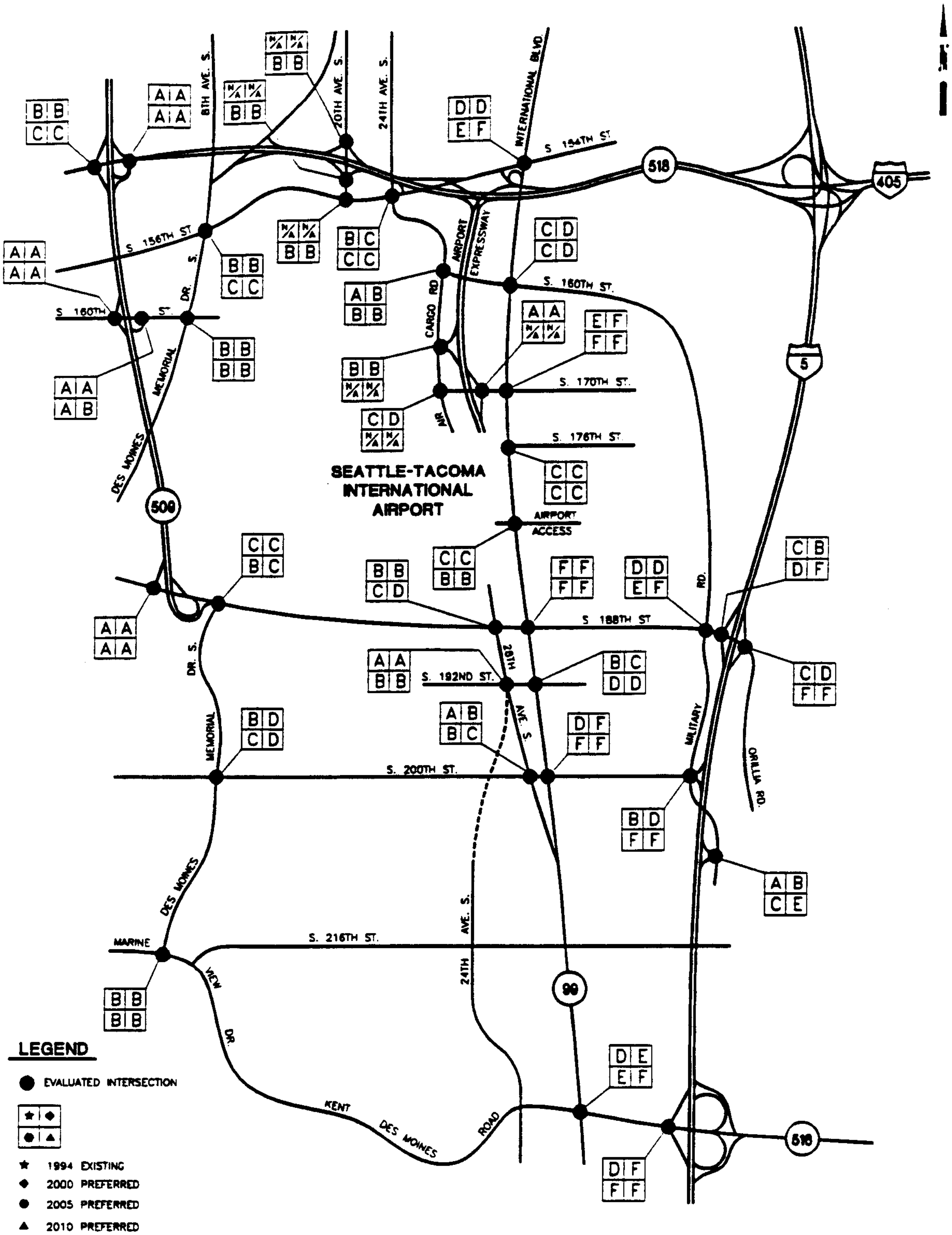
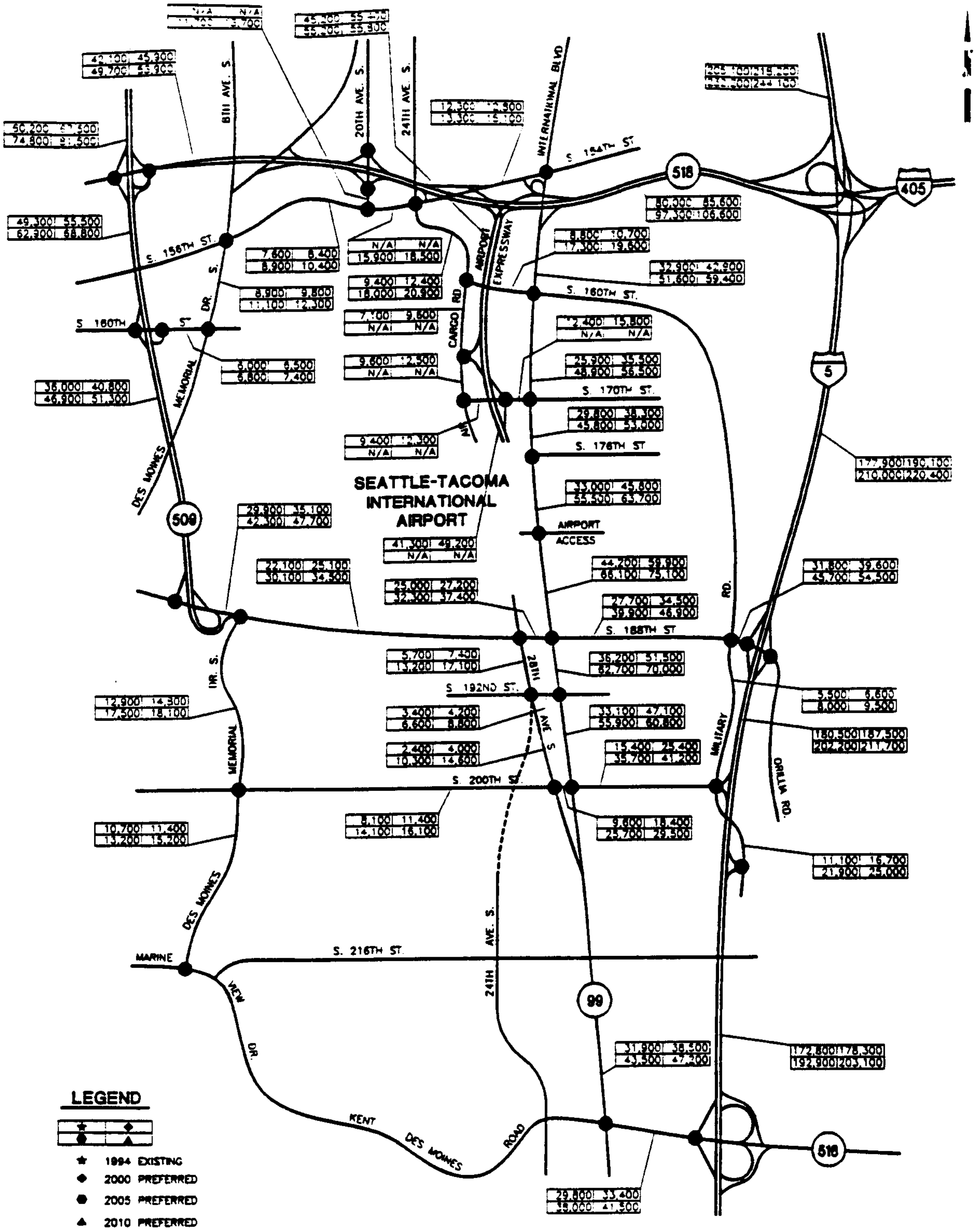


Seattle–Tacoma International Airport	YEAR 2010 TRNASPORTATION IMPROVEMENT PROJECTS	EXHIBIT: 5–1–6



Seattle-Tacoma International Airport	PREFERRED ALTERNATIVE INTERSECTION LEVEL OF SERVICE	EXHIBIT: 5-1-7



Seattle-Tacoma International Airport	PREFERRED ALTERNATIVE ANNUAL AVERAGE DAILY TRAFFIC VOLUMES	EXHIBIT: 5-1-8

SECTION 5-2

AIR QUALITY

This section of the Supplemental EIS summarizes the potential air quality impacts associated with the new forecasts and new information that has arisen as described in Chapter 2. This analysis continues the analysis and supporting documentation presented in the Final EIS (namely Chapter IV, Section 9 and Appendix D and Appendix R) which are hereby incorporated by reference. In addition, **Appendix B** of the Final Supplemental EIS contains a Final Conformity Analysis based on the results of the analysis presented in this section. The Final Conformity Analysis reflects a revised air emissions inventory based on the comments received on the Revised Draft Conformity Analysis presented in the Draft Supplemental EIS. **Appendix F** contains the summary of the comments received and responses, while **Appendix G** contains the comment.

As is noted in Appendix F, several issues with the revised draft analysis were identified in comments from the air quality agencies and public. Based on these comments, and comments from the general public, a detailed quality assurance process was conducted for the data input to the air emissions and dispersion models. This section, and **Appendix B**, reflects the revised analysis. While the specific emissions estimate has been revised in some cases, the proposed improvements will result, in many cases, in less emissions than would be experienced under the Do-Nothing alternative. In all cases, the proposed improvements result in less emissions than the de-minimis levels contained in the Clean Air Act conformity rules.

This analysis focuses on three evaluations:

- Air Pollutant Emissions Inventory
- Area Dispersion Analysis
- Roadway Intersection Dispersion Analysis

Appendix C-2 of this report describes the modeling input assumptions and modeling methodology used in the analysis. As identified by the Final EIS air quality analysis, the two pollutants of concern include Carbon Monoxide (CO) and Nitrogen Oxides (NO_x). The Puget Sound Region was considered non-attainment for CO and Ozone until the fall of 1996, when the EPA approved the region's maintenance plan. Accordingly, this analysis focuses on airport-related emissions of CO and NO_x. The National, State and local Ambient Air Quality Standards (AAQS) for these pollutants are summarized in **Table 5-2-1**. Nitrogen Oxides and Hydrocarbons (HC) have been included in the air pollutant emission inventory because they react in sunlight to form ozone.

Final EIS Chapter IV, Section 9 "Human Health" discusses an evaluation of air toxics, while Appendix D of the Final EIS discusses air toxics monitoring in the Airport vicinity.

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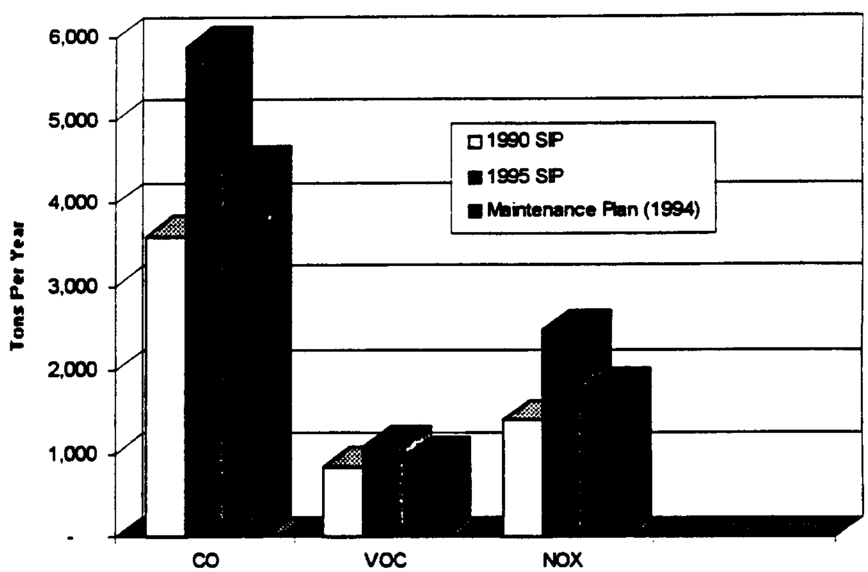
1. PUGET SOUND REGION

Until October 1996, the Puget Sound Region had been designated as a 'high-moderate' non-attainment area for carbon monoxide, and as a 'marginal' ozone non-attainment area. The CO non-attainment area extended from north of Everett to Tacoma. The ozone non-attainment area comprised all of Pierce County, all of King County except for a small portion in the northwest corner, and the western portion of Snohomish County. In January 1996, the region submitted to EPA a request for redesignation of the region to attainment, and a maintenance plan for how the region will maintain compliance with the Clean Air Act. In October 1996 the EPA approved the maintenance plan for both CO and Ozone. The redesignation became effective November 25, 1996.

The Washington State Department of Ecology has prepared implementation plans for reducing CO and ozone levels within the Puget Sound Region. The State Implementation Plan (SIP) inventories pollutant emissions for a variety of sources within the Puget Sound Region including Sea-Tac Airport. Once all the pollutant sources are inventoried, the SIP then focuses on measures to reduce pollutant levels in order to meet pollutant reduction goals for the Region. The SIP inventories do not mean that activity within the Region cannot grow. **Exhibit 5-2-1** identifies the SIP aircraft emissions inventory levels for Sea-Tac for 1990 and 1995.

EXHIBIT 5-2-1
SIP AIRCRAFT EMISSIONS INVENTORY



The SIP anticipated that overall emissions within the Region would decrease by 37% between 1990 and 1995. At the same time, the SIP planned for aircraft emissions at Sea-Tac to increase: by 63% for Carbon Monoxide, 77% for Nitrogen Oxides, and 31% for Volatile Organic Compounds (VOC's; hydrocarbons or "ozone precursors"). Because motor vehicles are expected

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to remain the largest contributor of pollutants in the region, the SIP focuses on reducing emissions from motor vehicles to achieve the Region's goals for reducing air pollutants. The anticipated decrease in emissions from motor vehicles is expected to result from continuation of the vehicle inspection and maintenance program, and by the replacement of older automobiles with newer, cleaner, more efficient models.

2. AIR POLLUTANT EMISSIONS INVENTORY

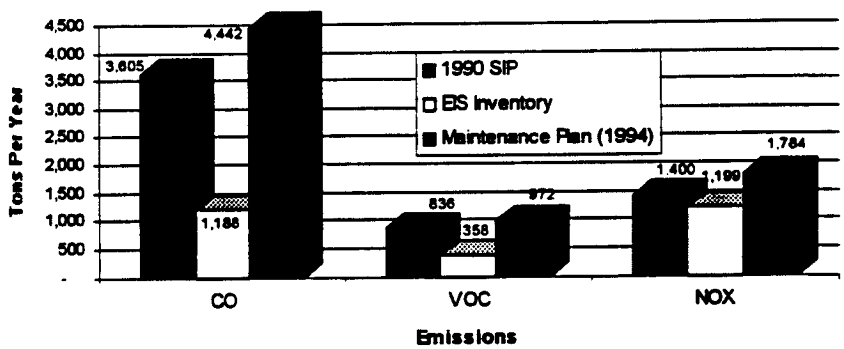
For the Final EIS and this Supplemental EIS evaluation, aircraft pollutant inventories were prepared similar to the SIP aircraft pollutant inventory. The aircraft pollutant inventory summarizes the *total* quantity of each pollutant emitted by aircraft operating at the Airport. The aircraft emissions inventory was performed using the FAA's Emissions and Dispersion Modeling System (EDMS) computer model. The following paragraphs present the existing (1994) inventory levels and future (2000, 2005, 2010) Do-Nothing and "With Project" pollutant emissions for the Airport. The emission levels for CO, NOx, and VOC's for the existing scenario is compared to the 1990 SIP, whereas the future scenarios are compared to the 1995 SIP emission levels.

(A) Existing (1994) Inventory

Exhibit 5-2-2 compares the existing emissions for Sea-Tac with the State's 1990 emissions inventory levels for Sea-Tac.

EXHIBIT 5-2-2

EXISTING EMISSIONS INVENTORY COMPARED TO THE SIP



As is shown above, the existing aircraft pollutant emission in inventory prepared for the Final EIS shows that aircraft emissions are less than the SIP and less than the maintenance plan. In addition, the future aircraft emissions identified by the February 1996 Final EIS, as well as this Final Supplemental EIS are less than the SIP or maintenance plan inventories.

(B) Future Emissions Inventory With the Revised Forecasts

Future aircraft emission levels were evaluated based on the revised forecast levels as described in Chapter 2. The future Do-Nothing and "With Project" emission levels were then compared to the 1995 SIP. **Exhibit 5-2-3** illustrates the change in emissions for each future Do-Nothing and "With Project" scenario. As shown, with or without a new runway aircraft emissions are

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expected to increase as forecast aircraft activity increases. However, aircraft emissions are expected to continue to be well below the 1995 SIP levels.

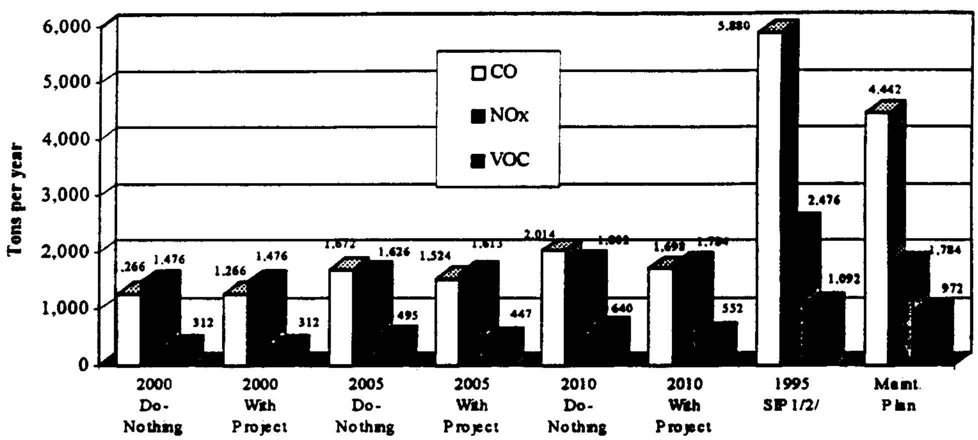
In 2000, the Do-Nothing and all "With Project" aircraft emissions would be the same, as the primary action that would affect aircraft operations (the operation of the third parallel runway) would not be available for use. By 2005, the proposed improvements (including the runway and terminal improvements discussed in Chapter 2) would reduce aircraft CO emissions by 9%, reduce NO_x emissions by 1%, and reduce VOC emissions by 10%. By 2010, the projects relative to the Do-Nothing would reduce aircraft CO emissions by 16%, reduce NOx emissions by 1%, and reduce VOC emissions by 14%, and result in no change in NO_x.

3. EDMS DISPERSION ANALYSIS

An air pollution dispersion analysis was performed to determine the impact of airport-related activity on pollutant levels in the vicinity of the Airport. Unlike the emissions inventory that focused on aircraft emissions, this dispersion evaluation reflects a study area in the immediate airport vicinity, and includes all sources of pollution in the study area. The analysis prepared for this Supplemental EIS supports the Final EIS conclusion that development of the proposed third parallel runway would not create new exceedances of the ambient air quality standards for all forecast periods.

EXHIBIT 5-2-3

AIRCRAFT EMISSIONS INVENTORY



1/ Non-highway mobile projections for 1995, Emissions Inventory for Carbon Monoxide and Precursors of Ozone for King, Pierce and Snohomish Counties, Washington State, Puget Sound Air Pollution Control Agency, September, 1994.

2/ Includes military, commercial, general aviation, and commuter aircraft for Seattle-Tacoma International Airport.

The EDMS dispersion analysis encompasses a wide range of airport-related sources in comparison to the air pollution inventory, which focused solely on aircraft emissions. The dispersion analysis considers all direct and indirect emissions from aircraft and aircraft support equipment, on and off-airport parking lots, roadways, training fires, fuel systems, terminal heating and cooling, and aircraft maintenance activities. The FAA's Emissions and Dispersion Modeling System (EDMS) computer model was utilized to perform the dispersion analysis. Modeled pollutant levels were compared to the Ambient Air Quality Standards (AAQS) presented in **Table 5-2-1**.

TABLE 5-2-1
AMBIENT AIR QUALITY STANDARDS

POLLUTANT	NATIONAL		WASHINGTON STATE	PUGET SOUND REGION
	PRIMARY	SECONDARY		
CARBON MONOXIDE				
8 Hour Average	9 ppm	N/A	9 ppm	9 ppm
1 Hour Average	35 ppm	N/A	35 ppm	35 ppm
NITROGEN DIOXIDE				
Annual Average	0.053 ppm	0.053 ppm	0.053 ppm	0.053 ppm
OZONE				
1 Hour Average[d]	0.12 ppm	0.12 ppm	0.12 ppm	0.12 ppm

Notes:
ppm = parts per million   No AAQS exist for Volatile Organic Compounds (VOC) a precursor of Ozone.
Annual standards never to be exceeded; shorter term standards not to be exceeded more than once per year unless noted.
Refer to Table IV.9-1 of the Final EIS for a complete listing of the AAQS for all criteria pollutants.

The EDMS dispersion analysis is based on consideration of hourly, weekly, and monthly distribution of operating conditions by each source, and actual weather data for 8,760 hours (over an entire year). Use of actual operating and weather data produces pollutant emission more closely linked to "real world" conditions.

Exhibit 5-2-4 identifies the receptor locations modeled for the EDMS dispersion analysis. The receptor locations were identified through consideration of "worst" case operational and meteorological conditions as summarized in Appendix D of the Final EIS. The receptor locations represent the location of highest pollutant concentration in the closest ambient location, and are consistent with the receptor locations evaluated for the Final EIS. An increase in airport activity would not alter the locations experiencing the highest air pollutant concentrations, but would influence the actual concentrations experienced. Included are receptor locations located at South 154th Street which is just 650 feet (200 meters) north of the end of Runway 16L, and along South 188th Street on either side of the roadway tunnel extending under Runway 34R. Airport property is located on either side of these roadways for nearly the entire roadway length in the Airport.

The following sections describe the results of the local areawide dispersion analysis. Background concentrations have been added to the modeled results to ensure that all direct and indirect emissions have been identified.

(A) Existing Pollutant Concentrations

As illustrated in **Exhibit 5-2-5**, the highest concentrations of Carbon Monoxide currently occur along the terminal curbfront. There were no exceedances of the short-term 1-hour and 8-hour standards for Carbon Monoxide (CO) identified by the EDMS dispersion analysis. For each receptor location, the source of the concentration (i.e., airport, roadways, background) is identified. As shown, roadway sources are the major contributors to CO concentrations.

A possible exceedance of the Nitrogen Dioxide[1] (NO_2) ambient air quality standard (AAQS) was modeled at the South 154th Street receptor, which was located 650 feet north of the end of Runway 16L. The modeled NO_2 concentration of 0.08 ppm at this location exceeded the AAQS annual standard of 0.053 ppm. Pollutant concentrations at this location are influenced by emissions from aircraft takeoffs. Airport property is located on either side for the entire length of South 154th Street in the Airport area. There are no homes, parks or businesses located in this area. As this area requires security clearance to access, prolonged public exposure along South 154th Street would not be expected relative to the longer-term annual NO_2 standard. Concentrations at other receptors located within the surrounding community areas are below the ambient air quality standards for all pollutants including NO_2.

It is also worth noting that actual measurements of NO_2 in the Region have not exceeded the NAAQS. Also, there has never been an attainment issue for NO_2 in Washington State. EPA has indicated, in the preamble to the General Conformity Regulations, that use of detailed receptor modeling is not appropriate for NO_2 and Ozone, which are regional scale pollutants.

(B) <u>Future Conditions With the New Forecasts</u>

Exhibit 5-2-6 illustrates the results for the future Do-Nothing and "With Project" alternatives for the 1-hour CO, 8-hour CO, and NO_2 concentrations at each receptor location. The pollutant concentrations at all receptor locations are either below the AAQS or are less than for the Do-Nothing condition. This is consistent with the results identified by the February, 1996 Final EIS.

As for the existing conditions, the highest concentrations of 8-hour CO would continue to occur in the terminal area, and the highest concentration of NO_2 would continue to occur along South 154th Street just off the end of the Runway 16L. All future 1-hour CO concentrations continue to be well below the NAAQS.

(1) <u>Alternative 1 (Do-Nothing)</u>

Including background levels, the highest NO_2 concentration identified by the refined dispersion analysis would be along South 154th Street, which would exceed the AAQS for each forecast year of the Do-Nothing/No-Build alternative. By 2005, NO_2 concentrations along the eastern edge of South 188th Street would also exceed the standard. No other receptor locations would exceed the annual NO_2 standard with the Do-Nothing alternative.

Including background, the highest CO concentrations would continue to occur in the terminal area. By 2005, the 8-hour CO concentrations would exceed the AAQS. The highest CO concentrations would occur along the Airport terminal roadway in the area of the planned on-airport hotel and along the south-terminal area curbfront.

(2) <u>Alternative 3 (Preferred Alternative)</u>

As with the Do-Nothing condition, the highest concentration of NO_2 for all receptor locations would be along South 154th Street and South 188th Street. Concentrations of NO_2 would increase slightly over the Do-Nothing condition at Receptor 9A (SeaTac Industrial Park), and at Receptor 188th Street West (located south of the Airport) with use of the third parallel runway. However, such concentrations at both receptor locations

[1] The EDMS model used for this analysis evaluates concentrations of Nitrogen Oxides (NOx). Using EPA approved methodologies, the NOx concentrations were converted to Nitrogen Dioxide (NO_2) to enable comparison to the AAQS.

would be below the AAQS. No other receptor locations would be expected to exceed the annual NO_2 standard.

The Preferred Alternative would result in changes in surface transportation traffic volumes and aircraft movements. The highest concentrations of CO emissions would continue to occur in the existing terminal area. However, all concentrations would remain below the 1-hour and 8-hour CO standards.

(3) Alternatives 2 (Central Terminal) and Alternative 4 (South Unit Terminal)

Based on the analysis prepared for the Preferred Alternative for this Supplemental EIS, the impacts relative to "With Project" Alternatives 2 and 4 were estimated from the analysis in the Final EIS. Concentration levels for NO_2 and CO associated with Alternative 2 (Central Terminal) and Alternative 4 (South Unit Terminal) would change in the same fashion as identified for the Preferred Alternative. As with the Preferred Alternative, the higher concentrations of CO would occur in the existing terminal areas due to changes in traffic volumes and movements. All NO_2 and CO concentrations would be expected to be below the AAQS.

(C) Comparison to the Master Plan Update Forecast Impacts

The results of this Supplemental Environmental Impact Statement analysis are consistent with the results presented for the February, 1996 Final EIS. As indicated by the aircraft pollutant emissions inventory, emissions "With Project" would be less than for the Do-Nothing condition. **Table C-2-6** presents a comparison of emissions for the additional environmental evaluation and Final EIS. As shown, based on the higher activity levels presented by the new forecasts, the emission inventory evaluated by the Supplemental EIS is greater than the inventory presented in the Final EIS.

Pollutant concentrations at receptor locations around the Airport would either be less than the Ambient Air Quality Standards or less than for the Do-Nothing condition in all future years. **Table C-2-9** presents a comparison of pollutant concentrations for the new forecasts and the Final EIS. As shown, the results of the Supplemental EIS evaluation are consistent with the results identified for the Final EIS. With the increase in aircraft activity identified by the new forecasts, receptor concentrations for CO and NO_2 would be slightly higher or the same as concentrations identified for the Final EIS. As expected with the evaluation of peak activity, the 1-hour CO concentrations are 10 to 25% higher than for the Final EIS depending on receptor location. Nonetheless, the 1-hour CO concentrations remain well below the 1-hour CO standard.

Appendix C-2 presents a detailed comparison of the Final EIS and new forecast results for the air pollutant emissions inventory and dispersion analysis.

4. CAL3QHC LOCAL ROADWAY INTERSECTION ANALYSIS

Because motor vehicles are the major source of air pollutants in the Puget Sound and Sea-Tac area, a separate, more detailed air quality analysis was conducted for highly congested roadway intersections in the Airport area. In accordance with EPA CO modeling guidelines, the local roadway intersection dispersion analysis focused on the intersections with lowest levels of service and the highest activity levels. The most highly congested intersections in the Airport area today and in the future are:

- South 160th Street and International Boulevard/(SR99)
- South 170th Street and International Boulevard/(SR99)
- South 188th Street and International Boulevard/(SR99)
- South 200th Street and International Boulevard/(SR99)

Additionally, the intersection of South 154th Street and 24th Avenue South was also considered due to the proposed development of an employee parking lot north of SR 518, west of 24th Avenue South. The location of the intersections modeled are shown in **Exhibit 5-2-7**.

The intersection dispersion analysis was evaluated using the EPA approved CAL3QHC air quality computer model, with emission factors developed using MOBILE5A. The modeling methodology and input assumptions used in the analysis are described in **Appendix C-2**. These assumptions were designed to be conservative and to predict worst-case conditions.

Carbon Monoxide (CO) is the pollutant of greatest concern at roadway intersections because it is the pollutant emitted in the greatest quantity by motor vehicles for which short-term health standards exist. The analysis presents the results in terms of the two CO AAQS standards: 1-hour and 8-hour concentrations. The 1-hour CO AAQS standard is 35 ppm and the 8-hour CO standard is 9 ppm. Existing and future levels, as compared to the respective CO standards, are presented in **Exhibits 5-2-8 and 5-2-9**.

As is shown, in the Do-Nothing/No-Build and "With Project" alternatives for the existing and future years, exceedances of the CO AAQS are modeled to occur with the worst case meteorological conditions and use of regular unleaded fuels or oxygenated fuels, regardless of whether improvements are undertaken at Sea-Tac. If these conditions actually occurred, the maintenance plan would require the region to begin using oxygenated fuels during the winter months. However, as this section shows, even with oxygenated fuels exceedances of the CO AAQS could occur in the Do-Nothing/No-Build alternative. As exceedances are predicted regardless of the improvements at Sea-Tac Airport, this section presents the data for the oxygenated fuels. **Appendix C-2** presents the results of the intersection analysis for both oxygenated and regular unleaded gasoline fuel. On average, use of oxygenated fuels reduces CO emissions 10 to 20%.

(A) <u>Existing Impacts</u>

The already high traffic volumes at the four intersections and "worst case" poor meteorological conditions modeled by this analysis contributed to high 8-hour CO concentrations at all intersections considered. Although the 1-hour CO concentrations are well below the 35 ppm ambient air quality standard at each intersection, exceedances of the 8-hour CO standard occur at each intersection with the addition of background concentrations.

The highest concentration identified would occur at the busy intersection of International Boulevard at South 188th Street. A peak 8-hour concentration of approximately 18 ppm, including background was found at this location. For International Boulevard (SR 99) and South 170th Street, the highest 8-hour concentration was about 13 ppm. For South 160th Street, the highest 8-hour concentration was approximately 11 ppm, and 15 ppm at South 200th Street. These concentrations are all well above the 8-hour CO standard of 9 ppm.

Because modeling presented in the February, 1996 Final EIS predicted existing and continued future exceedances of the Carbon Monoxide AAQS, the Port of Seattle, the Washington State Department of Ecology, the Puget Sound Air Pollution Control Agency, and the U.S. Environmental Protection Agency entered into a Memorandum of Agreement (presented in **Appendix B**) to conduct air measurements in the vicinity of Sea-Tac Airport. The Department of Ecology has assumed responsibility for placing the monitoring equipment and collecting the data. Measurements were initiated in November 1996 and completed in February 1997. This monitoring effort found that actual measured concentrations along International Boulevard are between 3-5 ppm and "fell within health standards, even on days with the most pollution-prone weather". As noted by the Department of Ecology "'Air Quality in the study appears to be typical' ...'It even seems a little better than we've seen in similar high-traffic Areas elsewhere in the region...' Overall, 85% if the readings fell within the 'good' air quality range of 4.5 ppm and less. Fifteen percent of the readings were 'moderate' between 4.5 and nine ppm. There were no 'poor' air quality readings above nine ppm."

(B) Future Conditions With the New Forecasts

In the future, these four intersections would continue to experience high traffic volumes. Although improvements in vehicle emissions are expected that would reduce CO concentrations, the increase in regional traffic volume would counter the beneficial effect of these improvements. For the analysis presented in this Supplemental EIS, modeling was performed for only the Do-Nothing (Alternative 1) and Preferred Alternative (Alternative 3). The analysis presented for Alternatives 2 and Alternative 4 is based on an extrapolation from the Final EIS.

As is noted in Chapter 4, "Affected Environment" and in Section 5-1 "Surface Transportation", other regional development efforts are anticipated in the future that will affect surface traffic conditions. These improvements have been reflected in the surface transportation analysis and the air quality evaluation discussed in the following paragraphs. As shown in **Exhibits 5-2-8 and 5-2-9**, in the future, CO concentrations for the 1-hour level would be below the AAQS, while the 8-hour concentrations would exceed the standard similar to conditions that exist today, regardless of whether or not the improvements at Sea-Tac Airport are pursued.

(1) Alternative 1 (Do-Nothing)

For all four intersections along International Boulevard (SR 99), the future Do-Nothing CO concentrations would exceed the 8-hour standard under the Do-Nothing/No-Build.

For the year 2000, the highest CO concentration would occur at the intersection of International Boulevard (SR 99) at South 188th Street would be 19.1 ppm including background; 13.0 ppm at South 170th Street; 11.5 ppm at South 160th Street; and 15.1 ppm at South 200th Street. For 2005 and 2010, emissions would be expected to continued at these levels, as reductions in vehicle emissions noticeably compensate for increases in roadway traffic.

Exhibits 5-2-8 and 5-2-9 illustrate the maximum 1 and 8-hour CO concentrations at each intersection. The 8-hour CO standard would be exceeded at each intersection with the Do-Nothing alternative and use of oxygenated fuels (**Appendix B** presents the oxygenated fuels and unleaded fuel results).

(2) Alternative 3 (Preferred Alternative)

The Preferred Alternative would result in changes in the way traffic accesses the Airport and affect traffic movement in the Airport area. For instance, with the completion of the North Employee Parking Lot (north of SR 518), employee traffic would access this site instead of the existing employee lots. To address these changes in surface traffic patterns, the parking lot action includes the addition of turn lanes and signalization at South 154th Street at 24th Avenue South. Similarly, the development of the North Unit Terminal would result in the closure of South 170th Street (between International Blvd and Air Cargo Road) to through traffic using Airport roads to transit from eastern SeaTac to western SeaTac. Therefore, improvements to the South 160th Street interchange are included in the Master Plan Update to address changes in surface transportation conditions. As a result, additional traffic would be expected to use various intersections differently than the Do-Nothing/No-Build alternative.

CO Concentrations for the Preferred Alternative were evaluated at each of the intersections modeled. No exceedances of the AAQS would be expected based on the 1-hour CO standard. For each intersection, the 8-hour CO concentration would be at or below the future Do-Nothing condition. As a result, many of these intersections could continue to exceed the AAQS regardless of whether improvements are undertaken at Sea-Tac Airport. **Exhibits 5-2-8 and 5-2-9** illustrate the maximum CO concentrations at each intersection with the Preferred Alternative. Similar to the existing conditions, the 8-hour CO levels would be the greatest at the International Blvd intersection at South 188th Street. Conditions in year 2000 would produce the highest concentration "With Project" at 18.9 ppm, in contrast to the Do-Nothing/No-Build concentration of 19.1 ppm.

(2) Alternative 2 (Central Terminal) and 4(South Unit Terminal)

Based on the results of the Preferred Alternative evaluation discussed above, and the results presented in the Final EIS, the air pollutant conditions associated with the other "With Project" alternatives was examined. As was described in the Final EIS, the concentrations at the intersections for Alternatives 2 and 4 were virtually the same. As with the Do-Nothing and Preferred Alternative, concentrations at all intersections would be expected to be less than the AAQS for the 1-hour CO concentrations, but greater than the 8-hour CO AAQS. All of these alternatives would likely produce CO levels equal to or less than the Do-Nothing Alternative, assuming project modifications that could occur to minimize surface transportation congestion.

(C)Comparison of the New Forecasts to the Master Plan Update Forecast Air Quality

Relative to the information presented in the February, 1996 Final EIS, the analysis shown in the Supplemental EIS indicates higher pollutant concentrations in accordance with a greater level of surface traffic. The results of the "With Project" and Do-Nothing 8-hour CO concentrations are 1 ppm to 5 ppm greater than the results presented in the Final EIS. The following summarizes these differences between the "With Project" CO levels from this Supplemental EIS and the February, 1996 Final EIS:

	8-Hour CO Concentration (ppm)					
	Supplemental EIS			Final EIS		
Location	2000	2005	2010	2000	2010	2020
SR99/S.188th St.	19	18	18	15	20	13
SR99/S. 200th St	15	14	15	13	13	11
SR99/S. 170th St.	13	12	13	11	13	13
SR99/S. 160th St	11	11	12	11	11	12

Thus, the new information that has become available since publication of the Final EIS has resulted in the year 2000 concentrations being as much as 26% greater than presented in the Final EIS. While the forecast of total traffic levels (airport and regional traffic) in general is about 10% greater than the levels presented in the Final EIS, the level of delay experienced at the intersections produced the greater difference in pollutant concentrations.

5. CUMULATIVE IMPACTS

The cumulative impact of the SeaTac Master Plan improvements and other proposed local projects within the vicinity could create direct and indirect impacts on air emissions within the region. The impacts associated with the Master Plan Update and the specific other regional projects identified in Chapter 4 have been identified by this report. Additional improvements in the region would expect to affect air emissions. However, until project specific plans are developed for these developments, the cumulative impacts can not be identified. Projects resulting in physical development that add traffic to the area, without reducing congestion, would be expected to increase emissions.

6. AIR CONFORMITY DETERMINATION AND GOVERNOR'S CERTIFICATE

The Clean Air Act Amendments of 1990 require Federal agencies to ensure their actions conform to the appropriate State Implementation Plan (SIP). The SIP is a plan which provides for implementation, maintenance, and enforcement of the Ambient Air Quality Standards (AAQS), and includes emission limitations and control measures to attain and maintain the AAQS. Conformity is defined as demonstrating that a project conforms to the State Implementation Plan's purpose of eliminating or reducing the severity and number of violations of the ambient air quality standards and achieving expeditious attainment of such standards. The determination of conformity in a maintenance area is governed by the following principle:

- That the project will not cause or contribute to any new violations of any of the ambient air quality standards (AAQS) in the project area or the metropolitan area;

Because the analysis, using the worst case weather conditions, predicts exceedances of the AAQS if the Do-Nothing/No-Build were pursued, the analysis also considered non-attainment issues:

- That the project will not increase the frequency or severity of future modeled violations of any AAQS; and
- That the project will not delay timely attainment of the AAQS or any required interim emission reduction in the project area.

The purpose of the air quality analysis, therefore, is to demonstrate that the proposed improvements at Sea-Tac conform to the SIP requirements for the Puget Sound Region. Because the Master Plan Update includes proposed changes to the airfield, landside, terminal and off-airport roadways, two forms of conformity have been addressed: Transportation and general conformity.

The USEPA has issued rules for determining general conformity of airport related projects (40 CFR Part 93, Subpart B). Although the conformity determination is a Federal responsibility, State and local air agencies are provided notification and their expertise consulted. The Federal agency must provide a 30-day notice of the Federal action and draft conformity determination to the appropriate USEPA Region, and State and local air agencies. On March 31, 1997, a 45-day public comment period concluded on the Revised Draft Conformity Analysis presented in the Draft Supplemental EIS. Based on the comments received, **Appendix B** containing the Final Conformity Analysis was prepared. As is noted in Appendix F, a number of issues were identified in the Revised Draft Conformity Analysis. Based on these comments a detailed review was conducted of all data input to the models. The corrected results were discussed in this section and are detailed in **Appendix B** and **Appendix C-2.**

As the corrected analysis reflected in **Appendix B** of this report shows, the project will not increase emissions above the applicable de-minimis thresholds. Also, the project will not be considered "regionally significant" with regard to air pollution emissions. A formal conformity determination, therefore, is not legally required for this project. EPA's rules and guidance are clear that where the net emissions increase resulting from the project do not exceed the applicable threshold rates, there are no further obligations with regard to the conformity rules. Although a conformity determination is not legally required, an analysis of air quality impacts utilizing the conformity determination structure has been conducted to address community and agency concerns regarding potential air quality impacts. The analysis presented in Appendix B demonstrates that if this project was legally obligated to make a conformity determination, the project would conform to the applicable State Implementation Plan. This conclusion is especially strong given the conservative nature of the assumptions 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. Cumulatively, the conservative and worst-case inputs serve to provide a "cushion" to the analysis results, assuring that the positive conformity determination is well founded.

To meet the air quality criteria of conformity, the analysis relies on air quality modeling as specified in 40 CFR Section 93.158(a)(3). The results of the corrected modeling effort are used to demonstrate whether the Federal action will cause or contribute any new violations of the AAQS. As indicated in this section, a corrected emissions inventory and dispersion analysis were performed for the proposed improvements at Sea-Tac. The results of the dispersion analysis indicate that 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 addition of the proposed Federal action to the existing conditions results in fewer emissions than for the Do-Nothing condition, thereby demonstrating conformity with the State's SIP by not increasing emissions with respect to the baseline condition.

Therefore, it has been demonstrated, by USEPA standards, that the Federal action for proposed improvements at Sea-Tac conform to the applicable SIP for the Puget Sound Region. This conclusion of a positive general conformity determination for the Federal action planned at Sea-Tac fulfills the FAA's obligation and responsibility under 40 CFR Part 93, Subpart B. This conformity conclusion has been prepared as specified in Section 176(c)[42 USC 7506c] of the Clean Air Act Amendments of 1990. The conclusion has been made in accordance with the final rule of the U.S. Environmental Protection Agency (EPA), "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" as published in the Federal Register on November 30, 1993. The final rule (40 CFR Part 93, Subpart B) was effective January 31, 1994.

As requested by the air quality agencies, an additional public review is being conducted concerning the Final Conformity Analysis. Public notices announcing the availability of the Final Conformity Analysis have been published in four local newspapers (Highline News, Tacoma News Tribune, Seattle Times, and Seattle Post-Intelligencer). Responses to significant public or agency comments will be reflected in the FAA's Record of Decision.

7. AIR CERTIFICATION

49 USC 47106(c)(1)(B) requires that Airport Improvement Program applications for airport projects involving the location of a new runway may not be approved unless the Chief Executive Officer of the state (or the appropriate state official) in which the project is located, or the appropriate state official certifies in writing that there is "reasonable assurance" that the project will be located, designed, constructed, and operated in compliance with applicable air quality standards (the AAQS). On December 20, 1996 the Department of Ecology, under delegated authority from the governor, issued a letter certifying that such assurance was provided.

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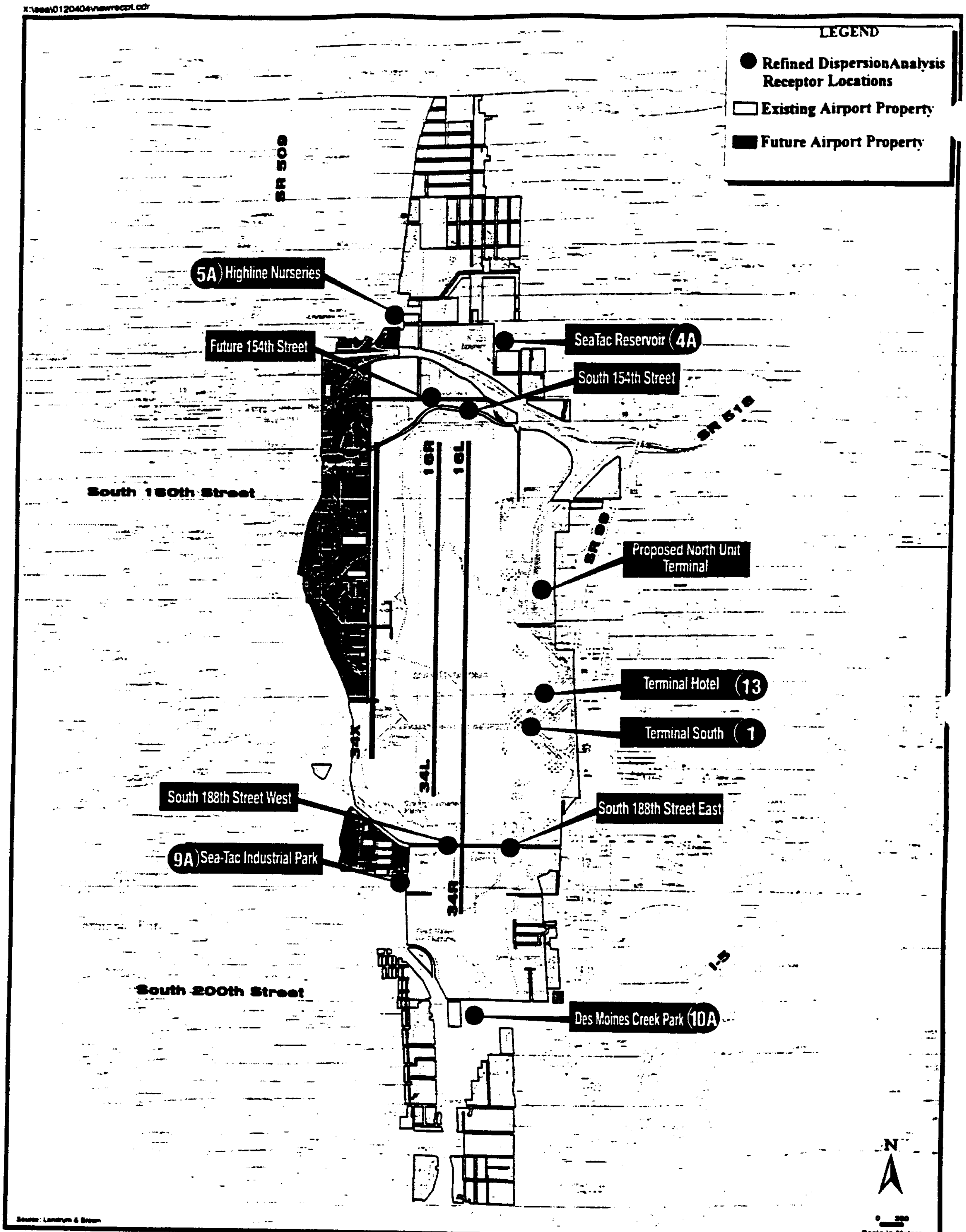


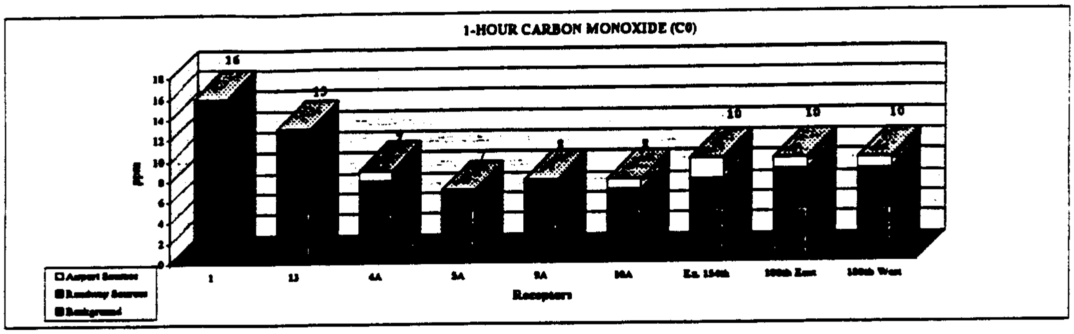
Seattle - Tacoma International Airport	Refined Dispersion Analysis Receptor Locations	EXHIBIT: 5-2-4

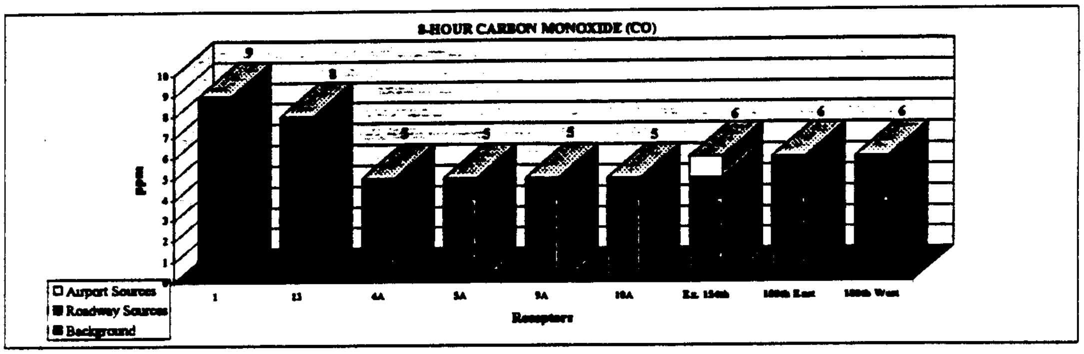
AR 040653

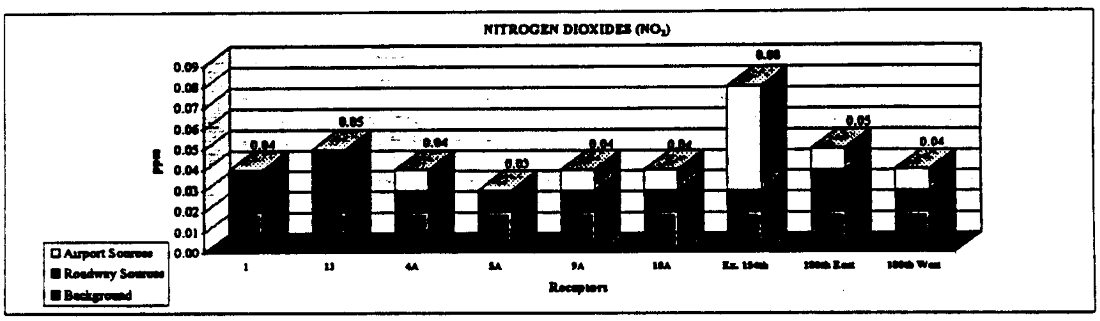
Exhibit 5-2-5

Seattle-Tacoma International Airport
Environmental Impact Statement

EXISTING CONDITIONS (1994)
REFINED DISPERSION ANALYSIS







Receptors: 1 = Terminal-South; 13 = Terminal Hotel; 4A = SeaTac Reservoir; 5A = Highline Nurseries; 9A = Sea-Tac Industrial Park; 10A = DesMoines Creek Park; Ex. 154th = Existing South 154th Street; 188th East = South 188th Street, East Receptor; 188th West = South 188th Street, West Receptor. Receptor locations are shown on Exhibit IV.9-1.

Source: Landrum & Brown, Inc., using EDMS Version 944

AAQS: 1-hour CO = 35ppm; 8-hour CO = 9 ppm; NO_2= 0.053 ppm

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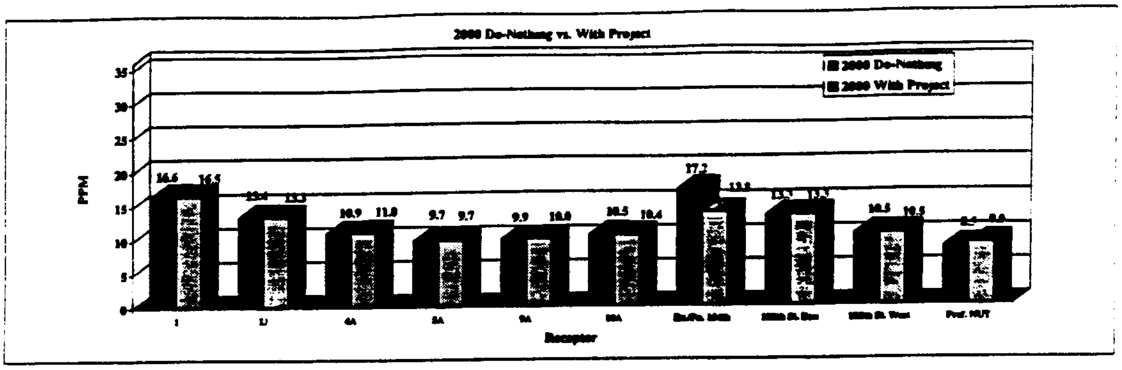
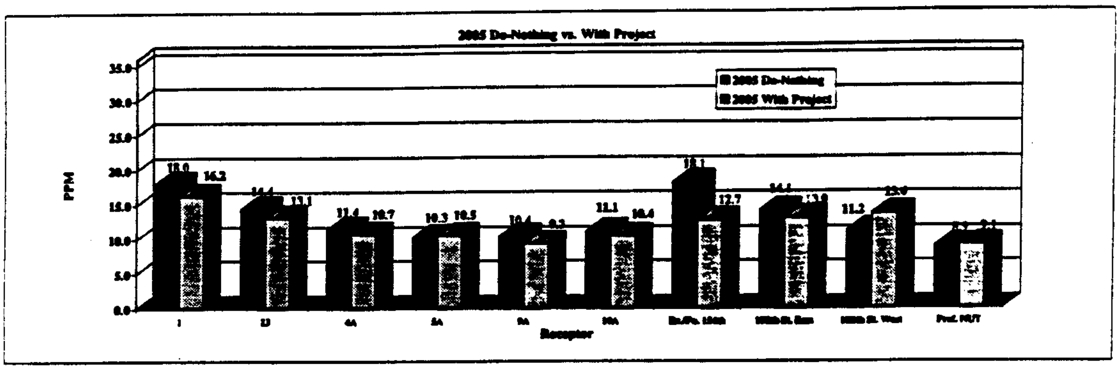
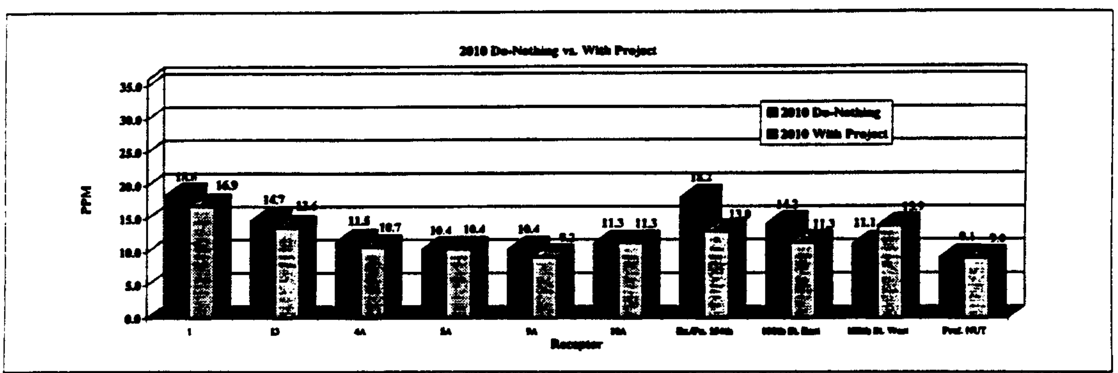
Exhibit 5-2-6
(Page 1 of 3)

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

CARBON MONOXIDE 1-HOUR CONCENTRATION (PPM)







Receptors: 1=Terminal-South; 13=Terminal Hotel; 4A=SeaTac Reservoir; 5A=Highline Nurseries; 9A=Sea-Tac Industrial Park; 10A=DesMoines Creek Park; Ex./Fu. 154th=Existing vs. Future South 154th Street; 188th East=South 188th Street, East Receptor; 188th West=South 188th Street, West Receptor.

Note: AAQS = 35.0 ppm
Background = 5.0 ppm

Source: Landrum & Brown, Inc., using EDMS Version 944

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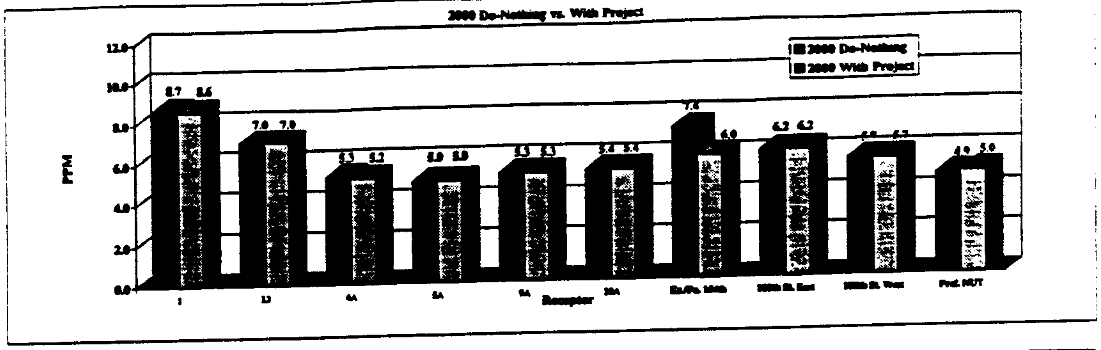
April 30, 1997

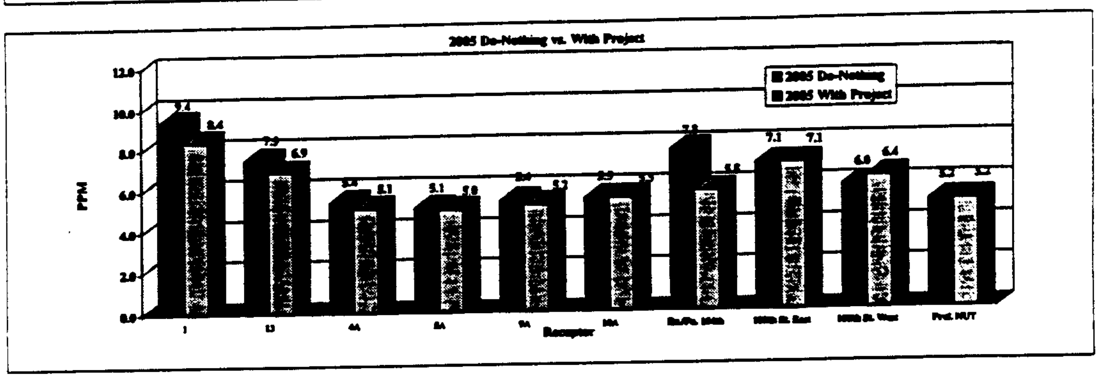
AR 040655

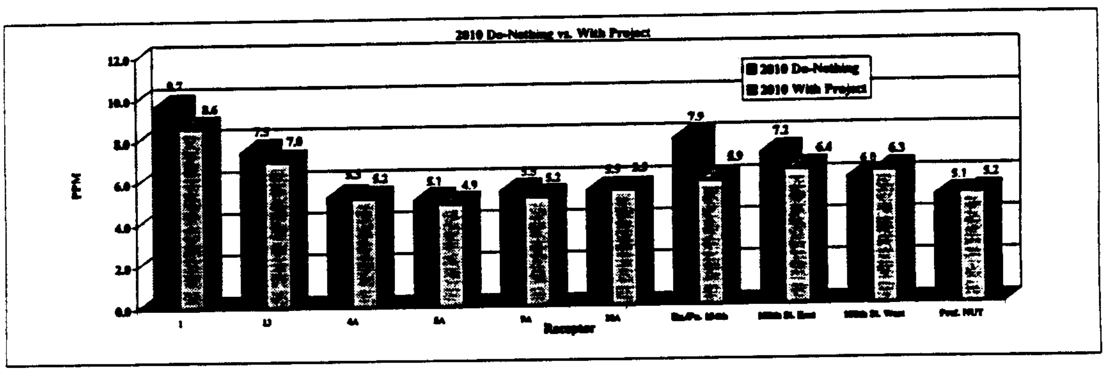
Exhibit 5-2-6
(Page 2 of 3)

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

CARBON MONOXIDE 8-HOUR CONCENTRATION (PPM)







Receptors: 1=Terminal-South; 13=Terminal Hotel; 4A=SeaTac Reservoir; 5A=Highline Nurseries; 9A=Sea-Tac Industrial Park; 10A=DesMoines Creek Park; Ex./Fu. 154th=Existing vs. Future South 154th Street; 188th East=South 188th Street, East Receptor; 188th West=South 188th Street, West Receptor.

Note: AAQS = 9.0 ppm
Background = 3.5 ppm

Source: Landrum & Brown, Inc., using EDMS Version 944
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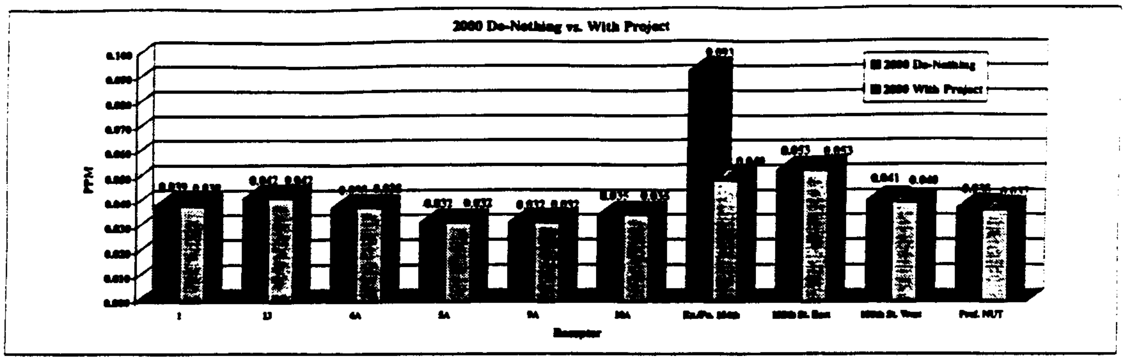
April 30, 1997

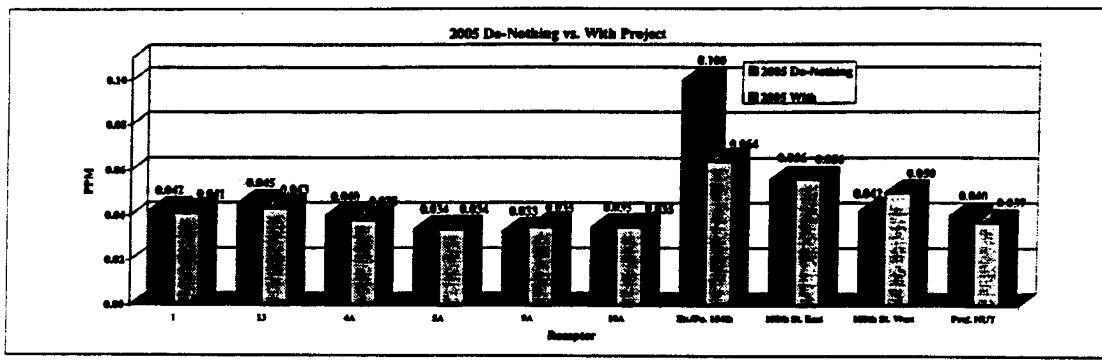
AR 040656

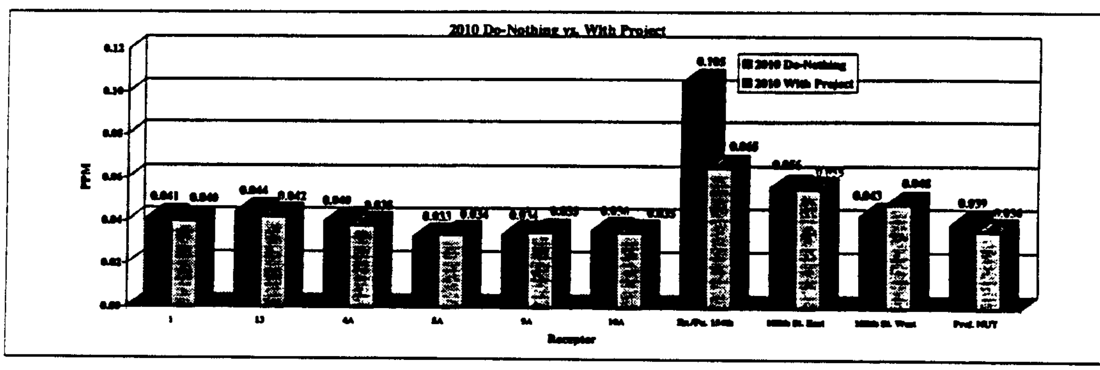
Exhibit 5-2-6
(Page 3 of 3)

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

NITROGEN DIOXIDE CONCENTRATIONS (PPM)







Receptors: 1=Terminal-South; 13=Terminal Hotel; 4A=SeaTac Reservoir; 5A=Highline Nurseries; 9A=Sea-Tac Industrial Park; 10A=DesMoines Creek Park; Ex./Fu. 154th=Existing vs. Future South 154th Street; 188th East=South 188th Street, East Receptor; 188th West=South 188th Street, West Receptor.

Note: AAQS = 0.053 ppm
Background = 0.02 ppm

Source: Landrum & Brown, Inc., using EDMS Version 944

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April 30, 1997

AR 040657

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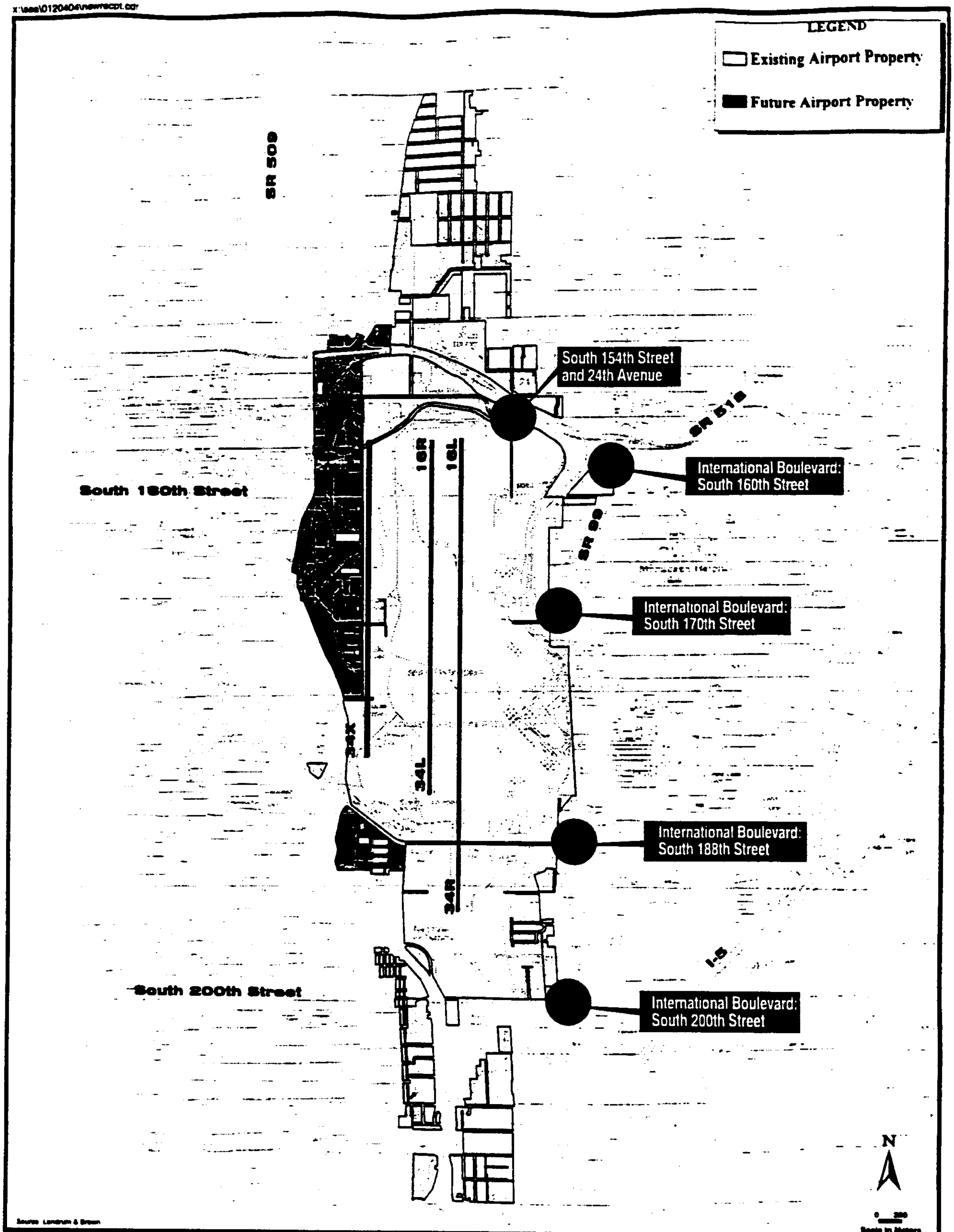


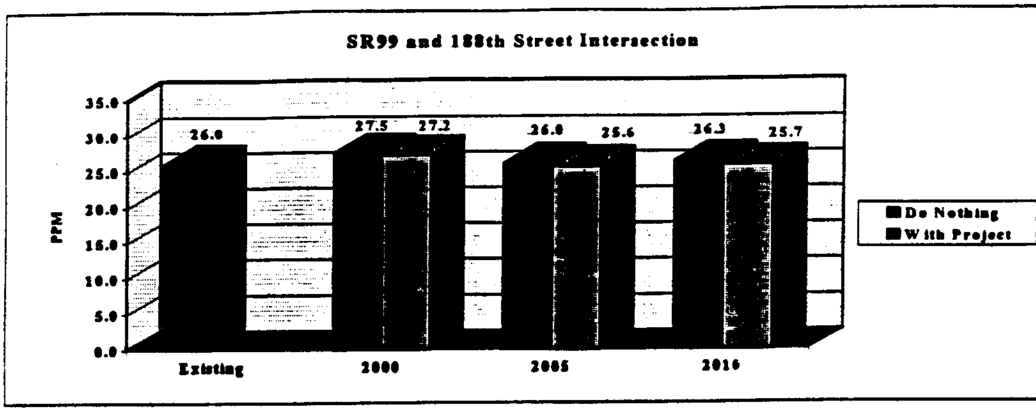
Seattle - Tacoma International Airport	Roadway Intersection Dispersion Analysis	EXHIBIT: 5-2-7

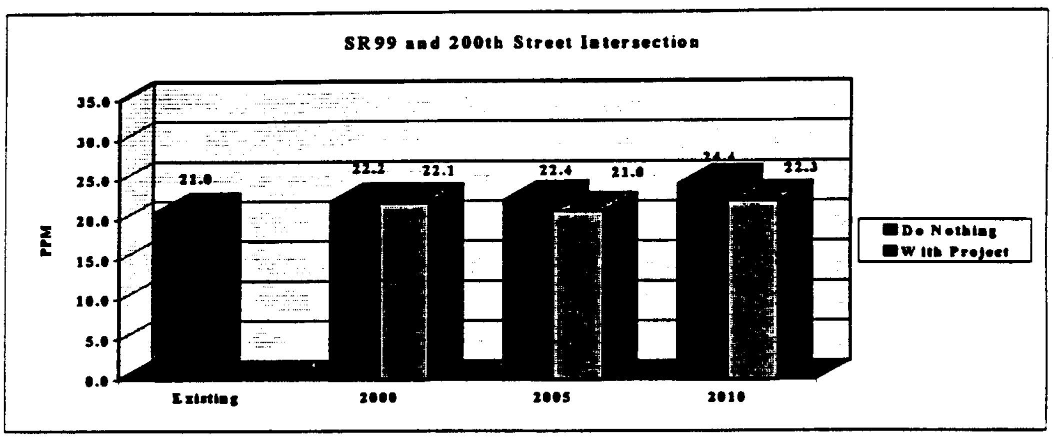
AR 040658

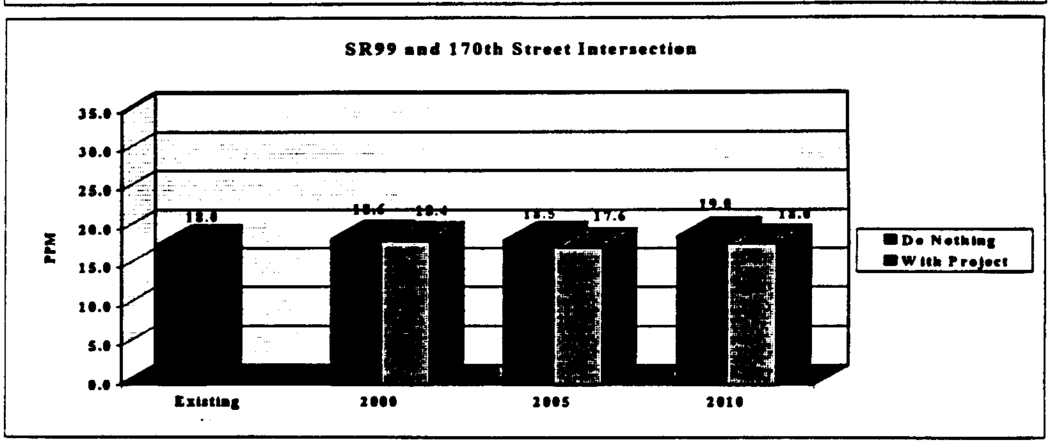
Exhibit 5-2-8
Page 1 of 2

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
1-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm







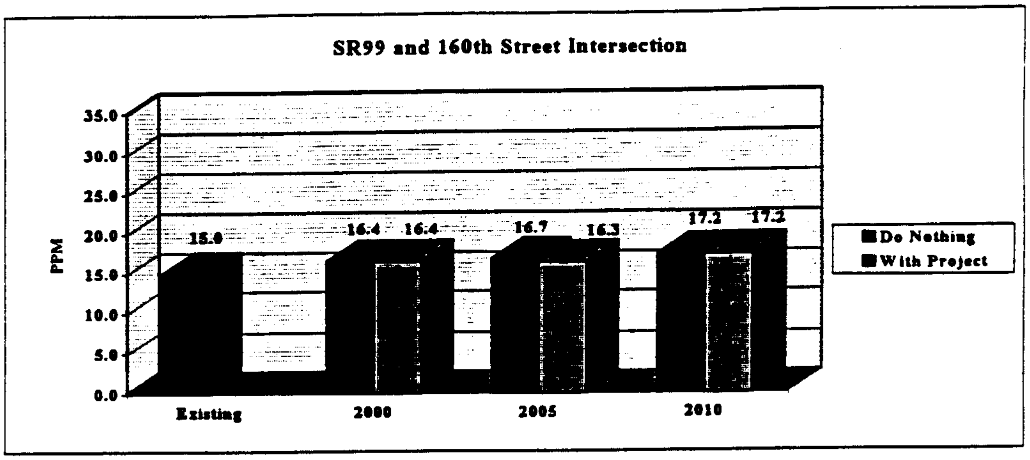
Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (1-Hour CO=35 ppm)
Intersections modeled are shown on Exhibit 5-2-7.

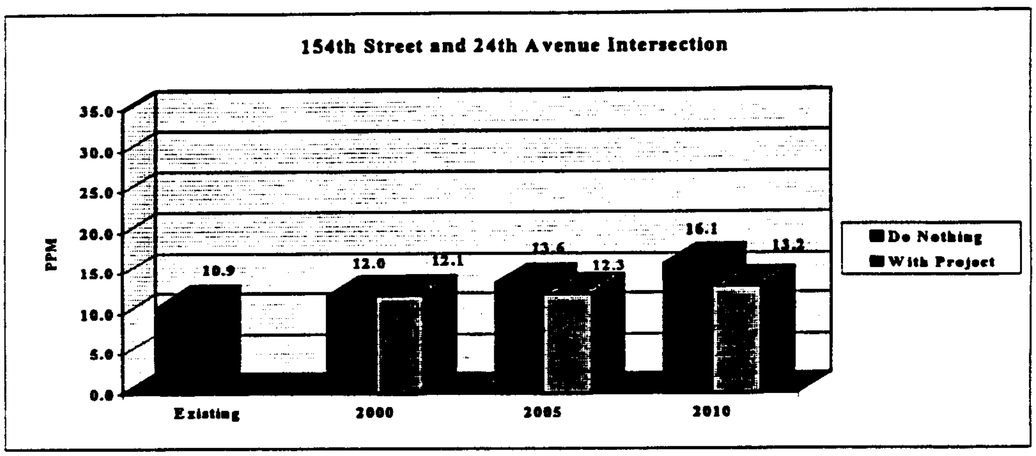
AR 040659

Exhibit 5-2-8
Page 2 of 2

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
1-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm





Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (1-Hour CO=35 ppm)
Intersections modeled are shown on Exhibit 5-2-7.

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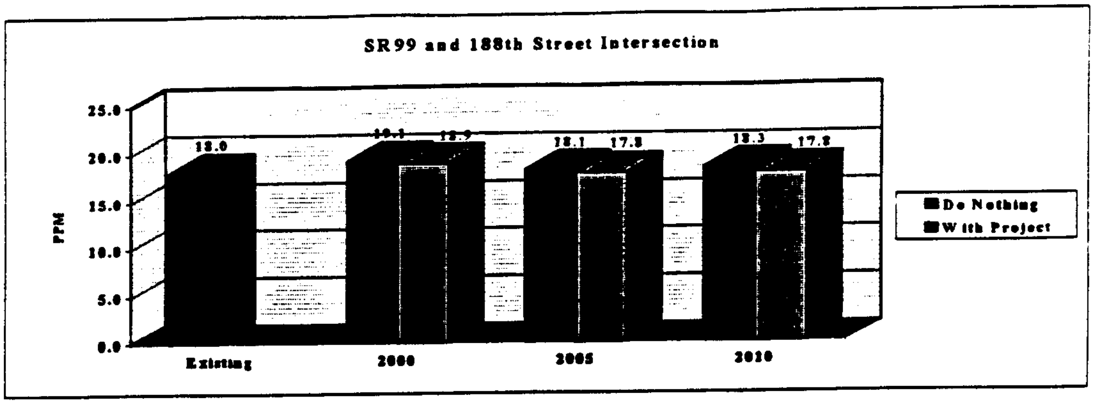
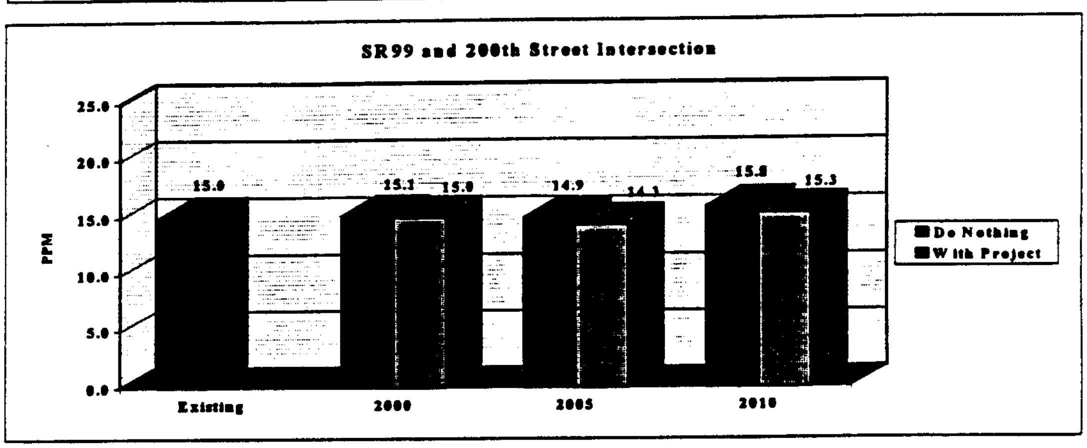
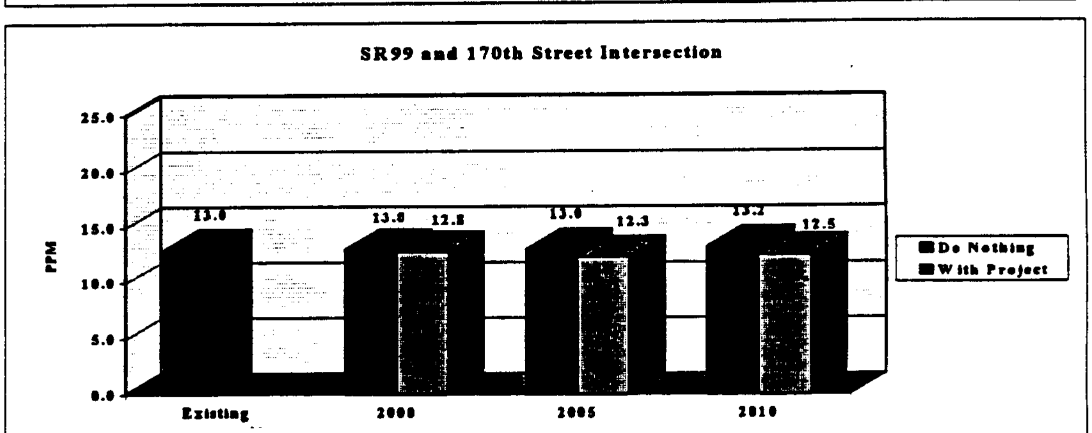
Exhibit 5-2-9
Page 1 of 2

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
8-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm







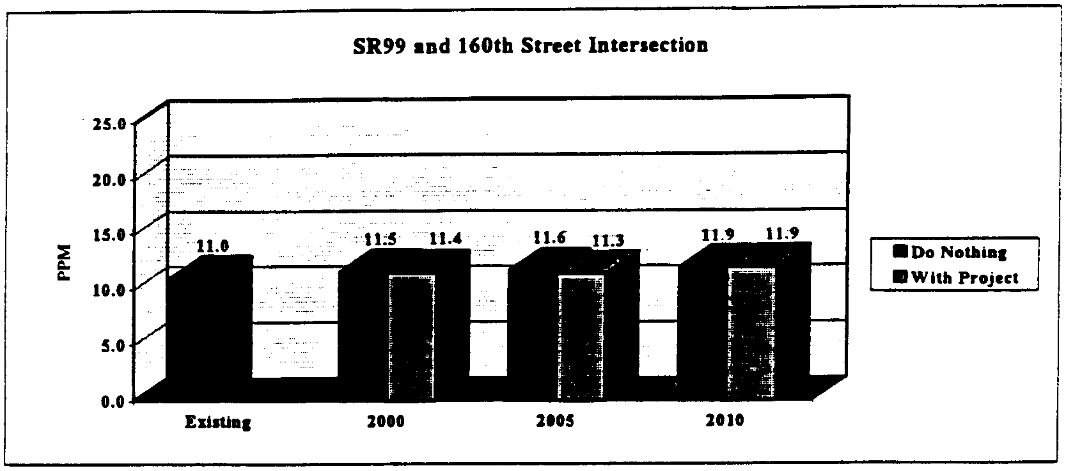
Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (8-Hour CO=9 ppm)
Intersections modeled are shown on Exhibit 5-2-7.

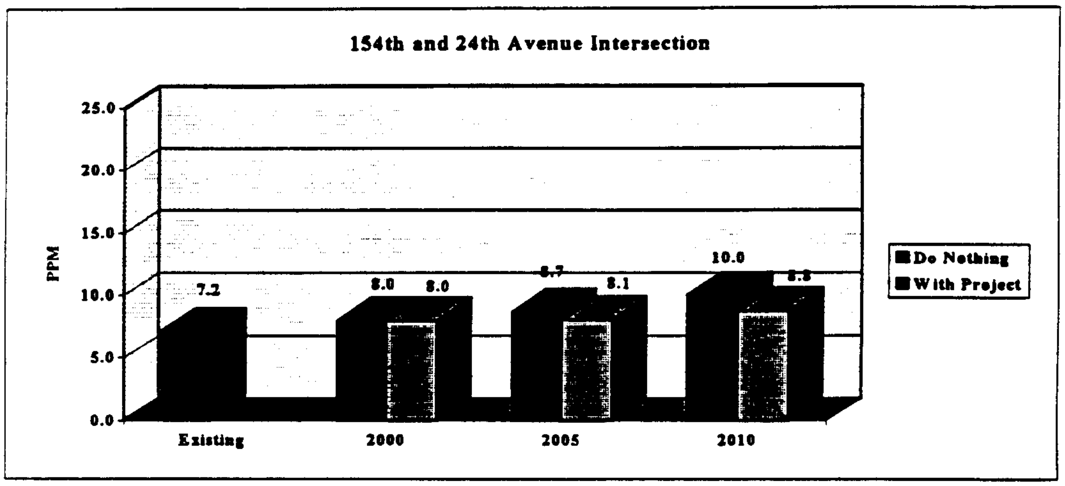
AR 040661

Exhibit 5-2-9
Page 2 of 2

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
8-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm





Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (8-Hour CO=9 ppm)
Intersections modeled are shown on Exhibit 5-2-7.

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TABLE 5-3-2
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Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

1.5 DNL OR GREATER CHANGE IN NOISE (2010)

Pt. No	Description	Approximate Description/Location	Year 2010 Noise Exposure (DNL) Alt. 1	Alt. 3	Change
5	RMS5	Noise Monitoring site (westside acquisition area)	62.6	70.3	7.7
10	RMS10	Noise Monitoring site (S. 192nd between Des Memorial & 8th Ave S.)	64.2	66.8	2.6
219	E20	Grid E20 (at S. 112th near 10th)	62.4	65.2	2.8
220	E21	Grid E21 (at S. 114th Place near 10th)	62.6	65.8	3.2
221	E22	Grid E22 (between S.117 and S. 120th near 10th)	62.7	66.7	4.0
222	E23	Grid E23 (between S.120th and S.124th near 10th)	62.7	67.1	4.4
223	E24	Grid E24 (between S.124th and S.128th near 10th)	62.5	67.4	4.9
224	E25	Grid E25 (at 130th Pl near 10th)	62.3	67.4	5.1
225	E26	Grid E26 (at 134th near 10th)	62.4	67.5	5.1
226	E27	Grid E27 (at 138th an 9th Place)	62.6	67.5	4.9
227	E28	Grid E28 (142nd Lane at 10th)	62.7	67.4	4.7
228	E29	Grid E29 (146th near 10th)	63.1	67.8	4.7
229	E30	Grid E30 (S. 150th Pl near 10th)	63.3	68.0	4.7
230	E31	Grid E31 (S. 10th near S 153rd)	64.3	70.1	5.8
231	E32	Grid E32 (S. 9th near 158th in acquisition area)	64.0	69.4	5.4
232	E33	Grid E33 (S. 9th south of 160th in acquisition area)	64.0	68.9	4.9
233	E34	Grid E34 (vicinity of S. 9th/S.166th in acquisition area)	62.8	67.9	5.1
234	E35	Grid E35 (S. 8th Place near S. 170th in acquisition area)	61.9	67.1	5.2
235	E36	Grid E36 (SR 509 at about 173rd in acquisition area)	61.9	68.4	6.5
236	E37	Grid E37 (S. 10th at about 177th in acquisition area)	62.5	69.6	7.1
237	E38	Grid E38 (SR 509 southbound exit to S. 188th)	63.8	70.4	6.6
238	E39	Grid E39 (between DesMoines Mem an 8th Ave at S 185th)	64.7	67.5	2.8
239	E40	Grid E40 (between DesMoines Mem an 8th Ave at S 190th)	64.4	67.0	2.6
240	E41	Grid E41 (S. 10th Place at S. 194th)	63.7	66.2	2.5
241	E42	Grid E42 (S. 197th near S. 10th)	63.2	65.3	2.1
299	F27	Grid F27 (S. 14th at S. 140th)	68.0	69.5	1.5
300	F28	Grid F28 (Des Moines Mem. Way Near 142nd)	68.2	70.0	1.8
301	F29	Grid F29 (Des Moines Mem.Way Near 146th)	68.2	70.5	2.3
302	F30	Grid F30 (near S. 16th at S. 150th)	68.5	71.8	3.3
303	F31	Grid F31 (S. 14th near S. 156th)	69.9	76.3	6.4
312	F40	Grid F40 (between DesMoines Mem an 16th Ave at S 190th)	69.5	71.5	2.0
313	F41	Grid F41 (S. 194th east of 16th)	68.7	70.5	1.8
858	NSF:A16	Historic Site (Sunnydale Elementary School)	62.3	65.1	2.8
867	NSF:A27	Historic Site (Brunelle Residence)	66.6	70.2	3.6
939	NSF:S102	School (SeaTac Occupational School)	62.2	66.6	4.4
950	NSF:S21	School (Sunnydale Elementary School)	62.3	65.1	2.8

Table 5-3-2
(Page 2 of 2)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

1.5 DNL OR GREATER CHANGE IN NOISE (2010)

Pt. No	Description	Approximate Description/Location	Year 2010 Noise Exposure (DNL) Alt. 1	Alt. 3	Change
1111	R-1	Along Des Moines Memorial near S. 146th	68.0	70.5	2.5
1112	R-2	Along 8th Ave near S. 148th	61.6	65.1	3.5
1113	R-3	Along 8th Ave near S. 148th	62.0	65.7	3.7
1114	R-4	Along Des Moines Memorial near S. 150th	64.0	69.7	5.7
1115	R-5	Along Des Moines Memorial near S. 150th	64.3	70.4	6.1
1120	R-10	Along S. 156th at S. 10th in acquisition area)	64.4	70.3	5.9
1123	R-13	Along S. 160th at 10th in acquisition area)	63.8	68.5	4.7
1124	R-14	Along S. 160th at 10th in acquisition area)	63.8	68.4	4.6
1128	R-19	At Des Moines Memorial at 200th	64.1	66.7	2.6
1129	R-20	Along 200th at S. 12th	66.4	69.0	2.6
1130	R-21	At Des Moines Memorial at 200th	64.0	66.6	2.6
1131	R-22	Along 200th at S. 12th	66.8	69.0	2.2
1132	R-23	Along Des Moines Memorial at S. 204th	63.1	65.6	2.5
1133	R-24	Along Des Moines Memorial at S. 204th	63.5	66.2	2.7
1177	M-4	Along SR509 at S. 172nd	60.9	65.1	4.2
1200	T-132	North of S. 188th at 8th Ave S.	62.2	66.5	4.3
1202	T-136	Along 8th Ave S. between 154th and 156th	63.1	66.6	3.5
1209	T-44	Along 8th Ave S. between 154th and 156th	63.1	66.5	3.4
1211	NSF:A22	Historic Site (Home Crosby Home)	61.8	65.4	3.6
1212	NSF: A29	Historic Site (Bryan House)	62.8	67.8	5.0
1217	NSF: A56	Historic Site (Vacca Farm)	63.0	67.3	4.3
1218	NSF:A57	Historic Site (Albert Paul House)	63.3	67.2	3.9
1225	NSF:S105	School (Woodside Elementary)	62.8	65.9	3.1
1227	NSF:S106	School (Sunny Terrace Elementary)	63.0	68.2	5.2
1254	N2	Pacific Telephone Building	61.7	65.2	3.5
1261	N16	Coil House	63.5	65.4	1.9

Source: Landrum & Brown 1996

On-airport Grid locations also experience 1.5 DNL increases and are not included in this table.

south and east. Ground noise effects on the contour pattern above 65 DNL remain within existing Airport boundaries.

A similar comparison of the Do-Nothing and Preferred Alternative contours for the year 2010 yields comparable observations, although the extent of the westward contour shift is more pronounced. As the number of operations increases toward capacity at the Airport, it is expected that many arrivals to Runways 16R/34L will shift to Runways 16X/34X to provide less intermixing of arrivals and departures on the center runway. Consequently, as more operations are assigned to the proposed new runway, the outer protrusions of the noise contour associated with approaches to that runway are enlarged.

As presented in **Appendix C-3**, the changes in DNL levels at 1,290 individual sites were computed. **Table 5-3-2** lists the sites which would be exposed to significant (1.5 DNL or greater noise levels within the 65 DNL noise contour) as a result of Alternative 3 in comparison to the Do-Nothing. There are 82 sites (including on-airport sites) that would be expect to experience significant increases in aircraft noise within 65 DNL. However, similar to the analysis presented in the Final EIS, many of these sites are located in areas that would be acquired or are compatible uses.

(C) <u>Alternative 2 (Central Terminal)and Alternative 4 (South Unit Terminal)</u>

Noise exposure associated with Alternative 2 (Central Terminal) and Alternative 4 (South Unit Terminal) would change based on the new forecasts in the same fashion as the Preferred Alternative described in the preceding section. While noise exposure contours were not developed for these alternatives, the noise impacts were estimated based on the analysis prepared for the Final EIS. All differences in the noise exposure contours between Alternatives 2, 3, and 4 would be as a result of different aircraft ground taxiing patterns for aircraft taxiing to a North Unit Terminal, a Central Terminal, or a South Unit Terminal. The resulting noise exposure differences would be on airport property and would not result in land use incompatibilities.

* * *

Each "With Project" alternative would result in an increase of between 4 and 9% in the area of noise exposure within 65 DNL over the Do-Nothing alternative during each year of evaluation after the third runway is available for use. The length of the proposed new runway would have little effect on the area within the noise pattern, although the number of operations to the new runway by large aircraft would become progressively less if the length of the runway was reduced. While this analysis has focused on the areas exposed to 65 DNL and greater sound levels, it is anticipated that changes in noise exposure could also occur outside the DNL 65. For residents that are disturbed by noise less than DNL 65, these impacts could continue and change slightly. As is shown by the assessment of noise impacts from aircraft overflights at altitudes between 3,000 feet and 18,000 feet, these impacts are not expected to be significant.

The noise patterns associated with each terminal development alternative would cover the same off-airport area. Notably, even with the addition of the proposed 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.

4. COMPARISON TO THE MASTER PLAN UPDATE FORECAST IMPACTS

As is noted by comparing the area within the contours shown in **Table 5-3-1**, the noise exposure associated with the new forecast is slightly larger than the impacts associated with the Master Plan Update forecast. As the new forecast reflect higher activity levels, the resulting noise impacts are slightly greater.

(A) Alternative 1 (Do-Nothing)

The noise contours for the new forecasts are approximately 12% larger than those projected by the Final EIS for comparable years. The growth appears proportionately throughout all of the contour, rather than in any specific location. Each noise contour level extends slightly further northward (by less than 1,000 feet) than the Do-Nothing contours presented in the Final EIS. To the south the noise contours remain in approximately the same locations with the higher activity levels.

The areas within the noise contours, including airport property, compare as follows:

	Do-Nothing Alternative 65 DNL and Greater Noise Exposure Impacts (Sq. Miles)	
Year	New Forecast	Master Plan Forecast
65 DNL and greater		
2000	6.81	6.12
2005	6.61	n/a
2010	7.08	6.33
75 DNL and greater		
2000	1.33	1.23
2005	1.28	n/a
2010	1.35	1.26

Note: area above includes airport property.

(B) "With Project" Alternatives

The noise contours of the "With Project" alternative in the year 2000 for this analysis do not reflect the presence of the third parallel runway, whereas the Final EIS assumed that the runway would be available for use in 2000. Consequently, there are substantial differences between the "With Project" contours for 2000 between this analysis and the Final EIS. The contours prepared for this analysis are the same as the Do-Nothing alternative for 2000.

By 2010, the new forecast evaluation assumes the presence of the third parallel runway, higher levels of aircraft operations, and slight changes in runway use assumptions relative to the analysis presented in the Final EIS. The activity levels associated with the higher forecast are described in Chapter 2 of this report. The slight changes in runway use are discussed in Appendix C-2 and reflect the findings of the final report of the Capacity Enhancement Update. The analysis presented in this report reflects a higher landing percentage use of the new runway, which results in a widening of the noise contours to the west. This is particularly noticeable in the area near South 112th Street and 12th Avenue South, and in the area immediately south of the new runway within the 70 DNL noise contour. As less landing traffic would use the center runway (existing runway 16R/34L) in 2010, the noise contours are slightly shorter to the south of the Airport than was presented in the Final EIS. In total, the area within the 65 DNL and greater noise contour is about 15% greater than was projected in the Final EIS.

The following contrast the "With Project" noise contours of the new forecast with the Master Plan Update forecast:

	Preferred Alternative Area Affected by Various Sound Levels (Sq. Miles)	
Year	New Forecast	Master Plan Forecast
65 DNL and Greater		
2000	6.81	6.53
2005	6.85	n/a
2010	7.69	6.68
75 DNL and Greater		
2000	1.33	1.49
2005	1.57	n/a
2010	1.76	1.53

5. CUMULATIVE IMPACTS

As is identified in Chapter 4 "Affected Environment" a number of non-airport related developments are planned in the airport vicinity. These actions would not likely affect aircraft operations or aircraft fleet mix. They could, however, affect surface transportation volumes in the Airport area. As additional surface traffic would occur, increased roadway noise levels would result. However, until specific project plans are completed for these developments, the total cumulative impacts can not be identified.

6. MITIGATION

Two key findings of the aircraft noise analysis are:

- Future impacts will be less than the current noise exposure regardless of which Master Plan Update alternative is pursued;
- The "With Project" alternatives would result in slightly greater noise exposure in comparison to the Do-Nothing.

Section 5-6 "Land Use Impacts" presents the population and dwelling unit impacts associated with each of the alternatives. In each case, the "With Project" alternatives would result in an increase over the "Do-Nothing" alternative in the number of persons and residences exposed to significant aircraft noise. Included in that section are a series of land use compatibility actions that would address the impacts of the proposed Master Plan Update improvements for residents not already included in the Port's Noise Remedy Program.

Table 5-3-1

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

AREA AFFECTED BY AIRCRAFT NOISE
(Square Miles)

WITH THE NEW FORECASTS

Alternative	DNL 65-70	DNL 70-75	DNL 75 & Greater	65 DNL & Greater	DNL 60-65	DNL 60 & Greater
Existing	**6.82**	**3.02**	**2.39**	**12.23**	**14.40**	**26.43**
2000						
Alternative 1	3.86	1.62	1.33	6.81	9.40	16.21
Alternative 2*	3.86	1.62	1.33	6.81	9.40	16.21
Alternative 3	3.86	1.62	1.33	6.81	9.40	16.21
Alternative 4*	3.86	1.62	1.33	6.81	9.40	16.21
2005						
Alternative 1	3.78	1.55	1.28	6.61	9.27	15.88
Alternative 2*	3.73	1.55	1.57	6.85	9.01	15.86
Alternative 3	3.73	1.55	1.57	6.85	9.01	15.86
Alternative 4*	3.73	1.55	1.57	6.85	9.01	15.86
2010						
Alternative 1	4.08	1.65	1.35	7.08	9.88	16.96
Alternative 2*	4.17	1.75	1.76	7.68	9.94	17.62
Alternative 3	4.17	1.75	1.76	7.68	9.94	17.62
Alternative 4*	4.17	1.75	1.76	7.68	9.94	17.62

WITH MASTER PLAN UPDATE FORECAST

Alternative	DNL 65-70	DNL 70-75	DNL75 & Greater	65 DNL and Greater	DNL 60-65	DNL 60 and Greater
Existing	6.82	3.02	2.39	12.23	14.40	26.63
2000						
Alternative 1	3.45	1.44	1.22	6.11	8.34	14.45
Alternative 2	3.56	1.49	1.48	6.53	8.39	14.92
Alternative 3	3.55	1.49	1.49	6.53	8.39	14.92
Alternative 4	3.55	1.49	1.49	6.53	8.39	14.92
2010						
Alternative 1	3.56	1.50	1.24	6.30	8.71	15.01
Alternative 2	3.66	1.51	1.52	6.69	8.75	15.44
Alternative 3	3.66	1.51	1.52	6.69	8.75	15.44
Alternative 4	3.66	1.51	1.52	6.69	8.75	15.44
2020						
Alternative 1	3.82	1.62	1.37	6.81	9.33	16.14
Alternative 2	3.87	1.61	1.66	7.14	9.31	16.45
Alternative 3	3.86	1.61	1.66	7.13	9.28	16.41
Alternative 4	3.86	1.61	1.67	7.14	9.31	16.45

Source: Landrum & Brown, from the Integrated Noise Model, Version 4.11, December 1996.

Area includes Port owned land.

* Note - Estimated based on results from the Final EIS.

SECTION 5-3

NOISE IMPACTS

The impact of aircraft noise levels upon the communities surrounding the Airport is presented in this section. The analysis includes an identification of impacts on the surrounding area in 1994 and as forecast for the years 2000, 2005, and 2010. The number of people, housing units, and area affected by 65 DNL and greater sound levels is expected to decline in the future in comparison to 1994 noise exposure regardless of future development at Sea-Tac Airport. This decline in impacts is expected due to the Port's noise reduction program and the Federal mandate to phase-out Stage 2 aircraft by the year 2000. This analysis focuses on the impacts within 65 DNL and greater noise exposure; however, areas exposed to 60-65 DNL were evaluated and are presented for information purposes. While this analysis has focused on the areas exposed to 65 DNL and greater sound levels, it is anticipated that changes in noise exposure could also occur outside the 65 DNL. For residents that are disturbed by noise less than 65 DNL, these effects could continue and change slightly.

The development of the third parallel runway would be expected to result in a slight reduction in noise impacts over the Do-Nothing in the initial years after the commissioning of the new runway. By 2010, when the third runway airfield is capable of accommodating more traffic than the Do-Nothing, the third runway would result in about 11 percent more people being affected in contrast to the Do-Nothing. Detailed information relative to the level of aircraft noise impacts within each jurisdiction surrounding the Airport is presented in **Section 5-6 "Land Use Impacts"**.

The following sections provide a brief summary of the methodology used and the resulting impacts. **Appendix C-3** provides detailed information related to the development of noise contours for Sea-Tac Airport.

1. METHODOLOGY

Day Night Sound Level (DNL) contours were developed using the Integrated Noise Model (INM), Version 4.11. The INM is a sophisticated computer model that evaluates the cumulative noise exposure of all aircraft operating to and from the Airport on an average annual day. Version 4.11 of the INM, released by the FAA in December of 1993, has some new features that allow a standard evaluation of aircraft noise to include the effects of: ground terrain; run-up noise; departure climbs adjusted for local elevation and temperature; and aircraft taxiing noise. The new features of the Integrated Noise Model were used in this analysis.

Appendix C-3 contains a detailed description of the following:

- Noise Modeling Assumptions
- Locational Impact analysis
  - DNL levels
  - Time Above a threshold of A-weighted Sound level
  - Peak Sound Exposure Level (SEL)
  - Equivalent Sound Level (Leq)

In addition, Appendix C of the Final EIS contains a description of historical noise studies prepared for Sea-Tac, the existing noise abatement program elements at Sea-Tac, actual noise measurements, and noise footprints for individual aircraft types operating at Sea-Tac.

For the purpose of this evaluation, aircraft noise impacts represent the land area and number of people and residences exposed to aircraft noise above predetermined levels. Contour lines representing average annual noise conditions were generated showing the Day-Night Average Sound Level (DNL or Ldn) of 60, 65, 70 and 75 dBA for aircraft operations. The number of existing residents and dwelling units located within the noise exposure pattern of current and each future alternative condition were identified.

2. EXISTING AIRCRAFT NOISE

On the basis of scientific surveys and analysis, the FAA has established 65 DNL as the critical level for the determination of noise impacts.[1] The 65 DNL contour incorporates 12.23 square miles (7,827 acres), including much of Airport property. The predominant use of southerly traffic flows at the Airport results in a larger portion of the contour pattern falling south of the airfield due to the prevailing winds. Owing to the greater thrust levels used, departures are typically several decibels louder than approaches at the same distance from the aircraft, resulting in larger noise contours in the principal direction of departing traffic. Therefore, the noise contours for the existing condition reach farther into communities south of the Airport than into those to the north.

The contour shape also reflects the predominant runway usage during north or south flow. When traffic is in south flow, Runway 16L (the east parallel runway) is used for most departures, while the west parallel runway (16R) is used for most approaches. In north flow, Runway 34L is used for most departures while Runway 34R is used for most approaches.[2] The resulting pattern of existing noise exposure indicated in **Exhibit 5-3-1** clearly shows greater noise exposure along the centerline of the approach to Runway 16R to the north and along the extended centerline of the approach to Runway 34R south of the Airport. This characteristic is further emphasized by compliance with the Standard Instrument Departure headings which are slightly to the left of the extended centerline when in either north or south traffic flow.

The 65 DNL noise exposure contour extends from its north end over the Duwamish River, just south of the Boeing plant at Boeing Field southward to terminate near 280th Street South. To the east, the contour generally follows Pacific Highway (SR 99) south of the passenger terminal complex. North of the terminals, the contour tapers from southeast to northwest across developed residential neighborhoods. West of the Airport, the 65 DNL contour tapers southeasterly across residential neighborhoods from the vicinity of 188th Street and 8th Avenue to its southern end. It remains generally east of and parallel to State Road 509, north of the Airport. Directly east and west of the runway ends, the contour bulges outward from the Airport, reflecting the locations at which thrust is initially applied to begin the takeoff roll for departing aircraft. Between the runway ends, the contour curves in toward the Airport as a result of greater attenuation rates applied to noise dispersion for aircraft which are on the ground.

1/ Federal Aviation Regulation Part 150 and the Federal Interagency Committee on Noise.

2/ The Federal Aviation Administration plans to improve the efficient use of the airfield through increased use of Runway 34R for departures and Runway 34L for arrivals during north flow. Therefore, it is incorporated into the evaluations of future Do-Nothing Conditions.

SECTION 5-4

CONSTRUCTION IMPACTS

Since publication of the Final EIS, new information has arisen that has lead to possible changes in the construction of the Master Plan Update improvements. Chapter 2 of this Supplemental EIS describes the effects of the new Port forecasts on construction phasing. Other construction related changes include:

- Third parallel runway haul duration - the Final EIS analyzed a 3 year haul, with the runway being available for use in the year 2000. This Supplemental EIS analyzes a 5-year haul, with the runway available for use in late 2004. Under this new construction schedule, the peak of hauling would occur in year 2000, with the haul complete in 2002. The lengthening of the haul duration would likely reduce the number of average daily truck trips;[1/]
- Additional haul routes have been identified - the Final EIS examined the primary haul routes that are anticipated to be used. Based on a further examination of barge transfer opportunities and a review of alternative material delivery methods, several additional routes were identified.
- Examination of two temporary interchanges - In addition to the identification of additional haul routes, two temporary, construction-only interchanges were identified: from SR 518 near 20th Avenue South and from SR 509 near South 176th Street.

No changes in the total quantity of fill material have been identified since publication of the Final EIS.

At this time, detailed design and construction plans have not been prepared. Therefore, it is not possible to identify the specific types of construction equipment and frequency of usage that could occur with construction of the proposed Master Plan Update improvements. However, based on a refined examination of possible equipment, additional analysis of possible construction impacts has been prepared. This section identifies a range of construction impacts, assuming two alternative scenarios:

1. Option 1: minimum excavation from on-site sources, and
2. Option 2: maximum excavation from on-site sources.

To implement the proposed new parallel runway and other Master Plan Update improvements, one or more permitted material site(s) off of Port owned land may be used to supply the required fill (or serve as transfer sites from barge to truck). Permitted material sites have or will be subjected to environmental review as part of the appropriate regulatory process that granted the permits and which established conditions of operations. Several municipalities have recently adopted truck route ordinances that may pose additional conditions on operations from individual

[1/] The February 1996 Final EIS examined 109 one-way hourly truck trips based on a 3-year haul. This Supplemental EIS, unless otherwise noted, examines 66 one-way hourly truck trips based on a 5-year haul. These truck levels represent an average hourly truck level over the duration of the haul. Therefore, conditions during any one day could incur higher or lower truck trip levels.

material sites. The process of removing fill material from the source location and transporting it to the fill site must comply with valid and legally enforceable local permits, operating conditions, legal load limits, and restoration associated with the source site(s) and haul routes. This is standard procedure for construction projects in the Puget Sound Region.

Provisions of FAA Advisory Circular 150/5370-10 "Standards for Specifying Construction of Airports", would be incorporated into construction specifications.

(A) METHODOLOGY

A number of assumptions were made concerning the construction of the Master Plan Update alternatives:

- Schedule:
  1. Activities involving the hauling of embankment fill material for the construction of the proposed new parallel runway, the expansion of Runway Safety Areas, and the haul of fill material for the South Aviation Support area are anticipated to occur over a five year period between 1997 and the year 2002. The runway would be available for use in late 2004.
  2. Year 2000 would represent the peak year of haul activity.
  3. Transport of fill material from off-site sources could occur as much as 270 days per year and 16 hours per day. Transport of fill material from on-site sources could occur as much as 210 days per year and 16 hours per day. It is anticipated that during peak periods, haul could occur more than 16 hours a day.
  4. While the analysis presented in this study reflects an average annual haul over the 5 year period, peak conditions with greater truck levels could occur. For instance, during good summer weather periods, truck haul would be anticipated to be as high as 109 one-way truck trips. During winter periods, of cold or wet weather, truck trips could be expected to be substantially reduced.
- On-Site Borrow:
  1. The Final EIS, and this Supplemental EIS, addresses both the likely minimum and the likely maximum use of on-site fill (Option 1 and Option 2 defined previously).
  2. The Port will explore non-trucking alternatives for material extracted from Port land. Alternatives such as conveyer belts could be used to move fill within Port-owned land. To present a worst case assessment, this EIS assumes that on-site fill is transported to the embankment area by truck. Impacts associated with alternative on-site movement of material would be expected to lessen the environmental impacts of conventional truck haul.
  3. The analysis prepared for the Supplemental EIS reflect the average on-site haul over the construction period. It is anticipated that the time to excavate any individual site could take as little as 4 months to as much as about 38 months.
- Off-Site Borrow:
  1. At this time, it is not possible to determine the exact off-site material sources that will be used. Several permitted sites exist within 20 miles of the Airport, sufficient to supply some or all of the material needed for the Master Plan Update improvements. Given the fill requirements of the Master Plan Update, it is also possible that new material sites could be economically developed and permitted. A selection will be made among the material sites based on availability, costs, mitigation requirements for the use of those material sites, and other considerations.

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2. Fill may be transported by rail or barge to locations near to the Airport and then trucked or conveyed by belt systems to the Airport construction sites. To present a worst case assessment, this EIS assumes that fill will be most likely transported by truck (or by barge to a transfer site, where trucks would transport the material the remaining distance).
3. Material transported by truck will use freeway, highway, arterial class roadways, designated truck routes, permitted local streets, or Port properties, until reaching the on-airport haul routes. Include in this analysis is use of existing permitted barge transfer sites where material could be transferred from barge to truck .

Table 5-4-1 shows fill requirements associated with the Master Plan Update improvements. The compacted in-place fill requirements were increased by 15 percent to account for swell/shrinkage during placement of transported fill material. Based on an assumed average capacity of 22 cubic yards per truck, about 1,200,000 truck loads of fill would be needed to complete all of the improvements included in the Master Plan Update. Using the five year construction haul period, the average number of trucks required to haul the required material could range from 44 one-way truck trips to 17 trips per hour, per direction for Option 1 (minimum on-site) and Option 2 (maximum on-site) respectively. A factor of 1.5 was assumed to account for average peaking of truck traffic, resulting in off-site truck traffic rates of 66 and 26 trucks per hour, per direction for Option 1 and 2, respectively. On-site truck traffic necessary to haul material would average 33 trucks per hour, per direction or adjusted for peaking to 50 trucks per hour, per direction. Construction vehicles, such as scrapers or loaders, are anticipated for use in moving the common excavation material, with no trips on public roads.

The following contrast the assumptions of this Supplemental EIS with those of the Final EIS:

	Supplemental EIS		1996 Final EIS	
Haul Duration	5 years		3 years	
Total Fill Required (Million Cubic Yards)	23.64		23.64	
On-Site/Off-Site Fill Sources	Option 1	Option 2	Option 1	Option 2
On-Site (Million Cubic Yards)	0	12.35	0	8.0
Off-Site (Million Cubic Yards)	20.74	8.19	20.74	12.54
Common (Million Cubic Yards)[2/]	2.90	3.10	2.90	3.10
Average Hr Traffic/Peaking	Option 1	Option 2	Option 1	Option 2
On-Site truck traffic (1 direction)	0	50	0	33
Off-Site truck traffic (1 direction)	66	26	109	66

Option 1= Minimum use of on-site material Option 2= Maximum use of on-site material

As is shown above, and in **Table 5-4-1**, this Supplemental EIS examines possible use of a greater quantity of fill from on-site sources. This Supplemental EIS Option 2 (maximum use of on site sources) evaluated a greater quantity from On-Site Borrow Source #1 relative to the Final EIS, the same as the Final EIS for On-Site Sources #2 through #4, and no material from On-Site Source #5. The revision to On-Site Source #1 reflects the quantity identified by the Preliminary Engineering Study. On-Site Source #5 will not be used to provide material due to the potential operational costs associated with excavation. The net result is that the Supplemental EIS

2/ Material moved from one portion of the construction site to another location in the site.

examines a greater quantity for Option 2 for on-site sources (12.35 MCY versus the Final EIS evaluation of 8.0 MCY).

Of the on-site options, Option 1 would result in the greatest amount of off-airport truck traffic. For Option 1, the Final EIS examined 109 hourly truck trips on all roads, whereas with the new construction schedule and fill source assumption, the average truck trips could be lessened. Therefore, the analysis described in the Supplemental EIS reflects a lower, more realistic level of truck travel on the arterials in the airport area (with 66 on-way truck trips per average hour). With the exception of International Blvd.(SR99), the off-airport site haul routes converge on three roads (I-5, SR 509, SR 518). For these three roads, the analysis relies on the evaluation prepared for the Final EIS with the higher truck trips, which under the longer construction haul period would reflect peak construction conditions on these roads.

(B) SURFACE TRANSPORTATION

The following section summarizes construction related surface transportation impacts. Off airport hauling could affect the level of service on freeways, highways, arterials, and permitted local streets used for hauling. The degradation of service levels would be significant if hauling occurs in congested areas during peak travel times. However, these impacts would be temporary and would be mitigated as a part of actions to be included in the Construction and Earthwork Management Plan and similar mitigation measures. For the purpose of the construction surface transportation analysis, a significant impact was found if the construction activity would create LOS F (or on arterials LOS E or LOS F) or worsen an existing LOS F intersection.

(1) On-Site Source Transportation

Source Locations: Due to wetland impacts, type of material, and operational costs, four of the eight on-airport sites identified by the Preliminary Engineering Study would likely be used to extract fill (Source locations #1 through 4). The location of those sources and potential haul routes are shown in **Exhibit 5-4-1**.

On-site Sources #1 through 4 are located south of South 188th Street and north of South 216th Street. All of Site #2 and portions of #1 and #3 lie within the City of Des Moines. Portions of #1 and #3, and all of Sites #4 and #5 lie within the City of SeaTac.

This analysis assumes a constant hourly rate of truck trips, and accounted for the ability to construct during poor weather. A construction haul period of 210 days per year was assumed to account for the water sensitive nature of the on-site material source soils.

Haul Conveyance Mechanism: As was noted earlier, several means exist for the transport of fill. While trucks are anticipated to be used, contractors may bid use of conveyor systems for the on-site sources. The Final EIS, and this Supplemental EIS, presents a worst case evaluation by assuming truck modes. Use of conveyors would reduce or eliminate truck trips.

Haul Routes and Service Levels: Transport of the material from the southern on-site material sources would most likely use on-site haul routes constructed within or adjacent to the on-site sources to reach South 200th Street, whereupon the trucks would either access directly into the area known as SASA or to the on-airport roadway system. Construction activity could cross South 188th Street via the runway bridge or an at-grade flagged crossing (which would not be used during peak traffic hours). Because off-site routes could be used, the EIS assessed their use.

Construction trucks from On-Site Sources #1 through 4 could use South 200th Street to access Des Moines Memorial Drive and Starling Drive at the intersection with South 188th Street. Both South 200th Street and Des Moines Memorial Drive in this area are designated truck routes. As residences exist along both South 200th Street and Des Moines Memorial Drive, travel conditions were examined along these routes. This analysis showed that entering sight distance, roadway width, and shoulder conditions are adequate for safe truck traffic along these roadways. Through the year 2000, all intersections along this alternative construction route are expected to operate at LOS C or better. The use of both South 200th Street and Des Moines Memorial Way may require rehabilitation of the pavement at the end of the construction period.

On-Site Source #2 is anticipated to be connected to Site #1 via a constructed east-west haul route, and then use the on-site haul route through Site #1 to South 200th Street. This route would roughly parallel South 216th Street, traversing the existing WsDOT SR 509 Extension right-of-way. In the event that this haul route could not be constructed, the Port could seek permits from the City of Des Moines for the use of South 216th Street as an alternative route, between Sites #1 and #2.

As was noted earlier, no material is anticipated to be excavated from On-Site Source #5 or #8.

(2) <u>Off-Site Source Transportation</u>

As noted earlier, the amount of truck trips that would occur would depend on the quantity of soil obtained on-site versus off-site, as well as the source of material, its quality, and weather conditions. Using the new construction timetable, Option 1 (minimum on-site) versus Option 2 (maximum on-site) off-site truck trips necessary to transport required import material could range from 66 to 26 trucks per hour, per direction respectively, adjusted for peaking conditions. As was noted earlier, the evaluation prepared for this Supplemental EIS reflects the use of this lower, average annual haul, while the converge points in the Airport vicinity (I-5, SR 509, and SR 518) reflect the higher 109 one-way trips, reflecting the greater possibility of peak traffic occurring on these roadways.

Source Locations: Eighteen (18) off-site material source locations were identified in the Final EIS. Potential haul routes to access those sites are depicted in **Exhibit 5-4-2**. Based on a further review of the off-site sources, the truck haul would most likely focus on Off-Site Sources 4 (SeaTac-Kent-Tukwila), 7 (Auburn), 9 (Maltby), 11 (Black Diamond), 11A (Black Diamond), 12 (Covington/Kent), 13 (North Bend), 15 (Maury Island), and a potential future site at the Maury Island King County Park (15A) due to the quantity of material these sites can provide, and the condition of the roadway access to these sites. **Table 5-4-2** lists the following haul route characteristics for these off-site locations: roadway jurisdiction; roadway classification; number of lanes; current pavement condition; speed limit along route; and existing average daily traffic volumes.

Most of the probable off-site material locations are currently permitted. Sites 11A, 13, and the Maury Island King County Park site could require additional permits.[1/] Most likely a combination of sites would be required to comply with hours of operation and future truck route conditions. For these off-site sources, the expected haul routes are arterial or highway roads, in 'fair' or better pavement conditions. No safety concerns are anticipated due to sight distance or roadway configuration. **Table 5-4-3** summarizes the conditions along the off-site haul routes, and Final EIS evaluations of potential use of the off-site material sources.

[1/] Currently, the Maury Island King County Park site is not permitted, although one would be anticipated with the grading associated with the King County project. The other Maury Island site has been exhausted of fill material under the present permit requirements. Weyerhaeuser is presently working with the owner concerning expansion of the fill capability.

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The Port also anticipates the use of suitable fill material from other construction projects in the region as well as possible sources outside the region/state or country. The Final EIS and this Supplemental EIS analyze the impact of virtually all likely routes that converge on the Airport construction site. Transport of material in the immediate vicinity of those other regional construction projects would be assessed in the environmental approval documents for those projects.

Haul Conveyance Mechanism: Similar to the on-site source conveyance, trucks are expected to be the likely mode of transport from off-site sources. Other potential ways of providing material to the construction site involve barges to the Duwamish area from sites #15 and the King County Parks site (#15A), and/or rail supplied material from site #9 to either the Duwamish or Kent Valley areas. Material barged or rail transported to the Duwamish could be trucked to the Airport via SR 509. In 1996, the Port of Seattle completed the first phase of an Alternative Delivery Method Study that identified several barge sites in the Duwamish where fill could be transferred from barge to truck. The feasible sites include several existing private operations (including Lone Star, Cadman, Ash Grove, etc.), and Port properties at: Terminal 105, Terminal 115, and Terminal 106 West-Container Freight Station (W-CFS). Capacity exists, as the private operators currently operate subject to appropriate permits for the transfer of such fill material, and these facilities could be used in accordance with their permit requirements. Port owned land was also considered. Terminal 2 and Terminal 18 could also be used, but would require haul traffic to cross congested intersections at Southwest Spokane Street. Port owned properties at Terminal 105 and Terminal 115, and the private operations have existing capacity to enable barge traffic associated with the Sea-Tac Airport fill requirements and are located south of Southwest Spokane Street, along West Marginal Way (a four lane arterial that is in good condition with light to moderate traffic volumes). SR 509, south of West Marginal Way, currently operates at LOS E and is anticipated to remain at LOS E through the year 2010. **Exhibit 5-4-3** shows the locations of these sites.

Material transported by rail to the Kent Valley area could be trucked to the site, but due to roadway congestion in that area, trucking may be limited to evening and night periods. Required environmental review would be conducted and compliance with permitting requirements would occur prior to development of a new rail station or rail spur for this rail alternative.

An alternative to the import of off-site material by trucks has been suggested. This alternative could use a conveyor belt system to transport material barged or transported by rail to a site in the general vicinity of the Airport. Based on one proponents suggestion, several conveyance routes were reviewed. These include: conveyance south from the Duwamish industrial area along SR 509, conveyance from the Kent valley west along Orilla Road, and conveyance from Puget Sound, along the Des Moines Creek. The Port's 1996 Alternative Material Delivery Study performed a more detailed consideration of the alternatives. That study found that only the Des Moines Creek and SR 509 routes to be technically viable alternatives to conventional truck haul. The SR 509 route would result in significant right-of-way difficulties.

The Des Moines Creek route is in the initial stages of development by a private proponent. It is anticipated to require an in-water of Puget Sound off-load and docking station near the Des Moines Beach Park, and installation of an above-ground conveyor belt system approximately two miles along the Des Moines Creek Park via a Midway Sewer District easement to the construction site. The advantages of this proposal is that it has been used effectively on other large scale projects and it could effectively eliminate all off-site fill material truck transport. Due to the size and quality of the material sites that could barge material, this alternative could also eliminate the need for use of the on-site material sources. The conveyor belt proponent has obtained an agreement with the Sewer District for the use of the easement, but has not obtained other permits or environmental review which could be insurmountable. Thus, the Final EIS (and this Supplemental EIS) assumes transport of material by truck (and a truck/barge combination). Required environmental review would be conducted and compliance with applicable permitting requirements would occur prior to development of an off-site conveyor system and any associated facilities.

Haul Routes and Service Levels: The Final EIS examined the haul routes that were believed to be the routes most likely to be used. However, since completion of the Final EIS, additional routes have been identified that could be used by construction traffic. Routes that were not examined in the Final EIS, but assessed in this additional analysis are:

- I-5 from the North or South to South 188th Street, to Starling Drive
- I-5 from the South to South 200th Street to International Blvd. to South 188th Street to Starling Drive
- I-5 from the South to Kent-Des Moines Road (SR 516) to International Blvd./SR99 to South 188th Street to Starling Drive
- South 154th/156th Street, Southcenter Blvd., SW Grady Way
- State Route 509 to South 176th Street temporary construction traffic access
- State Route 518 to 20th Avenue South temporary construction traffic access
- State Route 518 to International Blvd. to South 192nd Street
- I-5 from the North or South to South 188th Street, to 28th Street South to South 192nd Street
- I-5 from the North or South to South 200th Street, to 28th Street South to South 192nd Street
- I-5 from the South to Kent-Des Moines Road (SR 516) to International Blvd./SR99 to South 192nd Street

All haul routes considered by this Supplemental EIS are shown in **Exhibit 5-4-2.**

Contractor use of off-site material sites east of I-5 would require the use of I-5 or I-405 to reach SR 518 and SR 509 to access the Airport construction site. Use of material sources located on Maury Island, Port Gamble, or the Dupont area are expected to be barged into the Duwamish and trucked to the Airport construction site. Level of service analysis throughout the day for year 2000 volumes at key locations with conditions expected to cause congestion impacts due to increased volumes of heavy vehicles were performed. Year 2000 traffic was chosen as a worst case condition, even though most construction haul activities are to occur before then, as well as up through 2002. Year 2000 is anticipated to represent the peak period of haul.

As is shown in **Exhibit 5-4-2**, all haul routes (with the exception of SR 99/International Blvd) converge on either I-5, SR 509 or SR 518 in the immediate Airport vicinity. Therefore, for the purpose of this evaluation, I-5, SR 509 and SR 518 were evaluated using a 109 one-way peak hour truck trips and the remaining roadways were examined using the lower 66 one-way truck trips. The higher 109 trips reflect peak construction conditions on these converge points, while the lower 66 represents the peak construction conditions on these other roadways, either due to congestion or distance/location relative to the construction site.

Results of the level of service analysis are summarized in **Table 5-4-4.** Analysis conducted by the Final EIS for both minimum and maximum off-site truck traffic found that varying impacts to the regional transportation network were predicted where background levels of congestion are near or exceed roadway capacity and where extended grades exist.[4] The minimum off-site truck traffic examined in the Final EIS corresponds to the maximum truck traffic now expected as a result of the changes to the Airport Master Plan discussed previously in this supplemental analysis. The year 2000 was used as the forecast year in the Final EIS analysis of the regional system, and under the new construction schedule would represent the peak year of construction activity for the third parallel runway.

In the Final EIS, there were six (6) locations where the maximum (109 one-way truck trips) off-site haul truck volumes would reduce the expected operating conditions to LOS F from a LOS E or higher (or deeper into LOS F) relative to the "Do Nothing" condition. These included:

1. I-5 southbound between SR 518 and South 188th Street during the Midday and PM peak hours of the day.
2. SR 518 westbound between I-5 and SR 99 during the PM peak.
3. SR 18 westbound, between I-5 and SR 167 during all hours except the evening and night hours.
4. SR 167 southbound, between I-405/Carr Street, during the PM peak.
5. I-405 northbound between SR 167 and I-5, during the AM peak and the PM peak.
6. I-405 southbound between SR 167 and I-5 during the Midday and PM peak.

At the reduced volumes associated with a longer construction period, deterioration to LOS F from "Do Nothing" conditions occurs at five (5) regional system locations:

1. Interstate 5 Southbound between SR 518 and South 188th Street during the PM peak.
2. SR 18 westbound, between I-5 and SR 167 during all hours except the evening and night hours.
3. State Route 167 Southbound, between Interstate 405 and SW 34th Street, during the PM peak.
4. Interstate 405 Northbound, between State Route 167 and Interstate 5, during the AM and PM peak.
5. Interstate 405 Southbound, between State Route 167 and Interstate 5, during the Midday and PM peak.

Haul truck access directly to the Third Runway construction site from either State Route 509 at South 176th Street or from State Route 518 in the area of 20th Avenue South may be occur through the development of construction only temporary interchanges. Construction access from State Route 509 and State Route 518 would be temporary, being used only during construction of the Third Runway by construction related traffic. Key issues involved in WSDOT permitting of these access points would be operational affects on State Route 509 and State Route 518, as well as safety and traffic control. LOS conditions with these facilities are:

<u>State Route 518</u>

• West Bound Off Ramp to 20th Avenue South	LOS C
• East Bound On Ramp from 20th Avenue South	LOS B

[4] *Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, February 1996, Section 23, B-2, p. IV 23-4

State Route 509

• South Bound Off Ramp to South 176th Street	LOS C
• North bound On Ramp from South 176th Street	LOS B

Peak Hour (PM) level of service analysis was performed for major intersections along these routes for the five year haul process. Level of service results are summarized in **Table 5-4-5**. Of the 40 intersections analyzed, 14 degraded to LOS E, or further into LOS F, when compared to the Do-Nothing condition as a result of the construction truck traffic.

Most intersections listed in **Table 5-4-5** are only affected by a few of the alternative truck routes. Level of service was calculated for all intersections for all alternatives in order to also determine the affects of trips generated by the Preferred Alternative and construction employee traffic. As was the case for the Final EIS, construction employee traffic was estimated as 50 vehicles per hour during the peak hour.

Potential airport vicinity haul routes were reviewed to supplement off-site route analysis performed under the Final EIS. A summary of that review is included as **Table 5-4-5**.

All of the additional haul routes identified through the Alternative Materials Delivery Study are minor arterial or above in classification, in fair or better pavement condition. Evaluated routes within the City of SeaTac are designated truck routes, although South 188th Street, South 200th Street, and Des Moines Memorial Drive south of South 188th Street has abutting residential land use.[3] All the additional routes considered serve commercial or industrial areas and have existing truck movements. The additional routes are classified appropriately for use by truck traffic, subject to any truck ordinance restrictions or street use permits.

(3) Temporary Construction Only Interchanges

The Port of Seattle is considering the development of construction-traffic-only interchanges that would be developed to enable transport of fill material directly from State roads onto Airport property. Two interchanges are being considered: 1) from SR 518 near 20th Avenue South and 2) from SR 509 near South 176th Street. Use of these interchanges would be envisioned to be used solely by airport construction traffic. The purpose of their development and use would be to minimize impacts to the off-airport arterial roadway system and adjoining neighborhoods.

The SR 518 interchange could be completed in the location of the future ramps proposed by the Master Plan Update near 20th Avenue South. While the ramps are not needed for public traffic until the development of the North Unit Terminal, the ramps could be developed earlier to serve as an interchange for the construction traffic. No homes or businesses are located in the immediate vicinity of this location and, therefore, no adverse impacts on the built or social environment would be expected. All natural resource (water, wetland, biotic communities, floodplains) impacts associated with the use of a construction interchange would be the same as would occur with the public access ramps addressed by the Final EIS and this Supplemental EIS. Air quality impacts would be less than if all traffic were to access the site from South 160th Street/SR 509, which is projected to be well below the AAQS.

The SR 509 interchange would occur in the vicinity of the South 176th Street overpass. This interchange would be developed to only accommodate airport related construction traffic, and would be abandoned after completion of the runway embankment. This interchange could be developed within the current WSDOT right-of-way, and thus would not disrupt any significant natural resources. Homes on the east side of SR 509 are being acquired as part of

[3] *City of SeaTac, Comprehensive Transportation Plan*, February, 1994, Figure 3, Truck Route Plan

the Master Plan Update. A few residences exist west of SR 509, along South 176th Street. Impacts to these residential areas would be similar to those that would occur if the existing South 160th Street were used, and are discussed throughout this section, which would not be significant.

During construction of the temporary interchange(s) construction impacts would occur including, additional roadway traffic, movement of earth to develop the interchanges, etc. Construction impacts would be minimized through the implementation of the construction best management practices shown in **Table 5-4-8**.

(4) <u>Cumulative On-Site and Off-Site</u>

The proposed new Runway embankment and runway safety areas lie along the west side of the existing airfield. Potential direct access from existing roadways include South 154/156th Street, South 160th Street, Starling Road, Airport Perimeter Road, and associated airport security roads. Haul traffic would reach these roads from SR 518, the Northern Airport Expressway, Air Cargo Road, Des Moines Memorial Drive, SR 509, South 188th Street, and 24th Avenue South. Construction traffic transporting off-site fill material requirements for SASA are anticipated to use SR 509, South 188th Street, and 28th Avenue South. The traffic level of service both with and without construction traffic was calculated at key intersections and freeway locations, and for combinations of on-site and off-site truck volumes.

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 exceed capacity. However, there are periods and routes which can be used to haul the required material to the site without significant degradation of levels of service.

WSDOT, upon review of the information developed for Final EIS, requested several conditions as mitigation for use of the State Highway System: Based on WSDOT comments and the revised surface transportation analysis, the following were identified in addition to those listed in **Table 5-4-8:**

- Legal load limit and other hauling requirements must be enforced on State Highways. In addition to weight requirements, this requires top of loads to be 6 inches or more below top of truck bins (freeboard) or use of covered loads.
- Coordination must occur with the WSDOT Construction Traffic Office regarding all haul routes on State Routes. Coordination must be maintained through the Construction Traffic Office in order to minimize conflicts between Port construction activities and any WSDOT projects along the haul routes.
- The Port should consider restricting hauling activities during peak hours through congested areas of the State Highway System.
- Provisions should be considered that would handle complaints of broken windows and other damage to vehicles caused by flying debris off the trucks identified as associated with these projects.
- Haul truck traffic should avoid or minimize use of arterial routes with afternoon peak hour congestion of LOS E or LOS F. This would include State Route 99 between State Route 518 and State Route 516, South 188th Street, and South 200th Street.
- Haul truck traffic should avoid or minimize use of arterial routes during evening and night conditions with abutting residential land use. This would include South 188th Street,

South 200th Street, South 154th Street/Southcenter Boulevard/Grady Way, and Des Moines Memorial Drive.

- Many of the potential haul routes are scheduled for reconstruction or improvements between 1997 and the year 2005. Haul truck traffic should avoid or minimize use of those routes while under construction. The contractor should be required to coordinate activities with contractors working on roadway projects.

(C) <u>SITE AESTHETICS</u>

As part of continued preliminary design associated with the proposed third parallel runway, additional consideration has been given to the layout of the area where the runway would be developed. Additional review was also performed of the on-site borrow sources. The following summarize these efforts.

1. **<u>Westside Third Runway Embankment</u>**

A number of comments have been received requesting clarification of how the embankment would look when complete and how it would appear to residents living west of the Airport. **Exhibit 5-4-5** illustrates possible conditions in the northern portion of the site as well as the southern portion. These illustrations show a site where a retaining wall may be used while the other site shows the earth embankment with a 2:1 slope.

2. **<u>Borrow Source Areas</u>**

The following summarize the on-site borrow source locations, which are shown in **Exhibit 5-4-1**. The Master Plan Update does not identify an eventual use of this land, as no specific users or uses have been identified. However, to provide a greater understanding how the site would be excavated, a visualization of the property after excavation was undertaken. The following paragraphs summarize the sources and possible after-use options:

- **Borrow Site Area 1** - this site consists of approximately 111 acres and is located South of the Airport at the corner of South 216th Street and 24th Avenue South. The north and west sides of the site is bound by Des Moines Creek Park and the Washington State Department of Transportation (WSDOT) SR 509 Extension right of way and is located in the City of Des Moines and City of SeaTac. The site is mostly vegetated by a mixture of Douglas Fir, Western Red Cedar, Alder, Cottonwood, Ferns, Salal, English Ivy, and Brambles. Existing topography is characterized by gently sloping from the east to the west toward Des Moines Creek with significantly steep slopes on the northwest side.

- **Borrow Site Area 2** - is located south of the Airport approximately at the corner of South 216th Street and 15th Avenue South and consists of 17 acres. Bordering the site to the west and the south is residential development, with future Business Park zoning to the south. The north and east sides are bound by the Des Moines Creek and the existing WSDOT right of way. The site lies entirely within the limits of the City of Des Moines. Primarily existing vegetation includes mostly grasses with some mix of Douglas Fir, Western Red Cedar and minimal ornamental shrubs, the northwest corner of the site is heavily wooded with Douglas Fir, Western Red Cedar, Alder, Cottonwood, with an understory of ferns, salal, and blackberry. The existing topography is primarily gently sloping toward the Des Moines Creek drainage area. This site has been identified as the potential park and recreational opportunity area with view points identified in the northwest corner at approximately elevation 250.

- **Borrow Site Area 3** - consists of approximately 60 acres at the northwest corner of South 200th Street and 15th Avenue. Bordering the site to the north and east is WSDOT right of way and Des Moines Creek Park. To the west is residential development and to the south is Des Moines Creek. The site is split between the City of Des Moines and the City of SeaTac at approximately South 208th Street. The site is mostly vegetated heavily with Douglas Fir, Western Red Cedar, Alder, and Cottonwood with an understory of blackberries, salal, ferns, English Ivy, and grasses. The existing topography is characterized as gently sloping to the southeast with steep slopes adjacent to the Des Moines Creek ravine on the southern end of the site. The southern end of the site is identified as having potential for recreational/open space opportunities which will link to the potential park site in Area 2. The site offers view opportunities down to the Des Moines Creek from the southeast corner of the site.

- **Borrow Site Area 4** - Site 4 is an area of approximately 40 acres in size and is located to the west of Tyee Golf Course. Bordering the site to the north is South 196th Street which includes existing residential development. The site is bound by South 200th Street to the south and the proposed WSDOT right of way to the east. Area 4 lies solely within the City of SeaTac and its future zoning designated by the city is Industrial. Access to the site is primarily from South 196th Street and 18th Avenue South. The site is heavily wooded with a mix of Douglas Fir, Western Red Cedar, Alder, Cottonwood, Salal, ferns, and blackberry. The existing topography of the site is described as a hillside with a knoll located approximately in the center of the site, with primary drainage to the golf course.

- **Borrow Source Area 5 and 8** - Several borrow source areas were identified north of the existing airfield. Because of operational issues, the Port does not propose to excavate material from Borrow Source 5. No material would be excavated from Borrow Source 8 due to the quantity of wetland on that site.

In examining how the sites could be left upon excavation, a number of possible objectives were identified, including:

- **Access and Circulation**
  1. Link the various functional use portions of the site with pedestrian and bicycle trails.
  2. Provide adequate vehicular access to redevelopment. Access could be from South 216th Street, 24th Avenue South, 15th Avenue South, 18th Avenue South, South 200th Street, the proposed SR 509 Extension.
  3. Take advantage of SR 509 alignment for trail locations.
  4. Explore use of the Des Moines Creek natural area for trail use.
  5. In conjunction with commercial redevelopment, explore a multi-purpose trail system throughout the borrow area to optimize pedestrian and bicycle opportunities.

- **Redevelopment Sites**
  1. Adequately buffer the borrow site(s) from adjacent residential areas. As is shown in **Exhibit 5-4-6**, about 96 acres of open space could serve as a buffer to surrounding land uses (Area 1 could provide 34 acres, Area 2 - 17 acres, Area 3 - 21 acres, Area 4 - 24 acres);
  2. Site grading should optimize the amount of borrow material from redevelopment sites.
  3. Contour edges of borrow sites to optimize stands of existing trees to maximize buffering opportunities while minimizing costs to Port of Seattle. The slopes could be terraced with new evergreen and deciduous plants to provide a visual buffer to adjacent land uses. Existing vegetation would be preserved within a 30-foot right-of-way adjacent to redevelopment areas.

4. Maximize opportunities within overall borrow site for redevelopment. Approximately 132 acres of land could be developed for commercial uses.

No specific development plans exist for the borrow source locations after material is excavated. However, the features identified in the preceding section represent possibilities that the Port would pursue in obtaining any permits to excavate the material.

(D) NOISE

Noise impacts will occur in the vicinity of the construction sites associated with the "With Project" alternatives. Earth work and site preparation activities will result in elevated levels of noise generated by the types of equipment used on most construction sites. Noise from this equipment would vary from model to model, and would change according to the operation (type of construction) involved. **Table 5-4-6** lists an estimate of the typical sound level energy from each basic type of construction equipment. The total sound level energy is essentially a product of the machine's sound level, the number of such machines in service, and the average time they operate.

TABLE 5-4-6

CONSTRUCTION EQUIPMENT NOISE

Type	Typical Sound Level dB(A) at 50'
Dump Truck	88
Portable Air	81
Concrete Mixer	85
Jackhammer	88
Scraper	88
Dozer	87
Paver	89
Generator	76
Pile Driver	101
Rock Drill	98
Pump	76
Pneumatic Tools	85
Backhoe	85

Source: *Handbook of Noise Assessment*,, May, D.N. Page 215. Van Nostrand Reinhold Company, New York, 1978

Although pile drivers and rock drills produce the greatest sound levels, it is dump trucks, air compressors, and concrete mixers that, due to their greater number or longer operating times, produce the most total sound energy. However, with a few exceptions, there would be limited off-airport construction-related noise impacts because of the distances of most residential areas from the sound sources at the various construction sites. A pile driver and rock drill are not anticipated to be used in the borrow source areas or in the runway embankment area. Therefore, the primary vehicles to be used in the construction of the embankment would be dump trucks (Option 1 with minimum use of on-site material could result in 66 average off-site truck trips per hour). Therefore, dump truck traffic noise would be the most significant during the construction period.

Based on the maximum hourly number of truck trips prepared for the February, 1996 Final EIS, the FHWA's STAMINA 2.0 model was used to quantify the changes in noise exposure to residential areas located along the haul routes. The analysis from the Final EIS was not updated, as the higher traffic levels associated with the Final EIS (with 109 average hourly one-way trips) was shown to not produce a significant change in roadway related noise levels. The following peak hour average sound level changes were identified, based on the February, 1996 Final EIS average 109 hourly trips:

- With maximum use of on-site material, property located along South 200th Street, between the on-site borrow sources and Des Moines Memorial Drive could experience construction noise levels of as high as 5.5 dBA over existing roadway-related noise levels if South 200th Street is used as a haul route. However, in this area, aircraft noise levels are substantially greater than the peak hour average construction related roadway noise levels;
- Residences facing Des Moines Memorial Drive, between South 200th Street and SR 509 would experience an increase in sound level of about 3.6 dBA due to airport-related construction haul;
- With maximum use of off-site sources, residences facing South 160th Street east of the SR 509 interchange could experience an increased peak hour average roadway-related noise levels of about 7.6 dBA due to airport-related construction haul. Because of this increase noise level, the area between Des Moines Memorial and the new runway embankment is proposed for acquisition.

With the 5-year haul presented earlier, the Option 1 truck trips would be 66 per hour instead of the 109 analyzed above. As less truck traffic would generate less noise, the longer construction duration would reduce hourly and daily noise levels. However, instead of occurring over a 3 year period, the noise exposure would occur over a 5 year period.

While construction related noise could increase by 5 dBA or more above existing or Do-Nothing (a substantial increase) with the 109 one-way truck trips assessed in the February 1996 Final EIS, according to Washington State Department of Transportation guidelines, these impacts are not permanent changes in noise levels, and are, thus, exempt from the 5 dBA criterion. The construction noise impact exemption, however, does not apply during nighttime hours (10 p.m. to 7 a.m.). As a result, the Port will develop the Construction and Earthwork Management Plan to minimize nighttime noise impacts on noise sensitive facilities adjacent to the haul routes. However, even with noise management actions in use during the nighttime hours, residents west of the proposed runway may experience dump truck related construction noise. Consideration was also given to the noise that could be experienced in the residential areas near the borrow source locations. The following summarizes these noise levels:

- Runway Embankment - the earth moving equipment in this area is anticipated to generate a noise level of 91 dBA at 50 feet from the noisiest source. Sound would be reduced to noise levels equivalent to ambient daytime noise in nearby residential areas (about 60 dBA). During periods of low aircraft traffic, residential areas west of Des Moines Memorial Way could experience elevated sound levels from construction activity associated with the third parallel runway embankment.
- Borrow Source Areas - based on the anticipated usage of earth moving equipment, maximum noise levels 50 feet from the equipment could reach 94 dBA. However, given the proposed site grades, buffering, and distances of the sites from residential areas, construction noise levels would be less. Each of the borrow source locations is directly under the flight path of the existing runways and currently receive average noise levels in excess of 70 DNL. Residential areas to the west of Borrow Source Areas 2, 3 and 4 could experience elevated noise as a result of construction activity when aircraft overflights are not present.

(E) AIR QUALITY

Construction will have a short-term impact on local air quality. Air pollution levels during the construction period would be a consequence of one or more of the following activities: Vehicular activity in support of construction; wind erosion of soils; the movement of construction vehicles along haul routes; excavation; and cement and aggregate handling. Air pollution impacts would be most pronounced at the individual construction sites and along the construction haul routes.

The air quality impacts associated with the hauling of construction fill material was evaluated through a separate pollutant dispersion modeling analysis. The analysis presented in the Final EIS is repeated here, and is based on 109 peak hour truck trips, instead of the longer construction period trips of 66 trips per hour. CAL3QHC, a USEPA approved model used to predict pollutant concentrations from motor vehicles, was used to examine construction related pollutant Carbon Monoxide concentrations. Vehicle emission rates for input into the CAL3QHC model were derived from two other USEPA air quality models, MOBILE5A for carbon monoxide emissions and PART5 for particulate matter.

Particulate matter (PM10) is usually the pollutant of greatest concern related to construction activity. To quantify the effects of dispersing the pollutants within the surrounding environs, receptors were modeled at three meters (12 feet) from the edge of the roadways along each of the proposed haul routes.

It should be noted that the methodology used in this analysis relies on the use of modeling default values and input assumptions, as determined in consultation with the Department of Ecology and USEPA. Because of lack of data concerning the Puget Sound Region, this analysis used the more arid (dry) environment associated with Spokane. These assumptions tend to overstate PM10 concentrations associated with construction activity at Sea-Tac Airport.

TABLE 5-4-7

CONSTRUCTION AIR POLLUTION CONCENTRATIONS

	CO Concentrations (ppm)			
	1-Hour		8-Hour	
Haul Route	Do-Nothing	With Project	Do-Nothing	With Project
SR 509 from SR 518 to S. 160th Street	1.4	1.5	1.0	1.1
South 160th Street from SR 509 to Des Moines Memorial Drive	2.1	2.5	1.5	1.7
Des Moines Memorial Dr. from S. 160th Street to 8th Ave. South	1.8	2.1	1.3	1.5
Des Moines Memorial Dr. from 8th Ave. South to 148th Street	1.5	2.0	1.1	1.4
Des Moines Memorial Dr. from S. 200th Street to S. 188th Street	3.2	3.5	2.2	2.4
South 200th St. from Des Moines Memorial to 26th Ave. South	3.5	3.7	2.5	2.6
Unpaved on-Airport Road south airfield	-	0.1	-	0.1
Ambient Air Quality Standard	35	35		9

Haul Route	PM10 Concentrations (ug/m3) 24-Hour Do-Nothing	With Project	Annual Do-Nothing	With Project
SR 509 from SR 518 to S. 160th Street	156	253	31	51
South 160th Street from SR 509 to Des Moines Memorial Drive	105	352	21	70
Des Moines Memorial Dr. from S. 160th Street to 8th Ave. South	84	311	17	62
Des Moines Memorial Dr. from 8th Ave. South to 148th Street	67	318	13	64
Des Moines Memorial Dr. from S. 200th Street to S. 188th Street	154	276	31	55
South 200th St. from Des Moines Memorial to 26th Ave. South	164	309	33	62
Unpaved on-Airport Road south airfield	-	462	-	93
Ambient Air Quality Standard	150	150	50	50

Source: Final EIS, Chapter IV, Section 23 Tables IV.23-6 and IV.23-7.

(1) Carbon Monoxide Concentrations

The use of diesel haul trucks would not be expected to produce substantial carbon monoxide (CO) emissions. As shown in **Table 5-4-7**, the maximum 1-hour and 8-hour CO concentrations along each of the haul routes would be expected to be well below the CO ambient air quality standards. The "With Project" concentrations would all be well below the Ambient Air Quality Standards.

(2) PM10 Concentrations

The high volume of construction truck activity would be expected to generate considerable fugitive dust emissions, or particulate matter especially during dry conditions. Without mitigation or the use of control measures, the results would be particulate emissions above the ambient air quality standards along each of the proposed construction haul routes. **Table 5-4-7** presents the maximum 24-hour and annual PM10 (particulate matter of 10 microns ore smaller) concentrations along each construction route based on arid assumptions.

Based on arid assumptions and the use of no controls, the PM10 concentrations could exceed the 24-hour and annual standards along all routes with the 109 hourly truck trips. If truck trips were reduce by 30 percent (to 66 truck trips). At the reduced trip level (longer construction period) , the annual AAQS would not be expected to be exceeded, but the 24-hour standard could be exceeded during arid conditions along all haul routes.

(3) Mitigation Measures

Control measures for paved roads focus on either preventing material from being deposited on the roads (preventive controls), or removal from the travel lanes of any material that has been deposited (mitigative controls). Preventive measures include policies requiring "wetting" of material being hauled, cleaning vehicles before they leave a construction site, using 'bump strips' or grates to 'shake' dust from vehicles, or by paving the construction site access roads nearest to the paved roads. **Table 5-4-8** lists construction BMP's that would be used to reduce PM_{10} emissions.

For example, vacuum sweeping along each route would reduce particulate matter by almost 40 percent. Flushing the roadways with water followed by sweeping could reduce particulates by over 90 percent if performed frequently. However, the Port's Temporary Erosion Control Plan does not allow for flushing of streets because of potential water quality impacts. Control measures for unpaved roads will include frequently applying water or chemical stabilizers, paving, and traffic control measures limiting vehicle speeds and traffic volumes during dry periods. These measures could achieve up to 80 percent reduction in fugitive dust during dry periods.

(F) SOCIAL

This section summarizes potential social and neighborhood impacts from truck hauling of fill for the construction of the new parallel runway and runway safety areas. As is noted in **Table 5-4-3**, residential neighborhoods are located along a portion of the haul routes from the following off-sites borrow sources:

- Site 2 (Des Moines Memorial Drive/SR 509) residents abut Des Moines Memorial Drive,
- Site 6 (Federal Way) residents along Milton Road;
- Site 7 (Auburn) residents along 41st and Ellingson;
- Site 9 residents along Maltby Road.
- Alternative haul routes could result in truck traffic using International Blvd./SR 99, South 188th Street, South 192nd Street, South 200th Street, South 154th Street, SR 516 (Kent-Des Moines Road) etc. Residential areas about or are in close proximity of these busy roadways.
- The temporary construction traffic only interchanges off SR 509 at South 172nd Street and SR 518 near 24th Avenue South would have residential areas in close proximity of these interchanges.

In addition, residential properties are located along the southern on-site borrow source routes: Des Moines Memorial Drive (the most likely haul route for the southern on-site material) is a minor arterial, with residential development located on the east and west sides of the street. On-site haul routes have been revised to include routes consisting mostly of Port-owned land (see **Exhibit 5-4-1**, which shows potential on-site haul routes). The routes would help to minimize social and neighborhood impacts from truck traffic. South 160th Street, between SR 509 and the Airport, could also potentially be used as a haul route. About 15 residential properties face this street.

Temporary construction impacts would include increased noise, dust, vibration, congestion, and truck traffic near residences, businesses, and institutions located along construction routes near on-site construction areas. Normal vehicular traffic patterns would be disruptive if regional traffic chose to cut-through neighborhoods to avoid congestion along haul routes. Neighborhood cohesion could be adversely affected by increased traffic.

Construction traffic using SR 509, SR 518, and Interstate 5 likely would not result in significant impacts to schools because they are limited access highways, with grade separated crossings. The following schools are located in the vicinity of these limited access haul routes: Dunlap Elementary; Highline High; Woodside Elementary (currently an administrative center); Thorndyke Elementary; Holy Innocents; and Sea-Tac Occupational Skills Center.

The following schools are located near or along haul routes in the immediate Airport area (other than SR 509, SR 518, and I-5) and could be adversely affected: Angle Lake Elementary, Maywood Elementary, Normandy Christian, Sunny Terrace Elementary (currently a mental health facility), Sunnydale Elementary, and Tyee Jr. High School. A number of churches, parks, and nursing homes are located along or in close proximity to these routes.

At this time, haul routes have not been finalized; specific routes will depend upon final borrow source usage, phasing, selected contractor(s) means and methods, and method used to transport fill. Some routes for on-site borrow sources are being investigated that maximize use of Port property. The potential for social impacts at public facilities noted previously as well as residential areas would be reduced with the use of these routes. The use of routes on Port property for On-Site Borrow Sources #1 through 4 could result in potential indirect impacts (primarily noise, fugitive dust, vibration, and truck traffic on nearby roads) on Des Moines Creek Park which could adversely affect public enjoyment of this limited access park area during the construction period. While the park is a designated park facility, limited access is allowed in the area of the on-site borrow sources.

Because of the social disruption that would occur in the general vicinity of the new runway construction activity, a construction mitigation acquisition program has been recommended. This acquisition includes about 70 residential and commercial properties located east of Des Moines Memorial Drive between SR 509 and SR 518. Current Port plans include acquisition of these residential areas and commercial businesses. However, the commercial businesses will be allowed to remain, as they are compatible with the location of the runway, if the owner determines that the construction activities would not have an adverse impact on the business. Only 15 residences would remain in close vicinity to the merge points between on-site and off-site haul traffic. These residences, and those closer to the off-site sources, would experience increased air and noise pollution during the construction period and could, during peak traffic periods experience difficulty in entering and exiting their property.

(G)INDUCED SOCIO-ECONOMIC IMPACTS

The new construction schedule would not likely affect the socio-economic impacts identified in the Final EIS. These include:

	Construction Related Employment
Do-Nothing (Alternative 1)	
Direct Jobs	3,687
Indirect Jobs	4,465
Total	8,152
"With Project" (Alternative 2, 3 and 4)	
Direct Jobs	20,559
Indirect Jobs	24,894
Total	45,453

(G)WATER QUALITY

Potential construction impacts include temporary increases in suspended sediment concentrations caused by an increase of eroded materials entering/reaching Miller and Des Moines Creeks. Construction activities including clearing, grading, and filling at the runway site. The new forecast, construction phasing, and construction duration would not alter the effects of construction on water quality, as described in the Final EIS.

(H) SOLID WASTE

The new forecast, construction phasing, and construction duration would not alter the effects of construction on solid waste, as described in the Final EIS. A substantial amount of demolition and construction waste will be generated. The majority of the waste material will result from off-Airport site building, road, and associated infrastructure demolition, as well as on-site building, road, and taxiway demolition to accommodate new and expanded landside and airside facilities at the Airport.

(I) CUMULATIVE IMPACTS

The completion of the proposed Master Plan Update improvement, in combination with other regional construction projects, could have an impact in the Airport area. As is described in **Appendix C-1 and C-4** of this Supplemental EIS, a number of roadway improvements are anticipated to occur in the Airport area between 1997 and 2005. Construction activity associated with the Master Plan Update improvements and these regional roadway projects could worsen the levels of service afforded at already congested intersections along International Blvd. Contractor construction best management practices for the Airport construction project would be expected to minimize the adverse impacts by using less congested routes.

(J) MITIGATION

Based on the selected hauling plan, the Port of Seattle will develop a Construction and Earthwork Management Plan. **Table 5-4-8** lists general construction best management practices designed to minimize congestion and pollution related effects of construction activity.

Because of the social disruption that would occur in the general vicinity of the proposed new runway construction, a construction mitigation acquisition program will be implemented. This acquisition includes about 70 residential and commercial properties located east of Des Moines Memorial Drive between SR 509 and SR 518.

It is anticipated that the Port of Seattle will coordinate with surrounding jurisdictions and WSDOT on the proposed schedule for improvements to the regional roadways and the relationship of these improvements to the proposed Master Plan Update improvements. The purpose of this coordination would be to coordinate construction activity and to evaluate the merits of accelerating or delaying such improvements if appropriate to minimize the adverse impacts from multiple construction activities.

TABLE 5-4-1

Seattle-Tacoma International Airport
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CONSTRUCTION FILL REQUIREMENTS

Fill Available

On-Site Borrow Source	Available On-Site Fill (Million Cubic Yards) Minimum	Available On-Site Fill (Million Cubic Yards) Maximum
Area 1	0.00	6.60**
Area 2	0.00	0.65
Area 3	0.00	2.90
Area 4	0.00	2.20
Area 5	0.00	0.00**
Area 8	0.00	0.00
Subtotal	0.00	12.35
Common Excavation	2.90	3.10
Total On-Site Fill Available	2.90	15.45

Fill Requirements

Master Plan Update Construction Activity	Total Fill Requirements (Million Cubic Yards) In-Place	Total Fill Requirements (Million Cubic Yards) Adjusted
8,500 Foot New Parallel Runway	17.25	19.84
RSA Improvements	0.98	1.13
Relocation of South 154th Street	0.13	0.14
SASA Facilities	2.20	2.53
Subtotal	20.56	23.64
Runway 34R Extension	2.40	2.76
Total Fill Required	22.96	26.40

** Reflects changes in fill availability since publication of the Final EIS. Availability is based on the *Preliminary Engineering Study*, Volume 2, March 1994

Source: INCA Engineers, January 1997.

TABLE 5-4-2
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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #1 - SeaTac, King County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
International Boulevard/SR99	WSDOT	Principal Arterial	5 lanes	Very Good	45 mph	33,000	
South 160th Street	City of SeaTac	Minor Arterial	4 lanes	Good	35 mph	9,000	

SOURCE #2 - SeaTac, King County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Des Moines Memorial Drive South	City of SeaTac	Minor Arterial	2 lanes	Good	35 mph	13,000	

SOURCE #3 - SeaTac/Kent/Tukwila, King County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Orillia Road	King County	Principal Arterial	2 lanes	Good	35 mph	27,000	
South 188th Street	City of SeaTac	Principal Arterial	4 lanes	Very Good	40 mph	27,000	

SOURCE #4 - Dieringer, Pierce County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
East Valley Highway	Pierce County	Principal Arterial	2 lanes	Good Poor	35 mph	11,000	North of Forest Canyon Road South of Forest Canyon Road
8th Street East	Pierce County	Principal Arterial	2 lanes	Fair	35 mph	12,000	
State Route 167	WSDOT	Principal Arterial Fwy	4 lanes	Very Good	55 mph	56,500	
West Valley Highway	City of Auburn	Principal Arterial	4 lanes	Good	40 mph		
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	68,000	Steep Grades
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

Notes: 1. Limited quality or quantity . Use of Material not anticipated.
2. Local access route congested. Use of Material not anticipated.

TABLE 5-4-2
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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #5, #8 - Tacoma, Pierce County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Marine View Drive/East-West Road	City of Tacoma	Minor Arterial	2 lanes	Fair/Poor	35 mph	8,300	
Taylor Way/54th Avenue East/ Valley Avenue	City of Tacoma	Minor Arterial	5 lanes	Good	35 mph	13,500	
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

SOURCE #6 - Federal Way, King County (See Note 2)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Milton Road/16th Avenue South	King County	Collector Arterial	2 lanes	Fair/Poor Excellent	35 mph	5,000	South of 375th Street North of South 375th Street
Enchanted Parkway/ State Route 161	WSDOT	Minor Arterial Minor Arterial	2 lanes 5 lanes	Good	35 mph	23,000	South of 351st Street North of South 351st Street
South 348th Street/State Route 18	WSDOT	Principal Arterial	5 lanes	Good	35 mph	51,000	
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

SOURCE #7 - Auburn, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Kersey Way/"R" Street SE	Auburn	Principal Arterial	2 lanes	Good	35 mph	12,200	
Private Truck Route	Private						
Ellingson Road/41st Street SE	Algona/Auburn/ Pacific	Principal Arterial	4 lanes	Good	35 mph	10,800	
State Route 167	WSDOT	Principal Arterial Fwy	4 lanes	Very Good	55 mph	56,500	
West Valley Highway	City of Auburn	Principal Arterial	4 lanes	Good	40 mph		
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	68,000	Steep 6% Grade between I-5 and SR 167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

TABLE 5-4-2
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #9 - Maltby, Snohomish County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Maltby Road/Yew Road/ Paradise Lake Road/State Route 524	WSDOT	Collector Arterial	2 lanes	Good	35 mph	9,300	
State Route 522	WSDOT	Principal Arterial Fwy	2 lanes 4 lanes	Very Good	55 mph	45,500	North of the SR9 Interchange South of the SR9 Interchange
Interstate 405	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	129,000	

SOURCE #10, #11, #11A - Black Diamond, King County (Source 10, See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Black Diamond-Enumclaw Road/ State Route 169	WSDOT	Minor Arterial	2 lanes	Good	50 mph 35 mph	9,000	South of Black Diamond Within Black Diamond
Maple Valley-Black Diamond Road/ State Route 169	WSDOT	Minor Arterial	2 lanes 4 lanes	Fair	50 mph 35 mph	11,000	North of Black Diamond Within Black Diamond
Auburn - Black Diamond Road	King County	Principal Arterial	2 lanes	Good	50 mph 40 mph	7,600	East of Kent-Black Diamond Road West of Kent-Black Diamond Road
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	68,000	Steep 6% Grade between I-5 and SR167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

TABLE 5-4-2
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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #12 - Covington/Kent, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Covington - Sawyer Rd	King County	Minor Arterial	2 lanes	Good/Fair	35 mph	11,000	
Kent - Kangley Rd/South 272nd Street/ State Route 516	WSDOT	Principal Arterial	5 lanes	Excellent/ Very Good	35 mph	25,000	
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes 2 lanes	Good	55 mph	49,000	South of Auburn-Black Diamond I/C North of Auburn-Black Diamond I/C Steep 6% Grade between I-5 and SR167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

SOURCE #13 - North Bend, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
468th Avenue SE	King County	Collector Arterial	2 lanes	Good/Fair	35 mph	11,000	
Interstate 90	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	70,500	West of North Bend
Interstate 405	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	129,000	

SOURCE #14 - Dupont, Pierce County
SOURCE #15 - Maury Island, King County
SOURCE #15A - Maury Island, Future King County Park
SOURCE #16 - Port Gamble, Kitsap County (Source 16, See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
East Marginal Way South/SR99	WSDOT	Principal Arterial	7 lanes	Good/Fair	45 mph	43,500	The Borrow Source material would be barged into Duwamish Waterway.
West Marginal Way South (Spokane Street to 2nd Ave SW)	City of Seattle	Principal Arterial	5 lanes	Good/Fair	40 mph	13,300	
West Marginal Way South (S Holden Street to Highland Parkway SW)	City of Seattle	Principal Arterial	6 lanes	Excellent	35 mph	18,500	
State Route 509	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	40,500	

TABLE 5-4-2
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCES EAST OF INTERSTATE 5

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
SW Grady Way (from 167 to Interurban Ave)	City of Renton	Principal Arterial	5 lanes	Good	35 mph	41,000	
Southcenter Blvd./ S 154th Street (from Interurban Ave to SR 99)	City of Tukwila	Principal Arterial	4 lanes	Good	35 mph	10,750	
S 188th Street (from I-5 to Des Moines Mem Dr.)	City of SeaTac	Principal Arterial	5 lanes	Good	35 mph	25,000	
S 200th Street (from I-5 to SR 99)	City of SeaTac	Principal Arterial	4 lanes	Good	35 mph	17,100	Accident concerns @ I-5 & Military Rd/S. 200th intersection; Elementary school crossing @ 32nd Ave./South 200th Street
SR 516 (from I-5 to SR 99)	WSDOT	Principal Arterial	5 lanes	Good	35 mph	29,800	
International Blvd. (SR 99) (from SR 518 to SR 516)	City of SeaTac City of Des Moines	Principal Arterial	5 lanes	Good	35 mph	33,000	

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TABLE 5-4-3

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

SUMMARY OF CONSTRUCTION TRAFFIC IMPACTS
REVIEW FOR USE OF OFF-SITE BORROW SOURCES ACCESS ROUTES

Borrow Source	Feasible Site: Quality/ Quantity	Residential Concerns	Safety Concerns	Roadway Classifications	Roadway Condition	Comments
1	Limited Class C		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.
2	Limited Class C May be on SR 509 Alignment	Des Moines Drive	Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.
3	B/C	Along Orillia Road and South 188th	Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated
4A/4B	Yes		Satisfactory	Satisfactory	Satisfactory	
5	Yes		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.
6	Yes	Along Milton Road	Satisfactory	Satisfactory	Satisfactory	Local access route congested throughout the day. Use not anticipated.
7	Yes, Could Supply All	Along 41st/ Ellingson	Satisfactory	Satisfactory	Satisfactory	
8	Yes		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated
9	Yes	Along Maltby Road	Satisfactory	Satisfactory	Satisfactory	Potential Rail Source
10	Yes, Could Supply All		Satisfactory	Satisfactory	Satisfactory	limited quality. Use not anticipated.
11/11A	Yes		Satisfactory	Satisfactory	Satisfactory	
12	Yes		Satisfactory	Satisfactory	Satisfactory	
13	Yes, Could Supply All		Satisfactory	Satisfactory	Satisfactory	
14, 15, 15A	Yes, Could Supply All		Satisfactory	Satisfactory	Satisfactory	
16	Class C		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.

Off-site borrow source construction truck traffic could range from 66 truck trips to 109 truck trips per hour. Exhibit IV.23-2 shows the possible off-site sources.

Source: INCA Engineers, January 1997.

TABLE 5-4-4

Seattle-Tacoma International Airport
Environmental Impact Statement

REGIONAL SYSTEM LEVEL OF SERVICE SUMMARY SHEET

	1994					Haul Process 1997-2002														
	Existing Condition					*"Do-Nothing" Without Const. Trucks*					*Final EIS Maximum Off-Site Haul**					*Supplemental Max. Off-Site Haul***				
Facility Section	AM	MID.	PM	EVE	NIGHT	AM	MID.	PM	EVE	NIGHT	AM	MID.	PM	EVE	NIGHT	AM	MID.	PM	EVE	NIGHT
I-5 NB	E	D	D	B	A	E	D	E	B	A	E	D	E	C	B	E	D	E	C	B
(SR 518 to S 188th St.) SB	D	E	F	D	A	D	E	F	D	A	D	F	F	E	B	D	E	F	D	B
SR 518 EB	C	C	D	B	A	C	C	E	C	A	D	D	E	C	A	C	D	E	C	A
(I-5 to SR 99) WB	C	C	D	B	A	C	C	D	B	A	D	D	F	C	B	D	D	E	C	A
SR 518 EB	A	B	B	A	A	A	B	C	A	A	B	C	C	B	A	B	C	C	B	A
(SR 99 to SR 509) WB	B	B	C	A	A	B	B	C	A	A	D	B	C	A	A	B	B	C	A	A
SR 18 EB	D	C	D	B	A	D	D	D	B	A	E	D	E	C	B	E	D	E	B	B
(I-5 to SR 167) WB	F	E	F	B	B	F	F	F	C	B	F	F	F	E	E	F	F	F	D	D
SR 509 NB	D	B	C	B	A	E	C	C	B	A	E	C	D	C	B	E	C	C	C	A
(North of SR 518) SB	B	B	C	A	A	B	B	C	A	A	C	C	E	C	B	C	C	D	C	A
SR 509 NB	B	A	B	A	A	C	A	B	A	A	C	B	C	A	B	C	A	C	A	A
(SR 518 to S. 160th St.) SB	C	C	D	B	C	D	D	D	B	C	D	D	D	C	C	D	D	D	C	C
SR 167 NB	D	D	C	B	A	E	D	D	B	B	E	E	D	C	B	E	D	D	C	B
(I-405 to SW 34th St., Carr St.) SB	C	D	E	C	A	D	E	E	C	B	E	E	F	D	B	D	E	F	D	B
I-405 NB	F	E	E	C	B	F	E	E	C	B	F	E	F	D	C	F	E	F	C	B
(SR 167 to I-5) SB	D	E	F	C	A	D	E	F	D	A	E	F	F	E	B	E	F	F	E	B

* 109 Trucks per Hour, Adjusted for Peaking.
** 66 Trucks per Hour, Adjusted for Peaking.
NB = North Bound on segment
SB = South Bound on segment
Source: INCA Engineers, January 1997.

AR 040699

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 1			Route 1-A			Route 2		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	C	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	E	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	F	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	C	D	C	C	D	C	C	D	C
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 1 State Route 518, Airport Expressway, Air Cargo Road, South 156th Street

Route 1A State Route 518, to 20th Avenue South, Temporary Construction Access

Route 2 State Route 518, Des Moines Memorial Drive South, South 156th Street

TABLE 5-4-5
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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 3			Route 4			Route 4-A		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	C	B	B	C	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	C	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	E	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	C	D	C	C	D	C	C	D	C
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 3 State Route 518, Des Moines Memorial Drive South, South 160th Street

Route 4 State Route 518, State Route 509, South 160th Street

Route 4A State Route 518, State Route 509, South 176th Street, Temporary Construction Access

AR 040701

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 5			Route 6			Route 7		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	E	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	E	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	E	E	E	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	F	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	E	D	D	C	D	C	C	D	C
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 5 State Route 518, International Boulevard / State Route 99, South 188th Street, Starling Drive
Route 6 State Route 509, State Route 518, Airport Expressway, Air Cargo Road, South 156th Street
Route 7 State Route 509, South 160th Street

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 7-A			Route 8			Route 9		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	C	D	C	D	D	D	E	D	D
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 7A State Route 509, to South 176th Street, Temporary Construction Access

Route 8 State Route 509, South 188th Street, Starling Drive

Route 9 Interstate 5 (from North), South 188th Street, Starling Drive

TABLE 5-4-5
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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 10			Route 11			Route 12		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	E	D	D	E	D	D	E	D	D
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	F	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	F	F	F	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	F	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 10 Interstate 5 (from South), South 188th Street, Starling Drive

Route 11 Interstate 5 (from South), South 200th Street, International Boulevard / State Route 99, South 188th Street, Starling Drive

Route 12 Interstate 5 (from South), Kent-Des Moines Road / State Route 516, International Boulevard / State Route 99, South 188th Street, Starling Drive

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 13			Route 14			Route 15		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	n/a	B	B	n/a	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	n/a	F	F	n/a	F
Des Moines & 8th Ave South	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 154th St.	E	E	E	E	E	n/a	E	E	n/a	E
24th Ave S & S 154th St.	C	D	D	D	D	n/a	D	D	n/a	D
Des Moines & S 156th St.	C	C	C	C	C	n/a	C	C	n/a	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	n/a	D	D	n/a	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & S 160th St.	B	B	B	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 160th St.	D	D	D	D	E	n/a	E	D	n/a	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	n/a	E	E	n/a	E
Airport Expressway & S 170th St.	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 170th St.	F	F	F	F	F	n/a	F	F	n/a	F
International/SR 99 & S 176th St.	C	C	C	C	C	n/a	C	C	n/a	C
International/SR 99 & S 180th St.	D	D	D	D	D	n/a	D	D	n/a	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & S 188th St.	C	C	D	C	C	n/a	C	E	n/a	D
28th Ave S & S 188th St.	C	B	B	B	B	n/a	B	C	n/a	B
International/SR 99 & S 188th St.	F	F	F	F	F	n/a	F	F	n/a	F
Military Rd & S 188th St.	E	E	E	E	E	n/a	E	E	n/a	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	n/a	D	D	n/a	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	n/a	E	E	n/a	E
28th Ave S & S 192nd St.	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 192nd St.	D	C	C	C	D	n/a	C	C	n/a	C
Des Moines & S 200th St.	B	B	B	B	B	n/a	B	B	n/a	B
28th Ave S & S 200th St.	C	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 200th St.	F	F	F	F	F	n/a	F	F	n/a	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	n/a	E	E	n/a	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	n/a	C	C	n/a	C
Des Moines & Marine View Drive	B	B	B	B	B	n/a	B	B	n/a	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	n/a	E	E	n/a	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	n/a	E	E	n/a	E
SB I-5 Ramps & SR 516	F	F	F	F	F	n/a	F	F	n/a	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 13 South 154th/156th Street

Route 14 State Route 518, International Boulevard / State Route 99, South 192nd Street

Route 15 State Route 509, South 188th Street, 28th Avenue South, South 192nd Street

TABLE 5-4-5
Page 7 of 8

1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 16			Route 17			Route 18		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	n/a	B	B	n/a	B	B	n/a	B
Northbound SR 509 Ramps & SR 518	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & EB SR 518 On-Ramp	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & WB SR 518 Off-Ramp	F	F	n/a	F	F	n/a	F	F	n/a	F
Des Moines & 8th Ave South	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 154th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
24th Ave S & S 154th St.	C	D	n/a	D	D	n/a	D	D	n/a	D
Des Moines & S 156th St.	C	C	n/a	C	C	n/a	C	C	n/a	C
Southbound SR 509 & S 160th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Northbound SR 509 & S 160th St.	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & S 160th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 160th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 160th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Air Cargo Rd & Airport Expressway	B	B	n/a	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 170th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
Airport Expressway & S 170th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 170th St.	F	F	n/a	F	F	n/a	F	F	n/a	F
International/SR 99 & S 176th St.	C	C	n/a	C	C	n/a	C	C	n/a	C
International/SR 99 & S 180th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Southbound SR 509 & S 188th St.	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & S 188th St.	C	C	n/a	C	C	n/a	C	C	n/a	C
28th Ave S & S 188th St.	C	C	n/a	B	C	n/a	B	B	n/a	B
International/SR 99 & S 188th St.	F	F	n/a	F	F	n/a	F	F	n/a	F
Military Rd & S 188th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
Southbound I-5 Ramps & S 188th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Northbound I-5 Ramps & S 188th St.	F	E	n/a	E	F	n/a	E	E	n/a	E
28th Ave S & S 192nd St.	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 192nd St.	D	C	n/a	C	C	n/a	C	C	n/a	D
Des Moines & S 200th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
28th Ave S & S 200th St.	C	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 200th St.	F	F	n/a	F	F	n/a	F	F	n/a	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	n/a	E	E	n/a	E	F	n/a	E
Military Rd & Northbound I-5 Ramps	C	C	n/a	C	C	n/a	C	C	n/a	C
Des Moines & Marine View Drive	B	B	n/a	B	B	n/a	B	B	n/a	B
Pacific Highway/SR 99 & S 216th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
Pacific Hwy./SR 99 & SR 516	E	E	n/a	E	E	n/a	E	E	n/a	E
SB I-5 Ramps & SR 516	F	F	n/a	F	F	n/a	F	F	n/a	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 16 Interstate 5 (from North), South 188th Street, 28th Avenue South, South 192nd Street

Route 17 Interstate 5 (from South), South 188th Street, 28th Avenue South, South 192nd Street

Route 18 Interstate 5 (from North), South 200th Street, 28th Avenue South, South 192nd Street

TABLE 5-4-5
Page 8 of 8

1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks					
		Route 19			Route 20		
		1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	n/a	B	B	n/a	B
Northbound SR 509 Ramps & SR 518	A	A	n/a	A	A	n/a	A
Des Moines & EB SR 518 On-Ramp	A	A	n/a	A	A	n/a	A
Des Moines & WB SR 518 Off-Ramp	F	F	n/a	F	F	n/a	F
Des Moines & 8th Ave South	B	B	n/a	B	B	n/a	B
International/SR 99 & S 154th St.	E	E	n/a	E	E	n/a	E
24th Ave S & S 154th St.	C	D	n/a	D	D	n/a	D
Des Moines & S 156th St.	C	C	n/a	C	C	n/a	C
Southbound SR 509 & S 160th St.	D	D	n/a	D	D	n/a	D
Northbound SR 509 & S 160th St.	A	A	n/a	A	A	n/a	A
Des Moines & S 160th St.	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 160th St.	B	B	n/a	B	B	n/a	B
International/SR 99 & S 160th St.	D	D	n/a	D	D	n/a	D
Air Cargo Rd & Airport Expressway	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 170th St.	E	E	n/a	E	E	n/a	E
Airport Expressway & S 170th St.	B	B	n/a	B	B	n/a	B
International/SR 99 & S 170th St.	F	F	n/a	F	F	n/a	F
International/SR 99 & S 176th St.	C	C	n/a	C	C	n/a	C
International/SR 99 & S 180th St.	D	D	n/a	D	D	n/a	D
Southbound SR 509 & S 188th St.	A	A	n/a	A	A	n/a	A
Des Moines & S 188th St.	C	C	n/a	C	C	n/a	C
28th Ave S & S 188th St.	C	B	n/a	B	B	n/a	B
International/SR 99 & S 188th St.	F	F	n/a	F	F	n/a	F
Military Rd & S 188th St.	E	E	n/a	E	E	n/a	E
Southbound I-5 Ramps & S 188th St.	D	D	n/a	D	D	n/a	D
Northbound I-5 Ramps & S 188th St.	F	E	n/a	E	E	n/a	E
28th Ave S & S 192nd St.	B	B	n/a	B	B	n/a	B
International/SR 99 & S 192nd St.	D	C	n/a	C	D	n/a	D
Des Moines & S 200th St.	B	B	n/a	B	B	n/a	B
28th Ave S & S 200th St.	C	B	n/a	B	B	n/a	B
International/SR 99 & S 200th St.	F	F	n/a	F	F	n/a	F
Military Rd & S 200th St. / SB I-5 Ramps	F	F	n/a	F	E	n/a	E
Military Rd & Northbound I-5 Ramps	C	C	n/a	C	C	n/a	C
Des Moines & Marine View Drive	B	B	n/a	B	B	n/a	B
Pacific Highway/SR 99 & S 216th St.	E	E	n/a	E	E	n/a	E
Pacific Hwy./SR 99 & SR 516	E	E	n/a	E	F	n/a	E
SB I-5 Ramps & SR 516	F	F	n/a	F	F	n/a	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 19 Interstate 5 (from South), South 200th Street, 28th Avenue South, South 192nd Street

Route 20 Interstate 5 (from South), Kent-Des Moines Road / State Route 516, International Boulevard / State Route 99, South 192nd Street

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TABLE 5-4-8

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

The following construction management practices are typically included in the Port of Seattle's contract specification. It is anticipated that this listing would be included in the requests for bids, and included in contractors construction plans:

A. The Port will monitor all off-site loading operations, haul routes, and on-site operations to ensure compliance with all applicable mitigation provisions.

B. The Contractor will be required to identify and assign a **Haul Route Supervisor**. The Haul Route Supervisor shall be a supervisory person, well-trained, and experienced in handling excavated materials both with "on-highway" and "off-highway" equipment. The Haul Route Supervisor shall be completely familiar with the approved haul routes. The Haul Route Supervisor shall document all activities and answer all complaints regarding spillage, traffic violations, property damage claims, safety, equipment breakdowns, and the terms and conditions of required bonds and permits. The Haul Route Supervisor need not be a full-time employee dedicated to this project. The responsibilities may be shared with other project personnel provided the above-stated qualifications are satisfied.

C. The Contractor will be required to maintain documentation concerning its activities. The Contractor will maintain project records concerning fill material borrow site and haul routes. Before any material is loaded at the fill material source borrow site, the Contractor shall submit the following information: (a) Haul Route to the site and return. (b) Copies of permits, agreements, or letter of understanding from regulatory agencies, towns, cities, or other governmental entities. (c) Description, owner, vehicle number, and license number of each hauling vehicle. (d) Each vehicle operator's name and driver's license number.

D. Vehicles delivering materials to or hauling material, shall **access the site from** [to be inserted] via the contractor's access route. These routes and a specific contractor hauling plan will be reviewed by the Port and approved prior to implementation. When reviewing requested haul routes, the Port will consider the potential impacts on traffic congestion, roadway conditions, impacts on neighboring properties, and other relevant factors. Based on this consideration, and in consultation with other jurisdictions (such as WSDOT and adjacent cities), the Port may accept or reject proposed haul routes or impose conditions on the use of haul routes, including hours of operating and number of vehicles permitted to use the route. The hauling vehicle shall proceed to the project site via the approved haul route. Any deviation from the approved haul route shall be approved by the Haul Route Supervisor and the Port.

E. The Contractor shall provide an asphalt or concrete paved drive for haul truck access to and exit from the construction site. This paved/concrete drive, in conjunction with a rock run-out area, should be 500-1,000 feet continuous from connection to public roads or the project site.

F. Contractors will be required to maintain and repair all equipment in a manner that reasonably minimizes adverse environmental impacts, such as air pollution, noise, and entrainment of dust. Contractors will be required to maintain minimum freeboard on all hauling trucks with continuous monitoring for compliance. The Haul Route Supervisor will ensure that all haul vehicles have effective mufflers at all times and that Jake Brakes are not used except in specifically designated areas.

TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

G. The vehicle operator shall conform to the agreed upon all operational procedures established by the site operator and the Contractor. The procedure shall include but not be limited to, traffic control, turn-outs, turn-arounds, queue time, truck washing facilities, gate security, etc. The contractor will provide all **flagging, signing, lighting**, etc., as required by the applicable jurisdiction (including City of SeaTac, King County, State of Washington or the Port of Seattle) to provide all **reasonable safety measures** to protect all persons using the roads The contractor shall obey all vehicular weight and speed limits established by the applicable jurisdiction. Flagging, signs and all traffic control devices shall conform to WAC 296-155-300, -05, -310 and -315 and specific regulation or requirements of the City of SeaTac. Flaggers must meet the requirements of the State of Washington, Department of Labor and Industries (WAC 296-155-305). All workers engaged in flagging or traffic control shall wear reflective vests and hard hats. Contractors will use truck scales or loading equipment scales at borrow sites to ensure compliance with legal load limits.

   The local jurisdiction may notify the Port if a safety issue arises, and subsequent to the Port and Contractor taking reasonable steps to promptly address the safety issues, may assign a uniformed officer to enforce safety regulations, including overweight vehicle enforcement.

   The Contractor shall appoint one employee as the responsible representative in charge of traffic control and safety. The appointed representative shall have authority to act on behalf of the Contractor and shall be available, on call, twenty-four hours a day throughout the period of construction for the Contract. A twenty-four hour phone number shall be provided to the Port of Seattle for use in case of an off-hour emergency. The Contractor shall provide immediate response to correct any and all deficiencies upon notification and keep a log of the response and actions taken to address deficiencies.

H. The contractor shall continuously **sweep and wash-down** access routes to the construction areas and existing adjacent paving areas. These areas shall be kept free of debris at all times. Sediment shall be removed from roads by shoveling or sweeping and be transported and place within the fill area. Coordinate the sediment disposal area with the Port of Seattle. Street washing shall be allowed only after sediment has been removed. 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 Port. Water may be used for dust control purposes provided that runoff does not discharge directly into a receiving stream.

I. Any **damage** (including lane striping and lane turtles) along the contractor access/haul routes due to the contractors use for this project shall be repaired immediately. At the completion of the project, all pavements and surfaces along the access routes that were existing at the start of the project shall be restored to their original condition or fees paid in lieu of repairs as agreed by the Port and local jurisdiction. The contractor shall repair any damage to the haul road due to their operations. The contractor shall coordinate and meet the cleaning and repair requirements set by other public agencies for use of their roads for Sea-Tac Airport related work. Existing pavements, facilities, utilities, or equipment which are damaged shall be replaced or reconstructed to original strength and appearance at the Contractor's expense. The Contractor shall take immediate action to replace any damaged facilities and equipment and reconstruct any damaged area which is to remain in service.

TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

J. The contractor shall keep a vacuum sweeper truck and a water truck on site at all times during the working and non-working hours and shall maintain the site **free from dust and objectionable debris**. During the periods of time that there is no construction activity (i.e., between work shifts), the water truck must be ready with on-site contractor's personnel available to respond immediately to a dust problem, as identified by Airport Operations staff or the Port Engineer. At no time shall there be more than a 20 minute response time to calls concerning dust/debris problems during work hours and a 90-minute response time at all other tomes on a 24-hour per day basis. 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, the Contractor will be required to improve the method or utilize a new method at no additional cost to the Port.

The contractor shall provide whatever means are necessary to prevent foreign object debris (FOD) in aircraft movement areas on a 24-hour basis. Trucks and equipment shall have all loose dirt, rocks, and other materials removed when accessing the Airport Operations Area or when leaving the work area and using public roads. They will be continuously monitored by the Port and if the Contractor's method is not adequate, the Contractor will be required to improve their method or utilize a new method at no additional cost to the Port.

The Contractor shall provide **truck washes, rumble strips, stabilized construction entrances**, shakers or whatever means are necessary to prevent any foreign material from being deposited on public roads.

When Airport roadways and public highways are used in connection with construction under this contract, 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. If the Contractor is negligent in cleanup and Port forces are required to perform the work, the expense of said cleanup shall be paid by the Contractor.

K. At all times keep objectionable **noise** generation to a minimum by: (1) Equip air compressors with silencing packages. (2) Equip jackhammers with silencers on the air outlet. (3) Equipment that can be electrically driven instead of gas or diesel is preferred. If noise levels on equipment cannot reasonably be brought down to criteria, listed as follows, either the equipment will not be allowed on the job or use time will have to be scheduled subject to approval of the Port of Seattle. Objectionable noise received on neighboring (non-Port-owned) properties is defined as any noise exceeding the noise limits of State Regulations (WAC 173-60-040) or City ordinance, or as any noise causing a public nuisance in residential area, as determined by the Port and community representatives, or by the nuisance provisions of local ordinances. The noise limitations established are as set forth in the following table after any applicable adjustments provided for herein are applied:

	RECEIVING PROPERTY		
Noise Source	Residential	Commercial	Industrial
Airport	50 dBA	65 dBA	70 dBA

Between the hours of 10:00 p.m. and 7:00 a.m. on weekdays and 10:00 p.m. and 9:00 a.m. on weekends the noise limitations above may be exceeded for any receiving property by no more than:

TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

(a) Five dBA for a total of 15 minutes in any one hour period; or (b) Ten dBA for a total if 5 minutes in any one hour period; or (c) 15 dBA for a total of 1.5 minutes in any one hour period.

In addition to the noise controls specified, demolition and construction activities conducted within 1,000 feet of residential areas may have additional noise controls required.

L. To minimize pollution emissions, the Contractor shall:

1. Develop and submit for approval a Contractor Erosion Control Plan (CECP). The CECP shall include all the erosion and sedimentation control features required by: (1) The project specifications. (2) The Temporary Erosion and Sedimentation Control Plan (TESCP); (3) Storm Water Management Manual for the Puget Sound Basin (Volumes I and II). (4) Regulatory agencies and such additional controls made necessary by the Contractor's operation. The Contractor shall maintain a copy of the CECP and all references at the job site.
2. Designate an experienced Sedimentation and Erosion Control Representative (SEC). The SEC shall have authority to act on behalf of the Contractor and shall be available, on call, 24 hours a day throughout the period of construction. A 24 hour phone number shall be provided to the Port of Seattle. The Contractor shall provide immediate response to correct all deficiencies.
3. Coordinate and schedule the installation of the controls, features, and best management practices (BMPs) identified in the Contractor Erosion Control Plan. Coordinate the erosion and sedimentation control work with the other contract work in order to provide continuous erosion and sedimentation control and protection.
4. Maintain the installed BMPs and controls for the duration of the project or as indicated in the contract documents.
5. Provide periodic inspection and response to ensure that the installed BMPs function during any and all storm events. Contractor shall be responsible for erosion and sedimentation control 24 hours a day, seven days a week, including holidays.
6. Remove all temporary controls at the end of the project or when no longer needed as determined by the Port of Seattle.
7. Conduct project operations in accordance with the State National Pollution Discharge Elimination System (NPDES) permit for storm water discharges associated with construction activity.
8. No grading or earthwork shall be started before the CECP is submitted and the Best Management Practice (BMPs) erosion and sedimentation control items are in place and functioning. BMPs once installed shall be maintained for the life of the project or until their erosion and sediment control function has been completed. BMPs shall be reviewed after each major storm event. BMPs shall be maintained during all suspensions of work and all non-work periods.
9. Clearing limits, sensitive/critical areas and their buffers, trees, drainage courses, and wetland areas shall be clearly delineated in the field. Extreme care shall be taken to prevent sediment deposition or contamination of the golf course property, wetland areas, existing drainage courses, or public streets. In the event that these areas suffer degradation in the opinion of the Port of Seattle, the Port Engineer may stop construction activities until the situation is rectified. BMPs intended as sediment trapping measures shall be installed and functional before land disturbing activities take place. Properties and waterways downstream shall be protected from erosion due to increases in the volume, velocity and peak flow rate of storm water from the

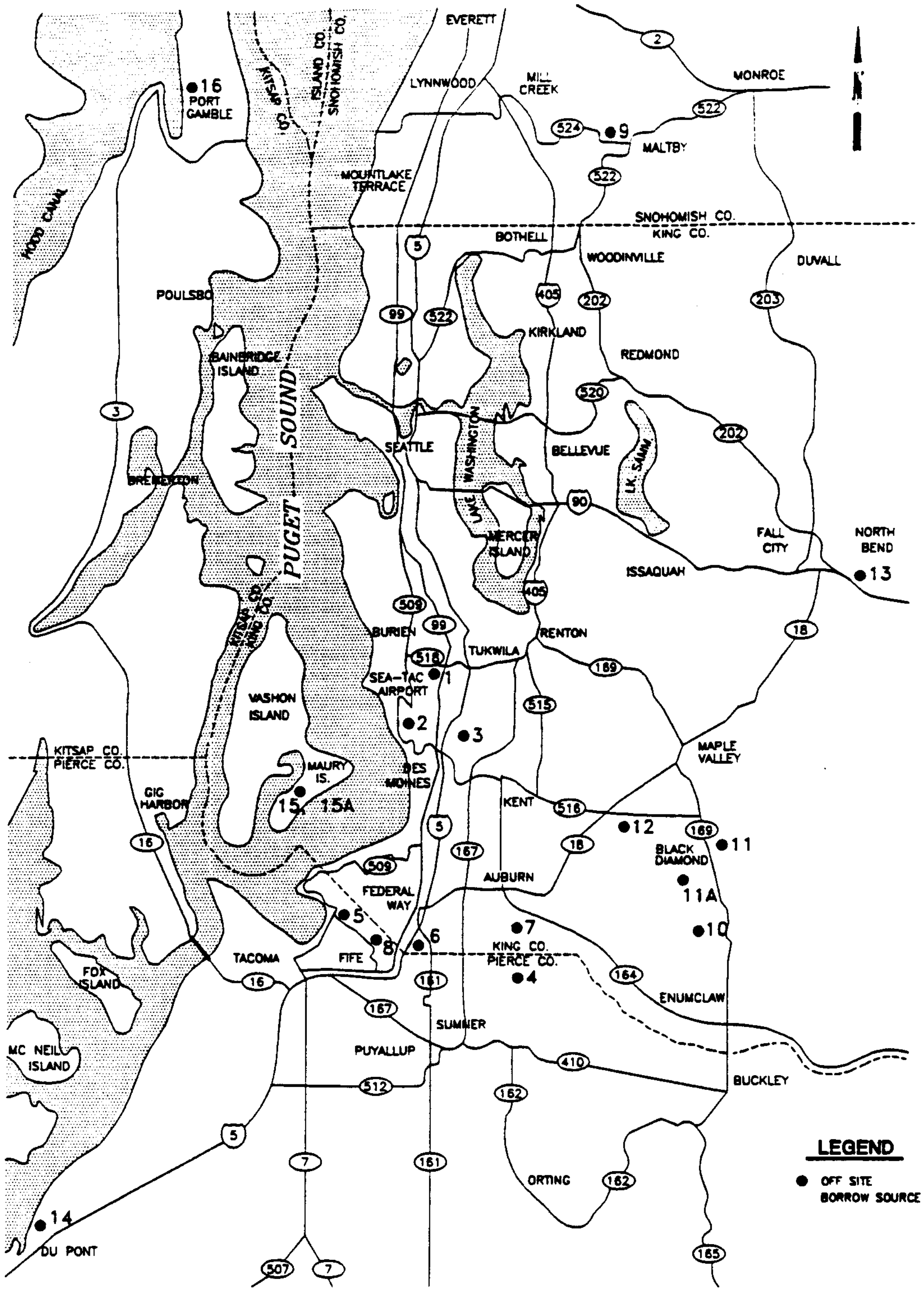
TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

project site. All temporary on-site conveyance channels shall be designed, constructed and stabilized to prevent erosion from the expected velocity of flow from a 2 year, 24 hour frequency storm for the developed condition. When warranted, application for a Temporary Modification of Water Quality Certification, 401 Permit will be made. All requirements of the permit will be adhered to for the duration of the project.

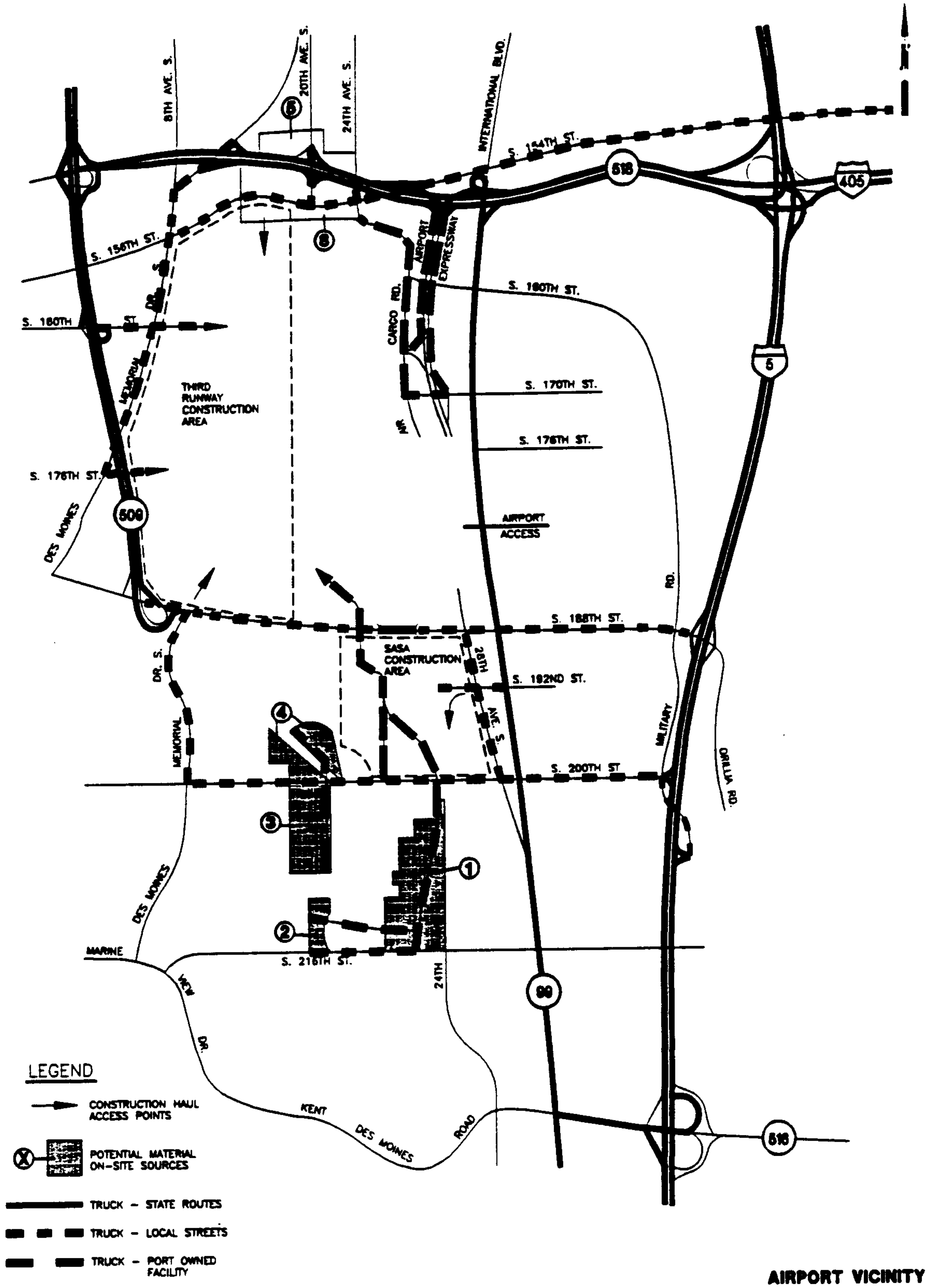
10. All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Disturbed soil areas resulting from removal shall be permanently stabilized.
11. Dewatering devices shall discharge into a sediment trap or sediment pond. All pollutants other than sediment that occur on-site during construction shall be handled and disposed of in a manner that does not contaminate storm water.
12. A designated maintenance area will be established for all construction sites with appropriate pollution controls. Fueling of Contractor's equipment will be performed away from storm drain inlets in areas designated by the Contractor and reviewed by the Port of Seattle. Extreme care shall be taken to prevent fuel spills. Contractor's representative shall be present at all times when equipment is being fueled. In the event of a spill the Port of Seattle Fire Department shall be called by way of the Port of Seattle. Place oil absorbent pads and drip pans beneath the vehicle being fueled and under parked vehicles (overnight and otherwise). Provide and maintain absorbent materials, shovels, and five gallon buckets at the fueling area for spill cleanup.



INCA
INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

REGIONAL VICINITY MAP
& OFF-SITE MATERIAL SOURCES
EXHIBIT 5-4-1

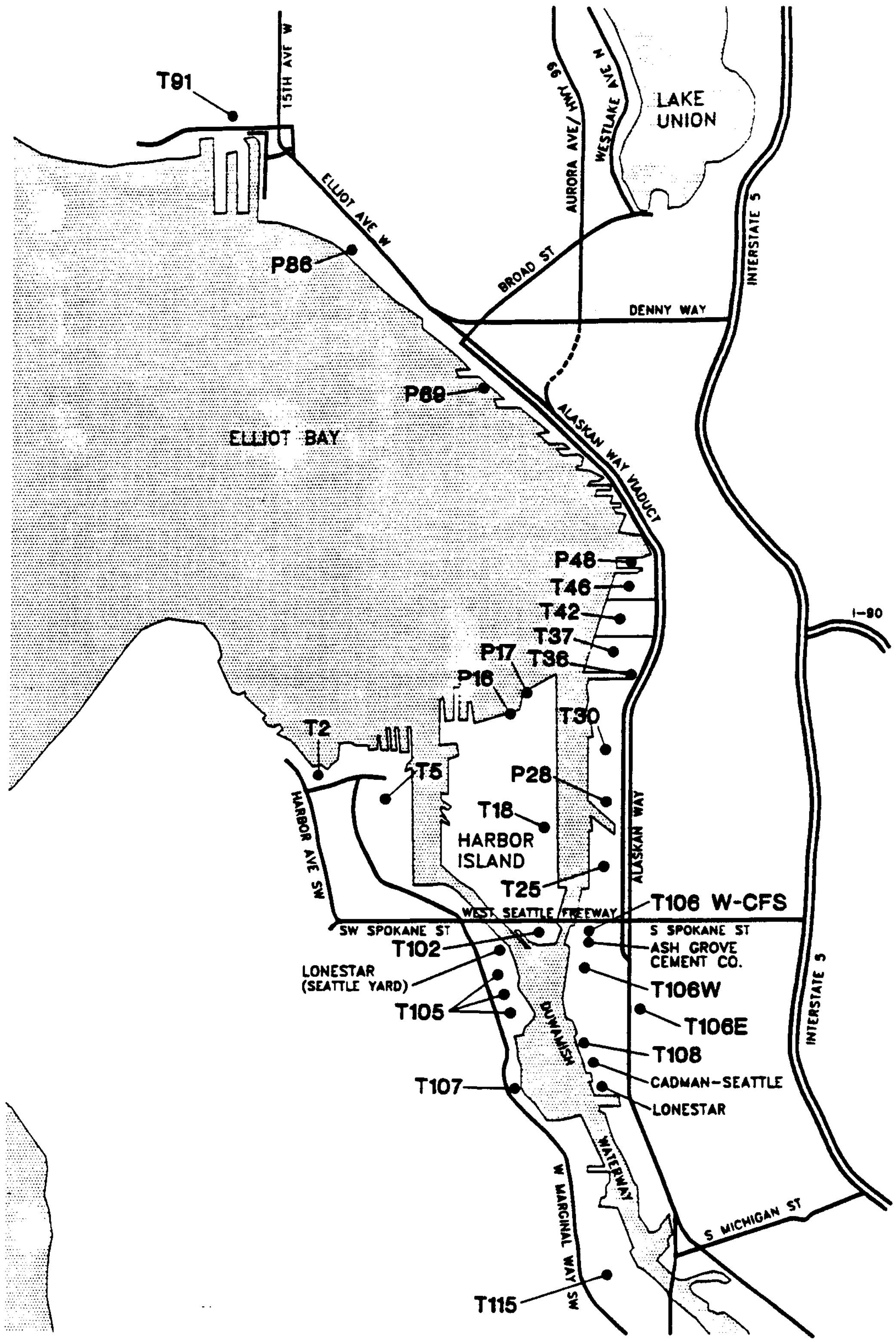


INCA
INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

AIRPORT VICINITY HAUL ROUTES

EXHIBIT 5-4-2



SOURCE: HNTB ALTERNATIVE DELIVERY STUDY, NOVEMBER 1996.

INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

POTENTIAL BARGE TRANSFER LOCATIONS
EXHIBIT 5-4-3

EMBANKMENT SECTION
NORTH END OF THIRD RUNWAY

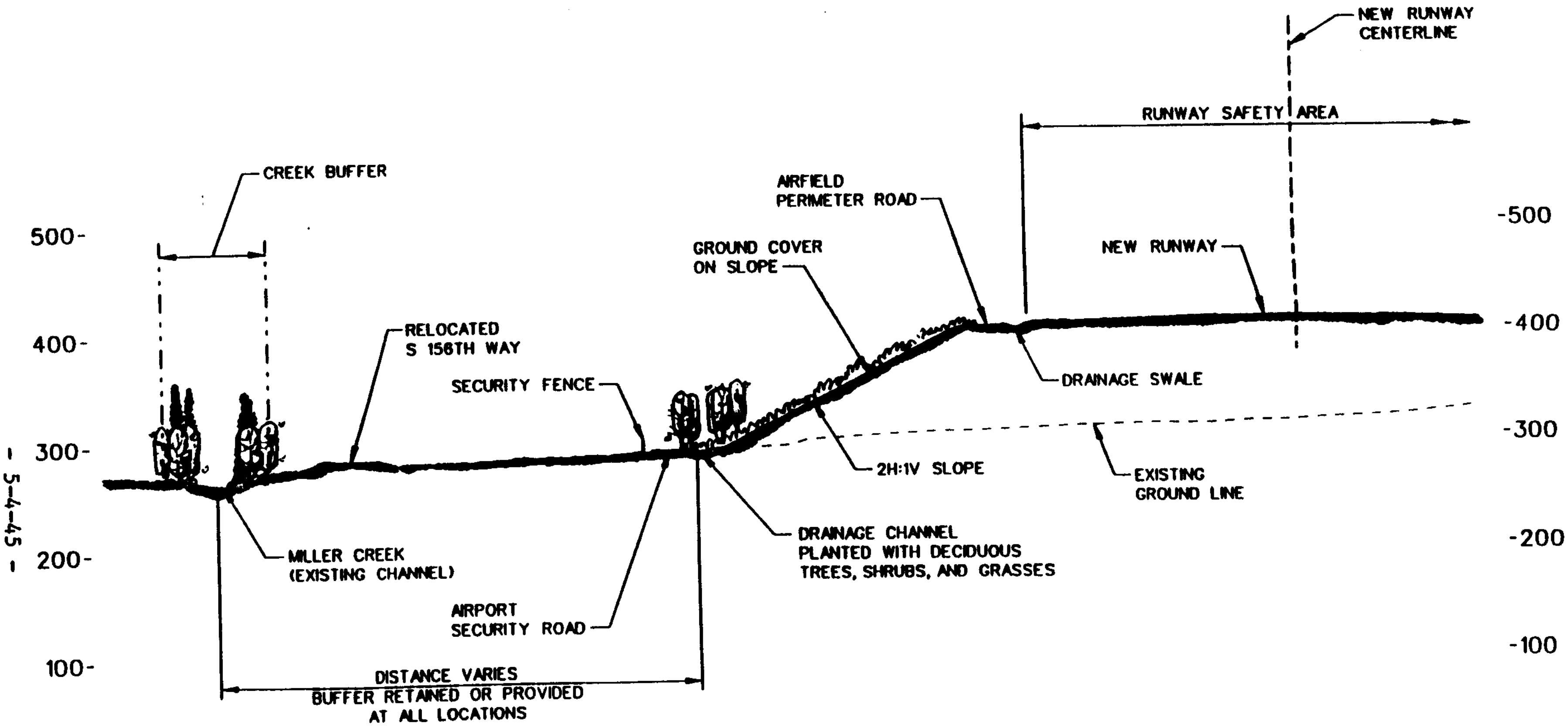
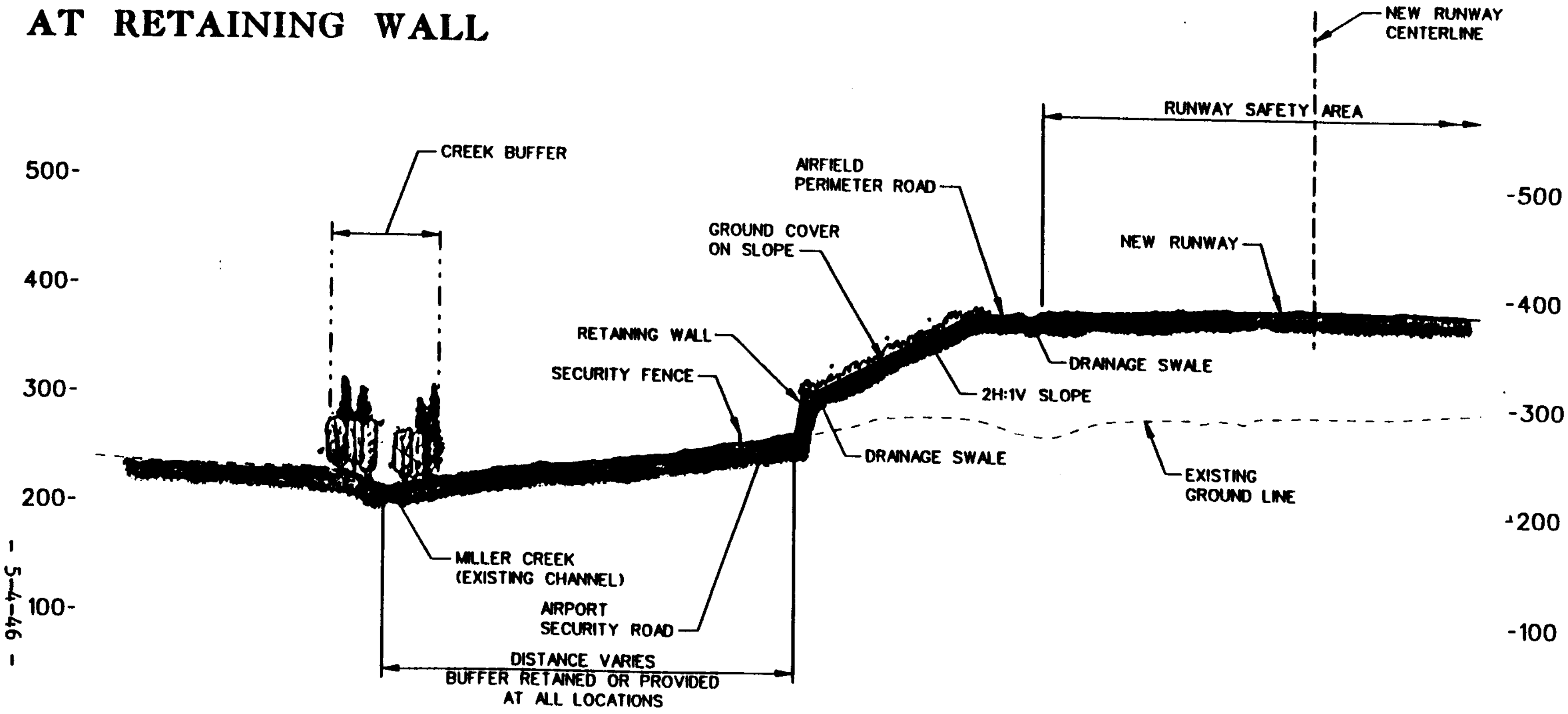
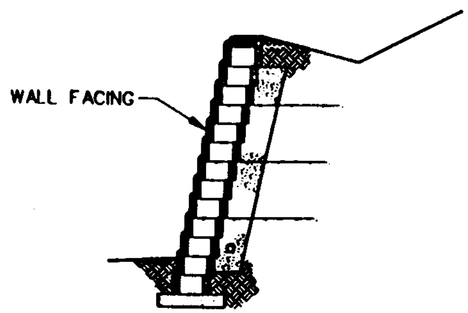


Exhibit 5-4-5A
New Runway Embankment
(North End)

JANUARY 17, 1997

EMBANKMENT SECTION AT RETAINING WALL



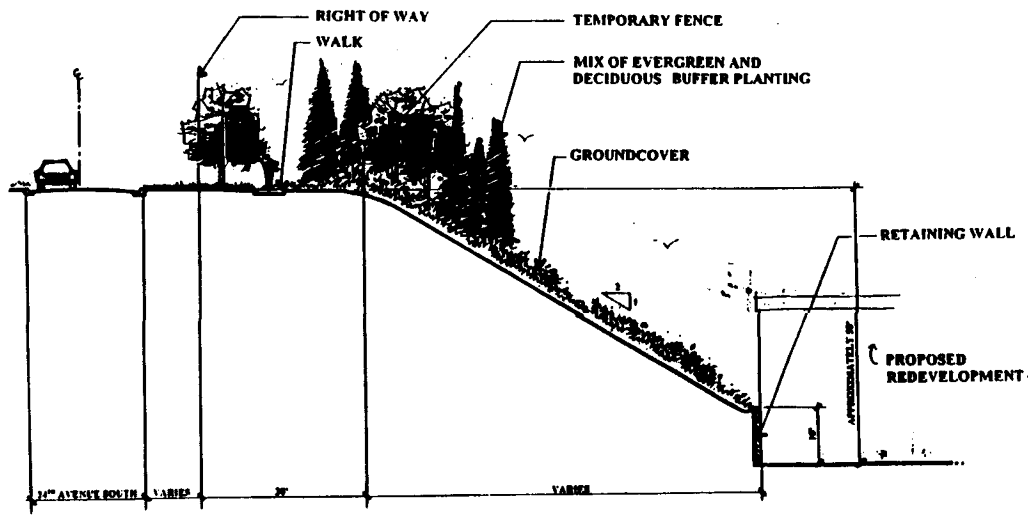


POSSIBLE RETAINING WALL CONCEPT

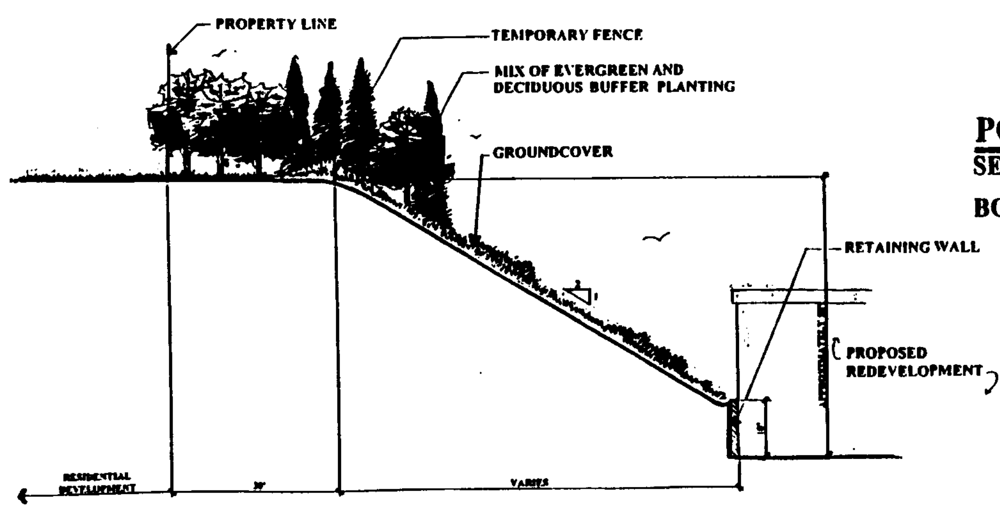
Exhibit 5-4-5B
New Runway Embankment
(Retaining Wall)

JANUARY 17, 1997

REDEVELOPMENT CONCEPT SECTIONS



SECTION A - A



SECTION B - B

PORT OF SEATTLE
SEATAC INTERNATIONAL AIRPORT
BORROW SITE REDEVELOPMENT

Exhibit 5-4-6
South On-Site Borrow Source
Redevelopment Concept

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SECTION 5-5

BIOTIC COMMUNITIES, WETLANDS AND FLOODPLAINS

Chapter IV of the Final EIS (located in Volume I) presents the impacts of the Master Plan Update improvements relative to biotic communities (including creeks), wetlands, floodplains. Since the issuance of the Final EIS, information concerning two key areas has been produced:

- Submission of the wetland fill Section 404 permit application to the U.S. Army Corps of Engineers and further definition of wetland mitigation and Miller Creek relocation mitigation; and
- Survey of raptors in the area of the third runway.

This section of the additional environmental analysis presents the new information.

The Final EIS (Chapter IV, Section 16) states:

> Approximately 40 percent of the detailed study area is occupied by Sea-Tac Airport and is characterized by frequently mowed grassland bisected by service roads and taxiways. This area provides little wildlife habitat value. Wildlife habitat surrounding the airfield consists of fragmented habitat, which is composed of forest, shrub, and grassland with scattered wetlands. These areas are subject to a variety of airport-related disturbances as well as increasing residential, commercial, and industrial development. Each of the "With Project" alternatives would remove approximately the same amounts of vegetation (about 712 acres total). Of that total, the majority is managed grassland (about 303 acres), which provides little wildlife habitat value. In addition, about 269 acres of forest, 78 acres of shrub, 52 acres of unmanaged grassland, and 10 acres of wetlands would be removed under each "With Project" alternative.
>
> About 3,700 feet of Miller Creek and its tributaries would require realignment and relocation to complete the runway. About 200 feet of Des Moines Creek would require relocation due to the 600 ft extension of Runway 34R. About 2,200 feet of open channel on Des Moines Creek would require relocation due to the South Aviation Support Area. The 200-foot section of Des Moines Creek that would be affected by the extension of Runway 34R is within the area that would be realigned as mitigation for SASA. Proposed mitigation would reduce potential impacts on the hydrology, water quality, and aquatic habitat and biota of Miller and Des Moines Creeks and Puget Sound.

The findings of the Final EIS remain current. The following summarize the status of other processes and information developed as part of the mitigation planning, further investigations were undertaken concerning wetland impacts, and stream relocation, and possible use of the site by raptors.

1. Wetland Impacts and Relocation of Miller Creek

In December 1996, the Port submitted an application to the Army Corps of Engineers for a permit to fill wetlands at Sea-Tac Airport associated with the Master Plan Update improvements in compliance with the Clean Water Act, Section 404. The 404 permit application submitted to the Corps of Engineers includes a completed Joint Aquatic Resources Project Application (JARPA) form, in a report entitled "JARPA Application for Proposed Improvements at Seattle Tacoma

International Airport" dated December 1996. Copies of this document, that includes the jurisdictional delineation of wetlands at Sea-Tac, the proposed Wetland Mitigation Plan, the proposed mitigation for relocation of Miller Creek, and accompanying tables and drawings are available for review at the Port of Seattle Engineering Office at Sea-Tac Airport and the Northwest Mountain Region FAA Office in Renton, Washington at the addresses noted on the cover of this Supplemental EIS. These documents are hereby incorporated by reference.

The Final EIS noted that about 10.4 acres of wetland would be filled in order to complete the proposed improvements. Since issuance of the Final EIS, the Port has refined its evaluation of the projects affecting wetlands, including identification of nearly two (2) additional acres of wetland impacts, documented its review of in-basin mitigation options, and further defined plans for development of a wetland mitigation site in Auburn.

Based on a refined evaluation of the wetlands, the following impacts were identified:[1]

Project Element	New Data	Final EIS
Runway impacts		
Embankment	5.46	5.48
Borrow Source impacts	1.92	2.38
Runway Safety Areas 16L/R	2.34	Included above
Runway 34R Extension	0.00	0.00
Terminal/Landside		
N. Employee Parking lot	0.81	0.81
Development in SASA	1.70	1.70
Total	12.23	10.40

As is noted in Chapter 2 (page 2-19) two alternatives are possible for the relocation of S/154th/S. 156th around the Runway Safety Areas for 16L/16R. Option 1 would result in the relocation of the road just around the existing RSA, and connect to the existing alignment of the road (it would not address the alignment of the third parallel runway). This option would affect 2.34 acres of wetland. Option 2 would account for the new parallel runway, and would relocate the roadway as shown in the Preferred Alternative (Exhibit 3-3) around the RSA's for all three runways. Wetlands impacted by Option 2 would include the 2.34 acres from Option 1 plus an additional 0.73 acres that is included in the runway impacts above (5.46 acres noted for the embankment includes the 0.73 acres for the road relocation), for a total of 3.04 acres.

To mitigate for the unavoidable impacts to wetlands, the Port proposes to create new wetlands on a 47-acre site of an approximately 69-acre parcel located within the city limits of Auburn, Washington. Wetland mitigation at the Airport, within the watersheds where the impacts may occur, is not feasible for three reasons: (1) most of the area surrounding the Airport is developed, and not enough available land exists in the watershed to create compensatory mitigation wetlands without relocation of additional business and residences; (2) the FAA has indicated that "wildlife attractions" within 10,000 ft of the edge of any active runway is not recommended; and (3) wildlife control activities in wetlands near the airport would conflict with wetland habitat mitigation goals. Because of wildlife attraction issues, the Port cannot commit to maintaining sites on or near the Airport as wetland habitat mitigation

[1] The quantity of wetland to be filled is based on the best information available at this time. The Port and FAA do not have access to all property to be acquired for construction of the third runway. It is possible that some additional wetland areas could be identified when access is available to all property in the acquisition area.

in perpetuity. If a wetland site were to become a safety concern because of its attraction to wildlife, particularly birds, and jeopardize aircraft safety, the Port would be compelled to remove the hazard, including flora and/or fauna. However, the hydrologic functions the wetlands perform would be replaced at the Airport with the proposed storm water management facilities, relocation of the drainage channels, and relocation of affected portions of Miller Creek.

Because much of the wetland mitigation was established based on FAA guidance, the FAA Advisory Circular, approved on May 1, 1997 has been included in its entirety at the end of this section.

(A) Impacts to Wetlands

Implementation of the proposed Sea-Tac Airport Master Plan Update improvements would impact all or portions of 36 wetlands. The total area of wetland impact is 12.23 acres. Most impacts would occur during the first phase (1997-2000) of implementation, which includes construction of the new parallel runway, north employee lot, site preparation of the land known as SASA, and runway safety area upgrades. The wetland mitigation would compensate for all anticipated wetland impacts attributed to full implementation of the proposed Master Plan Update improvements. **Table 5-5-1** lists the impacts by wetland location and type.

The ecological characteristics of wetlands within the proposed impact areas have been evaluated and incorporated into the mitigation design to ensure that mitigation compensates for unavoidable wetland impacts from the entire Master Plan Update. Due to similarities in vegetation, many of the affected wetlands serve similar physical and biological functions and have been grouped for ecological assessment. Wetlands within the impact area occur in the Des Moines Creek and Miller Creek drainage basins, where natural habitats (including wetlands) are fragmented by urban development. In addition to substantial fragmentation of habitat, the small size of most impacted wetlands suggests that they function independently rather than as a natural ecological system.

According to the Washington State Natural Heritage Program information system and field studies, no rare plants, high-quality native wetlands, or high-quality native plant communities occur in the study area. Nineteen vegetation communities were identified in the proposed Master Plan Update study area, including nine (9) wetland and ten (10) upland vegetation communities. The wetland vegetation communities include forested wetland, shrub wetland, and emergent wetland.

Wetland Functions and Values: The biological and physical functions of wetlands within the study area were assessed to identify important qualities that should be replicated by the mitigation design.

Impacts associated with the Master Plan Update improvements are to small (<0.5 acre) wetlands that are isolated from other significant aquatic or semi-aquatic habitat, and occur in a landscape fragmented by streets, commercial, residential, or airport development. Therefore, for most functions, the wetlands were not considered to provide high function. Emergent wetlands (some with associated shrub habitat) were rated low for the following functions: export of production; baseflow support; and control of floodflow. Forested wetlands (some with associated shrub habitat) received a low functional value for export of production and stormwater runoff storage functions.

The wildlife habitat functions are generally significant to the local vicinity (rather than to a larger landscape or watershed) because urban development isolates the area for many species of wildlife, and the size of many of the wetlands are smaller than the habitat requirements of many mammal and bird species. The biological functions of wetlands are further limited by the lack of permanent open water, the short duration of seasonal ponding or soil saturation, and the high occurrence of non-native plant species in some emergent wetlands. The wildlife habitat value increases where trees and/or shrubs are adjacent to the grass-dominated emergent areas.

TABLE 5-5-1

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CLASSIFICATION, SIZE, AND IMPACTS TO WETLANDS

				Vegetation Cover Types Impacted (Acres)		
Wetland Number	Classification[1]	Wetland Size (Acres)	Total Impact[5] (Acres)	Forested	Shrub-Scrub	Emergent
1	Forested	0.07	0.07	0.07	–	–
2	Forested/Emergent (60/40)	0.74	0.74	0.44	–	0.29
3	Forested	0.56	0.19	0.19	–	–
4	Forested	5.02	0.46	0.46	–	–
5	Forested/Shrub-Scrub (10/90)	4.58	1.69	0.17	1.52	–
6	Shrub-Scrub	0.87	0.00	–	–	–
7	Forested/Open Water/Emergent	6.70	0.00	–	–	–
8	Shrub-Scrub/Emergent	4.95	0.00	–	–	–
9	Emergent/Forested (60/40)	2.85	0.13	0.05	–	0.08
10	Shrub-Scrub	0.31	0.00	–	–	–
11	Forested/Emergent (80/20)	0.50	0.47	0.37	–	0.09
12	Emergent/Forested (80/20)	0.21	0.21	0.04	–	0.16
13	Emergent	0.05	0.05	–	–	0.05
14	Forested	0.19	0.19	0.19	–	–
15	Emergent	0.28	0.28	–	–	0.28
16	Emergent	0.06	0.06	–	–	0.06
17	Emergent	0.03	0.03	–	–	0.03
18	Forested	0.12	0.12	0.12	–	–
19	Forested	0.57	0.57	0.57	–	–
20	Shrub-Scrub/Emergent (90/10)	0.06	0.06	–	0.06	0.01
21	Forested	0.22	0.22	0.22	–	–
22	Emergent/Shrub-Scrub (90/10)	0.06	0.06	–	0.01	0.05
23	Emergent	0.78	0.78	–	–	0.78
24	Emergent	0.14	0.14	–	–	0.14
25	Forested	0.06	0.06	0.06	–	–
26	Emergent	0.02	0.02	–	–	0.02
27	Emergent[2]	0.00	0.00	–	–	–
28	Open Water/Shrub-Scrub (0/100)	18.10	0.06	–	0.06	–
29	Forested	0.74	0.74	0.74		–
30	Forested/Shrub-Scrub (80/20)	0.50	0.50	0.40	0.10	–
31	Emergent	0.05	0.00	–	–	–
32	Emergent	0.05	0.05	–	–	0.05
33	Forested/Shrub-Scrub/Emergent/Open Water	17.60	0.00	–	–	–
34	Open Water	1.40	0.00	–	–	–
35	Emergent	0.21	0.18	–	–	0.18
36	Forested/Emergent	0.30	0.00	–	–	–
37	Forested/Shrub Scrub (70/30)	2.41	1.68	1.17	–	0.50
38	Emergent/Shrub Scrub [3]	0.00	0.00	–	–	–
39	Forested	0.07	0.00	–	–	–
40	Forested	0.09	0.09	0.09	–	–
41	Emergent	0.09	0.08	–	–	0.08

AR 040723

Wetland Number	Classification[1]	Wetland Size (Acres)	Total Impact[5] (Acres)	Vegetation Cover Types Impacted (Acres) Forested	Shrub-Scrub	Emergent
42	Emergent	0.50	0.00	–	–	–
43	Emergent/Shrub-Scrub/Forested/Open Water	30.3	0.00	–	–	–
44	Forested/Shrub-Scrub	0.70	0.00	–	–	–
45	Emergent	5.00	0.00	–	–	–
46	Open Water	0.06	0.00	–	–	–
47	Open Water	0.20	0.00	–	–	–
48	Emergent	0.02	0.00	–	–	–
49	Emergent	0.02	0.03	–	–	0.03
50	Shrub-Scrub	0.03	0.12	–	0.02	–
51	Forested	2.41	0.48	0.48	–	
52	Forested/Shrub-Scrub (90/10)	1.00	1.00	0.90	0.10	–
53	Forested	0.60	0.60	0.60	–	–
54	Shrub-Scrub/Open Water	25.70	0.00	–	–	–
55	Shrub-Scrub	0.04	0.04	–	0.04	–
TOTAL[4]		**143.86**	**12.23**	**7.34**	**2.00**	**2.88**

1 All wetland are palustrine based on USFWS classification system. Where more than one cover type is present, the percent impact to each cover type is shown in parenthesis.

2 Fill of this wetland completed with an approved Section 404 Nationwide 26 permit.

3 This wetland was determined not to be a regulated wetland by the City of Sea-Tac and the Corps of Engineers.

4 Values are rounded to two significant figures. Actual values/totals may differ slightly due to the effects of rounding.

5 Exact areas of wetland impact are subject to minor changes due to final engineering design and completion of wetland delineations on private property.

Hydrologic functions (such as floodflow storage, groundwater discharge, and storm water detention) are potentially important at the watershed level, because, when present, they may affect hydrologic and habitat conditions in off-site locations, especially fish habitat in Miller and Des Moines Creeks. Forested wetlands, on groundwater seeps adjacent to Miller and Des Moines Creeks, help to support the baseflow of the creeks by providing seasonal or perennial sources of water. Some of the forested wetlands associated with the creeks temporarily store floodwaters, which alleviates the severity of downstream flooding, and streambank erosion. Other wetlands help reduce peak flows by collecting and storing storm runoff, reducing the rate and volume of water that reaches the stream systems during storms. The on-site wetlands have a limited ability to provide these functions, largely due to their small size, the lack of direct connections to the creeks, or topographic conditions that limit seasonal detention of stormwater.

The groundwater recharge function of wetlands appears to be limited throughout much of the site. Many wetlands occur on compact till soils (Alderwood Series) above the Miller Creek and Des Moines Creek ravines. The wetlands have formed in shallow depressions where a perched water table has developed on low permeability till. Due to the low permeability of the till layer, it is unlikely these wetlands contribute significantly to recharge of groundwater.

These functional assessments were used in developing the appropriate mitigation for the proposed improvements at Sea-Tac Airport.

As was noted earlier, wetland impacts will occur due to the three specific development actions: 1) development of the third parallel runway and use of on-site borrow sources, 2) Relocation of S. 154th Street due to the Runway Safety Areas; 3) development of the North Employee Parking Lot (north of SR 518); and 4) Development of the area known as the

South Aviation Support Area (SASA). The following summarize the alternatives to these projects:

(1) **Third Parallel Runway/Use of On-Site Borrow**

The following alternatives were considered for the third parallel runway and borrow source areas:

- Use of Other Modes of Transportation - Three forms of other modes of transportation were considered (Auto/Bus, Rail, and Telecommunication) and are described on Page 3-1 and 3-2 of this Supplemental EIS. As discussed, less than 5% of passengers could use alternative of modes of transportation. A reduction in traffic by 5% would not eliminate the need for the proposed project. Therefore, while this alternative is feasible,[2] it would not address poor weather operating requirements of the Airport. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 operations (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.[3]
- Use of Other Airports or Construction of a New Airport - A substantial amount of study and deliberation over an 8 year period has been conducted concerning the development of a new/replacement airport or a supplemental airport. The regional consideration of this alternative showed that this is not a feasible alternative because: 1) there is not sponsor for such an undertaking, 2) regional consensus is that there is no "feasible" site, and 3) neither the lack of sponsor nor the conclusion of the PSRC's regional planning process appears to depend on the level of air travel demand in the region.
- Activity/Demand Management - The primary objective of activity management alternatives is to increase airport efficiency by the airport operator's establishment of pricing or regulatory actions, thereby delaying or eliminating the need for future airport development. The Flight Plan Study concluded that "... demand management measures will at best delay for a few years the need for capacity improvements. For purposes of this analysis, therefore, it was assumed the maximum demand management set of measures will delay capacity improvements for five years." This conclusion has been supported by the PSRC Expert Panel on Noise and Demand/System Management in their December 8, 1995 final order on system/demand management. Therefore, as this action would not satisfy the need, current poor weather demands would remain and would continue to grow in the future. While this is feasible, it is not a prudent alternative because of the delay costs incurred at Sea-Tac. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 operations (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.
- Other Development at Sea-Tac Airport - Several alternative runway layouts (locations, lengths, and orientations) were considered. As was shown, only a parallel air carrier length runway, with a 2,500 foot separation from 16L/34R would satisfy the poor weather operating needs. An air carrier runway of any length, with the anticipated demand for air travel that is now forecast, would likely result in 1.5 DNL or greater noise levels at these historic sites. Runways with a separation of less than 2,500 feet were considered, these

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[2] Feasible for this analysis is defined as a action that can be enacted through sound engineering principles.

[3] *Seattle-Tacoma International Airport, Capacity Enhancement Plan Update*, FAA, July 1995. Page 19.

locations could not be used during poor weather conditions and thus the existing poor weather delay would not be addressed. While this is a feasible alternative, it is not prudent due to the delay levels that would be experienced. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 operations (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.

About 1.92 acres of wetland impacts are associated with the excavation of fill material from on-site sources. Alternatives to the wetland fill would be use of off-site sources. The Final EIS,[4] as well as Section 5-4 of this Supplemental EIS, describe the impacts that would result from the construction haul, including social impacts, noise impacts, air quality impacts, etc. Impacts to the wetlands at these on-site borrow source locations could be avoided, but would result in environmental related tradeoffs, primarily construction related surface transportation. The following contrast the wetlands at each of the on-site borrow source locations:

On-Site Borrow Source	Fill Available (MCY)	Wetlands (Acres)	Possible Daily 1-Way Trips
#1	6.60	0.68	225
#2	0.65	0.0	22
#3	2.90	1.24	99
#4	2.20	0.0	75
#5	1.75	0.81	60
#8	0.30	20.7	11

The Port of Seattle has agreed to not excavate material from On-Site Sources #5 and #8. Impacts to wetlands associated with Borrow Area #5 could occur regardless of excavation for the runway, as the site is planned for use as a future employee parking lot, as is discussed later in this section. Therefore, the project scope has been designed to avoid 20.7 acres of wetland associated with Borrow Area #8. Further trade-offs could occur by not excavating fill from other on-site sources, but would result in use of off-site material and the associated off-airport truck trips. For each 1million cubic yard of material imported from off-airport sites, about 45,460 truck trips would result, which could amount to an average 33 truck one-way trips per day (or about 3 one-way trips during a peak hour). Because of the negative impacts associated with off-airport truck trips, and the ability to provide equal or better wetland resource through mitigation, avoidance of wetland fill of the on-site sources is not prudent.

- Use of Technology - As is shown, no technology exists (or appears eminent) that would address the poor weather operating constraints experienced at Sea-Tac. While a Localizer Directional Aid (LDA) would address visual flight rule conditions, it would not address the instrument flight rule conditions (poor weather) and it would likely result in increased noise exposure at other residential and locally significant historic sites. Because half of the poor weather constraint would not be addressed, delay would result. While this alternative is feasible, it is not a prudent alternative. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at

[4] *Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, FAA and Port of Seattle, February, 1996.

a cost of $132 million annually. When activity reaches 525,000 operations(now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.

- Delayed or Blended Alternatives - This alternative has become the Preferred Alternative, as the new construction schedule for the runway would entail it being available 5 years later than was addressed in the Final EIS.

- Do-Nothing - as is discussed, the Do-Nothing alternative would prevent the adverse impact to the 4(f) properties, but would not satisfy the purpose and need and as a result poor weather related arrival delay would increase. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million. Therefore, it is not a prudent alternative.

(2) Runway Safety Areas (RSAs)

The following alternatives were considered for the Runway Safety Areas:

- Declared Distances/Displace the runway threshold: Recognizing that airports may incur difficulty in achieving the full RSA standard, the FAA has enacted declared distance criteria. With the declared distance criteria, the FAA requires that an airport declare which portions of the runway are available for take-off and landing, so that the full 1,000-foot safety areas are provided for operations on the runway. Those portions of the runway declared not usable for takeoff and landings are then considered part of the RSA. The following declared distance/displaced thresholds were considered:

  - **Runway 16R**:

    -- *(Alternative RSA-1A)* A 250-foot displacement to the threshold of Runway End 16R. This alternative would include a partial grading and filling for 750 feet of the area north of the existing runway threshold. With the 250-foot displacement, the full 1,000-foot long RSA would be provided. This alternative would avoid the northward relocation of South 154th Street, but would require the construction of a retaining wall along the roadway and relocation of approach lights and other navigational aides. However, when in north flow (arrivals on 34L or departures on 34L) the ASDA (accelerate-stop distance available) and LDA (landing distance available) would be reduced by 250 feet. In south flow, a reduced LDA of 250 feet would occur. The Port estimated that this option would cost between $3-6 million to complete. For these reasons, this alternative was found unreasonable.

    -- *(Alternative RSA-2A)* A 450-foot displacement to the threshold of Runway End 16R. This alternative is the same as the above, except with an expansion of the existing RSA out to 550 feet, using a 450 displacement of the north runway end to achieve the requisite 1,000 feet. While other lengths could occur, this distance would avoid the development of the retaining wall. As a result, a 450-foot reduced LDA to the south on Runway 16R would occur. The Port estimated that this option would cost between $1.0 and $3.0 million to complete.

    The reduced landing distances would restrict the usage of taxiway M to some aircraft, thus increasing the runway occupancy. For these reasons, this alternative was found unreasonable.

- *(Alternative RSA-3A)* A 770-foot displacement to Runway End 16R. This alternative would use the existing 230 feet of full-width RSA with a 770-foot displacement. This alternative would result in a 770-foot reduction in the LDA to the south and a 770-foot reduction in the ASDA to the north. A relocation to South 154th would not be required. The Port estimated that this option would cost between $0.5-1.5 million to complete.

  Because of the reduced available runway length, aircraft landing would not be able to use the existing taxiway exits in an efficient manner. Thus runway occupancy would be increased or additional taxiway exits would need to be developed. For these reasons, this alternative was found unreasonable.

- **Runway 16L**:
  - *(Alternative RSA-1B)* A 300-foot displacement to 16L (which is currently displaced 490 feet - thus the existing displacement would be reduced), and a slight build out of the 16L RSA to 700'. As a result of the displacements, the south flow LDA would be reduced to 11,600 and the ASDA would be 11,900 feet. In north flow, the LDA would be reduced to 11,600 and the ASDA would be reduced to 11,600 feet. Due to the length requirement of 12,500 feet identified in the Master Plan Update, displacement of this runway was not considered a realistic alternative.

Relative to declared distances, the FAA noted to the Port in a February 1993 letter "The FAA strongly recommends that declared distances not be used at Seattle-Tacoma International Airport. Aircraft operations during low visibility conditions are a major concern. Declared distance lighting would be required in addition to low visibility lighting and result in a confusing lighting system during low visibility operations. We recommend you consider relocating the threshold to adjoin the starting boundary of the RSA".[5] For these reasons, these alternatives were not found reasonable. However, because the Port must address the RSA compliance issue, if clearance, grading and filling were not undertaken, the declared distances would be the Do-Nothing action.

- <u>Clearance, grading, filling and development of the requisite areas for 1,000 feet beyond the existing pavement end</u>: These alternatives would result in the conventional configurations for the RSAs.
  - <u>Runway 16R *(Alternative RSA-4A)*</u>: To provide the necessary area, the north RSA would require the relocation of South 154th Street around the RSA. About 2.34 acres of wetland would be affected by the relocation of South 154th Street around a corrected RSA for this runway. While the road could be tunneled under the RSA, the cost of such tunneling is prohibitive, about $40 million. Consideration was given to avoiding the tunnel, and attempting to minimize the impacts of the RSA by developing a retaining wall. The cost of a retaining wall to avoid the tunnel would cost about $12.5 million more than the Preferred Alternative to avoid the impacts to wetlands, but would result in 1.13 acres of wetland impact.

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[5] Letter from Paul Johnson, Civil Engineer, Seattle Airports District Office to the Port of Seattle, February 19, 1993

The following contrasts the costs of the South 154th Street relocation options:

Scenario	Wetland Impact (ac)	Cost
Tunnel - Avoid Wetlands	0.00	$46.2 million
Retaining Wall - Minimize Impacts	1.13	$19.3 million
Preferred Alternative	2.34	$6.8 million

Source: HNTB, December 1996

As compliance with RSA standards must occur, the only other alternative would be use of the declared distances, which is not prudent with the Region's low-visibility conditions as discussed earlier, or the fill of wetlands with mitigation provided by equal or higher quality wetlands as is proposed.

- Runway 16L *(Alternative RSA-4B)*: Currently Runway 16L is displaced 460 feet due to trees that once penetrated the approach surfaces to the runway. Therefore, two options exist: 1) maintain the current threshold and clear and grade the requisite 1,000 feet or 2) remove the displacement and clear and grade the requisite area. The first option would require clearing and grading for 310 feet, while the second option would require 800 feet. In either case, South 154th Street and the airport service road would require relocation. While neither of the options for this runway end would affect wetlands, the relocation of South 154th Street would require coordination with the RSA for 16R.

- Delayed Alternative - As is noted earlier, SEPA requires the consideration of the benefits and disadvantages of delaying implementation of the proposed alternative. Delaying implementation of actions to addressing the RSA issues is not possible, due to the FAA grant assurances. Therefore, the only non-development options would be the establishment of declared distance procedures and displaced runway thresholds.
- Do-Nothing/No-Build [6] This alternative would maintain the current RSA dimensions, which do not meet FAA requirements. As this option may result in the FAA bringing an RSA enforcement action against the Port of Seattle, it is not a reasonable alternative. The result of a Do-Nothing alternative would be the requirement that displaced thresholds be developed, as described previously. While this option is considered to be a last resort action for airports with low visibility conditions, it is technically feasible; declared distances are not recommended due to the low visibility lighting confusion that pilots could experience. Each displacement would require relocation of approach lights and other navigation aides.

(3) North Employee Parking Lot

As a landside related project, the following alternatives were considered:

- Use of Other Modes of Transportation Alternatives - Alternative modes of transportation were evaluated in terms of their capability to meet the needs of freight shippers and travelers who presently use Sea-Tac Airport. Based upon the characteristics of freight shipments and travelers from Sea-Tac, alternative modes of

[6] Technically, the literal Do-Nothing is not an option for addressing the RSA issues. The Port of Seattle has two options for addressing RSAs, both of which require some action: grade and develop off the ends of the runways or establish declared distance procedures. The Do-Nothing alternative presented in this EIS reflects the non-development action (declared distances).

transportation, such as rail (traditional or high speed) or automobile/bus, cannot be realistically considered as providing a suitable solution to needs identified in this study at Sea-Tac Airport.

- Use of Other Airports or Development of a New Airport Alternatives - An extensive study of the development of a replacement or supplemental airport was conducted by the Puget Sound Regional Council. This study found: "The Executive Board concludes that there are no feasible sites for a major supplemental airport within the four-county region and that continued examination of any local sites will prolong community anxiety while eroding the credibility of regional governance."[7] Based on the analysis presented earlier and the findings of the Puget Sound Regional Council, it is unlikely that use of other airports or development of a new airport are reasonable alternatives to serving future air travel demands.

- Activity/Demand Alternatives - Another group of alternatives which are frequently suggested when considering airport development include traffic demand management and activity restrictions. As was described in a preceding section, activity alternatives would not reduce demand such as to prevent the need for improvements at Sea-Tac Airport.

- Landside Development at Sea-Tac Airport Alternatives -Chapter 3 of this Supplemental EIS, beginning on Page 3-14 discusses the alternatives to this project.

- Delayed/Blended Alternative - Delaying implementation of the SASA would result in the Do-Nothing for some period. This alternative is not a reasonable alternative as it would not satisfy the need.

- Do-Nothing/No-Build Alternative - The Do-Nothing alternative would result in the Airport remaining as it is today. Therefore, future operational congestion and delay would not be relieved, and would increase. Although this alternative may not be prudent, it is feasible, and therefore, is one of the alternatives considered throughout the Environmental Impact Statement.

(4) Development of SASA

The following summarize the alternatives to satisfying future terminal/landside improvements that envision the development of cargo and maintenance functions in the area known as the South Aviation Support Area:

- Use of Other Modes of Transportation Alternatives - Alternative modes of transportation were evaluated in terms of their capability to meet the needs of freight shippers and travelers who presently use Sea-Tac Airport. Based upon the characteristics of freight shipments and travelers from Sea-Tac, alternative modes of transportation, such as rail (traditional or high speed) or automobile/bus, cannot be realistically considered as providing a suitable solution to needs identified in this study at Sea-Tac Airport.

- Use of Other Airports or Development of a New Airport Alternatives - An extensive study of the development of a replacement or supplemental airport was conducted by the Puget Sound Regional Council. This study found: "The Executive Board concludes that there are no feasible sites for a major supplemental airport within the four-county region and that continued examination of any local sites will prolong

[7] PSRC Executive Board Resolution EB-94-01.

community anxiety while eroding the credibility of regional governance."[8] Based on the analysis presented earlier and the findings of the Puget Sound Regional Council, it is unlikely that use of other airports or development of a new airport are reasonable alternatives to serving future air travel demands.

- Activity/Demand Alternatives - Another group of alternatives which are frequently suggested when considering airport development include traffic demand management and activity restrictions. As was described in a preceding section, activity alternatives would not reduce demand such as to prevent the need for improvements at Sea-Tac Airport.

- Landside Development at Sea-Tac Airport Alternatives - The following summarizes options to addressing cargo and maintenance facilities.

  Centralized Cargo Option - About 176 acres of land would be required to centralize the cargo facilities in a single complex. To centralize the facilities, it is assumed that the existing cargo facilities would be abandoned and redeveloped at another location on-airport. Two locations for centralized facilities were identified: the area known as the South Aviation Support Area (SASA) and a north site. Because of the site characteristics and size requirements and cost, the complete redevelopment of a new centralized cargo complex is not practical.

  Decentralized Cargo Option - The decentralized cargo option would result in supplementing existing cargo facilities at new sites on-airport. Decentralized cargo facilities could be developed within the existing cargo development (to the north of the Main Terminal), further north on existing airport property or in the SASA. Within the existing cargo area, all of the year 2005 needs can be served and about 67% of the year 2010 cargo building area needs can be accommodated and about 57% of the hardstand needs. The post year 2005 forecast needs can then be accommodated in the SASA.

  Aircraft Maintenance - As is described in the Final EIS and Record of Decision of the South Aviation Support Area (SASA), three principal objectives will be met through the development of the SASA: to accommodate displaced line maintenance facilities, to accommodate future line maintenance facilities, and to accommodate a major base maintenance facility. That EIS addressed three sites for the development of aircraft maintenance needs: northeast, far north and southeast. The northeast was rejected as there is insufficient land to develop the requisite 84 acres. The far north site (located north of SR 518, west of 24th Avenue South) was rejected because of the cost of developing a taxiway bridge over SR 518, and fill requirement costs.

  Because of the need to use portions of the SASA site for supplemental cargo facilities, the extent of aircraft maintenance facility development in the SASA would be dictated by the displacement caused by alternative terminal development.

- Delayed/Blended Alternative - Delaying implementation of the SASA would result in the Do-Nothing for some period. This alternative is not a reasonable alternative as it would not satisfy the need.

- Do-Nothing/No-Build Alternative - The Do-Nothing alternative would result in the Airport remaining as it is today. Therefore, future operational congestion and delay would not be relieved, and would increase. Although this alternative may not be

[8] PSRC Executive Board Resolution EB-94-01.

prudent, it is feasible, and therefore, is one of the alternatives considered throughout the Environmental Impact Statement.

(B) Evaluation of Mitigation In the Same Basin

The recommended preference for selecting wetland mitigation sites in Washington is as follows: (1) on-site and in-kind; (2) off-site, within the watershed, and in-kind; (3) off-site, out of the watershed, and in-kind; and (4) off-site, out of the watershed, and out-of-kind. The proposed mitigation represents option 3 (off-site, out of the watershed, and in-kind). Mitigation within the Sea-Tac Airport operations area (on-site) was eliminated from consideration, because the siting criteria for the first and second preferences could not be met. In addition, on-site mitigation could be subject to degradation from wildlife control for safety reasons, or on-going airport operations.

In evaluating option 2 (off-site, within the same watershed), the Miller Creek basin and Des Moines Creek basins were examined for suitable mitigation development. All undeveloped, non-forested, non-wetland sites with average slopes less than 5% were identified in both basins. Based on these criteria, 19 potential mitigation sites were identified, six (6) of which are between airport runways and taxiways at Sea-Tac Airport and cannot be used for wetland mitigation. The suitability of the thirteen remaining sites (although all are within the 10,000-ft radius of concern for wildlife hazards to aircraft) for wetland mitigation was evaluated further. **Exhibit 5-5-1a and 5-5-1b** shows the sites considered.

For this level of analysis, it was assumed that each site identified could be modified to perform hydrologically, so evidence of high water tables was not considered. Large sites (in this instance greater than 30 acres) are preferred because combining the functions of several small, isolated wetlands in a single large wetland mitigation site enhances the probability of achieving mitigation goals, ensuring long-term protection, and ultimately providing wetland functions to compensate for project impacts. A site at least 30 acres in size would allow an average mitigation ratio of 2:1 with adequate buffers. Compensating for wetland impacts on more than one site offers fragmented habitat blocks of less overall value. However, in order to adequately address the issue of mitigation within the watersheds, smaller sites (at least 10 acres) were also evaluated.

Field verification of each site identified primary limiting factors for wetland mitigation within the watersheds:

1. Most of the potential sites are too small to support the compensatory mitigation on one site, which would result in two or more sites without habitat connectivity to each other or to other habitat areas;
2. The watersheds are largely urbanized and most of the potential sites are fragmented by homes, roadways, or other development; and
3. Proximity to the existing and proposed runways creates a potential hazard between birds and aircraft.

Table 5-5-2 lists the evaluation considerations for each of the 19 areas.

The primary reason for pursuing mitigation outside the airport area is due to potential bird strike incidents. Increased aircraft operations frequently results in conflicts between aircraft and birds. Bird strikes and jet-engine bird ingestion have caused in the worst situations, aircraft to crash and resulted in loss of human life, or in lesser cases millions in dollars of aircraft damage. Such examples include a Boeing E-3 that crashed at Elmendorf Alaska in September 1995 after it ingested about 30 Canada geese on departure, resulting in the crash of the aircraft, killing all 24 on board.

Jet engines are more vulnerable to birds than prop aircraft. Although the larger engines are designed to withstand ingesting an occasional small bird, a large bird or large number of smaller birds sucked into a jet aircraft engine can do significant damage and/or disable the engine. When flying at 200 miles per hour, a two-pound gull can produce the force equal of over 10,000 pounds. In a jet flying at 600 mph, the same gull would produce a force of 36 tons. Bird strikes in North America are most frequent during the months of August through October. Between 1986 and 1990, nearly 7000 bird strikes were reported in North America. According to the FAA's Aeronautical Information Manual, 90 percent of bird strikes occur when aircraft are under 3,000 ft altitude, which typically occurs with 3-5 miles of an airport. Over 50 percent of the strikes were reported when aircraft are below 100 feet altitude (above the airfield), or within 1,000 feet of touchdown.

A variety of birds find airport lands attractive for feeding, roosting, and loafing. Large soaring or flocking birds, such as raptors, gulls and blackbirds represent the greatest hazards. Airports serve as attractants to birds for reasons ranging from the airport being a large undeveloped land source in an urban area, to the actual bird attractant properties of the airport itself. Runways draw birds during colder seasons, as pavement is typically warmer than grass, and birds settle around the heat. Second, a wet runway reflects its adjacent airfield lighting. At night, this causes the pavement to resemble a lake, attracting shoreline birds. Because of the natural attraction provided by airport facilities, FAA discourages airports from providing further attractions of water, feeding and resting habitat.

At Sea-Tac Airport, approximately 20 bird strike incidents occur each year.[9/] Currently, the Port of Seattle is attempting to decrease the bird strike hazards by removing large trees that have grown near the runways and by relocating populations of Canada geese from Tyee Valley Golf Course. Creation of additional wildlife habitat that would increase use of the area by birds would not meet the goals of the Master Plan Update improvements in which landing and take-off safety is a major consideration.

(C) Proposed Wetland Mitigation in Auburn

The 47-acre mitigation site is part of a 69-acre parcel located within the City of Auburn immediately west of the Green River. The undeveloped parcel has been farmed in the recent past and currently supports a mix of upland pasture grasses and forbs that are common to abandoned agricultural land in the Puget Sound basin. Approximately 4.3 acres of emergent wetland was delineated during previous site investigations and is included in the 47-acre portion of the site proposed for mitigation (only 0.27 acres of these wetlands would be impacted by the mitigation). The wetland mitigation would be located a minimum of 200 ft west of the ordinary high water mark of the adjacent Green River.

The site is bound by a variety of land uses including agriculture to the north and south; undeveloped land, multi-family housing, and a drive-in theater to the west; and the Green River, patches of riparian forest, and undeveloped, forested slopes on the east side of the Green River. King County is proposing to construct a trail along the Green River, east of the proposed mitigation project. The site is currently zoned single-family residential (R2) by the City of Auburn and the 1995 Comprehensive Plan designation is single-family. The site is nearly level but gently slopes to the northwest, with elevations ranging from 45 ft in the northwest corner to 52 ft along the eastern property boundary. The mitigation site is within the boundaries of the Draft Mill Creek Special Areas Management Plan (SAMP).

9/ Port of Seattle records, December 1996.

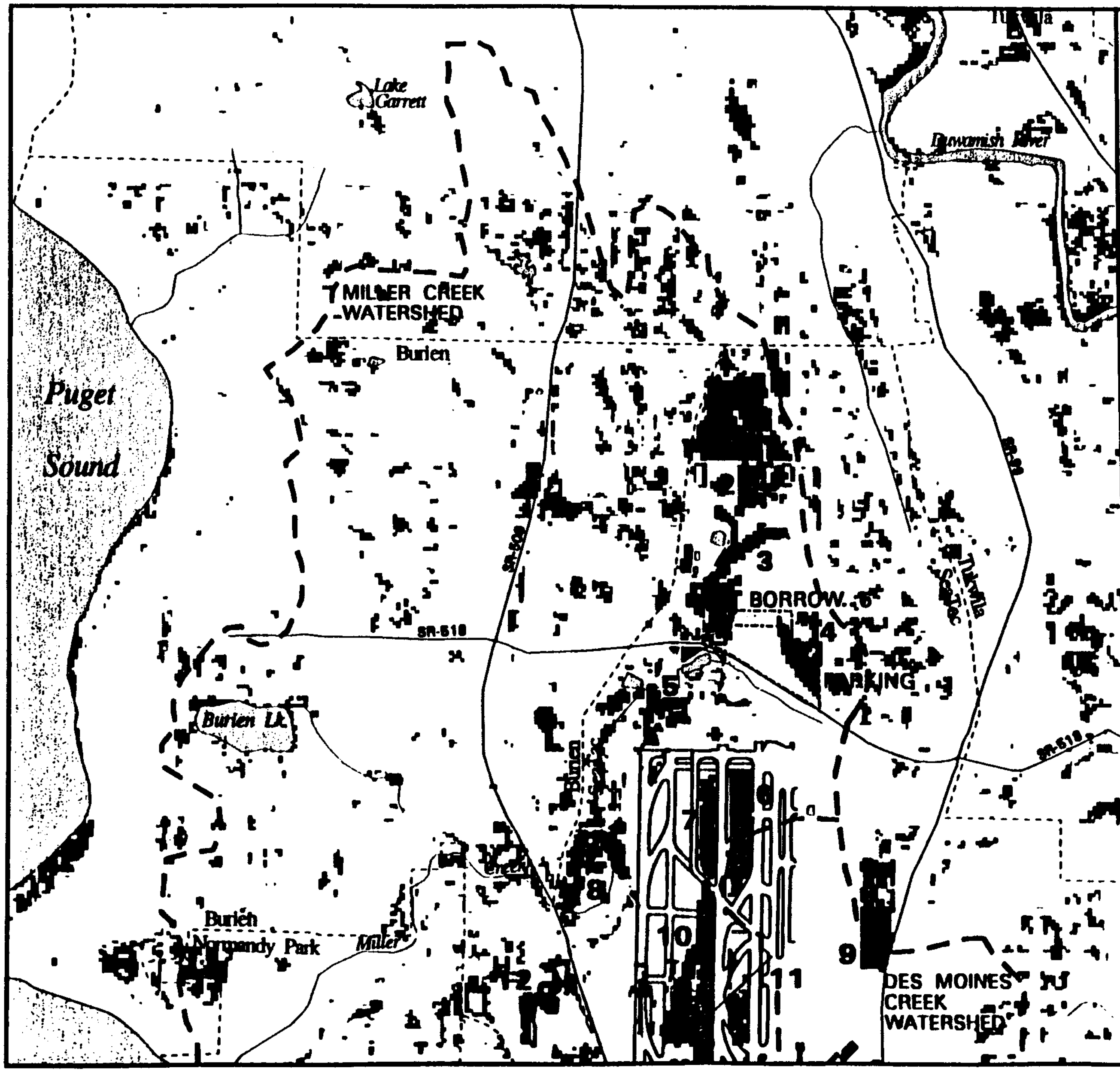

Exhibit 5- 5- 1a

Potential Mitigation Sites Evaluated in the Miller Creek & Des Moines Creek Watersheds.

(North Map)

- Major Highway
- Watershed boundary
- City Boundary
- Present Runway
- Proposed Runway
- Impact area
- Suitable area with slopes < 5%, undeveloped, Non-Forested, and Non-Wetland.
- Unsuitable area with slopes > 5%, Developed, Forested, or Wetland.
- 8 Suitable Site > 10 acres.

Data provided by: PSRC, CH2MHill, Shapiro, King Co.

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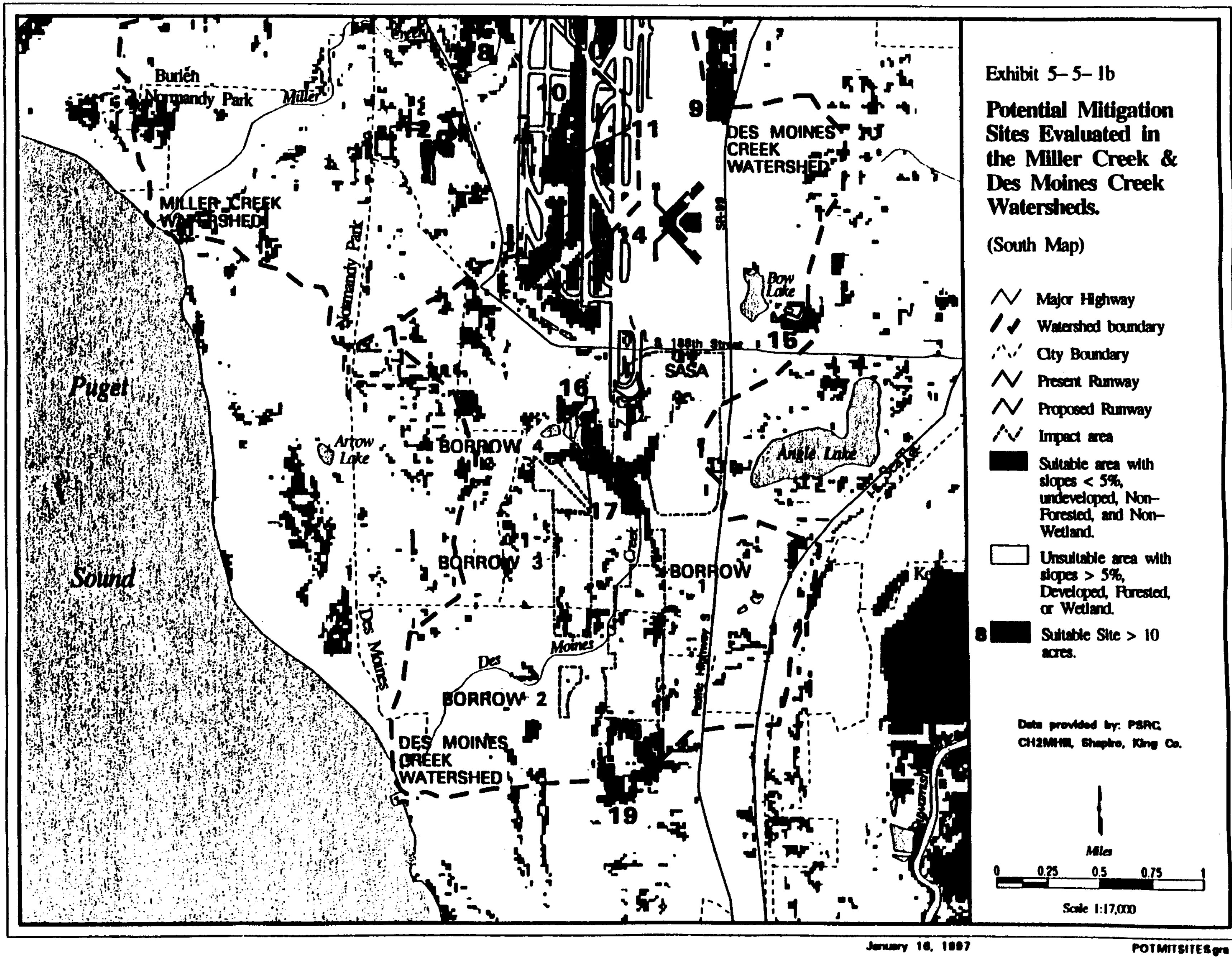
Exhibit 5- 5- 1b
Potential Mitigation Sites Evaluated in the Miller Creek & Des Moines Creek Watersheds.
(South Map)
Major Highway
Watershed boundary
City Boundary
Present Runway
Proposed Runway
Impact area
Suitable area with slopes < 5%, undeveloped, Non-Forested, and Non-Wetland.
Unsuitable area with slopes > 5%, Developed, Forested, or Wetland.
Suitable Site > 10 acres.
Data provided by: PSRC, CH2MHill, Shapiro, King Co.
Miles
0 0.25 0.5 0.75 1
Scale 1:17,000
Burien
Normandy Park
Miller
MILLER CREEK WATERSHED
DES MOINES CREEK WATERSHED
Puget
Sound
Arrow Lake
Bow Lake
Angle Lake
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The overall wetland mitigation goal is to compensate for unavoidable wetland impacts by in-kind replacement of habitat. This would be accomplished by creating a diverse replacement habitat with a net gain in functional value and acreage. Specifically, mitigation goals are as follows:

1 Create about 21 acres of palustrine forested, scrub/shrub, and emergent wetland at an average replacement ratio of 1.5:1;

2 Consolidate impacts of many lower functioning wetlands into one large wetland ecosystem on a single site with long-term protection. Maximize habitat value of the new wetland by providing habitat connections or corridors to other significant habitat areas;

3 Provide in-kind wildlife habitat replacement while maximizing public safety and minimizing wildlife hazards to aircraft; and

4 Mitigate for all impacted hydrologic functions (water quality, flood storage, and stormwater storage) within the Miller Creek and Des Moines Creek watersheds, with an overall replacement ratio of at least 1:1.

Table 5-5-2 lists the goals of the mitigation site. The off-site wetland mitigation site is designed to provide in-kind replacement of wetland habitat functions affected by the proposed Master Plan Update improvements. Although not related to impacts of the proposed Master Plan Update improvements, additional Green River floodplain storage capacity would be created as part of the design process to assist issues being faced by the City of Auburn.

Wildlife Habitat - Construction of the forested, shrub, and emergent wetlands would create conditions that provide habitat for a variety of wildlife species. Habitat structure and availability would change as vegetation matures over the next several decades, and the wildlife species using the site are expected to change over time.

Post-construction habitat structure in proposed forested wetlands would be similar to regenerating forest, and would develop mature forest habitat attributes after several decades. The shrub understory would enhance the development, of habitat structure. Songbird use, in early stages of habitat development, would include foliage and bark-gleaning species (kinglet, chickadee, bushtit, vireo) that forage in the area. In later years, Oregon ash, vine maple, willow, red cedar, and hemlock seed production would be used by additional songbird species. Small mammals would likely forage on the forest floor for seeds and invertebrates, even though optimal habitat conditions would not occur for one or more decades. As a tree canopy begins to develop, it would provide nesting habitat and cover for predator avoidance.

Post-construction habitat structure in shrub wetlands would generally be similar to that of forested systems during the first several years of development. However, since shrub communities would periodically be flooded, ground-dwelling animals would be less common. The shrub community would reach functional maturity in 15 to 25 years following planting.

Emergent communities would provide resting and foraging habitat for shore and water birds within one (1) year of planting. Following two (2) to three (3) years, most of the intended wildlife functions should be present, and following five (5) to ten (10) years, relatively mature communities should be present.

Tree-nesting songbirds (such as thrushes, vireos, and warblers) are expected to use horizontal branches for nesting when the canopy closes enough to provide cover. Leaf litter and forest detritus would begin to accumulate, providing habitat for the invertebrates that amphibians (such as ensatina), small mammals, and ground-foraging birds feed on. Small mammals, in turn, are likely to become food for predators, such as barred owls. Over the course of several decades. competition for light, or disease would result in mortality. Dead and decaying trees would provide woody debris and snag habitat for flickers, woodpeckers, and small cavity-nesting birds.

The shrub and emergent wetlands should reach stable habitat conditions earlier than the forested wetland community. Shrub wetland communities should produce forage and nesting opportunities within two to ten years. Swainson's thrush and Wilson's warblers use moist shrub habitats for nesting and foraging. Berries produced by salmonberry, elderberry, and red-osier dogwood are used by several songbird species to supplement fall and winter diets. Shrews and other small mammals would consume insect and aquatic invertebrates that thrive in shrub and emergent wetlands. Wading birds, such as great blue herons and bitterns, can feed on small mammals and amphibians.

Although flooded emergent wetlands can provide substantial forage opportunities for ducks, habitat use would vary with proximity to upland predator cover. Waterfowl, which are wary of dense shrubs that allow predators to approach undetected, prefer interspersion of flooded emergent vegetation and open water. Slough sedge, spike rush, and scouring rush are all species preferred by dabbling ducks and geese during migration. Narrow-leaf burreed is preferred by dabblers and migrating wood ducks. As decaying vegetation builds up in flooded areas, shovelers, pintails and other diving species could use growing populations of plankton, algae, aquatic insects, and snails. Additionally, some amphibious species, such as Pacific giant salamander, northwestern salamander, and rough-skinned newt commonly migrate through terrestrial habitats and could use the mitigation site.

Construction of the mitigation wetland would require the excavation of about 375,000 cubic yards of soil. A basin would be excavated that would range in depth from 4 to 12 feet. Approximately one-third of the material would be selectively stockpiled on the site for use as backfill. The remaining material would be available for uses, including fill for nearby area developments, or possibly as part of the fill requirement at Sea-Tac Airport.

Stormwater runoff could cause erosion of the soils disturbed during ground clearing, excavation, and stockpiling of earth materials. Stormwater runoff may also carry other pollutants, such as oil or fuel, from construction equipment and vehicles into nearby water courses. Mitigation measures to control impacts from stormwater runoff during construction could include the following: 1) protection of disturbed areas by covering stockpiled soils with plastic and exposed soils with straw; 2) minimization of the extent and duration of exposed soils with revegetation as soon as possible; 3) use of silt fences, hay bales, sediment traps or other construction Best Management Practices to control eroded sediment from leaving the site; and 4) construction equipment would be well maintained to ensure that they are not leaking fuel or oil.

The construction equipment accessing the site would be expected to use South 277th Street and Auburn Way North. If material were transported to Sea-Tac, it would then use the haul routes discussed in **Section 5-4 "Construction Impacts"**. If it were used to satisfy fill requirements for other regional developments, access would be expected from Auburn Way to that site. Because Auburn Way is a major arterial, with significant average daily traffic levels, the addition of as many as 30-40 truck trips per hour would not be expected to have a significant effect (the truck trips would represent less than 3% of total traffic) on surface transportation conditions on any major arterial or highway in the vicinity of the mitigation site. No changes would be expected in levels of service on these roadways.

The Final EIS summarized a site assessment that was performed for this mitigation site. No new additional information has arisen concerning that assessment.

These and related topics are discussed in more detail in the document "Wetland Mitigation Plan for Proposed Master Plan Update Improvements at Seattle-Tacoma International Airport" dated December 1996, which is attached to the JARPA application noted previously.

(D) Proposed Relocation of Miller Creek

The proposed Master Plan Update improvements include fill activities that would directly affect three areas in the Miller Creek watershed due to the proposed third parallel runway embankment. The Miller Creek basin encompasses about 8 square miles and includes a small portion of Sea-Tac Airport, as well as parts of the cities of SeaTac and Burien. Sea-Tac Airport covers an estimated 5% of the entire basin. The Miller Creek watershed consists of drainage channels that originate at Arbor, Burien, and Tub lakes; surface water and seep drainages from the north end of Sea-Tac Airport; and overflows from the Reba Regional Stormwater Detention Facility and Lora Lake. The creek generally flows south and southwest toward Puget Sound. The areas of this basin that would be affected include:

1. Area 1 includes approximately 980 feet of Miller Creek. The affected portions extend approximately 1,000 feet south of Lora Lake.
2. Area 2 includes Class III drainage channels totaling 2,080 feet, that originate as seeps in the Airport Operations Area (AOA) then flow west to Miller Creek.
3. Area 3 includes 200 feet of the Class III headwaters of Walker Creek. These waters, which originate from seepage and storm water runoff at the corner of 12th Avenue South and South 176th Street, flow northwest to SR 509.

The primary mitigation goal is to replace the basic characteristics and functions of the three portions of Miller Creek and its associated drainage channels that would be affected by the proposed airport improvements. Miller Creek in Area 1 is no longer in a natural stream channel because the creek has been dredged and straightened for farmland reclamation and wetland drainage. Land development, roadway construction, and past airport development have also altered the segment. The goal of the Miller Creek relocation (Area 1) is to provide a new stream channel of at least the same length as the existing channel, with enhanced features.

A farm ditch located in the project area flows parallel to Miller Creek for approximately 800 feet. The ditch provides positive drainage for the westerly portion of the farm, connecting to the main channel near South 156th Way. A small segment of the side channel (approximately 250 feet) would be impacted by the fill; however, because this segment is at the upper end of the side channel, drainage and conveyance would not be affected. No habitat would be impacted, since the channel flows intermittently in response to rain, and has little riparian habitat due to farming. For these reasons, no mitigation is proposed.

Area 2 consists of two small intermittent drainage channels with an indication of minor seepage. Area 3, the headwater of Walker Creek, contains a short segment of drainage channel. All three drainage channels have been affected by existing airport drainage, perimeter road crossings, or channelization. The mitigation goal for Areas 2 and 3 is replacing the drainage function of the channels.

The proposed Miller Creek channel would be constructed near the bottom of a broad, flat valley located south of Lora Lake. The existing 1,080-ft-long main channel of Miller Creek would be displaced approximately 200 feet to the west. The new Miller Creek channel would be constructed near the lowest path through the broad flat trough that defines the creek floodplain in the project area, with the channel edge offset from the proposed fill a minimum of 25 feet to provide a buffer. Channel slope and minimum flow depth would influence final channel alignment. The new creek would connect with the existing Miller Creek channel downstream at the earliest possible point to minimize stream relocation impacts. Channel relocation guidelines presented below may vary due to the limited space available between Lora Lake and the proposed fill area. High flows would be diverted through Lora Lake in the upper segments of the proposed Miller Creek channel.

Careful consideration of the benefits that Miller Creek and the three drainage channels now provide was given when determining the required features for the post-mitigation stream. Streams and waterways can provide many important functions such as conveying surface water and storm water, including flood waters, and providing in-stream and riparian habitat for fish and other water-dependent animals. The proposed mitigation plan ensures that present uses are not reduced and that other beneficial uses be included or enhanced. Beneficial use criteria provide design considerations and require consistency with the overall mitigation plan. Goals are prioritized from the most critical function that the existing channel provides to enhancements that would improve channel habitat. A list of impact compensation goals describes the decision-making priorities for the proposed relocated creek. If goals conflict, the higher priority takes precedence.

Miller Creek Goals

Goal 1: The creek would continue to provide base flow conveyance.

Goal 2: The new Miller Creek channel would provide improved fish habitat.

Goal 3: The mitigation would accommodate peak flows up to the 100-year flow; no net reduction of 100-year floodplain storage or floodway conveyance.

Goal 4: Minimum flow velocity should minimize fine sediment deposition.

Goal 5: The channel would replace or increase riparian habitat.

Goal 6: The channel cannot include expansive, long-standing water pools or wetlands that could potentially attract wildlife.

Goal 7: The proposed Miller Creek corridor should accommodate passive recreational uses, such as walking trails

Beneficial uses of the three Miller Creek drainage channels include flow conveyance, base flow seepage, water quality benefits from natural filtration, and limited habitat. Mitigating fill impacts would include:

Drainage Channel Goals

Goal 1: The mitigation drainage channel would continue to provide adequate flow conveyance.

Goal 2: The mitigation drainage channel would collect seepage to maintain base flows.

Goal 3: The new drainage channel would provide an open channel of equivalent length as the existing drainage channels.

The mitigation site was chosen because it is relatively close to the edge of the third parallel runway embankment, therefore, requires the shortest stream relocation length. Also, extremely flat site conditions dictate that the proposed channel be as short as possible to provide the maximum possible channel slope. The proposed realigned creek would be located as close to the base of the proposed fill slope of the new parallel runway as possible. The downstream end of the channel would connect with the existing Miller Creek channel at the earliest possible point to minimize stream relocation impacts. The channel edge would be a minimum of 25 feet from the base of the slope, to accommodate a riparian buffer. However, because of the limited space between Lora Lake and the proposed embankment, narrower buffers might be required in this area. To compensate for the restrictive high flow area, flows in excess of channel capacity are planned to be diverted from the main channel of Miller Creek into Lora Lake and then reintroduced at the lake outlet channel.

The drainage channel mitigation site was selected as the only appropriate option for recreating the equivalent drainage length for the filled drainage channels. The existing channels could not be left undisturbed or reconstructed on the fill slope because of fill stability requirements.

Approximately 9,630 cubic yards of floodplain storage would be lost in the proposed fill area due to the Master Plan Update improvements. Approximately 10,000 cubic yards of floodplain storage and floodway conveyance would be created, not including storage for the proposed stream channel.

* * *

Potential environmental impacts of relocating Miller Creek and its tributaries are discussed in an attachment to the JARPA 404 permit application titled "Relocation Plan for Proposed Master Plan Update Improvements at Seattle-Tacoma International Airport" dated December 1996. This document, which includes a detailed mitigation plan, was submitted as part of the Section 404 permit for the wetland mitigation site and Miller Creek relocation. This document is on file with the U.S. Army Corps of Engineers, Seattle District Office and is the subject of the 404 public hearing process. Among other topics, that document discusses potential impacts to fish and wildlife, aquatic habitat, floodplain, and riparian vegetation.

.2. RAPTOR SURVEY

The Final EIS found that a number of species of fauna exist in the airport area. Among these were a number of bird species that are known to inhabit the area where the third parallel runway would be completed. However, no threatened or endangered species were identified: the U.S. Fish and Wildlife Service concurred with this finding. The Final EIS also indicated that no raptors nest in the area where the third parallel runway would be located. However, subsequent to the publication of the Final EIS, several residents notified the Port of Seattle that raptors, specifically the Red-tailed hawk (*Buteo jamaicensis*), were seen nesting in that area. As a result of these comments, the Port commissioned a survey of the area to determine if raptors were nesting in forested areas west of the Airport.

Appendix M of the Final EIS states the following:

> "Bird species observed in this habitat include European starling, barn swallow, tree swallow, goldfinch, and white-crowned sparrow. Predatory birds and mammals, such as red-tailed hawk, Cooper's hawk, and coyote, commonly hunt in open grassland areas and may utilize these portions of the site."
>
> "Mixed deciduous/coniferous forest in the portion of the project area west of the AOA provides habitat for a variety of wildlife due to its vegetative diversity and availability of forage and nest sites. This forested habitat is downslope from the airport flight operations area and is less disturbed than the Lake Reba wetland complex or other forested areas within the immediate vicinity of the AOA. Several species of songbirds utilize the area for foraging and nesting including northern flicker, downy woodpecker, bushtit, American robin, black-capped chickadee, Steller's jay, and song sparrow. Mammals likely to use this portion of the site include opossum, raccoon, coyote, shrew-mole,

Townsend's vole, deer mouse, masked shrew, and striped skunk. Several eastern gray squirrels and coyote scat were observed during field surveys."

"Approximately 187 acres of second-growth deciduous forest lies in the central portion of the South Borrow Area. This area encompasses Des Moines Creek Park and provides the most valuable wildlife habitat in the project area. Because of its size, high snag density, and vegetative and structural diversity, this woodland parcel provides habitat for interior-dependent wildlife species and neo-tropical migrant songbirds, including the pileated woodpecker. The pileated woodpecker is currently listed as a State candidate species for protection, because of limited breeding areas and feeding territories.[10/] Pileated woodpeckers typically inhabit dense, mature forests with significant numbers of large snags and fallen trees. Nest trees west of the Cascades are generally Douglas fir or grand fir snags with bark and broken tops.[11/] Two potential nest trees are located upslope from the west bank of Des Moines Creek. Pileated woodpeckers forage for insects on large snags, logs, or stumps. Recently excavated snags provide evidence of foraging activity in this area. ... Snags and large trees in this area provide perch sites for raptors. A red-tailed hawk was observed perched on a snag upslope from Des Moines Creek. At dusk on the same day, a great-horned owl was observed perched in a large Douglas fir tree near the same snag. Several band-tailed pigeons were observed along the edge of this forested habitat during field surveys conducted in December 1994. "

"The large complex of wetlands surrounding Lake Reba (Regional Stormwater Detention Facility) and Lora Lake, located immediately north of the airport runways in the North Borrow Area, contains open water, emergent, scrub-shrub, and forested wetlands that potentially provide quality habitat for a variety of wildlife. High vegetative diversity and availability of forage and nest sites makes this area some of the most valuable wildlife habitat in the study area. Additional significant habitat features commonly occurring in this area include snags and downed woody debris. However, significant noise from aircraft limits use of the area to disturbance-tolerant species. Low altitude fly-over by aircraft occur frequently, because of the areas' proximity to runways. Bird species observed in this area during field visits include black-capped chickadee, bushtit, American robin, European starling, dark-eyed junco, song sparrow, and common flicker. These species are year-round residents and utilize this area for foraging and breeding. Several bird nests were observed in the forested wetland areas surrounding Lake Reba and Lora Lake. Disturbance-sensitive, migratory bird species such as Swainson's thrush, olive-sided flycatcher, and orange-crowned warbler may forage during late summer and fall migrations. Consultation with a Port of Seattle biologist confirmed use of the site by raptors, especially red-tailed hawks. No known nesting activity occurs on the site; however, red-tailed hawks and other raptors such as Northern harrier, sharp-shinned hawk, and Cooper's hawk, utilize grassland and forested areas of the site for foraging and perching.[12/] Snags and downed trees along wetland edges are used as perch sites for these species. Red-tailed hawks were frequently observed flying over the site and perching on the Airport directional towers near Lake Reba."

"Emergent marsh adjacent to SR 518 and north of Lake Reba supports a variety of wildlife species. This area is bordered by forested wetland and shrubland on all sides except for the northern side, where it borders SR 518. The convergence of forest, shrub, and emergent marsh habitats in this area provides an abundance of habitat niches for birds, small mammals, and amphibians. Numerous small mammal tunnels were observed in ground vegetation throughout this area. The abundance of small mammals in this area provides quality foraging habitat for predatory birds and mammals. Raptors were frequently observed circling this area during field visits."

"Open-water habitats in the project area, such as Tub Lake and Angle Lake, and their associated wetlands provide valuable habitat for an assemblage of species similar to that of the Lake Reba complex. High structural diversity, high snag density, large amounts of woody debris, and downed trees provide an abundance of habitat niches for many species. These areas provide quality breeding and foraging habitat for migratory and resident waterfowl. Bald eagles use open water and wetland habitats at Angle Lake for foraging and perching. In 1995, a pair of bald eagles attempted to nest on private property along the northern edge of Angle Lake. The nesting attempt was unsuccessful (e.g., no young were produced); however the pair still occupies the area. Additional information on the eagle

10/ *Management Recommendations for Priority Species*. Washington State Department of Wildlife, 1991.
11/ *Home Range and Habitat Use of Pileated Woodpeckers, Western Oregon*. Mellen, T.K., Oregon State University, 1987.
12/ Personal communication with author. Bullman, Dennis, Port of Seattle, June 2,1994.

nest and an analysis of potential effects of the proposed project on the eagle pair would be presented as an addendum to the Biological Assessment in the Final EIS."

On September 23, 1996 a ground survey was conducted of Port-owned land to the west of the existing parallel runways. This area, as identified in the EIS, consists of mixed vegetation including mixed forest and shrub/grassland. All trees capable of supporting a raptor nest and greater than 15 feet tall were examined from all aspects using binoculars. The tree trunk was examined from beneath the canopy and the area under the tree was also examined for feces and prey remains. Squirrel nests were also examined for nest modifications to ensure that sharp-shinned hawks were not occupying the nests. The conclusion of the survey is that raptors are not nesting in this area.

Raptors reported in the area include the sharp-shinned hawks *(Accipiter straitus)*, Coopers hawk *(Accipiter cooperi)*, Red-tailed hawk (*Buteo jamaicensis*), Northern harrier *(Circus cyaneus)*, and American kestrel *(Falco spaverius)*. The most commonly reported raptor is the Red-tailed hawk, which usually nests in deciduous trees in mixed open forest, and nests in conifers have been seen. Nests are usually placed in the divergence between limbs of the tree, and are composed of twigs, branches, and some live foliage. Nests can usually be found between 15 to 70 feet above the ground. The Red-tailed hawk exhibits territorial fidelity over multiple nesting seasons and each territory may contain more than one alternative nest.

Sharp-shinned hawks have also been observed in the area. Their nests are usually associated with dense mixed or coniferous forest habitat, with nests made of fine twigs, conifer needles, and deciduous leaves. These nests are usually located near the trunk of a conifer.

Northern harriers nest in open prairie, savannah, or wetland areas. The mixed vegetation in the Airport area is not well suited to the northern harrier habitat. Harriers usually forage over open areas with low ground cover.

American kestrels are cavity-nesters and prefer open areas with scattered trees.

No raptor nests were found in the study area. Three squirrel nests were examined and determined to not be used by sharp-shinned hawks. One sharp-shinned hawk was observed in the study area, and one Red-tailed hawk was also observed soaring over the area. Raptor use of the area is likely limited to foraging. All of the raptors noted use a perching strategy for foraging and likely use the area as a vantage point over the open vegetation of the Airport.

In removing trees from Airport property, the Port will comply with the Endangered Species Act, the Migratory Bird Treaty Act, and other legal requirements should applicable species be identified.

While no raptors were identified, other wildlife species observed included cedar waxwing, common flicker, Stellar's Jay, black capped chickadee, bushtit, house finch, American goldfinch, Hutton's vireo, European starling and rock dove. None of these species are threatened or endangered.

TABLE 5-5-2

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

SUMMARY OF WETLAND IMPACTS AND COMPENSATORY DESIGN OBJECTIVES

Project Impact	Compensatory Design Objectives	Potential Acreage Provided[1]	Compensation Ratio[1]
Fill of 7.34 acres of forested wetland and loss of associated wildlife habitat.	Provide in-kind replacement of forested wetland vegetation cover and increase overall wildlife habitat value.	14.68 acres of forested wetland	2.0:1
Fill of 2.01 acre of shrub wetland and loss of associated wildlife habitat.	Provide in-kind replacement of shrub wetland vegetation cover and increase overall wildlife habitat value.	2.01 acres of shrub wetland	1.0:1
Fill of 2.88 acres of emergent wetland and loss of associated wildlife habitat.	Provide in-kind replacement of emergent wetland vegetation cover and increase wildlife habitat value.	4.32 acres of emergent wetland	1.5:1
Loss of water quality functions.	On-site replacement of surface water functions would be included in the engineering design of the proposed Master Plan Update improvements. The design features would include 3-celled wetponds (with a maximum 48-hour detention), wet vaults, bioswales, and detention, as necessary to meet or exceed all BMPs.	Best Management Practices for stormwater quality would be followed.	NA
	Additional mitigation to provide flood storage capacity in the Green River drainage basin.	Approximately 30 to 60 acre-ft of flood storage capacity.	NA
Loss of degraded wetland buffers.	In-kind replacement for upland buffer impacts and additional mitigation for wildlife using both wetland and non-wetland habitats.	Approximately 3 acres of forested upland buffer.	NA

1 Acreages of mitigation and compensation ratios are identified as potential since verification of wetland impacts is in process and because ratios would be subject to negotiation.

NA = Not applicable.
Source: Parametrix, December 1996.

TABLE 5-5-3
SUMMARY OF POTENTIAL MITIGATION SITES ANALYZED WITHIN THE MILLER CREEK AND DES MOINES CREEK WATERSHEDS

Site	Watershed	Acres	Existing Conditions	Mitigation Limitations
1	Miller Creek	55	The site is within the direct flight path to the Airport. It is within an abandoned residential area and is being developed as the North SeaTac Park (which includes play fields, a picnic shelter, restrooms, a playground, parking, and trails), pursuant to an agreement between the Port of Seattle and the City of SeaTac.	Use of the site for wetland mitigation would eliminate use of much of the site as community park. The site is approximately 6,400 ft north of the existing runways. Enhancement of wildlife habitat in this area would increase wildlife hazards to aircraft.
2	Miller Creek	14	The area is within the direct flight path to the Airport. It is in an abandoned residential area with scattered deciduous trees, blackberries, grasses, and weeds. The site drains from east to west into Tub Lake.	Some slopes on the site are steeper than mapped in the GIS data base, and only approximately 5 acres of the site are suitable for wetland creation. The site is 4,500 ft north of the existing runways, and enhancement of wildlife habitat in this area would increase wildlife hazards to aircraft.
3	Miller Creek	33	The area is in an abandoned residential area in the direct flight path to the Airport. Vegetation is largely comprised of blackberries, ornamental trees, grasses, and weeds. The smaller, northern portion of the site connects to the Tub Lake wetland on one side, with an approximate rise in elevation of 30 to 50 ft on other sides. The southern portion of the site is also topographically higher than the Tub Lake wetland.	The site is fragmented by three streets, which could be detrimental to wildlife using a created wetland at this site. The site is approximately 2,600 ft north of the nearest existing runway. Creation of wetland habitat at this site would increase wildlife hazards to aircraft.
4	Miller Creek	17	The area is at a topographic high point in the direct flight path of airplanes landing and taking off from the airport. There are patches of mixed deciduous and ornamental trees. A large water tower lies in the northern portion of the site.	The area is not large enough to mitigate wetland impacts at one site, and there is no wildlife corridor to the other potential sites or other habitat areas. The site is within the fenced airport security area which would preclude use of the wetland by some forms of wildlife including deer, coyote, and fox. The site is within the area of proposed Master Plan Update Improvements where warehouse and parking is proposed. This site is approximately 2,300 ft north of the nearest runway. Wetland creation would not be feasible due to the close proximity of low-flying aircraft and increased wildlife hazards.

TABLE 5-5-3(Continued)

SUMMARY OF POTENTIAL MITIGATION SITES ANALYZED WITHIN THE MILLER CREEK AND DES MOINES CREEK WATERSHEDS

Site	Watershed	Acres	Existing Conditions	Mitigation Limitations
5	Miller Creek	11	The site is on a slope within the fenced airport security area. Patches of deciduous and ornamental trees are scattered throughout the site.	The majority of the site would be developed as part of the Master Plan Update Improvements. It appears that only about one or two acres would remain after construction. The close proximity to existing airport operations (approximately 2,000 ft from existing runways and 1,000 ft from the proposed runway) results in increased wildlife hazards to aircraft.
6 and 7	Miller Creek	45	These sites are grassy areas between the existing runways and taxiways within the airport operation area.	Locating wetland habitat within the airport operation are not feasible for safety reasons.
8	Miller Creek	23	This site consists of landscaped yards in a semi-rural residential area west of the airport. Miller Creek flows through portions of the relatively flat site.	The eastern portion of this site is within the fill footprint for the proposed runway. The remaining portion of the site is not large enough to mitigate for the wetland impacts associated with the project. The mitigation area would be isolated from other habitat areas by 154th Street South, the airport, and SR 509, which would not be conducive to optimal wildlife habitat. The mitigation area would be 3,100 ft southwest of the end of the nearest existing runway and 2,100 ft southwest of the end of the proposed runway. The site is approximately 1,000 ft directly west of the edge of the proposed runway. The close proximity of airport operations increases the wildlife hazard to low-flying aircraft.
9	Des Moines Creek	24	The site is a cemetery.	It would not be reasonable to locate wetland mitigation in a cemetery. The proximity of the site (3,600 ft southeast of the end of the nearest runway and 2,600 ft east of the edge of the nearest runway) to runways presents a wildlife hazard to aircraft.
10, 11, 13, and 14	Miller Creek (sites 10 and 13) and Des Moines Creek (sites 11	100	These sites are located between and adjacent to the existing runways and taxiways. They are grassy areas mowed and maintained for airport safety reasons.	Locating wetland habitat within the airport operations area is not feasible due to safety reasons.

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TABLE 5-5-3(Continued)

SUMMARY OF POTENTIAL MITIGATION SITES ANALYZED WITHIN THE MILLER CREEK AND DES MOINES CREEK WATERSHEDS

Site	Watershed	Acres	Existing Conditions	Mitigation Limitations
	and 14)			
12	Miller Creek	16	This relatively flat area consists of large expanses of lawn bordered by roads, houses, and a large scrub/shrub wetland.	Wetland mitigation at this site would require displacement of additional residents. The site is not large enough to mitigate all of the wetland impacts at one location. The area is bordered by major roadways (SR 509 and Des Moines Way South) on two of the three sides, which would not be conducive to optimal wildlife habitat. Mitigation would be about 1,800 ft west of the proposed runway and approximately 4,500 ft from either end of the proposed runway. The close proximity of the proposed runway to mitigation increases the wildlife hazard to aircraft.
15	Des Moines Creek	11	Site 15 is a horse pasture surrounded on three sides by steep slopes. A scrub/shrub wetland, which connects to Bow Lake, lies on the western side of the pasture. Single family homes, a trailer park, and a hotel overlook the site.	Less than half of the site would be available for wetland mitigation due to the surrounding topography and the presence of existing wetland. The close proximity of a trailer park, hotel, and single-family homes; and the small size of available upland area make this site undesirable for wetland habitat mitigation. The site is roughly 5,200 ft east of the ends of the existing runways, and 4,700 ft east of the edge of the nearest runway.
16	Des Moines Creek	35	Site 16 is located in the direct flight path and consists of the northern portion of Tyee Valley Golf Course. Currently, a safety area for Runway 34R, which encroaches on the golf course, is under construction.	Much of the area is included in the Master Plan Update Improvement area (including the safety area under construction and the SASA). If the preferred alternative for the airport expansion is implemented, there would not be enough suitable land remaining for wetland creation. Mitigation at this site may not be protected in perpetuity due to the close proximity of airport operations. It is approximately 1,500 ft south of Runway 34R which would increase wildlife hazards to aircraft.
17	Des Moines Creek	23	This site is the southern portion of Tyee Valley Golf Course. It is bordered by a mixed	The site would be confined by ongoing disturbances or developments including the airport, the SASA area, and borrow

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TABLE 5-5-3(Continued)

SUMMARY OF POTENTIAL MITIGATION SITES ANALYZED WITHIN THE MILLER CREEK AND DES MOINES CREEK WATERSHEDS

Site	Watershed	Acres	Existing Conditions	Mitigation Limitations
			forest to the west and south, residential and recreational to the east, and the northern portion of the golf course to the north. Des Moines Creek divides the northern and southern portions of the golf course.	areas for construction of the proposed runway, which is not conducive for wildlife habitat replacement. It is 2,100 ft directly south of the end of runway 34R, which results in increased wildlife hazards to aircraft. There is not enough land to mitigate wetland impacts on one site that could be protected in perpetuity.
18	Des Moines Creek	16	This site consists of grass pastures and landscaped yards adjacent to a forested area on the west side, and residential areas to the north, east, and south. Most of the site is on a topographically high area.	The necessary acreage required for compensatory mitigation could not be attained at this site. It is fragmented by homes and active roads, and residents would have to be displaced for mitigation. The site is approximately 4,900 ft south of the existing runways, and increases wildlife hazards to aircraft.
19	Des Moines Creek	12	Site 19 consists of landscaped yards and some pasture area with large forested area to the north. Most of the site is topographically high.	Several roads and homes fragment this site. Mitigation would require displacing several residents, businesses, and possibly vacating roads. The necessary acreage required for compensatory mitigation could not be attained at this site. Site 19 is approximately 5,200 ft south of the existing runways, and increases wildlife hazards to aircraft.

Source: Parametrix December 1996.

U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS

Date: 5/1/97

Initiated by: AAS-310 and APP-600

AC No: 150/5200-33

Change:

1. **PURPOSE.** This advisory circular (AC) provides guidance on locating certain land uses having the potential to attract hazardous wildlife to or in the vicinity of public-use airports. It also provides guidance concerning the placement of new airport development projects (including airport construction, expansion, and renovation) pertaining to aircraft movement in the vicinity of hazardous wildlife attractants. Appendix 1 provides definitions of terms used in this AC.

2. **APPLICATION.** The standards, practices, and suggestions contained in this AC are recommended by the Federal Aviation Administration (FAA) for use by the operators and sponsors of all public-use airports. In addition, the standards, practices, and suggestions contained in this AC are recommended by the FAA as guidance for land use planners, operators, and developers of projects, facilities, and activities on or near airports.

3. **BACKGROUND.** Populations of many species of wildlife have increased markedly in the last few years. Some of these species are able to adapt to human-made environments, such as exist on and around airports. The increase in wildlife populations, the use of larger turbine engines, the increased use of twin-engine aircraft, and the increase in air-traffic, all combine to increase the risk, frequency, and potential severity of wildlife-aircraft collisions.

Most public-use airports have large tracts of open, unimproved land that are desirable for added margins of safety and noise mitigation. These areas can present potential hazards to aviation because they often attract hazardous wildlife. During the past century, wildlife-aircraft strikes have resulted in the loss of hundreds of lives world-wide, as well as billions of dollars worth of aircraft damage. Hazardous wildlife attractants near airports could jeopardize future airport expansion because of safety considerations.

DAVID L. BENNETT
Director, Office of Airport Safety and Standards

SECTION 1. HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS.

1-1. TYPES OF HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS. Human-made or natural areas, such as poorly-drained areas, retention ponds, roosting habitats on buildings, landscaping, putrescible-waste disposal operations, wastewater treatment plants, agricultural or aquacultural activities, surface mining, or wetlands, may be used by wildlife for escape, feeding, loafing, or reproduction. Wildlife use of areas within an airport's approach or departure airspace, aircraft movement areas, loading ramps, or aircraft parking areas may cause conditions hazardous to aircraft safety.

All species of wildlife can pose a threat to aircraft safety. However, some species are more commonly involved in aircraft strikes than others. Table 1 lists the wildlife groups commonly reported as being involved in damaging strikes to U.S. aircraft from 1993 to 1995.

Table 1. Wildlife Groups Involved in Damaging Strikes to Civilian Aircraft, USA, 1993-1995.

Wildlife Groups	Percent involvement in reported damaging strikes
Gulls	28
Waterfowl	28
Raptors	11
Doves	6
Vultures	5
Blackbirds-Starlings	5
Corvids	3
Wading birds	3
Deer	11
Canids	1

1-2. LAND USE PRACTICES. Land use practices that attract or sustain hazardous wildlife populations on or near airports can significantly increase the potential for wildlife-aircraft collisions. FAA recommends against land use practices, within the siting criteria stated in 1-3, that attract or sustain populations of hazardous wildlife within the vicinity of airports or cause movement of hazardous wildlife onto, into, or across the approach or departure airspace, aircraft movement area, loading ramps, or aircraft parking area of airports.

Airport operators, sponsors, planners, and land use developers should consider whether proposed land uses, including new airport development projects, would increase the wildlife hazard. Caution should be exercised to ensure that land use practices on or near airports do not enhance the attractiveness of the area to hazardous wildlife.

1-3. SITTING CRITERIA. FAA recommends separations when siting any of the wildlife attractants mentioned in Section 2 or when planning new airport development projects to accommodate aircraft movement. The distance between an airport's aircraft movement areas, loading ramps, or aircraft parking areas and the wildlife attractant should be as follows:

a. Airports serving piston-powered aircraft. A distance of 5,000 feet is recommended.

b. Airports serving turbine-powered aircraft. A distance of 10,000 feet is recommended.

c. Approach or Departure airspace. A distance of 5 statute miles is recommended, if the wildlife attractant may cause hazardous wildlife movement into or across the approach or departure airspace.

SECTION 2. LAND USES THAT ARE INCOMPATIBLE WITH SAFE AIRPORT OPERATIONS.

2-1. GENERAL. The wildlife species and the size of the populations attracted to the airport environment are highly variable and may depend on several factors, including land-use practices on or near the airport. It is important to identify those land use practices in the airport area that attract hazardous wildlife. This section discusses land use practices known to threaten aviation safety.

2-2. PUTRESCIBLE-WASTE DISPOSAL OPERATIONS. Putrescible-waste disposal operations are known to attract large numbers of wildlife that are hazardous to aircraft. Because of this, these operations, when located within the separations identified in the sitting criteria in 1-3 are considered incompatible with safe airport operations.

FAA recommends against locating putrescible-waste disposal operations inside the separations identified in the siting criteria mentioned above. FAA also recommends against new airport development projects that would increase the number of aircraft operations or that would accommodate larger or faster aircraft, near putrescible-waste disposal operations located within the separations identified in the siting criteria in 1-3.

2-3. WASTEWATER TREATMENT FACILITIES. Wastewater treatment facilities and associated settling ponds often attract large numbers of wildlife that can pose a threat to aircraft safety when they are located on or near an airport.

a. New wastewater treatment facilities. FAA recommends against the construction of new wastewater treatment facilities or associated settling ponds within the separations identified in the siting criteria in 1-3. During the siting analysis for wastewater treatment facilities, the potential to attract hazardous wildlife should be considered if an airport is in the vicinity of a proposed site. Airport operators should voice their opposition to such sitings. In addition, they should consider the existence of wastewater treatment facilities when evaluating proposed sites for new airport development projects and avoid such sites when practicable.

b. Existing wastewater treatment facilities. FAA recommends correcting any wildlife hazards arising from existing wastewater treatment facilities located on or near airports without delay, using appropriate wildlife hazard mitigation techniques. Accordingly, measures to minimize hazardous wildlife attraction should be developed in consultation with a wildlife damage management biologist. FAA recommends that wastewater treatment facility operators incorporate appropriate wildlife hazard mitigation techniques into their operating practices. Airport operators also should encourage those operators to incorporate these mitigation techniques in their operating practices.

c. Artificial marshes. Waste-water treatment facilities may create artificial marshes and use submergent and emergent aquatic vegetation as natural filters. These artificial marshes may be used by some species of flocking birds, such as blackbirds and waterfowl, for breeding or roosting activities. FAA recommends against establishing artificial marshes within the separations identified in the siting criteria stated in 1-3.

d. Wastewater discharge and sludge disposal. FAA recommends against the discharge of wastewater or sludge on airport property. Regular spraying of wastewater or sludge disposal on unpaved areas may improve soil moisture and quality. The resultant turf growth requires more frequent mowing, which in turn may mutilate or flush insects or small animals and produce straw. The maimed or flushed organisms and the straw can attract hazardous wildlife and jeopardize aviation safety. In addition, the improved turf may attract grazing wildlife such as deer and geese.

Problems may also occur when discharges saturate unpaved airport areas. The resultant soft, muddy conditions can severely restrict or prevent emergency vehicles from reaching accident sites in a timely manner.

e. Underwater waste discharges. The underwater discharge of any food waste, e.g., fish processing offal, that could attract scavenging wildlife is not recommended within the separations identified in the siting criteria in 1-3.

2-4. WETLANDS.

a. Wetlands on or near Airports.

(1) Existing Airports. Normally, wetlands are attractive to many wildlife species. Airport operators with wetlands located on or nearby airport property should be alert to any wildlife use or habitat changes in these areas that could affect safe aircraft operations.

(2) Airport Development. When practicable, the FAA recommends siting new airports using the separations identified in the siting criteria in 1-3. Where alternative sites are not practicable or when expanding existing airports in or near wetlands, the wildlife hazards should be evaluated and minimized through a wildlife management plan prepared by a wildlife damage management biologist, in consultation with the U.S. Fish and Wildlife Service (USFWS) and the U.S. Army Corps of Engineers (COE).

NOTE: If questions exist as to whether or not an area would qualify as a wetland, contact the U.S. Army COE, the Natural Resource Conservation Service, or a wetland consultant certified to delineate wetlands.

b. Wetland mitigation. Mitigation may be necessary when unavoidable wetland disturbances result from new airport development projects. Wetland mitigation should be designed so it does not create a wildlife hazard.

(1) FAA recommends that wetland mitigation projects that may attract hazardous wildlife be sited outside of the separations identified in the siting criteria in 1-3. Wetland mitigation banks meeting these siting criteria offer an ecologically sound approach to mitigation in these situations.

(2) Exceptions to locating mitigation activities outside the separations identified in the siting criteria in 1-3 may be considered if the affected wetlands provide unique ecological functions, such as critical habitat for threatened or endangered species or ground water recharge. Such mitigation must be compatible with safe airport operations. Enhancing such mitigation areas to attract hazardous wildlife should be avoided. On-site mitigation plans may be reviewed by the FAA to determine compatibility with safe airport operations.

(3) Wetland mitigation projects that are needed to protect unique wetland functions (see 2-4.b.(2)), and that must be located in the siting criteria in 1-3 should be identified and evaluated by a wildlife damage management biologist before implementing the mitigation. A wildlife damage management plan should be developed to reduce the wildlife hazards.

NOTE: AC 150/5000-3, *Address List for Regional Airports Division and Airports District/Field Offices*, provides information on the location of these offices.

2-5. DREDGE SPOIL CONTAINMENT AREAS. FAA recommends against locating dredge spoil containment areas within the separations identified in the siting criteria in 1-3, if the spoil contains material that would attract hazardous wildlife.

SECTION 3. LAND USES THAT MAY BE COMPATIBLE WITH SAFE AIRPORT OPERATIONS.

3-1. GENERAL. Even though they may, under certain circumstances, attract hazardous wildlife, the land use practices discussed in this section have flexibility regarding their location or operation and may even be under the airport operator's or sponsor's control. In general, the FAA does not consider the activities discussed below as hazardous to aviation if there is no apparent attraction to hazardous wildlife, or wildlife hazard mitigation techniques are implemented to deal effectively with any wildlife hazard that may arise.

3-2. ENCLOSED WASTE FACILITIES. Enclosed trash transfer stations or enclosed waste handling facilities that receive garbage indoors; process it via compaction, incineration, or similar manner; and remove all residue by enclosed vehicles, generally would be compatible, from a wildlife perspective, with safe airport operations, provided they are not located on airport property or within the runway protection zone (RPZ). No putrescible-waste should be handled or stored outside at any time, for any reason, or in a partially enclosed structure accessible to hazardous wildlife.

Partially enclosed operations that accept putrescible-waste are considered to be incompatible with safe airport operations. FAA recommends these operations occur outside the separations identified in the siting criteria in 1-3.

3-3. RECYCLING CENTERS. Recycling centers that accept previously sorted, non-food items such as glass, newspaper, cardboard, or aluminum are, in most cases, not attractive to hazardous wildlife.

3-4. COMPOSTING OPERATIONS ON AIRPORTS. FAA recommends against locating composting operations on airports. However, when they are located on an airport, composting operations should not be located closer than the greater of the following distances: 1,200 feet from any aircraft movement area, loading ramp, or aircraft parking space; or the distance called for by airport design requirements. This spacing is intended to prevent material, personnel, or equipment from penetrating any Obstacle Free Area (OFA), Obstacle Free Zone (OFZ), Threshold Siting Surface (TSS), or Clearway (see AC 150/5300-13, *Airport Design*). On-airport disposal of compost by-products is not recommended for the reasons stated in 2-3.d.

a. Composition of material handled. Components of the compost should never include any municipal solid waste. Non-food waste such as leaves, lawn clippings, branches, and twigs generally are not considered a wildlife attractant. Sewage sludge, wood-chips, and similar material are not municipal solid wastes and may be used as compost bulking agents.

b. Monitoring on-airport composting operations. If composting operations are to be located on airport property, FAA recommends that the airport operator monitor composting operations to ensure that steam or thermal rise does not affect air traffic in any way. Discarded leaf disposal bags or other debris must not be allowed to blow onto any active airport area. Also, the airport operator should reserve the right to stop any operation that creates unsafe, undesirable, or incompatible conditions at the airport.

3-5. ASH DISPOSAL. Fly ash from resource recovery facilities that are fired by municipal solid waste, coal, or wood, is generally considered not to be a wildlife attractant because it contains no putrescible matter. FAA generally does not consider landfills accepting only fly ash to be wildlife attractants, if those landfills: are maintained in an orderly manner; admit no putrescible-waste of any kind; and are not co-located with other disposal operations.

Since varying degrees of waste consumption are associated with general incineration, FAA classifies the ash from general incinerators as a regular waste disposal by-product and, therefore, a hazardous wildlife attractant.

3-6. CONSTRUCTION AND DEMOLITION (C&D) DEBRIS LANDFILLS. C&D debris (Class IV) landfills have visual and operational characteristics similar to putrescible-waste disposal sites. When co-located with putrescible-waste disposal operations, the probability of hazardous wildlife attraction to C&D landfills increases because of the similarities between these disposal activities.

FAA generally does not consider C&D landfills to be hazardous wildlife attractants, if those landfills: are maintained in an orderly manner; admit no putrescible-waste of any kind; and are not co-located with other disposal operations.

3-7. WATER DETENTION OR RETENTION PONDS. The movement of storm water away from runways, taxiways, and aprons is a normal function on most airports and is necessary for safe aircraft operations. Detention ponds hold storm water for short periods, while retention ponds hold water indefinitely. Both types of ponds control runoff, protect water quality, and can attract hazardous wildlife. Retention ponds are more attractive to hazardous wildlife than detention ponds because they provide a more reliable water source.

To facilitate hazardous wildlife control, FAA recommends using steep-sided, narrow, linearly-shaped, rip-rap lined, water detention basins rather than retention basins. When possible, these ponds should be placed away from aircraft movement areas to minimize aircraft-wildlife interactions. All vegetation in or around detention or retention basins that provide food or cover for hazardous wildlife should be eliminated.

If soil conditions and other requirements allow, FAA encourages the use of underground storm water infiltration systems, such as French drains or buried rock fields, because they are less attractive to wildlife.

3-8. LANDSCAPING. Wildlife attraction to landscaping may vary by geographic location. FAA recommends that airport operators approach landscaping with caution and confine it to airport areas not associated with aircraft movements. All landscaping plans should be reviewed by a wildlife damage management biologist. Landscaped areas should be monitored on a continuing basis for the presence of hazardous wildlife. If hazardous wildlife is detected, corrective actions should be implemented immediately.

3-9. GOLF COURSES. Golf courses may be beneficial to airports because they provide open space that can be used for noise mitigation or by aircraft during an emergency. On-airport golf courses may also be a concurrent use that provides income to the airport.

Because of operational and monetary benefits, golf courses are often deemed compatible land uses on or near airports. However, waterfowl (especially Canada geese) and some species of gulls are attracted to the large, grassy areas and open water found on most golf courses. Because waterfowl and gulls occur throughout the U.S., FAA recommends that airport operators exercise caution and consult with a wildlife damage management biologist when considering proposals for golf course construction or expansion on or near airports. Golf courses should be monitored on a continuing basis for the presence of hazardous wildlife. If hazardous wildlife is detected, corrective actions should be implemented immediately.

3-10. AGRICULTURAL CROPS. As noted above, airport operators often promote revenue-generating activities to supplement an airport's financial viability. A common concurrent use is agricultural crop production. Such use may create potential hazards to aircraft by attracting wildlife. Any proposed on-airport agricultural operations should be reviewed by a wildlife damage management biologist. FAA generally does not object to agricultural crop production on airports when: wildlife hazards are not predicted; the guidelines for the airport areas specified in 3-10.a-f. are observed; and the agricultural operation is closely monitored by the airport operator or sponsor to ensure that hazardous wildlife are not attracted.

NOTE: If wildlife becomes a problem due to on-airport agricultural operations, FAA recommends undertaking the remedial actions described in 3-10.f.

a. Agricultural activities adjacent to runways. To ensure safe, efficient aircraft operations, FAA recommends that no agricultural activities be conducted in the Runway Safety Area (RSA), OFA, and the OFZ (see AC 150/5300-13).

b. Agricultural activities in areas requiring minimum object clearances. Restricting agricultural operations to areas outside the RSA, OFA, OFZ, and Runway Visibility Zone (RVZ) (see AC 150/5300-13) will normally provide the minimum object clearances required by FAA's airport design standards. FAA recommends that farming operations not be permitted within areas critical to the proper operation of localizers, glide slope indicators, or other visual or electronic navigational aids. Determinations of minimal areas that must be kept free of farming operations should be made on a case-by-case basis. If navigational aids are present, farm leases for on-airport agricultural activities should be coordinated with FAA's Airway Facilities Division, in accordance with FAA Order 6750.16, *Siting Criteria for Instrument Landing Systems.*

NOTE: Crop restriction lines conforming to the dimensions set forth in Table 2 will normally provide the minimum object clearance required by

FAA airport design standards. The presence of navigational aids may require expansion of the restricted area.

c. Agricultural activities within an airport's approach areas. The RSA, OFA, and OFZ all extend beyond the runway shoulder and into the approach area by varying distances. The OFA normally extends the farthest and is usually the controlling surface. However, for some runways, the TSS (see AC 150/5300-13, Appendix 2) may be more controlling than the OFA. The TSS may not be penetrated by any object. The minimum distances shown in Table 2 are intended to prevent penetration of the OFA, OFZ, or TSS by crops or farm machinery.

NOTE: Threshold Siting standards should not be confused with the approach areas described in Title 14, Code of Federal Regulations, Part 77, (14 CFR 77), *Objects Affecting Navigable Airspace*.

d. Agricultural activities between intersecting runways. FAA recommends that no agricultural activities be permitted within the RVZ. If the terrain is sufficiently below the runway elevation, some types of crops and equipment may be acceptable. Specific determinations of what is permissible in this area requires topographical data. For example, if the terrain within the RVZ is level with the runway ends, farm machinery or crops may interfere with a pilot's line-of-sight in the RVZ.

e. Agricultural activities in areas adjacent to taxiways and aprons. Farming activities should not be permitted within a taxiway's OFA. The outer portions of aprons are frequently used as a taxilane and farming operations should not be permitted within the OFA. Farming operations should not be permitted between runways and parallel taxiways.

f. Remedial actions for problematic agricultural activities. If a problem with hazardous wildlife develops, FAA recommends that a professional wildlife damage management biologist be contacted and an on-site inspection be conducted. The biologist should be requested to determine the source of the hazardous wildlife attraction and suggest remedial action. Regardless of the source of the attraction, prompt remedial actions to protect aviation safety are recommended. The remedial actions may range from choosing another crop or farming technique to complete termination of the agricultural operation.

Whenever on-airport agricultural operations are stopped due to wildlife hazards or annual harvest, FAA recommends plowing under all crop residue and harrowing the surface area smooth. This will reduce or eliminate the area's attractiveness to foraging wildlife. FAA recommends that this requirement be written into all on-airport farm use contracts and clearly understood by the lessee.

Table 2. Minimum Distances Between Certain Airport Features And Any On-Airport Agriculture Crops.

Aircraft Approach Category And Design Group [1]	Distance In Feet From Runway Centerline To Crop		Distance In Feet From Runway End To Crop		Distance In Feet From Centerline Of Taxiway To Crop	Distance In Feet From Edge Of Apron To Crop
	Visual & ≥ ¾ mile	< ¾ mile	Visual & ≥ ¾ mile	< ¾ mile		
Category A & B Aircraft						
Group I	200 [2]	400	300[3]	600	45	40
Group II	250	400	400[3]	600	66	58
Group III	400	400	600	800	93	81
Group IV	400	400	1,000	1,000	130	113
Category C, D & E Aircraft						
Group I	530[3]	575[3]	1,000	1,000	45	40
Group II	530[3]	575[3]	1,000	1,000	66	58
Group III	530[3]	575[3]	1,000	1,000	93	81
Group IV	530[3]	575[3]	1,000	1,000	130	113
Group V	530[3]	575[3]	1,000	1,000	160	138
Group VI	530[3]	575[3]	1,000	1,000	193	167

1. Design Groups are based on wing span, and Category depends on approach speed of the aircraft.

Group I:	Wing span up to 49 ft.	Category A:	Speed less than 91 knots
Group II	Wing span 49ft. up to 78 ft.	Category B	Speed 91 knots up to 120 knots
Group III:	Wing span 79 ft. up to 117 ft.	Category C	Speed 121 knots up to 140 knots
Group IV:	Wing span 118 ft. up to 170 ft.	Category D	Speed 141 knots up to 165 knots
Group V:	Wing span 171 ft. up to 213 ft.	Category E	Speed 166 knots or more
Group VI:	Wing span 214 ft. up to 261 ft.		

2. If the runway will only serve small airplanes (12,500 lb. And under) in Design Group I, this dimension may be reduced to 125 feet; however, this dimension should be increased where necessary to accommodate visual navigational aids that may be installed. For example farming operations should not be allowed within 25 feet of a Precision Approach Path Indicator (PAPI) light box.

3. These dimensions reflect the TSS as defined in AC 150/5300-13, Appendix 2. The TSS cannot be penetrated by any object. Under these conditions, the TSS is more restrictive than the OFA, and the dimensions shown here are to prevent penetration of the TSS by crops and farm machinery.

SECTION 4. NOTIFICATION OF FAA ABOUT HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AN AIRPORT.

4-1. GENERAL. Airport operators, land developers, and owners should notify the FAA in writing of known or reasonably foreseeable land use practices on or near airports that either attract or may attract hazardous wildlife. This section discusses those notification procedures.

4-2. NOTIFICATION REQUIREMENTS FOR WASTE DISPOSAL SITE OPERATIONS. The Environmental Protection Agency (EPA) requires any operator proposing a new or expanded waste disposal operation within 5 statute miles of a runway end to notify the appropriate FAA Regional Airports Division Office and the airport operator of the proposal (40 CFR 258, *Criteria for Municipal Solid Waste Landfills*, section 258.10, *Airport Safety*). The EPA also requires owners or operators of new municipal solid waste landfill (MSWLF) units, or lateral expansions of existing MSWLF units that are located within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used only by piston-type aircraft, to demonstrate successfully that such units are not hazards to aircraft.

a. Timing of Notification. When new or expanded MSWLFs are being proposed near airports. MSWLF operators should notify the airport operator and the FAA of this as early as possible pursuant to 40 CFR Part 258. Airport operators should encourage the MSWLF operators to provide notification as early as possible.

NOTE: AC 150/5000-3 provides information on these FAA offices.

b. Putrescible-Waste Facilities. In their effort to satisfy the EPA requirement, some putrescible-waste facility proponents may offer to undertake experimental measures to demonstrate that their proposed facility will not be a hazard to aircraft. To date, the ability to sustain a reduction in the numbers of hazardous wildlife to levels that existed before a putrescible-waste landfill began operating has not been successfully demonstrated. For this reason, demonstrations of experimental wildlife control measures should not be conducted in active aircraft operations areas.

c. Other Waste Facilities. To claim successfully that a waste handling facility sited within the separations identified in the siting criteria in 1-3 does not attract hazardous wildlife and does not threaten aviation. the developer must establish convincingly that the facility will not handle putrescible material other than that as outlined in 3-2. FAA requests that waste site developers provide a copy of an official permit request verifying that the facility will not handle putrescible material other than that as outlined in 3-2. FAA will use this information to determine if the facility will be a hazard to aviation.

4-3. NOTIFYING FAA ABOUT OTHER WILDLIFE ATTRACTANTS. While U. S. EPA regulations require landfill owners to provide notification, no similar regulations require notifying FAA about changes in other land use practices that can create hazardous wildlife attractants. Although it is not required by regulation, FAA requests those proposing land use changes such as those discussed in 2-3, 2-4, and 2-5 to provide similar notice to the FAA as early in the development process as possible. Airport operators that become aware of such proposed development in the vicinity of their airports should also notify the FAA. The notification process gives the FAA an opportunity to evaluate the effect of a particular land use change on aviation safety.

The land use operator or project proponent may use FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, or other suitable documents to notify the appropriate FAA Regional Airports Division Office.

It is helpful if the notification includes a 15-minute quadrangle map of the area identifying the location of the proposed activity. The land use operator or project proponent should also forward specific details of the proposed land use change or operational change or expansion. In the case of solid waste landfills, the information should include the type of waste to be handled, how the waste will be processed, and final disposal methods.

4-5. FAA REVIEW OF PROPOSED LAND USE CHANGES.

a. The FAA discourages the development of facilities discussed in section 2 that will be located within the 5,000/10,000-foot criteria in 1-3.

b. For projects which are located outside the 5,000/10,000-foot criteria, but within 5 statute miles of the airport's aircraft movement areas, loading ramps, or aircraft parking areas, FAA may review development plans, proposed land use changes, operational changes, or wetland mitigation plans to determine if such changes present potential wildlife hazards to aircraft operations. Sensitive airport areas will be identified as those that lie under or next to approach or departure airspace. This brief examination should be sufficient to determine if further investigation is warranted.

c. Where further study has been conducted by a wildlife damage management biologist to evaluate a site's compatibility with airport operations, the FAA will use the study results to make its determination.

d. FAA will discourage the development of any excepted sites (see Section 3) within the criteria specified in 1-3 if a study shows that the area supports hazardous wildlife species.

4-6. AIRPORT OPERATORS. Airport operators should be aware of proposed land use changes, or modification of existing land uses, that could create hazardous wildlife attractants within the separations identified in the siting criteria in 1-3. Particular attention should be given to proposed land uses involving creation or expansion of waste water treatment facilities, development of wetland mitigation sites, or development or expansion of dredge spoil containment areas.

a. **AIP-funded airports.** FAA recommends that operators of AIP-funded airports, to the extent practicable, oppose off-airport land use changes or practices (within the separations identified in the siting criteria in 1-3) that may attract hazardous wildlife. Failure to do so could place the airport operator or sponsor in noncompliance with applicable grant assurances. FAA recommends against the placement of airport development projects pertaining to aircraft movement in the vicinity of hazardous wildlife attractants. Airport operators, sponsors, and planners should identify wildlife attractants and any associated wildlife hazards during any planning process for new airport development projects.

b. **Additional coordination.** If, after the initial review by FAA, questions remain about the existence of a wildlife hazard near an airport, the airport operator or sponsor should consult a wildlife damage management biologist. Such questions may be triggered by a history of wildlife strikes at the airport or the proximity of the airport to a wildlife refuge, body of water, or similar feature known to attract wildlife.

c. **Specialized assistance.** If the services of a wildlife damage management biologist are required, FAA recommends that land use developers or the airport operator contact the appropriate state director of the United States Department of Agriculture/Animal Damage Control (USDA/ADC), or a consultant specializing in wildlife damage management. Telephone numbers for the respective USDA/ADC state offices may be obtained by contacting USDA/ADC's Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD, 20737-1234, Telephone (301) 734-7921, Fax (301) 734-5157. The ADC biologist or consultant should be requested to identify and quantify wildlife common to the area and evaluate the potential wildlife hazards.

d. **Notifying airmen.** If an existing land use practice creates a wildlife hazard, and the land use practice or wildlife hazard cannot be immediately eliminated, the airport operator should issue a Notice to Airmen (NOTAM) and encourage the land owner or manager to take steps to control the wildlife hazard and minimize further attraction.

APPENDIX 1. DEFINITIONS OF TERMS USED IN THIS ADVISORY CIRCULAR.

1. GENERAL. This appendix provides definitions of terms used throughout this AC.

a. **Aircraft movement area.** The runways, taxiways, and other areas of an airport which are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft exclusive of loading ramps and aircraft parking areas.

b. **Airport operator.** The operator (private or public) or sponsor of a public use airport.

c. **Approach or departure airspace.** The airspace, within 5 statute miles of an airport, through which aircraft move during landing or takeoff.

d. **Concurrent use.** Aeronautical property used for compatible non-aviation purposes while at the same time serving the primary purpose for which it was acquired; and the use is clearly beneficial to the airport. The concurrent use should generate revenue to be used for airport purposes (see Order 5190.6A, *Airport Compliance Requirements*, sect. 5h).

e. **Fly ash.** The fine, sand-like residue resulting from the complete incineration of an organic fuel source. Fly ash typically results from the combustion of coal or waste used to operate a power generating plant.

f. **Hazardous wildlife.** Wildlife species that are commonly associated with wildlife-aircraft strike problems, are capable of causing structural damage to airport facilities, or act as attractants to other wildlife that pose a wildlife-aircraft strike hazard.

g. **Piston-use airport.** Any airport that would primarily serve FIXED-WING, piston-powered aircraft. Incidental use of the airport by turbine-powered, FIXED-WING aircraft would not affect this designation. However, such aircraft should not be based at the airport.

h. **Public-use airport.** Any publicly owned airport or a privately-owned airport used or intended to be used for public purposes.

i. **Putrescible material.** Rotting organic material.

j. **Putrescible-waste disposal operation.** Landfills, garbage dumps, underwater waste discharges, or similar facilities where activities include processing, burying, storing, or otherwise disposing of putrescible material, trash, and refuse.

k. **Runway protection zone (RPZ).** An area off the runway end to enhance the protection of people and property on the ground (see AC 150/5300-13). The dimensions of this zone vary with the design aircraft, type of operation, and visibility minimum.

l. **Sewage sludge.** The de-watered effluent resulting from secondary or tertiary treatment of municipal sewage and/or industrial wastes, including sewage sludge as referenced in U.S. EPA's *Effluent Guidelines and Standards*, 40 C.F.R. Part 401.

m. **Shoulder.** An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface, support for aircraft running off the pavement, enhanced drainage, and blast protection (see AC 150/5300-13).

n. **Turbine-powered aircraft.** Aircraft powered by turbine engines including turbojets and turboprops but excluding turbo-shaft rotary-wing aircraft.

o. **Turbine-use airport.** Any airport that ROUTINELY serves FIXED-WING turbine-powered aircraft.

p. **Wastewater treatment facility.** Any devices and/or systems used to store, treat, recycle, or reclaim municipal sewage or liquid industrial wastes, including Publicly Owned Treatment Works (POTW), as defined by Section 212 of the Federal Water Pollution Control Act (P.L. 92-500) as amended by the Clean Water Act of 1977 (P.L. 95-576) and the Water Quality Act of 1987 (P.L. 100-4). This definition includes any pretreatment involving the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW. (See 40 C.F. R. Section 403.3 (o), (p), & (q)).

q. **Wildlife.** Any wild animal, including without limitation any wild mammal, bird, reptile, fish, amphibian, mollusk, crustacean, arthropod, coelenterate, or other invertebrate, including any part, product, egg, or offspring there of (50 CFR 10.12, *Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants*). As used in this AC, WILDLIFE includes feral animals and domestic animals while out of the control of their owners (14 CFR 139.3, *Certification and Operations: Land Airports Serving CAB-Certificated Scheduled Air Carriers Operating Large Aircraft (Other Than Helicopters)*).

r. **Wildlife attractants.** Any human-made structure, land use practice, or human-made or natural geographic feature, that can attract or sustain hazardous wildlife within the landing or departure airspace, aircraft movement area, loading ramps, or aircraft parking areas of an airport. These attractants can include but are not limited to architectural features, landscaping, waste disposal sites, wastewater treatment facilities, agricultural or aquacultural activities, surface mining, or wetlands.

s. **Wildlife hazard.** A potential for a damaging aircraft collision with wildlife on or near an airport (14 CFR 139.3).

2. RESERVED.

SECTION 5-6

LAND USE IMPACTS

[LAND USE COMPATIBILITY, DOT SECTION 4(F), AND ARCHAEOLOGICAL, CULTURAL, AND HISTORIC SITES]

Chapter IV of the February, 1996 Final EIS contains several sections that describe land use related impacts associated with the proposed Master Plan Update improvements. This section of the additional environmental analysis summarizes the impacts of the new forecast relative to these land use issues. Specifically addressed are:

- Population, and housing units affected by aircraft noise
- DOT Section 4(f) impacts
- Impacts to archaeological/cultural and historic sites

Tables 5-6-1 and 5-6-2 contrast the noise impacts to these facilities from the new forecasts versus the impacts associated with the Master Plan Update forecasts. **Appendix F** summarizes the comments received on the Draft Supplemental EIS and responds to comments.

1. POPULATION, HOUSING UNITS AND NOISE SENSITIVE FACILITIES AFFECTED BY AIRCRAFT NOISE

Aircraft noise is generally regarded to be the primary impact of an airport on surrounding land uses. This section summarizes the population, housing units, and noise-sensitive facilities that are affected by noise from existing airport operations (1994), and by those of the Master Plan Update improvements for future years 2000, 2005 and 2010.

(A) Existing Conditions

The Final EIS (Chapter IV, Section 2) presents a detailed description of existing noise related land use impacts. Existing land use impacts are categorized into two groups: residential uses and noise-sensitive facilities. All residential land uses, with the exception of motels and hotels, are considered to be sensitive to aircraft noise levels above 65 DNL (Day-Night Average Sound Level). Schools, nursing homes, hospitals, churches, libraries, and some public parks are also considered noise sensitive, as defined by FAA land use compatibility guidelines.

There are currently 31,800 people residing in 13,620 housing units affected by 65 DNL or greater noise levels. Of these people, the greatest proportion (34 percent, or 10,780 people) reside in the City of Des Moines. An almost equal proportion (31 percent, or 9,920 people) reside in unincorporated areas of King County, north and south of the Airport.

Table 5-6-2 shows that the following noise-sensitive facilities are affected by 65 DNL or greater noise levels under existing conditions: 28 schools, 24 churches, 2 libraries, and 3 nursing homes. While 12 parks or recreational areas are affected by 65 DNL and greater sound levels, only two are affected by 75 DNL or greater noise levels, the normal threshold of compatibility for such uses.

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(B) Future Conditions With the New Forecast

The following summarize the noise impact conditions that could occur if demand continues to grow as projected by the new forecast. **Table 5-6-3** lists the noise impacts by jurisdiction. **Appendix F** of the Final Supplemental EIS, response to comment 7-Y (Table F-7) lists the noise exposure impacts by Census Tract.

(1) Alternative 1 (Do-Nothing)

As was described in the Final EIS, noise exposure conditions are expected to continue to decline in the future as aircraft activity increases, regardless of whether the Master Plan Update improvements are undertaken. Assuming higher aviation activity levels, the reduction in noise exposure would not be as great as predicted in the Final EIS; yet would continue to be less than current levels. A total of 11,310 people in 4,820 housing units would be affected by 65 DNL or greater noise levels in the year 2000; a 64 percent reduction in population affected from existing conditions. Between 2000 and 2005 continued reductions in aircraft noise exposure due to fleet modernization are anticipated, as by 2005 all aircraft operating in the U.S. must comply with Stage 3 noise levels. However, between 2005 and 2010, as aircraft operations increase, an increase in noise exposure is anticipated -- but the impacts will be less than current conditions. By year 2010, if the Master Plan Update improvements are not undertaken, a total of 11,940 people in 5,060 housing units would be affected by 65 DNL and greater noise levels. This would be a 62 percent reduction in population affected from existing conditions.

Compared to existing conditions, the number of affected noise-sensitive facilities (65 DNL and greater) in 2010 would be reduced from 28 to 15 schools, from 24 to 13 churches, from 2 libraries to 1 library, and from 3 nursing homes to 1 nursing home. Parks and recreational facilities impacted by 75 DNL and greater noise levels would decrease from 2 (current conditions) to 1 by 2010. Impacts on local, State, and nationally recognized historic sites are discussed in a separate subsection of this section.

(2) Alternative 3 (Preferred Alternative)

While terminal improvements are anticipated to be in place by year 2000, the third parallel runway would not be used until late 2004/early 2005. As a result, the Do-Nothing and Preferred Alternative noise exposure would be the same in year 2000. By 2005, when the third parallel runway is available along with other terminal and landside improvements, the noise impacts associated with the Do-Nothing and With Project would vary. Compared to the 2005 Do-Nothing alternative, the proposed Master Plan Update improvements would affect about 10 less people with noise exposure levels of 65 DNL or greater. By 2010, when demand is expected to exceed the operating capability of the existing airfield, the proposed improvements would affect about 11 percent more people by 65 DNL and greater noise levels than the Do-Nothing (about 1,280 people in 460 dwelling units).

Assuming the higher aviation activity levels, the number of noise sensitive facilities affected was evaluated. Relative to the Do-Nothing, the proposed improvements would affect fewer noise sensitive facilities in year 2005: 4 fewer schools, 3 fewer churches, and 1 fewer nursing home. By 2010, the proposed improvements continue to affect fewer noise sensitive facilities, relative to the Do-Nothing: 2 fewer schools, 2 fewer churches and 1 fewer park. The proposed improvements would impact more residences by 2010, as noted above, but would impact fewer other noise sensitive facilities due to shifts in area underlying the noise contours associated with the third parallel runway.

In year 2010, the project impacts (noise levels above that which would occur in the Do-Nothing) would result in 1.5 DNL or greater increases at 12 noise sensitive facilities noted above: four (4) schools and eight (8) historic residences. One of the facilities is included in both the school count as well as the historic site count. Of these facilities, the greatest change would occur at Sunny Terrace Elementary (5.2 DNL in year 2010). Other significant changes, as defined by the 1.5 DNL guideline, would occur at Bryan House (5.0 DNL change in 2010), SeaTac Occupational School (4.4 DNL), Albert Paul House (3.9 DNL increase in 2010), Homer Crosby Home (3.6 DNL in 2010), Brunelle Residence (3.6 DNL in 2010), Woodside Elementary (3.1 DNL increase in 2010), Pacific Telephone Building (3.5 DNL in 2010), Coil House (1.9 DNL in 2010), and Sunnydale Elementary (2.8 DNL increase in 2010). At two sites (SeaTac Occupational School and Albert Paul House) noise levels in year 2010, with the proposed Master Plan Update improvements would be slightly greater (less than 1 DNL) than existing (1994) noise levels. While noise exposure would increase by more than 1.5 DNL at the Pacific Telephone Building, the existing and future noise exposure with and without the proposed improvements would be compatible with the existing commercial use (by U.S. West).

The following list the DNL levels at each site:

		Year 2000		Year 2005		Year 2010	
	Existing	Do-Nothing	"With Project"	Do-Nothing	"With Project"	Do-Nothing	"With Project"
Sunny Terrace Elem. (S106)	68.8	62.8	62.8	62.6	66.0	63.0	68.2
SeaTac Occupational (S102)	65.9	61.5	61.5	61.7	65.1	62.2	66.6
Woodside Elementary (S105)	66.4	62.1	62.1	62.3	64.8	62.8	65.9
Sunnydale Elementary (S21/A16)	65.8	61.6	61.6	61.7	63.7	62.3	65.1
Vacca Farm (A56)	68.0	62.4	62.4	62.5	65.6	63.0	67.3
Bryan House (A29)	68.6	62.6	62.6	62.5	65.6	62.8	67.8
Albert Paul House (A57)	66.8	62.7	62.7	62.8	65.4	63.3	67.2
Homer Crosby Home (A22)	67.2	61.5	61.5	61.4	63.5	61.8	65.4
Brunelle Residence (A27)	72.4	66.6	66.6	66.3	68.4	66.6	70.2
Pacific Telephone Building (N2)	67.0	61.4	61.4	61.3	63.3	61.7	65.2
Coil House (N16)	67.1	63.5	63.5	63.2	63.9	63.5	65.4

Source: Landrum & Brown, December 1996.

The residential areas that would experience the 1.5 DNL or greater increase are located in the west side acquisition area or directly under the north and south approach path to the runway for a distance of about 3 miles to the north and a mile and a half to the south of the third runway. Much of this area overlies the existing Noise Remedy Program boundary, where residences are currently in the process of being sound insulated. Upon commissioning of the third parallel runway, the contours are expected to lie within the boundaries of the existing Noise Remedy Program in 2004/2005. However, as demand for air travel grows, the noise contours will increase in size. By 2010, residential areas outside the existing Noise Remedy Program boundary are expected to be exposed to 65 DNL and greater noise levels, an increase of 1.5 DNL or greater than levels under the Do-Nothing condition. By 2010, this area would include about 170 residences. **Exhibit 5-6-1** compares the 65 DNL and 75 DNL noise contours for the Do-Nothing to the Preferred Alternative in year 2010 with the new forecast.

(3) <u>Alternatives 2 (Central Terminal) and 4 (South Unit Terminal)</u>

Based on the impact analysis prepared for the Final EIS, the impacts associated with these other "With Project" alternatives were considered. **Table 5-6-1** presents the estimated impacts associated with these alternatives in comparison to Alternative 1 and Alternative 3. As was shown by the Final EIS, these alternatives would result in nearly identical noise impacts as the Preferred Alternative. Differences between these "With Project" alternative would be associated with ground noise in the immediate terminal vicinity from aircraft taxiing to/from the various terminal locations: the location and use of the third parallel runway would be the same for all "With Project" alternatives.

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(C) Comparison to the Master Plan Update Forecast Impacts

As is noted by comparing the population, housing and noise sensitive facility impacts shown in **Tables 5-6-1 and 5-6-2**, the noise exposure contours associated with the new forecasts are slightly larger than the impacts associated with the Master Plan Update forecasts. As the new forecasts reflect higher activity levels, the resulting noise impacts are slightly greater.

(1) Alternative 1 (Do-Nothing)

The following summarizes the differences in the population and housing impacts for the Do-Nothing alternative when comparing both forecasts:

	Do-Nothing Alternative 65 DNL and Greater Noise Exposure Impacts (Sq. Miles)	
Year	New Forecast	Master Plan Forecast
Population		
Existing	31,800	31,800
2000	11,310	8,970
2005	10,450	na
2010	11,940	9,450
Housing		
Existing	13,620	13,620
2000	4,820	3,870
2005	4,450	na
2010	5,060	4,060

As is shown above, the new forecast results in 25 to 26 percent greater population and housing impact in year 2000 and 2010 than was anticipated using the Master Plan Update forecasts for the Do-Nothing alternative.

Similarly, the new forecasts produce greater noise sensitive facility impacts. The Preferred Alternative, relative to the Do-Nothing alternative for the new (higher) forecast, would result in 3 additional schools, 1 additional church and 6 additional parks being impacted by 65 DNL or greater in year 2000. By 2010, 4 additional schools, 1 additional church and 7 additional parks would be impacted by 65 DNL or greater with the higher forecast in comparison to Master Plan Update forecast.

(2) Alternative 3 (Preferred Alternative)

The following summarize the differences in the population and housing impacts for the proposed Master Plan Update improvements between the new forecasts and the Master Plan Update forecast:

	Preferred Alternative 65 DNL and Greater Noise Impacts (Sq. Miles)	
Year	New Forecast	Master Plan Forecast
Population		
Existing	31,800	31,800
2000	11,310	9,890
2005	10,440	na
2010	13,220	9,860
Housing		
Existing	13,620	13,620
2000	4,820	4,020
2005	4,400	na
2010	5,520	4,190

As is shown above, the new forecasts result in 25 to 26 percent greater population and housing in year 2000 than was anticipated using the Master Plan Update forecasts for the Do-Nothing alternative. By year 2010, the differences in the population and housing impacts would be 32-34 percent greater than the Master Plan Update forecasts.

A comparison was also made of the effects of the higher forecasts on noise sensitive facilities. In year 2000, the higher forecast would result in the proposed improvements affecting 8 more schools, 3 more churches, 1 more nursing home, and 6 more parks in comparison to the Master Plan Update forecast. By 2010, 5 more schools, 1 more church, and 5 more parks would be affected by the proposed improvements with the higher forecast relative to the forecast of the Master Plan Update.

(3) Alternatives 2 (Central Terminal) and 4 (South Unit Terminal)

As was noted earlier, the higher demand forecast associated with each "With Project" forecast using the new forecast would result in higher noise exposure impacts relative to the forecast presented in the Final EIS. The changes in the impacts of these other "With Project" alternatives would be nearly identical to those of Alternative 3, described in the preceding section.

(D) Cumulative Impacts

This additional environmental analysis and the Final EIS presents a detailed summary of the impacts that the proposed Master Plan Update improvements would have on land use conditions in the immediate airport area. These projects, coupled with further population, economic growth, and development within the Puget Sound Region is expected to place added land use pressures on the area in the airport area. Such pressures would include new development, infill development and redevelopment of residential, and commercial areas. However, these improvements would be expected to be completed within the context of the individual jurisdictions long-term comprehensive or master plans. The impacts associated with the Master Plan Update, using the Master Plan Update forecasts or the new forecasts presented in this report have been documented. Other non-airport related improvements would be expected to add land use pressures to the airport area. Specific conditions cannot be predicted until specific plans for these other developments are known.

(E) Mitigation

The Final EIS identified a noise mitigation program consisting of three noise related land use mitigation actions. Changes to the mitigation program as a result of changes in the noise exposure are identified in *italics*. However, to address changes in specific noise conditions, primarily associated with the third parallel runway, the following mitigation would be undertaken:

Mitigating Significant Noise Impacts on Public Facilities and Historic Sites: The following *nine* public facilities or historic sites would experience significant increased noise impacts (i.e. an increase of 1.5 DNL or more) in the year 2010 in comparison to the Do-Nothing alternative:

1. Sea-Tac Occupational Skills Center (S102) would experience an increase of *4.41 DNL in 2010*;
2. Woodside Elementary School (S105) would experience an increase of *3.1 DNL in 2010*;
3. *Sunnydale Elementary (S21/A16) would experience a 2.8 DNL increase in year 2010*

4. *Albert Paul House (A57) would experience an increase 3.9 DNL in 2010;*
5. *Homer Crosby House (A22) would experience an increase of 3.6 DNL in 2010;*
6. Sunny Terrace Elementary School (S106) would experience an increase of *5.2 DNL in 2010*;
7. Brunelle Residence (A27) would experience an increase of *3.6 DNL in 2010* (the house no longer exists on the property);
8. *Coil House (N16) would experience an increase of 1.9 DNL in 2010;*
9. Bryan House (A29) would experience an increase of *5.0 DNL in 2010*.

Impacts on the facilities incompatible with noise associated "With Project" will be mitigated by acoustical insulation that would allow their uses to be compatible with increased noise levels. Two of the schools are currently not being used for educational uses, and future plans for these buildings need to be confirmed with the Highline School District. Port Commission Resolutions 3125 *and 3212* and the 1993 Update to Sea-Tac's Part 150 Noise Compatibility Program contain Port intentions to expand the Airport's insulation programs for public buildings. The Port has been discussing school insulation with the Highline School District, *and through Resolution 3212 has agreed to commit $50 million to the insulation of schools*. Depending upon the District's designation of the long-term use of the two impacted schools and on the District's desire to have these buildings insulated, they would undergo insulation treatment as needed for compatibility independent of a formal school or public building insulation program. The residences would be addressed by the existing Noise Remedy insulation program if the owners agree. *Because of their historic value, these facilities could require custom treatment to avoid significant alternation of the architectural style. In pursuing sound insulation of these structures, the Port's Noise Remedy Office will work with a historian to preserve such characteristics.*

<u>Provide Directional Soundproofing</u>: Residences that were insulated prior to 1992 may need additional directional soundproofing to mitigate noise generated from a new flight path from the operation of the proposed new third runway. To mitigate noise caused by the proposed airport improvements, these facilities would be further insulated. The Port of Seattle estimates that some 60 to 70 houses were evaluated and/or insulated prior to 1992 and could require additional soundproofing at a cost of about $6,000 to $10,000 per residence. The additional sound insulation measures that could be required include new windows, new doors, and thicker walls.

<u>Acquisition in the Approach Transitional Area</u> - In recognition of the fact that the standard Runway Protection Zone (RPZ) dimensions do not always provide sufficient buffer to the satisfaction of nearby residents, the FAA has indicated that funding could be available to airport operators acquiring "up to 1,250 feet laterally from the runway centerline, and extending 5,000 feet beyond each end of the primary surface.[1/] Based on the configuration of current airport land, local streets, and residential development patterns, the approach and transitional area selected for use as a mitigation area includes the standard Runway Protection Zone and a rectangular extension of the RPZ outward another 2,500 feet.

The acquisition of properties within the approach transitional areas north and south of the proposed runway may serve as a feasible and appropriate mitigation measure. 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 the south of the new runway ends. Commercial land uses, which make up most of the eligible area to the south, need not be acquired and may remain in place on both runway ends.

1/ FAA Memorandum, Action: Land Acquisition - eligible Runway Protection, Object Free Area and Approach and Transitional Zones, dated April 30, 1991.

In the northern approach transitional area, 82 single-family residential parcels, 2 apartment buildings (with 28 units), and 2 mobile home parks, with 96 units, could be acquired. To the south, 71 single-family residential parcels and 6 apartment buildings (with 32 units) could be acquired. Based on the current assessed value of these 309 residential homes and multi-family buildings, it is estimated that the cost of acquisition and relocation could be approximately $35 million.

As was noted in the EIS, input from the affected residents is necessary to design and initiate an acceptable relocation program. Such input was solicited during the Draft EIS's 90-day public comment period and through display boards, which were created and used at the June 1, 1995 Public Hearing for the express purposes of soliciting feedback from the affected residents concerning this action. As is shown in Appendices R and T of the Final EIS few comments concerning the program were received. Therefore, as the probable impact of low flying aircraft would not be experienced until the opening of the proposed new parallel runway, this option will receive further consideration during the forthcoming Sea-Tac Airport FAR Part 150 Update, which the Port anticipates undertaking during 1997. It is anticipated that during the Part 150 Update, the Port would further explore this action with the specific residents within the Approach Transition Area, and, if the residents so desire, establish a program including relocation objectives, timing and funding priorities.

<u>Sound insulation of residences affected by 1.5 DNL or greater within 65 DNL noise exposure</u> - Approximately 1,000 residents living in 460 housing units would be impacted in 2010 as a result of the proposed improvements in comparison to the Do-Nothing alternative. About 170 of these homes within 65 DNL would be exposed to a 1.5 DNL higher noise levels as a result of the proposed improvements and are not already subject to the Port's existing Noise Remedy Program. No residential areas outside the existing Noise Remedy Program boundaries would experience 1.5 DNL increases in year 2005 as a result of the proposed improvements.

The Port will develop an implementation strategy to sound insulate these 170 additional homes within the 65 DNL noise contours as part of the Part 150 Noise Compatibility Plan study effort that will be initiated in 1997. The purpose of delegating finalization of the implementation approach for this action to determination during the Part 150 is to ensure that consideration is given to the proposed Approach Transition Area acquisition and the relationship of that area to the existing Noise Remedy Program boundary, as well as the westerly expansion of the Noise Remedy Program to accommodate this added insulation.

Port Resolution 3125 dated November 1992 states "Port staff is also directed to develop and implement an plan to insulate up to 5,000 eligible single family residences in the existing noise remedy program included on the waiting list as of December 31, 1993, before commencing construction of the proposed runway. The remaining eligible single family residences on the waiting list are to be insulated prior to operation of the proposed runway. In addition, the Port commits to complete insulation of all single-family residences that become eligible for insulation as a result of actions taken based on the site-specific EIS and are on the waiting list as of December 31, 1997, prior to commencing operations of said runway."

For the purpose of the Resolution, the term "eligible" is all single family properties located within the Noise Remedy Boundary, as established by the Port's 1985 Part 150 Study, with the exception of homes built after appropriate building codes were enacted in the Part 150 Study in 1985. As a result of this resolution and on-going implementation of the Part 150 Study, residents located in the Noise Remedy Boundary have come to expect the Port to complete the program, regardless of future airport facility improvements. Therefore, included as mitigation for implementing the third parallel runway, the Port agrees to insulate these single family residential areas regardless of the existing or future noise exposure.

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2. DOT SECTION 4(F) IMPACTS

The U.S. Department of Transportation Act of 1966 (49 USC 303(c)) known as Section 4(f), provides for the protection of certain resources. DOT Section 4(f) resources include public parks; recreational areas; wildlife and waterfowl refuges of federal, state, or local significance; or any land from an historic site of federal, state, or local significance. Impacts to historic sites within the Airport area are described later in this chapter.

As is shown in the Final EIS, no DOT Section 4(f) properties would be directly affected (through acquisition) by the proposed improvements. However, the increased air travel demand will alter aircraft noise exposure and air quality. Therefore, these impacts are described in the following section.

(A) Existing Conditions

A total of 15 parks and recreation facilities are currently affected by aircraft noise levels of 65 DNL or greater. Two of these are privately owned golf courses (Glen Acres Golf Club and the Rainier Golf Course) and are not DOT Section 4(f) land. Another facility (Tyee Valley Golf Course) is not a Section 4(f) resource because it is a temporary use, as it is leased from the Port of Seattle for private use. The lease has at all times contained a special termination provision that provides the Port of Seattle the option to reclaim all or a portion of the land for the purpose of expanding airport operations or facilities into the leased area.

There are 12 publicly-owned parks within the general study area that are currently affected by noise levels of 65 DNL and greater and that could qualify as DOT Section 4(f) resources. These include the following:

- *Southern Heights Park (P14)*: This small neighborhood park is operated by King County. Southern Heights Park has two tennis courts, play equipment, and a large grassy area. There are no trails in this park.
- *North SeaTac Park (P28)*: The City of SeaTac is currently in the process of completing a construction document describing its plan to invest $9 million on capital improvements for these two parks (North SeaTac Park and South 142nd Street Park), which are adjacent to one another. Currently, North SeaTac Park has an equestrian center, a BMX facility (an off-road bicycle course), a new community center building, three soccer fields, four baseball fields, and several open space trails. At the center of North SeaTac Park, two additional buildings (a gymnasium and a one-story building previously used as a ceramics activity center and currently owned by the Department of Public Works) have been abandoned for ten years. Both buildings were closed for asbestos abatement. Initial park proposals discussed the need to demolish these buildings but, with the increasing cost of demolition, the City of SeaTac is considering renovating the structures. A final decision is not expected in the near future. These parks are operated by the City of SeaTac.
- *Angle Lake Park (P43)*: Angle Lake Park provides swimming opportunities in Angle Lake. There are restrooms, concessions, a children's play equipment area, a small lifeguard structure, and a park maintenance storage facility. There is an area of unique Douglas fir trees, several trails, and a residential structure belonging to a previous park caretaker. Angle Lake Park is operated by the City of SeaTac.
- *Des Moines Creek Park (P44)*: Des Moines Park covers an area of over 100 acres and includes bike trails and hiking trails. This park is jointly operated by the Cities of Des Moines and SeaTac.
- *Parkside Park (P53)*: This park is a very small rest area park which is operated by the City of Des Moines. There are no recreational facilities at this park.

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- *Parkside Wetlands (P54)*: Parkside Wetlands is an undeveloped park, with a few unpaved trails. The park is jointly operated by the City of Des Moines and the City of Kent.
- *Barnes Creek Nature Trail (P64):* The Barnes Creek Nature Trail is a gravel and natural pedestrian trail in the heart of residential Des Moines. The trail follows Barnes Creek through a wooded area with both canopy and understory vegetation. Children and adults heavily use this trail for jogging and mountain bike activities. The 1.2 acre, 0.6 mile trail runs north-south to SR-509 right-of-way between Kent-Des Moines Road and South 223rd Street, and is owned by the City of Des Moines. The trail will be an important section of a planned north-south pedestrian trail from Saltwater Park to the City of SeaTac.
- *City Park/Kiddie Park (P67)*: City Park/Kiddie Park is an older, family park of lawn, trees, play structures, picnic tables and nature trails. The active areas overlook and provide access to the Massey Creek ravine with a beautiful strand of trees and understory vegetation. The park is used primarily by children and families from the surrounding neighborhood. The 3.2 acre park is located at 21st Avenue South and South 231st Street.
- *Midway Park (P71)*: Midway Park is a small neighborhood park with play structures, a basketball court, play fields, picnic tables, and walking paths. The park is heavily used by children from nearby low-income housing units and preschool children from at least three daycare facilities. The 1.6 acre park is located southeast of South 221 Street and 28th Avenue South, and is owned by the City of Des Moines.
- *Mount Rainier Pool (P72):* Mount Rainier Pool provides year-round swimming activities through organized swim teams, lap swimming, free swim and classes. Mount Rainier Pool is located adjacent to Mount Rainier High School at 22450 19th Avenue South, and is owned and operated by King County.
- *Sonju Property (P76 future park site):* The Sonju property is an undeveloped natural, wooded area with potential future use as part of the north-south pedestrian trail. The property contains numerous trees and understory vegetation. The property is located south of South 245th Street between 16th and 20th Avenues South. The 9.5 acre property is owned by the Sonju family, and is under negotiation for purchase by the City of Des Moines.
- *Zenith Park (P79):* Zenith park is a neighborhood park with significant open space and heavily used sports fields. The 11.6 acre park is located northwest of South 240th Street and 16th Avenue South, and is leased by the City of Des Moines from the Highline School District.

None of these parks and recreational facilities include noise-sensitive facilities. A park is typically considered compatible with aircraft noise up to 75 DNL, based on the Federal Aviation Regulation Part 150 land use compatibility guidelines, unless it hosts noise-sensitive facilities or activities. The only facilities that are currently affected by noise levels of 75 DNL and greater are Des Moines Creek Park, and the Tyee Valley Golf Course. As discussed previously, the Tyee Valley Golf Course does not constitute a Section 4(f) resource, as it is a temporary use.

In spring 1995, Burien, Des Moines, and Normandy Park designated a number of parks and recreation areas and historic properties within their respective city limits as locally or regionally significant.

Parks and Recreation Areas Which May be Locally Significant

The ordinances discussed below relating to the protection of parks and recreation areas were adopted by Burien, Des Moines, and Normandy Park. All three of these ordinances state that park and recreation areas designated by the respective city as locally or regionally significant should generally be protected from noise levels that exceed 55 DNL. In addition, these ordinances also state that noise levels should not exceed 60 DNL for specific park and recreational facilities (e.g., golf courses, ball fields, outdoor spectator sports areas, amusement parks, riding stables, nature trails, and wildlife refuges) designated as locally significant. The Burien ordinance also states that

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for outdoor amphitheaters and music shells designated as being of local or regional significance by the City, noise levels should not exceed 50 DNL.

All of these ordinances sets noise level criteria below those specified by 14 CFR Part 150 guidelines. According to Part 150 of the Federal Aviation Regulations, public parks and recreational areas are normally considered compatible with air operations at or below 75 DNL. If the public park or recreational area contains a noise-sensitive use, such as an auditorium or outdoor performance center, the use would be compatible at or below 65 DNL.

Many of these parks are presently affected by noise levels in excess of the recently adopted local noise guidelines. This Supplemental Environmental Impact Statement evaluation focused on determining the existing and future noise exposure with and without the proposed improvements. In accordance with FAA Orders 1050.1D and 5050.4A, significant impacts are considered to occur if an increase in noise exposure of 1.5 DNL occurs to sites exposed to 65 DNL or greater noise exposure. Thus, the following section presents the assessment of noise impacts on park and recreational facilities under this Federal standard of significance.

- Burien: Ordinance No. 131 (adopted April 10, 1995) designated 10 parks and recreation areas as locally significant and one as regionally significant. Designated locally significant parks and recreation areas include the following: Burien Park (P33); Chelsea Park (P32); Des Moines Memorial Park (P70); Lakeview Park (P34); Moshier Park (P29); Salmon Creek Park (P20); and Seahurst Park (P31). Seahurst Park was designated by Ordinance No. 131 as regionally significant. Four other parks designated as locally significant in Ordinance No. 131 (Highline Community Center Park, Lake Burien Park, Seola Beach Park, and Shorewood Park) are located west of First Avenue South and thus are outside the general study area for the Master Plan Update. None of these five parks are located within the existing (1994) 65 DNL noise contour nor would they be exposed to 65 DNL or greater noise levels under any of the future Master Plan Update alternatives.
- Des Moines: Ordinance No. 1123 (adopted April 6, 1995) designates 13 parks and recreation areas as locally significant: Des Moines Beach Park (P45); Des Moines Creek Park (P44); Des Moines Marina and Fishing Pier (P68 and P69); Big Catch Plaza (P65); Mt. Rainier Pool (P72); Parkside Wetlands (P54); Redondo Waterfront Park (P75); Saltwater State Park (P56); Woodmont Park (P57); and Zenith Park (P79). One other designated locally significant park, Des Moines Field House Park, is located at 1000 220th Street South in Des Moines Park (P46) and would not be exposed to noise levels exceeding 65 DNL under current conditions or under any of the Master Plan Update alternatives.

Two other proposed parks and recreation areas are designated as locally significant in Ordinance 1123: "Proposed Sports Park" and "Proposed Des Moines Creek Trail." The proposed Sports Park would be located at the northwest corner of 216th Street South and 24th Avenue, primarily on land owned by the Port of Seattle. This City of Des Moines development is planned to include several baseball fields, soccer fields, tennis courts, and possibly a golf driving range. No noise-sensitive uses, such as an outdoor performing hall, are planned. The Des Moines City Council has approved the Sports Park, and the project is currently in negotiations between the Port of Seattle and Des Moines. DNL noise levels for this proposed park would be similar, but slightly less, than for Des Moines Creek Park (P44), which is located closer to the Airport (about one-half mile to the north of the proposed site). Consequently, the proposed Sports Park would not be exposed to noise levels that exceed 75 DNL (or 1.5 DNL additional noise when comparing the Do-Nothing to the "With Project") under any of the Master Plan Update alternatives. The draft *Greater Des Moines Comprehensive Plan* (October 18, 1995) contains a policy (6-03-24) that allows the City to waive the maximum noise limitations for parks of local significance "when it is determined by the City Council that the public interest would be better served by allowing the establishment of a park or recreation area of local significance within an area with excessive noise levels." The "Proposed Des Moines Creek Trail" would link Des Moines Creek Park with Des Moines Beach Park. Maximum

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noise levels for the proposed trail would be the same as those for Des Moines Creek Park (P44). As a result, the proposed trail would not be exposed to noise levels that exceed 75 DNL under any of the Master Plan Update alternatives and the change in noise levels for facilities within 65 DNL would be less than 1.5 DNL.

- *Normandy Park*. Ordinance No. 609 (adopted March 28, 1995) designated seven parks as locally significant. These are the following: Brittany Park; Decorative Parks; City Hall Park; Civic Center Park; Marine View Park; Nature Trails Park; and Walker Preserve. As the entire city of Normandy Park is located outside of the general study area as well as the 65 DNL for existing conditions (1994) or any of the Master Plan Update alternatives (including the contours associated with the new forecasts), none of these parks would be exposed to noise levels that exceed 65 DNL.

Historic Properties Which May be Locally Significant

Ordinances relating to the protection and preservation of historic resources were adopted in 1995 by Airport-vicinity jurisdictions. The following ordinances were adopted: Burien (Ordinance No. 130, adopted April 10, 1995); Des Moines (Ordinance 1125 adopted April 6, 1995); and Normandy Park (Ordinance No. 608 adopted March 28, 1995).

The adopted ordinances for all three of these jurisdictions generally provide for protection of historic properties of local significance from noise levels that exceed 55 DNL. While Part 150 land use compatibility guidelines do not have a specific designation for historic sites, the use at the site, such as open space, residential, commercial, are addressed. The local ordinances set noise-level criteria below those specified by the Federal Aviation Regulation (FAR) Part 150 land use guidelines. FAR Part 150 land use guidelines indicate that virtually all land uses are compatible with noise levels above the 55 DNL of the local ordinances.

(B) Future Conditions With the New Forecast

The following summarize the noise impact to DOT Section 4(f) properties that could occur if demand continues to grow as projected by the new forecast.

(1) Alternative 1 (Do-Nothing)

The Do-Nothing alternative would result in 10 parks being affected by aircraft noise above 65 DNL in 2000 and 2005, and would increase to a total of 11 parks by 2010. Parks affected in the 2000 and 2005 timeframe include: Southern Park (P14), North SeaTac Park (P28), Des Moines Creek Park (P44), Barnes Creek Nature Trail (P64), Des Moines City Park/Kiddie Park (P67), Mount Rainier Pool (P72), Zenith Park (P79), Glen Acres Golf Club (G2), Rainier Golf Course (G3), and Tyee Valley Golf Course (G5). By 2010, the Sonju Property (P76) would become affected by 65 DNL and greater sound levels assuming that the Master Plan Update improvements are not undertaken. Only Tyee Golf Course would be anticipated to be affected by 75 DNL or greater noise levels under the Do-Nothing condition in all future years.

As is noted earlier, none of these parks consists of noise sensitive facilities and, thus, no DOT 4(f) impacts would result to these facilities.

The Do-Nothing alternative would result in the Brunelle Residence (A27) being affected by 65-70 DNL and the Hillgrove Cemetery (A60) being affected by 70-75 DNL noise levels in years 2000, 2005 and 2010. Hillgrove Cemetery is compatible with aircraft noise that would be experienced in future years with and without the proposed improvements. The State Historic

Preservation Officer (SHPO) has determined that the Brunelle House is not eligible for the National Register of Historic Places.[2/]

(2) "With Project" Alternatives (Alternatives 2, 3 and 4)

The "With Project" alternatives would result in 10 parks being affected by aircraft noise above 65 DNL in all three time periods examined. Parks affected in the 2000 and 2005 timeframe include: Southern Park (P14), North SeaTac Park (P28), Des Moines Creek Park (P44), Barnes Creek Nature Trail (P64), Des Moines City Park/Kiddie Park (P67), Mount Rainier Pool (P72), Zenith Park (P79), Glen Acres Golf Club (G2), Rainier Golf Course (G3), Tyee Valley Golf Course (G5). Only Tyee Golf Course would be anticipated to be affected by 75 DNL or greater noise levels. As is noted earlier, none of these parks consists of noise sensitive facilities and thus are compatible with the noise predicted. Therefore, no DOT 4(f) park impacts would result. However, impacts on sites which have been designated locally significant could occur.

DOT Section 4(f) Evaluation (49 USC 303)

The "With Project" alternatives are anticipated to result in two (2) locally significant historic sites being affected by 65 DNL and greater noise levels in 2000. By 2005, five (5) sites would be affected and by 2010 eight (8) sites would be affected.

The following list the DNL levels at each site:

		Year 2000		Year 2005		Year 2010	
	Existing	Do-Nothing	"With Project"	Do-Nothing	"With Project"	Do-Nothing	"With Project"
Sunnydale Elementary (S21/A16)	65.8	61.6	61.6	61.7	63.7	62.3	65.1
Vacca Farm (A56)	68.0	62.4	62.4	62.5	65.6	63.0	67.3
Bryan House (A29)	68.6	62.6	62.6	62.5	65.6	62.8	67.8
Albert Paul House (A57)	66.8	62.7	62.7	62.8	65.4	63.3	67.2
Homer Crosby Home (A22)	67.2	61.5	61.5	61.4	63.5	61.8	65.4
Brunelle Residence (A27)	72.4	66.6	66.6	66.3	68.4	66.6	70.2
Pacific Telephone Building (N2)	67.0	61.4	61.4	61.3	63.3	61.7	65.2
Coil House (N16)	67.1	63.5	63.5	63.2	63.9	63.5	65.4

Source: Landrum & Brown, December 1996.

49 USC 303 (c) states "The Secretary may approve a transportation program or project requiring the use ... of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if- (1) there is no prudent and feasible alternative to using that land; and (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use."

A "constructive use" impact on DOT 4(f) lands can occur when the proposed project does not require the physical use of the land, but where the project's proximity impacts adversely affects the protected features or attributes that qualify a resource for protection under section 4(f). According to FAA Order 5050.4A "When there is no physical taking but there is the possibility of use of or adverse impacts to section 4(f) land, the FAA must determine if the activity associated with the proposal conflicts with or is compatible with the normal activity associated with the land" (Paragraph 47e(7)4(b) of Order 5050.4A)

2/ As noted in a letter from Greg Griffith, Washington State Office of Archaeology and Historic Preservation; November 22, 1995.

Therefore, the following issues must be addressed in a 4(f) evaluation:

1. Compatibility of Action with Historic Property Use

The following summarize the impacts to and characteristics of these historic sites:

a) **Sunnydale Elementary (S21/A16)** is located on the corner of Des Moines Memorial Drive and S. 154th (15631 - 8th Avenue South) in Burien. It is the original site of a school, that now houses a newer 1928 school that served all children from White Center to Des Moines. The site is presently used as a school by the Highline School District and, while located along a major arterial with commercial properties, the area is predominantly residential. The inventory that identified the historic significance of this site indicates its value as "A = important" with an architectural value of "common". The Sunnydale School had a 1994 enrollment of 515 students. The Public Draft Discussion Comprehensive Plan for Burien titled "The Burien Plan - Part II Existing Conditions" dated November 1996 indicates that Sunnydale School will be remodeled by the year 2002 to increase the capacity of the school to 650 students. Currently, Sunnydale School is exposed to 65.8 DNL. By 2010, impacts with the proposed improvements would produce a noise exposure of 65.1 DNL or 62.3 DNL without the improvements (a 2.8 DNL increase by the project in year 2010).

b) **Vacca Farm (A56)** is located at 15060 Des Moines Way South in the City of SeaTac. This property contains farm property and a home, owned by the Vacca Family, that was built in 1930 and is representative of the Vernacular architecture of its time with a gable front. During the inventory process of identifying this site, it was noted that the house consists of a small depression style box house, with an exterior consisting of concrete/asbestos brick. The farm is locally known as the pumpkin patch, and includes a 'rundown' commercial structure used as an outside fruit stand. The fruit stand was built in about 1915 and was moved to the street location along Des Moines Way. The fruit stand is a commercial use. The Port of Seattle currently has an option on this property and will acquire this property. This property currently experiences noise levels of 68 DNL. By 2010, this site would be exposed to 67.3 DNL "With Project" or 63.0 DNL under the Do-Nothing.

c) **Bryan House (A29)** is located at 1029 South 146th Street in Burien. The property is currently owned by Mr. Leetch. The house, originally built in 1908, is a 2.5 story residences with classical detailing seen in the detail work below the eaves and pilasters at the cornerboards. This building was modified in 1990 such that the style is no longer recognizable, including: replacement windows, porch alterations, the addition of concrete block steps, new exterior chimney, and vinyl siding. This home is currently exposed to 68.6 DNL. By 2010, the property would be exposed to 62.8 DNL without the improvements or 67.8 DNL "With Project" (an increase of 5.0 DNL). As is noted in correspondence located in Appendix E of the Final EIS, this site is not eligible for inclusion on the National Register of Historic Sites.

d) **Albert Paul House (A57)** is located at 839 South 157th Place in the City of SeaTac. This craftsman style home was built in 1904. This home is currently exposed to 66.8 DNL and by 2010 would be exposed to 67.2 "With Project" or 63.3 DNL under the Do-Nothing (an increase of 3.9 DNL). As is noted in correspondence located in Appendix E of the Final EIS, this site is not eligible for inclusion on the National Register of Historic Sites. The inventory of this site indicated that it is a "Well maintained craftsman home with a single dual window dormer-full length porch with columns."

e) **Homer Crosby House (A22)** is located at 14628 - 8th Avenue South in Burien and is owned by Mr. Brown. The home was built in 1900 and was the residence of Homer Crosby between approximately 1907 and 1952. Mr. Crosby promoted the Burien Railroad that was built between Ambaum & First Avenue S, and built the water system. King County records indicate that the architectural character has been changed through an addition to the home on the south, remodeling of porch and windows, such that the home now resembles a 1950s ranch. The 1994 inventory of this site that identified its local significance indicated that the architectural value was F "Remodel or demolition" and historic value of "A - Important". This home is currently exposed to 67.2 DNL and by 2010 would be exposed to 65.4 "With Project" or 61.8 DNL without the improvements (an increase of 3.6 DNL). As is noted in correspondence located in Appendix E of the Final EIS, this site is not eligible for inclusion on the National Register of Historic Sites. Furthermore, this property has already been sound insulated based on the Port's existing Noise Remedy Program.

f) **Brunelle Residence (A27)** is located at 1243 South 140th Street and is currently owned by Mr. & Mrs. Brunelle. A 1995 site visit showed that the building was demolished or moved from the site. The King County Landmarks and Heritage Commission Historic Resources Inventory lists the building as having been altered and its integrity lost in 1993. As the property is undeveloped, it could be considered compatible with the projected noise exposure. As is noted in correspondence located in Appendix E of the Final EIS, this site is not eligible for inclusion on the National Register of Historic Sites. The site is currently exposed to 72.4 DNL. and by 2010, the site would be exposed to 70.2 DNL with the project or 66.6 DNL without the project.

g) **Pacific Telephone Building (N2)** - is located at 14605 - 8th Avenue South in Burien and is owned and used by U.S. West Communications. This site is in "excellent exterior condition based on a 1994 inventory, where it was determined that it is an "Excellent architectural example of 1940s commercial structure." It is a four story brick structure with decorative ceramic lintels. It is a "unique example in Burien". The inventory determined it to have a historic value of U - "unknown" and an architectural value of A -"special style". Currently this site is exposed to 67 DNL and by 2010 the site would be exposed to 65.2 DNL "With Project" or 61.7 under the Do-Nothing.

h) **Coil House** - is located at 1218 - 216th Street South in Des Moines and is owned by Mr. Coil. This site has local significance due to its special style and is a wooden structure which is an residence built in about 1938. The City of Des Moines inventory notes the historic significance of this home as "Important" and the architectural style to be "Special Style". The Coil House is currently exposed to 67.1 DNL. By 2020, the site would be exposed to 65.4 DNL "With Project" or 63.5 DNL under the Do-Nothing.

The Master Plan Update improvement that causes aircraft noise levels to increase at these sites over the levels that would be experienced in the Do-Nothing alternative is aircraft operations using the third parallel runway. None of these sites would be exposed to adverse air quality impacts caused by the proposed improvements. Therefore, the impacts to these sites are aircraft noise. In examining the impact of aircraft noise on these sites, the following issues were given consideration:

(1) *Compatibility of the Current Use of the Sites with Aircraft Noise Exposure* - FAA Part 150 Land Use Compatibility Guidelines have been accepted as the guideline for determining the compatibility of various land uses with aircraft noise exposure. No compatibility designation is available for historic sites. Therefore, this evaluation relied upon the FAA's land use compatibility guidelines for the use of the historic site. These land use guidelines indicate that residential and educational uses are compatible with noise up to 65 DNL. Residential and educational uses can be compatible with aircraft noise exposure of 65-75 DNL if the structure is sound insulated. Commercial properties are compatible with aircraft noise exposure up to 75 DNL.

Because the Brunelle House had been removed from the site, it is vacant land which does not represent an incompatibility. The Vacca Farm and Pacific Telephone Building are commercial properties with uses that are compatible with the existing and future noise exposure. As the Homer Crosby Home has been sound insulated, it is also considered a

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compatible use. Therefore, based on the current use of the sites, land use related incompatibilities would occur at Sunnydale School, Bryan House, Albert Paul House, and the Coil House (1 school and 3 homes).

As was noted earlier, several local jurisdictions have enacted ordinances indicating that locally significant historic sites are not compatible with noise above 55 DNL. However, the ordinances do not appear to reflect the current ambient or aircraft noise exposure at the sites identified as locally significant. Further, EPA's "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare With an Adequate Margin of Safety" (page 14) indicates that urban areas can expect DNL levels ranging from 58 to 63, while rural areas could expect noise levels of 52 to 58 DNL. The EPA's general description of noise levels for an urban area are supported by the roadway noise level data in the area of Sea-Tac Airport prepared a part of the February, 1996 Final EIS showing that noise from roads such as SR 509 and SR 518 produce levels in excess of the ordinances.

(2) *Effects of Noise on Historic/Architectural Value* - All of the affected locally significant historic sites were inventoried and valued by either King County or the local jurisdictions during the early 1990s. As the noise impact table indicates, with the exception of the Albert Paul House, the future noise exposure with and without the proposed improvements is expected to be less than current impacts. Therefore, as the existing noise exposure was present when the historic or architectural value was determined, the reduced impact in the future would not be expected to degrade the historic or architectural values of these locally historic sites. Impacts could then only occur at the Albert Paul House. As the future noise levels at this site "With Project" would be 0.5 DNL greater than existing levels, below the FAA's guideline for determining significant impacts, there is little basis for concluding any significant 4(f) impacts.

2. Prudent or Feasible Alternatives Evaluation

The proposed third parallel runway would result in the noise impact changes at these properties. The purpose and need for the third parallel runway is discussed in Chapter 2 and is "Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay". As is discussed in Chapter 2 of this Supplemental EIS, and earlier studies such as the Final EIS and the Flight Plan EIS, alternatives to satisfying this need are:

- <u>Use of Other Modes of Transportation</u> - Three forms of other modes of transportation were considered (Auto/Bus, Rail, and Telecommunication) and are described on Page 3-1 and 3-2 of this Supplemental EIS. As discussed, less than 5% of passengers could use alternative modes of transportation. A reduction in traffic by 5% would not eliminate the need for the proposed project. Therefore, while this alternative may be feasible,[3] it would not address poor weather operating requirements of the Airport because poor weather delay would not be reduced. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2002), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 operations (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.[4]
- <u>Use of Other Airports or Construction of a New Airport</u> - A substantial amount of study and deliberation over an 8 year period has been conducted concerning the development of a new/replacement airport or a supplemental airport. The regional consideration of this alternative showed that this is not a feasible alternative because: 1) there is no sponsor for such an

[3] Feasible in this analysis represents actions that can be completed using sound engineering practices.

[4] *Seattle-Tacoma International Airport, Capacity Enhancement Plan Update*, FAA, July 1995. Page 19.

undertaking, 2) regional consensus is that there is no "feasible" site, and 3) neither the lack of sponsor nor the conclusion of the PSRC's regional planning process appears to depend on the level of air travel demand in the region.

- Activity/Demand Management - The primary objective of activity management alternatives is to increase airport efficiency by the airport operator's establishment of pricing or regulatory actions, thereby delaying or eliminating the need for future airport development. The Flight Plan Study concluded that "... demand management measures will at best delay for a few years the need for capacity improvements. For purposes of this analysis, therefore, it was assumed the maximum demand management set of measures will delay capacity improvements for five years." This conclusion has been supported by the PSRC Expert Panel on Noise and Demand/System Management in their December 8, 1995 final order on system/demand management. Therefore, as this action would not satisfy the need, current poor weather demands would remain and would continue to grow in the future. While this is feasible, it is not a prudent alternative because of the delay costs incurred at Sea-Tac. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2002), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 (now forecast to occur around the year 2019) would reach 283,000 hours at a cost of $454 million.

- Other Development at Sea-Tac Airport - Several alternative runway layouts (locations, lengths, and orientations) were considered. As was shown, only a parallel air carrier length runway, with a 2,500 foot separation from 16L/34R would satisfy the poor weather operating needs. An air carrier runway of any length, with the anticipated demand for air travel that is now forecast, would likely result in 1.5 DNL or greater noise levels at these historic sites. Runways with a separation of less than 2,500 feet were considered, these locations could not be used during poor weather conditions and thus the existing poor weather delay would not be addressed. While this is a feasible alternative, it is not prudent due to the delay levels that would be experienced. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2002), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 (now forecast to occur around the year 2019) operations, delay levels would reach 283,000 hours at a cost of $454 million.

- Use of Technology - As is shown, no technology exists (or appears eminent) that would address the poor weather operating constraints experienced at Sea-Tac. While a Localizer Directional Aid (LDA) could address visual flight rule conditions, it would not address the instrument flight rule conditions (poor weather) and it would likely result in increased noise exposure at other residential and locally significant historic sites. Because half of the poor weather constraint would not be addressed, delay would result. While this alternative is feasible, it is not a prudent alternative. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2002), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 (now forecast to occur around the year 2019) operations, delay levels would reach 283,000 hours at a cost of $454 million.

- Delayed or Blended Alternatives - This alternative has become the Preferred Alternative, as the new construction schedule for the runway would entail it being available 5 years later than was addressed in the Final EIS.

- Do-Nothing - as is discussed, the Do-Nothing alternative would prevent the adverse impact to the 4(f) properties, but would not satisfy the purpose and need and as a result poor weather related arrival delay would increase. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2002), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 (now forecast to occur around the year 2019) operations, delay levels would reach 283,000 hours at a cost of $454 million. Therefore, it is not a prudent alternative.

3. Measures are available to minimize impacts to the 4(f) properties.

As is discussed in the preceding section, the Port proposes to sound insulate all noise sensitive schools and residential structures affected by 65 DNL and greater noise that would experience a 1.5 DNL or greater increase as a result of the Master Plan Update improvements. The Port of Seattle proposes to insulate the sites designated by the local communities as locally significant that could experience significant noise increases as a result of the proposed improvements. Based on the preceding analysis, this would include: Sunnydale School, Bryan House, Albert Paul House, and the Coil House. Therefore, the Port proposes to perform custom insulation (similar to its on-going sound insulation program) for these residential facilities and the historic school. The Port's Noise Remedy Office has an established program for addressing residential sound insulation. Because of the architectural significance of the Bryan House and the Albert Paul House, a custom program of sound insulation would be developed in consultation with a architectural historian.

The Port proposes to sound insulate Sunnydale School to reduce existing impacts and to mitigate the impacts associated with the proposed project. This school is operated by the Highline School District. In 1996, the Port of Seattle offered to sound insulate the noise affected schools in this district, including Sunnydale. The Highline District has expressed concern with the approach that the Port has offered for the sound insulation. Currently, the Highline District has indicated that they will be hiring a consultant to examine conditions at the district schools. The Port has indicated that they are willing at any time to begin an insulation program that would include this school.

As sound insulation is a proven technique, and would not result in as great an impact as relocating the facilities away from their present location, insulation was chosen to mitigate the adverse impacts of the third parallel runway.

(C) Comparison to the Master Plan Update Forecast Impacts

The following sections contrast the impact of the new forecast with the impacts presented in the Final EIS for the Master Plan Update forecast on DOT Section 4(f) lands.

(1) Alternative 1 (Do-Nothing)

The following summarize the differences in the historic, archaeological and cultural impacts for the Do-Nothing alternative:

	Do-Nothing Alternative	
Year	New Forecast	Master Plan Forecast
Parkland (75 DNL and greater noise exposure)		
2000	1	2
2005	1	na
2010	1	2
Historic Sites (65 DNL and greater noise exposure)		
2000	2	2
2005	2	na
2010	2	2

The new forecast would not alter the number of parkland affected when contrasting the new and Master Plan Update forecasts for the Do-Nothing alternative. Tyee Golf Course (which is not a DOT 4(f) property) is the only parkland affected by 75 DNL and greater sound levels. As is shown above, the same historic/archaeological and cultural resources would be affected by 65 DNL and greater noise level using the new (higher) forecast or the Master Plan Update forecast in 2000 and 2010.

(2) "With Project" Alternatives (Alternatives 2, 3 and 4)

The following summarize the differences in the historic, archaeological and cultural resource impacts for the proposed Master Plan Update improvements between the new forecasts and the Master Plan Update forecast:

	Preferred Alternative 65 DNL and Greater Noise Exposure Impacts	
Year	New Forecast	Master Plan Forecast
Parkland (75 DNL and greater)		
2000	1	1
2005	1	na
2010	1	1
Historic Sites (65 DNL and greater)		
2000	2	2
2005	5	na
2010	8	2

The new forecast would not alter the number of parkland affected by the proposed Master Plan Update improvement, when contrasting the new and Master Plan Update forecasts. Tyee Golf Course (which is not a DOT 4(f) property) is the only parkland affected by 75 DNL and greater sound levels.

As is shown above, the higher demand forecasts assuming implementation of the Master Plan Update improvements would result in 6 additional historic sites being affected by aircraft noise above 65 DNL by year 2010. The same facilities would be affected in 2000 in comparing the new forecast to the Master Plan Update forecast.

(D) Cumulative Impacts

The cumulative impact of the SeaTac Master Plan and other proposed local projects within the vicinity could create direct and indirect impacts on historical, archaeological and cultural resources. The impacts associated with the Master Plan Update have been identified by this report. Additional improvements in the region would expect to increase impacts to these facilities. However, until project specific plans are developed for these developments, the cumulative impacts can not be identified. However, such projects would be expected to increase the adverse impacts to these sites.

(E) Mitigation

The following historic sites would experience significant increased noise impacts (i.e. an increase of 1.5 DNL or more) in the year 2010 in comparison to the Do-Nothing alternative:

1. Sunnydale Elementary (S21/A16)
2. Vacca Farm (A56)
3. Bryan House (A29)
4. Albert Paul House (A57)

5. Homer Crosby House (A22)
6. Brunelle Residence (A27)
7. Pacific Telephone Building (N2)
8. Coil House

The 4(f) evaluation showed that the impacts would not qualify as DOT 4(f) impacts under 49 USC 303(c). However, as was noted in the land use compatibility section, the Port proposes to offer sound insulation to the residents and school that experience a 1.5 DNL or greater noise impact increase. Impacts on these facilities will be mitigated by acoustical insulation that would allow their uses to be compatible with increased noise levels. Port Commission Resolutions 3125 and 3212 and the 1993 Update to Sea-Tac's Part 150 Noise Compatibility Program contain Port intentions to expand the Airport's insulation programs for public buildings. The Port has been discussing school insulation with the Highline School District, and through Resolution 3212 has agreed to commit $50 million to the insulation of schools. Depending upon the District's designation of the long-term use of the two impacted schools and on the District's desire to have these buildings insulated, they would undergo insulation treatment as needed for compatibility independent of a formal school or public building insulation program. The residences would be addressed by the existing Noise Remedy insulation program if the owners agree. Because of their historic value, these facilities could require custom treatment to avoid significant alternation of the architectural style. In pursuing sound insulation of these structures, the Port's Noise Remedy Office will work with a historian to preserve such characteristics.

3. IMPACTS TO ARCHAEOLOGICAL/CULTURAL AND HISTORIC SITES

The preceding section discussed the impacts of the proposed projects on archaeological/cultural and historical sites under the provisions of DOT Section 4(f). This section discusses the impacts to such properties under the National Historic Preservation Act of 1966 and the Archaeological and Historic Preservation Act of 1974. These acts focus of archaeological, cultural, and historical resources of national significance.

Subject to continued coordination under the Section 106 process, as was shown in the Final EIS, no direct impacts (through acquisition) to historic/archaeological or cultural resources would occur as a result of the Master Plan update improvements. However, the increased air travel levels in the future would alter future noise and air quality conditions. These impacts are discussed in the following sections.

(A) Existing Conditions

Table 5-6-4 lists previously recorded properties within the general study area that have been identified as archaeological sites, national or state historic sites, or local historic sites as inventoried by King County[5] or SHPO.[6] It should be noted that, for these properties, termed "local historic sites," none are currently identified as being on or eligible for the State or National Register.

Table 5-6-4 lists existing and future DNL noise levels for the historic sites. A review of previously recorded sites showed the existence of two historic (Vacca Farm and the Albert Paul House) and no archaeological sites within the acquisition area. An additional ten previously recorded sites (9 historic and 1 archaeological) were identified in the existing 65 DNL or greater noise exposure.

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[5] Personal Communication with Charles Sundberg, King County Office of Historic Preservation. September, 1994.

[6] Personal Communication with Sara Steel, Washington State Office of Archaeology and Historic Preservation. May, 1994.

These sites are: 14th Avenue South Bridge (A2); Sunnydale School (A16); Homer Crosby Home (A22); Brunelle Residence (A27); Bryan House (A29); Rayback House (A38); Walsworth House (A39); Chesney House (A42); Hillgrove Cemetery (A60); and Muckleshoot Indian Campground (A68). The 14th Avenue South Bridge is listed on the National Register of Historic Places.

(B) Future Conditions With the New Forecast

The following sections identify the noise impacts to historic/archaeological and cultural resources associated with the new forecasts.

(1) Alternative 1 (Do-Nothing)

The Do-Nothing alternative would result in the Brunelle Residence (A27) being affected by 65-70 DNL and the Hillgrove Cemetery (A60) being affected by 70-75 DNL noise levels in years 2000, 2005 and 2010. The SHPO has determined that the Brunelle House is not eligible for the National Register of Historic Places.[7] The Hillgrove Cemetery is considered compatible with noise levels as up to 75 DNL.

(2) "With Project" Alternatives (Alternatives 2, 3 and 4)

The "With Project" alternatives are anticipated to result in two (2) historic sites being affected by 65 DNL and greater noise levels in 2000. By 2005, five (5) sites would be affected and by 2010 eight (8) sites would be affected. In year 2000, the Brunelle Residence (A27) would be affected by 65-70 DNL and the Hillgrove Cemetery (A60). In 2005, the five properties being affected by 65-70 DNL are: Brunelle Residence (A27), Bryan House (A29), Vacca Farm (A56), Albert Paul House (A57),and Hillgrove Cemetery (A60). No properties would be affected by 70-75 DNL. By 2010, properties affected by 65-70 DNL include: Sunnydale School (A16), Homer Crosby Home (A22), Bryan House (A29), Chesney House (A42), Vacca Farm (A56), Pacific Telephone Building (N2), Coil House (N16), and Albert Paul House (A57). The Hillgrove Cemetery (A60) would be affected by 70-75 DNL in 2010.

With the exception of the Albert Paul House (A29), all of these historic sites are currently exposed to aircraft noise in excess of the levels that would be experienced in each of the future years. Because the Pacific Telephone Building is a commercial use, which is compatible with the existing and future noise exposure "With Project", it would not be considered a noise sensitive use.

The following historic and cultural resources are incompatible with either existing and/or future noise and could experience an increase in aircraft noise exposure of 1.5 DNL or greater with the proposed improvements in contrast to the Do-Nothing alternative:

		Year 2000		Year 2005		Year 2010	
	Existing	Do-Nothing	"With Project"	Do-Nothing	"With Project"	Do-Nothing	"With Project"
Bryan House (A29)	68.6	62.6	62.6	62.5	65.6	62.8	67.8
Vacca Farm (A56)	68.0	62.4	62.4	62.5	65.6	63.0	67.3
Albert Paul House (A57)	66.8	62.7	62.7	62.8	65.4	63.3	67.2
Homer Crosby Home (A22)	67.2	61.5	61.5	61.4	63.5	61.8	65.4
Brunelle Residence (A27)	72.4	66.6	66.6	66.3	68.4	66.6	70.2
Sunnydale Elementary (S21/A16)	65.8	61.6	61.6	61.7	63.7	62.3	65.1
Coil House (N16)	67.1	63.5	63.5	63.2	63.9	63.5	65.4

Source: Landrum & Brown, December 1996.

[7] Letter from Greg Griffith, Washington State Office of Archaeology and Historic Preservation, November 22, 1995.

As is shown above, none of the sites would experience an increase of 1.5 DNL or greater as a result of the proposed improvements in year 2000. By 2005, when the third parallel runway is operational, the project would result in 1.5 DNL or greater increases relative to the Do-Nothing, with the greatest project related impacts occurring in 2010. In comparison to the Do-Nothing, six sites would experience DNL increases of 1.5 or more with the "With Project": Bryan House (5.0 DNL change in 2010), Albert Paul House (3.9 DNL increase in 2010), Homer Crosby Home (3.6 DNL in 2010), Vacca Farm (4.3 DNL in 2010), Brunelle Residence (3.6 DNL in 2010), Coil House (an increase of 1.9 DNL in 2010), and Sunnydale School (2.8 DNL increase). The 1.5 DNL or greater increase in areas affected by DNL 65 and greater is an FAA guideline (as identified in FAA Order 5050.4A, Chapter 5, paragraph 47e). Only at the Albert Paul House would the future noise exposure exceed the impacts currently experienced. All of the residential historic sites have been determined by the SHPO not to be eligible for inclusion on the National Register of Historic Locations. However, the Sunnydale School may be eligible, and Section 106 Consultation with the SHPO is currently underway to determine its eligibility.

(C) Comparison to the Master Plan Update Forecast Impacts

The following sections contrast the impact of the new forecast with the impacts presented in the Final EIS for the Master Plan Update forecast on DOT Section 4(f) lands.

(1) Alternative 1 (Do-Nothing)

The following summarize the differences in the historic, archaeological and cultural impacts for the Do-Nothing alternative:

	Do-Nothing Alternative	
Year	New Forecast	Master Plan Forecast
Historic Sites (65 DNL and greater impacts)		
2000	2	2
2005	2	na
2010	2	2

As is shown above, the same historic/archaeological and cultural resources would be affected by 65 DNL and greater noise level using the new (higher) forecast or the Master Plan Update forecast in 2000 and 2010.

(2) "With Project" Alternatives (Alternatives 2, 3 and 4)

The following summarize the differences in the historic, archaeological and cultural resource impacts for the proposed Master Plan Update improvements between the new forecasts and the Master Plan Update forecast:

	Preferred Alternative 65 DNL and Greater Noise Impacts	
Year	New Forecast	Master Plan Forecast
Historic Sites (65 DNL and greater)		
2000	2	2
2005	5	na
2010	8	2

As is shown above, the higher demand forecasts assuming implementation of the Master Plan Update improvements would result in six (6) additional historic sites being affected by aircraft noise above 65 DNL by year 2010. The same facilities would be affected in 2000 in comparing the new forecast to the Master Plan Update forecast.

(D) Cumulative Impacts

The cumulative impact of the SeaTac Master Plan and other proposed local projects within the vicinity could create direct and indirect impacts on historical, archaeological and cultural resources. The impacts associated with the Master Plan Update have been identified by this report. Additional improvements in the region would expect to increase impacts to these facilities. However, until project specific plans are developed for these developments, the cumulative impacts can not be identified. However, such projects would be expected to increase the adverse impacts to these sites.

(E) Mitigation

Because no direct or indirect impacts to cultural, historic, and archaeological resources listed on or eligible for the National Register of Historic Places were identified, no mitigation measures are anticipated to be necessary at this time under the Section 106 process. It is possible that unknown cultural, historical or archaeological sites could be discovered during construction. In the event that any artifacts are discovered during construction activities, construction in such areas will be halted immediately and the SHPO and other proper authorities will be contacted within 24 hours. This will be done so that the findings could be recorded and the level of significance determined. If findings of significance were made, mitigation measures would be developed through a Memorandum of Agreement among FAA, the Washington State Office of Archaeology and Historic Preservation, Advisory Council on Historic Preservation, and others.

TABLE 5-6-1

Seattle-Tacoma International Airport
Master Plan Update Additional Environmental Analysis

POPULATION IMPACT COMPARISON

Impacts Assuming New Aviation Forecasts

	60-65 DNL	65-70 DNL	70-75 DNL	75 DNL +	Total 65 DNL & greater	Total 60 DNL & greater
Existing	53,210	26,230	5,570	0	31,800	85,010
2000						
Alt 1 (Do-Nothing)	36,710	10,330	950	30	11,310	48,020
Alt 2 (Central) *	36,690	10,330	950	30	11,310	48,000
Alt 3 (North)	36,690	10,330	950	30	11,310	48,000
Alt 4 (South) *	36,690	10,330	950	30	11,310	48,000
2005						
Alt 1 (Do-Nothing)	35,880	9,640	780	30	10,450	46,330
Alt 2 (Central) *	34,360	9,640	700	100	10,440	44,800
Alt 3 (North)	34,360	9,640	700	100	10,440	44,800
Alt 4 (South) *	34,360	9,640	700	100	10,440	44,800
2010						
Alt 1 (Do-Nothing)	38,890	10,990	920	30	11,940	50,830
Alt 2 (Central) *	38,060	11,960	1,070	190	13,220	51,280
Alt 3 (North)	38,060	11,960	1,070	190	13,220	51,280
Alt 4 (South) *	38,060	11,960	1,070	190	13,220	51,280

* Estimated based on the Final EIS.

Final EIS Analysis Using Master Plan Forecasts

	60-65 DNL	65-70 DNL	70-75 DNL	75 DNL +	Total 65 DNL & greater	Total 65 DNL & greater
Existing	53,210	26,230	5,570	0	31,800	85,010
2000						
Alt 1 (Do-Nothing)	32,320	8,250	750	0	8,970	41,320
Alt 2 (Central)	32,800	9,220	670	0	9,890	42,690
Alt 3 (North)	32,810	9,220	670	0	9,890	42,700
Alt 4 (South)	32,810	9,220	670	0	9,890	42,700
2010						
Alt 1 (Do-Nothing)	33,680	8,690	760	0	9,450	43,130
Alt 2 (Central)*	34,280	9,190	680	0	9,870	44,150
Alt 3 (North)	34,290	9,180	680	0	9,860	44,150
Alt 4 (South)	34,290	9,180	680	0	9,860	44,150
2020						
Alt 1 (Do-Nothing)	37,250	9,860	940	0	10,800	48,050
Alt 2 (Central)*	35,970	10,480	790	0	11,270	47,240
Alt 3 (North)	35,940	10,450	790	0	11,240	47,180
Alt 4 (South)	35,980	10,480	790	0	11,270	47,250

Source: Landrum & Brown and Gambrell Urban, December 1996

TABLE 5-6-2

Seattle-Tacoma International Airport
Master Plan Update Additional Environmental Analysis

COMPARISON OF NOISE SENSITIVE FACILITY IMPACTS

IMPACTS ASSUMING THE NEW AVIATION FORECASTS

	Impacted by 65 DNL and greater Noise Exposure				
	Schools	Churches	Libraries	Hospitals/ Nursing Homes	Public Parks/Recreation
DNL 65 & Greater					
Existing	28	24	2	3	12
2000 Alt 1 (Do-Nothing)	15	13	1	1	10
2000 Alt 2, 3 & 4	15	13	1	1	10
2005 Alt 1 (Do-Nothing)	13	13	1	1	10
2005 Alt 2, 3 & 4	9	10	1	0	10
2010 Alt 1 (Do-Nothing)	15	13	1	1	11
2010 Alt 2, 3 & 4	13	11	1	1	10

IMPACTS ASSUMING THE MASTER PLAN UPDATE FORECASTS

	Impacted by 65 DNL and greater Noise Exposure				
	Schools	Churches	Libraries	Hospitals/ Nursing Homes	Public Parks/Recreation
DNL 65 & Greater					
Existing	28	24	2	3	12
2000 Alt 1 (Do-Nothing)	12	12	0	1	4
2000 Alt 2, 3 & 4	7	10	1	0	4
2010 Alt 1 (Do-Nothing)	11	12	0	1	4
2010 Alt 2, 3, & 4	8	10	1	0	4
2020 Alt 1 (Do-Nothing)	13	13	1	1	4
2020 Alt 2, 3 & 4	11	10	1	1	5

Source: Gambrell Urban, Shapiro and Associates, Inc., and Landrum and Brown, 1996.

TABLE 5-6-3
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Seattle-Tacoma International Airport
Master Plan Update Additional Environmental Analysis

POPULATION RELATED NOISE IMPACTS ASSUMING NEW FORECASTS

	2000		2005		2010	
	Do-Nothing	**Alternative 3**	**Do-Nothing**	**Alternative 3**	**Do-Nothing**	**Alternative 3**
Jurisdiction						
60-65 DNL						
Burien	2,820	2,810	2,960	3,640	3,480	3,740
Des Moines	8,440	8,440	8,720	9,260	8,640	10,470
Federal Way	5,630	5,630	4,880	3,510	5,800	3,330
Kent	880	880	840	670	900	710
SeaTac	5,870	5,870	5,900	4,000	6,350	4,470
Seattle	1,480	1,480	1,410	1,660	1,980	3,250
Tukwila	-	-	-	-	-	-
Unincorp. King Co.	11,590	11,580	11,170	11,620	11,740	12,090
Subtotal	**36,710**	**36,690**	**35,880**	**34,360**	**38,890**	**38,060**
65-70 DNL						
Burien	680	680	650	1,540	680	2,220
Des Moines	5,060	5,060	4,460	3,300	5,180	3,500
SeaTac	1,760	1,760	1,690	2,070	1,920	2,250
Unincorp. King Co.	2,830	2,830	2,840	2,730	3,210	3,990
Subtotal	**10,330**	**10,330**	**9,640**	**9,640**	**10,990**	**11,960**
70-75 DNL						
Burien	100	100	80	10	100	300
Des Moines	220	220	120	40	160	-
SeaTac	580	580	550	650	580	770
Unincorp. King Co.	50	50	30	-	80	-
Subtotal	**950**	**950**	**780**	**700**	**920**	**1,070**
75+ DNL						
SeaTac	30	30	30	100	30	190
Subtotal	**30**	**30**	**30**	**100**	**30**	**190**
65 DNL and Greater						
Burien	780	780	730	1,550	780	2,520
Des Moines	5,280	5,280	4,580	3,340	5,340	3,500
SeaTac	2,370	2,370	2,270	2,820	2,530	3,210
Unincorp. King Co.	2,880	2,880	2,870	2,730	3,290	3,990
Subtotal	**11,310**	**11,310**	**10,450**	**10,440**	**11,940**	**13,220**

Source: Landrum & Brown, and Gambrell Urban using 1990 Census

TABLE 5-6-3
(Page 2 of 2)

Seattle-Tacoma International Airport
Master Plan Update Additional Environmental Analysis

HOUSING RELATED NOISE IMPACTS ASSUMING NEW FORECASTS

	2000		2005		2010	
	Do-Nothing	**Alternative 3**	**Do-Nothing**	**Alternative 3**	**Do-Nothing**	**Alternative 3**
Jurisdiction						
60-65 DNL						
Burien	1,340	1,340	1,420	1,780	1,680	1,800
Des Moines	3,450	3,450	3,570	3,810	3,550	4,400
Federal Way	2,860	2,860	2,570	2,020	2,930	1,940
Kent	360	360	340	250	370	270
SeaTac	2,500	2,500	2,510	1,740	2,740	1,980
Seattle	690	690	660	760	900	1,500
Tukwila	-	-	-	-	-	-
Unincorp. King Co.	4,860	4,860	4,670	4,780	4,930	4,970
Subtotal	**16,060**	**16,060**	**15,740**	**15,140**	**17,100**	**16,860**
65-70 DNL						
Burien	280	280	260	660	280	990
Des Moines	2,230	2,230	2,000	1,460	2,280	1,480
SeaTac	710	710	690	820	780	890
Unincorp. King Co.	1,150	1,150	1,150	1,130	1,290	1,620
Subtotal	**4,370**	**4,370**	**4,100**	**4,070**	**4,630**	**4,980**
70-75 DNL						
Burien	40	40	30	-	40	140
Des Moines	110	110	0	10	70	-
SeaTac	270	270	250	280	270	320
Unincorp. King Co.	20	20	10	-	40	-
Subtotal	**440**	**440**	**340**	**290**	**420**	**460**
75+ DNL						
SeaTac	10	10	10	40	10	80
Subtotal	**10**	**10**	**10**	**40**	**10**	**80**
65 DNL and Greater						
Burien	320	320	290	660	320	1,130
Des Moines	2,340	2,340	2,050	1,470	2,350	1,480
SeaTac	990	990	950	1,140	1,060	1,290
Unincorp. King Co.	1,170	1,170	1,160	1,130	1,330	1,620
Subtotal	**4,820**	**4,820**	**4,450**	**4,400**	**5,060**	**5,520**

Source: Landrum & Brown, and Gambrell Urban using 1990 Census

TABLE 5-6-4

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

NOISE SENSITIVE FACILITY COMPARATIVE DNL ANALYSIS

NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Churches									
All Saints Lutheran Church	56.6	56.6	0.0	56.3	55.4	-0.9	56.7	55.7	-1.0
Angle Lake Neighborhood Church	54.2	54.2	0.0	54.3	53.7	-0.6	54.8	54.4	-0.4
Apostolic Ch. of Jesus Christ	68.1	68.1	0.0	67.9	67.8	-0.1	68.2	67.8	-0.4
Associated Churches	50.2	50.2	0.0	49.9	49.2	-0.7	50.3	49.6	-0.7
Atonement Lutheran Ch.	59.8	59.8	0.0	59.5	61.2	1.7	59.8	63.0	3.2
Bahai of Normandy Park	53.8	53.8	0.0	54.3	54.9	0.6	54.7	55.0	0.3
Beautiful Saviour Lutheran Chu	57.5	57.5	0.0	57.5	56.9	-0.6	58.0	57.6	-0.4
Bethel Baptist Korean Ch.	59.3	59.3	0.0	59.2	58.9	-0.3	59.5	59.0	-0.5
Bible Baptist	53.0	53.0	0.0	53.4	54.8	1.4	53.9	55.8	1.9
Bible Fellowship	57.9	57.9	0.0	57.9	57.6	-0.3	58.1	57.7	-0.4
Dominion/Chiristian Faith Center	67.9	67.9	0.0	67.4	65.2	-2.2	67.7	65.4	-2.3
Christ's Church	57.2	57.2	0.0	57.1	57.1	0.0	57.3	58.1	0.8
Christ Church at Federal Way	57.5	57.5	0.0	57.1	56.0	-1.1	57.6	56.2	-1.4
Church of Christ Southwest	59.8	59.8	0.0	59.7	61.1	1.4	60.0	62.9	2.9
Comm Chapel Christian	62.0	62.0	0.0	62.1	64.2	2.1	62.6	64.9	2.3
Community Chapel - S. Campus	57.2	57.2	0.0	57.6	58.8	1.2	58.0	59.7	1.7
Cornerstone Comm. Baptist Church	55.9	55.9	0.0	55.6	54.6	-1.0	56.0	55.0	-1.0
Des Moines Foursquare Church	69.1	69.1	0.0	68.5	67.7	-0.8	68.8	66.9	-1.9
Des Moines Gospel Chapel	57.4	57.4	0.0	57.2	57.8	0.6	57.5	58.8	1.3
Des Moines United Methodist Ch	59.6	59.6	0.0	59.4	60.2	0.8	59.7	61.6	1.9
Federal Way Mission Church	52.6	52.6	0.0	52.3	52.7	0.4	52.4	53.4	1.0
First Baptist Ch. of Des Moine	69.2	69.2	0.0	68.7	68.2	-0.5	69.1	67.4	-1.7
Good Sheperd Episcopal Church	52.1	52.1	0.0	51.8	52.2	0.4	51.9	52.8	0.9
Grace Church of Federal Way	53.2	53.2	0.0	53.0	53.3	0.3	53.0	54.0	1.0
Grace & Peace Korean Church	49.3	49.3	0.0	49.0	49.7	0.7	49.1	50.0	0.9
Highline Ch. of the Nazarene	54.8	54.7	-0.1	54.8	55.6	0.8	55.2	56.6	1.4
Holy Trinity Lutheran Church	63.4	63.4	0.0	63.1	62.5	-0.6	63.5	62.3	-1.2
Jehovah's Witnesses	53.2	53.2	0.0	53.0	53.3	0.3	53.1	54.1	1.0
Lutheran Ch. of the Resurrecti	55.1	55.1	0.0	55.1	55.3	0.2	55.4	55.8	0.4
Marcus Whitman Presbyterian	64.5	64.5	0.0	64.1	63.4	-0.7	64.5	63.1	-1.4
Midway Comm. Covenant Church	65.8	65.8	0.0	65.2	63.6	-1.6	65.6	63.7	-1.9
Normandy Christian Church	62.4	62.4	0.0	62.3	63.3	1.0	62.6	64.3	1.7
Parks of the Pines	58.9	58.9	0.0	58.7	57.4	-1.3	59.1	57.8	-1.3
Pierce King Christian Ministri	57.6	57.6	0.0	57.6	57.4	-0.2	57.8	57.6	-0.2
Prince of Peace Lutheran	61.7	61.7	0.0	61.8	63.6	1.8	62.3	64.3	2.0
Rose of Sharon Christian Church	45.5	45.5	0.0	45.3	46.3	1.0	45.4	46.6	1.2
SeaTac Baptist Church	49.1	49.1	0.0	48.9	48.1	-0.8	49.3	48.5	-0.8
Seattle Full Gospel Church	61.4	61.4	0.0	61.0	59.8	-1.2	61.4	60.0	-1.4
Seventh Day Adventist Ch.	54.4	54.4	0.0	54.3	54.5	0.2	54.4	55.4	1.0
Sound View Baptist Ch.	70.1	70.1	0.0	69.4	68.4	-1.0	69.7	67.7	-2.0
Southminster Presbyterian	60.8	60.8	0.0	60.7	61.9	1.2	61.1	62.8	1.7

TABLE 5-6-4

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

NOISE SENSITIVE FACILITY COMPARATIVE DNL ANALYSIS

NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Churches Continued									
St. David of Wales Anglican	63.8	63.8	0.0	63.4	62.0	-1.4	63.9	62.2	-1.7
St. Philomena Catholic Church	69.1	69.1	0.0	68.7	68.0	-0.7	69.1	67.6	-1.5
Steel Lake Presbyterian Church	58.6	58.6	0.0	58.5	58.2	-0.3	58.8	58.1	-0.7
Unitarian Univ. Ch. of Seattle	62.1	62.1	0.0	62.0	61.6	-0.4	62.3	62.1	-0.2
Victory Baptist Church	68.7	68.7	0.0	68.3	67.6	-0.7	68.6	67.3	-1.3
West Campus Ch. of Christ	60.4	60.4	0.0	60.2	59.8	-0.4	60.6	59.9	-0.7
Voice of Zion Chapel	65.2	65.2	0.0	65.1	64.5	-0.6	65.5	65.3	-0.2
Calvary Christian	57.4	57.4	0.0	57.2	57.0	-0.2	57.5	57.7	0.2
Boulevard Park Presbyterian	69.6	69.6	0.0	69.3	69.1	-0.2	69.7	69.1	-0.6
Burien Adventist	68.7	68.7	0.0	68.5	68.9	0.4	68.8	70.1	1.3
Woodmont Christian	62.4	62.4	0.0	62.3	61.8	-0.5	62.7	61.9	-0.8
Way of Salvation	66.6	66.6	0.0	66.4	66.5	0.1	66.8	66.5	-0.3
Burien Methodist	59.4	59.4	0.0	59.4	61.3	1.9	59.9	62.5	2.6
Riverton Heights Baptist	63.2	63.2	0.0	63.0	62.9	-0.1	63.4	63.5	0.1
Historic Sites									
14th Ave S. Bridge	62.3	62.3	0.0	62.3	61.9	-0.4	62.7	62.3	-0.4
Allentown Shell Midden	48.9	48.9	0.0	48.8	48.9	0.1	49.2	49.6	0.4
Old Georgetown City Hall	60.3	60.3	0.0	60.3	60.1	-0.2	60.6	61.0	0.4
Maple Donation Claim	58.3	58.3	0.0	58.2	58.4	0.2	58.6	58.6	0.0
Georgetown Steam Plant	59.3	59.3	0.0	59.3	59.2	-0.1	59.7	59.5	-0.2
Boeing Airplane Company Building	56.7	56.7	0.0	56.6	56.7	0.1	56.9	57.2	0.3
Maddocksville Landing	51.2	51.2	0.0	51.2	50.3	-0.9	51.3	50.5	-0.8
14th Ave S. Bridge	62.6	62.6	0.0	62.6	62.2	-0.4	63.0	62.7	-0.3
Old Georgetown City Hall	60.4	60.4	0.0	60.4	60.1	-0.3	60.8	60.7	-0.1
Georgetown Steam Plant	60.2	60.2	0.0	60.2	60.0	-0.2	60.6	60.3	-0.3
Columbia City Historic Distric	47.8	47.8	0.0	47.7	47.9	0.2	48.0	48.6	0.6
Covenant Beach Church Camp	58.2	58.2	0.0	58.0	58.8	0.8	58.4	60.0	1.6
Maple Donation Claim	59.6	59.6	0.0	59.6	59.6	0.0	60.0	59.8	-0.2
Sunnydale School	61.6	61.6	0.0	61.7	63.7	2.0	62.3	65.1	2.8
Homer Webster Home	51.2	51.4	0.2	51.5	52.9	1.4	52.1	53.6	1.5
Dodds Homestead	58.5	58.5	0.0	58.4	59.8	1.4	58.7	61.4	2.7
Teague House	57.4	57.4	0.0	57.3	58.8	1.5	57.6	60.3	2.7
Woods House	57.9	57.9	0.0	58.1	59.7	1.6	58.6	61.2	2.6
Haselton Home	52.2	52.1	-0.1	52.4	53.5	1.1	52.5	54.2	1.7
Homer Crosby Home	61.5	61.5	0.0	61.4	63.5	2.1	61.8	65.4	3.6
Clubhouse (Highline Men's Prog	55.6	55.6	0.0	55.9	56.5	0.6	56.8	57.2	0.4
Kormasoff House	53.7	53.8	0.1	53.9	55.3	1.4	54.3	56.3	2.0
F.W. Dashley Home	53.4	53.4	0.0	53.8	54.2	0.4	54.7	54.9	0.2
Schoening Home	55.3	55.3	0.0	55.6	56.1	0.5	56.5	56.7	0.2
Brunelle Residence	66.6	66.6	0.0	66.3	68.4	2.1	66.6	70.2	3.6
Burien Historic Business Distr	55.3	55.3	0.0	55.7	56.8	1.1	56.3	57.8	1.5

TABLE 5-6-4

Seattle-Tacoma International Airport
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NOISE SENSITIVE FACILITY COMPARATIVE DNL ANALYSIS

NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Historic Sites (Continued)									
Bryan House	62.6	62.6	0.0	62.5	65.6	3.1	62.8	67.8	5.0
George Albee Estate	53.6	53.6	0.0	54.0	54.5	0.5	54.8	55.3	0.5
Highline High School	57.9	57.8	-0.1	58.1	59.7	1.6	58.7	60.5	1.8
Community Club Hall	57.3	57.3	0.0	57.1	57.8	0.7	57.4	58.9	1.5
Van Gasken House	55.3	55.3	0.0	55.2	55.7	0.5	55.5	56.4	0.9
Latimer House	58.5	58.5	0.0	58.3	59.0	0.7	58.6	59.9	1.3
Finnell House	56.2	56.2	0.0	56.0	56.7	0.7	56.4	57.6	1.2
Elsey House	59.1	59.1	0.0	58.9	59.7	0.8	59.3	61.1	1.8
Case Home	60.5	60.5	0.0	60.3	61.2	0.9	60.6	62.7	2.1
Rayback House	61.7	61.7	0.0	61.4	62.3	0.9	61.8	64.0	2.2
Walsworth House	61.9	61.9	0.0	61.6	62.4	0.8	62.0	64.0	2.0
L. H. Smith House	59.9	59.9	0.0	59.6	60.5	0.9	60.0	61.9	1.9
Lindahl House	55.0	55.0	0.0	54.9	55.2	0.3	55.2	55.8	0.6
Chesney House	64.3	64.3	0.0	64.0	64.4	0.4	64.3	65.7	1.4
WPA Park Building	60.3	60.3	0.0	60.0	60.9	0.9	60.4	62.4	2.0
Old Star Lake Lake School	60.5	60.5	0.0	60.1	59.4	-0.7	60.5	59.3	-1.2
Redondo Heights Grocery	61.1	61.1	0.0	60.9	60.4	-0.5	61.2	60.5	-0.7
Steele Lake Schoolhouse	59.1	59.1	0.0	58.6	58.1	-0.5	59.1	58.0	-1.1
Maddocksville Landing	49.5	49.5	0.0	49.5	49.3	-0.2	49.7	49.5	-0.2
Greene Residence	50.2	50.2	0.0	50.1	49.8	-0.3	50.3	50.0	-0.3
Biggar House	50.4	50.4	0.0	50.3	50.0	-0.3	50.6	50.2	-0.4
Kent Highlands House	51.5	51.5	0.0	51.5	50.3	-1.2	51.6	50.5	-1.1
Kent Highlands House II	53.5	53.5	0.0	53.4	52.6	-0.8	53.7	52.9	-0.8
Winston House	48.0	48.0	0.0	47.9	47.7	-0.2	48.2	47.9	-0.3
Hughett House	53.3	53.3	0.0	53.8	54.1	0.3	54.1	54.3	0.2
Clark House	53.1	53.1	0.0	53.6	53.9	0.3	53.9	54.1	0.2
Gustin House	53.3	53.3	0.0	53.7	54.1	0.4	54.1	54.3	0.2
Felix Vacca Farm	62.4	62.4	0.0	62.5	65.6	3.1	63.0	67.3	4.3
Albert Paul House	62.7	62.7	0.0	62.8	65.4	2.6	63.3	67.2	3.9
Farmstead (unidentified)	53.8	53.8	0.0	53.7	52.9	-0.8	53.9	53.1	-0.8
L. Mayer Residence	56.7	56.7	0.0	56.7	56.6	-0.1	57.3	57.3	0.0
Hillgrove Cemetery	70.4	70.4	0.0	70.2	69.9	-0.3	70.5	70.2	-0.3
Boeing Airplane Company Bldg	56.7	56.7	0.0	56.5	56.6	0.1	56.9	57.1	0.2
Georgetown Poor Farm Annex	59.8	59.8	0.0	59.7	60.0	0.3	60.1	61.2	1.1
Riverton Park United Methodist/	52.3	52.3	0.0	52.1	52.1	0.0	52.5	52.9	0.4
Nash House	50.1	50.1	0.0	50.0	50.0	0.0	50.4	50.7	0.3
Delta Masonic Temple	50.2	50.2	0.0	50.0	50.0	0.0	50.4	50.8	0.4
Albert Tutt Property	50.8	50.8	0.0	50.7	50.7	0.0	51.1	51.4	0.3
Gus Johnson Residence	49.3	49.3	0.0	49.2	49.2	0.0	49.6	50.0	0.4
Muckleshoot Indian Campground	62.8	62.8	0.0	62.5	61.8	-0.7	62.8	61.5	-1.3
Lumber Mill Office	52.6	52.6	0.0	52.4	52.6	0.2	52.7	53.4	0.7

TABLE 5-6-4

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NOISE SENSITIVE FACILITY COMPARATIVE DNL ANALYSIS

NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Historic Sites (Continued)									
Long Farmhouse	52.0	52.0	0.0	51.8	50.9	-0.9	52.3	51.4	-0.9
Star Lake School	56.3	56.3	0.0	55.9	55.0	-0.9	56.3	55.4	-0.9
Lenhart House	52.7	52.7	0.0	52.5	52.7	0.2	52.8	53.5	0.7
F.W. Morse Summer House	52.7	52.7	0.0	52.5	52.7	0.2	52.7	53.4	0.7
W. D. Cotter Summer House	52.6	52.6	0.0	52.4	52.7	0.3	52.7	53.4	0.7
Boeing Field Archaeological Si	57.8	57.8	0.0	57.6	58.3	0.7	58.0	59.7	1.7
Duwamish Archaeological Site	55.9	55.9	0.0	55.8	56.3	0.5	56.1	57.6	1.5
Tukwila Archaeological Site	60.1	60.1	0.0	59.9	60.0	0.1	60.3	60.4	0.1
Kent Archaeological Site	47.3	47.3	0.0	47.3	46.6	-0.7	47.7	47.2	-0.5
Hospitals									
Highline Community Hospital	54.5	54.5	0.0	54.7	55.6	0.9	55.3	56.5	1.2
Highline Riverton Com. Hospital	57.9	57.9	0.0	57.6	57.5	-0.1	58.0	58.1	0.1
Highline Community Hospital	50.3	50.3	0.0	50.8	53.2	2.4	51.1	53.8	2.7
Pacific Medical Center	55.5	55.5	0.0	55.6	55.3	-0.3	55.9	56.1	0.2
Shorewood Osteopathic Hosp.	51.0	50.9	-0.1	51.4	53.4	2.0	51.5	54.3	2.8
Veterans Affairs Medical Bldg.	58.9	58.9	0.0	59.0	58.6	-0.4	59.4	59.0	-0.4
Cascade Kidney Center	55.6	55.6	0.0	55.8	56.7	0.9	56.3	57.8	1.5
Valley Medical Center	36.8	36.8	0.0	37.1	37.5	0.4	37.4	37.7	0.3
Northwest Reg. Hosp. for Respil	57.9	57.9	0.0	57.6	57.5	-0.1	58.0	58.1	0.1
Libraries									
Boulevard Park Library	65.6	65.6	0.0	65.3	65.6	0.3	65.7	65.6	-0.1
Burien Library	52.8	52.8	0.0	53.2	55.1	1.9	53.6	56.0	2.4
Columbia Library	48.5	48.5	0.0	48.3	48.5	0.2	48.6	49.2	0.6
Des Moines Library	62.0	62.0	0.0	61.7	62.6	0.9	62.1	64.3	2.2
Foster Library	51.2	51.2	0.0	51.1	51.1	0.0	51.6	51.8	0.2
Holly Park Library	51.3	51.3	0.0	51.2	51.3	0.1	51.5	51.9	0.4
Rainier Beach Library	43.8	43.8	0.0	43.7	43.6	-0.1	44.0	44.3	0.3
Tukwila Library	44.5	44.5	0.0	44.5	44.3	-0.2	45.1	45.0	-0.1
Valley View Library	48.4	48.4	0.0	48.4	48.0	-0.4	48.9	48.6	-0.3
Nursing Homes									
Midway Manor	60.9	60.9	0.0	60.6	59.3	-1.3	61.0	59.6	-1.4
Monarch Care Center	63.2	63.2	0.0	62.9	61.0	-1.9	63.2	61.4	-1.8
Burien Terrace Nursing Center	51.5	51.4	-0.1	51.8	53.7	1.9	51.9	54.5	2.6
Federal Way Convalescent Center	55.7	55.7	0.0	55.6	55.6	0.0	55.7	56.5	0.8
Hallmark Manor	50.5	50.5	0.0	50.3	50.8	0.5	50.3	51.2	0.9
Highline Care Center	55.6	55.6	0.0	55.9	56.7	0.8	56.5	57.7	1.2
Judson Park Retirement	57.6	57.6	0.0	57.4	58.1	0.7	57.8	59.4	1.6
Riverton Heights Convalescent	56.9	56.9	0.0	56.7	56.6	-0.1	57.1	57.3	0.2
Seatoma Convalescent	62.2	62.2	0.0	61.8	60.3	-1.5	62.2	60.6	-1.6
Wesley Care Center	59.5	59.5	0.0	59.2	60.0	0.8	59.6	61.1	1.5
Abba Senior Family Home	55.9	55.9	0.0	55.7	55.9	0.2	56.0	57.0	1.0

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NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Nursing Homes (Continued)									
Harmony Gardens	65.6	65.6	0.0	65.6	64.9	-0.7	66.0	65.1	-0.9
Hillhaven Rehab. and Health Care	37.5	37.5	0.0	37.8	38.1	0.3	38.2	38.4	0.2
Helping Hands	54.0	54.0	0.0	53.7	52.2	-1.5	54.4	52.8	-1.6
Masonic Nursing Home	57.6	57.6	0.0	57.4	58.0	0.6	57.8	59.4	1.6
Parks & Recreation									
Jefferson Park Golf Course	57.2	57.2	0.0	57.2	57.1	-0.1	57.6	57.3	-0.3
Glen Acres Golf Club	63.9	63.9	0.0	63.7	64.1	0.4	64.1	65.5	1.4
Rainier Golf Course	65.3	65.3	0.0	65.1	65.1	0.0	65.6	65.3	-0.3
Foster Golf Links	44.4	44.4	0.0	44.4	44.3	-0.1	44.9	45.0	0.1
Foster Golf Links	43.2	43.2	0.0	43.2	43.1	-0.1	43.7	43.7	0.0
Tyee Valley Golf Course	76.1	76.1	0.0	75.4	74.3	-1.1	75.6	73.8	-1.8
Riverbend Golf Complex	49.7	49.7	0.0	49.7	48.8	-0.9	49.9	49.1	-0.8
Riverbend Golf Complex	47.5	47.5	0.0	47.6	46.9	-0.7	47.7	47.1	-0.6
Mt.Baker/Stan Sayres Memorial/Seward Park/Genesee Pg.	43.0	43.0	0.0	42.9	43.2	0.3	43.2	44.0	0.8
Columbia Park	48.9	48.9	0.0	48.8	48.9	0.1	49.1	49.6	0.5
Dearborn Park	52.3	52.3	0.0	52.1	52.3	0.2	52.5	52.8	0.3
Brighton Playground	47.1	47.1	0.0	47.0	47.1	0.1	47.3	47.8	0.5
Maple Wood Playground	58.4	58.4	0.0	58.3	58.5	0.2	58.7	59.6	0.9
Cleveland Playground	59.7	59.7	0.0	59.7	59.4	-0.3	60.1	60.2	0.1
S. Homer St. Playground	58.7	58.7	0.0	58.6	58.8	0.2	59.0	60.0	1.0
Van Asselt Playground	52.3	52.3	0.0	52.2	52.3	0.1	52.5	52.9	0.4
Othello Playground	45.6	45.6	0.0	45.4	45.6	0.2	45.8	46.3	0.5
Atlantic City Park	42.4	42.4	0.0	42.3	42.3	0.0	42.6	43.0	0.4
Kubota Gardens	44.5	44.5	0.0	44.5	44.3	-0.2	44.7	44.9	0.2
S. Norfolk St. Playground	41.7	41.7	0.0	41.9	41.5	-0.4	41.9	41.9	0.0
S. Sullivan St. Playground	58.7	58.7	0.0	58.5	59.5	1.0	58.9	60.9	2.0
Southern Heights Park	66.3	66.3	0.0	66.0	66.2	0.2	66.3	67.6	1.3
Arbor Lake Park	56.1	56.1	0.0	56.0	56.6	0.6	56.3	58.1	1.8
Westcrest Park	51.4	51.4	0.0	51.3	51.5	0.2	51.6	52.5	0.9
White Center Heights Park	50.1	50.1	0.0	50.1	50.3	0.2	50.4	51.3	0.9
White Center Park	47.4	47.4	0.0	47.4	47.6	0.2	47.6	48.4	0.8
Lakewood Park	49.5	49.5	0.0	49.5	49.8	0.3	49.8	50.7	0.9
Salmon Creek Park	49.7	49.7	0.0	49.8	50.2	0.4	50.0	51.0	1.0
S. 133rd St. Park	50.0	50.0	0.0	49.9	49.9	0.0	50.3	50.7	0.4
Southgate Park	50.7	50.7	0.0	50.6	50.6	0.0	51.0	51.3	0.3
Crystal Springs Park	49.2	49.2	0.0	49.2	48.3	-0.9	49.8	49.1	-0.7
Crestview Park	51.0	51.0	0.0	51.0	49.7	-1.3	51.5	50.4	-1.1
Bow Lake Park	47.8	47.8	0.0	47.8	47.5	-0.3	48.3	48.2	-0.1
Hilltop Park	59.8	59.8	0.0	59.5	59.4	-0.1	59.8	60.0	0.2
S. 142nd St. Park	60.3	60.3	0.0	60.2	60.0	-0.2	60.5	60.6	0.1
North Seatac Park	71.3	71.3	0.0	71.0	71.3	0.3	71.3	71.2	-0.1

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NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Parks (Continued)									
Moshier Park	58.6	58.6	0.0	58.9	60.2	1.3	59.5	61.1	1.6
Hazel Valley Park	52.6	52.6	0.0	52.5	53.1	0.6	52.9	54.1	1.2
Ed Munro Seahurst Park	48.6	48.6	0.0	49.3	52.7	3.4	49.4	52.8	3.4
Ed Munro Seahurst Park	47.9	47.9	0.0	48.2	49.3	1.1	48.7	49.9	1.2
Chelsea Park	52.2	52.1	-0.1	52.5	54.7	2.2	52.6	55.1	2.5
Burien Park	53.0	53.0	0.0	53.4	55.4	2.0	53.8	56.2	2.4
Lakeview Park	55.3	55.3	0.0	55.6	56.2	0.6	56.3	57.0	0.7
Kiwanis Park	54.2	54.3	0.1	54.4	55.5	1.1	55.0	56.5	1.5
City Hall Park	51.9	52.0	0.1	52.2	52.4	0.2	52.6	53.1	0.5
Private Park	50.4	50.4	0.0	50.8	50.4	-0.4	51.1	50.7	-0.4
Valley Ridge Park	52.7	52.7	0.0	52.7	52.4	-0.3	53.3	53.0	-0.3
Brisco Meander Park	45.5	45.5	0.0	45.6	45.1	-0.5	46.1	45.8	-0.3
Van Dorans Landing Park	50.5	50.5	0.0	50.5	50.1	-0.4	50.7	50.2	-0.5
Grandview Park	54.7	54.7	0.0	54.7	53.5	-1.2	55.0	53.8	-1.2
West Canyon Park	51.7	51.7	0.0	51.6	50.7	-0.9	51.9	51.0	-0.9
Angle Lake Park	62.1	62.1	0.0	62.1	60.7	-1.4	62.6	61.2	-1.4
Des Moines Creek Park	72.0	72.0	0.0	71.5	70.5	-1.0	71.7	70.0	-1.7
Des Moines Beach Park	58.3	58.3	0.0	58.1	58.7	0.6	58.4	59.6	1.2
Des Moines Park	60.2	60.2	0.0	60.0	60.8	0.8	60.3	62.3	2.0
Nature Trails Park	53.2	53.2	0.0	53.6	53.8	0.2	54.1	55.3	1.2
Normandy Park	53.9	53.9	0.0	54.2	54.9	0.7	54.6	56.0	1.4
Marine View Park	51.8	51.8	0.0	52.0	52.6	0.6	52.3	52.0	-0.3
Fishing Hole Park	49.2	49.2	0.0	49.2	48.2	-1.0	49.4	48.5	-0.9
Lake Fenwick Park	49.2	49.2	0.0	49.1	48.1	-1.0	49.4	48.5	-0.9
Linda Heights Park	56.4	56.4	0.0	56.1	55.0	-1.1	56.5	55.4	-1.1
Parkside Park	62.6	62.6	0.0	62.3	61.0	-1.3	62.7	61.2	-1.5
Parkside Wetlands	62.8	62.8	0.0	62.4	61.2	-1.2	62.8	61.3	-1.5
Glenn Nelson Park	57.3	57.3	0.0	57.0	55.9	-1.1	57.3	56.3	-1.0
Saltwater State Park	58.1	58.1	0.0	57.9	58.3	0.4	58.2	59.5	1.3
Woodmont Park	60.2	60.2	0.0	60.1	59.9	-0.2	60.4	60.8	0.4
Woodmont Beach Park	55.3	55.3	0.0	55.1	55.5	0.4	55.4	56.6	1.2
Camelot Park	51.0	51.0	0.0	50.8	49.8	-1.0	51.3	50.3	-1.0
A Park in Federal Way	60.2	60.2	0.0	59.8	59.0	-0.8	60.2	59.0	-1.2
Wildwood Park	59.3	59.3	0.0	58.8	58.3	-0.5	59.3	58.1	-1.2
Sacajawea Park	58.4	58.4	0.0	58.3	58.1	-0.2	58.6	58.7	0.1
Steel Lake Park	57.5	57.5	0.0	57.0	56.3	-0.7	57.4	56.3	-1.1
Barnes Creek Nature Trail	65.2	65.2	0.0	64.9	64.9	0.0	65.3	65.5	0.2
Big Catch Plaza	58.1	58.1	0.0	57.9	58.5	0.6	58.2	59.4	1.2
Cecile Power Park	61.4	61.4	0.0	61.3	61.2	-0.1	61.6	62.0	0.4
Des Moines City Park/Kiddie Park	65.4	65.4	0.0	64.9	63.5	-1.4	65.3	63.6	-1.7
Des Moines Marina	54.9	54.9	0.0	54.7	55.3	0.6	55.1	56.0	0.9

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NAME	2000 Do-Nothing (Alt 1)	2000 Preferred Alternative (Alt 3)	2000 DNL Change	2005 Do-Nothing (Alt 1)	2005 Preferred Alternative (Alt 3)	2005 DNL Change	2010 Do-Nothing (Alt 1)	2010 Preferred Alternative (Alt 3)	2010 DNL Change
Parks (Continued)									
Des Moines Marina Fishing Pier	53.9	53.9	0.0	53.7	54.2	0.5	54.1	54.9	0.8
Des Moines Memorial Park	57.6	57.6	0.0	57.4	57.8	0.4	57.7	58.6	0.9
Midway Park	61.2	61.2	0.0	60.9	59.3	-1.6	61.2	59.7	-1.5
Mount Rainier Pool	68.2	68.2	0.0	67.7	67.0	-0.7	68.1	66.6	-1.5
Overlook Park I	55.7	55.7	0.0	55.5	56.1	0.6	55.9	56.9	1.0
Overlook Park II	55.7	55.7	0.0	55.5	56.0	0.5	55.9	56.8	0.9
Redondo Waterfront/Wooton Park	55.3	55.3	0.0	55.1	55.3	0.2	55.4	56.3	0.9
Sonju Property (future Park)	64.7	64.7	0.0	64.5	63.9	-0.6	64.9	63.8	-1.1
S. 239th St. Beach Access	56.2	56.2	0.0	56.0	56.6	0.6	56.4	57.7	1.3
South Marina Park	55.8	55.8	0.0	55.6	56.3	0.7	56.1	57.2	1.1
Zenith Park	64.6	64.6	0.0	64.4	63.9	-0.5	64.8	64.4	-0.4
Schools									
Beverly Park/Glendale	64.0	64.0	0.0	63.9	63.9	0.0	64.3	65.1	0.8
Bow Lake	53.2	53.2	0.0	53.2	52.8	-0.4	53.8	53.5	-0.3
Cedarhurst	58.6	58.6	0.0	58.4	59.7	1.3	58.7	61.4	2.7
Des Moines	59.6	59.6	0.0	59.4	60.2	0.8	59.7	61.6	1.9
Gregory Heights	50.6	50.8	0.2	50.9	52.3	1.4	51.6	53.0	1.4
Hazel Valley	53.1	53.1	0.0	53.2	53.9	0.7	53.4	54.7	1.3
Hill Top	60.7	60.7	0.0	60.5	60.4	-0.1	60.8	60.9	0.1
Madrona	61.6	61.6	0.0	61.4	59.7	-1.7	61.7	60.1	-1.6
MarVista	54.2	54.2	0.0	54.7	55.7	1.0	55.1	56.7	1.6
McMicken Heights	54.9	54.9	0.0	54.9	54.3	-0.6	55.4	55.0	-0.4
Midway	66.3	66.3	0.0	65.7	64.1	-1.6	66.0	64.1	-1.9
Mount View	48.0	48.0	0.0	48.0	48.3	0.3	48.2	49.1	0.9
North Hill	60.4	60.4	0.0	60.3	61.4	1.1	60.7	62.2	1.5
Parkside	65.3	65.3	0.0	64.7	63.2	-1.5	65.1	63.3	-1.8
Riverton Heights	58.7	58.7	0.0	58.6	58.7	0.1	59.1	59.4	0.3
Salmon Creek	50.4	50.4	0.0	50.5	50.9	0.4	50.8	51.8	1.0
Seahurst	49.2	49.2	0.0	49.5	50.3	0.8	50.0	51.0	1.0
Shorewood	47.8	47.8	0.0	48.7	50.7	2.0	48.7	51.4	2.7
Southern Heights	66.2	66.2	0.0	66.1	65.5	-0.6	66.5	66.3	-0.2
Sunnydale	61.6	61.6	0.0	61.8	63.7	1.9	62.3	65.1	2.8
Valley View	49.3	49.3	0.0	49.3	49.0	-0.3	49.8	49.6	-0.2
White Center Heights	49.6	49.6	0.0	49.6	49.7	0.1	49.9	50.7	0.8
Cascade	48.8	48.8	0.0	48.8	49.2	0.4	49.1	50.0	0.9
Chinook	53.7	53.7	0.0	53.8	53.2	-0.6	54.3	53.9	-0.4
Pacific	65.8	65.8	0.0	65.1	63.6	-1.5	65.5	63.7	-1.8
Sylvester	54.1	54.2	0.1	54.3	55.4	1.1	54.9	56.3	1.4
Evergreen	49.6	49.6	0.0	49.6	50.0	0.4	49.9	50.9	1.0
Highline	57.9	57.9	0.0	58.1	59.7	1.6	58.7	60.5	1.8
Mount Rainier	69.2	69.2	0.0	68.8	68.3	-0.5	69.1	67.4	-1.7

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NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Schools (Continued)									
Tyee	51.4	51.4	0.0	51.4	50.9	-0.5	52.0	51.6	-0.4
Satellite Alternative H.S.	60.2	60.1	-0.1	60.5	62.2	1.7	60.9	62.7	1.8
Highline Community	64.2	64.2	0.0	63.7	62.4	-1.3	64.1	62.4	-1.7
Highline Children's Ctr/Olympic Sch	58.6	58.6	0.0	58.6	59.4	0.8	58.9	60.0	1.1
Performing Arts Center	59.5	59.5	0.0	59.6	61.4	1.8	60.2	62.4	2.2
Indian Education	57.0	57.0	0.0	57.3	58.0	0.7	58.1	59.0	0.9
SeaTac Occupational Skills Ctr	48.6	48.6	0.0	49.4	52.7	3.3	49.5	52.9	3.4
Marine Technology Lab	61.5	61.5	0.0	61.7	65.1	3.4	62.2	66.5	4.3
Tukwila Elementary	44.7	44.7	0.0	44.7	44.5	-0.2	45.2	45.1	-0.1
Thorndyke Elementary	51.6	51.6	0.0	51.6	51.4	-0.2	52.2	52.1	-0.1
Cascade View Elementary	55.6	55.6	0.0	55.4	55.4	0.0	55.8	56.1	0.3
Showalter Middle School	49.5	49.5	0.0	49.5	49.4	-0.1	50.0	50.1	0.1
Foster High School	51.1	51.1	0.0	51.1	51.0	-0.1	51.6	51.7	0.1
Camelot	53.0	53.0	0.0	52.8	51.7	-1.1	53.3	52.3	-1.0
Mark Twain	60.8	60.8	0.0	60.4	59.5	-0.9	60.7	59.5	-1.2
Nautilus	56.6	56.6	0.0	56.5	56.5	0.0	56.7	57.6	0.9
Star Lake	52.5	52.5	0.0	52.2	51.4	-0.8	52.6	51.8	-0.8
Sunnycrest	51.7	51.7	0.0	51.6	50.6	-1.0	51.9	51.0	-0.9
Valhalla	51.7	51.7	0.0	51.5	50.6	-0.9	51.9	51.1	-0.8
Wildwood	59.1	59.1	0.0	58.7	58.0	-0.7	59.1	57.9	-1.2
Woodmont	62.3	62.3	0.0	62.2	61.6	-0.6	62.5	61.8	-0.7
Meredith Hill	46.3	46.3	0.0	46.3	45.0	-1.3	46.9	45.7	-1.2
Sacajawea	46.6	46.6	0.0	46.5	47.1	0.6	46.6	47.4	0.8
Totem	52.6	52.6	0.0	52.3	51.5	-0.8	52.7	51.9	-0.8
Federal Way	58.4	58.4	0.0	58.3	58.0	-0.3	58.5	58.2	-0.3
Thomas Jefferson	51.5	51.5	0.0	51.3	50.4	-0.9	51.7	50.9	-0.8
Beacon Hill	56.6	56.6	0.0	56.7	56.4	-0.3	57.1	57.0	-0.1
Graham Hill	41.5	41.5	0.0	41.5	41.8	0.3	41.8	42.5	0.7
Kimball	54.3	54.3	0.0	54.3	54.3	0.0	54.6	54.8	0.2
Muir	49.3	49.3	0.0	49.2	49.5	0.3	49.5	50.1	0.6
Hawthorne	47.0	47.0	0.0	46.9	47.1	0.2	47.2	47.8	0.6
Maple	58.8	58.8	0.0	58.8	58.8	0.0	59.2	59.7	0.5
Dearborn Park	53.0	53.0	0.0	52.8	53.0	0.2	53.2	53.5	0.3
Whitworth	44.0	44.0	0.0	43.9	44.1	0.2	44.2	44.9	0.7
Brighton	45.7	45.7	0.0	45.6	45.8	0.2	45.9	46.5	0.6
Van Asselt	53.4	53.4	0.0	53.2	53.3	0.1	53.5	53.9	0.4
Wing Luke	48.7	48.7	0.0	48.6	48.7	0.1	48.9	49.4	0.5
Dunlap	44.8	44.8	0.0	44.8	44.8	0.0	45.0	45.5	0.5
Emerson	41.6	41.6	0.0	41.7	41.4	-0.3	41.8	41.8	0.0
Rainier View	43.4	43.4	0.0	43.4	43.6	0.2	43.7	44.2	0.5
Highland Park	47.8	47.8	0.0	47.8	47.8	0.0	48.0	48.7	0.7

TABLE 5-6-4

Seattle-Tacoma International Airport
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NOISE SENSITIVE FACILITY COMPARATIVE DNL ANALYSIS

NAME	2000			2005			2010		
	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change	Do-Nothing (Alt 1)	Preferred Alternative (Alt 3)	DNL Change
Schools (Continued)									
Concord	58.6	58.6	0.0	58.4	59.4	1.0	58.8	60.8	2.0
Mercer	58.9	58.9	0.0	59.0	58.6	-0.4	59.4	59.1	-0.3
South Shore	43.9	43.9	0.0	43.9	43.8	-0.1	44.1	44.5	0.4
Franklin	50.3	50.3	0.0	50.1	50.4	0.3	50.4	51.0	0.6
Rainier Beach	42.9	42.9	0.0	42.9	42.8	-0.1	43.1	43.4	0.3
Cleveland	59.9	59.9	0.0	59.9	59.5	-0.4	60.3	60.1	-0.2
Orca/Columbia	49.2	49.2	0.0	49.0	49.2	0.2	49.3	49.9	0.6
Sharples	47.5	47.5	0.0	47.3	47.5	0.2	47.7	48.2	0.5
Amazing Grace Lutheran School	43.3	43.3	0.0	43.4	43.1	-0.3	43.5	43.6	0.1
Catskins Montesorri	52.8	52.9	0.1	52.9	52.6	-0.3	53.4	53.3	-0.1
Christian Faith	53.9	53.9	0.0	53.7	52.8	-0.9	54.0	53.1	-0.9
Colonial Christian School	46.4	46.4	0.0	46.3	47.0	0.7	46.5	47.3	0.8
Comm Chapel Christian School	62.0	62.0	0.0	62.1	64.2	2.1	62.6	64.9	2.3
Holy Innocents	58.8	58.8	0.0	58.4	57.5	-0.9	58.9	57.6	-1.3
Pegasus/Normandy Park Acad.	56.5	56.5	0.0	56.8	57.6	0.8	57.5	58.6	1.1
Rainier Valley Christian Schoo	43.1	43.1	0.0	43.1	43.1	0.0	43.3	43.8	0.5
St. Francis of Assisi School	52.7	52.7	0.0	53.1	53.4	0.3	54.0	54.0	0.0
St. Philomenas School	69.5	69.5	0.0	69.1	68.4	-0.7	69.4	67.8	-1.6
St. Vincent's School	54.6	54.6	0.0	54.4	54.7	0.3	54.6	55.6	1.0
SeaTac Christian Acad.	54.1	54.1	0.0	54.2	53.6	-0.6	54.7	54.4	-0.3
Seattle Christian	65.4	65.4	0.0	65.3	63.6	-1.7	65.7	64.1	-1.6
Evergreen Lutheran High /Trinity	63.4	63.4	0.0	63.1	62.5	-0.6	63.5	62.3	-1.2
John F. Kennedy Mem HS	55.1	55.1	0.0	55.1	56.3	1.2	55.4	57.4	2.0
Dominion/Chiristian Faith Center	67.9	67.9	0.0	67.4	65.2	-2.2	67.7	65.4	-2.3
Hamlin Robinson S. of Dyslexia	63.7	63.7	0.0	63.7	63.7	0.0	64.0	65.0	1.0
Pegasus/Normandy Park Acad.	56.5	56.5	0.0	56.8	57.6	0.8	57.5	58.6	1.1
Sea-Tac Occupational Skills Ct	61.5	61.5	0.0	61.7	65.1	3.4	62.2	66.6	4.4
Boulevard Park Elementary	67.3	67.3	0.0	67.0	67.4	0.4	67.4	67.4	0.0
Glacier High	64.4	64.4	0.0	64.2	63.9	-0.3	64.6	64.6	0.0
Woodside Elementary	62.1	62.1	0.0	62.3	64.8	2.5	62.8	65.9	3.1
Sunny Terrace Elementary	62.8	62.8	0.0	62.6	66.0	3.4	63.0	68.2	5.2
Angle Lake Elementary	66.4	66.4	0.0	66.4	64.9	-1.5	66.9	65.5	-1.4
Maywood Elementary	68.9	68.9	0.0	68.7	68.9	0.2	69.0	69.4	0.4
Zenith School	65.2	65.2	0.0	65.0	64.4	-0.6	65.4	64.6	-0.8
Des Moines Assembly of God	66.8	66.8	0.0	66.2	64.3	-1.9	66.6	64.5	-2.1

Sites shown with a shade, indicate sites exposed to 65DNL or greater where the project would increase noise by 1.5 DNL or more

Source: Landrum & Brown, December 1996.

TABLE 5-6-5

Seattle-Tacoma International Airport
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PART 150 LAND USE COMPATIBILITY GUIDELINES
Page 1 of 4

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL:						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Household units (11)						
Single units-detached (11.11)						
Single units-semidetached (11.12)						
Single units-attached row (11.13)						
Two units-side-by-side (11.21)						
Two units-one above the other (11.22)						
Apartments-walk up (11.31)						
Apartments-elevator (11.32)						
Group quarters (12)						
Residential hotels (13)						
Other residential (19)						
Mobile home parks (14)	Y	N	N	N	N	N
Transient lodgings (15)	Y	N[1]	N[1]	N[1]	N	N
PUBLIC USE:						
Schools, hospitals, and nursing homes	Y	25	30	N	N	N
Educational services (68)						
Hospitals, nursing homes (65.13, 65.16)						
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Cultural activities (including churches) (71)						
Auditoriums, concert halls (72.1)						
Governmental services (67)	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Railroad, rapid transit and street railway transportation (41)						
Motor vehicle transportation (42)						
Aircraft transportation (43)						
Marine craft transport (44)						
Highway and street right-of-way (45)						
Parking (46)	Y	Y	Y[2]2	Y[3]	Y[4]	N

Footnotes contained on page 4 of table.

TABLE 5-6-5

Seattle-Tacoma International Airport
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PART 150 LAND USE COMPATIBILITY GUIDELINES
Page 2 of 4

Land Use	Yearly Day-Night Average Sound Level (DNL) in Decibels: Below 65	65-70	70-75	75-80	80-85	Over 85
COMMERCIAL USE:						
Offices, business, and professional	Y	Y	25	30	N	N
Finance, insurance and real estate services (61)						
Personal services (62)						
Business services (63)						
Professional services (65)						
Other medical facilities (65.1)						
Miscellaneous services (69)						
Wholesale and retail-building materials, hardware and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Wholesale trade (51)						
Retail trade-building materials, hardware and farm equipment (52)						
Repair services (64)						
Contract construction services (66)						
Retail Trade - general	Y	Y	25	30	N	N
Retail trade-general merchandise (53)						
Retail trade-food (54)						
Retail trade-automotive, marine craft, aircraft and accessories (55)						
Retail trade-apparel and accessories (56)						
Retail trade-furniture, home furnishings and equipment (57)						
Retail trade-eating and drinking establishments (58)						
Other retail trade (59)						
Utilities (48)	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication (47)	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Food and kindred products - manufacturing (21)						
Textile mill products-manufacturing (22)						
Apparel and other finished products made from fabrics, leather and similar materials-manufacturing (23)						
Lumber and wood products (except furniture) - manufacturing (24)						
Furniture and fixtures-manufacturing (25)						
Paper and allied products-manufacturing (26)						
Printing, publishing, and allied industries (27)						
Chemical and applied products-manufacturing (28)						
Petroleum refining and related industries (29)						
Rubber and misc. plastic products-manufacturing (31)						

TABLE 5-6-5

Seattle-Tacoma International Airport
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PART 150 LAND USE COMPATIBILITY GUIDELINES
Page 3 of 4

Land Use	Below 65	65-70	70-75	75-80	80-85	Over 85
	Yearly Day-Night Average Sound Level (DNL) in Decibels					
Stone, clay and glass products-manufacturing (32)						
Primary metal industries (33)						
Fabricated metal products-manufacturing (34)						
Miscellaneous manufacturing (39)						
Photographic and optical	Y	Y	25	30	N	N
Professional, scientific, and controlling instruments, photographic and optical goods; watches and clocks manufacturing (35)						
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Agriculture (except livestock) (81)						
Agriculture related activities (82)						
Forestry activities and related services (83)						
Livestock farming and breeding (81.5 - 81.7)	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Fishing activities and related services (84)						
Mining activities and related services (85)						
Other resource production and extraction (89)						
RECREATIONAL:						
Outdoor sports arenas and spectator sports (72.2)	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters (72.11)	Y	N	N	N	N	N
Nature exhibits and zoos (72.1)	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Amusements (73) Parks (76)						
Public assembly (72)						
Resorts and group camps (75)						
Other cultural, entertainment and recreation (79)						
Golf course, riding stables and water recreation (74)	Y	Y	25	30	N	N

Numbers in parentheses refer to Standard Land Use Coding Manual (SLUCM)

* The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses remains with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

TABLE 5-6-5

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

PART 150 LAND USE COMPATIBILITY GUIDELINES
Page 4 of 4

KEY TO TABLE

Number in ( )	Standard Land Use Coding Manual (SLUCM).
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
25, 30, or 35	Land Use and related structures generally compatible; measures to achieve Noise Level Reduction (NRL), outdoor to indoor, of 25, 30, or 35 must be incorporated into design and construction of structure.

NOTES FOR TABLE

1. Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
2. Compatible where measures to achieve NLR of 25 are incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
3. Compatible where measures to achieve NLR of 30 are incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4. Compatible where measures to achieve NLR of 35 are incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
5. Land use compatible provided special sound reinforcement systems are installed.
6. Prime use only, any residential buildings require NLR of 25 to be compatible.
7. Prime use only any residential buildings require an NLR of 30 to be compatible.
8. Prime use only, NLR for residential buildings not normally feasible, and such uses should be prohibited.
   g. Designations contained in the table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptability and permissible land uses remain with the local authorities.
   h. Although Table 2 of FAR Part 150 defines the compatibility or noncompatibility of various land uses for the purposes of Federal Aid, programs, or sanctions under the ASNA Act, adjustments or modifications of the descriptions of the land use categories may be desirable after consideration of specific local conditions.

Source: Federal Aviation Administration Advisory Circular AC 150/5020-1, **Noise Control and Compatibility Planning For Airports**, Appendix 1, August 5, 1983.

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SECTION 5-7

OTHER IMPACTS

The new forecasts were examined relative to the remaining environmental factors that are required to be considered by the National Environmental Policy Act and Washington State Environmental Policy Act (SEPA). The new forecasts and new information that has become available since publication of the February, 1996 Final EIS would not change the conclusions or findings of the impacts in these areas. Considered were:

1. Prime and Unique Farmland,
2. Social Impacts,
3. Human Health,
4. Induced Socio-Economic Impacts,
5. Water Quality,
6. Coastal Zone Management and Coastal Barriers,
7. Wild and Scenic Rivers,
8. Public Services and Utilities,
9. Earth,
10. Solid Waste,
11. Hazardous Waste and Materials,
12. Energy Supply and Natural Resources, and
13. Aesthetics and Urban Design.

The following summarize these impacts.

1. PRIME AND UNIQUE FARMLAND IMPACTS

Throughout the 20th century, the nation's prime and unique farmland has decreased dramatically because of urban development throughout the country. The Farmland Protection Policy Act of 1981 was enacted to minimize the extent to which federal programs contribute to unnecessary and irreversible conversion of farmland to non-agricultural uses. No prime or unique farmlands were identified within the acquisition or construction areas of any "With Project" alternative. Thus, no such farmlands would be adversely affected.

2. SOCIAL IMPACTS

The Master Plan Update alternatives were evaluated for their impact on adjacent residential communities, and businesses. Social impacts considered include the following: residential and business displacement, and disruption of existing communities and planned development.

The following number of properties could be acquired under the "With Project" alternatives to complete construction, to clear the runway protection zones (RPZs), and to mitigate adverse environmental impacts:

8,500-ft Dependent	Number to be Acquired: Single Family	Condos/ Apartments	Business
Runway related:			
Alternative 1	0	0	0
Alt. 2, 3, & 4	388	260	105
Non-Runway related:			
Alternative 1	3	0	0
Alternative 2 & 3	3	0	0
Alternative 4	3	0	12

Included in the acquisition noted above is the assumption that 88 business that are located within the southern Runway Protection Zone (RPZ) which is located south of South 188th Street. During the fall of 1996, Port of Seattle representatives met with and inventoried the businesses in this location. The significant majority of these business owners indicated a preference to retain their present location and most of the operations at these businesses are compatible with an RPZ location. As a result, the Port of Seattle is proceeding with an evaluation of purchasing the necessary easement from these business owners. The few businesses that are required to be relocated because their use would conflict with the requirements of the RPZ, or those which indicate a preference for relocation will be acquired, following the provisions of the Uniform Act.

3. HUMAN HEALTH IMPACTS

The Final EIS assessed the human health related issues associated with:

- noise,
- air quality,
- water quality,
- radio transmissions and light emissions, and
- aircraft incidents/accidents.

The Airport's present environment has the potential to affect human health, although the potential is difficult to assess and characterize because many research studies indicate conflicting reports of human health impacts.

In general, adverse environmental impacts are expected to decrease in the future as improved technology results in lower air, noise, and water pollutant emissions. The proposed Master Plan Update alternatives are expected to increase noise and stormwater flows over the Do-Nothing alternative. However, the impacts of the future "With Project" alternatives are expected to be less than the current conditions.

4. INDUCED SOCIO-ECONOMIC IMPACTS

As major passenger and cargo transportation facility, Sea-Tac Airport directly and indirectly contributes to the economic structure of the Puget Sound Region. Induced socio-economic benefits are generated in the Region by changes in employment opportunities, payroll generation, business expenditures for goods and services, and tax revenue. The existing and forecast Do-Nothing induced socio-economic impacts are shown below.

Direct, indirect and induced construction-related jobs would be approximately 8,200 for the Do-Nothing (Alternative 1) and about 45,500 for each of the "With Project" alternatives.

	Airport Activity Related Impacts Alternative 1, 2, 3, and 4		
	1993	2010	2020
Total Jobs	205,690	335,344	418,632
Personal Income (Millions)	2,585.6	4,215.4	5,262.4
Earnings/Dir Jobs (Millions)	15,910	25,938.7	32,380.9
Business Revenue (Millions)	6,355.7	10,361.9	12,935.5
State & Local Taxes (Millions)	406.6	662.9	827.9

The activity-related, induced socio-economic impacts would be the same for all Master Plan Update alternatives. However, the acquisition effects would differ. The following summarize the impacts of the "With Project" alternatives compared to the Do-Nothing (Alternative 1):

	Impacts Due to:		
	Alt 2	Alt 3	Alt 4
Annual Loss in Property Tax (Thousands)	$227.5	$227.5	$291.9
Annual Lost Taxable Sales Transactions (Millions)	$2.2	$2.2	$15.6
Jobs Displaced	627	627	822

Impacts are less if displaced businesses relocated within the area. Assumes the 8,500 ft new dependent parallel runway. and that commercial property in the RPZ is acquired.

A new 8,500 foot parallel runway would displace businesses and numerous residences through property acquisitions, reducing the existing property and sales tax revenue and employment. The property tax and sales impacts to an individual community are less than five percent. This would occur primarily in the City of SeaTac and, to a lesser extent, in the City of Burien. The only acquisition of property landside development the is the South Unit Terminal (Alternative 4), which would acquire 12 properties on the northwest corner of International Blvd. and South 188th Street.

Reductions in tax revenues would be offset long term by positive net gains in future tax receipts as property is more intensely developed in the Airport vicinity. Local sales tax revenues will be generated by people directly employed at Sea-Tac Airport and induced revenues by airport activity (e.g., taxable spending on goods and services by people employed at the Airport, air cargo businesses, hotel and commercial uses).

5. WATER QUALITY IMPACTS

Changing the Airport's landscape, as would happen with the proposed Master Plan Update alternatives, could affect the hydrology of the airport area as well as the downstream systems. The "With Project" alternatives (Alternatives 2, 3, and 4) would include earthwork and the addition of impervious land surface area. This decreases the amount of rainfall infiltrating the soil and increases stormwater runoff flow rates and volumes.

About 61 acre-feet of new on-site detention storage volume would be required for the proposed developed areas that drain to Miller Creek, and 31 acre-feet of storage for areas draining to Des Moines Creek. These detention volumes would attenuate peak runoff rates from the Airport to provide protection from downstream flooding for storms having up to a 100-year return period. New impervious areas would increase annual runoff volumes to Miller Creek by 6 to 8 percent and volumes to Des Moines Creek by 1 to 2 percent. Most of the additional volume would flow through the downstream systems at rates that have low erosion potential. Higher runoff volumes could be partially offset by stormwater infiltration where on-site soils are suitable.

The Master Plan Update Final EIS (Chapter IV, Section 10) included a storm water management plan to mitigate storm water flow rate impacts associated with the proposed Master Plan Update improvements. The plan included proposed sizes and locations for storm water control facilities. To identify the facilities for analysis in the Final EIS, a number of assumptions were made. These assumptions included runoff model parameters (for example, future land use of currently undeveloped property), applicable regulations, the final design of the various Master Plan Update improvements, and the location of discharge points (outfalls) and detention ponds. The plan was developed using a conservative, worst-case approach, as is appropriate for environmental documents. In other words, the control facilities were designed using assumptions that would result in the greatest probable detention requirements. Changes in any of these assumptions would change the storm water management plan. In most cases, detention requirements and the size of the detention facilities would decrease because of the original conservative assumptions. Also, existing storm water control facilities may be modified to mitigate future project storm water impacts.

As engineering design work on the Master Plan Update improvements continues, the storm water control requirements will become more precisely known, and as a result it may be possible to reduce the detention needs.

Although pollutant loading will increase somewhat because of greater amounts of stormwater runoff associated with the "With Project" alternatives, implementation of mitigation would prevent significant pollution or degradation of surface and groundwater resources.

In early 1997, the Port completed its Comprehensive Stormwater Review, in accord with the NPDES requirements. Key findings of this study, titled Sea-Tac International Airport Storm Drainage System Comprehensive Plan, dated February 1997 are:

- "The capacity of the existing SDS (Storm Drainage System), which was developed over a period of approximately 50 years, was for the most part, sized to handle the 10-year storm event. Future SDS projects will be sized to handle the 25-year, 24-hour event, the generally accepted design standard...
- Despite the historic lower design standard upon which the present SDS was sized, hydraulic modeling results indicate that about 95.5% of the SDS is capable of handling at least the 25-year, 24-hour storm event. Hydraulic modeling result indicate that the hydraulic capacity would be exceeded during the 25-year, 24-hour storm event in 7,900 feet of SDS piping (about 4.5% of the system), located in various sections of the system. The design capacities of these segments would be exceeded by 20 percent or more for 15 to 60 minutes....
- As indicated in the report, the SDS was evaluated using 1974 as the base condition. Due primarily to the transfer of contributing area from the SDS to the Industrial Waste System (IWS), the area of the SDS that drains to Des Moines Creek has decreased by approximately 98 acres (about 12%) since the 1974 base condition.... Since 1974, approximately 55 acres of the area of the SDS draining to Des Moines Creek have been converted from pervious to impervious due to paving and building construction. Approximately 17 acres draining to Miller Creek were converted from pervious to impervious.
- The estimated peak flows for design storms have decreased in the southeast and southwest basins and increased slightly in the north basin since the 1974 predeveloped base condition. From the analysis, it is apparent that existing SDS basin detention facilities at the Lake Reba Regional Detention Facility at the north end and the Northwest Ponds and Tyee Pond on the south end are adequate to meet current STIA detention requirements. As a result, additional detention is not required to reduce peak flows in any of the major SDS drainage basins." (Pages 1-2 through 1-4)

This report, titled *Sea-Tac International Airport Storm Drainage System Comprehensive Plan*, dated February 1997 is hereby incorporated by reference and is available for review during normal business hours at the FAA Offices in Renton ,Washington and the Port of Seattle Offices at Sea-Tac Airport.

In addition, the Port of Seattle is participating in a basin plan for the Des Moines Creek Basin along with King County, City of SeaTac and City of Des Moines. It is anticipated that this plan will be finalized in 1997 and will identify improvements within the basin to address conditions such as creek flow, erosion, water quality, fish passage blockage, and cooperative planning and implementation actions. The plan has identified several conceptual options that may result in the development of a detention facility at the site of the Port's Northwest Ponds (south of South 188th Street).

Based on concerns of Seattle Water Department (now known as the Seattle Public Utilities), the Port undertook additional groundwater and geotechnical investigations concerning soil characteristics, including permeability and adsorptive capacity. This analysis found:

"Permeability (or hydraulic conductivity) and adsorptive capacity of soil are significant factors because they largely control the rate at which contaminants can infiltrate and migrate in the subsurface....Near surface soils across the site largely consist of till or a thin layer of fill and recessional outwash over till. .. The till (or till-like outwash) underlying the site consists of a very dense mixture of silt, sand, and gravel. The ability of till to transmit water is very low. This is due in part to its relatively high silt content typically ranging between 25 percent and 40 percent ... and to its compression beneath thousands of feet of glacial ice after deposition... Calculating hydraulic conductivity from available grain size data ... resulted in permeability values in the range of 3 to 4 x 10^{-5} cm/sec. ... These data and the wide recognition of Vashon Till as a low permeability aquitard, show that the till underlying the site has a very low permeability... We therefore conclude there is low potential for contaminants released during construction in the fill/outwash area to infiltrate..."

"Summary and Mitigation Recommendation: We conclude the proposed parking lot has a very low potential to impact groundwater quality in the Shallow Aquifer. This conclusion is based on the fact that threats to groundwater quality are largely governed by the degree to which surface water can be contaminated and then infiltrate and reach underlying groundwater. ... The extremely small fraction of surface water that does manage to bypass all of the above (drainage system, pavement basecourse, trench backfills, topsoil horizon, etc.) will have to migrate downward through up to 80 feet of dense till before reaching the Shallow Aquifer. In our opinion, the rate and volume of this movement would be so slow that it would pose essentially no risk to groundwater quality." *Draft Groundwater Quality Impact Evaluation Proposed North Employee Parking Lot, Seattle Tacoma International Airport*, AGI Technologies, April 1997.

Thus, this analysis confirmed the findings of the Final EIS concerning the potential for aquifer contamination. The draft report, titled "Draft Groundwater Quality Impact Evaluation Proposed North Employee Parking Lot Seattle-Tacoma International Airport" dated April 1997 is hereby incorporated by reference. Copies of this report are available for public review during normal business hours at the FAA Offices in Renton, Washington and at the Port of Seattle Offices at Sea-Tac Airport.

Additional coordination is expected to occur with the Seattle Public Utilities concerning the development of the parking lot at this site. Construction and operational BMPs will be used to address concerns voiced by the Utility. These include:

- Prohibiting fuel or bulk material storage on the parking lot unless it is strictly inert material;
- Prohibit vehicle washing and maintenance activities on the parking lot;
- Carefully design sealing methods for all joints and pipe connections, and establish quality assurance check during construction to confirm that sealing has been accomplished in accordance with project specifications;
- Design bio-swales for optimum petroleum hydrocarbon degradation;
- Control agriculture chemical (landscaping fertilizer) application, particularly during the initial planting;
- Regular maintenance of the drainage system, focusing on the removal of sediments from catch basins and detention vaults and oil from oil/water separators;
- Require contractor to prepare and implement a construction spill response plan;
- Require the contractor to centralize equipment fueling and repair operations and to construct on-site spill containment measures for the operations area; and
- Establish fill placement specifications which lower fill permeability to the greatest degree practicable

In addition, it is expected that a guard will be available in the parking lot to ensure that activities are not conducted in the lot or adjoining area that could result in contamination. The Port will also place signage in the lot to notify users that the lot is in near proximity to the Utilities wellhead. Because of the presence of the wellhead in this area, the Port and Seattle Public Utilities are expected to continue coordination to ensure that contamination does not occur.

6. COASTAL ZONE MANAGEMENT AND COASTAL BARRIERS

The Airport Master Plan alternatives will conform to all applicable Coastal Zone Management Program policies. The Port will certify that the Master Plan Update improvements conform to all applicable Coastal Zone Management and Shoreline Management policies.

7. WILD AND SCENIC RIVERS

The proposed Master Plan Update alternative will not affect wild or scenic rivers.

8. PUBLIC SERVICES AND UTILITIES

Public services and utilities would require minor changes based on the residences, businesses, and facilities displaced by development. Major utilities that would be relocated or protected in-place are the Southwest Suburban Sewer District, Miller Creek Interceptor, Seattle Water Department trunk line, Puget Power third electrical service metering point, and US West trunk lines entering at S. 176th Street. A variety of existing utility services, both on the Airport and off the Airport, would be abandoned.

9. EARTH

Project construction and operation (including clearing, grading, excavation, and fill placement) are evaluated and potential mitigation measures identified. Source of fill materials, depth of fill placement, and methods of placement and compaction also are addressed. Actions that would occur in sensitive hazard areas are identified and described.

The Master Plan Update alternatives would require the movement of the following quantities of earth:

Alternative	Million Cubic Yards of Fill
Alternative 1 (Do-Nothing)	2.4
Alternative 2	23
Alternative 3	23
Alternative 4	23

Note: Alternatives 2, 3 and 4 assume a new parallel runway with a length up to 8,500 feet, located 2,500 ft west of Runway 16L/34R.
- The Do-Nothing includes the development of the South Aviation Support (SASA) and Des Moines Creek Technology Campus.

Of the 23 million cubic yards of fill needed, about 17.25 million cubic yards would be needed for an 8,500-foot new parallel runway. All of the required fill could be obtained from a combination of Port of Seattle-owned property and off-site borrow sources.

Two seismic hazard areas have been identified by the City of SeaTac on the site of the proposed new parallel runway. They are small areas of shallow, loose sediment that likely would liquefy during a seismic event. During construction this sediment would be removed and replaced with compacted fill.

Erosion of exposed soils in areas of excavation, fill, and stockpile would occur during construction. The amount of erosion would depend on the design and implementation of an Erosion and Sedimentation Control Plan, as described in Section 5-2 "Construction Impacts".

10. SOLID WASTE

Solid waste is composed of solid and semi-solid waste, including such things as garbage, rubbish, metal, paper, plastic, and wood. Based on the analysis of solid waste conditions, and the impacts of the

Master Plan Update alternatives, no significant impacts on solid waste generation and disposal are expected.

11. HAZARDOUS WASTE AND MATERIAL

Operations at the Airport by the Port and airport tenants involve the storage and use of hazardous materials and the generation of hazardous wastes. Fifty-one potential or known hazardous substance sites exist on the Airport property and in the vicinity of the Sea-Tac Airport. Eleven of those sites are located in the area where a new parallel runway would be completed, and one is located in the proposed SASA Area. Sites located west of the Airport, and those located on Port of Seattle (POS) property, have the potential to be most affected by the Master Plan Update alternatives.

Potential hazards during construction phases (of all alternatives) could include the exposure of contaminated soils during excavation, release of hazardous substances during UST removal and building demolition, and spills of construction-related hazardous materials (e.g., fuels, lubricants, paints, and asphalt).

Mitigation for potential construction-related hazards include developing a Spill Prevention, Control, and Countermeasures Plan (SPCCP) outlining procedures for transport, storage, and handling of hazardous materials, and a Hazardous Substances Management and Contingency Plan outlining procedures for removal, storage, transportation, and disposal of hazardous wastes. All federal, state, and applicable local rules and guidelines for handling and disposal of hazardous substances would be followed.

12. ENERGY SUPPLY AND NATURAL RESOURCES

Energy and natural resources in the form of electricity, natural gas, aviation fuel, diesel fuel, and gasoline are consumed through the operation of the airport facilities, aircraft, and attendant equipment. Demand for Airport services, would increase demand on the sources of energy at the Airport. The proposed "With Project" alternatives (Alternative 2, 3 and 4) are expected to increase in annual energy usage seven to nine percent over the Do-Nothing (Alternative 1). All suppliers of these natural resources have indicated the capability of serving the increased demand.

13. AESTHETICS AND URBAN DESIGN

The proposed "With Project" will change the visual character of the area. Adherence to applicable design and landscaping standards can ensure that this impact would not be adverse, rather enhance the views and aesthetic characteristics around the Airport perimeter. Section 5-4 "Construction Impacts" provides additional information concerning the proposed third runway embankment area as well as the on-site borrow source locations.

CHAPTER 6
ABBREVIATIONS, ACRONYMS, INDEX AND GLOSSARY

LIST OF ABBREVIATIONS AND ACRONYMS

AAIA	Airport & Airway Improvement Act
AADT	Annual Average Daily Traffic
AF	Airway Facilities Division, FAA
AG	Agricultural Land
AGL	Above Ground Level
AIRTRAC	Air Transportation Commission
ALP	Airport Layout Plan
ALS	Approach Light System
ALSF-2	High Intensity Approach lighting System with Sequenced Flashers
AMF	Airmail Facility
ANCA	Airport Noise and Capacity Act
AP	Airports Division, FAA
APEC	Asian Pacific Economic Cooperation
ARFF	Airport Rescue and Fire Fighting Facility
ARSA	Airport Radar Service Area
ARSR	Air Route Surveillance Radar
ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal System
ASDA	Accelerate - Stop Distance Available
ASDE	Airport Surface Detection Equipment
ASIL	Acceptable Source Impact Levels
ASR	Airport Surveillance Radar
ASV	Annual Service Volume
AT	Air Traffic Division, FAA
ATC	Air Traffic Control
ATCT	Airport Traffic Control Tower
BBTU	Billion British Thermal Units
BOD	Biological Oxygen Demand
BMP	Best Management Practice
BTU	British Thermal Unit
CAB	Civil Aeronautics Board
CATI	Category I Instrument Landing System (uses MALSR)
CATII	Category II Instrument Landing System (uses ALSF-2)
CATIII	Category III Instrument Landing System (uses ALSF-2)
CBRA	Coastal Barriers Resources Act
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CEQ Regulations	Council on Environmental Quality Regulations Implementing The National Environment Policy Act

LIST OF ABBREVIATIONS AND ACRONYMS (Continued)

CFR	Code of Federal Regulations
CL	Centerline lights
Class "AA"	Extraordinary (waters)
CMSA	Consolidated Metropolitan Statistical Area
CO	Carbon Monoxide
COE or USCOE	U.S. Army Corps of Engineers
CTI	Cell Therapeutics INC.
cy	cubic yards
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DARC	Direct Access Radar Channel
db	Decibels
dBA	Decibels A-weighted
DEIS	Draft Environmental Impact Statement
DNL or Ldn	Day-Night Average Sound Level
DOE	Washington State Department of Ecology
DOI	U.S. Department of the Interior
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EDMS	Emissions Dispersion Modeling System
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EO	Executive Order
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FCC	Federal Communication Commission
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIA	Federal Flood Insurance Administration
FICON	Federal Inter-agency Committee on Noise
FICAN	Federal Inter-agency Committee on Aircraft Noise
FIRM	Flood Insurance Rate Map
FIS	Federal Inspection Services
FMS	Flight Management System
FO	Forested Land
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FR	Federal Register
ft.	Feet
FTA	Federal Transit Administration, U.S. Department of Transportation
GA	General Aviation
GI	Geographic Information System

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LIST OF ABBREVIATIONS AND ACRONYMS (Continued)

GMA	Growth Management Act
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HC	Hydrocarbons
HCT	High Capacity Transit System
HIRL	High Intensity Runway Lights
HOV	High Occupancy Vehicle
HPA	Hydraulic Project Approval
HSGT	High Speed Ground Transportation Study
HUD	Housing & Urban Development
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INM	Integrated Noise Model
ISTEA	Intermodal Surface Transportation Efficiency Act
IWS	Industrial Waste System
kwh	Kilowatt
LDA	Localizer Directional Aid or Landing Distance Available
Ldn or DNL	Day-Night Equivalent Sound Level
LdnT	Day-Night Equivalent Sound Level-Total (including non-aircraft related sounds)
Leq	Equivalent Sound Level
LF	Linear Footage
LLWAS	Low Level Wind Shear Alert System
LOS	Level of Service
LTO	Landing and Takeoff Cycle
LUST	Leaking Underground Storage Tank
MALS	Medium Intensity Approach Lighting System
MALSF	Medium Intensity Approach Lighting System with Sequential Flashing Lights
MALSR	Medium Intensity Approach lighting System with Runway Alignment Indicator Lighting System
MCY	Million Cubic Yard
Mgd	Million Gallons per Day
MIRL	Medium Intensity Runway lights
MITL	Medium Intensity Taxiway lights
MLS	Microwave Landing System
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistic Area
MSL	Mean Sea Level
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics Space Administration
NAS Plan	National Airports System Plan
NBEG	Narrow Body Equivalent Aircraft Gate
NEPA	National Environmental Policy Act
NLR	Noise Level Reduction

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LIST OF ABBREVIATIONS AND ACRONYMS (Continued)

NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Elimination System
NPIAS	National Plan of Integrated Airport Systems
NPDES	National Pollutant Discharge Elimination System
NTSB	National Transportation Safety Board
N/S	North/ South Corridor
OAG	Official Airline Guide
ODALS	Omnidirectional Airport Lighting System
OFA	Object Free Area
O&D	Origination-Destination
ORDER 1050.1D	Policies and Procedures for Considering Environmental Impacts
ORDER 5050.4A	Airport Environmental Handbook
PAH	Polynuclear Aromatic Hydrocarbons
PAPI	Precision Approach Path Indicator System
Part 150	FAR Part 150 Noise Compatibility Planning Process
PFC	Passenger Facility Charge
PM	Particulate Matter
POS	Port of Seattle
ppm	Parts per million
PPP	Pollution Prevention Plan
PRM	Precision Runway Monitors
PSATC	Puget sound Air Transportation Committee
PSCOG	Puget sound council of Governments
PSRC	Puget Sound Regional Council
PSRCMSA	Puget Sound Regional Council Major Supplemental Airport
R/W	Runway
RAILS	Runway Alignment Indicator Lighting System
RASP	Regional Airport System Plan
REIL	Runway End identifier Lights
ROD	Record of Decision
ROFA	Runway Object Free Area
RPZ	Runway Protection Zone (once called a Clear Zone)
RSA	Runway Safety Area
RTA	Regional Transit Authority
RT/R	Remote Transmitter/Receiver
RVR	Runway Visual Range
SASA	South Aviation Support Area
SCS	U.S. Soil Conservation Service
SEA	Seattle-Tacoma International Airport
SEPA	Washington State Environmental Policy Act
SEL	Sound Exposure Level
SF	Square Feet

LIST OF ABBREVIATIONS AND ACRONYMS (Continued)

SHPO	State Historic Preservation Officer
SIMMOD	Airspace and Airport Simulation Model
SIP	State Implementation Plan
SMGCS	Surface Management Guidance and control System
SR	State Route
SWPPP	Stormwater Pollution Prevention Plan
TA	Time- Above
TAF	Terminal Area Forecast
TCA	Terminal Control Area
TCAS	Traffic Alert and Collision Avoidance System
TDM	Transportation Demand Management
TDZ	Touchdown Zone
TODA	Takeoff Distance Available
TORA	Takeoff Run Available
TRACON	Terminal Radar Approach Control
μg/m	Micro grams per meter
UAL	United Airlines
UMTA	Urban Mass Transportation Administration
USC	U.S. Code
USCOE or COE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VOC	Volatile Organic Compound
VOR	Very High Frequency Omnidirectional Range
VORTAC	VHF Omni directional Range with Tactical Air Navigation
WsDOT or WSDOT	Washington State Department of Transportation

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GLOSSARY OF TERMS

A-Weighted Sound (dBA) - A measurement representing a sound generally as the human ear hears it by filtering out as much as 20 to 40 decibels of sound below 100 hertz (Hz). Used for aircraft noise evaluations.

Airport Elevations - The highest point on an airport's usable runways expressed in feet above mean sea level (MSL).

Airport Improvement Program (AIP) - A Federal funding program for airport improvements. Funds are derived from sources such as airline tickets, aviation fuel, etc.

Airport Layout Plan - An airport plan (ALP) is a scaled drawing of existing and proposed land and facilities necessary for the operation and development of the airport. Any airport will benefit from a carefully developed plan that reflects current FAA design standards and planning criteria. The ALP shows boundaries and proposed additions to all areas owned or controlled by the sponsor for airport purposes, the location and nature of existing and proposed airport facilities and structures, and the location on the airport of existing and proposed non-aviation areas and improvements thereon.

Airport Operations - The total number of movements in landings (arrivals) plus takeoffs (departures) from an airport.

Airport Surveillance Radar (ASR) - A radar system which allows air traffic controllers to identity an arriving or departing aircraft's distance and direction from an Airport.

Annual Service Volume (ASV) - A planning term which describes the number of annual aircraft operations which Is possible at an airport with an acceptable amount of delay. The measure is specific to individual airports because it is derived from their own particular capacity characteristics.

ASIL - Acceptable Source Impact Levels. Values established by the Puget Sound Air Pollution Control Agency which represent incremental ambient air impact concentrations for air emissions sources.

Attainment Area - An area in which the federal or state standards for ambient air quality are being achieved.

Automated Radar Terminal System (ARTS) - Computer-aided radar display subsystems capable of associating alphanumeric data with radar returns.

Base Floodplain - That area subject to a one percent or greater chance of flooding in any given year (i.e., the 100-year floodplain).

Best Management Practices - Methods employed during construction and included in the development for ensuring environmental management to the greatest possible extent.

Biochemical Oxygen Demand - The oxygen used in meeting the metabolic needs of aerobic microorganisms in water rich in organic matter.

Building Restriction Line (BRL) - A line which identifies suitable building area locations on airports. The BRL encompasses the runway protection zones, the runway visibility zone areas required for airport traffic control tower clear line of sight, and all airport areas with less than 35 foot (10.5m) clearance under the FAR Part 77 surfaces.

Capacity - The number of aircraft operations possible at a particular airport. When a continuous demand of activity is assumed, regardless of delay, it is described as ultimate capacity. When a limit on the number of operations is considered based on an acceptable level of delay, it is described as practical capacity.

Commuter Aircraft - Commuters are those carriers that provide regularly scheduled passenger or cargo service or aircraft predominantly seating fewer than 66 passengers or holding cargo with 18,000 pounds of payload or less. A typical commuter flight operates over a trip distance of 100 to 300 miles and is flown at lower altitudes than those operated by the long-haul carriers.

Connecting Passenger - An airline passenger who transfers from an arriving aircraft to a departing aircraft at a hub airport in order to reach their ultimate destination.

Connection Passenger - An airline passenger who transfers from an arriving aircraft to a departing aircraft at a hub airport in order to reach their ultimate destination. Also described as a "through" passenger. The opposite of a connecting passenger.

Constructive Use - Refers to the possible indirect impacts to DOT Section 4(f) properties such as parks. Constructive use is considered to occur when a transportation project does not incorporate land from a Section 4(f) resource but the project's proximity impacts are so severe that the protected activities, features or attributes that qualify a resource for protection under section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features or attributes of the resource are substantially diminished. For example, a substantial increase in noise levels at a park due to transportation project may represent a constructive use, even though the park is not directly affected through acquisition or development.

Day-Night Equivalent Sound Level (DNL)- A noise measure used to describe the average aircraft noise levels over a 24-hour period, typically an average day over the course of a year. Ldn considers aircraft operations that occur between the hours of 10 p.m. and 7 a.m. to be 10 decibels louder than they actually are to account for increased annoyance. Ldn may be determined for individual locations or expressed contours. Ldn is currently the accepted measure for aircraft noise analysis. See Appendix 4.

Decibel (dB) - A unit of noise level representing a relative quantity. This reference value is a sound pressure of 20 micronewtons per square meter.

Delay - The difference, in minutes, between the scheduled time and actual time of an aircraft arrival or departure. For airport planning purposes, it is often expressed as an annual average per aircraft operation (in minutes).

Dewatering - The temporary or permanent lowering of the groundwater table to allow excavation to be carried out in relatively dry conditions above the lowered groundwater table.

Dispersion Analysis - the examination of air pollutant conditions at specific locations. Expressed in parts per million or micro-grams per meter.

Displaced Threshold - A threshold that is located at a point on the runway other than the designated beginning of the runway. The portion of pavement behind a displaced threshold may be available for takeoffs in either direction and landings from the opposite direction.

Enplanements - Domestic, territorial, and international revenue passenger enplanements in scheduled and nonscheduled service of aircraft in intrastate, interstate, and foreign commerce.

Environmental Assessment (EA) - An environmental assessment is a concise document that assesses the environment impacts of a proposed Federal action. This document discusses the need for, and environmental impacts of, the proposed action and alternatives. A listing of agencies and persons consulted is also included. An environmental assessment should provide sufficient evidence and analysis for a Federal determination whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

Environmental Impact Statement (EIS) - An EIS is normally required for a first time airport layout plan approval or airport location approval for a commercial service airport located in a standard metropolitan statistical area and Federal financial participation in or airport layout plan approval of, a new runway capable of handling air carrier aircraft at a commercial service airport in a standard metropolitan statistical area. Even though these actions normally require an environmental impact statement, the preparation of the environmental impact statement will usually be preceded by an environmental assessment. If the environmental assessment demonstrates that there are no significant impacts, the action shall be processed as a FONSI instead of an EIS.

Equivalent Level (Leq) - The equivalent steady noise level which in a stated period of time would contain the same noise energy as the time-varying noise during the same period. The Leq can be for any defined period, unlike the DNL.

Erosion - Wearing away of rock or soils by the gradual detachment of soil or rock fragments by wind, ice, water, and other forces.

Farmland Conversion Impact Rating - A form (form AD-1006) used by the U.S. Soil Conservation Service to evaluate soils which are potentially eligible for protection as Prime or Unique farmland under the Farmland Protection Policy Act of 1981.

FAR - Federal Aviation Regulation.

Federal Aviation Administration - The FAA constructs, operates, and maintains the National Airspace System and the facilities which are a part of the system; allocates and regulates the use of the airspace; ensures adequate separation between aircraft operating in controlled airspace; and through research and development programs, provides new systems and equipment to improve utilization of the nation's airspace.

Federal Aviation Regulation (FAR) Part 150 - Established by Congress under the Aviation Safety and Noise Abatement Act of 1979 for the purpose of developing a balanced and cost effective program to reduce the effects of aircraft noise on local communities.

Finding of No Significant Impact - Following the preparation of an environmental assessment, the Federal Agency determines whether to prepare an EIS or FONSI. If the proposed project is determined not to result in any significant environmental impact, a finding (FONSI) is made by the Federal Agency.

Flight Track Utilization - The use of established routes for arrival and departure by aircraft to and from the existing runways at the airport.

Growth Management Act - The act requires all cities and counties in Washington State to do some planning and calls for the fastest growing counties to plan extensively in accordance with state goals.

Grid Analysis - A type of aircraft noise analysis which evaluates the noise levels at individual points rather than generate noise contours.

Habitat - The specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be free of harmful contaminants.

Hub - An airport which serves airlines that have hubbing operations.

Hubbing - A method of airline scheduling that times the arrival and departure of several aircraft in a close period of time in order to allow the transfer of passengers between different flights of the same airline in order to reach their ultimate destination. Several airlines may conduct hubbing operations at an airport.

Hydraulic Project Approval - a permit granted by the Washington Departments of Fisheries and Wildlife for work to be performed on or near a body of water, such as a creek or river.

Instrument Flight Rules (IFR) - Federal Aviation Regulations rules that govern the procedures for conducting instrument flight (FAR Part 91).

Instrument Landing System (ILS) - An electronic system installed at some airports which helps to guide pilots to runways on landing during periods of limited visibility or adverse weather. A pilot must have proper training and his aircraft property equipped to use an ILS. Most major airports have at least one of their runways equipped with an ILS.

Instrument Meteorological Conditions (IMC) - Meteorological conditions expressed in terms of visibility, distance from cloud and ceiling which are less than the minimums specified for visual meteorological conditions.

Integrated Noise Model (INM) - A computer model developed and maintained by the FAA to predict the noise Impacts generated by aircraft operations.

Land Use Compatibility - The ability of land uses surrounding the airport to coexist with airport-related activities with minimum conflict.

Landing and Takeoff (LTO) Cycle - The time that an aircraft is in operation at an airport. An LTO cycle begins when an aircraft starts its final approach (arrival) and ends after the aircraft has made its climb-out (departure).

Level-of-Service (LOS) - A measure of the effect of a number of factors on surface traffic flows. LOS is a function of volume and composition of traffic and speeds attained on any specific roadway, and is defined as LOS "A' through "F" . LOS A is unencumbered free flow, LOS C is stable flow with frequent delay and LOS F is forced flow with extensive backup.

Liquefaction - A temporary condition during which soil behaves more like a viscous liquid than a solid medium. The condition is due to the build-up of water pressure in the spaces (pores) between the soil particles and the inability of the sold to drain quickly, as energy is imparted to the soil mass during an earthquake.

Local Passenger - A passenger who either enters or exits a metropolitan area on flights served by the area's airport The opposite of a connecting passenger.

Location Impact Analysis - An analysis conducted to determine if noise level Increases associated with projected development would approach the FAA threshold of a 1.5 DNL increase within the 65 DNL or greater noise contours over any noise-sensitive land use.

Loudness - The subjective intensity of sound.

Master Plan Update - An update to the long-range airport development requirements. These plans are typically updated every 5-7 years.

Missed Approach - A prescribed procedure to be followed by aircraft that cannot complete an attempted landing at an airport.

Mitigation - The avoidance or minimization of an adverse impact.

Mitigation Measure - An action taken to alleviate adverse impacts.

Modal Split - The distribution of trips among competing travel modes, such as walk, auto, bus, etc.

Mode - A particular form or method of travel, such as walk, auto, bus, etc.

Narrowbody Aircraft - A commercial passenger jet having a single aisle and maximum of three seats on each side of the isle. Narrowbody aircraft include B727, B737, B757, DC9, MD80, MD90 and A320.

Navaid - Any facility used for guiding or controlling flight in the air or during the landing and takeoff of aircraft.

NEPA - The National Environmental Policy Act of 1969 (NEPA) is the original legislation establishing the environmental review process.

Noise - Unwanted Sound.

Noise Abatement - a procedure of the operation of aircraft at an airport which minimizes the impact of noise on the environs of an airport.

Noise Contour Map - A map representing average annual noise levels summarized by lines connecting points of equal noise exposure.

Noise Exposure Map (NEM) - A map of an airport and its environs which identifies the area impacted by various aircraft noise levels. The FAA has specified criteria for presentation of Part 150 Noise Exposure Maps.

Noise Level Reduction (NLR) - The amount of noise level reduction achieved through incorporation of noise attenuation (between outdoor and indoor levels) in the design and construction of a facility.

Non-Attainment Area - an area in which the federal or state standards for ambient air quality are being exceeded.

Operation - An aircraft arrival at or departure from an airport.

Origin and Destination Passengers - Those passengers, whether visitors or residents, that begin or end their trip in the region.

Outer Fix - As point in the destination terminal area from which aircraft are cleared to the approach fix or final approach course.

PAX - Passenger

Precision Approach Procedure/Precision Approach - A standard instrument approach procedure in which an electronic glidescope/glidepath is provided, e.g., ILS and PAR.

Primary Commercial Service Airport - A commercial airport which enplanes 0.01 percent or more of the total annual U.S. enplanements.

Primary Runway - the runway on which the majority of operations take place. At large, busy airports, there may be two or more parallel primary runways.

Public Use Airport - Any public, airport, any privately owned reliever airport, any privately owned airport which is determined to enplane annually 2,500 or more passengers and receive scheduled passenger service of aircraft, and which is used or to be used for public purposes.

Reliever Airport - An airport which, when certain criteria are met, relieves the aeronautical demand on a busier air carrier airport.

Riparian - Relating to, living in, or located on the bank of a natural watercourse, such as a river.

Rotational Runway Use - Variance in the particular runways in use over a specific time period to prevent constant use of one runway.

Run-Up - A routine procedure for testing an aircraft engine at a high power setting. Engine run-ups are normally conducted by airline maintenance personnel checking an engine following the conduct of maintenance.

Runway - A defined rectangular area on an airport prepared for the landing and takeoff run of aircraft along it's length. Runways are normally numbered in relation to their magnetic direction rounded off to the nearest 10 degrees, e.g., Runway 14, Runway 32.

Runway Protection Zone (RPZ) - An area (formally the clear zone) trapezoidal in shape and centered about the extended runway centerline, is used to enhance the safety or aircraft operations. It begins 200 feet (60m) beyond the end of the area usable for takeoff or landing. The RPZ dimensions are functions of the design aircraft, type of operation, and visibility minimums.

Runway Safety Area (RSA) - A defined surface surrounding the runway prepared or suitable for reducing the risk or damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Sediment - Material suspended in or settling to the bottom of liquid.

Sound - Sound is the result of a sound source vibration in the air. The vibration produces alternating bands of relatively dense and sparse particles of air, spreading outward from the source in the same way as ripples do on water after a stone is thrown into it. The result of the movement is fluctuation in the normal atmospheric pressure or sound waves.

Sound Exposure Level (SEL) - The constant sound level which has the same amount of energy in one second as the original sound event.

Stage 2 Aircraft - Aircraft which meet the noise levels prescribed by FAR Part 36 and are less stringent than those established for the quieter designation (Stage 3). The Airport Noise and Capacity Act requires the phase-out of all Stage 2 aircraft by 1999, with case-by-case exceptions through the year 2003.

Stage 3 Aircraft - Aircraft that meet the most stringent noise levels set in FAR Part 36.

Taxiway - A defined path established for the taxiing of aircraft from one part of an airport to another.

Threshold - the beginning of that portion of the runway usable for landing.

Time Above (TA) - Time above indicates the time in minutes that a given dB(A) level is exceeded during a 24-hour period.

Tributary - A stream that flows into another.

Watershed - The geographic region from which water drains into a particular river or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains.

Vehicle-Miles-Traveled (VMT) - a measure of total travel within a study area, usually estimated as the total number of trips multiplied by the average length of a typical trip.

Very High Frequency Omnirange Station - A ground-based radio (electronic) navigation aid transmitting radials in all directions in the VOR frequency spectrum; provides azimuth guidance to pilots by reception of electronic signals.

Visual Approach - An approach by an IFR flight when either part or all of an instrument approach procedure is not completed and the approach is executed in visual reference to terrain.

Visual flight Rules (VFR) - Rules that govern the procedures for conducting flight under visual conditions. In addition, it is used by pilots and controllers to indicate type of flight plan.

Visual Meteorological Conditions (VMC) - Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specific minimum. Typically, these conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level, distance to cloud is 1 statue mile, and the visibility is at least 3 statue miles.

APPENDICIES OF THE SUPPLEMENTAL EIS

APPENDIX A

RESPONSE TO COMMENTS RECEIVED CONCERNING THE

FEBRUARY 1996 FINAL EIS

APPENDIX A

RESPONSE TO COMMENTS ON THE FINAL ENVIRONMENTAL IMPACT STATEMENT

Comments concerning the Feeburary 1996 Final Environmental Impact Statement (Final EIS) were received from 12 individuals, groups and agencies. The following summarize the comments and provide a response.

Comment: Ms. Maria Little requested information concerning the **water runoff mitigation** associated with the proposed new parallel runway.

Response: The Final EIS, Volume 1, Chapter IV, Section 10 addresses water quality and hydrology. Mitigation associated with the proposed improvement are addressed on pages IV.10-16 through IV.10-20.

Comment: Ms. Maria Little questioned if the mitigation has been approved by the Corps of Engineers.

Response: Final approval of the wetland mitigation will not occur until the Port has been issued a Section 404 permit. A permit will not be issued until after completion of the Record of Decision and compliance with the Corps of Engineers permitting process. However, the Corps of Engineers served as a cooperating agency in preparing the EIS to ensure their general concurrence on the mitigation included in the document.

Comment: Ms. Maria Little questioned if the wetlands were assessed after the February 5, 1996 floods.

Response: The wetland delineation of the airport wetlands, as well as the delineation of the mitigation site, were conducted prior to the February 5, 1996 floods. A substantial review of the mitigation site was conducted during and after the February flood conditions. As a result of the Green River riverbank erosion that occurred from this flood, the Port is considering incorporating riverbank stabilization actions into the mitigation plans. This fine tuning of the mitigation plan will occur during the permitting process.

Comment: Ms. Maria Little questioned how stormwater runoff can be mitigated by replacing the wetlands outside the drainage basin.

Response: As is described in the Final EIS, the runoff from the proposed improvements will be mitigated through on-site retention and is not associated with the proposed wetland mitigation.

Comment: Ms. Maria Little stated "Will the runway be perforated?"

Response: The proposed runway will consist of concrete panels similar to the existing runways at Sea-Tac.

Comment: Mr. Rodney Hansen, King County Solid Waste Division, noted that the Final EIS incorrectly states that municipal solid waste is exported out of county; all municipal solid waste is disposed of within King County.

Response: Comment noted.

Comment: Ms. Diana Gale, Seattle Water Department, indicated concerns with development north of SR 518 and possible impacts to the Seattle Water Department well.

Response: Since receipt of this letter from the Seattle Water Department, the Port of Seattle has held numerous meetings with Seattle Water Department staff concerning issues associated with development north of SR 518. As a result, the Port has decided to not excavate material from Borrow Source area 5 (located beneath the site of the future North Employee Parking Lot). Subsequent information provided to Seattle Water demonstrated that there is reasonable assurance that contamination would not occur over the majority of the site. Additional geo-techincal work will be completed as part of the design of the lot to ensure that site work in the southern portion of the site does not result in the potential to contaminate this water supply.

Comment: Ms. Martin indicated her objection to a perceived recent change in air traffic control procedures.

Response: As is described in the Final EIS, Volume 4, Appendix R, the public perceives that there was a recent change in flight tracks. The Port of Seattle, FAA and other agencies and groups have evaluated comments of this nature from numerous residents and determined that no change in arrival or departure procedure has occurred.

Comment: Mr. Rosen, Cutler & Stanfield on behalf of the Airport Communities Coalition stated that:

1. The FEIS fails to identify the action being taken
2. FEIS contains insufficient analysis of cumulative impacts
3. FEIS fails to give sufficient consideration to a reasonable range of alternatives
4. FEIS noise analysis is based on implausible assumptions and omits critical information
5. FEIS construction analysis grossly understates the effects from hauling
6. FEIS land use impacts fails to recognize or assess the Master Plan's inconsistencies with the comprehensive plans of neighboring cities
7. FEIS air quality analysis fails to comply with federal guidelines and inaccurately represents impacts

8. FEIS air quality analysis fails to acknowledge significant increase in air toxics from an expanded facility
9. FEIS wetland analysis omits important information about permitting and mitigation, including the requirements for mitigation within the area drainage basin
10. FEIS transportation analysis contains improper assumptions and omits critical information including regional impacts
11. FEIS environmental analysis is based on unreasonable assumptions concerning aviation demand
12. FEIS fails to consider reasonable mitigation and does not explain impact of proposed mitigation.

<u>Response:</u> The following responses are provided:

1. Final EIS, Volume 1, Chapter 2 provides a thorough description of the proposed project.
2. Final EIS, Volume 1, Chapter IV describes the cumulative impacts of the proposed improvements along with other regional improvements. Each of the environmental consequence subsections of Chapter IV (sections 1 through 24) summarize the cumulative impacts.
3. Final EIS, Volume 1, Chapter 2 presents the full range of alternatives to the proposed project.
4. Final EIS, Volume 1, Chapter IV, Section 1 and Volume 2, Appendix C contain a detail assessment of noise impacts.
5. Final EIS, Volume 1, Chapter IV, Section 23 presents construction impacts, including impacts from hauling activity, associated with the proposed improvements.
6. Final EIS, Volume 1, Chapter IV, Section 2 Pages IV.2-7 through IV.2-18 summarize the compatibility of the Master Plan Update improvements with local and regional land use plans.
7. Final EIS, Volume 1, Chapter IV, Section 9 and Volume 2 Appendix D describe the air quality analysis. The scope and approach to the air quality evaluation was developed in consultation with the US. EPA, Puget Sound Air Pollution Control Agency and the Washington Department of Ecology.
8. Final EIS, Volume 1, Chapter IV, Section 7 Page IV.7-8 describes the impacts on air toxics from the proposed improvements, The scope and approach to the air toxic evaluation was developed in consultation with the air quality agencies.
9. Final EIS, Volume 1, Chapter IV, Section 11 describes the wetland impacts, permitting requirements, and proposed mitigation.
10. Final EIS, Volume 1, Chapter IV, Section 15 contains a detailed description of the surface transportation conditions with and without the proposed improvements.
11. Final EIS, Volume 1, Chapters 1 and 2 and Volume 4, Appendix R contains a detailed summary of the aviation demand assumptions. Pages R-2 through R-13 respond to the reasonableness of alternative assumptions.
12. Final EIS, Volume 1, Chapter IV, Sections 1 through 24 present mitigation associated with significant adverse environmental consequences of the proposed improvements.

Additional information concerning these issues is presented in this Supplemental Environmental Impact Statement.

Comment: Mr. Richard Parking, US. Environmental Protection Agency, indicated that the Final EIS should have noted the demographic conditions and potential social impacts of the alternatives on residents of the Rainier Valley.

Response: The Draft and Final EIS provides a detailed assessment of the impact of the proposed improvements on minority, income, and age groups (see Chapter IV, Section 6). Because residents of the Rainier Valley would not be displaced by the proposed improvement and would not be affected by noise above 60 DNL, this area was not included in the analysis. However, to aid residents outside the 60 DNL with understanding sound levels that could be experienced, the Final EIS includes the sound exposure level (SEL) footprints for five predominant aircraft operating at Sea-Tac (see Appendix C of the Final EIS).

This issue was clarified in a follow-up letter to the Port of Seattle dated April 25, 1996. EPA suggested that the Record of Decision (ROD) include a discussion that relates the SEL levels to the DNL noise exposure contours.

Comment: Mr. Keith Harris, Highline Water District, indicated that the "Draft Environmental Impact Statement" did not indicate what steps would be taken to mitigate contamination of groundwater or to mitigate for loss of groundwater recharge.

Response: The Final EIS contains an expanded discussion of groundwater impacts and presents an evaluation of impacts to the Highline aquifer.

Comment: Ms. Elizabeth Phinney, Department of Ecology, and Ms. Barbara Stuhring indicated that Appendix R incorrectly characterized the glycol treatment by the Industrial Wastewater System.

Response: Comment noted.

Comment: David Pierce, Department of Natural Resources, reported that a Surface Mining Act reclamation permit may be required for excavation of material from on-site sources.

Response: The Port of Seattle will comply with all permit requirements.

Comment: The Airport Communities Coalition submitted a report prepared by Dr. Clifford Winston concerning the forecast of air traffic at Sea-Tac Airport.

Response: On behalf of the ACC, a report prepared by Dr. Clifford Winston was submitted in comments on the Final Environmental Impact Statement (FEIS) for the Sea-Tac Master Plan Update disputing the Master Plan Update aviation demand forecast assumptions. The central conclusion of the Winston Report is that the aviation demand forecast used in the Draft and Final EIS underestimates the number of annual aircraft operations that would occur at Sea-Tac as a result of building an additional runway. The report claims that the effect of the new runway on airport capacity was not considered in the preparation of the aircraft operations forecast. In examining the justification for this claim, it is acknowledged in this Supplemental EIS and the February 1996 Final EIS (Appendix R) that the Do-Nothing would result in a less than all of the demand being satisfied in comparison to the "With Project" at the point in time where demand exceeds the capacity of the existing airfield. In general terms, airport capacity may limit aviation operations demand when the operations capacity of an airport is less than the expected operations demand. Further, the number of annual operations served at an airport is not limited by airport capacity during conditions in which sufficient operations capacity is available. This response demonstrates that the Final EIS was prepared based on the Master Plan Update "unconstrained" forecast of demand that could be efficiently served at Sea-Tac upon construction of the new runway. As such, this paper reaffirms that the construction of the new runway would not induce additional demand.

Whether or not the effect of capacity is reflected in an airport demand forecast, such as the one prepared for the Master Plan Update, depends on the methodology used to develop the forecast. In general, aviation demand forecasts can be characterized as constrained or unconstrained:

a. A **constrained forecast** is often prepared when the physical or operational limitations of an airport preclude future development that would enable the airport to serve all demand. If the aviation demand forecast was prepared in a manner that reflected a physical capacity constraint (i.e. a "constrained" forecast), then the elimination or mitigation of the relevant constraint may result in a level of activity that would be higher than the forecast level of activity. For example, an airport may be unable to expand due to its location between two major roadways. A constrained forecast for such an airport would recognize the inability to provide sufficient capacity to serve all demand. However, if it was later deemed feasible to expand the airport by relocating one of the constraining roadways, then it is possible that the expansion of the airport would induce additional unserved forecast demand.

b. An **unconstrained forecast** is typically prepared during an airport master plan study to provide the basis for defining the level of facilities and procedures required to serve future demand. If a forecast was prepared to represent unconstrained activity (i.e., an "unconstrained" forecast, like the Sea-Tac forecast), and sufficient capacity is provided in the master plan to efficiently serve such a level of activity, then the future level of activity would be equal to but not greater than the forecast. If, on the other hand, a physical or operational constraint resulted in a level of airport capacity that was less than forecast demand, then actual future activity could be less than the forecast level of activity. As an example, if a forecast required a new runway to serve future demand, then the runway construction would allow the forecast to be realized but would not induce additional demand. Conversely, if the airport was unable to acquire additional land to build the new runway, then it is possible that future activity may be less than forecast, for a given level of performance.

As the Sea-Tac Master Plan Update forecast represents an unconstrained forecast, *that forecast did not underestimate the number of operations that would occur due to the construction of a new runway*. As is noted in Chapter 2 of this Supplemental EIS, aviation demand forecasting is often incorrectly perceived as a science, where all variables are predictable and known. However, as is shown by comparing any forecast to conditions that actually occur during the period that was forecast, forecasting is more an art than a science. As a result, precise forecasting for specific future years, particularly years more than 10 years in the future in the volatile air travel industry, is very difficult. It is not uncommon for forecasts to show more or less airport activity for a particular year than actually occurs. When forecasts turn out to be different than the subsequent actual experience, it is sometimes the amount of future growth which does not match reality, but much more often is the difficulty in forecasting the precise timeframe in which specified amounts of growth will occur. Although forecasts for near-term years may not match actual experience, typically those differences are relatively small. For more distant years, forecasting is much more uncertain. This uncertainty is inherent in the nature of forecasting and the nature of the air travel industry and cannot be cured by changing forecasting techniques.

It is recognized that the data used to develop a demand forecast greatly influences the forecast results, as is evidenced by the new forecasts prepared for this Supplemental EIS. This data consists of historical aviation activity, regional demographic information, airline fares, airline industry trends, and many other factors. The regression techniques used to assimilate this information and project future activity also influences the forecast results. The Winston Report does not question the underlying data used to develop the forecasts nor does it take issue with the regression methodology. It can therefore be assumed that the Winston paper is in agreement with the fundamental data and the regression model used to establish the demand forecast, and as a consequence, the adequacy of this information is not addressed herein.

The primary claim in the Winston Report is that the construction of the new runway would increase the capacity of Sea-Tac and as a result, would generate demand in excess of the Airport's unconstrained demand forecast. It has already been established that the Sea-Tac Master Plan Update and new Port forecasts reflect unconstrained demand. Therefore, the factors identified in the Winston Paper as justification to the claim that a new runway will result in additional operations were already reflected in the unconstrained forecast. For example, the Master Plan Update forecast (or the new Port of Seattle forecast) did not assume that future aircraft delay would limit demand, so it is not logical that a reduction in aircraft delay would increase demand. Similarly, the other factors cited in the Winston Report would not further increase the number of unconstrained operations expected to occur after completion of the new runway:

- **Travel Time** - The Winston report claims that the reduction in delay resulting from the new runway will encourage more people to fly than projected in the unconstrained forecast. In order to accurately portray the effect of travel time on demand, one must understand the nature of delay at Sea-Tac. For over half of the year, during high ceiling/visibility conditions (56.1 percent of the time), delays at Sea-Tac are minimal and are expected to remain so throughout the planning horizon. (Arrival delays are expected to increase from 1.0 minute per operation with 345,000 annual operations to 3.1 minutes per operation with 525,000 annual operations). During conditions in which the ceiling is less than 5,000 feet or the visibility is less than five nautical miles, arriving aircraft are restricted to a single runway. It is during these conditions that aircraft delays increase to significant levels, at substantial costs to the airlines and the traveling public. Arrival delays of this magnitude, therefore, would be incurred only during certain weather conditions by passengers whose origin is not Seattle, many of which may be on the return leg of their journey. Passengers returning to Seattle certainly would not be discouraged from making the trip due to an unexpected weather delay, and it is doubtful that significant numbers of visiting passengers would change travel plans solely on the basis of an expected increase in travel time due to weather. Similarly, a reduction in travel time during poor weather will probably not encourage additional people to travel by air.

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Notwithstanding the above, the unconstrained forecast prepared for the Master Plan Update and the Supplemental EIS did not assume that passengers would be discouraged from traveling to Seattle because of expected weather delays. Therefore, any improvement designed to reduce such delays, like the construction of a new runway, would not result in more passengers choosing to fly to Seattle, as proposed in the Winston Report.

- <u>Schedule Delay</u> - The theoretical concept of "schedule delay" is defined in the Winston Report as the difference between the time a passenger desires to fly and the scheduled time offered by the airline. This type of delay is difficult if not impossible to quantify since data is not collected about the time a passenger actually desires to fly. Further, it is generally accepted that passengers choose flights on the basis of many factors other than departure time from the origin airport. The scheduled arrival time at the destination, which is influenced by distance, expected delay enroute, and winds aloft, also influence a passenger's choice of travel time. And because passenger demand is one of the more important factors used by airlines in developing flight schedules, it is logical that the timing of flights for any given airport over time is representative of the times passengers are willing to fly, particularly in today's competitive airline environment. It is not logical, therefore, that the act of constructing a runway will result in significantly more passengers desiring to fly at a particular time, as postulated in the Winston Report. It is possible that relieving a physical constraint on the number of operations possible at peak travel times could result in additional operations during the peak hour. This condition has been reflected in the higher forecasts developed for this Supplemental EIS.

- <u>Airline Fares</u> - The Winston Report assumes that construction of a new runway will reduce fares by encouraging competition and by lowering airline operating cost, and as a result, will encourage more people to fly than expected in the unconstrained forecast. First, the construction of the new runway was proposed in the EIS as a means to efficiently (i.e. with lower poor weather delays) serve an expected increase in demand that is justified based on the projected demographic characteristics of the region. This demand could be served by either incumbent or new entrant carriers. The runway is not being proposed as a "speculation" project with the hopes that it will attract latent demand beyond the unconstrained growth projections. Such an assumption in today's competitive airline market would never muster the support of the airline and the financial community necessary to fund such a project.

  The second assumption in the Winston Report that the construction of a runway would lower airline operation costs and subsequently result in lower fares is equally unrealistic. In today's environment, the only way a project can be justified is if its benefits outweigh its expected costs. In the case of the proposed runway at Sea-Tac, the reduction in airline operating costs due to lower aircraft delays is required to offset the increase in capital and Operations and Maintenance (O&M) costs associated with the new runway, rather than be passed on to consumers in the form of a lower fares.

  Finally, the unconstrained forecast prepared for use in the Draft and Final EIS, as well as the new forecast prepared for the Supplemental EIS, recognized the effect of airfare on passenger demand. As such, average fare was one of the independent variables used in the regression model. Since the effect of airfare is already reflected in the unconstrained forecast, and because it not realistic to assume that construction of a new runway will result in a further significant reduction in airfare, it is not logical that the runway will result in additional unconstrained demand.

- <u>Regional Economic Activity</u> - The Winston Report correctly points out that quality air service and an efficient international airport is one of the many criteria used in the selection of corporate headquarters, distribution, and manufacturing centers. Independent projections on the population and per capital personal income of the Puget

Sound Region reflect the strength of the region and the expectation for continued economic growth. As such, these projections, which were not constrained by potential future airport system deficiencies, were also used as independent variables in the preparation of the unconstrained forecasts. Therefore, it is not likely that any airport improvement designed to provide continued high quality air service, like the new runway, cannot on its own accord generate substantial economic activity and significant additional passenger demand above and beyond the unconstrained demand forecast.

Each of the factors discussed above were presented in the Winston Report as evidence that the construction of a new runway will result in more passengers and aircraft operations than those expected in the unconstrained forecast. To the extent that these factors actually influence aviation demand, and given that the unconstrained forecast did not assume high delays, travel times and airfare, then the construction of the runway will not likely generate additional demand, but rather, it will enable the unconstrained forecast to be achieved with greater efficiency than would otherwise occur.

Finally, the Winston report focuses on factors that influence passenger demand but ignores operations demand criteria. Indeed, travel time, delay, air fare and quality air service are all factors that influence a person's likelihood of taking a trip by air, as correctly pointed out in the Report. However, the Report concludes that the Final EIS understates aircraft operations demand because it did not consider these passenger demand criteria. In making this claim, the report fails to differentiate between *aircraft operations* demand factors and *passenger* demand factors. While there is often a direct relationship between operations demand and passenger demand, the number of operations needed to serve forecast passenger demand depends on a host of other criteria, including airline market strategies, route structures, crew and equipment scheduling requirements and poor weather operating plans. In many cases, airlines can absorb more passengers during peak periods through higher load factors rather than with an increase in operations, which results in a disproportionate relationship between operations demand and passenger demand.

For example, airlines' routinely employ sophisticated flight cancellation strategies and flow control procedures to minimize passenger disruptions during poor weather conditions in which hourly capacity is limited. These techniques allow airlines to optimize the utilization of crews and equipment while maximizing the flow of passengers throughout each airline's route system by canceling selected flights and consolidating others during high delay weather conditions. For an airport like Sea-Tac that experiences substantial poor weather delays, these computerized techniques enable the airlines to continue serving passenger demand even during periods of reduced operations capacity, albeit with higher levels of delay and operating costs. Accordingly, the factors identified in the Winston Report that influence passenger demand do not have the same effect on operations demand, particularly at an airport like Sea-Tac which experiences significant levels of poor weather delays.

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APPENDIX B

FINAL

AIR QUALITY CONFORMITY ANALYSIS

(40 CFR Part 93, Subpart B)

Proposed Master Plan Update Improvements

Seattle- Tacoma International Airport

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CLEAN AIR ACT CONFORMITY

EXECUTIVE SUMMARY

On February 9, 1996, the FAA and the Port of Seattle issued the Final Environmental Impact Statement for the Master Plan Update improvements at Seattle-Tacoma International Airport. In addition to presenting the requisite environmental analysis, the Final EIS contained a draft conformity analysis. Comments concerning the draft conformity analysis were received until June 6, 1996. As is shown in **Attachment A** of this appendix, comments were received from eight individuals and/or organizations (19 letters were received). In February 1997, a Revised Draft Conformity Analysis was issued, followed by a 45-day comment period. **Appendix F** of the Final Supplemental EIS summarizes these comments and responds to applicable comments, including comments on the revised draft conformity analysis.

The Revised Draft Conformity Analysis was prepared in response to new aviation demand forecasts that were prepared for Seattle-Tacoma International Airport, and other data as described in this appendix and Chapter 2 of the Supplemental EIS. In addition, Attachment A contains responses to public/agency comments concerning the original draft conformity analysis. Also, since issuance of the February 1996 Draft Conformity Analysis, EPA approved redesignation of the region to attainment for all pollutants with the approval of a maintenance plan for Carbon Monoxide and Ozone. Therefore, this appendix of the Supplemental EIS was prepared to document the changed conditions relative to air quality conformity.

A 45-day public and agency comment period was conducted on the Updated Draft Conformity Analysis presented in the Draft Supplemental EIS. These comments are reproduced in **Appendix G** of the Final Supplemental EIS. Responses to comments on the Revised Draft Conformity Analysis are provided in **Appendix F**, and in response to these comments Appendix B was revised. Most notably the comments received identified three primary issues concerning the emissions calculations. In response to these comments, a comprehensive quality assurance effort was conducted to verify all of the data input to the models. The issues identified by the commentors were corrected, as well as other issues that were identified as part of the quality assurance process.

Using the corrected input files, a final emissions inventory was prepared and is presented in this appendix. The results of this analysis continue to show that the total direct and indirect emissions from the proposed improvements will not exceed the de-minimis thresholds identified in the EPA General Conformity regulations and will not cause or contribute to any new violations of any of the Ambient Air Quality Standards (AAQS). The projects will also not increase the frequency or severity of any future modeled violations of the AAQS or delay timely attainment of the AAQS.

INTRODUCTION

The Clean Air Act Amendments of 1990 require Federal agencies to ensure that their actions conform to the appropriate State Implementation Plan (SIP). The SIP is a plan which provides for implementation, maintenance, and enforcement of the AAQS, and includes emission limitations and control measures to attain and maintain the AAQS. Conformity is defined as demonstrating that a project conforms to the State Implementation Plan's purpose of eliminating or reducing the severity and number of violations of the ambient air quality standards and achieving expeditious attainment of such standards. The evaluation of conformity for projects at Sea-Tac Airport is governed by the following maintenance area principle:

- That the project will not cause or contribute to any new violations of any of the ambient air quality standards (AAQS) in the project area or the metropolitan area;

Because the computer modeling shows that exceedances of the Carbon Monoxide AAQS could occur in the future without the proposed improvements (Do-Nothing/No-Build), consideration was also given to the two non-attainment area principles:

- That the project will not increase the frequency or severity of any existing violations of any AAQS; and
- That the project will not delay timely attainment of the AAQS or any required interim emission reduction in the project area.

Because the Master Plan Update improvements include proposed changes to the airfield, landside, terminal and off-airport roadways, two forms of conformity have been addressed: Transportation and General Conformity. Transportation Conformity applies to roadway and transit projects to be funded or approved by the Federal Highway Administration (FHWA) or Federal Transit Administration (FTA). The Port of Seattle and the FAA have determined that transportation conformity does not apply, even through roadway improvements are part of the proposed improvements, because no approvals or funds from FHWA or FTA are anticipated. However, if transportation conformity would apply, as is shown by the analysis in this appendix, conformity to the State Implementation Plan and thus transportation conformity could be demonstrated using the dispersion analysis evaluation discussed in this paper.

Federally funded projects not governed by Transportation Conformity, are subject to the "General Conformity" regulations (40 CFR Part 93, Subpart B). General Conformity applies to Federal actions occurring in non-attainment and maintenance areas for any of the criteria pollutants. Until the fall of 1996, the Puget Sound Region was designated non-attainment for Carbon Monoxide (CO) and Ozone (O_3). In the fall of 1996, the Puget Sound was re-designated as a maintenance area for CO and Ozone. In accordance with the Clean Air Act amendment requirements, this conformity analysis focuses on CO and the Ozone precursors (NOx-Nitrogen Oxides, and VOCs-Volatile Organic Compounds).

Although the conformity analysis and determination is a Federal responsibility, State and local air agencies are provided notification and their expertise consulted. The EPA rules mandate that the sponsoring Federal agency must provide a 30-day notice of the Federal action and draft conformity analysis to the appropriate USEPA Region, and State and local air agencies. The sponsoring Federal agency must also make the draft analysis available to the public to allow opportunity for review and comments.

The February 1997 Draft Supplemental EIS for the Master Plan Update Improvements at Seattle-Tacoma International Airport served as the Updated Draft Conformity document, and notification was provided in the Seattle Times, Seattle Post-Intelligencer, Tacoma News Tribune, and Highline News. **Appendix G** provides the comments received during the 45-day comment period that ended March 31, 1997. **Appendix F** responds to the comments. This Final Conformity Analysis reflect these comments.

As is described in Chapter 2 of this Supplemental EIS, the new forecast for Sea-Tac Airport indicates that demand could grow faster than was earlier identified. Should demand grow at the newly identified rate, a number of terminal/landside facility improvements would be needed sooner in time than was defined in the Master Plan documentation or the Final EIS. Chapter 2 of the Supplemental EIS provides a detailed description of the various improvements that constitute the "project" and their purpose and need. Since issuance of the Final EIS, the project phasing was altered to address the new forecast, and improvements to the plan were made to address surface transportation conditions at two intersections in the Airport area.

Purpose and Need Statement	Project
(A) Improve The Poor Weather Airfield Operating Capability in a Manner That Accommodates Aircraft Activity with an Acceptable Level of Delay	New Parallel Runway and associated operational procedures, taxiways, and navigational aids including the acquisition of land for the project.
(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.	Extension of Runway 34R
(C) Provide Runway Safety Areas (RSAs) that meet current FAA Standards	Clearing and Grading the requisite lengths off each runway end, including the relocation of S. 154th Street around the ends of the RSA
(D) Provide Efficient and Flexible Landside Facilities to Accommodate Future Aviation Demand.	1997-2000 Expansion of Concourse A, including expansion of Main Terminal at A Improvements to the Main Terminal roadway and recirculation roads, including a partial connection to the South Access Roadway and a ramp roadway from the upper level roadway to the airport exit Overhaul and/or replacement of the STS Expansion of the main parking garage to the South, North and East Construct first phase parking lot north of SR 518 for employee use (3500 stalls) Construction of the overnight aircraft parking apron Removal of the displaced threshold on 16L Construction of the new air traffic control tower/TRACON Relocation of Airborne Cargo due to new Control Tower Expansion or redevelopment of the cargo facilities in the north cargo complex Development of a new snow equipment storage facility between RPZ and 34L and 34X Site preparation at SASA site for displaced facilities Removal of the Northwest Hangar - replacement in SASA Development of a ground support equipment location at SASA Development of GA/Corporate aviation facilities in SASA or north airfield location Development of a new airport maintenance building and demolition of existing facility Development of on-airport hotel

	Development of the Des Moines Creek Technology Campus 2001-2005 Dual taxiway 34R Improved access and circulation roadway improvements at the Main Terminal, provide upper roadway transit plaza at Main Terminal Additional expansion of the main parking garage Expansion of the north employee parking (North of SR518) to 6,000 stalls and improvements to the intersection of S.154th Street/24th Avenue S. Construction of second phase of overnight apron Development of the first phase of the North Unit Terminal (south Pier) and improvements to the intersection of International Blvd/S. 160th St. Construct first phase of the North Unit Terminal parking structure for public and rental cars Development of the North Unit Terminal Roadways Interchange near 24th/SR-518 for access to cargo complex Relocate ARFF facility to north of the North Unit Terminal Additional improvements to the South Access Roadway connector Relocation of the United Maintenance complex to SASA Continued expansion of the north cargo facilities 2006-2010 Expansion of North Unit Terminal (North Pier) Additional taxiway exists on 16L/34R Complete connectors to south access roadway Additional expansion of main parking garage Additional Expansion of north employee lot to 6,700 stalls Further expansion or redevelopment of north cargo complex Expand North Unit Terminal parking structure for public parking 2011-2020 Development as needed to accommodate growth in demand SR 509 Extension/South Access

Source: Port of Seattle, January 1997. Typographical errors corrected March, 1997.

A conformity determination is required for a project proposed to be located in a maintenance area if the project's total direct or indirect emissions would equal or exceed the annual *de-minimis* emissions levels in 40 CFR 93.153. Because the Puget Sound Region is a maintenance area for Ozone and Carbon Monoxide (CO), the applicable *de-minimis* emission levels are 100 tons per year each for CO, Nitrogen Oxides (NO_x), and Volatile Organic Compounds (VOC). [40 CFR 93.153(b)(2)] NO_x and VOC are the precursor pollutants to ozone formation. If the project's total direct and indirect emissions meet or exceed these levels, a conformity determination is required, including requisite air quality analyses. If the project's direct and indirect emissions do not meet or exceed these levels (and is not considered "regionally significant"), a conformity determination is not required. [40 CFR 93.153(b)] Total direct and indirect emissions are the sum of the emissions increases and decreases from the proposed action, or the "net" change in emissions anticipated to occur as a result of the proposed project. [40 CFR 93.152] Therefore, a conformity determination is not required if the differences in emissions with the proposed action, as compared with not taking the action (the Do-Nothing/No-Build alternative), are below the applicable *de-minimis* levels.

AR 040837

As shown by the analysis presented in the Draft and Final EIS and Supplemental EIS, airport related emissions are less than 10% of the regional area total pollutant levels for each of the criteria pollutants. Emissions for Sea-Tac are below the 10% threshold considered regionally significant; therefore, the Federal action is assumed to have no regional significance with regard to emissions.

As the analysis reflected in **Figure A** shows, the project will not result in emissions that would equal or exceed the applicable de-minimis thresholds, nor will it be considered "regionally significant" with regard to air pollution emissions. A formal conformity determination, therefore, is not legally required for this project. EPA's rules and guidance are clear that where the net emissions increase resulting from the project do not exceed the applicable threshold rates, there are no further obligations with regard to the conformity rules. Although a conformity determination is not legally required, an analysis of air quality impacts utilizing the conformity determination structure has been conducted to address community and agency concerns regarding potential air quality impacts. The analysis presented in this appendix demonstrates that if this project was legally obligated to make a conformity determination, the project would conform to the applicable State Implementation Plan. This conclusion is especially strong given the conservative nature of the assumptions used in the analysis, and the fact that "worst case" assumptions were used, even through the conformity regulations do not specify this as a requirement. Cumulatively, the conservative and worst-case inputs serve to provide a "cushion" to the analysis results, assuring that the positive conformity conclusion is well founded.

ANALYSIS YEARS

Conformity requires the consideration of the following cases (49 CFR 93.183):

(1) **The year mandated by the Clean Air Act amendments for attainment by the region or the farthest year for which emissions are projected in the maintenance plan** - In late 1996, the EPA approved the maintenance plan for the Puget Sound Region. The analysis years of the maintenance plan are 1996 through 2010, the same years considered by this analysis.

(2) **The year in which the total direct and indirect emissions from the project are greatest** - In general, in examining emissions from on-going operations, the period in which the activity levels are the greatest typically produce the greatest emissions. However, because automobile emissions are anticipated to decline in the future through reduced vehicle emissions, the increase in traffic must be contrasted with the reduction in emissions per vehicle. While total regional surface traffic levels would be greater furthest out in time, total emissions (primarily driven by surface traffic) would be greatest in year 2005 (as shown in **Figure B**).

To account for all direct and indirect emissions, construction emissions were also considered. Construction associated with the proposed Third Runway would be expected to be the greatest quantity of project related emissions. As was noted in the Supplemental EIS, Chapter 2, the construction of the Third Runway is anticipated to begin in 1997 and be completed in late 2004. Peak earth movement and construction haul activity is expected to occur in 2000, and would be combined with terminal and landside project improvement construction.

AR 040838

This conformity evaluation considered both 2000 (the peak construction year) as well as year 2005, the peak operating emissions year. Year 2010 represents the greatest net change in operating emissions. But as is shown in **Figure A**, the construction emissions during this year would be much lower than the construction emissions in year 2000.

(3) **Any year for which the applicable SIP specifies an emissions budget** - The maintenance plan reflects two primary surface transportation actions: continuation of the existing vehicle inspection/maintenance program and VOC maximum achievable control technologies. These actions have been reflected in the emission rates used for this analysis.

The analysis in the following sections reflects the years required by the conformity regulation.

EMISSIONS INVENTORY

Figure A presents the results of the total emissions inventory by each source-type considered, which totals the operating and construction direct and indirect emissions. **Figure B** presents the respective operating related emissions that were used to derive the data presented in Figure A. Together, the operating and construction emissions reflect the quantifiable direct and indirect emissions.

FIGURE A
CHANGE IN EMISSIONS INVENTORY
"With Project" and Construction versus Do-Nothing (tons per year)

Year	CO	NOx	VOC
2000			
Operating	(127)	(28)	(12)
Construction*	99	118	18
Total	(28)	90	6
2005			
Operating	(315)	(16)	(61)
Construction	100	14	12
Total	(215)	(2)	(49)
2010			
Operating	(224)	16	(75)
Construction	92	48	14
Total	(132)	64	(61)
De-minimis (maintenance area)	**100**	**100**	**100**

Emissions reflect direct and indirect sources. (x) numbers indicate a project-related reduction in emissions relative to the Do-Nothing.

* Construction emissions reflect excavation from Borrow Sources, employee trips, and material delivery by 280,700 annual diesel truck trips and other construction considerations as described on page B-13.

Source: Landrum & Brown and Synergy Consultants, Inc.

FIGURE B

Seattle-Tacoma International Airport
Final Conformity Analysis

Detailed Operating Emissions Inventory

Tons/Year (does not include construction emissions)

	CO		NOx		VOC	
Year/Source	Do-Nothing	Preferred Alternative	Do-Nothing	Preferred Alternative	Do-Nothing	Preferred Alternative
2000						
Roadways	19,822	19,701	2,394	2,366	1,670	1,659
Parking Lots	280	274	20	19	22	21
Heating Plts	4	4	16	17	1	1
Surf. Coat.	0	0	0	0	4	4
Tank Farms	0	0	0	0	18	18
Grnd Sup Eq	599	599	115	115	132	132
Aircraft	1,266	1,266	1,476	1,476	312	312
Total	21,971	21,844	4,021	3,993	2,159	2,147
Change With Project vs Do-Nothing	(127)		(28)		(12)	
2005						
Roadways	21,978	21,813	2,652	2,646	1,851	1,838
Parking Lots	334	331	23	23	26	26
Heating Plts	4	5	16	19	1	1
Surf. Coat.	0	0	0	0	4	4
Tank Farms	0	0	0	0	20	20
Grnd Sup Eq	649	649	124	124	143	143
Aircraft	1,672	1,524	1,626	1,613	495	447
Total	24,637	24,322	4,441	4,425	2,540	2,479
Change With Project vs Do-Nothing	(315)		(16)		(61)	
2010						
Roadways	20,636	20,702	2,391	2,417	1,773	1,780
Parking Lots	343	351	21	22	26	27
Heating Plts	4	5	16	21	1	1
Surf. Coat.	0	0	0	0	4	5
Tank Farms	0	0	0	0	21	21
Grnd Sup Eq	687	704	133	135	151	155
Aircraft	2,014	1,698	1,802	1,784	640	552
Total	23,684	23,460	4,363	4,379	2,616	2,541
Change With Project vs Do-Nothing	(224)		16		(75)	

Source: Landrum & Brown, March, 1997. Sources reflect direct and indirect emissions from on and off-airport sources.

Data reflects new Port forecasts and phasing discussed in Chapter 2 of the Supplemental EIS.
(xx) indicates that the proposed project results in a reduction in pollutant emissions.

For the year 2000, the operating related emissions of the "With Project" condition for all sources would result in a decrease in CO, NOx, and VOC in contrast to the Do-Nothing; "With Project" emissions of CO without construction emissions would decrease by 127 tons per year, NOx would decrease by 28 tons; and VOC's would decrease by 12 tons per year in comparison to the Do-Nothing. The majority of the decrease in emissions would occur due to the decreases in surface vehicle travel, as terminal/landside improvement projects are implemented to reduce roadway congestion and parking constraints. No changes in aircraft related emissions would occur in 2000, as the third parallel runway would not be completed. Construction emissions would be expected to be the greatest in year 2000 due to hauling activity associated with the third parallel runway embankment. Construction CO emissions in 2000 would be 99 tons of CO, 118 tons of NOx, and 18 tons of VOC. When construction emissions are added to operating emissions for year 2000, the project would reduce CO by 28 tons, increase NOx by 90 tons, and increase VOC by 6 tons. The emissions increase for NOx and VOC are below the *de-minimis* threshold for General Conformity.

FIGURE C

CHANGE IN AIR EMISSIONS BY PROJECT (tons per year)

Operating Emissions Only (Does not include construction emissions)

	Third Runway			Extend 34R			RSA's		
Year	**CO**	**NOX**	**VOC**	**CO**	**NOX**	**VOC**	**CO**	**NOx**	**VOC**
2000	0	0	0	0	0	0	0	0	0
2005	(148)	(13)	(48)	0	0	0	0	0	0
2010	(348)	(21)	(102)	49	5	19	0	0	0

	Landside Improvements			Total Master Plan Improvements		
Year	**CO**	**NOx**	**VOC**	**CO**	**NOx**	**VOC**
2000	(127)	(28)	(12)	(127)	(28)	(12)
2005	(167)	(3)	(13)	(315)	(16)	(61)
2010	75	32	8	(224)	16	(75)

Source: Landrum & Brown, March 1997.

Data in () indicate that the proposed project element would reduce pollutant emissions. Data may not add due to rounding.

Note: This is a summary of the information presented in Figure B, showing the project needs that cause changes in emissions

The future years 2005 and 2010 would experience decreases in the total direct and indirect operating emissions due to reduction in airport congestion as facility locations are consolidated and the roadway improvements associated with the North Unit Terminal are completed. The total change in emissions in 2010 (from construction and operating related emissions) would be an decrease of 132 tons CO, an increase of 64 tons NOx, and an decrease of 61 tons VOC when comparing the Preferred Alternative to the Do-Nothing. The projected increases in CO and NOx in year 2010 are below the applicable *de-minimis* threshold.

Figure A shows that the total direct and indirect emissions from the proposed airport improvements (the projects) will be less than the *de-minimis* levels established by the EPA conformity rules in years 2000, 2005, and 2010. (40 CFR 93.153(b)(2)) **Section 5-2** of the Supplemental EIS, as well as **Appendix C-2** and **Appendix F** provide additional information about the conduct of this analysis. The following summarize the total direct and indirect emissions.

A. Operating Emissions

Each of the individual projects proposed by the "With Project" condition can have an effect on air quality. The air quality analysis presented in this Supplemental EIS considered each of the proposed project improvements cumulatively once the improvements have been completed and are in operation. This section of the appendix examines how each of the proposed improvements, based on need being satisfied, would affect air pollutant emissions. For the emissions inventory, the following summarizes the change in emissions (tons per year) by project need for the "With Project" condition as compared to the Do-Nothing condition.

To determine the effects of the proposed improvements on air pollution conditions at specific locations, a detailed dispersion assessment was performed. This dispersion analysis is presented later in this report.

1. Proposed New Third Parallel Runway

The addition of a third parallel runway would result in a decrease in annual departure queue delay time (about a 5% reduction), and an increase in taxi-in/taxi-out distances and travel time. The change in taxi time is based on average annual runway use expected with the availability of a third parallel runway. As was noted earlier, the runway would be completed in late 2004, with its first full year of operation being 2005.

As is shown in **Figure C**, emissions associated with the third parallel runway in 2005 would result in a reduction in CO by 148 tons, a reduction in NOx of 13 tons, and a reduction in VOCs of 48 tons in comparison to the Do-Nothing. By 2010, where the runway would enable Sea-Tac to accommodate the entire aircraft demand, 348 less tons of CO, 21 less tons of NOx, and 102 less tons of VOC would be emitted in comparison of the Preferred Alternative to the Do-Nothing.

2. Extend Runway 34R by 600 feet

A 600 foot extension to Runway 34R would have minimal effect on aircraft taxiing distances (based on average annual runway use and taxi distances). This additional runway length would add little to the average taxi-in/taxi-out distances. While adding to the taxi-out distance, the extension could also reduce arrival taxi-in time due to use of runway exits closer to the terminal area. Therefore, the additional taxi distance emissions on departure "With Project" would be partially off-set by the reduced taxi distance emissions on arrival. However, as a worst-case evaluation, queue length and taxi-time was increased for all aircraft types using the runway to calculate the full potential impact of this extension. The average time-in-mode was recalculated to reflect the increase in queue length and taxi-in/out-time, resulting in an increase in CO, NOx, and VOC by 49 tons, 5 tons and 19 tons respectively.

3. Runway Safety Areas

Providing for the required safety areas off the ends of the existing (and proposed future) runway ends would have no effect on aircraft taxiing and or departure queue time. However, the relocation of South 154th Street around the 16L/16R RSA's would move the roadway further to the north. Moving the roadway further to the north would potentially reduce pollutant emissions at this location due to increased distance from the runway ends. Relocating the road around the RSA's would not affect traffic volumes, and would minimally affect vehicle travel distances and the resulting air pollution.

4. Terminal and Landside Improvements

As is shown by the emissions inventory, the proposed terminal and landside improvements are anticipated to create the greatest change in air pollutant emissions. Between 1997 and 2000, expansion of the public parking and employee parking facilities would occur, resulting in reductions in surface traffic congestion. The addition of the North Unit Terminal in year 2005 would result in a slight increase in aircraft arrival taxi distances. However, that project would produce substantial roadway improvements in the existing terminal area and would affect how vehicles access and park at the Airport, and reduce surface transportation emissions associated with airport traffic.

Figure C shows that the terminal and landside improvements would produce significant reductions in pollutant emissions through the year 2010 when comparing the Preferred Alternative to the Do-Nothing. By 2010, these elements of the Master Plan Update would produce slight increases in NOx and VOC emissions.

B. Construction Impacts

Prior to the opening and operation of the new parallel runway, substantial construction activity is anticipated to occur to transport material and build the embankment. In addition, other construction activity is anticipated to address terminal and landside improvements. Using MOBILE5A emission factors for automobiles and trucks and EPA emission factors for earth moving equipment,[1/] an emissions inventory (in tons per year) from construction activity was calculated.

In commenting on the Revised Draft Conformity construction emissions evaluation, EPA expressed concern with the consideration of "other construction" equipment. Based on these comments, additional coordination occurred with the EPA. As is noted in **Attachment E**, in preparing the Draft Supplemental EIS analysis, four construction cases were evaluated. The case presented in the Draft Supplemental EIS and Revised Draft Conformity Analysis represented the highest emissions of any of the four cases evaluated. In its comments, EPA questioned the use of this case because it did not specifically include any emissions from "other construction" equipment. The case included in the Revised Draft Conformity Analysis substantially overstates the amount of fill that will be needed for the entire Master Plan Update improvements, and the related emissions because it assumes two mutually inconsistent options for getting the needed fill: maximizing fill from both on-site and off-site sources at the same time. This case is not plausible, because if the Port actually maximized getting fill from on-site and off-site sources at the same time, it would obtain about 50% more fill than will be needed for project construction. By substantially overestimating the fill related emissions, this case already incorporates worst case assumptions without specifically accounting for "other construction" equipment.

1/ *Nonroad Engine and Vehicle Emission Study*, EPA Office of Mobile Sources, October 1991 and data available on the Internet through EPA.

Because another case (Case A listed in Attachment E) is the plausible case with the highest construction emissions (and which specifically include "other construction" equipment emissions), consideration was given to using it in the Final Supplemental EIS and Final Conformity Analysis. Nevertheless, with EPA's verbal concurrence, Case C (that was used in the Revised Draft Conformity Analysis) was retained for this analysis because it reflects the highest emissions of any case evaluated. This ensures that worst case assumptions are reflected in the Final Supplemental EIS and Conformity Analysis.

Year 2000 construction activity was calculated based on earth moving activity assumed to be occurring at two on-site borrow locations (Option 2 - maximum use of on-site material), earth movement and placement, material delivery occurring in the third runway embankment area, and the maximum off-site haul (Option 1 - minimum use of on-site fill) of 109 truck trips per peak hour. The material delivery analysis for year 2000 considered 280,700 annual truck trips, traveling 20 miles, reflecting the peak period of 109 truck trips considered by the construction analysis presented in Section 5-4 of the Supplemental EIS. For one borrow area, the emissions assumed that one excavator, three loaders, a sweeper and a water truck would be in operation. In another borrow area, the emissions assume that one excavator, two scrapers, three loaders, one sweeper and one water truck would be operating. In the embankment area, the emissions assume three scrapers, seven dozers, five miscellaneous HDDV trucks, and two water trucks would be in operation. In addition, the material transport was assumed to be through 109 peak hour truck trips traveling 20 miles. Accounting for vehicle usage, horsepower rating, and load factors (based on EPA data), annual tonnage of construction related emissions were calculated. Employment related vehicle trips were calculated using light-duty gasoline vehicles emission factors from MOBILE5A making 32,400 trips over the year, with a trip distance of 30 miles.

The construction emissions noted in **Figure A** reflect the following:

- Year 2000 - this time period would reflect the peak activity associated with the third runway embankment. The Runway Safety Areas would be completed before year 2000. Material transport and employee related emissions, using the assumptions described above, would account for 69 tons CO, 70 tons NOx, and 13 tons VOC. Activity in the borrow source locations would account for 30 tons CO, 47 tons NOx, and 5 tons VOC.
- Year 2005 - construction activity associated with the third parallel runway would be completed in mid 2004. By 2005, all construction activity would be associated with terminal and landside improvements and would produce 100 tons CO, 14 tons NOx, and 12 tons VOC.
- Year 2010 - The significant majority of the proposed improvements would be complete before 2010. Employee, runway extension and material transport emissions were calculated. Construction emissions associated with this extension would be expected to be 21 tons CO, 32 tons NOx, and 5 tons VOC for material transport activity, and 71 tons CO, 17 tons NOx, and 9 tons VOC for the runway extension construction activity.

The construction emissions were then added to the operating related emissions for the "With Project" alternative to derive the total direct and indirect emissions from the proposed improvements.

C. <u>Cumulative Impacts</u>

In commenting on the Draft Conformity Analysis, several groups and agencies questioned if the air quality analysis reflected a cumulative impact evaluation. The surface transportation analysis and associated air emissions inventory and dispersion analysis reflects a cumulative impact evaluation. Included in the analysis are:

- On-Airport Hotel
- Des Moines Creek Technology Campus with CTI development
- City of SeaTac Airport Business Center
- Federal Detention Center also know as the regional justice facility
- South Aviation Support Area development
- Roadway projects included in the Transportation Improvement Plan, such as widening International Boulevard, 28th/24th Avenue South improvements, etc.
- Regional roadway projects, such as SR 509 Extension and Southern Airport Expressway

This Supplemental EIS and Appendix O of the Final EIS contains a detailed discussion of these projects that their effects on surface transportation conditions.

DISPERSION ANALYSIS

To examine the impacts of the proposed airport improvements on pollutant levels at specific sites, a hot spot or dispersion analysis was performed for the maintenance pollutants (Carbon Monoxide and the precursor to Ozone: Nitrogen Oxides) using the EPA approved models Emissions Dispersion Modeling System (EDMS) and CAL3QHC. Although a dispersion analysis is not required to show conformity because all project emissions fall under the EPA's de-minimis thresholds, this dispersion analysis was retained for information and comparative purposes. Whereas the inventory quantifies the total pollutant emissions of various sources within a defined study area, the dispersion analysis enables the quantification of pollutant levels at a specific location in the units of measure (ppm or ug/m^3) in which the Ambient Air Quality Standards (AAQS) are based. Two types of dispersion analysis were performed:

1. **EDMS dispersion analysis** - this analysis was performed at a screening level as well as at a refined level and reflect pollutant concentrations for all significant sources in the study area;
2. **CAL3QHC intersection analysis** - as was shown by the emissions inventory, and confirmed by the EDMS dispersion analysis, surface transportation sources account for the greatest quantity of pollutant emissions in the Sea-Tac area. Therefore, the roadway intersection analysis was performed to quantify the changes in pollutant concentrations that could occur as a result of the proposed improvements.

The following summarize these analyses.

A. EDMS Dispersion Analysis

This dispersion analysis encompasses a wide range of sources and accounts for emissions from aircraft and aircraft support equipment, on and off-airport parking lots, roadways, training fires, fuel systems, terminal heating and cooling, and aircraft maintenance activities. A detailed discussion of the methods used in the analysis, which relied upon the EDMS computer model, is available in Appendix D of the February, 1996 Final EIS, and **Appendix C-2** of the Supplemental EIS.

1. Existing Pollutant Concentrations

Figure E (at the end of the section) shows the concentrations of Carbon Monoxide and Nitrogen Dioxide[2] (NO_2) with the addition of background levels (which account for pollution blowing into the area or from sources not included in the dispersion evaluation) for each receptor location for the existing condition. The addition of background concentrations enables consideration of all direct and indirect emissions. There were no exceedances of the 1-hour and 8-hour standards for Carbon Monoxide identified by the areawide dispersion analysis for the existing condition (1994). A possible exceedance of the NO_2 ambient air quality standard (0.08 ppm as compared to the annual 0.053 ppm standard) was identified at one receptor location (South 154th Street). There are no homes, parks or businesses located in this area. Pollutant concentrations at this location are influenced by emissions from aircraft takeoffs. There were no exceedances of the NO_2 standard modeled in any of the community areas surrounding the Airport.

It is also worth noting that there has never been an attainment issue for NO_2 in Washington State. Conformity, therefore, does not require an evaluation of NO_2. EPA has indicated in the preamble to the General Conformity Regulations that use of detailed receptor modeling is inappropriate for NO_2 and Ozone, which are regional scale pollutants.

2. Future Pollutant Concentrations

Figure E presents the results for the future Do-Nothing and "With Project" alternatives for CO and NO_2. As is shown, no exceedances of the 1-hour CO standard are expected at any of the receptor sites. In years 2010 and 2020, possible exceedances of the 8-hour CO standard could be found in the Do-Nothing condition at Receptor 1 (Southern portion of the existing main terminal). Two locations under the Do-Nothing condition could experience modeled exceedances of the NO_2 standard: South 154th Street, east side of South 188th Street, and west side of South 188th Street. The exceedances near South 154th Street could result from aircraft queuing for departure while the exceedances at South 188th Street could result from roadway congestion. As is noted earlier, the modeled results for NO_2 are not directly relevant to conformity and, based on EPA conformity guidance, should be evaluated with technical reservations due to the regional scale of this pollutant.

3. Project Impacts

The analysis indicates that all "With Project" CO levels, for both the 1-hour and 8-hour evaluation would be below the AAQS. As is shown in **Figure E**, future CO concentrations could exceed the AAQS, but the proposed Master Plan Update improvements could reduce CO levels at all sites relative to the Do-Nothing/No Build. The "With Project" NO_2 concentrations would either be less with the "With Project", or for receptors that would experience a project related increase, the concentrations would be less than the AAQS.

This screening analysis indicated a need to perform the refined intersection dispersion analysis, which later showed that "With Project" CO levels are equal to or less than the Do-Nothing Alternative. As a result of this analysis, the intersection dispersion evaluation was conducted to ascertain with more precise modeling the impacts of the proposed improvements.

[2] The EDMS enables the evaluation of Nitrogen Oxides. Therefore, NOx concentrations were converted to Nitrogen Dioxides in accordance with EPA guidelines to enable comparison to the AAQS.

Of the modeling available for airport sources, the EDMS is the only model developed to specifically address airport activity (aircraft and non-aircraft sources). As is shown by this analysis, non-surface travel sources associated with the proposed improvements will not create new exceedances of the AAQS or increase the frequency or severity of exceedances of the AAQS. Non-surface transportation related projects are:

- New Parallel Runway and associated operational procedures and taxiways
- Extension of Runway 34R
- Clearing and Grading the requisite lengths off each runway end

As the preceding EDMS analysis showed, CO and NOx concentrations for aircraft and airport facilities for the "With Project" are equal to or less than the concentrations associated with the Do-Nothing/No-Build. Therefore, conformity for the projects is presumed because the emissions are less than the *de-minimis* and because the projects will not worsen pollutant levels relative to the Do-Nothing. This conclusion of a positive general conformity determination for the Federal action planned at Sea-Tac Airport fulfills the FAA's obligation and responsibility under 40 CFR Part 93, Subpart B.

Because the EDMS modeling showed potential terminal/landside project related impacts, an additional dispersion analysis was conducted with the CAL3QHC model (intersection analysis).

B. CAL3QHC Dispersion Analysis (Intersection Analysis)

Because motor vehicles are the major source of air pollutants in the Airport area, a separate, more detailed air quality analysis was conducted for several highly congested roadway intersections. This analysis used the methodologies defined by EPA guidance, which states "...those intersections at LOS D, E or F or those that have changed to LOS D, E, or F because of increased volumes of traffic or construction related to a new project in the vicinity of a project should be considered for modeling."[1] "Intersections that are at LOS A, B or C probably do not require further analysis i.e., the delay and congestion would not likely cause or contribute to a potential CO exceedance of the NAAQS". The EPA guidelines further recommend that five steps be followed: 1) rank the top 20 intersections by traffic volumes; 2) calculate the LOS for the top intersections; 3) rank these intersections by LOS; 4) model the top 3 intersections based on LOS; and 5) model the top intersections based on the highest traffic volumes. This approach was used in performing the air quality assessment for the Final EIS and the Supplemental EIS.

Based on the surface transportation analysis, the intersection analysis focused on emissions generated by motor vehicles in the immediate vicinity of four (4) intersections along International Boulevard (SR 99): at South 160th Street; South 170th Street; South 188th Street; and at South 200th Street. Because the project would generate a substantial quantity of traffic to the intersection of South 154th/24th Avenue South, modeling was also performed for that location. Carbon Monoxide is the pollutant of greatest concern at roadway intersections because it is the criteria pollutant emitted in the greatest quantity by motor vehicles. The intersection dispersion analysis used the CAL3QHC air quality computer model. In total, thirty-two receptor locations were modeled in the vicinity of each intersection. A comparison of existing and future concentrations is presented in **Figures F**

[1] *"Guidelines for Modeling Carbon Monoxide from Roadway Intersections"*, U.S. EPA, October 1990

and G. The analysis presented in this section, reflect the use of oxygenated fuels and regular unleaded gas. The approved maintenance plan for CO indicates that if attainment with the AAQS can not be shown in the future, the region will return to using oxygenated fuels. Because the hot spot analysis uses worst-case meteorological conditions, exceedances of the CO AAQS were modeled for the current and future conditions, with or without the proposed improvements. As that comparison shows, oxygenated fuels would reduce CO levels by 10 to 20%.

The modeling results presented in this conformity analysis reflects worst case weather and operating conditions, such as peak traffic levels (peak airport traffic and peak regional traffic which do not occur at the same time), and weather conditions that result in stagnant air. As is shown by this analysis, all "With Project" emissions would be equal to or less than the Do-Nothing/No-Build condition.

1. **Future Impacts**

In the future, these intersections are expected to continue to experience high traffic levels. Although improvements in vehicle emissions are expected that would reduce CO emission rates, increases in traffic could counter the beneficial pollution reductions. As is shown in **Figures F and G**, modeled 8-hour CO concentrations could exceed the AAQS in all future time frames with or without the proposed Master Plan Update improvements due to the congested nature of these intersections.

2. **Project Impacts**

Development of the proposed Master Plan Update terminal and landside improvements would result in changes in the way traffic accesses the Airport and affect traffic movement in the Airport area. Similar to the Do-Nothing condition, each of the heavily congested intersections along International Boulevard (SR 99) are modeled to possibly exceed the 8-hour CO standard with the proposed Master Plan Update. However, as the table shows, the CO levels with the project would be the same or less than the Do-Nothing.

3. **Construction Related Emissions**

The air quality impacts associated with the hauling of construction fill material was evaluated through a separate pollutant dispersion modeling analysis. The construction vehicle dispersion analysis was performed using the CAL3QHC air quality computer model, as described in Appendix D of the Final EIS. CAL3QHC is a USEPA approved model used to predict pollutant concentrations from motor vehicles. Vehicle emission rates for input into the CAL3QHC model were derived from MOBILE5A for Carbon Monoxide.

The use of diesel haul trucks would not be expected to produce substantial Carbon Monoxide (CO) emissions along concentrated haul routes. As shown in **Figure H**, while the "With Project" concentrations would be equal to or slightly above the Do-Nothing condition, they would be well below the 1-hour and 8-hour CO AAQS.

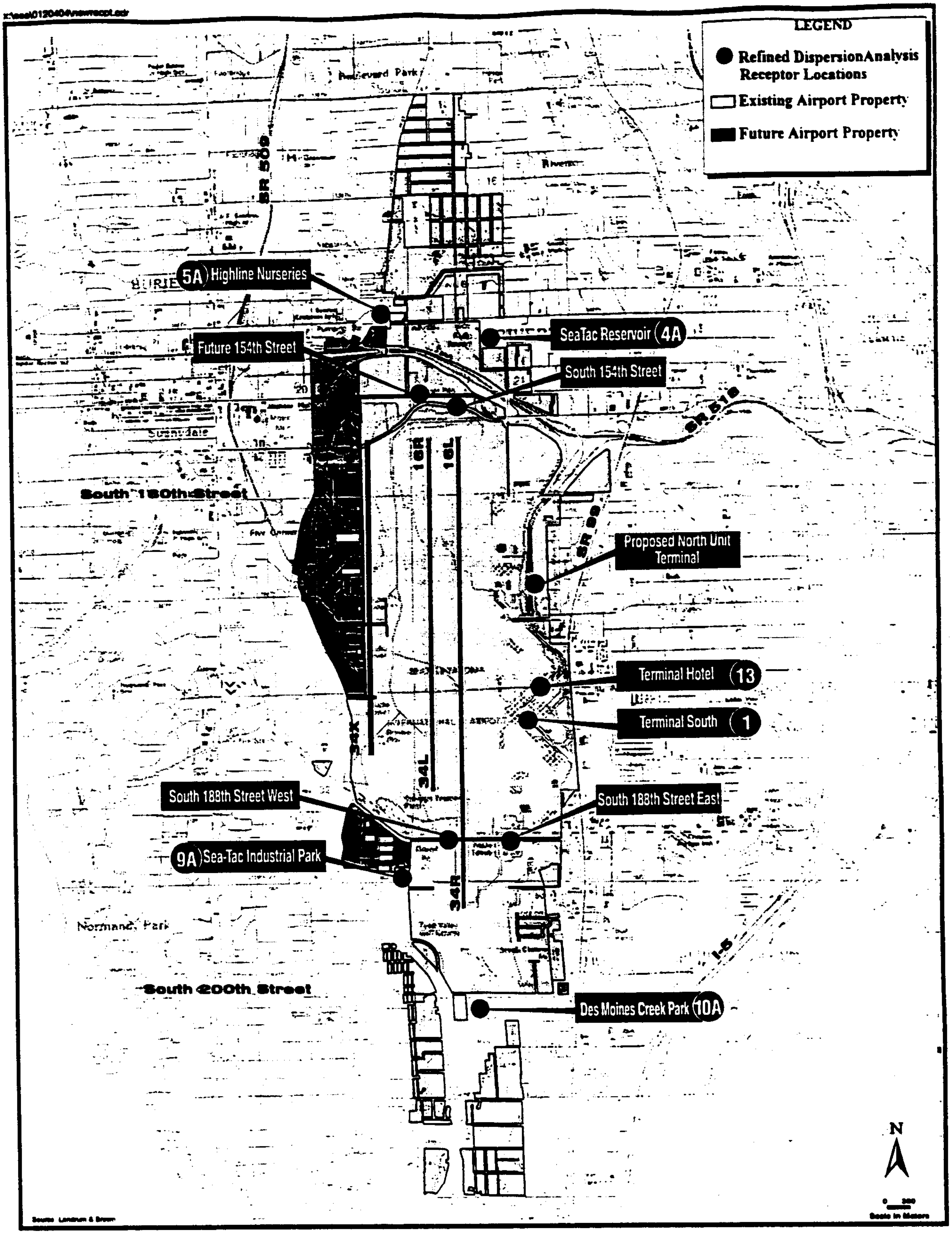
Based on the surface transportation analysis presented in **Section 5-1** of the Supplemental EIS, and the supporting **Appendix C-1**, a review was performed of the surface transportation conditions that would be experienced at other intersections in the airport area. Based on the level of service conditions, and delay levels, the proposed project will not create new exceedances of the AAQS or worsen existing exceedances.

The FAA and the Port of Seattle believe that the analysis prepared of the Final EIS, the Supplemental EIS, and this conformity analysis reflect worst case conditions. **Attachment C** of this appendix provides a comparison of the modeling protocol used for these studies in contrast to the Draft Programmatic EIS for the Extension of SR 509 (which identified lower concentrations along International Blvd.). The differences between the studies reflect the degree of worst case assumptions employed in each study. The analysis in the Final Supplemental EIS uses more conservative assumptions than the SR 509 Study.

In 1996, the Port of Seattle, the Puget Sound Air Pollution Control Agency and the U.S EPA entered in to a Memorandum of Agreement to conduct air measurements in the vicinity of Sea-Tac Airport, based on the findings of the February 1996 Final EIS. Carbon Monoxide measurements were initiated in November 1996 and initial results were complete in late February 1997. This monitoring effort found that actual measured concentrations along International Boulevard are between 3-5 ppm and "fell within health standards, even on days with the most pollution-prone weather". As noted by the Department of Ecology "'Air Quality in the study appears to be typical' ...'It even seems a little better than we've seen in similar high-traffic Areas elsewhere in the region...' Overall, 85% if the readings fell within the 'good' air quality range of 4.5 ppm and less. Fifteen percent of the readings were 'moderate' between 4.5 and nine ppm. There were no 'poor' air quality readings above nine ppm." This supports the conclusion that the modeling results for the Final EIS and Supplemental EIS incorporate worst-case assumptions and are conservative.

FINAL CONFORMITY CONCLUSION

As is shown, the proposed improvements at Seattle-Tacoma International Airport have been demonstrated by this document to conform to the Washington State Implementation Plan. As the revised analysis reflected in **Figure A** shows, the project will not result in emissions that would equal or exceed the applicable de-minimis threshold rates, nor will it be considered "regionally significant" with regard to air pollution emissions. A formal conformity determination, therefore, is not legally required for this project. EPA's rules and guidance are clear that where the net emissions increase resulting from the project do not exceed the applicable threshold rates, there are no further obligations with regard to the conformity rules. Although a conformity determination is not legally required, an analysis of air quality impacts utilizing the conformity determination structure has been conducted to address community and agency concerns regarding potential air quality impacts. The analysis presented in this appendix demonstrates that if a conformity determination was legally required for the project, the project would conform to the applicable State Implementation Plan. This was shown by dispersion analysis, because the concentrations associated "With Project" are equal to or less than the Do-Nothing/No Build (or in the case of the EDMS dispersion NO_2 evaluation, the increases caused by the project are less than the AAQS). This conclusion is especially strong given the conservative nature of the assumptions used in the analysis, and the fact that "worst case" assumptions were used, even through the conformity regulations do not specify this as a requirement. Cumulatively, the conservative and worst-case inputs serve to provide a "cushion" to the analysis results, assuring that the positive conformity conclusion is well founded. Thus, the proposed airport improvements are consistent with the SIP.

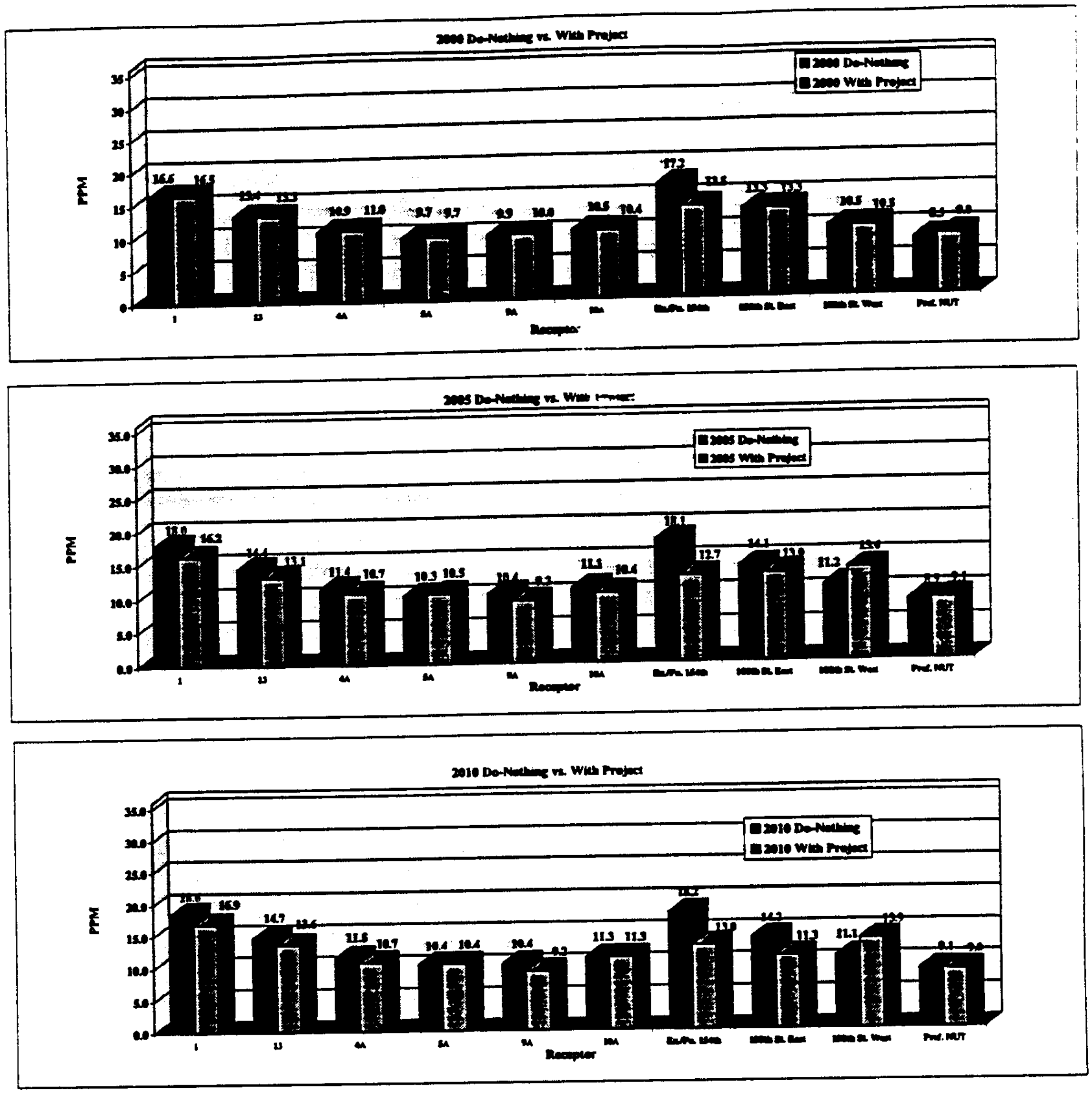


Seattle - Tacoma International Airport	Refined Dispersion Analysis Receptor Locations	FIGURE: E

Figure E
(Page 1 of 3)

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

CARBON MONOXIDE 1-HOUR CONCENTRATION (PPM)



Receptors: 1=Terminal-South; 13=Terminal Hotel; 4A=SeaTac Reservoir; 5A=Highline Nurseries; 9A=Sea-Tac Industrial Park; 10A=DesMoines Creek Park; Ex./Fu. 154th=Existing vs. Future South 154th Street; 188th East=South 188th Street, East Receptor; 188th West=South 188th Street, West Receptor.

Note: AAQS = 35.0 ppm
Background = 5.0 ppm

Source: Landrum & Brown, Inc., using EDMS Version 944

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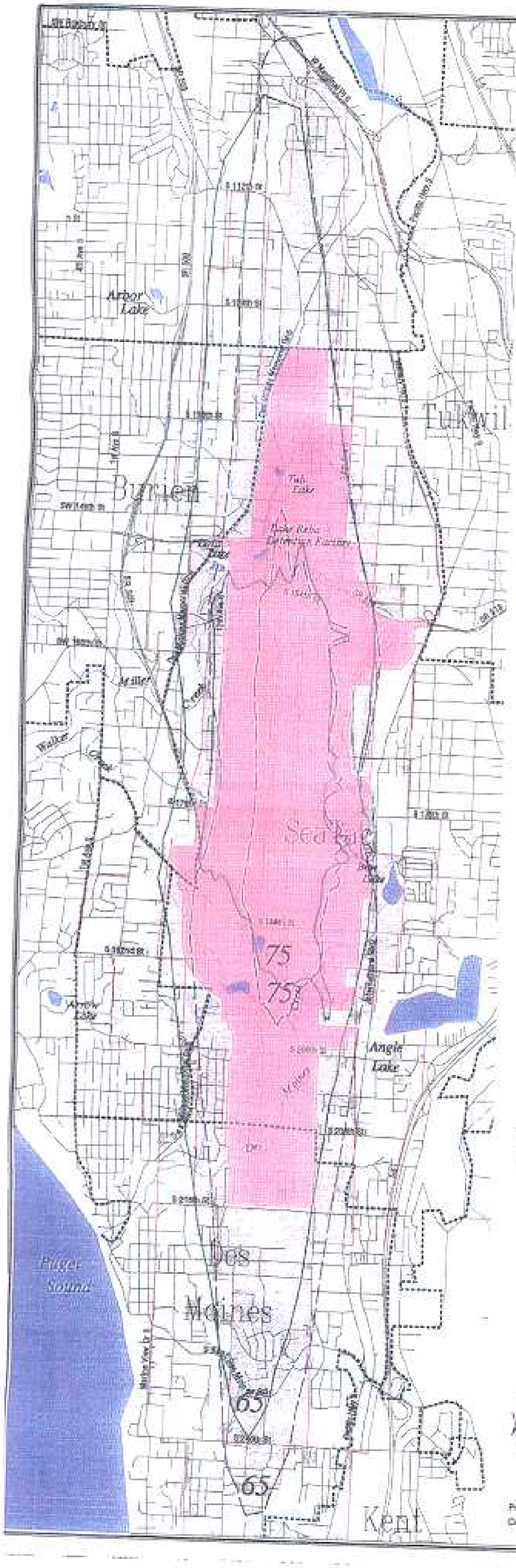


Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement
for the Master Plan Update

Exhibit 5-6-1

Comparison of Noise Contours 2010 Alternative 3 to 2010 Alternative 1

Remedial Acquisition

Custom Remedial Measures

Standard Remedial Measures

Jurisdictional Boundary

2010 Alternative 1 (Do Nothing)

2010 Alternative 3 (Preferred Alternative)

Source: Gambrell Urban, Inc. and Landrum & Brown, Inc., 1996
Port of Seattle, 1991
Files SEAX115 and SEAX112

Scale 1" = 3,200'

0 2000 4000 6000 8000

Scale of Feet

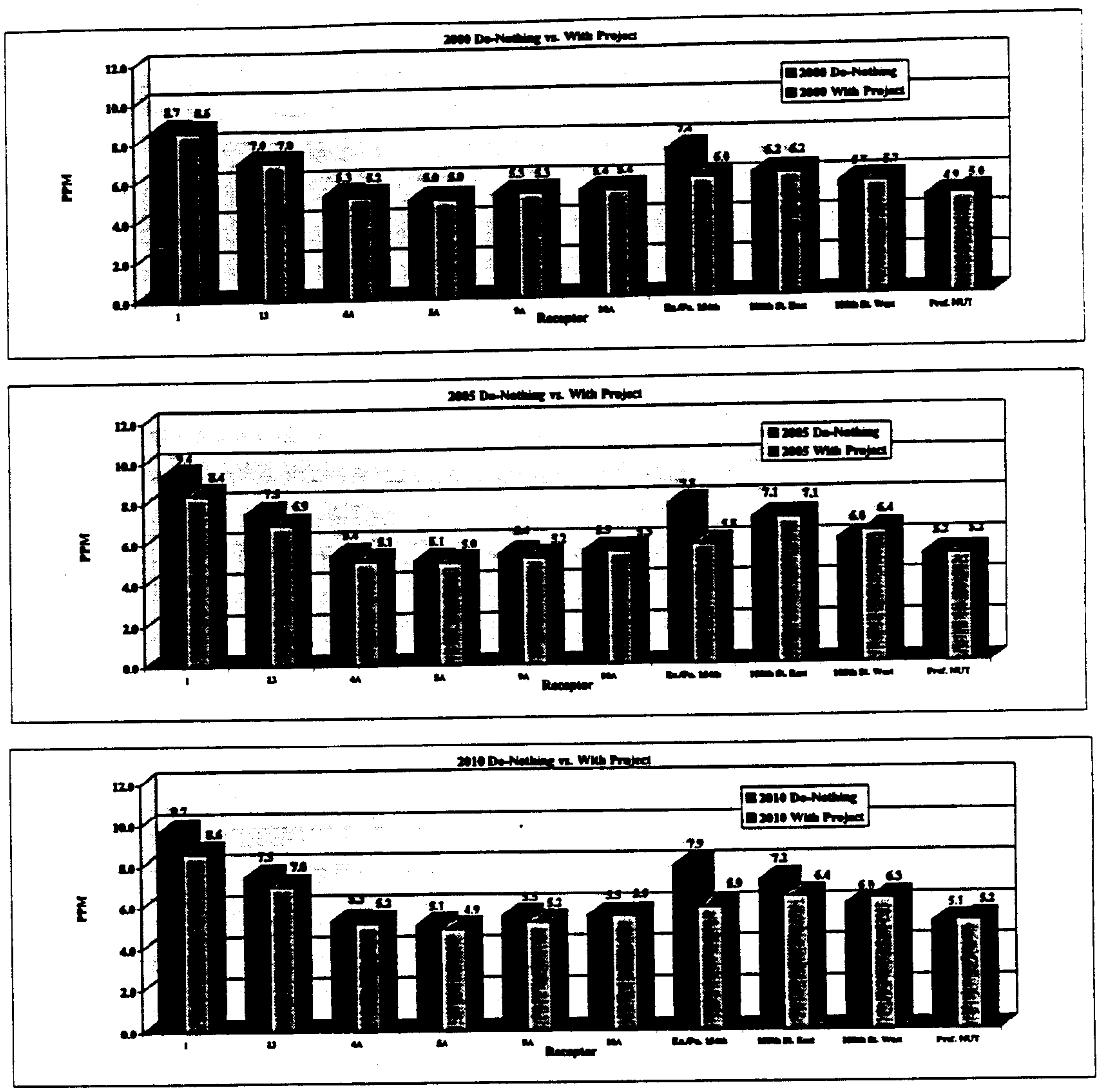
Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

December 27, 1996

Figure E
(Page 2 of 3)

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

CARBON MONOXIDE 8-HOUR CONCENTRATION (PPM)



Receptors: 1=Terminal-South; 13=Terminal Hotel; 4A=SeaTac Reservoir; 5A=Highline Nurseries; 9A=Sea-Tac Industrial Park; 10A=DesMoines Creek Park; Ex./Fu. 154th=Existing vs. Future South 154th Street; 188th East=South 188th Street, East Receptor; 188th West=South 188th Street, West Receptor.

Note: AAQS = 9.0 ppm
Background = 3.5 ppm

Source: Landrum & Brown, Inc., using EDMS Version 944

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April 30, 1997

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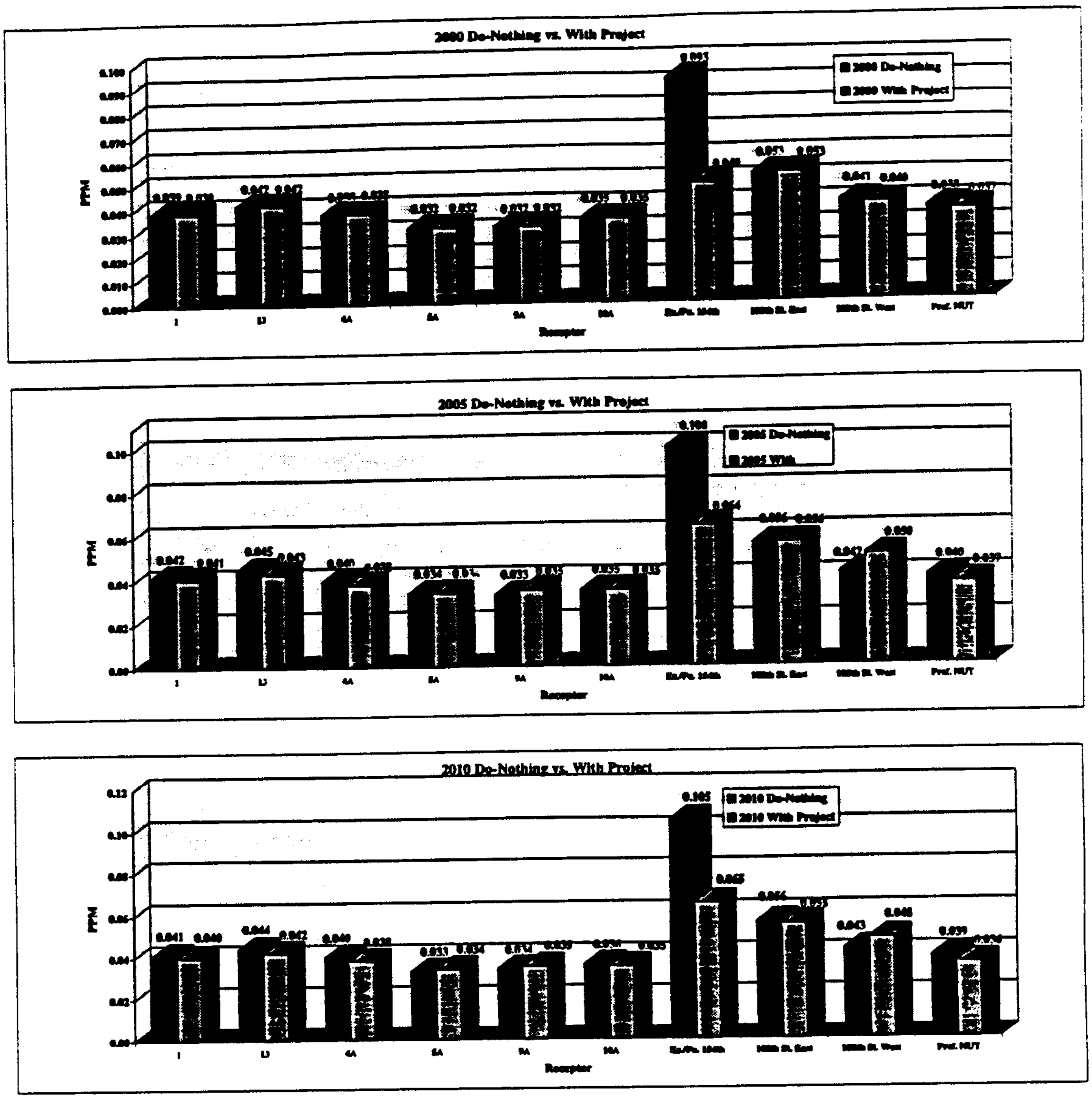
Figure E
(Page 3 of 3)

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

NITROGEN DIOXIDE CONCENTRATIONS (PPM)



Receptors: 1=Terminal-South; 13=Terminal Hotel; 4A=SeaTac Reservoir; 5A=Highline Nurseries; 9A=Sea-Tac Industrial Park; 10A=DesMoines Creek Park; Ex./Fu. 154th=Existing vs. Future South 154th Street; 188th East=South 188th Street, East Receptor; 188th West=South 188th Street, West Receptor.

Note: AAQS = 0.053 ppm
Background = 0.02 ppm

Source: Landrum & Brown, Inc., using EDMS Version 944

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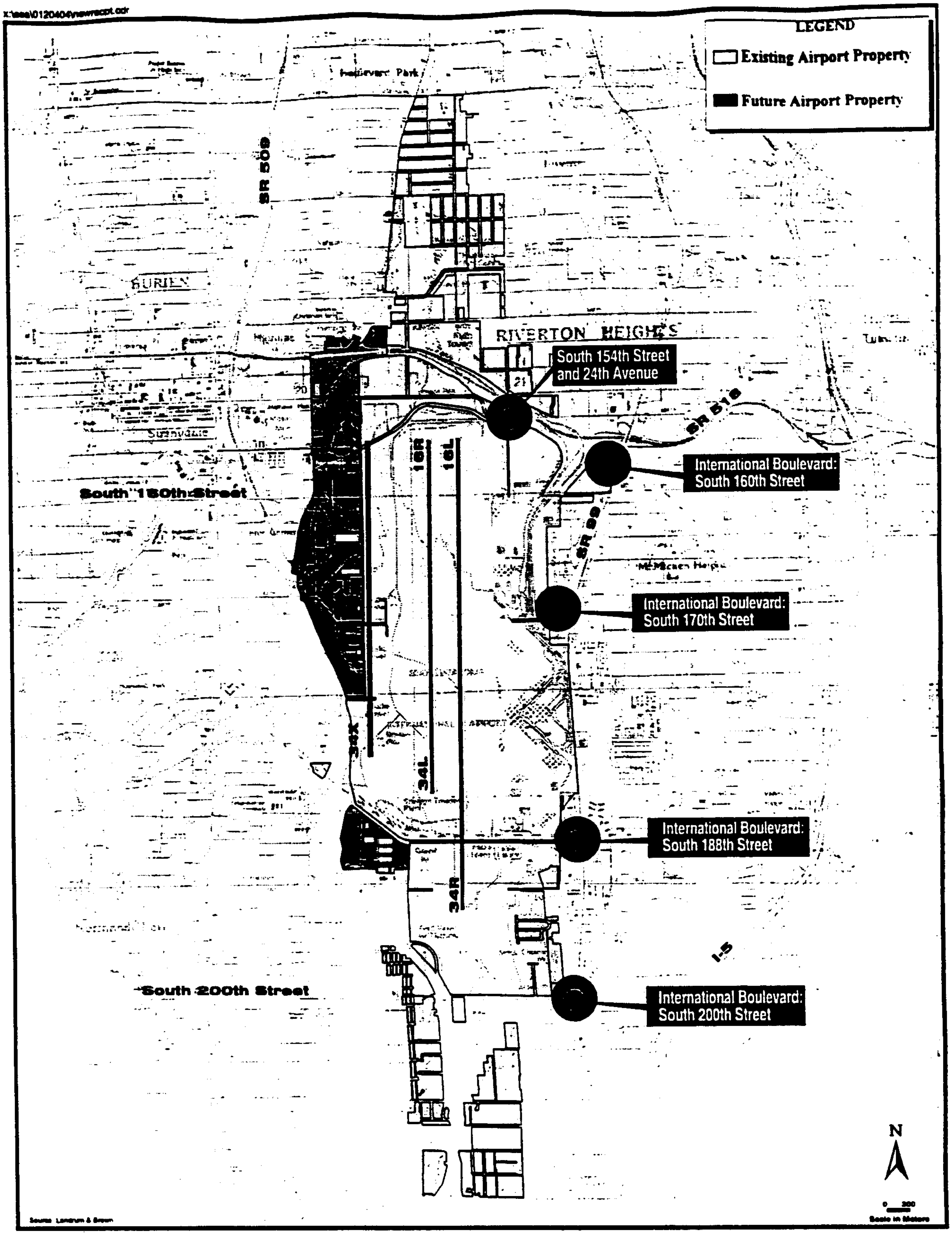
April 30, 1997

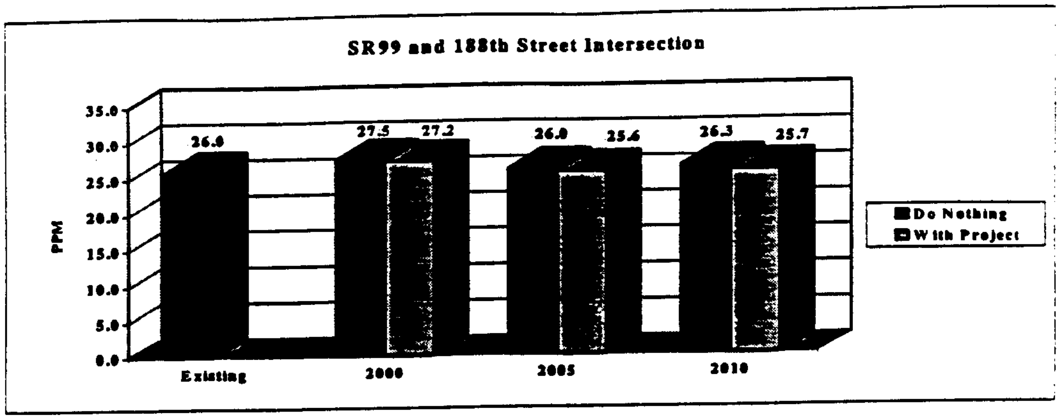


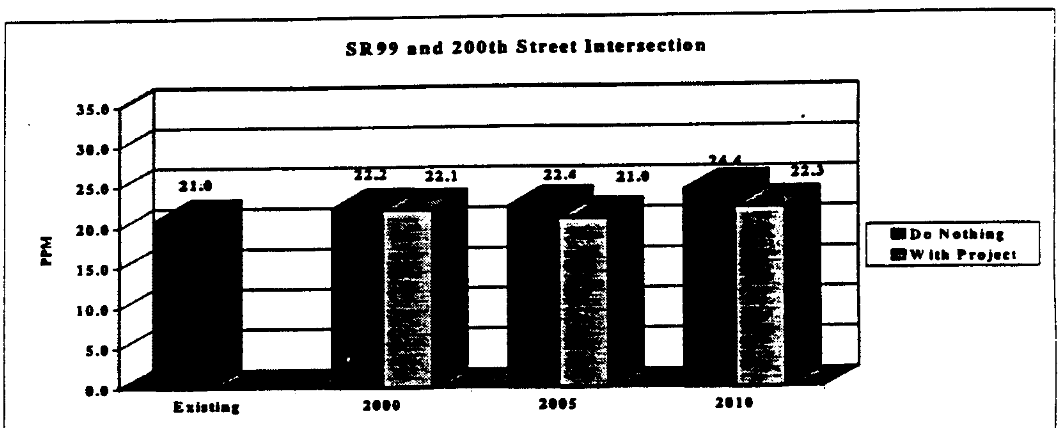
Seattle - Tacoma International Airport	Roadway Intersection Dispersion Analysis	FIGURE F

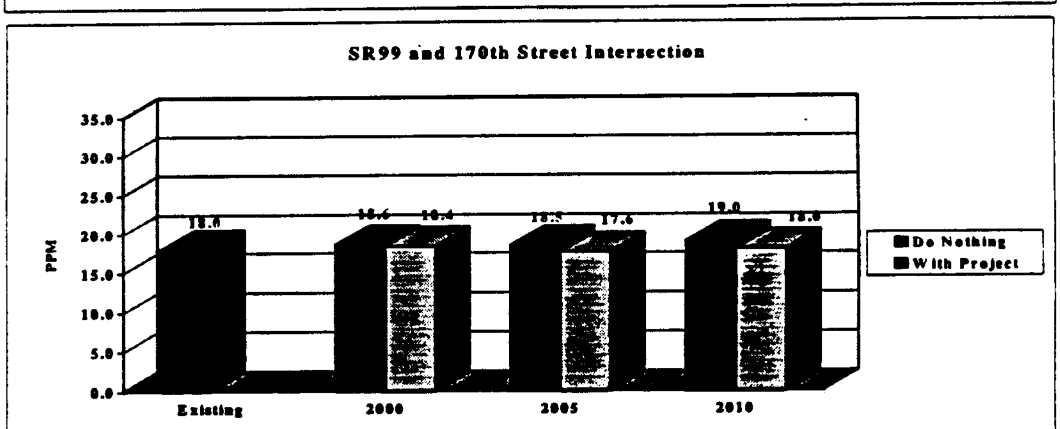
Figure F
Page 1 of 4

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
1-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm







Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (1-Hour CO=35 ppm)
Intersections modeled are shown on Exhibit 5-2-7.
p:\sea\postfeis\airqual\conform\figure-f.doc

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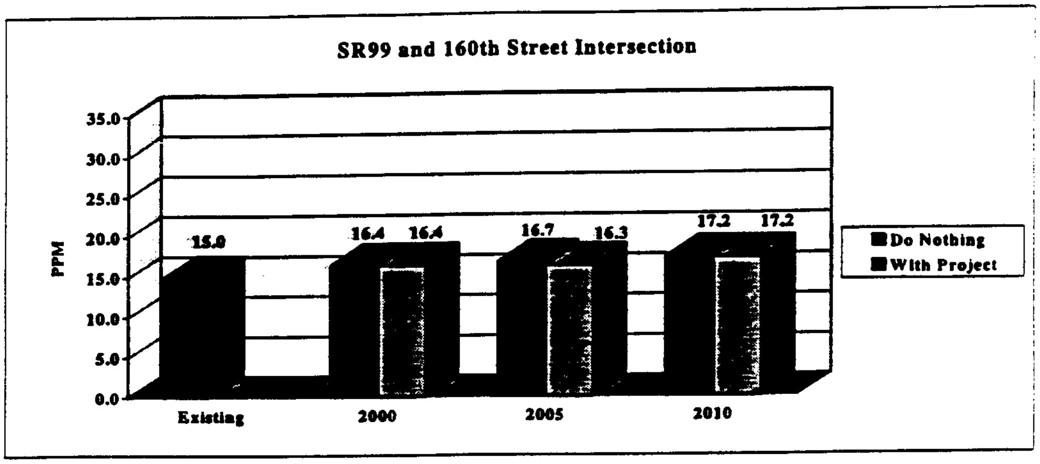
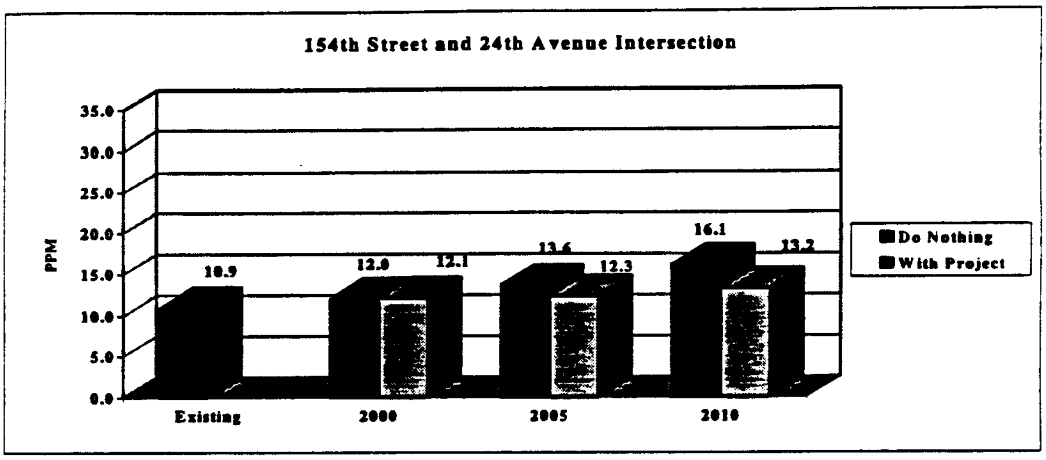
Figure F
Page 2 of 4

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
1-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm





Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (1-Hour CO=35 ppm)
Intersections modeled are shown on Exhibit 5-2-7.
p:\sea\postfeis\airqual\conform\figure-f.doc

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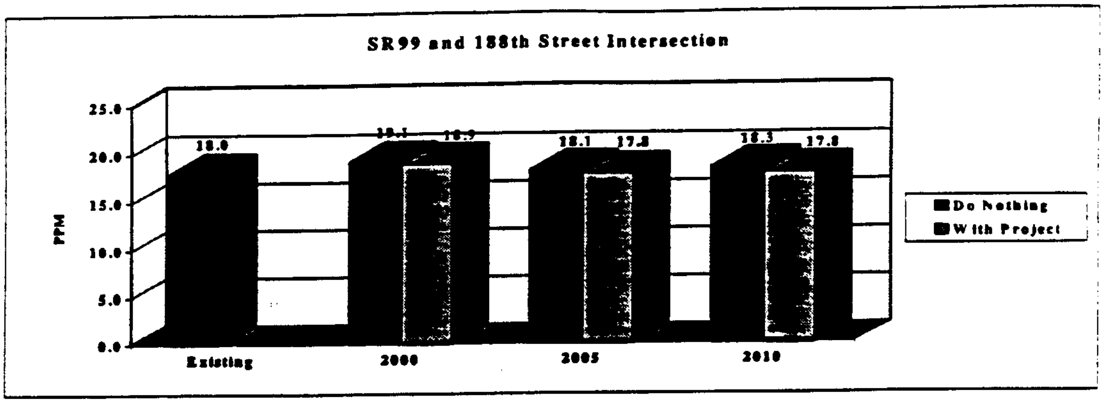
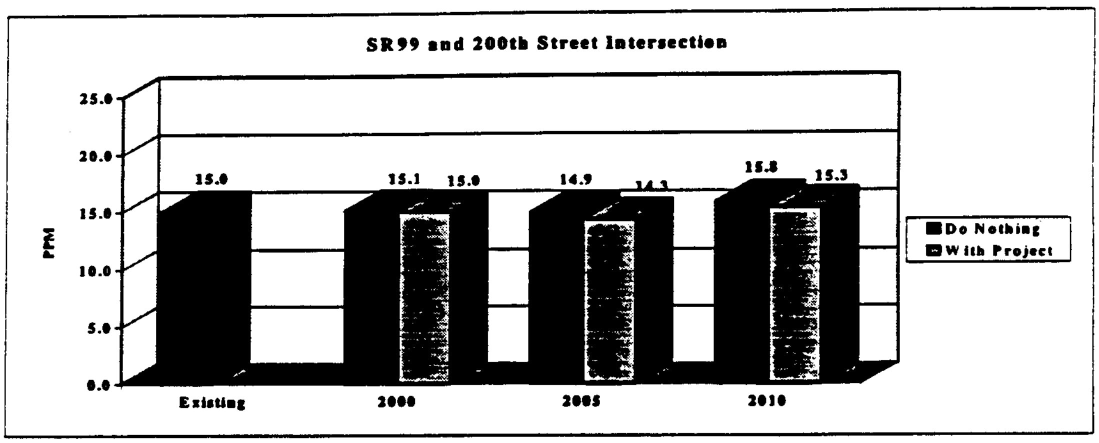
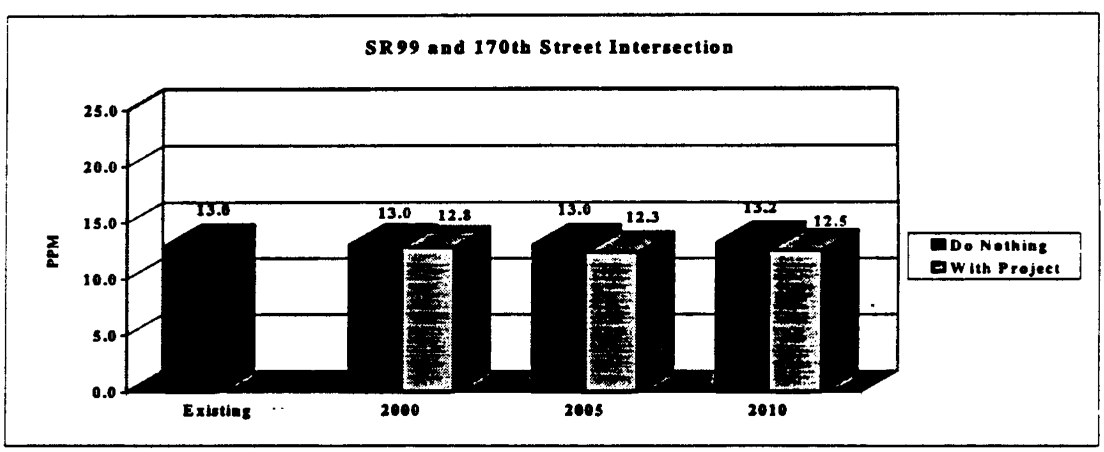
Figure F
Page 3 of 4

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
8-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm





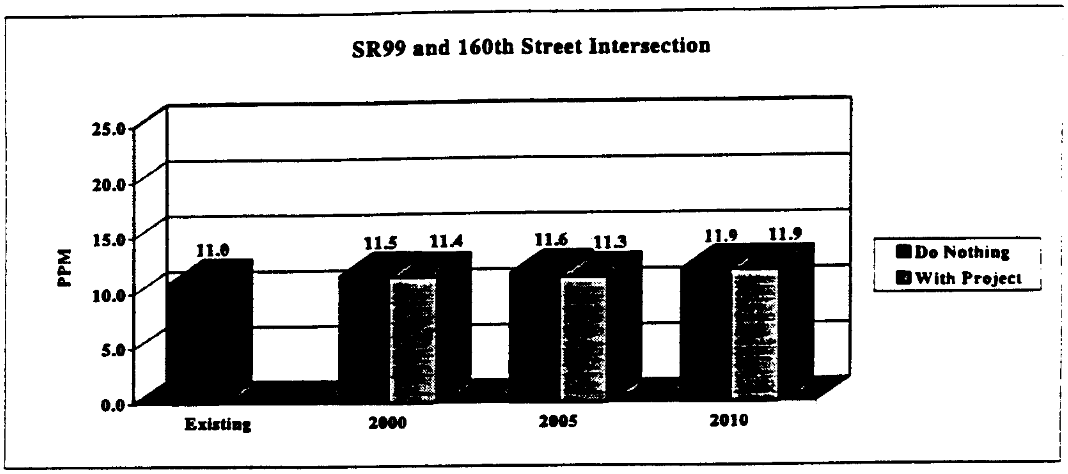


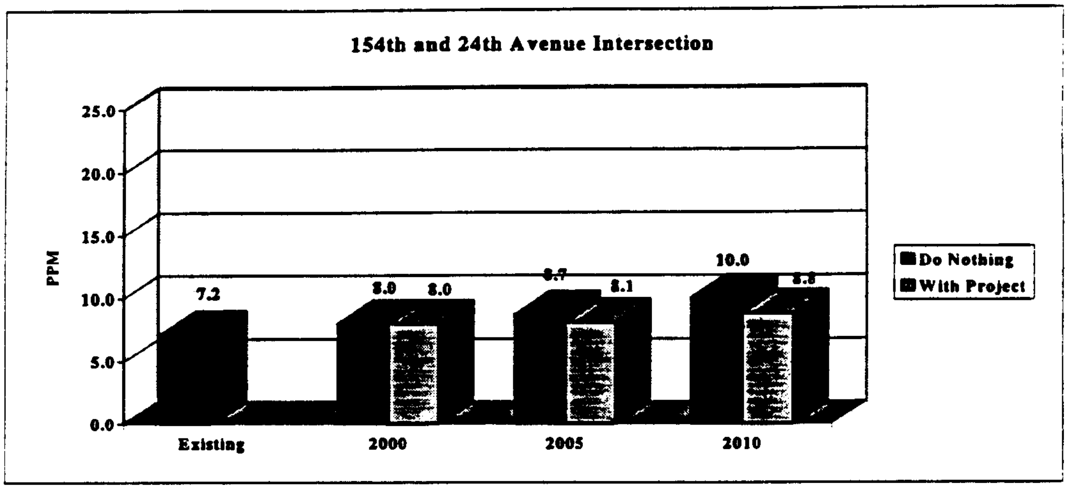
Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (8-Hour CO=9 ppm)
Intersections modeled are shown on Exhibit 5-2-7.

Figure F
Page 4 of 4

Seattle-Tacoma International Airport
Supplemental EIS - Air Quality Analysis

INTERSECTION DISPERSION ANALYSIS
8-HOUR CARBON MONOXIDE (CO) WITH BACKGROUND LEVEL 5.0 ppm





Source: Landrum & Brown, Inc., December, 1996
Note: AAQS=Ambient Air Quality Standards (8-Hour CO=9 ppm)
Intersections modeled are shown on Exhibit 5-2-7.
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FIGURE G

CARBON MONOXIDE CONCENTRATIONS
COMPARISON OF ALTERNATIVES

1-Hour Concentration (ppm)

	Do-Nothing		With Project	
	Oxy Fuel	**Regular**	**Oxy Fuel**	**Regular**
Year 2000				
SR 99/ S. 160th St.	16.4	20.3	16.4	20.0
SR 99 /S. 170th St.	18.6	23.1	18.4	22.9
SR 99/ S. 188th St.	27.5	34.9	27.2	34.2
SR 99/ S. 200th St.	22.2	27.9	22.1	27.6
S. 154th/24th Ave S.	12.0	13.9	12.1	13.9
Year 2005				
SR 99/ S. 160th St.	16.7	20.7	16.3	19.8
SR 99 /S. 170th St.	18.5	23.0	17.6	21.8
SR 99/ S. 188th St.	26.0	32.9	25.6	32.0
SR 99/ S. 200th St.	22.4	27.9	21.0	26.1
S. 154th/24th Ave S.	13.6	15.8	12.3	14.5
Year 2010				
SR 99/ S. 160th St.	17.2	21.3	17.2	21.2
SR 99 /S. 170th St.	19.0	23.7	18.0	22.6
SR 99/ S. 188th St.	26.3	33.3	25.7	32.8
SR 99/ S. 200th St.	24.4	29.8	22.3	27.7
S. 154th/24th Ave S.	16.1	18.5	13.2	15.5
NAAQS	**35**	**35**	**35**	**35**

8-Hour Concentration (ppm)

	Do-Nothing		With Project	
	Oxy Fuel	**Regular**	**Oxy Fuel**	**Regular**
Year 2000				
SR 99/ S. 160th St.	11.5	14.2	11.4	13.9
SR 99 /S. 170th St.	13.0	16.1	12.8	16.0
SR 99/ S. 188th St.	19.1	24.3	18.9	23.8
SR 99/ S. 200th St.	15.1	19.1	15.0	18.8
S. 154th/24th Ave S.	8.0	9.3	8.0	9.2
Year 2005				
SR 99/ S. 160th St.	11.6	14.4	11.3	13.7
SR 99 /S. 170th St.	13.0	16.1	12.3	15.2
SR 99/ S. 188th St.	18.1	22.9	17.8	22.2
SR 99/ S. 200th St.	14.9	18.7	14.3	17.9
S. 154th/24th Ave S.	8.7	10.2	8.1	9.7
Year 2010				
SR 99/ S. 160th St.	11.9	14.8	11.9	14.7
SR 99 /S. 170th St.	13.2	16.5	12.5	15.8
SR 99/ S. 188th St.	18.3	23.2	17.8	22.8
SR 99/ S. 200th St.	15.8	19.6	15.3	19.1
S. 154th/24th Ave S.	10.0	11.7	8.8	10.4
NAAQS	**9**	**9**	**9**	**9**

Oxygenated Fuels versus Regular Unleaded Fuel.

Source: Landrum & Brown, January 1997.

FIGURE H

Seattle-Tacoma International Airport
Final Conformity Analysis

CONSTRUCTION AIR POLLUTION CONCENTRATIONS

Haul Route	CO Concentrations (ppm) 1-Hour Do-Nothing	1-Hour With Project	8-Hour Do-Nothing	8-Hour With Project
SR 509 from SR 518 to S. 160th Street	1.4	1.5	1.0	1.1
South 160th Street from SR 509 to Des Moines Memorial Drive	2.1	2.5	1.5	1.7
Des Moines Memorial Dr. from S. 160th Street to 8th Ave. South	1.8	2.1	1.3	1.5
Des Moines Memorial Dr. from 8th Ave. South to 148th Street	1.5	2.0	1.1	1.4
Des Moines Memorial Dr. from S. 200th Street to S. 188th Street	3.2	3.5	2.2	2.4
South 200th St. from Des Moines Memorial to 26th Ave. South	3.5	3.7	2.5	2.6
Unpaved on-Airport Road south airfield	-	0.1	-	0.1
Ambient Air Quality Standard	35	35		9

Source: Final EIS, Chapter IV, Section 23 Tables IV.23-6 and IV.23-7.

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ATTACHMENT A

RESPONSE TO COMMENTS ON THE DRAFT CLEAN AIR ACT CONFORMITY ANALYSIS

A draft conformity analysis was included in the February 1996 Final EIS. Originally, the comment period was slated to close on March 18, 1996. At the request of the reviewers, the comment period was extended until June 6, 1996. Comments were received from eight individuals or organizations. The following text responds to these comments. Comments on the Updated Draft Conformity Analysis are presented in **Appendix G**, and a summary of the comments and responses are provided in **Appendix F.**

1. February 29, 1996 **Debbie DesMarias**, 24322 - 22nd Ave S, Des Moines, WA 98198

Comment 1: Commentor expressed concerns that existing violations of the standards could be occurring and that the EIS/Conformity analysis does not mitigate these impacts. Commentor also indicated that the EIS's identification of existing exceedances of the NOx levels should be treated as a new violation.

Response: As noted by Ms. DesMarias, the Final EIS air quality analysis focuses on satisfying three general conditions as required by the Clean Air Act and amendments for a non-attainment area: 1) that the *project* will not cause or contribute to any new violations of any of the ambient air quality standards (AAQS) in the project area or the metropolitan area; 2) That the *project* will not increase the frequency or severity of any existing violations of any AAQS; and 3) that the *project* will not delay timely attainment of the AAQS or any required interim emission reduction in the project area (*emphasis added*). Therefore, the EIS identified the impacts of the proposed Master Plan Update improvements by comparing the "With Project" to the Do-Nothing condition. In late 1996, the Puget Sound was redesignated by the EPA as a maintenance area. Therefore, the updated draft conformity analysis evaluates the principles according to a maintenance area.

The Port and FAA have met with local, state and federal agencies concerning air monitoring due to the results of the existing and future air modeling. These meetings lead to the development of a Memorandum of Agreement to conduct monitoring in the airport vicinity. This monitoring was initiated in late 1996 and is slated to be conducted over a 24 month period. The Port and FAA expect that actual measurements will show that the models significantly over-predict actual conditions by using worst-case meteorological and operating assumptions.

Comment 2: Commentor noted that "Expansion of airport parking facilities, drives and additional gates prior to the North Unit Terminal build-out have not been considered as additive in the model". In addition, the commentor noted concerns that cumulative impacts of other projects were not adequately addressed (Hotel, DMCTC, SASA, SR 509 Extension/South Access, International Blvd. Improvements).

Response: The air quality analysis, and other analysis presented in the Final EIS, includes all proposed Master Plan Update improvements in years in which they would be completed. In addition, other regional projects and Port sponsored non-Master Plan projects that received environmental approval prior to the Final EIS were included in the Do-Nothing and "With Project" evaluations. The air quality analysis presented in the Final EIS represents a cumulative impact analysis, as it addresses the impacts of future planned improvements in the Airport area.

Comment 3: Commentor disputes findings of revised modeling assumptions used in the FEIS.

Response: Appendix D, beginning on page D-34 of the Final EIS, presents the results of a number of "test cases". The purpose of the test cases was to examine the effect on pollutant concentrations of alternative modeling assumptions. The following scenarios were tested:

1. revising the receptor locations modeled;
2. revising the analysis to reflect peak hour aircraft departure activity; and,
3. increasing the peak hour departure queue delay time.

A separate analysis examined peak hour aircraft departures and peak hour departure queue delay time.

The assumptions of the peak hour scenarios were discussed in the Final EIS Appendix R, response to comment R-10-14 beginning on Page R-122. As is described, if larger size aircraft (relative to the peak hour modeled) were operating, these larger aircraft would require greater spacing between aircraft (both on the ground and in the air). Therefore, this scenario could be expected to result in fewer peak hour departures to provide the requisite separation in landing and takeoffs. As indicated on page D-38, a separate analysis confirmed that even if the average annual fleet and the highest peak hour level of departures could occur at the same time (which the FAA's actual data indicates does not occur), the change in pollutant levels would be minimal with all concentrations, except as noted at 154th Street, below the AAQS.

The Final EIS analysis considers future changes in aircraft operations and fleet mix, including use by newer type aircraft. However, as described in the response to comment R-10-15 (Final EIS, Appendix R, Page R-125), peak hour departure activity is restricted due to the existing noise abatement departure procedures; the noise abatement procedures prevent quick turns on takeoff. Additionally, the separation standards between entrail aircraft limits the number of departing aircraft during any one hour. Therefore, as two runways are available for departure today, the addition of a new parallel runway would not be expected to change the peak hour departure levels.

Comment 4: Concerns with air measurements in the baggage area versus air measurements at other locations in the region.

Response: The short-term NO_2 monitoring measurements in the baggage area were conducted in areas restricted to employee-only access to measure compliance with Washington Industrial Safety and Health Act (WISHA) standards which regulate employee exposure to air pollutants. Historically, the levels have been well below the WISHA standards. Employee-only access locations are not reflective of ambient air quality locations or the duration at which prolonged public exposure could be expected relative to the annual NO_2 standards. Accordingly, the measurements conducted in the baggage area are not comparable to the ambient locations monitored in the region.

Comment 5: Commentor questioned how pollutant levels at Sea-Tac contrast with pollutants emissions in other portions of the region on a per acre basis.

Response: As would be expected, the acreage containing Sea-Tac Airport emits a greater level of air pollution than the average acre within King County for specific pollutants. Generally, Airport lands (encompassing 2,500 acres) produce greater levels of nitrogen oxides (NOx) for each airport acre than do all sources for each of King County's 1.4 million acres. However, aircraft emissions of Volatile Organic Compounds (VOC) and Carbon Monoxide (CO) for each Airport acre are nearly the same as compared to all sources for each King County acre.

Nitrogen Oxide (NOx): Aircraft activity at Sea-Tac produces approximately 0.5 tons NOx for each Airport acre (2,500 acres). All sources (aircraft, motor vehicles, fuel tanks, etc.) produce about 0.2 tons NOx for each acre within the Master Plan Update EIS study area (15,000 acres). Comparatively, all sources within King County (mobile, non-road mobile, point and stationary sources) produce 0.1 tons NOx for each King County acre.

Volatile Organic Compound (VOC): Aircraft produce approximately 0.1 tons per year VOC for each Airport acre. All sources produce just over 0.1 tons VOC per year for each acre within the EIS study area. The airport and airport area per acre level is the same as the King County level of about 0.1 tons VOC per acre.

Carbon Monoxide (CO): Aircraft produce about 0.5 tons CO per year for each Airport acre. All sources in the study area produce 1.5 tons CO per year for each acre. All sources within King County produce 0.4 tons CO per year for each acre in King County.

Comment 6: Commentor questioned if the airport should be treated like a point source instead of as mobile sources?

Response: Sea-Tac Airport facilities consist of a complex mix of stationary, mobile and non-road mobile sources. Stationary or point sources are typically limited in size to a single facility in comparison to the 2,500 acres at Sea-Tac consisting of numerous individual facilities. Emissions from aircraft and motor vehicles are consistently treated as mobile sources under the Clean Air Act. Additionally, although the Port of Seattle owns the land, many of the structures on-airport are owned and maintained by the tenants using the Airport. These tenants have certain responsibilities and liabilities associated with their operation independent from the Port of Seattle. These facilities are regulated by the Puget Sound Air Pollution Control Agency as stationary sources. As a result, air pollution modeling for airports typically uses point, area, and line sources to characterize the types of sources and/or facilities.

Comment 7: Commentor expressed concerns with the role and results of the SIP.

Response: Ms. Des Marias correctly notes that "the goal of the SIP is to chart air pollution and improvements over time to eventually reach attainment of the standards to protect public health and better the environment." The SIP "inventories" pollutant levels by a variety of sources within the Region including airports. Once all the pollutant sources are inventoried, then the SIP focuses on measures to reduce pollutant levels in order to meet pollutant reduction goals for the Region. The SIP inventories do not mean that activity within the Region cannot grow, nor do they establish pollutant 'budgets' for a particular source that cannot be exceeded. For example, the SIP accounts for growth in aircraft activity at Sea-Tac. Because motor vehicles are expected to remain the largest contributor of pollutants, the SIP focuses on reducing emissions from motor vehicles to achieve the Region's goals for reducing air pollutants.

Accordingly, the SIP is an inventory of overall regional emissions from all sources. The SIP's function is not to conduct a project level or 'hot spot' analysis of potential exceedances of the Ambient Air Quality Standards (AAQS). However, project level evaluations, such as the Sea-Tac Master Plan Update EIS, focus on comparisons to the AAQS; see response to comment 1

The response to comment R-10-2 (see page R-109) in Appendix R of the FEIS describes the differences in modeling methodology and results between the SIP and Final EIS analysis. Although the SIP results are higher than identified in the Final EIS, the SIP inventory indicates that the Region's pollutant reduction goals can nonetheless be achieved due to emissions reductions from other sources throughout the Region.

Comment 8: Commentor questioned the application of transportation conformity guidelines to general conformity and the definition of the conformity process.

Response: Page IV.9-10 of the Final EIS provides a definition of conformity and how it was applied to the Master Plan Update improvements. As is described, transportation conformity does not apply as none of the Master Plan Update improvements alter regionally significant roadways and no FTA funds are anticipated. Thus, general conformity rules apply, because federal funding is anticipated and FAA approval of the Airport Layout Plan is required.

Comment 9: Commentor expressed concerns with the purpose and need for improvements at Sea-Tac and the anticipated growth projections relative to air pollutant conditions.

Response: The introduction to Volume 3, Appendix R and Volume 1 Chapter 1 of the Final EIS provides a detailed explanation of the project purpose and need and forecast assumptions used in the analysis.

2. March 5, 1996 **Debbie DesMarias**, 24322 - 22nd Ave S. Des Moines, WA 98198

Comment 10: Commentor noted several questions concerning the modeling assumptions at 154th street (screening vs. refined).

Response: Ms. Des Marias questioned the original concentrations quantified by the screening dispersion analysis at the S. 154th Street receptor location for the existing condition, in addition to wind speed and direction. Table D-10 in Appendix D of the Final EIS identifies, by pollutant source, the concentrations of NO_2 at each receptor based on the refined dispersion analysis. For the existing 154th Street receptor, the refined analysis indicates a concentration of 0.08 ppm NO_2, including approximately 0.05 ppm from aircraft sources, and 0.01 ppm from roadway sources, plus and additional 0.02 ppm attributed to background (all numbers were rounded). At this location, the screening dispersion analysis indicated a concentration of 0.215 ppm without roadway sources or background concentrations added.

The differences between the screening and refined analysis primarily relate to the meteorological assumptions. For the screening dispersion analysis, the highest concentration was identified at a worst case wind angle of 200 degrees (winds from the south/southwest) at a wind speed of 1 meter per second. To compare this concentration to the AAQS requires the assumption that wind conditions do not vary over the year. The refined dispersion analysis is based on actual weather data for an entire year. Therefore, the refined analysis used actual wind speed and direction for each of 8,760 hours for each year modeled. Use of actual annual weather data enables a comparison to the NO_2 standard, which is based on an annual average. The meteorological considerations used in the screening dispersion analysis are described in Appendix D, beginning on page D-21. The refined analysis methodology is described beginning on page D-27.

Contributions from roadway traffic along South 154th Street was added to the concentrations presented in Table D-10, and which is illustrated in the pollutant bar charts presented in the Final EIS in Table IV.9-3. As shown in Table D-10, roadway sources including traffic along 154th Street contribute about 0.01 ppm to the total NO_2 concentration at the 154th Street location. Background added 0.02 ppm. The concentration referenced by Ms. DesMarias in Table D-11 (0.068 ppm) does not include concentrations from any roadway traffic, although the 0.02 ppm background is included.

Comment 11: Commentor expressed concerns with the contrasts of cars emissions with aircraft emissions presented in Appendix R and requested contrast of a DC10/747/767 emissions versus a car.

Response: In commenting on the Draft EIS air quality analysis, Ms. DesMarias provided a general comparison of aircraft emissions for a DC-10 aircraft, for 2 minute takeoff thrust, to one car traveling one-mile at 30 mph. The response to comment R-10-5 also discusses the comparison of motor vehicle emissions to aircraft pollutant levels for a DC-9. A difference in the two comparisons is the measurement units. For example, a jet aircraft in the takeoff mode travels considerably further in two minutes than 1 car traveling two minutes (1 mile). Accordingly, there is no easily comparable unit of measurement. For the Final EIS, the response to comment R-10-5 is based on an attempt at an equivalent travel time, and thus assumes a car traveling at 30 mph.

Based on both the car and the aircraft traveling for two minutes, it would take approximately 11,095 cars to equal one DC-10 takeoff-climbout; 14,109 cars to equal one B-747 takeoff-climbout; and 7,043 cars to equal one B-767 takeoff-climbout. Based on the car traveling 30 miles per hour, it would take about 370 cars to equal the NOx produced by one DC-10 takeoff-climbout; about 235 cars to equal one B-767 takeoff and climbout; and about 470 cars to equal one B-747 takeoff and climbout.

3. March 10, 1996, **Debbie DesMarias**, 24322 - 22nd Ave S, Des Moines, WA 98198

Comment 12: Commentor noted concerns with the time in mode/queuing time and requested that the assumptions be clarified.

Response: The Final EIS analysis relies on the departure delay time and departure queue length identified by the FAA's Capacity Enhancement Study, as indicated in Appendix R, response to comments R-10-14 and R-10-17. Thus, for the existing condition, the average departure queue delay of 2.89 minutes was applied to each aircraft departure, with up to nine aircraft waiting in the queue to depart. The FAA's simulation analysis considers that some aircraft would experience substantially more delay, while others would proceed unimpeded from the gate to the end of the runway and departure. The result is that not all aircraft line up in a queue waiting to depart even during the peak departure hour. Therefore, the length of the departure queue represents the maximum number of aircraft identified during a portion (not all) of the average peak hour.

Based on an average aircraft length of approximately 107 feet, the departure queue modeled in the air quality analysis extends about 1,800 feet to allow for the variety of aircraft lengths in the average annual fleet, plus the addition of spacing between aircraft while waiting to depart. The modeled departure queue length was chosen as a reasonable worse case assumption to reflect the average fleet.

As indicated in response to comment R-10-17, field observation confirmed that during the peak departure hours, aircraft queues include up to 9 to 10 aircraft, with each aircraft in the queue waiting 6 to 10 minutes or more to depart. The test case analysis in Appendix D considered the effect of peak hour aircraft departures and peak hour departure queue.

Comment 13: Commentor questioned the requirements for a worst-case assessment.

Response: The modeling input assumptions and methodology used in the air quality analysis were identified in consultation with the Washington State Department of Ecology, the US EPA Region X, and PSAPCA. The airport-wide screening and roadway dispersion analyses incorporate a "worst case" operational condition as well as hypothetical meteorological conditions that likely result in an overestimation of pollution concentrations. Included is the assumption that peak activity for aircraft, roadways (airport traffic and non-airport regional traffic) and other source activity occurs at the same time. The analysis also considers that the "worst" weather conditions for pollutant dispersion also occurs at the same time as the peak activity levels. This combination of "worst" case weather conditions and peak operational activity produces an unlikely, if not improbable, combination of events and likely produces an overestimation of pollutant levels.

In addition to "worst" case operational considerations, the analysis also considered "worst" case meteorological assumptions. Included were more conservative assumptions of extremely calm wind speed (1 meter per second), a constant wind direction, and minimal wind turbulence (stability class E versus a more neutral stability class D which is usually used for detailed modeling). These conditions were assumed to occur for a uniform temperature, over extremely long periods of time.

The EIS analysis also used default or calculated motor vehicle travel speeds lower than posted speeds, resulting in higher CO emissions. Typically, off-airport motor vehicle sources could be considered as part of "background" pollutant levels. However, the EIS air quality analysis likely overestimates pollutant levels by considering all motor vehicle emissions in addition to the high background levels. The background levels were based on available monitoring data in the region (i.e., in locations with historic pollutant concerns that may not represent the airport area). The result may be substantially higher background levels over what may occur in the Airport area. Additionally, these background levels are maintained throughout the future years analysis even though pollutant level improvements are anticipated from a number of sources, particularly motor vehicles.

As indicated in the Final EIS, considerable interest was expressed in what the effect would be on air pollutant levels with peak departure activity and peak departure queue. See response to comment 1.

The results indicate that tripling the departure queue delay adds little additional NO_2 to the concentrations presented in Chapter IV, Section 9. Therefore, the EIS analysis resulted in the highest concentrations of NO_2 as compared to peak hour departures and increased departure queue time. Increased departure queue delay did result in an increase in the short-term 1-hour and 8-hour Carbon Monoxide concentrations. However, all 1 and 8-hour CO concentrations continued well below the AAQS.

As indicated on page D-38, a separate analysis also confirmed that even if the average annual fleet (i.e., all aircraft types in use) and the highest peak hour level of departures, maximized peak hour departure queue time could occur at the same time, the change in pollutant levels would be minimal. This analysis was also conducted for the future annual aircraft fleet. Except at South 154th Street, all pollutant concentrations would still be below the AAQS.

The test case analysis indicated that increased departure queue time would result in increased CO levels, while increased aircraft departures would result in increased NO_2 levels. However, as observed by historic FAA data, peak hour departures and peak hour queuing are mutually exclusive and do not occur at the same time. Nonetheless, the analysis indicates that all concentrations except at South 154th Street would be below the AAQS.

Comment 14: Commentor questioned the time-in-mode/taxi and requested a clarification of these assumptions.

Response: Appendix D, page D-5 discusses the evaluation of taxi-in and taxi-out times. Actual field observations were used to estimate the amount of time an aircraft spends in different modes, such as apron idling, taxiing, and idling at the end of the runway. Taxi-in and taxi-out times were based on an evaluation of existing airfield taxi distances and aircraft speed for seven different points on the airfield. The addition of the South Aviation Support Area (SASA) and the proposed terminal improvements were modeled in combination with the proposed third parallel runway. The average taxi distance was then calculated by applying the existing or future runway end use based on a constant aircraft taxi speed of 15 knots.

The use of the proposed new parallel runway for departures is expected to be limited for the reasons discussed in the Final EIS. Accordingly, taxi times are not expected to be substantially different over existing conditions (i.e., taxi times take into consideration runway use). For the existing conditions, each aircraft operation is expected to experience approximately 8.11 minutes of taxi-time (for both arrival and departure operations).

Comment 15: Commentor stated that the EDMS write-up in the EIS should have noted that all particulate data for jet aircraft had been removed.

Response: As stated in the EIS in Appendix R, response to comment R-10-2, the aircraft emission rates included in the EDMS for particulates was revised by the FAA to include only that data for which reliable particulate information is known. Accordingly, the most current EPA approved version of the EDMS model (which was used in preparing the analysis for the Final EIS) includes little information on particulates in comparison to older versions of the model. The FAA has not updated the particulate data because no reliable data on aircraft particulate emissions is available.

<u>Comment 16</u>: Requested an explanation of why the aircraft emissions in the Final EIS are less than those presented in the Draft EIS.

<u>Response</u>: As noted in Appendix D, page D-34, in re-evaluating the air quality analysis, all input assumptions used in preparation of the Draft EIS were re-examined. As part of that review, the hourly aircraft temporal factors used in the Final EIS analysis for the existing condition were revised to reflect hourly departure activity based on the FAA's Capacity Enhancement Study. The revised hourly temporal aircraft temporal factor resulted in a decrease in the emissions inventory. The temporals for the future scenarios were not affected. The temporal factors used in the Final EIS EDMS inventory analysis are presented in Table D-5.

<u>Comment 17</u>: Requested measurement/modeling of ozone.

<u>Response</u>: Ozone is created from a complex series of atmospheric reactions when hydrocarbons and nitrogen oxides accumulate in the atmosphere and are exposed to sunlight. Ozone can often form miles from the pollutant sources. A comprehensive evaluation of ozone would, therefore, require consideration of all major sources within the entire Region. Accordingly, a proposed project's potential contribution to ozone production is typically evaluated by examining emissions of the precursor pollutants hydrocarbons and nitrogen oxides. Accordingly, the air quality analysis focused on the evaluation of the ozone precursors.

<u>Comment 18</u>: Comments concerning emissions of cars versus aircraft

<u>Response</u>: See response to comment 1.

<u>Comment 19</u>: Comments concerning the hourly levels of aircraft activity modeled

<u>Response</u>: Ms. DesMarias questioned the peak hour aircraft fleet modeled in the air quality analysis. The response to comment R-10-14 addressed the peak hour level of aircraft activity used in the air quality analysis. Appendix D of the FEIS presents the results of a number of "test cases", beginning on page D-34. Included is an evaluation of peak hour aircraft departure activity.

For peak hour aircraft activity by aircraft type, <u>actual</u> radar data available through the Port of Seattle's ANOMS (Airport Noise and Operations Monitoring System) was used. This use of actual data in a test case revealed that, compared to the average annual fleet, the peak departure hour included fewer of the larger 3- and 4-engine jet aircraft and more of the medium 2-engine jets. The differences in light single and twin propeller and turboprop aircraft activity were minimal.

The ability to accommodate a large number of arrivals and departures is dependent on a number of factors including the type of aircraft (prop or jet, small or large), and on maintaining adequate spacing between aircraft both on the ground and in the air. Additionally, the effect of the existing noise abatement procedures on departure capacity is described beginning on page R-123. As stated, the existing noise abatement procedures have a tremendous impact on departure capacity. These procedures require that departing jets maintain heading until the aircraft reaches five miles or 3,000 feet altitude prior to initiating any turns. The procedures are intended to keep departing aircraft in the narrowest flight path possible to minimize the population exposed to departure noise. The noise abatement procedures in turn effect departures due to the need to maintain adequate spacing (both lateral between the two runways and in-trail between aircraft) for a considerable distance from the

Airport. Departures by light single and twin-engine propeller aircraft, and some turboprops (up to a Dash-8 aircraft) can turn immediately off runway centerline as soon as sufficient altitude has been reached (at 1,000 feet altitude).

Accordingly, to accommodate the estimated maximum number of departures a number of conditions must exist including good weather and excellent pilot visibility. Also needed is an aircraft fleet mix that includes few large aircraft, and a high percentage of small, quick turning single or twin-engine propeller aircraft, and some turboprop aircraft. With the availability of quick turns by aircraft that are not required to fly the noise abatement procedures, the required in-trail separation between departures would be reduced. Therefore, the maximum departure capacity at Sea-Tac is dependent upon a peak hour aircraft mix that includes a high percentage of the smaller, propeller aircraft.

Ms. DesMarias questioned whether 63 peak hour departures were considered with only 22 arrivals. As indicated in the response to comment R-10-14, the EDMS model assumes an equal number of arrivals as it does departures. Thus, if the a peak departure hour of 63 departures was modeled, the model would assume 63 arrivals, for a total of 126 aircraft operations. Actual data indicates that when the peak departure activity occurs (63 departures), 22 arrivals occurred. During a peak departure push, the airport cannot accommodate an equal number of arrivals. Nonetheless, the air quality analysis assumes an equal number of arrivals and departures during the peak hour.

Comment 20: Comments concerning fuel dumping.

Response: Aircraft landing fees are not based on the actual weight upon landing, but upon the certificated maximum aircraft landing weight for each type of aircraft. Therefore, unlike what is suggested by the commentor, there would be no financial incentive to the airlines to dump fuel. The response to comment R-10-9 in Appendix R of the Final EIS notes that fuel dumping is not common and is performed only in emergency situations when aircraft cannot land safely with the fuel present in the aircraft.

Prior to the completion of the Final EIS, no fuel dumping incidents had been reported in or around Sea-Tac Airport within the last two and one half years, according to Mr. Tom Davidson, FAA Air Traffic Manager, Seattle Tower. However, based on more recent conversations with Mr. Davidson, he confirmed that one reported fuel dumping incident may have occurred on July 8, 1996. No data is available from the FAA concerning the amount or location of the fuel dumping. Mr. Davidson indicated that fuel dumping incidents are rare. If an emergency incident arises and it becomes necessary to release fuel from the airport, the Seattle FAA TRACON personnel recommend that the fuel be dumped over non-populated areas. In addition, the cost to the airlines of unnecessarily fuel dumping would also be prohibitive due to the high cost of fuel.

Comment 21: Requested additional information concerning air toxics and population at risk to air pollution.

Response: The air toxics evaluation presented in the Final EIS is based on a comparison of air toxics to the Acceptable Source Impact Levels (ASILs) established by the Washington State Department of Ecology. The evaluation is based on the incremental change in concentrations between the Do-Nothing and "With Project" alternatives. Tables IV.7-3 and IV.7-4 in Chapter IV, Section 7 "Human Health" present a comparison of air toxic concentrations by receptor location to the ASILs. As shown, the incremental difference between the Do-Nothing and proposed development is minimal and would result in comparable or slightly less air toxic concentrations at most receptors. The analysis indicates that air toxics are present throughout the Region, and that air toxic levels would not differ with or without the proposed improvements due particularly to the influence of automobile emissions within the region.

Comment 22: Questioned the results of other air measurements conducted in the Sea-Tac Airport vicinity.

Response: Ms. DesMarias noted that she had submitted over 30 questions regarding the methodology and results of the 1993 Port of Seattle Air Quality Survey. The response to comment R-10-32 provides further explanation as to the potential implications of the toxics Air Quality Survey monitoring program. As stated in the response to comment R-10-32, the methodology and analysis of results as presented in the Air Quality Survey were determined independently of the EIS analysis. However, the methodology and results of that study appear to be reasonable, and are therefore included in the EIS to present a historical background on previous air quality studies and monitoring results. The objective of the Air Quality Survey was to provide a preliminary survey particularly for VOCs, and to assess sampling techniques that could possibly be used in more extensive air quality surveys.

As indicated in the Air Quality Survey, the type and concentration of air toxics identified appear to be typical of concentrations observed in similarly sized urban areas, and which are generally attributed to automobile sources. On that basis, the study concludes that all of the concentrations observed were consistent with automobile exhaust and did not resemble the VOC profiles associated with aircraft emissions.

The lab analysis concluded that aircraft contributions to the residues at these sites are minimal at best. The lab also concluded that no additional value could be expected from a more detailed air sampling program because of the low levels of polynuclear aromatics present in the residue samples analyzed. The lab indicated that levels of these types of compounds would have been expected in much higher concentrations if aircraft sources were suspected to warrant additional evaluation. The residue analysis was conducted by an independent laboratory analysis, AMTEST Labs, the same firm which evaluated residues for the Puget Sound Air Pollution Control Agency in a similar study conducted in 1994. The lab determined that the concentration of pyrene was not of concern as follows: "The presence of Pyrene was detected but only slightly above the detection limit. The source of the Pyrene may be from the presence of charred wood in the swab but most likely is an anomaly in the analysis as its concentration is right at the detection limit of the method."

Comment 23: Commentor questioned if the new runway would increase pollutant levels due to increased capacity.

Response: The introduction to Appendix R of Volume 4 of the Final EIS provides a detailed explanation of capacity and the forecast assumptions used in the analysis. In addition, Chapter 2 and Appendix A of the Supplemental EIS provides a discussion of the capacity of the existing and future airfields.

Comment 24: Commentor requested a comparison of delay at Sea-Tac versus other airports

Response: As stated in the Final EIS, the purpose of the proposed new parallel runway is to "improve the poor weather operating capability in a manner that accommodates aircraft activity with an acceptable level of delay." While Sea-Tac has sufficient operating capability during good weather conditions, during poor weather today, the existing runway system produces extensive arrival delays. Accordingly, when poor weather occurs, delay at Sea-Tac increases exponentially. Chapter I of the Final EIS, "Project Background and Purpose and Need" discuss the impact of poor weather delay at Sea-Tac. Delay levels at other airports is not germane to addressing the needs at Sea-Tac.

Comment 25: Commentor stated that Master Plan Update Technical Report #8 examined future aircraft operations in 2020 at 560,000 not 525,000.

Response: Based on the Master Plan Update forecasts, Sea-Tac was not expected to accommodate 560,000 annual operations during the 25 year planning horizon. The Master Plan Update forecasts indicate that about 440,000 annual operations are expected to occur by 2020. The FAA Capacity Enhancement Study examined two forecast activity levels (425,000 and 525,000 known respectively as Future 1 and Future 2). However, that study did not identify the year in which those activity levels could be expected. The analysis is Technical Report #8 relies on the Master Plan Update forecasts of 440,000 annual operations in year 2020. The new forecasts prepared for this Supplemental EIS indicate that demand could grow faster than was identified by the Master Plan Update. However, the new forecast does not reach the Future 2 (525,000 operations) forecast considered by the Capacity Enhancement Update.

Comment 26: Engine run-up question (does more than 1 engine test occur at a time)?

Response: As noted by Ms. DesMarias, a discussion of aircraft engine run-ups is provided in response to comment R-10-63. The Final EIS air quality analysis includes the assessment of nine B-747 aircraft run-ups per day for five minutes at full takeoff power for one engine and fifteen minutes idle power. Typically, only one engine is checked at a time.

The analysis represents a reasonable worse case analysis by applying full takeoff power for five minutes for a large aircraft at a level (nine B-747's run-ups) that was not observed in the historical data. In the future years (2010 and beyond), a total of 18 daily run-ups were considered by the air quality analysis. For both the existing and future scenarios, the number of run-ups considered represents an overestimation of the number of run-ups and thrust setting.

Comment 27: Commentor questioned if EDMS accepts fractional aircraft operations

Response: Ms. DesMarias comment refers to the fractional peak hour departures identified in Appendix D, Table D-1 and used in the EIS air quality analysis. The EDMS model accepts fractional peak hour departures for values up to two decimal places. In combination with the hourly temporal utilization factors used in the analysis, the fractional values represent whole numbers of operations by aircraft type on a daily basis.

Comment 28: The commentor asked if the FEIS considers dual simultaneous departures and what is the effect of doubling the departure levels with a third runway.

Response: The response to comment R-10-15 describes how the proposed third parallel runway would be used for departures. The use of dual simultaneous departures is constrained by the existing noise abatement procedures which require that departing jets essentially maintain runway heading until the aircraft reaches five miles or 3,000 feet altitude prior to initiating turns. These procedures affect departures due to the need to maintain adequate spacing (both lateral between the two runways, and in-trail between aircraft) for a considerable distance from the Airport. Combined with the required in-trail separation and maintenance of the "straight-out" noise abatement procedures, the useful departure capacity of a third runway is constrained.

These constraints on future departure activity apply with or without the proposed airport improvements. Accordingly, departure activity during the peak hour would be expected to be the same as it is today. Nonetheless, the air quality analysis considers that about 3-4 percent of all departures could occur on the proposed new parallel runway.

Comment 29: Cumulative air quality impacts

Response: See response to comment 2.

4. June 3, 1996 **Debbie DesMarias**, 24322 - 22nd Ave S, Des Moines, WA 98198

Comment 30: Is the EDMS able to predict peak hour emission rates due to its deriving an average of annual, and average of peak month, etc. and estimates a peak from the average rather than the peak of the peak. If true, then what, if any, false annual operations was used for the 63 departure number in the final EIS. If not so, then how is the peak hour set up to handle fractional aircraft.

Response: The EDMS model is able to estimate peak hour concentrations that can be compared to the National Ambient Air Quality Standards (NAAQS). By virtue of requiring the same number of arrivals as departures, "false" operations can be considered - see response to comment 19.

As is shown in Table D-1, fractional levels of aircraft operations were used to model the peak hour average fleet mix. The EDMS model accepts fractional peak hour departures for values up to two decimal places. In combination with the hourly temporal utilization factors used in the analysis, the fractional values represent whole numbers of operations by aircraft type on a daily basis.

Comment 31: If an annual average gives less than a whole airplane in the peak hour inventory, how much of the plane if any does the model estimate.

Response: The model uses temporal factors to adjust peak hour fractional activity levels to represent daily levels of whole aircraft.

Comment 32: Why is the tons per year inventory reduced in the Final EIS when annual average number of operations is unchanged between the draft and final.

Response: See Response to Comment 15.

Comment 33: If the model accepts peak hour data separate from annual average, why are fractional numbers used in the inventory? Does the model truncate fractions?

Response: As indicated in the response to comment 30, fractional levels of aircraft operations were used for the EIS analysis. The EDMS model accepts fractional peak hour departures for values up to two decimal places. Fractional values are used for the EIS analysis to model operations by all aircraft types in use at the Airport (i.e., all aircraft types in use at the airport, not just those aircraft types operating during the peak hour). As presented in Appendix D, a test case analysis was also conducted to evaluate 63 peak hour departures, based on actual aircraft types in use during the peak hour. That analysis relied on use of whole numbers of aircraft, as compared to the fractional values.

Table D-12 compares the results for peak departure activity. As shown, the EIS analysis indicates that the highest NO_2 concentrations could occur with less than the peak departure level of activity. Modeling of actual peak hour levels of departures and aircraft types would result in less NO_2 concentrations at every receptor location. However, slightly higher 1-hour CO concentrations could occur, but the 8-hour concentrations would be less.

Comment 34: Could you also give an explanation why the EDMS model seems to predict lower overall pollutant levels when airplane operations are increased?

Response: As indicated in response to comment 33, a test cast was prepared to address a higher peak hour level of departures. As is shown in Table D-12, modeling of the peak hour for departures (63 departures as compared to 43.9 used in the existing conditions analysis of the Final EIS) would result in less NO_2 concentrations than identified in the EIS. This decrease is due to the difference in aircraft fleet mix. The actual peak hour (63 departures) fleet includes fewer of the large 3 and 4 engine jet aircraft and more of the medium 2-engine jet aircraft, and also more of the light single engine and twin engine propeller aircraft in comparison to the EIS analysis. The EIS analysis is based on the average annual fleet, or all aircraft types which use the Airport during the year. Page D-36 of Appendix D presents a discussion of the peak hour analysis assumptions.

Comment 35: Could you also answer my previous question regarding the one-hour levels of nitrogen dioxide from the EDMS run in the FEIS?

Response: See response to comments 10 and 11.

5. April 30, 1996, **A.M. Brown,** 239 SW 189th Place, Normandy Park, WA 98166

Comment 36: "They take a location that already exceeds safety limits (by the Red Lion) and ADD more pollution BUT end up with LESS pollution than it has now."

Response: The analysis prepared for the EIS shows that whether or not improvements are made at Sea-Tac Airport, pollutant concentrations are expected to increase between 2000 and 2010, but decline to or below existing conditions by year 2020. This reduction in pollutant concentrations is expected despite a large increase in regional surface travel and is due to an anticipated reduction in automobile emission rates during the time frame.

Comment 37: "The complete impact of over 3000 truck trips per day plus all of the associated construction equipment and traffic for YEARS in an non-attainment zone also needs to be fully addressed."

Response: The EIS assesses the impact of the maximum use of off-site vehicular hauling on pollutant levels at the intersections where hauling is likely to occur. As this analysis shows, the pollutant concentrations are expected to be well below the national ambient air quality standards (See Table IV.23-6).

Comment 38: "Additional monitoring is needed around the airport because data in the DEIS suggests that it doesn't meet air toxin standards now."

Response: Comment acknowledged.

6. March 18, 1996, **Kristin Hanson, RCAA,** 19900 - 4th Ave SW, Normandy Park, WA 98166

Comment 39: Notice is premature, as the Port has not adopted the Master Plan Update.

Response: The notice was issued in compliance with all requirements of the Clean Air Act amendments.

Comment 40: Comments on the DEIS were ignored, as the air quality section contains no reference to Appendix R.

Response: The cover letter introducing the entire document acknowledged the receipt of comments and the responses present in Appendix R.

Comment 41: Analysis done in the DEIS and FEIS was not only inadequately reported but also was inadequately performed, that important pollutants and important sources of pollutants were not considered or properly analyzed and that the FEIS does not demonstrate compliance with the SIP.

Response: Comment acknowledged.

7. May 15, 1996 **Barbara Stuhring**, 24828 9th Place S., Des Moines, WA 98198

Comment 42: Comment indicating that the analysis was performed relative to the region versus communities in the vicinity.

Response: The analysis was prepared in accordance with FAA guidelines and the Clean Air Act amendments.

Comment 43: The 'Final Report: Air Quality Survey Sea Tac Airport January 1995' is a consultant's study from which you draw your conclusion that there will be no delay in attainment" and "In the 'Final Report, whenever the data shows higher concentrations of toxic aircraft emissions than conformity standards, our community is told not to worry, we are no worse off than 'other urban areas'.

Response: The noted report was referenced in the Draft and Final EIS to summarize all air measurements performed at and in the vicinity of the Airport. It was not used to draw conclusions concerning conformity or the impact of the proposed Master Plan Update improvements. See response to comment 22.

Comment 44: Commentor requested the conduct of a health risk study.

Response: Issues associated with health risk from airport activity are discussed in the Final EIS in Chapter IV, Section 9.

Comment 45: Requested information concerning Federal air quality conformity analysis.

Response: The Final EIS as well as Appendix B of the Supplemental EIS contains a summary of the clean air act conformity determination process and proposed findings.

8. March 18, 1996, Perry Rosen, **Cutler & Stanfield for the Airport Communities Coalition**

Comment 46: The traffic data used in the modeling of air quality is erroneous, internally inconsistent and differs from data presented in Appendix O.

Response: See response to comments 47 through 81.

Comment 47: Assumptions are flawed by using same number of aircraft/cars with and without the proposed improvements

Response: Comment acknowledged. Pages R-2 through R-16 present responses to the alternative forecast issues, as well as the response to comments on the Final EIS, presented in Appendix A of the Supplemental EIS.

Comment 48: The comment period is inadequate and should be extended.

Response: The comment period was extended from March 18, 1996 ultimately to June 6, 1996 in response to this commentor's request, as well as at the request of others.

9. March 27, 1996, Perry Rosen, **Cutler & Stanfield for the Airport Communities Coalition**

Comment 49: Requests access to the underlying data used in preparing the conformity analysis

Response: Commentor was provided with all reasonable data requests.

Comment 50: Requests computer data and the following:

1. Traffic route assignment models and input data
2. Actual separate route assignments for airport related and non-airport traffic
3. Methodologies and assumptions uses to estimate peak hour traffic volumes and detailed forecasts

4. Approach and turn movement projections for all relevant intersections;
5. methodologies used to translate aggregate daily traffic (airport and non-airport)into peak hour intersection approach volumes and turning movements
6. methodologies and assumptions used to estimate airport and non-airport traffic with associated growth factors;
7. methodologies and assumptions used to estimate the effects of the proposed Rout 509 extension; and
8. Bases for mode choice assumptions for each alternative analyzed.

Response: Data was supplied to the requester.

Comment 51: Requested additional review time.

Response: The comment period was extended in response to this commentor's request, as well as at the request of others.

10. April 2, 1996, Perry Rosen, **Cutler & Stanfield for the Airport Communities Coalition**

Comment 52: Requests a meeting with the air quality and surface transportation consultants to obtain the detailed modeling data.

Response: See FAA response dated October 3, 1996.

11. April 9, 1996, Tom Roth, **Cutler & Stanfield for the Airport Communities Coalition**

Comment 53: Continued request for meeting between consultants.

Response: This request was denied. All comments and questions were requested in writing.

Comment 54: Objects to not receiving TRAFFIX data, requests input data.

Response: Data was supplied to the requester.

Comment 55: Specific questions:

A. How were the CAL3QHC files developed from the intersection approach and turning volumes in the INCA appendices;
B. What methodology was used to segregate non-airport traffic from airport traffic in the PSRC 1995 MTP forecasts;
C. How was the August peak ratio obtained for cargo operations;
D. What are the details of the airport traffic origin-destination patterns summarized on Table O-B-2. Please provide zone map and O-D airport trip matrices for the airport vicinity;
E. What were the path inputs and percentage trip exchanges assigned to each path for distributing the various categories of airport traffic in the TRAFFIX model under each of the airport development alternatives;
F. Were the same background traffic volumes assigned for parallel scenarios of the no build and preferred alternative in each of the forecast years. If not, what were the differences;

Response: Data was supplied to the requester.

12. April 18, 1996, Tom Roth. **Cutler & Stanfield for the Airport Communities Coalition**

Comment 56: Requested definition of 33 subzones.

Response: Data was supplied to the requester; see FAA letter dated October 3, 1996.

Comment 57: Requested a zone map.

Response: Data was supplied to the requester; see FAA letter dated October 3, 1996.

13. May 1, 1996, Perry Rosen, **Cutler & Stanfield for the Airport Communities Coalition**

Comment 58: Requested an extension to the conformity period

Response: The conformity comment period was extended until June 6, 1996.

Comment 59: Requested a meeting to discuss assumptions and methodology

Response: See FAA letter dated October 3, 1996.

14. May 28, 1996, Tom Roth, **Cutler & Stanfield for the Airport Communities Coalition**

Comment 60: Actual output files used in developing tables presented in Appendix D.

Response: Data was supplied to the requester.

Comment 61: Specific Questions

A. Plots of all runs of the PSRC regional travel model used in developing the TRAFFIX model forecasts (including the latest data used) and including an index indicating which runs were used for each TRAFFIX forecast.
B. A file listing all growth factors used in estimating the growth of base traffic for each TRAFFIX runs and for shifts of base traffic in response to the Route 509 extension; and
C. A description of how the growth factors were derived from the PSRC model runs and identification of which factors were applied to each intersection and each turning movement in preparing the base traffic input to each traffic model run.

Response: FAA responded in indicating that the response would require an extensive period to put the files together and asked if the commentor would still want the data. In the Fall 1996, the FAA collected the requested data and provided it to the requester.

16. June 6, Tom Roth, **Cutler & Stanfield for the Airport Communities Coalition**

Comment 62: "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, passengers and surface traffic" (page 2) and other similar comments (page 4, 5, 6, 7) indicating that the airport would accommodate more traffic with the proposed improvements in contrast to the Do-Nothing.

Response: This issue was raised concerning the Draft EIS and is fully responded to in the Final EIS - see Chapter II and Appendix R pages R-2 through R-16. In addition, Chapter 2 of the Supplemental EIS, as well as Appendix A responses includes a discussion of these issues.

Comment 63: "Instead of making all relevant information available when the draft conformity determination was first issued, the FAA provided significant data and information critical to the 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 ..... In some cases (e.g., EDMS data for nitrogen oxide 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" Pg. 3

Response: The FAA provided all computer input and data files and models used in preparing the air quality analysis to the commentor. Because of extremely large file size, no output files were provided. However, any of the EDMS output files can be readily re-created by running the appropriate input file and program as provided. Each of the input files were re-checked by the FAA's consultants and found to contain no error messages. To re-create the EIS analysis, the EDMS input files referenced above (2020 Do-Nothing and "With Project") require the appropriate EDMS 2020 program file, which was also provided. It should be noted that in loading the appropriate EDMS program file, the user may need to identify the correct drive on which to load the model (an error message could result of the appropriate drive is not referenced). This does not affect any of the input files which can be loaded into any EDMS program file and viewed.

Comment 64: "Other procedural irregularities include the FAA's failure to notify all affected federal land managers responsible for protecting Class I areas located within 1090 kilometers (Mt. Rainier, Olympic National Park, and Mt. St. Helen's)."

Response: FAA provided notices to the Department of Interior which has responsibility over these lands.

Comment 65: "..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......"

Response: The Final EIS and the air conformity analysis address the individual and cumulative impacts of the Master Plan Update improvements. The issue of the projects attracting airport activity is addressed in an earlier response.

Comment 66: "None of the mitigation measures proposed by the FAA would bring these intersections (IB/160th and IB/170th) into compliance with the 8 hour CO standard."

Response: The mitigation included in the Final EIS addresses the requirement for mitigation as identified by the National Environmental Policy Act (NEPA), the Washington State Environmental Policy Act (SEPA) and the Clean Air Act conformity rules. These regulations require project sponsors to address the additional impacts caused by the proposed project. As a result, the mitigation identified in the Final EIS addresses the additional pollutant levels caused by the proposed Master Plan Update improvements.

Comment 67: "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 traffic to new entries. An objective analysis must also 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." (Pg. 7)

Response: The intersections considered for the surface transportation evaluation were established in consultation with the Washington State Department of Transportation and the City of SeaTac and included 33 intersections and 23 freeway ramp junctions in the vicinity of the Airport. The air quality analysis was developed in accordance with the EPA's modeling protocol and based on discussions with PSRC, PSAPCA, DOE and US EPA. EPA guidance states "...those intersections at LOS D, E or F or those that have changed to LOS D, E, or F because of increased volumes of traffic or construction related to a new project in the vicinity of a project should be considered for modeling."[4] "Intersections that are at LOS A, B or C probably do not require further analysis i.e., the delay and congestion would not likely cause or contribute to a potential CO exceedance of the NAAQS". The EPA guidelines further recommend that five steps be followed: 1) rank the top 20 intersections by traffic volumes; 2) calculate the LOS for the top intersections; 3) rank these intersections by LOS; 4) model the top 3 intersections based on LOS; and 5) model the top intersections based on the highest traffic volumes. This approach was used in performing the air quality assessment for the Final EIS. Therefore, no biases were introduced by the study process for Sea-Tac. In addition, the EPA it its August 6, 1996 letter concurred that this was an adequate approach.

Comment 68: "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" (Pg. 8) "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 roadway 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."

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[4] *"Guidelines for Modeling Carbon Monoxide from Roadway Intersections"*, U.S. EPA, October 1990

Response: The surface transportation models used in the Master Plan Update and EIS were selected in consultation with the Puget Sound Regional Council (PSRC) transportation planning staff. As evidenced in the PSRC's December 9, 1994 letter, the PSRC has reviewed the methodologies and regional transportation data underlying the EIS and concurred with the approach used in incorporating this data.

The surface traffic analysis used in the Master Plan Update and EIS relied on three basic transportation methodologies. For the on-airport traffic system, the industry standard ALPS (Airport Landside Planning Simulation) model was used. The off-airport regional surface transportation system analysis relied upon the PSRC Metropolitan Transportation Plan (MTP) regional transportation model. TRAFFIX, a transportation analysis software program, was then used to incorporate the PSRC MTP forecast of regional traffic growth trends with airport traffic levels for the assessment of surface traffic conditions. The Smith Report indicates that the TRAFFIX model is not appropriate and that a regional planning model, such as the PSRC's model, should have been used for the entire analysis. The PSRC's regional model was considered for use in analyzing the airport study area. However, since the PSRC's model is a four county macro level regional transportation model and the EIS requires a project specific evaluation, the PSRC's regional model was determined to not provide a refined enough evaluation. It was used, however, to facilitate the consideration of how changes in land use and the development of planned transportation improvements will affect regional traffic levels. TRAFFIX was determined to be a more appropriate airport study area tool, due to its sensitivity and flexibility in evaluating proposed Airport Master Plan Update improvements.

Comment 69: "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" (pg. 8) "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."

Response: Cutler & Stanfield, based on comments from Smith Engineering, argues that there are inconsistent assumptions regarding the traffic generation characteristics of certain airport related activities. Their comments are based on three separate issues: a) the difference in the amount of terminal related airport traffic between the alternatives for the year 2020; b) the differences in aircraft maintenance traffic between the alternatives; c) the difference in the development assumptions for the South Aviation Support Area (SASA) between alternatives.

The Final EIS analysis reflects a difference in traffic generated by Airport related activities in the terminal area between the Do-Nothing and With Project. While the same number of passengers are assumed for the Do-Nothing and With Project, the mode choice assumptions varied in accordance with Table 8-3 in Appendix O-C of the Final EIS. The differences in mode choice assumptions between the Do-Nothing and With Project are based on planning and policy decisions related to the amount of on-site versus off-site parking, as documented in the Master Plan Update Technical Reports and the Final EIS Appendix O. As is noted in Appendix O-C, Sea-Tac Airport accommodated about 31 percent of airport area parking demand in 1988, with the remaining 69 percent accommodated by off-site commercial parking lots. Expansion of the Main Parking Garage

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has enabled Port facilities to accommodate 45-50% of parking demand on-site. During the Master Plan Update, consideration was given to increasing the percentage of on-site parking to a level similar to other large airports. The Master Plan Update preferred alternative assumes that the Port maintains its current share of on-site versus off-site parking. The Do-Nothing assumes that through a no-action alternative, that the Port's share of on-site versus off-site parking would decline to historic levels. For example, with development of a new on-site parking garage with the North Unit Terminal, it was assumed that fewer passengers would utilize off-site parking and off-site rental car facilities, which in turn would significantly reduce the number of shuttle vehicles operating between the off-site facilities and the terminal.

The Final EIS also reflects differences in the amount of aircraft maintenance traffic between the Do-Nothing and With Project. For both alternatives, same level of employees will occur in the future, but the timing of the growth would vary in accordance with when facilities would be available. For the Do-Nothing alternative, aircraft maintenance facility expansion occurs by 2010, as defined in the 1992 SASA Final EIS. For the Preferred Alternative, expansion of airport maintenance facilities occurs in 2020, as guided by the Master Plan Update. The Smith Report also notes several inaccuracies in the actual data for aircraft maintenance. Minor errors in trip generation rates and route assignments were identified in the review and, as aircraft maintenance accounts for less than 4 percent of airport traffic, these errors would not alter the conclusions of the Final EIS. In addition, these issues have been addressed in the preparation of the revised air analysis associated with the new forecast.

The land use development in the area called SASA also varies between alternatives. The Do-Nothing reflects the assumptions associated with the aircraft maintenance as presented in the 1992 SASA Final EIS. The Master Plan Update preferred alternative reflects cargo as the dominant use of this site. Thus, the phasing and uses of this site creates the difference in trip generation between the two alternatives.

Comment 70: "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..... 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 would be markedly better....". (Pg. 9)

Response: Appendix R of the Final EIS contains a detailed discussion concerning the forecast assumptions and why the existing airport is capable of accommodating, with significant amounts of delay and congestion, the forecast demand for air travel. Appendix A of the Supplemental EIS responds to the alternative forecast assumptions offered by Dr. Clifford Winston on behalf of the Airport Communities Coalition. In addition, Chapter 2 of the Supplemental EIS contains a discussion of these issues.

Comment 71: "The traffic data input used by the FAA's consultant is inconsistent with data used by the Washington Department of Ecology for WDOE's air quality analysis for roadway projects in the area."

Response: The traffic data used in the Final EIS and draft conformity analysis is consistent with the requirement of the Clean Air Act air conformity rules which require that the analysis "be based on the latest planning assumptions most recently approved by the Metropolitan Planning Organization" (40 CFR Part 93.159)

Environmetrics Attachment

Comment 72: "In fact, implementation of the third runway could mean an increase in airport operations by as much as an annual average 33 percent above the projected Master Plan Update by 2020, which could translate into an increase of up to 50 percent above the projections for the peak hour" Pg. ii, 2

Response: The assumptions concerning the impact of the proposed improvements on aviation activity levels or demand is not correct. Appendix R of the Final EIS presents a detailed discussion concerning alternative demand assumptions. A response to the issues raised by Dr. Clifford Winston are presented in Appendix A of the Supplemental EIS.

Comment 73: "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" pg. 1 "1) 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 route assignments...." (pg. 3)

Response: In reviewing the surface transportation analysis in the Final EIS, no bias toward the Preferred Alternative was found. It was noted that passenger route selection would vary between the Do-Nothing and the "With Project" as a consequence of delays on area roadways. The commentor suggests that the analysis should have included in the Do-Nothing alternative a southern connector roadway that is part of the With Project (Master Plan Update improvement). This would not have been an accurate evaluation, as one selective Master Plan Update improvement project would have been included in the Do-Nothing to unfairly bias that alternative by reducing roadway congestion. In accordance with the National Environmental Policy Act (NEPA) and CEQA guidelines, a no action alternative must be considered. Thus, only projects that had already received environmental approval (or regional projects that were expected to be approved) were included in the Do-Nothing.

The commentor cites communications between the Port's Ground Access line of business manager and the Commission concerning ways of addressing congestion on airport roadways. The project evaluated by Tudor/P&D/Kaiser is the terminal drives improvements and seismic upgrade referenced in the Final EIS. As that project has been the subject of a separate environmental review and is under design, it was included in the Do-Nothing and With Project evaluation in the EIS. However, that project does not include the referenced connector roadway.

Comment 74: "These files (modeling of the intersections) 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...." pg. 4

Response: The FAA's consultants imported all of the coordinates of each intersection and plotted the results to determine if lanes overlapped, as implied in the comments or if inconsistencies existed with the surface transportation analysis. This review showed no inaccuracies or inconsistencies. The intersection air quality analysis is consistent with the intersection geometry's used in preparing the traffic study, including assignment of through lanes, left turn lanes, and consideration of the right turn movements. For example, the intersection of 188th and SR 99 (existing), the northbound and southbound geometry for SR 99 includes two through lanes in each direction, a dedicated left turn lane, and a dedicated right turn lane.

This comment could refer to the treatment of right turn movements in the EIS air quality analysis. In assessing the surface transportation levels through various intersections, several simplifying assumptions were made reflecting the conservative nature of the assessment. Specifically, to ensure that the analysis was conservative, the through vehicle queue time at the intersection was applied to the right-turning movements. This approach was applied to the Do-Nothing and With Project alternatives to avoid bias. In reality, right turn movements at the intersections in question experience less vehicle queue time than the through traffic, particularly with the availability of a dedicated turn lane. Applying higher times to the right turning vehicles, as considered in the EIS is conservative in that it results in slightly higher pollutant levels.

Comment 75: 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)" Pg. 4.

Response: The Final EIS analysis did not include the left turn movements with the through traffic leaving the intersection, which resulted in the difference in the number of vehicles entering and leaving the intersection. Because this approach was applied to the Do-Nothing and With Project alternatives, no bias was induced. These movements have a very small effect on the pollutant concentrations (less than 1 ppm) at the intersections, as the greatest contribution to pollutant levels occurring at a congested intersection are from vehicles idling or traveling at very slow speeds.

Comment 76: "Some of the signal timings were not properly computed" (Pg. 4)

Response: A review was performed of the signal timings used in the air quality analysis. Slight manual errors were found in the data entered in to the models, versus the signal timing calculations. However, these errors were assessed and found to have insignificant effects on the modeling results.

Comment 77: "The emission rate for moving vehicles appears to include 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 calculation assumes the use of reformulated gasoline.....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 were understated by approximately 20 percent." Pg. 4-5

Response: The protocol to be used in the modeling of air pollution concentrations was developed in consultation with the regional, state and Federal agencies involved in air pollution issues between May 1994 and the issuance of the Draft EIS. The emission rate used in CAL3QHC reflects the output of MOBILE5A for a composite of all vehicles (automobiles, vans, diesel vehicles etc.). As information is not available concerning the distribution of such vehicles on all roadway segments, a default average was used as produced by MOBILE5A. Specific SIP related registration data obtained from PSAPCA was used in developing the emission rates from MOBILE5A.

In performing the roadway intersection modeling for the Environmental Impact Statement (EIS), reformulated gas was incorrectly assumed for existing and future Do-Nothing and "With Project" scenarios. Until approval of the maintenance plan for the region in fall 1996, oxygenated fuels were mandated for use in the Puget Sound region between November 1 and February 28. Therefore, the analysis should have reflected oxygenated fuel instead of reformulated fuels (RFG). Pollutant concentrations assessed using RFG produce slightly higher Carbon Monoxide (CO) pollutant concentrations in comparison to Oxy fuel (the fuel currently mandated for use during winter months). As a result, the EIS slightly ***overstates*** pollutant concentrations occurring by using RFG versus Oxy fuel. As a result of the maintenance plan, it was identified that agencies in the region have approved discontinuing participation in the Oxy fuel program. However, if pollutant levels identified by this EIS, for the Do-Nothing or With Project occur, the maintenance plan would require the region to again require use of oxygenated fuels.

The intersection modeling reflects specific State Implementation Plan (SIP) data as provided by PSAPCA concerning locally registered vehicles. This analysis further reflected that 83 percent of the vehicle miles traveled are subject to vehicle Inspection & Maintenance (I&M) requirements. Therefore to reflect the I&M requirements, emission rates were developed in proportion to the vehicles governed by the I&M program.

As a result of the assumptions concerning meteorology and traffic conditions used in the Final EIS and air conformity analysis, it is believed that the concentrations modeled reflect an over-estimation of actual conditions.

Smith Engineering Attachment

Comment 78: "There is a substantial inconsistency between the treatment of the Do Nothing Alternative and the North Unit Terminal Alternative ... in the encoding of the TRAFFIX forecast model for year 2010. .... 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." AND "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 ... 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. .... 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."

Response: In reviewing the surface transportation analysis in the Final EIS, no bias toward the Preferred Alternative was found. It was noted that passenger route selection would vary between the Do-Nothing and the "With Project" as a consequence of delays on area roadways. The commentor suggests that the analysis should have included in the Do-Nothing alternative a southern connector roadway that is part of the With Project (Master Plan Update improvement). This would not have been an accurate evaluation, as one selective Master Plan Update improvement project had been included in the Do-Nothing to unfairly bias that alternative by reducing roadway congestion. In accordance with the National Environmental Policy Act (NEPA) and CEQA guidelines, a no action alternative must be considered. Thus, only projects that had already received environmental approval (or regional projects that were expected to be approved) were included in the Do-Nothing.

The commentor cites communications between the Port's Ground Access line of business manager and the Commission concerning ways of addressing congestion on airport roadways. The project evaluated by Tudor/P&D/Kaiser is the terminal drives improvement and seismic upgrade referenced in the EIS. As that project has been the subject of a separate environmental review and is under design, it was included in the Do-Nothing and With Project evaluation in the EIS. However, that project does not include the referenced connector roadway.

Comment 79: "The basic reason for undertaking the proposed SEA-TAC airport project... is because under the existing runway configuration adverse weather conditions impair inbound aviation operations about 44 percent of the time. During adverse weather ... 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."

Response: The commentor seems to imply that when capacity is impaired that aircraft do not land at all. This is not the case. When capacity is impaired, delay results. While in some cases delays are so severe that cancellations occur, such cancellations are not the average condition. See Appendix A of the Supplemental EIS responds to the issues raised by Dr. Clifford Winston.

Comment 80: "The entire EIS 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."

Response: See response to comment 69.

Comment 81: "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. 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. .... Including the south connection in the Do Nothing Alternative ... 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. "

Response: See response to comment 78 concerning the south connector bias.

EPA guidance states "...those intersections at LOS D, E or F or those that have changed to LOS D, E, or F because of increased volumes of traffic or construction related to a new project in the vicinity of a project should be considered for modeling."[1] Thus, the intersections modeled were those that could be adversely affected due to increased traffic volumes.

Comment 82: The Smith Report identified several specific issues with the Final EIS Surface Transportation Analysis. Including:

82-1 The FEIS ground transportation analysis makes inconsistent assumptions between the Do-Nothing and North Unit Terminal Alternative about the traffic generation characteristics of certain Airport related activities. It also makes inconsistent and unusual assumptions about air passenger use of off-site parking.

A. The FEIS projects 10,027 August 2020 PM peak hour trips for the North Unit Terminal Alternative, versus 11,081 August 2020 PM peak hour trips for the Do-Nothing Alternative. The Do-Nothing Alternative would generate about 15 percent more trips than the North Unit Terminal Alternative.

Response: The August 2020 PM peak hour trips mentioned by SMITH Engineering include both Airport traffic, and traffic associated with other nearby developments (i.e., Federal Detention Center, Des Moines Creek Technology Campus). According to the Supplemental EIS surface transportation analysis, the Do-Nothing Alternative will generate a total of 6,237 PM peak hour trips and the Preferred Alternative will generate a total of 5,769 PM peak hour trips for the year 2010 annual average weekday conditions. These volumes are summarized by type of Airport traffic in Table C-1-25 located in Appendix C-1, and do not include the traffic generated by other nearby developments. The differences between the Do-Nothing and Preferred Alternatives occur in passenger, off-site parking, and airfield operations area traffic as shown in Table C-1-25.

[1] *"Guidelines for Modeling Carbon Monoxide from Roadway Intersections"*, U.S. EPA, October 1990

- The Do-Nothing Alternative will generate 197 additional PM peak hour passenger related trips when compared to the Preferred Alternative. This difference is explained by the mode choice assumptions determined for each Alternative as described in Table C-1-4 of Appendix C-1.
- The Do-Nothing Alternative will generate 282 additional PM peak hour off-site parking related trips when compared to the Preferred Alternative. The Preferred Alternative includes a Port of Seattle policy to maintain the capacity necessary to accommodate 50 percent of the long-term parking demand for the Airport. Therefore, since more of the demand can be accommodated on-site, the Preferred Alternative will generate less off-site parking traffic than the Do-Nothing Alternative.
- The Preferred Alternative will generate 11 additional PM peak hour airfield operations area trips when compared to the Do-Nothing Alternative. Under the Preferred Alternative the Northwest on-site flight kitchen will be relocated off-site in the year 2000. This relocated flight kitchen is the source of the additional 11 PM peak hour trips.

B. The FEIS projects a total of 1,651 aircraft maintenance employees for the Do-Nothing Alternative, and 2,200 aircraft maintenance employees for the North Unit Terminal Alternative. However, the North Unit Terminal Alternative would generate 86 fewer trips than the Do-Nothing Alternative.

Response: Comment acknowledged. According to the Supplemental EIS surface transportation analysis, a total of 3,250 aircraft maintenance employees were projected for both the Do-Nothing and Preferred Alternatives. These 3,250 aircraft maintenance employees will generate a total of 6,270 average daily trips and 273 PM peak hour trips for both the Do-Nothing and Preferred Alternative.

C. The FEIS includes development within the South Aviation Support Area (SASA) for both the Do-Nothing and North Unit Terminal Alternatives, with the North Unit Terminal Alternative having a more intensified land use. However, the North Unit Terminal Alternative would generate 655 fewer trips than the Do-Nothing Alternative in year 2010, and 141 fewer trips in year 2020.

Response: Comment acknowledged. The South Aviation Support Area (SASA) development includes two different types of development: aircraft maintenance and non-Airport commercial. However, the differences between the Alternatives occur in the rate of development, and in the relocation of the existing aircraft maintenance facilities. Under the Do-Nothing Alternative the aircraft maintenance and non-Airport commercial facilities are essentially "built-out" by the year 2005, and all three existing aircraft maintenance facilities (Northwest, Alaska, Delta) will be relocated to SASA. While under the Preferred Alternative the aircraft maintenance and non-Airport commercial facilities are "built-out" by the year 2010, and only one of the three existing aircraft maintenance facilities (Northwest) will be relocated to SASA. According to the Supplemental EIS surface transportation analysis, SASA will generate a total of 1,302 PM peak hour trips under the Do-Nothing Alternative, and 1,210 PM peak hour trips under the Preferred Alternative for year 2010 annual average weekday conditions.

D. The FEIS assumes that in the years 2010 and 2020 a substantial amount of off-site passenger parking will occur for the Do-Nothing Alternative. However, for the North Unit Terminal Alternative the FEIS assumes that a large percentage of this off-site parking will be attracted into on-site parking facilities. This assumption is contrary to well understood behavior patterns.

Response: This assumption is in accordance with a Port of Seattle policy decision that is included in the Preferred Alternative. The Port of Seattle will maintain the capacity necessary to accommodate 50 percent of the long-term parking demand for the Airport on-site. Therefore, since more of the demand will be accommodated on-site in contrast to existing conditions, the Preferred Alternative will generate less off-site parking traffic than the Do-Nothing Alternative.

E. The year 2010 FEIS analysis projects 4,803 terminal related trips for the Do-Nothing Alternative, and 4,594 terminal related trips for the North Unit Terminal Alternative. If the number of passengers remains the same for both Alternatives, then the decrease of 109 trips is unfounded.

Response: Comment acknowledged. According to the Supplemental EIS surface transportation analysis, the Airport terminal area will generate 4,563 PM peak hour trips for the Do-Nothing Alternative and 4,366 PM peak hour trips for the Preferred Alternative for the year 2010 annual average weekday conditions. The Do-Nothing Alternative will generate 197 additional PM peak hour trips when compared to the Preferred Alternative. Even though the number of passengers remains the same, this difference is attributed to the mode choice assumptions determined for each Alternative as described in Table C-1-4 of Appendix C-1.

82-2 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 trip making between various Airport activity stations and specific locations in the region and the encoding of base traffic volumes are inconsistent between the North Unit Terminal and Do-Nothing Alternative in the FEIS analysis.

A. The FEIS assumes a 65% : 35% split between the primary and secondary paths for the north air cargo area (Zone 2) in the Do-Nothing Alternative year 2010 analysis. However, the FEIS assumes a 60% : 40% split between the primary and secondary paths for the north air cargo area (Zone 2) in the North Unit Terminal Alternative year 2010 analysis.

Response: Comment acknowledged. According to the Supplemental EIS surface transportation analysis, the northern portion of the air cargo complex generates 40 percent and the southern portion of the air cargo complex generates 60 percent of the air cargo traffic for both the Do-Nothing and Preferred Alternative.

B. The FEIS 2010 analysis includes encoded routes for each type of Airport activity. However, the encoded routes differ for the Do-Nothing and North Unit Terminal Alternatives between the SASA area (Zone 29) and the north Interstate 5 entrance / exit point (Gate 6), the south International Boulevard / State Route 99 entrance / exit point (Gate 28), and the east State Route 516 entrance / exit point (Gate 29).

Response: Comment acknowledged. Encoded routes were corrected for the Supplemental EIS surface transportation analysis.

C. The FEIS 2010 analysis assumes different percent distribution patterns of Airport traffic on the regional transportation system for the Do-Nothing and North Unit Terminal Alternatives.

Response: Comment acknowledged. Percent distribution patterns were corrected for the Supplemental EIS surface transportation analysis.

82-3 Under the North Unit Terminal Alternative, South 170th Street is closed to non-Airport traffic. This closure effects base traffic volumes at the intersection of International Boulevard / State Route 99 and South 170th Street. The FEIS analysis contains some erroneous adjustments to the base traffic volumes at this intersection.

Response: The construction of the North Unit Terminal and the resulting vacation of South 170th Street will impact the existing surface transportation patterns of background traffic (non-Airport) primarily at the intersections of International Boulevard / State Route 99 and South 170th Street, International Boulevard / State Route 99 and South 160th Street, and Air Cargo Road / Perimeter Road and South 160th Street. Traffic patterns in the vicinity were adjusted according to current traffic engineering methodologies to account for the vacation of South 170th Street in both the Final and Supplemental EIS surface transportation analysis.

South Access to Terminal

82-4. The FEIS analysis includes a south access point to the terminal, via the intersection of South 188th Street and 28th Avenue South, in the North Unit Terminal Alternative for the year 2010. This improvement was not included in the Do-Nothing Alternative and should be since this improvement is not a sole element of the North Unit Terminal Alternative, and because the Port of Seattle is actively planning this link as an immediate response to existing traffic problems.

Response: See response to comment 78.

82-5 The mitigation measures included in the FEIS for the North Unit Terminal Alternative are likely to occur by the year 2010 and therefore should be included in the year 2010 Do-Nothing Alternative analysis.

Response: Comment acknowledged. According to the Supplemental EIS surface transportation analysis, no significant impacts were identified for the Preferred Alternative and therefore, no mitigation measures are proposed.

Reduced Peak Period Ground Traffic during Weather-Impaired Flight Operations

82-6 According to the FEIS analysis, "poor-weather" flight operations occur up to 44% of the time. Therefore, reductions in the number of landings are common place. Therefore, for the Do-Nothing Alternative, these reductions should be included in the FEIS analysis (20%, 40%, 60%). The North Unit Terminal Alternative would not experience these reductions due to the construction of the Third Runway.

Response: See pages R-2 through R-16 in Appendix R of the Final EIS as well as Chapter 2 and Appendix A of this Supplemental EIS.

Increased Activity with North Unit Terminal Alternative

82-7 The North Unit Terminal Alternative will provide a much larger terminal complex and will therefore require a much larger work force and generate more facility-related traffic than the existing facility.

Response: Although the terminal facilities will be greater "With Project" versus the Do-Nothing, the level of traffic accommodated would be the same. As a result, significant congestion would occur with the Do-Nothing, requiring additional staffing. This analysis assumed that the level of staffing would be commensurate with the passenger levels.

82-8 The North Unit Terminal Alternative will also provide more all-weather flight capacity that would lead air carriers to schedule more of their flights during the peak periods. This would also lead to an increase in passenger activity. The Do-Nothing Alternative would not allow this.

Response: See pages R-2 through R-16 in Appendix R of the Final EIS as well as Chapter 2 and Appendix A of this Supplemental EIS.

Unrepresentative Indicator Intersections

82-9 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 North Unit Terminal Alternative, and maximally affected by the Do-Nothing Alternative.

Response: See response to comment 81.

Additional Comments on TRAFFIX Model

82-10 The TRAFFIX traffic forecast and analysis software and procedure for encoding TRAFFIX model for use in the Seattle-Tacoma International Airport Master Plan Update EIS is poorly suited to an application of this type.

Response: TRAFFIX was used for the EIS surface transportation analysis since it could accommodate a study area of up to 70 intersections, and it could accommodate the annual average growth rates determined from the Puget Sound Regional Council's Metropolitan Transportation Plan. TRAFFIX allows the user to program background traffic (non-Airport) separately from project traffic (Airport), and it includes a signal optimization feature that would allow an unbiased evaluation of future conditions at signalized intersections.

82-11 The base 1994 traffic counts contained in the FEIS analysis for the intersection of International Boulevard / State Route 99 and South 188th Street are in error. When compared to WSDOT PM peak hour volumes, there is as much as a 26 to 40 percent error in the individual approach volumes.

Response: PM peak hour intersection turning movement counts were collected at 32 of the 33 evaluated intersections during August, 1994. These counts were checked against each other, and against other historical counts to ensure the validity of the traffic counts. These intersection turning movement counts were then adjusted to reflect annual average weekday conditions in accordance with local WSDOT seasonal adjustment factors. The WSDOT PM peak hour volumes referenced by Smith Engineering are taken from an exhibit labeled 1993 Design Hour (PM Peak) Traffic Volumes. It is unclear as to what seasonal condition these design hour traffic volumes represent and what counts they are based on. According to the WSDOT seasonal adjustment factors there can be a 25 percent difference in traffic counts on a month by month basis.

82-12 The TRAFFIX model was not the best tool available for performing the traffic impact analysis. The PSRC EMME/2 model could have been used with about the same level of effort.

Response: The Puget Sound Regional Council (PSRC) Metropolitan Transportation Plan (MTP) EMME/2 is a four-county transportation model that is calibrated for screen line analysis of corridors that are many miles wide. The surface transportation network encoded in the PSRC

MTP EMME/2 model includes only the principal arterial system. The EIS surface transportation analysis needed to focus on a vehicle based analysis of individual intersections on principal, minor, and collector arterials. The PSRC MTP EMME/2 model could not provide the level of detail necessary to identify any potential impacts associated with the Preferred Alternative. INCA Engineers, Inc. met with the PSRC to determine the best analysis method for the EIS. The surface transportation analysis methods used in the EIS were developed in consultation with the PSRC.

82-13 Another flaw in the FEIS traffic analysis concerns the use of peak hour factors in the capacity analysis portion of the work. The FEIS analysis kept the peak hour factors at exiting 1994 levels throughout the analysis. However, when traffic conditions deteriorate deeply into LOS F, the peak hour factor moves to 1.0.

<u>**Response**</u>: There are three general approaches to using peak hour factors in future condition capacity analysis: increase the existing peak hour factors to 1.0 as traffic volumes and congestion levels increase, use a generic peak hour factor for both existing and future condition analysis, or hold the existing peak hour factors constant as traffic volumes and congestion levels increased. INCA Engineers, Inc., assumed the latter for the EIS surface transportation analysis since it represents the more conservative approach.

82-14 Another flaw in the FEIS traffic analysis is the treatment of right-turning traffic in the capacity analysis portion of the work. At most intersection approaches, the right-turns are ignored in the FEIS computations. 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. For year 2010 and 2020 conditions this application will usually not exist due to heavy congestion and the lack of exclusive departure lanes.

<u>**Response:**</u> Comment acknowledged. The treatment of right-turning traffic in the Supplemental EIS surface transportation analysis has been adjusted to represent a more conservative approach. At intersections where the right-turning traffic was signal controlled it was assumed that no vehicles turned right on red. At intersections where the right-turning traffic was yield controlled, the number of vehicles that turned right on red was estimated based on conflicting traffic volumes. At intersections where the right-turning traffic was uncontrolled, and utilizing a high-capacity right-turn treatment, it was assumed that all of the vehicles could turn right on red.

16. June 6, Tom Roth, **Cutler & Stanfield for the Airport Communities Coalition**

<u>**Comment 83**</u>: Response to the June 6, 1996 letter - Cutler & Stanfield requested FAA provide the data used in the surface transportation analysis.

<u>**Response:**</u> Data is presently being compiled for distribution to Cutler & Stanfield. This information was provided to the requester in the fall of 1996.

17. June 6, 1996, Chuck Clark, **U.S Environmental Protection Agency**, 1200 Sixth Avenue, Seattle, Washington 98101

Comment 84: Concerns with existing air conditions in the airport area.

Response: In recognition of the need for better actual data concerning air quality in the airport vicinity, the air agencies (PASPCA, EPA, and DOE) and Port of Seattle has entered into a Memorandum of Agreement (MOA) to conduct a 2-year measurement program. Attachment D contains a copy of the MOA which described the purpose and responsibilities.

Comment 85: Indicated that the draft conformity analysis does not meet the requirements of conformity. EPA suggested items that would be required depending upon the approach used.

Response: Comment acknowledged.

Comment 86: Questioned if the analysis had addressed the cumulative impacts of other major projects in the airport area. Commentor also noted that there were differences in the air modeling results between the environmental reviews of these other studies.

Response: The air analysis presented in the Final EIS consisted of a detailed cumulative impact evaluation. Because Chapter IV, Section 9 did not include a discussion of the cumulative projects, the Supplemental EIS provides clarification of the regional projects that were considered.

18. May 30, 1996, Joseph Williams, **Department of Ecology**, P. O. Box 47600, Olympia, Washington 98504

Comment 87: Noted that a written commitment to mitigation measures is required by the conformity rules

Response: Comment acknowledged.

Comment 88: Concerns with existing air conditions in the airport area and suggested a monitoring program to examine existing conditions.

Response: In recognition of the need for better actual data concerning air quality in the airport vicinity, the air agencies (PASPCA, EPA, and DOE) and Port of Seattle has entered into a Memorandum of Agreement (MOA) to conduct a 2-year measurement program. Attached is a copy of the MOA which described the purpose and responsibilities.

19. June 6, 1996, Dennis McLerran, **Puget Sound Air Pollution Control Agency**, 110 Union Street, Suite 500, Seattle, Washington 98101

Comment 89: Noted that a written commitment to mitigation measures is required by the conformity rules and additional clarification of how, as drafted, the mitigation would be implemented.

Response: Comment acknowledged.

Comment 90: Concerns with existing air conditions in the airport area and suggested a monitoring program to examine existing conditions.

Response: In recognition of the need for better actual data concerning air quality in the airport vicinity, the air agencies (PASPCA, EPA, and DOE) and Port of Seattle has entered into a Memorandum of Agreement (MOA) to conduct a 2-year measurement program. Attached is a copy of the MOA which described the purpose and responsibilities.

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ATTACHMENT B

IMPACT OF REGULAR GAS VERSUS REFORMULATED GAS AND OXYGENATED GAS ON AIR QUALITY MODELING PERFORMED FOR SEATTLE TACOMA INTERNATIONAL AIRPORT

In performing the roadway intersection modeling for the Final EIS for the Master Plan Update improvements for Seattle-Tacoma International Airport, reformulated gas was incorrectly assumed for existing and future Do-Nothing and "With Project" scenarios. At the time that the analysis shown in the Final EIS was prepared, oxygenated fuels were mandated for use in the Puget Sound region between November 1 and February 28. Therefore, the Final EIS analysis should have reflected oxygenated fuel. However, as is shown by this paper, by using the reformulated fuel assumption, the Final EIS could slightly overstate the air pollution impacts in the Airport area. The data presented in this attachment reflects the modeling and forecast data used in the February 1996 Final EIS. Additional modeling of the difference between Oxygenated Fuel versus regular Unleaded Fuel are presented in **Figure F** of the main text. The analysis presented in the Supplemental EIS, as well as the main text of Appendix B reflects oxygenated fuels.

In commenting on the draft conformity analysis, the U.S. EPA noted that oxygenated fuels will likely be discontinued in the near future. As a result, they questioned how this transition to regular unleaded gas would affect the modeling results. As is shown by this appendix and the Final EIS and Supplemental EIS, exceedances of the Ambient Air Quality Standards (AAQS) are expected in the airport vicinity with regular gas as well as with oxygenated fuels. The Maintenance Plan for the Puget Sound Region specifies that if exceedances of the AAQS are experienced, that the region will return to oxygenate fuels. Therefore, this information presents an pollutant analysis using both types of fuels.

The following summarizes possible gas assumptions:

- Reformulated gas (RFG) - As a result of the 1990 Clean Air Act amendments, reformulated fuels (cleaner burning fuels) are required for use in the most severe ozone non-attainment areas. This does not include the Puget Sound Region. Current air models assume this fuel to have an oxygen content of 2.1%.
- Oxygenated gas (Oxy fuel) - Oxygenated fuels are a form of reformulated fuel. Until October 1996, oxygenated fuels were mandated for use during winter months in the Puget Sound Area. It has an oxygen content of 2.7% and thus improves combustion. While the 1990 SIP data does not assume Oxy fuel, it was assumed in the 1995 SIP data.
- Non-oxygenated gas (Regular) - Assumes no oxygen additives to reduce pollutant emissions from fuel combustion.

Pollutant concentrations assessed using RFG would produce slightly higher Carbon Monoxide (CO) pollutant concentrations in comparison to Oxy fuel (the fuel currently mandated for use during winter months). Oxy fuel would produce lower concentrations in comparison to regular gas. As a result, the Final EIS slightly ***overstated*** pollutant concentrations occurring by using RFG versus Oxy fuel.

In order to run the intersection dispersion model,[1] users must first run MOBILE5A to obtain emission rates for surface vehicles. To test the impact of the various fuel assumptions, MOBILE5A was re-run and produced the following Carbon Monoxide (CO) emissions factors:

RFG all vehicles =	28.8 grams/mile CO
Oxy Fuel all vehicles =	28.0 grams/mile CO
Regular all vehicles =	36.6 grams/mile CO

[1] For the Master Plan Update EIS modeling analysis, the issue of fuel type only applies to the intersection analysis, which was performed using CAL3QHC. EDMS, used in the screening and refined dispersion analysis, does not enable assumptions concerning surface vehicle fuel.

The proposed improvements at Sea-Tac would not affect the type of fuel in use by surface vehicles. As the RFG assumption was used in both the Do-Nothing and "With Project" alternatives, it would not change in outcome of the impact of the proposed project (the difference between the Do-Nothing and the With Project would be the same). However, the individual modeled concentrations would differ.

To determine how the fuel assumption would affect 1-hour and 8-hour CO levels of the existing conditions at the 200th Street and International Boulevard intersection, CAL3QHC was re-run. The results of this analysis, based on information in the Final EIS, showed the following:

	Intersection of South 200th and International Blvd (ppm)	
	1-Hour CO	8-Hour CO
With RFG (EIS assumption)	21	15
With Oxy Fuel (actual fuel used)	21	15
With Regular	26	18
NAAQS	35	9

As is shown above, the following fuel versus CO emissions occur:

- The Final EIS, with RFG, overstated the current CO emissions (with Oxy fuel) occurring by less than 1 ppm for the 1-hour CO standard and less than 1 ppm relative to the 8-hour CO standard;
- If Oxy Fuel is discontinued, and regular gas were used, the Final EIS could understate future Do-Nothing and "With Project" conditions by 5 ppm (1-hour CO standard) or 3 ppm (8-hour CO standard).

The following summarizes the results of the 8-hour CO evaluation performed for the various intersections, based on the forecast information in the Final EIS:

	Existing					
	Do-Nothing			With Project		
		Concentration (ppm)			Concentration (ppm)	
Intersection	LOS	Oxy	Regular	LOS	Oxy	Regular
SR 99/S. 154th	D	na	na	na	na	na
SR 99/S. 160th	C	11	13	na	na	na
SR 99/S. 170th	F	13	16	na	na	na
SR 99/S. 176th	C	na	na	na	na	na
SR 99/S. 188th	F	19	23	na	na	na
SR 99/S. 192nd	F	na	na	na	na	na
SR 99/S. 200th	D	15	18	na	na	na

	2000					
	Do-Nothing			With Project		
		Concentration (ppm)			Concentration (ppm)	
Intersection	LOS	Oxy	Regular	LOS	Oxy	Regular
SR 99/S. 154th	D	na	na	D	na	na
SR 99/S. 160th	C	11	13	C	11	13
SR 99/S. 170th	F	12	14	F	11	14
SR 99/S. 176th	C	na	na	C	na	na
SR 99/S. 188th	F	16	20	F	15	19
SR 99/S. 192nd	C	na	na	C	na	na
SR 99/S. 200th	E	13	16	E	13	16

	2010					
	Do-Nothing			With Project		
		Concentration (ppm)			Concentration (ppm)	
Intersection	LOS	Oxy	Regular	LOS	Oxy	Regular
SR 99/S. 154th	F	na	na	F	na	na
SR 99/S. 160th	F	11	13	F	12	14
SR 99/S. 170th	F	13	15	F	13	15
SR 99/S. 176th	C	na	na	C	na	na
SR 99/S. 188th	F	15	18	F	14	17
SR 99/S. 192nd	D	na	na	D	na	na
SR 99/S. 200th	F	13	16	F	13	15

	2020					
	Do-Nothing			With Project		
		Concentration (ppm)			Concentration (ppm)	
Intersection	LOS	Oxy	Regular	LOS	Oxy	Regular
SR 99/S. 154th	F	na	na	E/F*	na	na
SR 99/S. 160th	F	12	14	F	12	15
SR 99/S. 170th	F	13	16	F	13	16
SR 99/S. 176th	C	na	na	D	na	na
SR 99/S. 188th	F	14	17	F	14	17
SR 99/S. 192nd	D	na	na	D	na	na
SR 99/S. 200th	F	12	15	F	12	14

Source: Final Environmental Impact Statement (Exhibit IV.15-9, Table O-B-18, and IV.9-8) which assumed the use of Reformulated Gas and included left turn movements.

Note: Oxy fuel and RFG were found to result in the same pollutant concentrations, and as a result, the Oxy fuel column also represents the RFG condition.

* LOS at SR-99/S.154th depends on the South Access/SR 509 Extension project. LOS F would result from the With Project and w/o SR509/South Access; LOS E would result from With Project and w/ SR509/South Access.

As the above data includes the reformulated fuel assumption, and worst-case operating and meteorological characteristics, inclusion of regular gas would increase modeled concentrations beyond those reported above. With such worst-case assumptions and regular gas, exceedances of the NAAQS could be modeled for intersections operating at LOS C or B. However, EPA modeling guidelines indicate that "Intersections that are at LOS A, B or C probably do not require further analysis i.e., the delay and congestion would not likely cause or contribute to a potential CO exceedance of the NAAQS".

While the inclusion of regular gas in the future modeling assessment would increase modeled concentration levels, it would affect the Do-Nothing and With Project equally.

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ATTACHMENT C

COMPARISON OF FEIS RESULTS TO THE SR-509 ANALYSIS

The following provides a comparison of the air quality modeling analysis prepared for the Sea-Tac Airport Master Plan Update Final EIS (Sea-Tac EIS) and the Supplemental EIS to the Draft Programmatic EIS for the SR 509 Extension (SR-509 EIS). This review consists of:

- Comparison of Results of the Modeling
- Comparison of Modeling Assumptions

1. Comparison of Results of Modeling

Both EIS's examined air quality conditions for an existing year, as well as for the year 2020 at two common locations: the intersection of International Blvd at S. 188th and at S. 200th. As is shown below, for the base year the results were very similar (within 1 ppm). However, in year 2020, significant differences result. The Sea-Tac Master Plan Update Final EIS and the Supplemental EIS forecasts significantly greater pollutant levels at both intersections.

	Existing (ppm)		Year 2020 (ppm)	
Location	**Sea-Tac FEIS**	**SR 509 EIS**	**Sea-Tac FEIS**	**SR 509 EIS**
International Blvd/S. 188th	18	18	13	6
International Blvd/S. 200th	15	14	10	7

Based on the results shown above, a review of the modeling assumptions of both studies was conducted, with an attempt to describe how the assumption affects the results of the modeling.

2. Comparison of Modeling Assumptions

The modeling performed for both studies was performed using the EPA's CAL3QHC intersection dispersion model. This model requires a significant amount of data as input which affects the resulting concentration. The following compares key data requirements for the year.

Assumption	Sea-Tac EIS	SR 509 EIS	Effects
Meteorology			
Stability Class	E	D	The Sea-Tac EIS used a more conservative stability class. Use of E assumes that air has less mixing and produces higher CO concentrations
Mixing height	2,000 ft	1,000 ft	Has very little effect on results
Wind speed	1 m/s	1 m/s	
Temperature	45F	45F	
Fuel type	Oxy fuel	Oxy fuel	
Vehicle speeds	19.6 mph	25+	The Sea-Tac EIS uses a slower speed for free flowing roadway segments, resulting in higher CO levels

Background concentrations	3.5 ppm for 8-hr	1.5 ppm for 8-hr	Sea-Tac EIS would predict CO levels 2 ppm higher all other assumptions equal
Traffic levels			The Sea-Tac EIS used higher traffic levels than the SR-509 EIS
Intersection geometry			The SR509 analysis included additional turn lanes and an additional lane on International Blvd. This additional capacity would result in lower emissions due to reduced congestion
Intersection signal cycle times			SR-509 EIS used shorter cycle lengths than the Sea-Tac EIS, resulting in lower concentrations. as queues were shorter
Receptor location	3 meters	3-4.5 meters	Sea-Tac EIS receptor locations which were closer. resulting in higher concentrations

APPENDIX B
ATTACHMENT D

COMMENTS RECEIVED CONCERNING THE

DRAFT CONFORMITY ANALYSIS

DATED FEBRUARY 1996

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COMMENTS CONCERNING THE DRAFT CONFORMITY ANALYSIS DATED FEBRUARY 1996

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February 29, 1996

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ANM-610

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

Comments on Draft General Conformity Determination for the Sea-Tac Airport Runway and Associated Development Projects

Dear Mr Ossenkop

I have reviewed the FEIS for the expansion project, the Supplement to the State Implementation Plan (SIP) and general conformity I have had extreme difficulty in determining what legal criteria are applicable to the draft General Conformity Determination I will attempt to outline some of my concerns below and then to comment on what I feel are certain, verifiable problems with a positive finding of conformity for the third runway project

The Draft EIS and FEIS Air Pollutant Methodology

Although the draft Conformity statement concludes that there are no unmitigatable predicted violations of the NAAQS for CO hot-spots identified in the FEIS, there are existing condition violations of the 8 hour standard which have no planned mitigation measures proposed A proposal to reduce project related increases in the severity of the violations is in keeping with the letter of the law, but allowing the no-build violations to continue is inconsistent with the heart and intent of the law (CAA)

Although the requirements for a finding of conformity for this project contain criteria relating to the creation of a new violation, increased severity or delaying of attainment, the existing violations in intersections along International Boulevard (transportation related) and along the curb-front on airport property, are both areas of public access where violations are occurring in the present condition which may or may not be mitigated by improvements Expansion of airport parking facilities, drives and additional gates prior to North Unit Terminal build-out have not been considered as additive in the model

Additionally, the FEIS predicts NO_2 violations in an area of restricted public access This recent discovery of an NO_2 violation could be considered a new violation of the standard since significant increases in aircraft operations have occurred over a relatively short period of time which have not been modeled until recently and has not been previously identified in the SIP (South 154th street) There is an expected new project related violation predicted to occur in the future in an area of public access along South 188th street for aircraft operation related NO_2. This could be considered a new, direct NAAQS

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project related violation or an attainment delay (ozone precursor) Neither nitrogen dioxide hot-spots are identified in the SIP or for mitigation measures in the FEIS

Comments to increase the existing condition worst-case scenario peak aircraft operations numbers by EPA and other interested public, were used in the FEIS However, the worst-case scenario which considered greater peak aircraft operation numbers, used greater light aircraft numbers than the previous annual average day level operations figures used in the draft EIS Additionally, the model did not consider future peak aircraft operations considering the following which could contribute far greater NOx and therefore, NO_2 levels than those predicted

1 Future larger aircraft emit more NOx
2 Future fleet mix expected to include more larger aircraft and more jets over light aircraft
3 High-bypass engines emit more NOx and will be included in the future fleet mix at Sea-Tac Airport
4 The dual simultaneous departure capabilities of the third runway
5 The ability for increased airport capacity accommodating up to 175,000 additional annual aircraft operations (Jet fuel consumption is expected to increase by 72% over existing use (1994) by 2020 Logically, a 72% jet fuel use would indicate a much greater increase in peak hour takeoffs than that which has been assessed by the FEIS)

It would be reasonable to conclude, considering all the above, that an existing NO_2 violation predicted at South 154th street, would worsen in the future and that there would be far more exceedances of the standard than merely one additional receptor at South 188th The existing condition has been modeled with 43 9 peak annual day average flights or roughly 385,000 flights per year Technical Report #8 states that the third runway will accommodate an increase in operations to approximately 560,000 flights per year adding 175,000 flights per year This figure equals a peak annual day average of 63 9 flights per hour This is not peak, this is average If NO_2 violations can be predicted to occur using 43 9, then surely this rate will increase with averages of 63 9

If an NO_2 present condition violation can occur at South 154th due to takeoffs, this same scenario should also tend to occur during peak hour when the departures are to the north If the same number of aircraft can depart during peak hour going to the south in south flow when winds are from the south, then the same exceedance should be expected to occur at South 188th in north flow when planes are taking off to the north in peak hour when winds are from the north unless it could be proven that winds are generally different for some reason when coming from the north or if north flow is somehow different than south flow during a given peak hour

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The documentation supporting nitrogen dioxide violations including predictions, modeling and monitoring was cited as comments on the draft EIS Supportive evidence from an EPA/FAA study of Hartsfield Atlanta Airport which included modeling and monitoring of NO_2 indicated that jet aircraft operations could be expected to be creating very high rates of NO_2 in the business and residential areas surrounding airports Additional studies support these conclusions and were also cited The likelihood of nitrogen dioxide violations occurring around airports has been an unstudied hypothesis for decades

Short-term NO_2 monitoring at Sea-Tac Airport in the baggage area detected levels of 0 1 average and 0 3 high, both parts per million The high level is nearly five times greater than the highest NOx level measured by a recent Ecology NOx saturation study which used the same time period and mobile monitoring from north of Seattle to Enumclaw This particular study concentrated heavily in Seattle and Bellevue but completely bypassed the Sea-Tac Airport area due to Ecology's assertion that Sea-Tac is not a large producer of ozone precursors (see enclosed), which is in direct contradiction to Ecology's own 1991 study which showed a great potential for NO_2 violations occurring in the neighborhoods and business districts around the airport with peak NO_2 rates estimated at 28 0 ppm

Using figures from the draft EIS airport inventory and comparing only NOx and VOC emission totals to the inventory for regional ozone precursors and dividing the results by area provides the conclusion that Sea-Tac Airport produces ozone precurosrs at a rate 50 times greater than the average regional nonattainment acre

The State Implementation Plan (SIP)

The way aircraft are considered a non-road mobile source rather than a point source in the SIP implies that this operation is a regional air pollution problem Snow-blowers, lawn mowers and the like do not all operate within a few limited regional acres like Sea-Tac airport Airports are more typical of a point source where pollution levels are high and concentrated within a limited geographical area There are potentially no greater single regional sources of ozone precursors, carcinogenic hydrocarbons, toxic and very fine diameter particulate matter (once predicted to violate the NAAQS and should have input in the model to estimate contribution and potential transport and impact to nearby nonattainment area) carbon monoxide, sulfur oxides and nitrogen oxides This chemical zoo could very well be responsible for the increased disease rates being reported by doctors treating airport neighbors Potential for carcinogenic nitrousamines, nitrous and nitro compounds for which the Clean Air Act once addressed concern where high rates of nitrogen oxides occur, have not been evaluated Considering that large quantities of criteria pollutants are emitted continuously at the airport, an area of only 2400 acres, it is irresponsible to average out this problem over the region One group of citizens, (a minority in comparison to regional population) are experiencing an unfair burden of

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impacts in violation of SEPA's provision for an inalienable right to a healthful environment

I believe it should be the responsibility of the agencies who develop the SIP to make as complete and thorough evaluation of emissions as possible This was not accomplished in regard to the emission rates for the aircraft operations at Sea-Tac Airport for 1995 SIP

The 1995 SIP levels are nearly three times higher in tons per year for CO, VOC's and NOx than the estimates presented in the FEIS

	1995 SIP Airport (Aircraft)			**1994 FEIS Airport (Sources/Aircraft)**		
	CO	VOC	NOx	CO	VOC	NOx
Tons/yr	5,880	1,092	2,476	1,188	358	1,199

Total SIP: 9,448 tons/year **Total FEIS: 2,745 tons/year**

Difference: 6,703 tons/year

The difference is equal to more than three times the 1994 FEIS estimates. These figures were derived, each from two scientifically based, technically oriented organizations, the SIP non-road mobile sources emission data supplied by PSAPCA in consultation with EPA 1992 Seattle Study data, and an experienced consultant using information supplied by the Port of Seattle. Both studies estimated pollution production levels using fleet mix and operational data obtained from the Port of Seattle/FAA Yet each study came up with such vastly divergent estimates that the conclusions cast doubt on the accuracy of ***either one*** The disparity between these two estimates demands a third party to evaluate the methods, data and conclusions used by each study and then render an unbiased opinion of either the flaw(s) of each or develop an entirely new study for comparative purposes

The goal of the SIP is to chart air pollution and improvements over time to eventually reach attainment of the standards to protect public health and better the environment. Implementation of control measures and identifying hot spots are two very important elements in achieving attainment of the Carbon Monoxide and Ozone standards Many costly studies and control measures have been implemented to this end If the airport project general conformity determination is approved with the existing predicted carbon monoxide and ozone precursor NO_2 violations continuing without any TCM or mitigation to bring levels to at or below the standards, the purpose and intent of the State Implementation Plan is not achieved, and public money has been wasted

Additionally, it should be the responsibility of those regulatory agencies with the charge over air quality in the region to identify the airport hot-spots in the SIP With CO and

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NO_2 violations occurring in the FEIS which uses below reality existing condition numbers of operations rather than real worst-case figures and unsubstantiated projections for improvements with the third runway, it is inconceivable that the hot-spots went unidentified by EPA, Ecology and/or PSAPCA when the much higher SIP numbers were developed. There could conceivably be more hot-spots of violations within the region which have, as yet, not been identified if the airport SIP failed to identify rates which could be triple 18.0 ppm 8/hour CO at Sea-Tac.

Conformity and the Clean Air Act

"The purpose of conformity is to ensure that transportation activities improve, or at least do not worsen air quality."[1] "The key conformity requirements are that transportation activities:

- Cannot cause or contribute to any new violation of national ambient air quality standards
- Cannot increase the frequency or severity of any existing violation of the standards
- Cannot delay timely attainment of the standards"[2]

"If conformity is not achieved then the plan, program, or project cannot be approved or funded. Since projects from non-conforming TIPs cannot be approved or funded, a single project can prevent all other projects in the nonattainment area from being built if it results in the regional TIP not being able to conform."[3]

Since predicted violations in CO hot-spots, and NO_2 exceedances of the NAAQS have been identified in the FEIS, it does not appear that the above criteria have been satisfied.

Although the CO hot-spots are predicted to worsen with project related impacts, the analysis assumes improvements in automobile combustion and congestion which may or may not be forthcoming. Additionally, 509 extension project is expected to create some benefit for congestion on SR99 and I-5, however, the project level analysis for 509 was not in agreement with the FEIS identification of hot-spots and this apparent contradiction between benefits and the enabling effect to bring more traffic through this area rather than along I-5 has not been considered contributory, additive or cumulative to existing impacts. The FEIS should analyze more thoroughly, the cumulative or additive effects of overall traffic increases for a number of contributory projects such as:

1. SASA aircraft maintenance base (Aircraft engine run-ups/testing)
2. Cargo distribution center to be located at or near SASA site.
3. The cumulative effects of atmospheric VOCs emitted from a planned

[1] Supplement to the State Implementation Plan WDOE January 1993 page 5-9
[2] Ibid page 5-10
[3] Supplement to the SIP page 5-14

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bio-chemical manufacturing plant to be constructed on airport property

4. Road widening projects for 24th South, South 200th, South 192nd, International Boulevard, airport drives, South Access roadway, etc.
5. 2,000 local heavy-heavy duty haul truck trips per day for 2 and a half to five years, 16 hours/day, 6 days per week for PM_{10} and NOx as additive short and/or long term impacts.

Thorough air quality analysis for these multiple projects should be included in the airport Master Plan FEIS since these projects aid the overall development, are necessary as integral parts of the development, are directly related to the project such as SASA which could contribute as much as 9,000 tons/year of air pollutant levels to the same general area as presently modeled airport existing operations, are on land bought with federal funds, are of a federal benefit or are actual federal facilities.

I believe that if all these were considered as additive and cumulative for this relatively small regional area, planners would be surprised at the amount and frequency of potential significant and extreme environmental degradation residents would be expected to bear.

Does this project meet the hot-spot criteria of §51.424, (58 FR 62223), §51.434 (58 FR 62225)? If so, has EPA called for an SIP revision? 58 FR 63222 states:

"The exclusive definition, in effect, includes an examination of the duties, continuing program responsibilities, and controls that a Federal agency can practicably implement. When the Federal agency owns or operates a facility, Federal responsibility for the direct and indirect emissions from that facility is clear. Where the Federal agency has the authority to impose lease conditions controlling future activities on the leased Federal land, these emissions must be analyzed in the conformity determination."

These considerations include projected future emissions as well as direct and indirect. The above criteria would apply to SASA, Federal Detention Center, CTI and other cargo distribution developments in the south end of airport property. There are other planned developments on airport property and to the north which will all be conducted on Federal land, such as a hotel which will generate significant peak hour traffic increases through the airport area, a parking garage north of SR 518, Aviation Business Center, etc.

The project sponsor continuously asserts that similar impacts would occur with or without a third runway. This premise is faulty because it forces the conclusion that if significant increases in frequency of flights could be accommodated without a new runway then why does this project propose the urgent need for a third runway? Secondly, this situation ignores EPAs request to analyze capacity enhancement, which

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is what this runway is all about Lastly, with the tremendous impact that jet aircraft have on the quality of the environment, it is irresponsible to forward the idea that 175,000 more aircraft operations per year will fall below de minimus levels with conclusions of annual negligible and less than zero future additional criteria pollutant build contribution

Conclusions and Recommendations

- **An independent third party is needed to support or correct the conclusions arrived at by the Port of Seattle consultant**
- **An independent study of the SIP in comparison to the FEIS inventory should be undertaken**
- **Regulators should attempt to justify how the hot-spots for CO and NO_2 were overlooked during the development of the SIP.**
- **Particulate matter for jet aircraft operations, which has been completely eliminated from the EDMS model should be estimated and considered additive with haul truck particulate in areas of simultaneous impact.**
- **All projects and direct and/or indirect impacts should be reevaluated for multiple, cumulative and additive air quality impacts for all foreseeable construction and operation of improved and new facilities**

This project does not satisfy the heart and intent of the Clean Air Act requirements to reduce air pollution in areas where pollution problems pose a threat to human health and the environment, and especially this area of dense population and sensitive land uses

Sincerely,

Debi L. DesMarais

Debi L. DesMarais
24322 22nd Ave S
Des Moines WA 98198
(206) 878-5093

Encl

cc: Governor Lowry
EPA
Ecology
PSAPCA
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PUGET SOUND AIR POLLUTION CONTROL AGEN[illegible]
KING COUNTY KITSAP COUNTY PIERCE COUNTY SNOHOMISH COU[illegible]

November 30, 1995

Debi DesMarais
24322 22nd Ave. S
Des Moines, WA 98198

Dear Ms DesMarais:

<u>Response to November 25, 1995 Correspondence</u>

In response to your November 25, 1995 correspondence, the Puget Sound Air Pollution Control Agency (PSAPCA) would not expect the aircraft inventory in the State Implementation Plan (SIP) to be the same as the Draft Environmental Impact Statement (DEIS). The reason is because the inventory in the SIP is a rough estimation of the area emission sources covered by the plan. It is appropriate in the development of a site specific EIS to perform more detailed emission calculations, which should result in a more accurate emission inventory. However, we would refer you to the Port of Seattle FAA and the EIS itself for details on the methodology used in calculating these emissions.

In regard to your second question, we have attached a copy of the letter we sent to you on July 6, 1995 which discusses Acceptable Source Impact Levels in WAC 173-460.

Sincerely

Margaret L. Corbin
Air Pollution Engineer

mj
Attachment

cc: D. S. Kircher

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PUGET SOUND AIR POLLUTION CONTROL AGENCY

KING COUNTY KITSAP COUNTY PIERCE COUNTY SNOHOMISH COUNTY

October 25, 1995

Debi DesMarias
24322 2nd Ave S
Des Moines, WA 98198

Dear Ms. DesMarias:

Exceedances of the CO Standard

In response to your October 10, 1995 letter, the national ambient air quality standards are achieved by developing regulations and enforcing those regulations. Measurements taken at permanent monitoring sites that meet EPA criteria are used to evaluate success at meeting and maintaining the national standards. Estimated or predicted "violations" are used in the planning process and for siting new monitors. However, only permanent sites are used to determine compliance with the standards. We do not directly enforce violations of the carbon monoxide standard because there is no identifiable person solely responsible for violations.

In response to your second question, PSAPCA does not have oversight on the training fires at Sea-Tac since the legislature granted an exemption from permitting.

Sincerely,

Margaret L. Corbin
Air Pollution Engineer

mj

cc: D. S. Kircher

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110 Union Street, Suite 500 Seattle, Washington 98101-2038 (206) 343-8800 (800) 552-3565 · FAX (206) 343-7522

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Northwest Regional Office, 3190 - 160th Ave. S.E. • Bellevue, Washington 98008-5452 • (206) 649-7000

October 30, 1995

Ms. Debi L. DesMarais
24322 22nd Avenue South
Des Moines, WA 98198

Dear Ms. DesMarais:

Thank you for your letter of October 3, 1995 concerning various studies in connection with the DEIS for the SeaTac Airport Master Plan (Third Runway issues). You should have by now received a response from D. J. Patin concerning other issues you have raised. I will try to answer the specifics of your October 3rd issues with this letter.

Each winter season we conduct a CO saturation study in a portion of the Puget Sound area. We started several years ago in the Tacoma area and worked our way north along the eastern portions of the metropolitan area through Auburn, Kent, Renton, Bellevue, Kirkland and Redmond areas. This year we will be working in the Bothell-Lynnwood area. Next year we plan to complete the first south-to-north run in the Everett area. After that we will decide whether to work our way southward through Seattle or to start in the southern King county area and work north through Seattle. At that time we will decide when we will be conducting the study in the SeaTac area.

In deciding where to locate samplers, we review current local traffic data , talk with local planning and engineering departments and take into consideration other known areas of concern such as the locations identified in the SeaTac EIS. Our limited resources permit us to only look at a fairly small area during each study season, so it takes a while to cover the entire region.

The SeaTac EIS must contain a certificate of conformity when it is completed. This means that the proposed action must not result in violations of the air quality standards. To comply with the requirements, the proposed project must mitigate any projected problems such as the traffic congestion issues at the two locations of concern. So, there will be changes to the road system around the airport. We will be planning our sampling in a way that will be indicative of the long term situation, not one that is going to be modified shortly. In other words, we won't sample in a location which is going to be significantly changed shortly after we complete the study.

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Ms Debi L. DesMarais
Page 2
October 30, 1995

The recent NO_x study was conducted in the urban Seattle area from the University district to south of the Beacon Hill area and then down the east side of Lake Washington and southeast to Enumclaw. You should have received a copy of that study. We do not have plans for NOx monitoring in the SeaTac vicinity because the airport activities contribute such a small portion of the total ozone precursors (NOx and VOCs). For this same reason, Ecology will not require an estimate of ozone contribution for conformity beyond the estimates of precursors already presented in the EIS.

The brownish haze which is sometimes visible over Seattle during periods of high pressure in the winter and summer is of concern to us. There have, in recent years, been heightened concerns about visibility in the region. Both Ecology and local air pollution agencies monitor visibility. The Puget Sound Air Pollution Control Agency (PSAPCA) is conducting a visibility study which will include an analysis to determine the constituents of the haze. The first data should be available late next year.

The individual who has been working with the consultant on the modeling for Ecology is Clint Bowman. He will continue to represent the agency interests in the modeling process. Several agencies, including Ecology, PSAPCA, Puget Sound Regional Council, EPA and the FAA, recently met with the Port of Seattle and their consultant to review concerns about the modeling and to provide suggestions to complete the modeling for the final EIS. I feel this effort is working well and will result in a good product.

Please contact me at 649-7082 or Clint Bowman at (360) 407-6815 if you have additional questions.

Sincerely,

Douglas J. Brown
Section Manager
Air Quality Program

DJB:djb:gg

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Port of Seattle

August 29, 1995

Ms. Lori Wardian
609 SW 187th Street
Normandy Park, WA 98166

Dear Ms. Wardian:

Thank you for your call to the Noise Information Line on August 23, 1995, in which you commented about jet fuel odor from Sea-Tac International Airport jet aircraft activity. A high number of jet aircraft operations may increase the smell of jet fuel odor and depending on weather conditions, localities around the Airport may notice the odor more. The recently released draft Environmental Impact Statement (EIS) on the proposed master plan developments at Sea-Tac addresses several different environmental categories, including air quality impacts associated with existing and future development at the Airport.

Generally, the Puget Sound Air Pollution Control Agency (PSAPCA) is the regional agency that deals with air quality issues. PSAPCA staff can be reached at 343-8800. I have enclosed a copy of a recent issue of FORUM, which addresses the EIS and where it can be reviewed. If you have additional questions about the EIS, please feel free to call Rachel Garson, Sea-Tac Public Information. She can be reached at 248-6851.

Sincerely,

Toni E. Turner
Noise Abatement Assistant

cc: Rachel Garson - Aviation Communications

Enclosure

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Seattle-Tacoma
International Airport
PO Box 68727
Seattle WA 98168 U.S.A.
TELEX 703433
FAX (206) 431-5912

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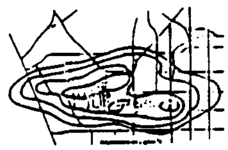

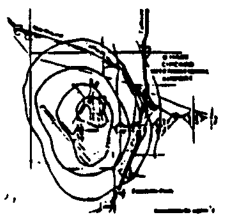

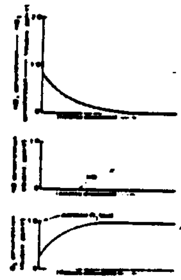

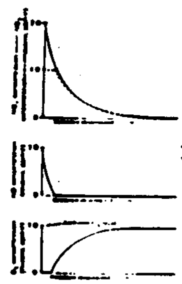

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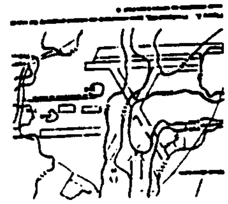
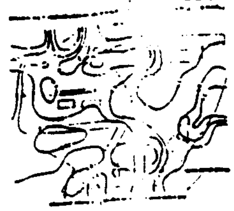
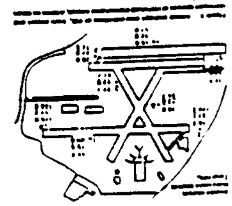
Emissions of Oxides of Nitrogen from Aircraft

17







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March 5, 1996

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR - 7 1996
ANM-610

Mr Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Avenue SW
Renton, WA 98055

Dear Mr Ossenkop

As per our telephone conversation this afternoon, this is a request for further information I would like to know what original values were arrived at when the EDMS model predicted nitrogen dioxide levels above the NAAQS at 154th Street South receptor, whether the 0 068 value is a refined analysis value, and at what percentage to determine nitrogen dioxide levels from nitrogen oxides group predicted in the model were used

Also, just for informational purposes, I would also like to know what specific wind speed and direction was used in the refined analysis when the 0 068 ppm occurred, and also if traffic along 154th was added to the EDMS estimates and what levels for any receptor identified in the screening would also be of potential concern in the future scenario which will include larger, higher bypass engines, heavier aircraft and more jets?

Could you also please have the consultant use any larger jet than a DC9 for a comparison to autos, such as a DC10, 747 or 767 for nitrogen oxides rates in comparison to a single car similar in situation to the other scenario?

Thank you,

D.L. DesMarais

D.L. DesMarais
24322 22nd Ave S
Des Moines WA 98198
878-5093

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March 10, 1996

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

Dear Mr. Ossenkop:

I have reviewed the "Air Pollutant Methodology" and Section 9 Air Quality of the FEIS as well as responses to comments in Volume 4. Although there have been some minor changes to the text in the final EIS there are unanswered comments and some greater problems than the draft and numerous unresolved uncertainties.

Under Time-In-Mode and Delay page -R-110-, eleven minutes was considered for each aircraft departure, and I am assuming this includes the taxi/in-out and queue. The text had stated that the queue was 7 to 9 aircraft in length in existing and would be well above this in the future condition. The time-in-mode graph on page -R-111- shows 2.89 queue time. If nine aircraft are in the queue, the average queue time-in-mode cannot be less than 5.0 minutes each. If seven, then 4.0. This is assuming 60 aircraft departures in one hour, or one every minute, well above the average annual numbers used by the consultant for the existing condition. It would not be unusual to expect that one or more plane in the queue might wait more then one minute to depart, especially with a third runway where arriving aircraft must cross two active runways. In this case, up to 8 or 9 aircraft will be delayed more than one minute per plane, bringing the entire average to greater than 5.0 or 4.0 minutes each.

This time-in-mode has failed to identify worst-case and failed to analyze the given average case. This time-in-mode identifies only the best case and does not consider future larger aircraft and up to 18 aircraft in the queue. This analysis disregarded the citizen and agency comments.

For taxi-in-out of 8 11 minutes, this is equal to 4.06 for arrival and could not have considered the distance from the south and north terminal for arrival conditions where the travel distance is nearly the entire length of the airport to reach the destination satellite, including SASA. (see enclosed taxi routes) The consultant should give figures for travel distance at taxi speed and rate of travel to justify the 4.06 minutes.

If 4.06 taxi-in time can happen in the average condition, what about the worst case? Can the consultant prove worst case will never happen? If just seven planes in the 43.9 take 10 minutes of taxi time on arrivals, this pushes the average of the entire 43.9 planes to 5.01 minutes per plane, considering that the remaining 36.9 take only 4.06 minutes each and ten minutes taxi in time is still conservative in comparison to average taxi time in mode for large congested airports considered at 13 minutes from EPA AP 42 Volume II, Mobile Sources.

On page -R-111, number 4, the consultant discusses the EDMS model update and on the next page states: "...particulates was (were) revised by the FAA to include only that data for which reliable particulate information is known." The consultant was answering at least one comment asking why the particulate tons/year was considerably lower in the draft analysis than in previous airport analyses. I have reviewed the files contained within the EDMS model and I believe it would have been more appropriate for the consultant to state that ***all particulate data for every jet aircraft operation has been removed.*** I find it very unusual that the FAA is allowed to maintain control over air pollution information. Is the FAA the agency with oversight of its own transportation impacts? This seems very irregular, may represent a conflict of interest and a bias. Does any agency have the authority to compel the FAA to update this information with more reliable data rather than allow the model to remain at zero, which is undoubtedly as wrong as wrong is? Why did not the FAA seek to make corrections to the erroneous data rather than remove all the data? Could it be that the model kept predicting NAAQS PM_{10} violations as it did in the 1991 Ecology screening study and this was the problem?

The inventory for tons per year has been reduced in the final EIS over the draft for aircraft even though the same number of peak hour annual average numbers are used in the final. The nitrogen dioxide and carbon monoxide levels are 400 tons per year lower. Why is this?

I asked that ozone be measured. It is my understanding that an ozone model exists. This was not conducted in the final and Sea-Tac Airport is the single greatest local contributor to ozone precursors. I estimated the amount of ozone precursors from the SIP 1995 to 2000 emission rates for mobile sources, considered the greatest overall regional contributor to ozone. I then divided the precursors NOx and VOCs by area and found that the draft EIS inventory contributed a 50 times greater ozone precursor production by area than the average regional nonattainment acre. Additionally, all indications are that jet engine produced nitrogen oxides will *continue to increase* in the future despite all efforts to reduce aircraft engine emissions.

I gave information on the amount of cars in comparison to jet operations for takeoff mode in pollution levels. I used a true worst case for nitrogen oxides, takeoff and all engines of a 3 engine jet aircraft such as a DC-10. My estimates concluded that 21,530 cars would be needed in a two minute takeoff operation to equal pollution levels of the one aircraft described. The consultant used a DC-9, one engine, compared for CO for which cars produce significant levels, used a fractional amount of time of the taxi/idle/queue mode and gave much different results. By utilizing a best-case, the consultant has managed to downplay the results. It is very uncommon for an analysis of this type to insist on presenting average or best case scenario results. This gives the planner no real idea of what the reality based mitigation requirements should be. The consultant has

failed to supply compelling evidence to convince anyone that worst case will never occur. The FAA has supplied written information indicating that the ideal condition functional existing capacity of the airport is able to occur now. The consultant insists that no more than 88 operations can occur in an hour, which represents a contradiction of FAAs own documented hourly operational existing condition capacity at 100 operations. These figures are nearly 20% higher than the average existing condition used to estimate impacts by the consultant. Also in disagreement is the peak hour scenario that the consultant predicts for the 2020 with project inventory at 50.07 or approximately 101 hourly operations where FAA states 141 is the theoretical operational dependent third runway airport capacity.

Peak hour was increased from 43.9 to 63/hour departures by the consultant. However, the consultant insists that these departures must accommodate greater light and general aviation aircraft because 63 all jet departures is unable to occur due to time constraints. How long does it take a light or GA aircraft to gain altitude and departure separation compared to a jet? The model input indicates that jet and GA are the same for departure time-in-mode. I realize that in this new scenario, light aircraft are able to veer off the flight path and, therefore, it is assumed that more planes are able to depart. However, this, again is not a worst case. One jet departure may occur every :45 seconds to one minute according to FAA data. This is equal to 60 plus jets departing in an hour. This new fleet mix also ignores the written documented comments from PSAPCA which indicate there is a greater jet fleet mix occurring at Sea-Tac in comparison to light and GA. Additionally, GA aircraft disappear from the future scenario of operations at Sea-Tac. The consultant has failed to present us with the worst-case scenario. In every situation where operational increases were considered, unexpected and undocumented adjustments were made to either the fleet mix or arrival numbers.

The consultant had previously stated that when 63 aircraft depart, the model automatically considers an equal number of arrivals. Then he goes on to state that 63 departures were considered with 22 arrivals. How was this possible considering the constraints of the model? Again, theoretical FAA capacity is 100 operations in an hour. The consultant never rose above 88 in every scenario. What is being hidden from us? Where people are at risk, it should be expected that overestimation's, rather than under-estimations would provide the greatest degree of safety level, rather than conclusions based on such minimal information offering a minimal amount of response and therefore, a minimal or even nonexistent mitigation plan.

Regarding the insistence of the consultant that fuel dumping rarely or never occurs, there is mounting evidence which supports the conclusions of many residents that fuel is being deposited on their properties below the path of aircraft on approach paths. Additionally, since landing fees are based upon aircraft weight, it would seem there is the potential for irresponsible behavior to cut costs by lightening the only expendable load. Maybe landing fees should be based upon the value of the cargo and resale market. Passenger jets could be charged based upon seating, for instance, the emptier the aircraft, the more the fee. This is a far greater economic and environmentally sound approach to determining costs to the carrier with consideration of people on the ground as well as a greater responsible use of the privilege of quick air travel. This will eliminate the desire of any carrier to jettison unused fuel before landing. Another approach would be a standard fee for landing which does not consider any of the above, but is merely a use charge which does not fluctuate.

With regard to the odor study from Boston Logan, it does not appear that enough information has been provided to know whether odor problems around that airport, or any airport, are a health threat. I find it odd that considerable amounts of funds are continuously spent around airports doing preliminary screening work. This type of study never concludes anything and has been ongoing for over two decades at least. Odors of naphthalene, aldehydes, benzene and the like are an acknowledged problem around airports, including our own, with the primary source being the amount of fuel used at airports, their burned and unburned qualities in the air and significant on road mobile uses of surrounding streets accommodating that airport. The fact that these odors travel into nearby communities, irregardless of the source, should be considered a national and local serious environmental health threat. It is high time for the national agencies with the charge of protecting public health, to stop the expense of public funds to screen the problem, and get down to the long overdue business at hand to fully assess this danger and get on with developing action based mitigation plans before the public health costs of taking care of all the injured population mounts beyond means. Burned and unburned fuel odors, benzene, naphthalene, aldehydes are carcinogenic. If they are present, the identification of the source is secondary, with the primary concern centering on the exposed population at risk and their immediate evacuation.

I asked for additional information on the toxics risk analysis. The exposed population at risk for cancer increases had not been identified. Since we had been told that risk existed in the present condition and would assume that the risk would increase in the future with increased frequency of flights and automobiles accessing the airport, it seemed appropriate that the final EIS identify where those people live who would experience this risk. However, the consultant did not provide further information and did not expand the risk analysis for the final citing a lack of information. Now that we know there will be risk, it is very urgent that the sites where increased risk will occur be identified. Without this information, there will be no way to plan a mitigation strategy. It seems very cruel indeed that people have been warned of the impending danger, but nobody is saying who it is out of tens of thousands of individuals. Should we all move away?

The McCulley Frick and Gilman survey had indicated that several of the VOC profiles were indicative of automobile exhaust and did not resemble the profile of aircraft. I had asked whether several out of 50 or more sampled would be considered a significant number. I had also asked what these VOCs were. These questions are not answered in the final EIS, nor the other 30 questions I asked regarding this survey. Several did not appear to me to be many considering the hundreds of petroleum hydrocarbons referenced

to Jet A fuel profiles monitored during each sampling period. I notice that in the final, instead of several, the consultant now says *most* were automobile related and even regional. I wonder what regional toxics studies he is using for comparative purposes, and how several became most or all?

Is he aware that the study concluded that all the aldehydes seemed to be airport related? Additionally, he states that the violation of the ASILs predicted for several hydrocarbons, formaldehyde, acetaldehyde and acrolein may trigger more refined health risk analysis but concludes that there is not enough available information to conduct such an analysis. Instead of may trigger, he should have said does trigger but he admits, in this case, it will not, due to a lack of information. Although the text says that the ASILs are overprotective, and used for screening new industrial source equipment, the screening would identify any potential violations and strategies to scrub out potential violations would be implemented. This is because the Class A toxics listed in the ASILs are carcinogenic and *must* be controlled. However, since airports are not new sources, or even sources at all, the law does not apply, not because ASILs are overprotective, they are meant to be protective, and in the usual case of toxic air pollutant releases into the ambient air, it is better to overprotect than underprotect, but it is because airports are ***not controlled*** by any of our local air quality protection agencies.

I had made a comment about the 17.0 ppb sulfur dioxide rate detected in the McCulley, Frick and Gilman survey and questioned whether this indicates a more serious SO_2 problem than what has been previously thought and expressed in Ecology's 1991 screening of criteria pollutants. Additionally, nearby residents have been recently reporting increased incidences of sulfur odors emanating from the airport area.

The text regarding the sooty residues collected from residential properties insists they exhibited little in relationship to jet engine combusted material. The likely sources of these sooty deposits is listed as wood stoves, tire wear and automobile combustion. However, the narrative does not indicate that 2.5 micrograms of pyrene collected on a 100 centimeter swab was detected at a residence at 2204 South 222nd, in the flight path. This residence is completely secluded from automobile traffic and there are no wood stoves operating nearby. Additionally, the minimum detection limit for the analysis was far to high to gather any health based information on the potential for airborne PAH. However, this sample of pyrene, likely airborne at some point in time, would normally be considered a health threat, but again, as is too often the case, the study is inconclusive and further tests are warranted, although they may not occur in our lifetime.

The consultant (page -R-146-) seems to indicate that the reduction of arrival delay will reduce pollutant levels due to a concurrent effect on departure delay. This was not the question. The consultant was asked whether the runway would increase pollutant levels due to increased capacity. The consultant sidesteps the issue by pointing to arrival delay reduction which will benefit only those areas above the mixing height when aircraft are circling and stack in holding patterns. Since there is minimal departure delay, as has been indicated several times in the text of the FEIS, this arrival delay reduction will have virtually no effect in reducing ground level pollutant levels. I have also recently seen the arrival delay statistics for airports nationally and it is interesting to note that Sea-Tac existing delay numbers are some of the smallest in the nation and the larger airports which have expanded such as Logan, Hartsfield and Dallas have 100 times greater delay averages than Sea-Tac. Since these three have been built into what is now known as HUB airports, I wonder whether creating hubs is the problem with delays due to capacity issues rather than weather related issues. Also, the text of the FEIS does not consider the Technical Report #8 figures for future aircraft operation in 2020 at 560,000 rather than the FEIS 525,000. Why such a difference between two documents? And why is there such a difference between the consultants predictions of 50.67 annual average departures considered in the air pollutant methodology which total yet a different 443,869 annual operations?

Under engine run-ups, is it common to test only one engine at a time? (page -R-152-)

Does the EDMS model accept fractional aircraft numbers? Which part(s) of the aircraft is eliminated in the analysis, for instance, where a 1.5 airplane is used?

I did not see dual simultaneous departures considered anywhere in the final EIS although I brought this up in my comments. The FAA Advisory Circular which was cited states that 2500 feet separation is the minimal distance required for dual departures to occur. What will the effect be on the communities for additional air pollution if the departure capability in peak hour is doubled with a third runway? If it *can* happen, it should be predicted. Additionally, Ecology believes the separation will alleviate localized hot spots near each runway end due to greater dispersion effects. Has anyone considered that this runway will create more pollution pockets completely independent of the first two runways in areas not previously considered for impacts? Will larger quantities of pollutants settle in low terrain? Again, the predictions should consider worst-case, not average or best case, also known as wishful thinking case which tends to downplay reality based potential adverse environmental impacts in need of mitigation?

The Port of Seattle made a commitment in the SASA final EIS to conduct a cumulative impacts analysis for all projects considered in the general area and to include this analysis in the final EIS for the Master Plan Update. Air quality is a key issue requiring this type of analysis. A third runway, SASA, 509 freeway/South Access, the additional traffic volumes accessing the airport today and in the future, the Hotel, CTI, Federal Detention Center, 28th/24th Arterial, Widening of 200th, 192nd, and International Blvd, 518 Interchange, new fly-over ramps at the airport, North Terminal parking, 10,000 additional parking slot additions to the airport, Aviation Business Center, Warehouse and Parking facility north of SR518, all these projects will have an air quality impact. None have been added to the other to figure the potential impacts. All contribute to ozone precursors and increased carbon monoxide levels in this area of nonattainment for both. Nitrogen dioxide and carbon monoxide violations are predicted in the existing condition without consideration of all the other additional forthcoming impacts. A cumulative impacts

analysis is critical at this point to help identify those impacts which may occur simultaneously to nearby residents.

I would like to close my statements with a quote from an analysis now being conducted on the effects that a new runway had on the Sydney, Australia area and some hindsight on the project proposal EIS recently published as part of a Senate report:

> "One of the worst features of the EIS process was the appalling way in which people appear to have been deliberately deceived and misled as to what the impact on them would be...The EIS on the third runway at KSA appears to have been nothing short of a sales and marketing job, with the aviation authorities failing totally in their duty to the pubic to ensure a decent standard of objectivity in assessing noise impacts...the EIS seems to have deliberately misrepresented and misused the available scientific literature."

Although this text is speaking of the noise issue, I see distinct parallels between these statements and my own view of how the air pollutant methodology analysis has been carried out.

Sincerely,

Debi L. DesMarais

Debi L. DesMarais
24322 22nd Ave South
Des Moines WA 98198
(206) 878-5093

Encl.

cc: EPA
ACC

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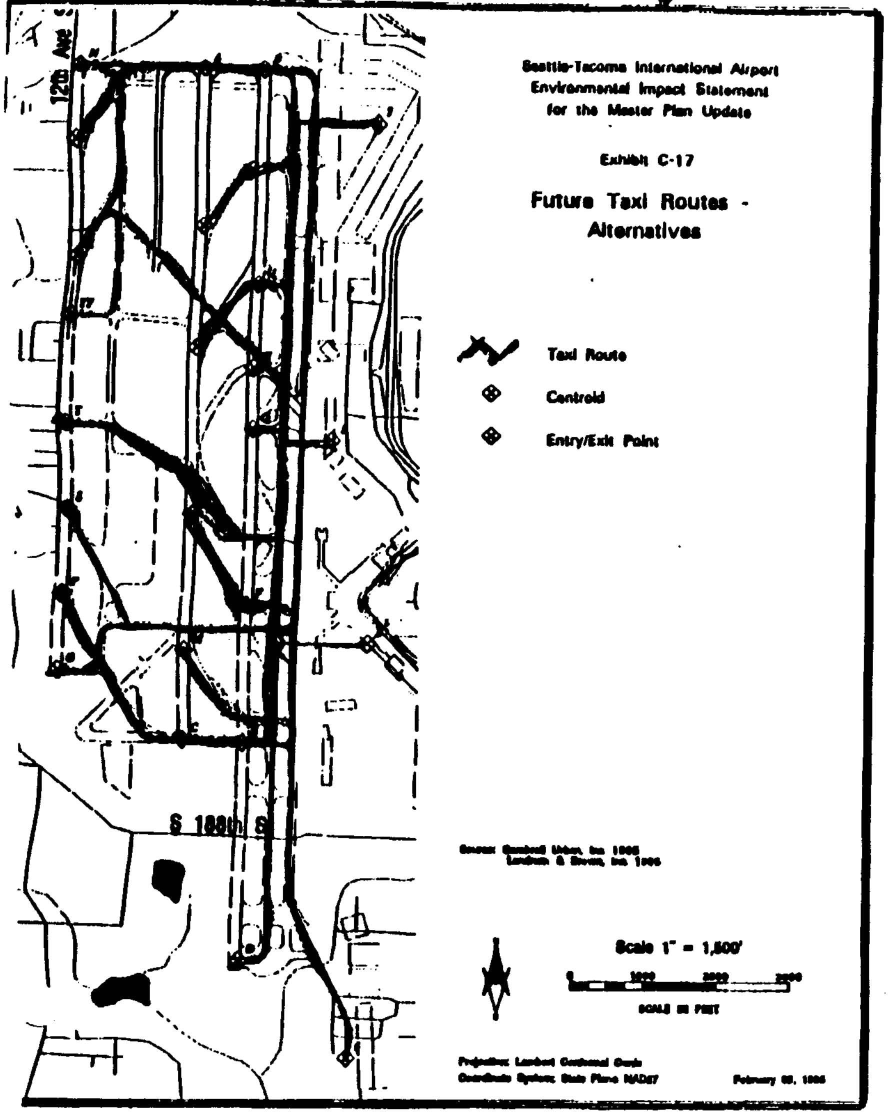

C-310

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ATTACHMENT #1

March 28, 1996

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

Dear Mr. Ossenkop:

Please consider this page as an attachment to the seven pages of air quality comments I faxed to your office yesterday, 3/27/96 which were dated 3/10/96 including all attachments.

I am also requesting that you include my conformity comments, this attachment and the seven pages of comments including attachments referenced above into the Record of Decision.

Conclusions

It is apparent that the methods, data, and standards used to determine air quality impacts with and without a third runway are questionable due to the fact that underestimations of impact using best case and average data permeate the final EIS analysis. Without the development of reality based worst-case predictions, it is nearly impossible to determine mitigation strategies. Only monitoring can confirm areas and degree of impact. However, the predicted CO, and NO_2 violations of the NAAQS require mitigation. TCMs, however determined to reduce the presence of CO rates above the NAAQS must be immediately implemented.. Studies must be conducted to determine the scope and rate of violations infiltrating any area of public exposure for both carbon monoxide and nitrogen dioxide. It is necessary that proper air sampling, using acceptable method and duration be conducted. To maintain uniformity between people in an atmosphere of environmental justice, it would seem appropriate that nitrogen dioxide monitoring consider the California short-term standard of 0.25 ppm one hour and that any area determined to exceed this level be considered for mitigation, i.e., removal of any land use providing free public access, including, but not limited to residential and business uses.

It is also important for an analysis of ozone to be conducted since the high rates of jet aircraft produced nitrogen oxides is the greatest local source of ozone precursors and a more thorough study of particulate must be conducted due to the way in which the model has predicted zero, which is undoubtedly in error.

-1-

Air Toxics

The McCulley, Frick and Gilman "Air Quality Survey" has indicated the presence of several hydrocarbons, benzene levels of particular concern, and aldehyde ASIL violations, however, the survey is not of sufficient duration to determine community exposure, risk and therefore, mitigation. Another study of greater duration which assesses community impacts is necessary and warranted by the preliminary results of the initial sampling.

Sincerely,

Debi L. DesMarais

Debi L. DesMarais
24322 22nd Ave S
Des Moines, WA 98198
878-5093

US Department of Transportation
Federal Aviation Administration

Seattle Airports District Office

April 24, 1992

Ms. Minnie O. Brasher
846 South 136th
Seattle, Washington 98168

D-15

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.

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CUTLER & STANFIELD, L.L.P.

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REC'D ANM 610
PLAN, PGM, & CAP BR
MAR 19 1996
ANM-610 ___

March 18, 1996

VIA FACSIMILE AND OVERNIGHT MAIL

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 ("ACC") on the FAA's Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport

Dear Mr. Ossenkop:

We represent 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"). On behalf of the ACC, we are submitting the following 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").

Section 176(c) of the Clean Air Act requires that before an agency can approve, provide financial assistance for, or "support in any way" any activity, it must first determine, through proper analysis, whether the proposed federal action conforms to the applicable state implementation plan ("SIP").

Here, the FAA has been asked to approve and provide federal monies for the proposed expansion of Sea-Tac, including, but not limited to, the construction and operation of a third parallel runway up to 8,500 feet in length, along with corresponding taxiways and utilities; the extension of existing

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Runway 34R by an additional 600 feet; the development of additional runway safety areas and a new air traffic control tower; the expansion of the existing terminal; and the addition of new terminal, parking, cargo, maintenance and support facilities. In aggregate, these activities would expand the operational capacity of the Airport significantly.

A. The FAA's Proposed Determination that the Expansion Conforms to the Washington SIP Is Erroneous

Despite the substantial expansion of the land and airside facilities currently proposed and the air and vehicular traffic it would bring, the FAA's draft conformity determination concludes that "the proposed improvements at Sea-Tac International Airport conform to the Washington State Implementation Plan ("SIP") and Ambient Air Quality Standards." This conclusion, and the FAA's underlying analysis, are fundamentally flawed because they are based on improper assumptions and methodologies which are not acceptable under federal law, including, but not limited to, the Clean Air Act.

The flaws in the conformity evaluation range from a failure to abide by well-established and -accepted modeling practices to the use of an invalid core assumption that serves as the basis for the entire analysis. Critical flaws include the following:

- The Traffic Data Actually Used in Modeling Air Quality Impacts Is Erroneous, Internally Inconsistent and Differs Substantially From That Reported in Appendix O of the FEIS

The traffic volumes actually used in executing the air quality models are inconsistent with, and differ substantially from, the traffic data reported to the public in Appendix O of the final environmental impact statement ("FEIS"). For instance, for the intersection at 188th Avenue and SR 99, the modeling data for the "do-nothing" scenario exceeds the FEIS numbers by approximately fifteen percent in 2000, thirty-four percent in 2010 and twenty percent in 2020. The FAA does not justify the use of this alternate data, nor does it explain how this new data was developed. The higher values used, however, would tend to inflate the prediction of air pollution problems under the do-nothing scenario. This error minimizes the difference between the action scenario and the do-nothing scenario, thus underestimating the air quality impact of the expansion project.

In other cases, the modeling data actually used is internally inconsistent. For instance, the data input files for specific intersections frequently do not account for all of the traffic. A good example of this can be found in file no.

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r1700wp.in. That data assumes that at the peak hour for the intersection of 170th Avenue and State Route 99 (Year 2000, With Project), 418 vehicles would turn left from State Route 99 northbound on to 170th Avenue west of the intersection. Inexplicably, the FAA then assumes that only 157 vehicles would leave the SR 99/170th Avenue intersection westbound on 170th. In other words, at a key intersection, the analysis fails to account for over half of the traffic. Similarly unrealistic and unreasonable assumptions can be found throughout the modeling analysis. These errors contributed to what appears to be a gross underestimation of the potential exceedances of air quality standards under the action scenario.

- **The FAA's Analysis Is Founded on a Core Assumption That Is Unreasonable and Not Supported by the Record**

The FAA's conformity determination and analysis also is flawed because it is based on the unreasonable assumption that the same number of planes, cars and people will use Sea-Tac regardless of whether the third runway and new expanded terminal are ever built. Because this assumption results in a severe underestimation of the effects that the project would have on air quality, the FAA cannot conclude that the activity would comply with the SIP.

Moreover, for the same reasons, the FAA cannot conclude, and has not demonstrated, that proposed mitigation measures would be sufficient to mitigate additional violations of air quality standards. Likewise, neither the FAA nor the Port of Seattle has made any binding or legally enforceable commitment to adequate mitigation measures.

B. The Comment Period Is Inadequate

Although the environmental review of this project has been on-going for some time, the FAA never included a conformity analysis in any of its environmental documentation until the release of the FEIS last month. Within a short period of time after reviewing the air quality section of the FEIS, it became clear that the data actually needed to assess the conformity determination was not in the FEIS, but instead existed only in separate computer files maintained by the FAA.

The ACC then filed a special request for the modeling data. However, given the time required to file the request, and the time required for the FAA to respond, the ACC did not receive the computer disks with the data until March 11, 1996. As a result, the ACC has had less than a week to review, analyze and provide comments on the FAA's analysis underlying the conformity

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determination. A complete evaluation of the FAA's Clean Air Act conformity determination can not be based solely on a review of the agency's two-page discussion of the analysis in the air quality section of the FEIS. On the contrary, it requires a time-consuming review of the underlying data, analysis and assumptions. That is particularly true here where the ACC's review thus far has uncovered numerous errors in the analysis and other anomalies which deserve further consideration.

C. Request for an Extension of the Comment Period

Emissions resulting from activities at and around Sea-Tac constitute a significant source of criteria and hazardous air pollutants. Thus, understanding the true air quality impacts that Sea-Tac has on the area is critical, especially in light of the fact that the State of Washington is petitioning the federal Environmental Protection Agency ("EPA") to have the Seattle area redesignated as in "attainment" with national air quality standards.

Given the potential impact of the proposed expansion on the air quality of the Puget Sound region, the minimal time that the ACC has had to review the underlying data, and the errors discovered already, the ACC respectfully requests that the FAA extend the period for public and agency comment on the conformity determination for an additional 45 days. This additional time is needed to evaluate the data more fully, and to ensure that the analysis truly reflects the potential effects of this project on Seattle's air quality and the health of the tens of thousands of residents living in the South King County area.

Thus, the ACC requests that the FAA (1) extend the period for public comment on the draft conformity determination until May 2, 1996; and (2) that the FAA refrain from granting approval for any element of the proposed expansion, or otherwise, "supporting in any way," the project until the FAA performs a revised analysis in compliance with federal law and accepted modeling protocol.

The ACC is submitting with these comments a copy of the resume of Michael G. Ruby, P.E., President and Director of Envirometrics, Inc., who is assisting the ACC with an evaluation of the air quality section of the FEIS and the conformity determination. The ACC also has submitted, under separate cover, comments on the FEIS and copies of items which should be included in the administrative record for both the FEIS and the conformity determination. To the extent that the FAA is creating a separate record in support of its conformity determination, we request that the FAA incorporate by reference the record established for the FEIS.

Mr. Dennis Ossenkop
March 18, 1996 -- 5

If you have any questions about the issues raised in our comments or about specific concerns we have about the FAA's conformity analysis and determination, please feel free to contact me.

Sincerely,

Perry M. Rosen

Perry Rosen

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.

ENVIROMETRICS INC

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A M Brown
239 SW 189 Place
Normandy Park, WA 98166
30 April 1996

Mr. Dennis Ossenkop
Northwest Mountain Region FAA
1601 Lind Ave SW
Renton, WA 9855-4056

Dear Mr. Ossenkop,

Enclosed are my comments on the Draft General Conformity for the Sea-Tac Airport Runway and Associated Development Projects

References
(a)Supplement to the State Implementation Plan for Washington State, January 1993, Amendments June 1994

(b) Sea-Tac Airport Master Plan Update Draft Environmental Impact Statement (DEIS)

(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 EIS response appendix

(d) Sea-Tac Airport Master Plan Update Final Environmental Impact Statement (FEIS)

Having spent hundreds of hours reviewing the DEIS (ref. b) as well as a substantial number reviewing the FEIS (ref. d) and the SIP (ref. a), it is my opinion that the Master Plan is **noncompliant**. The number of significant omissions, incorrect pollution parameters and incorrect pollution baselines are so huge that even if they are ignored now, I believe a jury will conclude later that they exist.

The carbon monoxide calculations in the DEIS and EIS offer a good example of the degree of engineering soundness. They take a location that already exceeds safety limits (by the Red Lion) and ADD more pollution BUT end up with LESS pollution than it has now. Most people would expect it to show an increase in pollution which would still exceed safety standards. The trick to

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adding pollution but having calculations show a reduction is that instead of using a locations REAL pollution values, you use "accepted levels in other studies" according to EIS R-10-60. Note, these other studies use numbers for attainment zones. Ironically, if the DEIS hadn't reported the real current values elsewhere in the report, I wouldn't have realized how misleading the analysis was.

The complete impact of over 3000 truck trips per day plus all the associated construction equipment and traffic for YEARS in an non-attainment zone also needs to be fully addressed. These calculations need to be done using the actual pollution levels and then adding on the trucks/equipment using pollution parameters (emissions in grams per mile) consistent with the age of the trucks.

Additional monitoring is needed around the airport because data in the DEIS (ref. b) suggests it doesn't meet air toxin standards now.

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. To assume only 11 minutes as the EIS does is absurd (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 5 runway Denver airport which also reduces SAFETY. Considering it will have a dependent flight paths with two airports and requires taxing in and out across two active runways, 11 minutes is a gross understatement.

It would take years to write up all the problems with the EIS and I know your time is valuable so I hope I've given you enough examples to convince you to carefully scrutinize any EIS or Port data. Most of my comments in my approximately 100 page response to the DEIS are still applicable to the EIS. Even when the EIS agrees that I'm correct it generally does not bother to update its analyses (for example we don't live in cold climate homes so the whole noise model understates the areas impacted).

Sincerely,

A. Brown

Please include this in the Record of Decision

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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

REC'D ANM-610
PLAN, PGM, & CAP BR
MAR 20 1996
ANM-610 ________

March 18, 1996

Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue SW
Renton, WA 98055-4056

Dear Mr. Ossenkop:

The Regional Commission on Airport Affairs (RCAA) hereby responds to the notice posted on behalf of the Federal Aviation Administration at 61 Federal Register, No. 28 dated 9 February 1996, as to air quality issues related to the proposed projects of the Port of Seattle and FAA for expansion of Seattle-Tacoma International Airport. That notice states that it is issued as part of the process of environmental review and analysis required by 42 USC § 7506 (c) & 40 CFR § 93.15 & seq.

I. Notice is premature. We believe that the above referenced notice is untimely and therefore ineffective and should be withdrawn. Our understanding is that, contrary to the statement in the notice, the Port of Seattle has *NOT* adopted a Master Plan Update. In our view, the FAA cannot properly under the statute and the regulation until the proponent(s) has or have adopted a complete proposal. So far as we know, the Commissioners of the Port of Seattle have yet to consider the proposed Master Plan Update or the *FEIS* accompanying let alone to select among the alternatives presented by those documents, or to adopt any version of the Master Plan Update.

II. Comments ignored. The air quality section of the *FEIS* presents no discussion of the numerous comments on the air quality discussion of the *DEIS*. The existence of these comments is not acknowledged in the *FEIS* text, nor is the reader provided any reference to these comments or the responses thereto by the FEIS preparers. There is no indication that the preparers of the air quality section of the FEIS gave any consideration. It follows that there is no reason to suppose that the air quality people in the FAA who reviewed the FEIS were aware of those comments, or took them into consideration.

III. Air Quality work in the FEIS is inadequate. We believe that the air quality work done in the preparation of the *DEIS* and *FEIS* was not only inadequately reported but also was inadequately performed, that important pollutants and important sources of pollutants were not considered or properly analyzed, and the *FEIS* does not demonstrate the necessary compliance with Washington's "State Implementation Plan".

Sincerely,

Kristin M. Hanson

Kristin M. Hanson
Administrative Director

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March 27, 1996

VIA FACSIMILE

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

Re: Request for All Relevant Data and Extension of Period for Commenting 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 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 must again request that you provide to us all supporting materials and data that served as the basis for the Federal Aviation Administration's draft conformity determination for the proposed expansion of Seattle-Tacoma International Airport ("Sea-Tac" or the "Airport").

Given the extremely short period of time which the public has to comment on the FAA's conformity determination, having immediate access to the data underlying the conclusions is essential in order to provide meaningful comments. The ACC has not had such access in this case.

As we noted in our March 1, 1996 request, much of the data necessary to review the FAA's draft conformity determination was not published in the Final Environmental Impact Statement ("FEIS"), but instead was contained in separate computer files not provided with the document.

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Mr. Dennis Ossenkop
March 27, 1996
Page 2

Based on representations made in the FEIS, the ACC requested these computer files that purportedly contained the relevant traffic and modeling data supporting both the conformity analysis and determination and the overall air quality analysis. The ACC specifically requested that the FAA provide the necessary modeling data on computer diskettes and inform the ACC as soon as they were ready so that we could arrange to have them picked up from your office. This request was ignored, and the diskettes were included in a shipment of documents responsive to our ongoing Freedom of Information Act ("FOIA") request, sent by regular mail. As a result, we did not receive the data until March 11, just one week before the close of the comment period.

Now, after additional review of both the modeling analysis and the data received, it has become apparent that the ACC has not yet received all of the underlying data and information necessary to evaluate fully the legitimacy of the FAA's air quality and conformity analysis. Therefore, the ACC hereby requests any and all data and documents supporting or describing the analytical methods and assumptions used by the FAA, its consultant or the Port of Seattle in evaluating the impact of project-related surface traffic on air quality. This request includes, but is not limited to,

- traffic route assignment models and input data;
- actual separate route assignments for airport related and nonairport traffic;
- methodologies and assumptions used to estimate peak hour traffic volumes and detailed forecasts;
- approach and turn movement projections for all relevant intersections;
- methodologies used to translate aggregate daily traffic (airport and non-airport) into peak hour intersection approach volumes and turning movements;
- methodologies and assumptions used to estimate airport and non-airport traffic, with associated growth factors;
- methodologies and assumptions used to estimate the effects of the proposed Route 509 extension; and

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Mr. Dennis Ossenkop
March 27, 1996
Page 3

- bases for mode choice assumptions for each alternative analyzed.

This request is made pursuant to FOIA, 5 U.S.C. § 552,[1] and 40 C.F.R. § 51.856(c), the regulations implementing the general conformity requirement of the Clean Air Act.

In order to give the ACC a reasonable opportunity to review the modeling analysis prepared or adopted by the FAA, the ACC also respectfully requests additional time to provide comments on the draft conformity determination. While the FAA has extended the time for public comment until April 1 -- two weeks beyond the original due date -- this period clearly is inadequate. Notwithstanding the ACC's requests for data, it has become apparent that the computer files furnished by the FAA do not represent the complete data on which the draft conformity determination is based. As a result of this missing data and information, it is nearly impossible to independently confirm the validity of the conformity determination, thus defeating the very purpose of the comment period.

In light of our limited access to the underlying data, the minimal time available for review and the complexity of the analysis required to assess the draft conformity determination, the ACC respectfully requests that the FAA extend the period for public and agency comment on the conformity determination until May 2, 1996, or until 30 days after the ACC has received all of the material requested, which ever is later.

The ACC also requests that the FAA refrain from granting approval for any element of the proposed expansion or otherwise "supporting in any way," the project until the FAA performs a revised analysis in compliance with federal law and accepted modeling protocol.

Sincerely,

Perry M. Rosen

[1] This specific request is made in accordance with ¶ 5 of procedures agreed to by the Office of Assistant Chief Counsel, Federal Aviation Administration, Northwest Mountain Region. See letter from Denise D. Knapp, Attorney, to Peter J. Kirsch, Cutler & Stanfield (Nov. 17, 1993).

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April 2, 1996

VIA FACSIMILE

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

Re: Renewed Request for All Relevant Data and Meeting with FAA Consultants

Dear Mr. Ossenkop:

This letter memorializes our oral request made on March 29, 1996 to set up a meeting between the Federal Aviation Administration's air quality and traffic consultants and the Airport Communities Coalition's consultants to obtain the detailed modeling data and information which we requested.

It is our understanding that the FAA has indicated in discussions with other federal agencies that its consultants are available to speak with, or meet with, the public. The ACC respectfully requests an opportunity to take advantage of this access, and accordingly, our expert consultants are available for a meeting as soon as possible. The ACC's expert consultants are experienced with air quality and traffic modeling, and will be able to describe the information and data needed in an time efficient manner.

I understood from our conversation yesterday that the FAA had not made a final decision on whether the public would be allowed access to the FAA's consultants and the information that they possess. Since the FAA has extended the comment period only until May 3, 1996, access to all of the modeling information as

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soon as possible is critical. In light of the complexity of the air quality and traffic models which the FAA's consultants have been developing during the last several years, it is extremely burdensome to the ACC and to the public to be forced to obtain the underlying data and methodological information in a piecemeal fashion.

The Clean Air Act and applicable guidelines make it clear that the public should have access to the data and analysis -- in other words, to the record -- which the FAA relied upon in making its positive conformity determination. Merely providing access to the conclusions and incomplete, unintelligible data, which is specifically devoid of key methodological information and assumptions, is insufficient. Such limited access makes it nearly impossible for the public to understand how the agency reached its decision. The extremely short period of time provided to review the analysis, the gaps in the data and analysis, and the technical complexity of the model make it clear that a denial of access to the FAA's consultants here would constitute a denial of key information critical to the FAA's reasoning and the agency's basis for its decision.

Please contact me or Perry Rosen of our office at (202) 624-8400 should you have any questions or concerns. Again, given the limited time available to comment, we respectfully request that the FAA fax any response to us at (202) 624-8410.

Sincerely,

Thomas D. Roth

CUTLER & STANFIELD, L.L.P.

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April 8, 1996

BY FACSIMILE; ORIGINAL BY MAIL

Denise Dee Knapp, Esq.
Attorney ANM-7G
FAA Northwest Mountain Region
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Re: Freedom of Information Request
Our Reference Number NP-13

Dear Ms. Knapp:

Pursuant to the Freedom of Information Act, 5 U.S.C. § 552, we request access to, and copies of, the following documents and records. This request is in accordance with § 5 of procedures agreed to by letter dated November 17, 1993, from the Office of Assistant Chief Counsel, Federal Aviation Administration, Northwest Mountain Region.[1] As used in this request, the terms "records" and "documents," have the meaning generally ascribed to those terms under the Freedom of Information Act. When used herein, the terms "correspondence" or "communication" include any documents attached to, or referenced in, such correspondence or communication.

The subject matter of this request is any documents, records, correspondence or communications -- including letters transmitted to or from a third party, facsimile transmissions, telexes and the like -- relating to:

---

[1] See attached Letter from Denise D. Knapp, Attorney, Federal Aviation Administration, Northwest Mountain Region, to Peter J. Kirsch, Cutler & Stanfield (Nov. 17, 1993).

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Denise Dee Knapp, Esq.
April 8, 1996
Page 2

Comments on the Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport; and

Comments on the FAA's draft General Conformity Determination for the Proposed Master Plan Update Development Actions At Seattle-Tacoma International Airport prepared pursuant to Section 176(c) (42 U.S.C.A. § 7506c)of the Clean Air Act Amendments of 1990.

This request is limited to those documents which previously have not been provided pursuant to any earlier Freedom of Information Act requests including our "continuing FOIA request."

If this request is denied in whole or in part, we ask that you justify all deletions by reference to the specific exemptions of the Freedom of Information Act. See, e.g., Vaughn v. Rosen, 484 F.2d 820 (D.C. Cir. 1973), cert. denied, 415 U.S. 977 (1974). We will also expect that you will release all reasonably segregable portions of otherwise exempt material. We reserve the right, of course, to appeal your decision to withhold any information.

The Freedom of Information Act provides for a waiver or reduction of fees if disclosure could be considered as "primarily benefiting the general public." This firm represents the cities of Normandy Park, Tukwila, Burien, Federal Way and Des Moines, Washington, which are charged by law with protecting the interests of their residents. This request is made pursuant to our clients' discharge of their legal obligations to engage in efficient land use planning, to coordinate planning with nearby land uses, and to protect the health, safety, and welfare of their residents, and is not made for any commercial purpose.

The FAA Assistant Administrator for Public Affairs previously has determined that this firm "represents the public that is directly affected by the SeaTac airport development" and that "the disclosure of the information [requested] will contribute significantly to the public understanding of the operations or activities of the government."[2] We therefore request that the search and copying fees for this request be waived.

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[2] See attached Letter from Sandra Allen, FAA Assistant Administrator to David F. Goossen, Cutler & Stanfield (Aug. 12, 1994).

D-24

Denise Dee Knapp, Esq.
April 8, 1996
Page 3

We would appreciate your communicating with us by telephone or facsimile if you have any questions about this request. We will expect your reply within the ten business days allowed by the Act for your response.

Sincerely,

BARBARA PALEY

Enclosures

CUTLER & STANFIELD, L.L.P.
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April 9, 1996

VIA FACSIMILE

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

Re: Response to FAA Denial of ACC's Request for All Relevant Data and Meeting with FAA Consultants

Dear Mr. Ossenkop:

This letter is in response to your April 1, 1996 letter to Mr. Perry Rosen of our office and your April 3, 1996 letter to me concerning the Airport Communities Coalition's requests for information and data underlying the Federal Aviation Administration's draft positive conformity determination made pursuant to section 176 of the Clean Air Act.

The FAA's April 1, 1996 letter enclosed a memorandum from the agency's traffic consultants, INCA Engineers, Inc. (the "INCA Memorandum"), which purports to respond to our March 27, 1996 request for information and data.[1] You indicate that the INCA Memorandum contains the "additional information . . . requested" and "adequately addresses . . . questions regarding air quality and traffic modeling." Your April 3, 1996 letter also denied the ACC's request for a meeting between our

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[1] Please note that neither the facsimile copy nor the mailed copy of the INCA Memorandum contained "attachment 1" referenced on page 3 of the memorandum; thus, we request that the FAA provide a copy of this document to us as soon as possible.

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Mr. Dennis Ossenkop
Federal Aviation Administration
April 9, 1996
Page 2

respective consultants on the basis that "[the FAA] do[es] not believe that a meeting is necessary."

After reviewing the INCA Memorandum carefully with our traffic consultants, we are concerned that the FAA continues to withhold important information and data which it relied upon in performing its air quality analysis and in making its conformity determination. We also continue to believe that in light of the ACC's difficulty in obtaining all data and information which the FAA relied upon, and the short period of time available to provide comments, a meeting between our consultants is necessary.

The thrust of the INCA Memorandum is that the information requested is contained in the appendices to Appendix O of the FEIS. In fact, critical information requested is <u>not</u> in the FEIS, Appendix O or in any other appendices. For example, INCA acknowledges in its memorandum that key "data files were not provided in the bibliography of reference material (sic), as the model is licensed to INCA." The TRAFFIX license, however, protects only the program itself, not input or output files. Withholding data files because the modeling software is licensed is akin to withholding computer files written in WordPerfect solely because the WordPerfect software is licensed. Like WordPerfect software license, a TRAFFIX software license is not exclusive and can be obtained easily. Thus, the data files -- <u>which the FAA and its consultant relied upon to make its conformity determination</u> -- simply can not be cloaked from public review, inspection and analysis on this basis.

The documentation and data files provided to date provide a broad overview of the methodological process of the ground transportation and air quality analysis. In a number of cases, however, information that provides the clear path of derivation for or linkage between the data files that were made available, appears to be missing. In other cases, data files are provided in such summary form that it is nearly impossible to replicate the analysis.

An example of this is Table O-B-2 which presents a summary of the origin-destination pattern of airport traffic. In this table, the local communities in the Airport vicinity (SeaTac, Renton, Kent, Des Moines) that purportedly account for 62 percent of Airport-generated traffic are presented as a single aggregate entity. Lumping the information together in this fashion impedes the ability of the public or other governmental bodies to perform alternative traffic analyses using the FAA's data.

Mr. Dennis Ossenkop
Federal Aviation Administration
April 9, 1996
Page 3

As another example, it appears that no document or data file was provided which shows the airport-related traffic for 1995 broken down into key categories such as passenger-related, employee, air cargo, airfield operations, general aviation, maintenance, other airport and "pipeline" or background. While Table O-B-1 provides this type of breakdown, it contains traffic data only for 1994. Moreover, it provides only "ADT," not p.m. peak hour, and several of the desired categories are missing or unreported. Information of this nature is needed to permit our consultants to properly reconstruct and verify the FAA's ground transportation and air quality analysis.

It should also be noted that nothing in the FAA's analysis describes basic assumptions and methodologies used by the agency or INCA in "running" the model. As is true with any computer model, the FAA's conclusions and analysis are based on this information as much as the traffic data input. For that reason, the ACC believes that a meeting between our respective consultants is essential to provide a complete picture of the FAA's air quality and conformity analysis. Below we have listed some sample questions that our consultants would be likely to ask at such a meeting:

- How were the CAL3QHC files developed from the intersection approach and turning volumes in the INCA appendices?
- What methodology was used to segregate non-airport traffic from airport traffic in the PSRC 1995 MTP forecasts?
- How was the August peak ratio obtained for cargo operations?
- What are the details of the airport traffic origin-destination patterns summarized on Table O-B-2? Please provide zone map and O-D airport trip matrices for the area summarized as "airport vicinity."
- What were the path inputs and percentages of trip exchanges assigned to each path for distributing the various categories of airport traffic in the TRAFFIX model under each of the airport development alternatives?

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Mr. Dennis Ossenkop
Federal Aviation Administration
April 9, 1996
Page 4

- Were the same "background" traffic volumes assigned for parallel scenarios of the no build and preferred alternatives in each of the forecast years? If not, what were the differences?

Answers to these and other inquiries regarding INCA's methodological approach would fill in numerous gaps between the raw data and the seemingly counter-intuitive conclusions which INCA has reached. As we noted in our earlier correspondence, this type of information is critical to understanding the agency's reasoning and basis for its decision.

Therefore, on behalf of the ACC, we respectfully renew our requests (1) for a meeting between our respective expert consultants, to be scheduled as soon as possible, and (2) for all relevant data, including specifically, the input and output files for the TRAFFIX model. Our consultants in Seattle are prepared to pick up the data at your offices or at INCA's offices on a few hours notice.

Please contact me or Perry Rosen should you have any questions or concerns. Again, in light of the May 2, 1996 deadline for comments, we respectfully request that you fax your response.

Sincerely,

Thomas D. Roth

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April 18, 1996

VIA FACSIMILE

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

Re: Follow up on Request for Information

Dear Mr. Ossenkop:

In our letter dated April 9, 1996, we requested all "zone" maps which the FAA used in its air quality and draft conformity analysis for the proposed expansion of Sea-Tac International Airport. This information was not included in the computer disks which you provided to us on April 11, 1996, nor was it contained in any written response which the FAA has provided to date.

In addition, the information made available to us does not appear to include a definition for each of the 33 subzones identified in the alternatives analyses. For instance, we surmise that the subzone "NAC Trucks," identified on a typical "Trip Generation Report" means "truck traffic from North Cargo Terminal," but this definition is not stated anywhere in the analysis.

Therefore, we request that the FAA provide all zone maps as well as definitions of the 33 subzone categories utilized in each of the alternatives analyses.

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Mr. Dennis Ossenkop
Federal Aviation Administration
April 18, 1996 - 2

Please contact me should you have any questions regarding this inquiry. As in the past, we respectfully request that you fax your response.

Sincerely,

Thomas D. Roth

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May 1, 1996

extended till 5/23

D-28

VIA FACSIMILE

Mr. Lowell Johnson
Airports Division Manager
Mr. Dennis Ossenkop
Environmental Protection Specialist
Federal Aviation Administration
Northwest Mountain Region
Airports Division
1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

Re: Request for Extension of Period for Commenting on the FAA's Draft Clean Air Act General Conformity Determination for the Proposed Expansion of Seattle-Tacoma International Airport

Gentlemen:

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 an extension of time to provide comments on the Federal Aviation Administration's draft general conformity determination for the proposed expansion of Seattle-Tacoma International Airport ("Sea-Tac" or the "Airport").

Despite the ACC's persistent efforts to obtain all relevant data and modeling information that the FAA relied upon in making its determination, we have received key traffic data files from the FAA only within the last few weeks. Moreover, the FAA has provided the requested information in a piecemeal and disjointed fashion that has impeded our efforts to review and evaluate the agency's analysis and modeling.

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Mr. Lowell Johnson
Mr. Dennis Ossenkop
May 1, 1996
Page 2

The FAA's conformity analysis and determination for Sea-Tac is one of the first determinations made by the agency under EPA's new general conformity rules. Thus, the methodology used here has important implications not only for the Seattle area, but for all areas around the country that are contemplating major airport expansions. This fact heightens the importance of providing an adequate and fair period of time to review, analyse and provide comments on the agency's determination.

In light of the difficulty we have had in obtaining the needed data, and the fact that we have had only a few weeks to review the FAA's analysis (since the receipt of the requested data and information), we respectfully request that the period for submitting public and agency comments on the draft conformity determination be extended until June 3, 1996. Given the Puget Sound Regional Council's recent decision to postpone any vote on amending the Regional Airport System Plan until at least mid-July, an additional 30 day comment period would not delay the project or otherwise prejudice the agency, other agencies or any other interested parties. In fact, we understand that the federal Environmental Protection Agency has requested an additional extension of the comment period as well.

If an extension is not granted, we would need to send our comments and supporting documents to the FAA in Seattle by overnight mail by the close of business today in order for it to arrive by May 2, 1996 deadline. As a courtesy, we therefore request that you fax a response to us by the close of business today. If you have any questions or concerns, please feel free to call me at (202) 624-8400.

Sincerely,

Thomas D. Roth

CC: Mr. David Field, FAA

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SAFETY & STANDARDS BR
MAY 20 1996
ANM-610

May 15, 1996

Dennis Ossenkop
FAA
1601 Lind Ave.
Renton, WA 98055

Subject: Sea Tac Airport Master Plan Update and a Third Runway Extension of Public Comment Period on Conformity to the Clean Air Act

Dear Mr. Ossenkop:

Concerning your first Public Notice dated 2-17-96 about the above mentioned conformity, I wish to make the following important comment:

> The question is - "what siting of a new runway and landside facilities will do to air quality in the local communities surrounding the airport". The question is NOT - "what siting will do to air quality in the REGION" (i.e. averaged over four counties).

The "Final Report: Air Quality Survey Sea Tac Airport, January 1995" is a consultant's study from which you draw your conclusion that there will be no delay in "timely attainment of the ozone or CO standards in the Puget Sound REGION", or in other words, a third runway will not adversely impact air quality. Besides disagreeing with the regional thrust, I find several weaknesses in this "Final Report". Such as follows:

1. The "Final Report" on air quality consisted of 4 days of air sampling in 1993 - on one Monday morning, one Tuesday morning, one Tuesday afternoon and one Friday afternoon. All four days were near the end of the year. The obvious weakness here is failing to sample in the four seasons and conclusions drawn from only 4 half days of sampling.

2. The reason given for this "Final Report" study was to allay community concern about decreasing air quality. Yet, of the 10 locations at which sampling was done on those 4 days, only one location was in a residential area. And that residential sampling was 2 miles from airport property. On 3 sides and within a 2 mile radius of the airport live thousands of people much closer to the airport than the residential site chosen for sampling. Some schools are also located within this 2 mile radius. One obvious weakness here is limited sampling in the impacted residential areas. One location site for sampling was at Gate 3, others were on or at the edge of airport property. People don't live in these locations, so what's the point of this kind of sampling in order to "allay community concern"?

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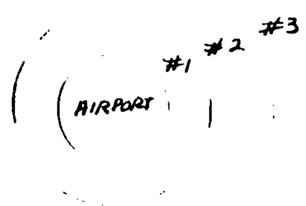
3. Toxic pollutants tested were VOC's (including benzene), CO, and carbonyls (including formaldehyde). Benzene was found in every sample. Formaldehyde was found in all samples. Many of the samples exceeded the ASIL's (acceptable source impact levels).

4. In the "Final Report, whenever the data show higher concentrations of toxic aircraft emissions than conformity standards, our community is told not to worry, we are no worse off than "other urban areas". To be no more polluted than other polluted areas is no comfort and no excuse.

In my opinion, although the report is called a "Final Report", it is a preliminary assessment which establishes a need for additional, more in-depth information about the possible perils of living in a community next to an airport.

Our community asks for further, extensive, definitive air quality studies. And in these studies keep any comparisons within our own residential area around the airport. I suggest a map be drawn as a circular plot:



13

and in each concentric area, a risk factor be determined. That is, if a resident in an area is exposed to a certain number of jet operations, then his chances of getting cancer or lung disease (or other illness) are one in so many thousands. This study and an explanatory map to go along with it will show if health risks are greater if one lives nearer Sea Tac Airport.

Sincerely yours,

Barbara Stuhring

Barbara H. Stuhring
24828 9th Pl. S.
Des Moines, WA 98198

cc: EPA
PSRC

P.S. Mr. Ossenkop - Please send me information about the Federal Air Quality Conformity Determination which is mentioned at the beginning of the Final EIS. Is there an actual certificate form which you will have to check off and sign? What is the procedure you will have to follow? Thank you for this information.

NOTICE OF AVAILABILITY
FINAL ENVIRONMENTAL
IMPACT STATEMENT
MASTER PLAN UPDATE
SEATTLE-TACOMA
INTERNATIONAL AIRPORT
SEATTLE, WASHINGTON

Agencies. Federal Aviation Adation (FAA) and the Port of

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 a third parallel runway (Runway 16X/34X) with a length of up to 8,500 feet, separated by 2,500 feet from existing Runway 16L/34R, with associated taxiways, utilities, and navigational aids. Other proposed development includes: extension of Runway 34R by 800 feet; establishment of standard Runway Safety Areas for Runways 16R/34L and 16L/34R; development of a new air traffic control tower; Main Terminal improvements and terminal expansion; development of a new unit terminal located to the north of the existing main terminal; 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. A Final Environmental Impact Statement has been prepared by the FAA and the Port of Seattle which accesses the impact of alterna-

'rport improvements. The pro- improvements would be completed during the 1996-2020 period, with initial 5-year development focused on the new parallel runway, and existing passenger terminal, parking and access improvements. As is noted in the *Final EIS*, the preferred alternative and all development alternatives will result in wetland filling, floodplain encroachment, stream relocation and property acquisition.

Copies of the seven volume Final EIS are available for review at the following locations:

- Federal Aviation Administration, Airports Regional Office, Room 540, 1601 Lind Avenue SW, Renton Wa
- Port of Seattle, Aviation Planning, 3rd 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 182nd, Bothell
- Boulevard Park Library, 12015 Roseberg South, Seattle

rien Library, 14700 - 6th SW, Buri-
en

- Des Moines Library, 21620 - 11th South, Des Moines
- Federal Way Regional Library, 34200 - 1st South, Federal Way
- Foster Library, 4205 South 142nd, 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 Library, 17210 Vashon Highway, Vashon
- West Seattle Library, 2306 - 42nd 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).

Published in the Highline News/Des Moines News on February 17, 1996.

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NOTICE OF AVAILABILITY
DRAFT CLEAN AIR ACT
GENERAL CONFORMITY
DETERMINATION
SEATTLE-TACOMA
INTERNATIONAL AIRPORT
SEATTLE, WASHINGTON

Lead Agency: Federal Aviation Administration (FAA)

Action: FAA's proposed action includes: 1) approval of the Airport Layout Plan (ALP) for the proposed improvements at Sea-Tac International Airport; 2) provide possible federal funding for eligible projects contemplated within the planning horizon as illustrated on the ALP; 3) development or revision of air traffic control procedures for the proposed improvements; and 4) establishment of navigational aids. The Port of Seattle, as operator of the airport, will design and build the proposed improvements. Because these actions are necessary for federal-funded public use airports, the FAA is required to meet the Clean Air Act (CAA) general conformity requirements under 40 Code of Federal Regulations, Part 93, Subpart B for the federal action for this undertaking.

Abstract: 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 a third parallel runway (Runway 16X/34X) with a length of up to 8,500 feet, separated by 2,500 feet from existing Runway 16L/34R, with associated taxiways, utilities, and navigational aids. Other proposed development includes: extension of Runway 34R by 800 feet; establishment of standard Runway Safety Areas for Runways 16R/34L and 16L/34R; development of a new air traffic control tower; Main Terminal improvements and terminal expansion; development of a new terminal located to the north of the existing main terminal; 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. A Final Environmental Impact Statement has been prepared which assesses the impact of alternative airport improvements. The proposed improvements would be completed during the 1996-2020 period, with initial 5-year development focused on the new parallel runway, and existing passenger terminal, parking and access improvements.

Based on the conformity applicability criteria and the attainment status of the affected area, the conformity determination focuses on potential air emissions of carbon monoxide (CO), and ozone. Based on the air quality analysis provided in the Final Environmental Impact Statement, the Federal Aviation Administration has determined that the proposed improvements at Sea-Tac International Airport conform to the Washington State Implementation Plan (SIP) and Ambient Air Quality Standards. The analysis of the proposed improvements at Sea-Tac has demonstrated that, with mitigation, the proposed improvements will not cause or contribute to new violations of any ambient air quality standards, nor increase the frequency or severity of an existing violation; nor delay timely attainment of the ozone or CO standards in the Puget Sound Region, and that the action is in compliance or consistent with all relevant requirements and milestones contained in the SIP. This conclusion of a positive general conformity determination fulfills the FAA's obligation and responsibility under 40 CFR Part 93, Subpart B. This General Conformity Determination has been prepared as specified in Section 176(c)(42 USC 7506c) of the Clean Air Act Amendments of 1990.

mouse, rat NTPTR* NTP-TR-289,86. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory. On Community Right-To-Know List.

OSHA PEL: (Transitional: TWA 10 ppm; CL 25 ppm; Pk 50 ppm/10M) TWA 1 ppm; STEL 5 ppm; Pk 5 ppm/15M/8H; Cancer Hazard
ACGIH TLV: TWA 10 ppm; Suspected Human Carcinogen; BEI: 50 mg(total phenol)/L in urine at end of shift recommended as a mean value.
DFG TRK: 5 ppm (16 mg/m³) Human Carcinogen.
NIOSH REL: TWA 0.32 mg/m³; CL 3.2 mg/m³/15M
DOT Classification: Flammable Liquid; Label: Flammable Liquid.

SAFETY PROFILE: Confirmed human carcinogen producing myeloid leukemia, Hodgkin's disease, and lymphomas by inhalation. Experimental carcinogenic, neoplastigenic, and tumorigenic data. A human poison by inhalation. An experimental poison by skin contact, intraperitoneal, intravenous, and possibly other routes. Moderately toxic by ingestion and subcutaneous routes. A severe eye and moderate skin irritant. Human systemic effects by inhalation and ingestion: euphoria, somnolence, changes in REM sleep, changes in motor activity, nausea or vomiting, reduced number of blood platelets, other unspecified blood effects, dermatitis, and fever. Experimental teratogenic and reproductive effects. Human mutation data reported. A narcotic. In industry, inhalation is the primary route of chronic benzene poisoning. Poisoning by skin contact has been reported. Recent (1987) research indicates that effects are seen at less than 1 ppm. Exposures needed to be reduced to 0.1 ppm before no toxic effects were observed. Elimination is chiefly through the lungs. A common air contaminant.

A dangerous fire hazard when exposed to heat or flame. Explodes on contact with diborane, bromine pentafluoride, permanganic acid, peroxomonosulfuric acid, and peroxodisulfuric acid. Forms sensitive, explosive mixtures with iodine pentafluoride, silver perchlorate, nitryl perchlorate, nitric acid, liquid oxygen, ozone, arsenic pentafluoride + potassium methoxide (explodes above 30°C). Ignites on contact with sodium peroxide + water, dioxygenyl tetrafluoroborate, iodine heptafluoride, and dioxygen difluoride. Vigorous or incandescent reaction with hydrogen + Raney nickel (above 210°C), uranium hexafluoride, and bromine trifluoride. Can react vigorously with oxidizing materials, such as Cl_2, CrO_3, O_2, $NClO_4$, O_3, perchlorates, ($AlCl_3$ + $FClO_4$), (H_2SO_4 + permanganates), K_2O_2, ($AgClO_4$ + acetic acid), Na_2O_2. Moderate explosion hazard when exposed to heat or flame. Use with adequate ventilation. To fight fire, use foam, CO_2, dry chemical.

Poisoning occurs most commonly via inhalation of the vapor, although benzene can penetrate the skin and cause poisoning. Locally, benzene has a comparatively strong irritating effect, producing erythema and burning, and, in more severe cases, edema and even blistering. Exposure to high concentrations of the vapor (3000 ppm or higher) may result from failure of equipment or spillage. Such exposure, while rare in industry, may cause acute poisoning, characterized by the narcotic action of benzene on the central nervous system. The anesthetic action of benzene is similar to that of other anesthetic gases, consisting of a preliminary stage of excitation followed by depression and, if exposure is continued, death through respiratory failure. The chronic, rather than the acute form, of benzene poisoning is important in industry. It is a recognized leukemogen. There is no specific blood picture occurring in cases of chronic benzol poisoning. The bone marrow may be hypoplastic, normal, or hyperplastic, the changes reflected in the peripheral blood. Anemia, leucopenia, macrocytosis, reticulocytosis, thrombocytopenia, high color index, and prolonged bleeding time may be present. Cases of myeloid leukemia have been reported. For the worker, repeated blood examinations are necessary, including hemoglobin determinations, white and red cell counts, and differential smears. Where a worker shows a progressive drop in either red or white cells, or where the white count remains low, 5,000/mm³ or the red count <4.0 million/mm³, on two successive monthly examinations, the worker should be immediately removed from benzene exposure. Elimination is chiefly through the lungs, when fresh air is breathed. The portion that is absorbed is oxidized, and the oxidation products are combined with sulfuric and glycuronic acids and eliminated in the urine. This may be used as a diagnostic sign. Benzene has a definite cumulative action, and exposure to a relatively high concentration is not serious from the point of view of causing damage to the blood-forming system,

provided the exposure ... poisoning, the worker ... dizzy, complains of tigh... and of pressure over th... has a stage of exciteme... exposed, he quickly ... lapses into coma. In a... is usually complete wi... ly. In chronic poisonin... the symptoms vague: f... ness, nausea and loss of... and weakness are com... cases. Later, pallor, nos... hemorrhagia, petechia... velop. There is great in... signs and symptoms of ... ing.

BB... BE... mf... PRC... and ... for ... mp ... 1.5... 1.528, flash p: 154°F ... in alc, ether, propylen... in two parts of 80% alc...

SYNS: ...

CONSENSUS REPO... TSCA Inventory.

SAFETY PROFILE: M... tion. Human skin irrit... When heated to deco... smoke and irritating fu...

BBP000 CAS ...
BENZENE-1,3-DIIS(...
mf: $C_8H_4N_2O_2$ mw ...

SYNS: 1,3-DIISOCYANAT... ... m-PHENYLENE DI... YLENE ISOCYANATE

CONSENSUS REPO... TSCA Inventory. Cy... are on the Communi...

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...of in water; insol in ..., chloroform, ether...

...NSENSUS REPORTS: ... CA Inventory.

...FETY PROFILE: Poison by ... intravenous routes. Exper... ...ic and reproductive effect... ...orted. When heated to decom... ...ic fumes of NO_x.

...ONSENSUS REPORTS: ... ...logy Program. EPA ... ...bstances List.

...SHA PEL: TWA 0.1 mg/... ...CGIH TLV: TWA 0.1 mg/...

...AFETY PROFILE: Poison ... ...ntact, and possibly other ... ...le. When heated to deco... ...ry toxic fumes of PO_x ...

...SUS REPORTS: Community Right-to-Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

... PROFILE: Human poison by intravenous ... Human systemic effects by intravenous ... muscle contractions or spasticity ... Questionable carcinogen with experimental neoplastigenic and tumorigenic data. ... data reported. When heated to decomposition it emits very toxic fumes of NH_3, NO_x, ... of ...

FORMALDEHYDE CAS: 50-00-0 HR: 3

... UN 1198/UN 2209
... mw: 30.03

... Clear, water-white, very slightly acid gas ... pungent odor. Pure formaldehyde is not available commercially because of its tendency to polymerize. It is sold as aqueous solutions containing from 37% to 50% formaldehyde by weight and varying amounts of methanol. ... solutions are used industrially and ... physical properties and hazards may be ... affected by the solvent. Lel: 7.0%, ... autoign temp: 806°F, d: 1.0, bp: ... flash p: (37% methanol-free): 185°F, flash p (15% methanol-free): 122°F.

SYNS: ... (FRENCH) ◆ AL... (ITALIAN) ◆ BFV ◆ FA... ◆ FORMALDEHYD (CZECH, POLISH) ◆ ... (DOT) ◆ FORMALIN ◆ ... (DUT) ◆ FORMA... ◆ ... (GERMAN) ◆ FORMALITH ◆ ... ◆ FIRMOL ◆ FYDE ◆ ... ◆ KARSAN ◆ LYSOFORM ◆ ... ◆ METHYL ALDEHYDE ◆ METHY... ◆ METHYLENE OXIDE ◆ MORBO... ◆ ... (DUTCH) ◆ ... ◆ OXYMETHYLENE ◆ PARA... ◆ ... GLYCOLS ◆ SUPERLYSOFORM

CONSENSUS REPORTS: IARC Cancer Review: GROUP 2A IMEMDT 7,211,87; Human Inadequate Evidence IMEMDT 29,345,82; Animal Sufficient Evidence IMEMDT 29,345,82. NTP Fourth Annual Report On Carcinogens, 1984. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 1 ppm; STEL 2 ppm (For certain industries: TWA 3 ppm; CL 5 ppm; Pk 10 ppm/30M

ACGIH TLV: TWA 1 ppm; Suspected Human Carcinogen (Proposed: CL 0.3 ppm; Suspected Human Carcinogen)

DFG MAK: 0.5 ppm (0.6 mg/m³); Suspected Carcinogen.

NIOSH REL: (Formaldehyde) Limit to lowest feasible level.

DOT Classification: Combustible Liquid; Label: None; ORM-A; Label: None; Flammable or Combustible Liquid; Label: Flammable Liquid.

SAFETY PROFILE: Confirmed carcinogen with experimental carcinogenic, tumorigenic, and teratogenic data. Human poison by ingestion. Experimental poison by ingestion, skin contact, inhalation, intravenous, intraperitoneal, and subcutaneous routes. Human systemic effects by inhalation: lacrimation, olfactory changes, aggression and pulmonary changes. Experimental reproductive effects. Human mutation data reported. A human skin and eye irritant. If swallowed it causes violent vomiting and diarrhea which can lead to collapse. Frequent or prolonged exposure can cause hypersensitivity leading to contact dermatitis, possibly of an eczematoid nature. An air concentration of 20 ppm is quickly irritating to eyes. A common air contaminant.

Combustible liquid when exposed to heat or flame; can react vigorously with oxidizers. A moderate explosion hazard when exposed to heat or flame. The gas is a more dangerous fire hazard than the vapor. Should formaldehyde be involved in a fire, irritating gaseous formaldehyde may be evolved. When aqueous formaldehyde solutions are heated above their flash points, a potential for an explosion hazard exists. High formaldehyde concentration or methanol content lowers the flash point. Reacts with NO_2 at about 180°, the reaction becomes explosive. Also reacts violently with perchloric acid + aniline, performic acid, nitromethane, magnesium carbonate, H_2O_2. Moderately dangerous,

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THE SEATTLE TIMES NATION FRIDAY, APRIL 28, 1995

Study finds ozone in smog poses health threat to kids

BY A.J. HOSTETLER
Associated Press

ATLANTA — One in four children is at risk for health problems because ozone in their communities exceeds government standards, health officials say.

The risk to minorities is greater because they are more likely to live in cities where ozone limits are exceeded, such as Los Angeles, New York City, Atlanta, Houston and Detroit, the federal Centers for Disease Control and Prevention reported yesterday.

Although ozone in the upper atmosphere forms a protective barrier against ultraviolet radiation, at lower levels it is a major component of smog and causes respiratory problems and irritation of the eyes and mucous membranes.

Levels of the pollutant dropped by 12 percent from 1984 to 1993, but 104 counties and cities still exceeded the limit during 1991-1993, according to the Environmental Protection Agency.

About 12.1 million children ages 13 and younger, or 24 percent of the nation's total in that age group, lived in those polluted communities, the CDC said.

"Children, even healthy children, are at risk because they're exposed to ozone when their lungs are still developing," said Mary White of the CDC's Air Pollution and Respiratory Health Branch.

The health hazard to children is also higher because they spend more time outdoors, she said.

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May 28, 1996

VIA FACSIMILE

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

Re: Follow up on Request for Information Related to the FAA's Draft General Conformity Determination for the Proposed Expansion of Sea-Tac

Dear Mr. Ossenkop:

Our analysis of the air quality modeling which the Federal Aviation Administration ("FAA") included in the Final Environmental Impact Statement ("FEIS"), and which has been offered in support the FAA's draft general conformity determination for the proposed Sea-Tac expansion, indicates that we still have not received critical information needed to understand the FAA's conclusions. This information was not included in the documents and computer disks which you have provided to us, nor was it contained in any written response which the FAA has provided to date.

Therefore, we request that the FAA provide us with the following documents and data:

- the actual output files which were used in developing the tables reported in Appendix D of the FEIS;[1]

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[1] This information is necessary because none of the EDMS output files provided previously contain the data used by the FAA to develop the tables in Appendix D. For example, the output

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- the plots of all runs of the Puget Sound Regional Council's ("PSRC") regional travel model used in developing the Traffix model forecasts (including the latest data used) and including an index indicating which runs were used for each Traffix forecast;
- a file listing all growth factors used in estimating the growth of base traffic for each Traffix run and for shifts of base traffic in response to the Route 509 extension; and
- a description of how the growth factors were derived from the PSRC model runs and identification of which factors were applied to each intersection and each turning movement in preparing the base traffic input to each Traffix model run.

As we previously have stated, the Clean Air Act and applicable guidelines make it clear that the public should have access to the data and analysis which the FAA relied upon in making a positive conformity determination. Providing incomplete, piecemeal data which is specifically devoid of key methodological information and assumptions severely impedes the public's ability to understand how the agency reached its determination. In light of the June 6 deadline for submitting comments, we would appreciate receiving this information as soon as possible.

Please contact me should you have any questions regarding this inquiry. As in the past, we respectfully request that you fax your response.

Sincerely,

Thomas D. Roth

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files provided contain partial reports, e.g., for a single wind direction, or, in at least one case, only an "error" message.

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ANM-610

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

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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

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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[1/]

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.

[1/] 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.

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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.

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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.

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.

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,

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

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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 <u>increase</u> 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. <u>See</u> 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. <u>See Id.</u>

- 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 <u>no</u> impact on the level of traffic at the airport. At a minimum, <u>arriving</u> 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

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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.

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.[5]

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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[5] 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.

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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

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JUN - 6 1996
ANM-610

Air Quality Conformity Review

for

Sea-Tac Master Plan Update

Prepared for

Airport Communities Coalition

June 5, 1996

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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.

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.

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[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.

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.

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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

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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

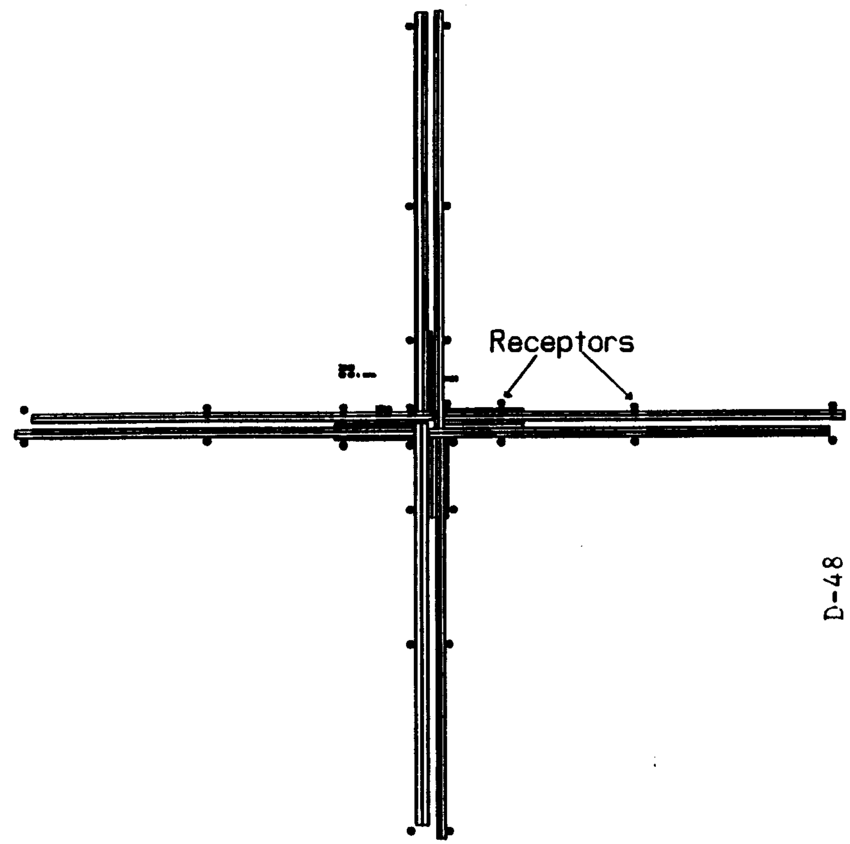
	Terminal South	Terminal Hotel	Highline Nurseries	SeaTac Reservoir	SeaTac Indus Pk	Des Moines Creek Pk	Existing 154th St.	Future 154th St.	188th St. (E)	188th St. (W)	North Terminal
Do Nothing											
Airport Sources	0.00	0.00	0.01	0.01	0.01	0.01	0.08	N/A	0.03	0.01	N/A
Roadway Sources	0.02	0.03	0.01	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	0.05	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	0.02	0.02	0.02	0.02
Total Project	0.04	0.04	0.04	0.04	0.04	0.04	N/A	0.07	0.06	0.05	0.04
Incr Pass Project											
Airport Sources	0.00	0.01	0.01	0.01	0.01	0.01	N/A	0.04	0.05	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 Incr 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



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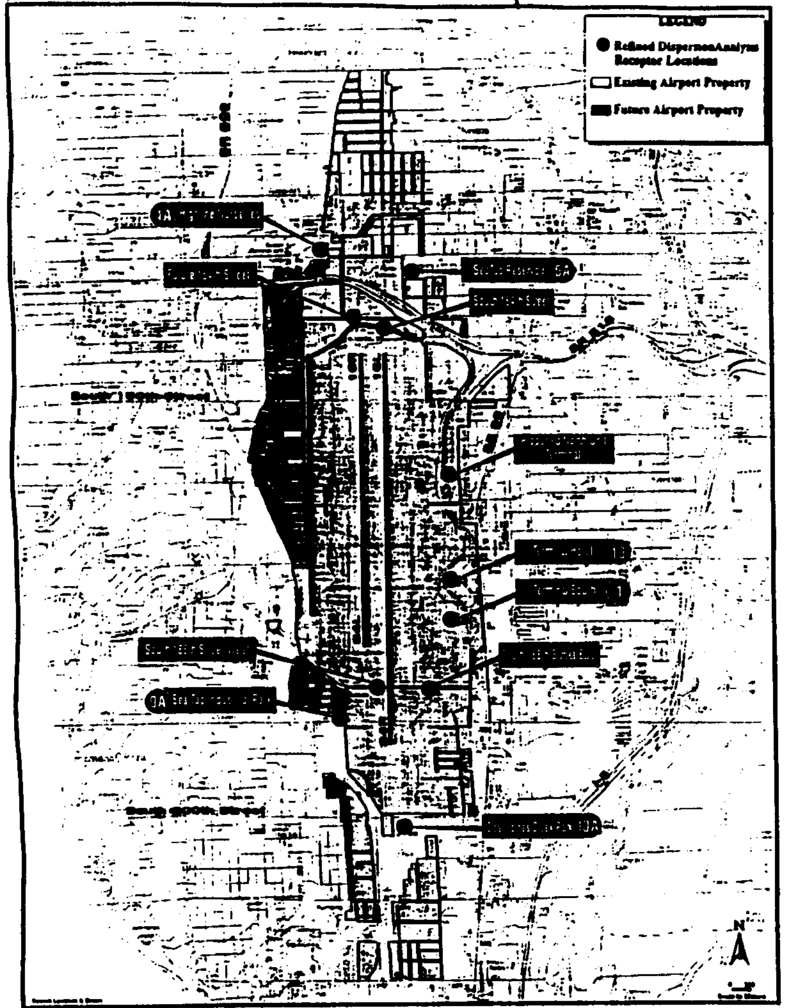
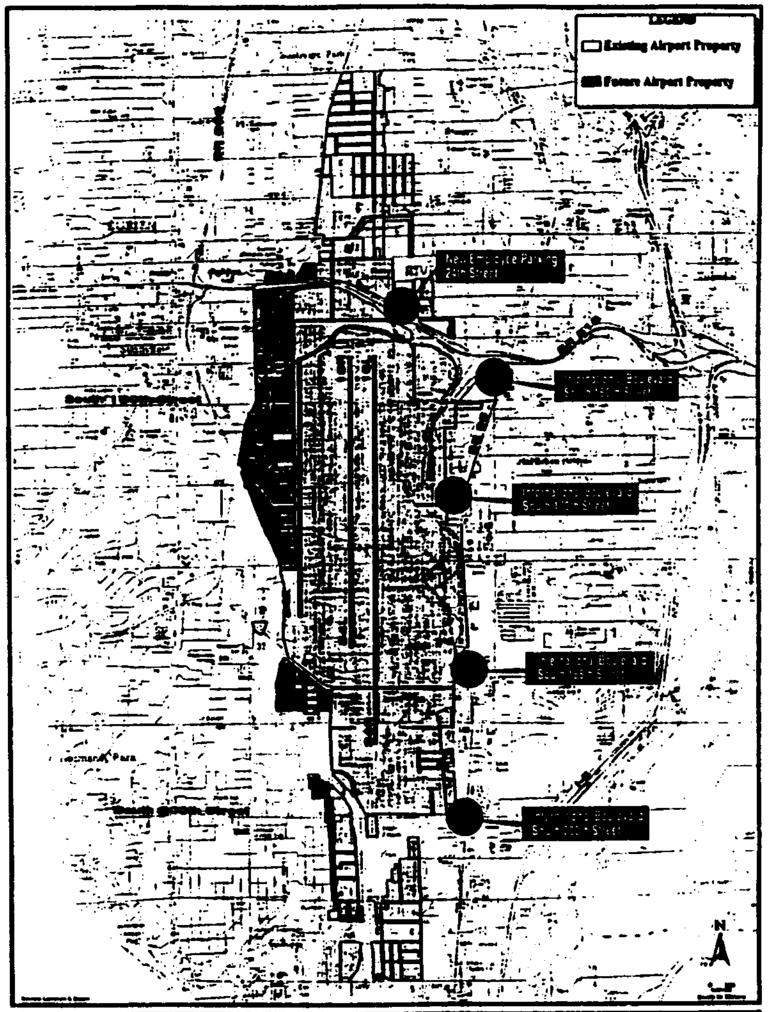


Seattle - Tacoma International Airport

Refined Dispersion Analysis Receptor Locations

EXHIBIT: IV.9-1



Seattle - Tacoma International Airport

Roadway Intersection Dispersion Analysis

EXHIBIT: IV.9-2

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: SR99 AND 160TH ST. (2010 W/mitigation S- RUN: SR99 & 160TH ST.w/mit S-EH

DATE : 5/20/96
TIME : 10:30:35

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	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	786.	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	3.0	1.01	11.7
4. SR99 NB Depart	4.4	-.7	66.4	300.3	307.	12.	AG	2217.	28.3	.0	12.0		
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	9.0		
7. SR99 SB QueueTH	-6.0	11.2	21.6	145.9	137.	12.	A	703.	100.0	.0	6.0	.96	22.9
8. SR99 SB QueueRT	-10.6	12.2	-9.6	16.9	5.	12.	AG	102.	100.0	.0	3.0	.09	.8
9. SR99 SB Queue Left	.1	10.1	28.6	146.8	140.	12.	AG	1361.	100.0	.0	6.0	1.09	23.3
10. SR99 SB Depart	-5.6	2.6	-56.4	-296.4	303.	189.	AG	1879.	28.3	.0	15.0		
11. 160 EB Approach	-301.1	2.8	-14.9	-3.5	286.	91.	AG	648.	28.3	.0	12.0		
12. 160 EB QueueT R	-3.5	-14.9	-87.0	-11.7	84.	273.	AG	1326.	100.0	.0	6.0	.81	8.9
13. 160 EB Queue Left	-14.7	-1.5	-211.0	10.5	197.	273.	AG	681.	100.0	.0	3.0	1.17	32.8
14. 160 EB Depart	-2.4	-3.8	299.6	6.6	302.	88.	AG	862.	28.3	.0	12.0		
15. 160 WB Queue Left	10.5	2.0	50.7	3.4	40.	88.	AG	739.	100.0	.0	3.0	.99	6.7
16. 160 WB Approach	299.6	14.8	10.5	5.0	289.	268.	AG	864.	28.3	.0	9.0		
17. 160 WB Queue TH	10.5	5.0	356.7	18.8	346.	88.	A	739.	100.0	.0	3.0	1.92	57.7
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	482.	28.3	.0	12.0		

JOB: SR99 AND 160TH ST. (2010 W/mitigation S- RUN: SR99 & 160TH ST.w/mit S-EH PAGE 2

DATE : 5/20/96
TIME : 10:30:35

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	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 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: SR99 AND 160TH ST. (2010 W/mitigation S-   RUN: SR99 & 160TH ST.w/mit S-EN

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	5.5	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	13.6	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

JOB: SR99 AND 160TH ST. (2010 W/mitigation S-   RUN: SR99 & 160TH ST.w/mit S-EN

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	11.5	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	5.0	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.

JOB: SR99 AND 160TH ST. (2010 W/mitigation S-   RUN: SR99 & 160TH ST.w/mit S-EN

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	.8	1.0

JOB: SR99 AND 160TH ST. (2010 W/mitigation S-   RUN: SR99 & 160TH ST.w/mit S-EN

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	4.5
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	2.5	.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

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut RUN: SR99 & 160TH ST.w/mitmut1

DATE : 5/20/96
TIME : 10:30:53

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 = 3.0 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	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	-86.4	-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	965.	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	.80	8.9
19. 160 WB Dep.	2.8	5.7	-300.7	11.6	304.	271.	AG	534.	28.3	.0	12.0		

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut RUN: SR99 & 160TH ST.w/mitmut1

DATE : 5/20/96
TIME : 10:30:53

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	1990	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	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 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

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmutl

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.	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.	8.7	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	9.8	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	18.6	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	5.2	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	7.5	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	9.8	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	15.6	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

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmutl

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	6.4	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	8.6
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	8.8	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.	8.9	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	16.6	19.4	18.3	16.6
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	15.8	17.3	17.1
360.	5.0	6.4	6.8	6.4	5.9	5.3	6.6	15.2	18.1	18.5
MAX	11.8	16.5	17.5	17.7	18.1	15.9	16.6	19.4	18.3	18.5
DEGR.	100	30	30	180	180	180	200	200	200	0

THE HIGHEST CONCENTRATION OF 19.40 PPM OCCURRED AT RECEPTOR REC28.

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmut1

DATE : 5/20/96
TIME : 10:30:53

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
1	2.3	1.3	.4	.2	.0	.0	.0	.0	.6	1.9
2	2.6	1.5	.3	.2	.0	.0	.0	.0	1.9	2.8
3	1.9	1.1	.3	.1	.0	.0	.0	.0	.5	1.3
4	1.8	.0	.1	.1	.2	.6	1.6	3.8	1.9	.9
5	.0	.0	.0	.0	.2	.4	1.2	2.2	1.7	1.0
6	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0
7	.0	.0	.0	.0	.2	.4	1.1	1.9	1.6	.9
8	.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
10	2.0	1.2	.5	.2	.0	.0	.0	.0	.2	.9
11	.0	.0	.1	.1	.1	.1	.0	.0	.0	.0
12	.3	.1	.8	.2	.1	.1	.0	.0	.2	.5
13	.0	.0	.2	.2	.1	.2	.0	.0	.0	.1
14	.5	.5	.7	.8	1.8	1.3	.8	.7	.3	.1
15	.5	1.3	1.8	.1	.1	1.6	1.2	.4	.1	.1
16	.2	.5	.7	.8	.6	.4	.3	.1	.0	.0
17	.8	1.5	2.4	1.2	1.2	1.3	1.1	.4	.1	.1
18	.9	1.3	.9	.1	.1	.7	.7	.2	.1	.1
19	.0	.0	.1	.1	.1	.1	.0	.0	.1	.1

LINK #	REC11 0	REC12 20	REC13 20	REC14 20	REC15 180	REC16 80	REC17 80	REC18 80	REC19 100	REC20 100
1	4.7	1.7	1.3	.3	2.2	.1	.0	.0	.2	.2
2	3.7	1.5	.8	.0	1.9	.1	.0	.0	.2	.2
3	1.0	1.0	1.0	.1	1.4	.1	.0	.0	.2	.2
4	.2	.3	1.1	1.8	.0	.4	.3	.2	.1	.1
5	.3	.2	.8	1.7	.0	.3	.2	.2	.0	.1
6	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0
7	.3	.3	.8	1.6	.0	.2	.2	.2	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.4	.3	1.3	2.7	.0	.5	.4	.4	.1	.1
10	1.8	3.8	3.8	2.3	4.3	.1	.1	.0	.2	.2
11	.1	.0	.0	.1	.0	1.3	1.3	1.4	.7	.6
12	.3	.1	.4	1.7	4.5	.9	.2	.1	.3	.5
13	.1	.0	.1	.2	.0	1.5	1.5	1.3	1.4	3.2
14	.0	.1	.1	.1	.0	.2	.1	.1	.1	.1
15	.0	.1	.1	.0	.0	.2	.1	.1	.1	.1
16	.0	.0	.0	.0	.0	.2	.1	.1	.0	.1
17	.0	.2	.2	.0	.0	.5	.2	.2	.2	.2
18	.0	.1	.1	.0	.0	.2	.1	.0	.0	.1
19	.0	.0	.1	.2	.0	.4	.5	.5	1.1	1.1

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmut1

DATE : 5/20/96
TIME : 10:30:53

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	.8	.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	.8	.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

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut RUN: SR99 & 160TH ST.w/mitmut2

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	293.	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	41.9
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	293.6	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	871.	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	83.6	9.9	83.	88.	A	803.	100.0	.0	3.0	.80	8.9
19. 160 WB Dep.	2.8	5.7	-300.7	11.6	304.	271.	AG	876.	28.3	.0	12.0		

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JOB: SR99 AND 160TH ST. (2010 W/mitigationmut RUN: SR99 & 160TH ST.w/mitmut2

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	500	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 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 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: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmut2

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	8.9	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	5.7	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	6.7	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	6.0	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	8.3	7.6	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	13.0	12.6	8.2	5.8	10.5	10.3	18.9	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	12.2	5.0	5.0	5.0	5.2	7.8
210.	16.2	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	7.8
220.	13.7	15.3	12.2	6.5	5.4	7.6	9.5	13.4	13.8	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	18.0	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	6.4	13.3	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	15.5	13.7	11.4	5.1	6.3	8.3	8.0	7.5	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

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmut2

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.	5.1	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.	6.4	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.	7.5	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	8.8	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	5.5	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	8.6	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	8.8	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	17.8	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.

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmmt2

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 0	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 20	REC16 90	REC17 80	REC18 80	REC19 100	REC20 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	.8	.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	1.5	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

JOB: SR99 AND 160TH ST. (2010 W/mitigationmut   RUN: SR99 & 160TH ST.w/mitmmt2

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 110	REC22 100	REC23 30	REC24 180	REC25 180	REC26 180	REC27 200	REC28 200	REC29 0	REC30 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	1.9	.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

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

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	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	-849.9	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	-858.7	1.4	849.	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	306.7	-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	406.	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		

JOB: SR99 AND 188TH ST 2010 adn   RUN: SR99 & 188TH ST. 2010 adn

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	183	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	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 WB5	300.0	-11.0	1.8
6. REC 6 WB6	155.0	-11.0	1.8
7. REC 7 WB7	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: SR99 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)

WIND ANGLE (DEGR)	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	5.0	5.1
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	5.1	5.5
20.	5.6	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	5.3	6.0
30.	5.3	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	5.6	6.5
40.	5.2	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	5.8	6.9
50.	5.2	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	6.1	6.9
60.	5.1	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	6.3	6.9
70.	5.2	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	6.5	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	12.8	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	6.1	5.1	5.0	12.4	12.6	13.8	21.4	17.5	20.5	20.1	16.6	17.0
100.	20.7	20.1	22.7	15.8	6.1	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	11.5
190.	27.7	18.7	15.3	14.7	5.1	5.6	9.7	20.4	19.0	22.2	15.5	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	5.9	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	6.9	8.2	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	5.0	5.1
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

JOB: SR99 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)

WIND ANGLE (DEGR)	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	16.5	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	6.9	6.3	17.4	17.9	17.9
210.	12.1	12.2	8.0	6.6	6.2	15.6	16.0	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 OF 27.70 PPM OCCURRED AT RECEPTOR REC1 .

JOB: SR99 AND 108TH ST 2010 mdn

RUN: SR99 & 108TH ST. 2010 mdn

DATE : 8/20/96
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
1	3.0	.0	.2	.2	.0	.1	.0	1.6	2.8	5.1
2	4.4	.0	.3	.3	.0	.1	.0	1.8	3.0	5.1
3	3.7	.0	.4	.3	.1	.1	.0	1.4	2.3	4.0
4	.7	.0	.1	.0	.0	.0	.0	.8	1.2	.1
5	1.6	.0	.2	.1	.3	.4	.0	.0	.7	.6
6	.0	.0	.0	.0	.1	.1	.0	.0	.5	.4
7	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1
8	.0	.0	.1	.0	.3	.3	.0	.0	1.1	1.1
9	.0	.0	.0	.0	.0	.1	.0	.0	.1	.1
10	.0	.0	.0	.0	.2	.2	.0	.0	.5	.4
11	1.3	.0	.3	.2	.0	.1	.0	1.2	.9	1.6
12	.0	.0	.6	.3	.2	.5	.0	2.5	.2	.2
13	.0	.0	1.1	.6	.5	.9	.0	3.9	.3	.3
14	.0	.0	.5	.3	.2	.5	.0	1.9	.2	.2
15	.0	.0	.1	.0	.0	.1	.0	.7	.1	.1
16	1.0	1.4	1.3	1.7	4.1	3.8	4.1	1.6	.3	.1
17	2.2	4.3	5.6	6.1	2.6	1.9	2.5	.0	.1	.1
18	2.3	5.0	5.2	5.7	2.8	2.1	3.4	.0	.1	.1
19	2.0	4.2	3.8	4.7	4.6	3.8	4.8	.0	.1	.1
20	.4	.2	.1	.0	.0	.1	.0	.0	.0	.0
21	.0	.0	.5	.2	.3	.6	.0	2.0	.5	.3

LINK #	REC11 350	REC12 10	REC13 10	REC14 170	REC15 80	REC16 80	REC17 80	REC18 80	REC19 100	REC20 100
1	5.5	1.9	1.4	1.8	.9	.2	.1	.0	.2	.2
2	5.5	2.3	1.7	2.8	1.0	.2	.1	.0	.3	.3
3	4.7	3.9	3.1	4.1	1.8	.3	.1	.1	.3	.4
4	.0	.0	.1	.0	.2	.1	.0	.0	.0	.1
5	.3	.3	.8	.0	.1	.4	.3	.3	.1	.1
6	.2	.1	.3	.0	.0	.1	.2	.1	.0	.0
7	.1	.4	.4	.4	.2	.0	.0	.0	.0	.0
8	.6	.5	1.0	.0	.0	.1	.3	.3	.0	.1
9	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
10	.2	.2	.4	.0	.0	.1	.2	.2	.0	.0
11	2.0	4.4	4.1	4.3	2.0	.5	.1	.0	.2	.3
12	.2	.0	.1	.0	.0	1.9	4.6	5.0	2.1	1.7
13	.3	.0	.1	.0	.0	2.2	5.3	5.8	2.9	2.2
14	.1	.0	.0	.0	.0	.6	1.8	2.1	1.8	1.5
15	.1	.0	.0	.0	.0	1.3	.2	.1	.1	.3
16	.0	.2	.2	.0	2.8	1.1	.4	.2	.2	.5
17	.0	.2	.3	.0	2.4	1.7	.7	.3	.3	.6
18	.0	.3	.3	.0	3.2	2.3	1.1	.6	.5	.9
19	.1	.3	.4	.0	4.3	2.5	1.0	.5	.5	1.0
20	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0
21	.2	.0	.1	.0	.0	.5	1.7	2.1	4.7	4.4

JOB: SR99 AND 108TH ST 2010 mdn

RUN: SR99 & 108TH ST. 2010 mdn

DATE : 8/20/96
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 100TH ST 2010 mutl RUN: SR99 & 100TH ST. 2010 mutl

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	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	386.	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 ApproachTH	-3.3	310.6	-3.3	11.8	299.	180.	AG	1539.	28.3	.0	12.0		
7. SR99 SB ApproachRT	-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	38.3	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	2802.	28.3	.0	15.0		
12. 100 EB Approach	-306.5	-3.0	-9.3	-3.0	297.	90.	AG	2360.	28.3	.0	12.0		
13. 100 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. 100 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. 100 EB Queue RT	-9.3	-7.7	-86.4	-7.7	77.	270.	AG	378.	100.0	.0	3.0	.67	12.8
16. 100 EB Depart	.2	-4.3	308.7	-4.3	309.	90.	AG	2035.	30.2	.0	12.0		
17. 100 WB Approach	308.7	7.7	11.4	7.7	297.	270.	AG	3012.	30.2	.0	12.0		
18. 100 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. 100 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. 100 WB Queue RT	11.4	12.2	71.1	12.2	60.	90.	AG	165.	100.0	.0	3.0	.78	9.9
21. 100 WB Depart	3.3	8.4	-306.5	8.4	310.	270.	AG	2272.	30.2	.0	12.0		

JOB: SR99 AND 100TH ST 2010 mutl RUN: SR99 & 100TH ST. 2010 mutl

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. 100 EB Queue th	180	121	1.0	1462	1600	298.60	1	3
14. 100 EB Queue Left	180	151	1.0	354	1600	298.60	1	3
15. 100 EB Queue RT	180	85	1.0	844	1600	298.60	1	3
18. 100 WB Queue th	180	122	1.0	1422	1600	298.60	1	3
19. 100 WB Queue Left	180	153	1.0	622	1600	298.60	1	3
20. 100 WB Queue RT	180	37	1.0	868	1600	298.60	1	3

RECEPTOR LOCATIONS

RECEPTOR	X	Y	Z
1. REC 1 WB1	14.5	17.5	1.8
2. REC 2 WB2	55.0	17.5	1.8
3. REC 3 WB3	155.0	14.5	1.8
4. REC 4 WB4	300.0	14.5	1.8
5. REC 5 WB5	300.0	-11.0	1.8
6. REC 6 WB6	155.0	-11.0	1.8
7. REC 7 WB7	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: SR99 AND 188TH ST 2010 mutl

RUN: SR99 & 188TH ST. 2010 mutl

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	5.3	5.9
30.	5.3	5.0	5.1	5.0	12.3	13.7	13.8	13.9	8.8	7.3	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	12.5
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	5.6	7.3	7.7	7.8	5.0	5.0	5.0	11.1	11.4
200.	20.5	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	8.9	10.5	12.3	17.8	13.3	14.8	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.	12.8	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

JOB: SR99 AND 188TH ST 2010 mutl

RUN: SR99 & 188TH ST. 2010 mutl

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	19.8	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	8.4	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	5.5	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.	5.5	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	19.8	20.5	20.7
DEGR.	100	100	170	170	170	190	190	190

THE HIGHEST CONCENTRATION OF 28.00 PPM OCCURRED AT RECEPTOR REC1 .

JOB: SR99 AND 188TH ST 2010 mutl RUN: SR99 & 188TH ST. 2010 mutl

DATE : 8/20/96
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	1.6	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	3.8	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

JOB: SR99 AND 188TH ST 2010 mutl RUN: SR99 & 188TH ST. 2010 mutl

DATE : 8/20/96
TIME : 10:31: 9

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	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 mit2 RUN: SR99 & 188TH ST. 2010 mit2

DATE : 5/20/96
TIME : 10:31:31

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	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	-88.7	81.	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	1.84	174.9
14. 188 EB Queue Left	-9.3	1.4	-862.1	1.4	853.	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	1806.	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		

JOB: SR99 AND 188TH ST 2010 mit2 RUN: SR99 & 188TH ST. 2010 mit2

DATE : 5/20/96
TIME : 10:31:31

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	1600	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	1840	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 WB1	14.5	17.5	1.8
2. REC 2 WB2	85.0	17.5	1.8
3. REC 3 WB3	155.0	14.5	1.8
4. REC 4 WB4	300.0	14.5	1.8
5. REC 5 WB5	300.0	-11.0	1.8
6. REC 6 WB6	155.0	-11.0	1.8
7. REC 7 WB7	85.0	-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: SR99 AND 188TH ST 2010 mut2 RUN: SR99 & 188TH ST. 2010 mut2

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	15.6	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	18.4	8.4	5.6	5.1	11.6	12.1
180.	28.4	16.2	18.2	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	15.7	15.0	5.1	5.7	9.9	20.9	19.5	22.6	15.7	5.7	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	5.0	5.4	5.4	5.5	5.0	5.0	5.0	10.5	11.3
210.	15.5	20.1	17.7	16.1	5.8	7.3	10.6	17.8	16.5	18.8	14.3	5.0	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	5.0	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	5.0	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	5.0	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	5.0	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	5.0	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	5.0	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	5.1	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	5.4	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	14.9	18.2	17.1	16.0	5.8	6.7	8.7	15.7	15.5	16.3	12.1	5.0	5.2
310.	12.9	8.3	6.9	6.2	16.5	17.1	18.5	13.2	18.7	17.9	16.9	5.9	6.8	8.7	14.5	14.4	14.9	11.6	5.0	5.2
320.	13.7	8.7	7.1	5.7	15.1	16.3	18.2	14.3	19.4	18.9	18.2	6.1	6.8	8.4	13.6	13.5	13.9	11.5	5.0	5.1
330.	14.7	8.9	6.7	5.6	14.3	15.5	17.9	16.9	19.8	20.5	20.0	6.4	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	6.6	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

JOB: SR99 AND 188TH ST 2010 mut2 RUN: SR99 & 188TH ST. 2010 mut2

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	10.9	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	18.2	18.8	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	8.0	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
DEGR.	100	100	170	170	170	190	190	190

THE HIGHEST CONCENTRATION OF 28.50 PPM OCCURRED AT RECEPTOR REC1 .

JOB: SR99 AND 188TH ST 2010 mut2

RUN: SR99 & 188TH ST. 2010 mut2

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 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	2.9	.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	.1	.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	1.9	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

JOB: SR99 AND 188TH ST 2010 mut2

RUN: SR99 & 188TH ST. 2010 mut2

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 100	REC22 100	REC23 170	REC24 170	REC25 170	REC26 190	REC27 190	REC28 190
1	.2	.0	1.5	.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

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.

ENVIROMETRICS INC

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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

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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-

[1] Dr. Clifford Winston, Evaluation of the FAA's Forecasts of Traffic at Sea-Tac Airport (Mar. 15 1996).

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.

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

TABLE 1: COMPARATIVE ANALYSIS - YEAR 2010 FORECASTS

Intersection	FEIS-DN	S-DN[1]	S-DN 2[2]	FEIS-NUT	S-NUT 1[3]	S-NUT 2[4]
Hwy.99/S.160'th						
delay/vehicle	81.9	81.9	73.6	112.8	128.4	154.6
volume/capacity	1.172	1.172	1.143	1.235	1.267	1.314
Level Of Service	F	F	F	F	F	F
Hwy.99/S.170'th						
delay/vehicle	350.1	281.9	255.5	187.6	259.9	348.2
volume/capacity	1.420	1.413	1.363	1.301	1.439	1.568
Level Of Service	F	F	F	F	F	F
Hwy.99/S.188'th						
delay/vehicle	468.4	466.3	398.8	322.5	449.9	575.9
volume/capacity	1.628	1.597	1.573	1.446	1.579	1.676
Level Of Service	F	F	F	F	F	F
Hwy.99/S.200'th						
delay/vehicle	207.2	197.4	175.8	164.7	195.7	222.2
volume/capacity	1.414	1.405	1.362	1.346	1.402	1.442
Level Of Service	F	F	F	F	F	F
188'th/Military Rd.						
delay/vehicle	243.9	271.5	235.4	197.1	283.3	337.8
volume/capacity	1.482	1.517	1.465	1.411	1.534	1.592
Level Of Service	F	F	F	F	F	F

[1] S-DN = Do Nothing Alternative with south access connecting terminal to intersection of S. 188th and 28th Ave. S.

[2] S-DN 2 = Do Nothing with south access to S. 188th and 20% weather impairment on inbound air passenger arrivals (ground traffic departures from terminal).

[3] S-NUT 1 = FEIS NUT (2010) with Traffic model input adjusted for consistency with Do Nothing input.

[4] S-NUT 2 = 2010 North Unit Terminal with assumption of increased airport activity over Do Nothing.

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.[3] 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.

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[3] 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.

[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.

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. 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.

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.

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 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.

APPENDIX

SUPPORT DOCUMENTS

DO NOTHING ALTERNATIVE FORECAST
BY SMITH ENGINEERING & MANAGEMENT

REVISED 2010 AUGUST PM PEAK HOUR FORECAST FEFLECTING 20 PERCENT REDUCTION IN PEAK HOUR AIR PASSENGER ARRIVALS DUE TO WEATHER

(Labled S-DN 2 on Table 1)

10DNAGR4.OUT
10DNAGRP.IN

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
YEAR 2010 - DO-NOTHING (AUG) W. TERMINAL CON. TO 188/28

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

S-DN

Intersection #12 INTERNATIONAL BLVD/SR99 & SOUTH 160TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.172
Loss Time (sec):	12	Average Delay (sec/veh):	81.9
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Ignore		
Min. Green:	5	10	10	5	10	10	5	5	5	5	5	0
Lanes:	1 0	1 1	0	1 0	2 0	1	1 0	1 1	0	1 0	1 1	0
Volume Module:												
Base Vol:	116	936	70	407	1144	72	183	218	20	77	146	247
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.00
Initial Bse:	132	1067	80	464	1304	82	209	249	23	88	166	0
Added Vol:	38	616	21	0	376	43	40	48	80	8	20	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	171	1683	101	464	1680	126	248	296	103	95	187	0
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.00
PHF Volume:	184	1810	108	499	1807	135	267	319	111	103	201	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	184	1810	108	499	1807	135	267	319	111	103	201	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.05	1.05	1.00	1.05	0.00
Final Vol.:	184	1901	114	499	1897	135	267	335	116	103	211	0
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.93	0.97	0.97	0.94	0.98	0.84	0.93	0.94	0.94	0.92	0.97	1.00
Lanes:	1.00	1.89	0.11	1.00	2.00	1.00	1.00	1.49	0.51	1.00	2.00	0.00
Final Sat.:	1676	3295	198	1684	3546	1507	1667	2503	867	1659	3492	0
Capacity Analysis Module:												
Vol/Sat:	0.11	0.58	0.58	0.30	0.53	0.09	0.16	0.13	0.13	0.06	0.06	0.00
Crit Moves:		****		****			****				****	
Green/Cycle:	0.13	0.49	0.49	0.25	0.62	0.62	0.14	0.13	0.13	0.06	0.05	0.00
Volume/Cap:	0.87	1.17	1.17	1.17	0.87	0.14	1.17	1.04	1.04	1.04	1.17	0.00
Level Of Service Module:												
Delay/Veh:	78.5	130	130.3	159.5	24.2	11.0	181.0	105	105.2	149.5	193	0.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.73	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	78.5	102	101.6	159.5	17.8	6.8	181.0	89.4	89.4	149.5	164	0.0
Queue:	11	176	176	43	80	3	24	30	30	8	19	0

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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

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Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.413
Loss Time (sec):	12	Average Delay (sec/veh):	281.9
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	[illegible]
Lanes:	1 0	1 1	0	1 0	2 0	1	1 0	1 0	1	1 0	0 1	0
Volume Module:												
Base Vol:	429	1355	70	165	1298	3	27	211	404	183	166	11.
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.1
Initial Bse:	489	1545	80	188	1480	3	31	241	461	209	189	12
Added Vol:	51	513	21	0	402	76	177	3	124	8	1	[illegible]
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Initial Fut:	540	2057	101	188	1881	79	207	243	584	216	191	12
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.9
PHF Volume:	594	2261	111	207	2068	87	228	267	642	238	210	14.
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Reduced Vol:	594	2261	111	207	2068	87	228	267	642	238	210	14
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.0
Final Vol.:	594	2374	116	207	2171	87	228	267	642	238	210	14
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.93	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.93	0.9
Lanes:	1.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	0.60	0.4
Final Sat.:	1676	3330	163	1676	3528	1499	1659	1746	1484	1684	994	67
Capacity Analysis Module:												
Vol/Sat:	0.35	0.71	0.71	0.12	0.62	0.06	0.14	0.15	0.43	0.14	0.21	0.2
Crit Moves:	****				****		****				****	
Green/Cycle:	0.25	0.59	0.59	0.10	0.44	0.44	0.10	0.19	0.44	0.06	0.15	0.1
Volume/Cap:	1.41	1.22	1.22	1.22	1.41	0.13	1.41	0.82	0.99	2.33	1.41	1.4
Level Of Service Module:												
Delay/Veh:	365.3	159	158.5	222.6	348	23.1	399.4	64.1	63.1	2671	382	381.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	365.3	124	123.6	222.6	271	14.3	399.4	54.5	53.6	2671	324	324.
Queue:	81	267	267	20	321	3	31	14	38	109	48	4

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Level Of Service Computation Report
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tersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET

cle (sec):	180	Critical Vol./Cap. (X):	1.597
ss Time (sec):	12	Average Delay (sec/veh):	466.3
imal Cycle:	180	Level Of Service:	F

proach:	North Bound			South Bound			East Bound			West Bound		
ement:	L	T	R	L	T	R	L	T	R	L	T	R
ntrol:	Protected			Protected			Protected			Protected		
hts:	Ignore			Ignore			Include			Ignore		
. Green:	3	5	0	3	5	0	3	3	3	3	3	0
nes:	2 0	2 0	1	1 0	2 0	1	1 0	2 0	1	2 0	2 0	1
ume Module:												
e Vol:	558	771	246	125	780	116	184	529	452	515	689	799
owth Adj:	1.14	1.14	0.00	1.14	1.14	0.00	1.14	1.14	1.14	1.14	1.14	0.00
tial Bse:	636	879	0	143	889	0	210	603	515	587	785	0
led Vol:	41	668	80	59	471	53	161	842	40	37	631	54
sserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
tial Fut:	677	1547	0	201	1360	0	371	1445	555	624	1416	0
r Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Adj:	0.84	0.84	0.00	0.84	0.84	0.00	0.84	0.84	0.84	0.84	0.84	0.00
F Volume:	806	1841	0	240	1619	0	442	1720	661	743	1686	0
uct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
uced Vol:	806	1841	0	240	1619	0	442	1720	661	743	1686	0
E Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Adj:	1.05	1.05	0.00	1.00	1.05	0.00	1.00	1.05	1.00	1.05	1.05	0.00
al Vol.:	847	1934	0	240	1700	0	442	1806	661	780	1770	0
uration Flow Module:												
/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
ustment:	0.92	0.99	1.00	0.94	0.99	1.00	0.94	0.98	0.84	0.92	0.99	1.00
nes:	2.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00	1.00
al Sat.:	3295	3582	1800	1693	3564	1800	1684	3546	1507	3295	3582	1800
pacity Analysis Module:												
/Sat:	0.26	0.54	0.00	0.14	0.48	0.00	0.26	0.51	0.44	0.24	0.49	0.00
t Moves:	****				****		****				****	
en/Cycle:	0.16	0.36	0.00	0.10	0.30	0.00	0.16	0.32	0.32	0.15	0.31	0.00
ume/Cap:	1.60	1.48	0.00	1.48	1.60	0.00	1.60	1.57	1.36	1.57	1.60	0.00
el Of Service Module:												
ay/Veh:	608.9	435	0.0	483.7	600	0.0	623.8	565	300.8	576.2	600	0.0
ay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
gAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
Del/Veh:	608.9	339	0.0	483.7	468	0.0	623.8	480	255.7	576.2	510	0.0
ue:	152	310	0	37	320	0	81	332	83	135	335	0

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Intersection #18 INTERNATIONAL BLVD/SR99 & SOUTH 200TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.405
Loss Time (sec):	12	Average Delay (sec/veh):	197.4
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	7	7	3	7	7	3	3	3	3	3	3
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	2 0	1	1 0	1 1	0
Volume Module:												
Base Vol:	94	491	119	343	1205	74	71	269	132	260	232	164
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	107	560	136	391	1374	84	81	307	150	296	264	187
Added Vol:	77	428	3	0	391	80	202	1138	177	3	457	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	185	988	139	391	1765	165	283	1445	327	299	721	187
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	196	1051	148	416	1878	175	301	1537	348	319	767	195
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	196	1051	148	416	1878	175	301	1537	348	319	767	195
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.05
Final Vol.:	196	1104	148	416	1971	175	301	1614	348	319	806	209
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.96	0.96
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.59	0.41
Final Sat.:	1693	3564	1515	1693	3564	1515	1693	3564	1515	1684	2731	708
Capacity Analysis Module:												
Vol/Sat:	0.12	0.31	0.10	0.25	0.55	0.12	0.18	0.45	0.23	0.19	0.30	0.30
Crit Moves:	****				****			****		****		
Green/Cycle:	0.08	0.27	0.27	0.21	0.39	0.39	0.17	0.32	0.32	0.13	0.29	0.29
Volume/Cap:	1.40	1.17	0.37	1.17	1.40	0.29	1.03	1.40	0.71	1.40	1.03	1.03
Level Of Service Module:												
Delay/Veh:	397.9	144	41.2	162.4	339	28.5	108.0	342	44.1	376.3	80.8	80.8
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	397.9	112	25.5	162.4	265	17.7	108.0	290	37.5	376.3	68.7	68.7
Queue:	27	90	6	35	277	6	21	218	16	43	63	67

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Level Of Service Computation Report
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Intersection #38 MILITARY ROAD & SOUTH 188TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.517
Loss Time (sec):	12	Average Delay (sec/veh):	271.5
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	5	5	5	5	5	5	10	10	5	10	10
Lanes:	1 0	0 1	0	1 0	1 0	1	1 0	1 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	75	237	24	572	601	117	99	994	50	95	826	246
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	85	270	27	652	685	133	113	1133	57	108	942	280
Added Vol:	4	5	0	0	11	1	4	971	5	0	716	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	89	275	27	652	696	135	117	2104	62	108	1658	280
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	100	309	31	733	782	152	132	2364	70	122	1863	315
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	100	309	31	733	782	152	132	2364	70	122	1863	315
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.05	1.00	1.05	1.00
Final Vol.:	100	309	31	733	782	152	132	2483	74	122	1956	315
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.95	0.99	0.99	0.95	0.99	0.85	0.94	0.98	0.98	0.94	0.99	0.84
Lanes:	1.00	0.91	0.09	1.00	1.00	1.00	1.00	1.94	0.06	1.00	2.00	1.00
Final Sat.:	1701	1611	162	1701	1791	1522	1684	3443	103	1693	3564	1515
Capacity Analysis Module:												
Vol/Sat:	0.06	0.19	0.19	0.43	0.44	0.10	0.08	0.72	0.72	0.07	0.55	0.21
Crit Moves:		****		****				****		****		
Green/Cycle:	0.05	0.13	0.13	0.28	0.36	0.36	0.07	0.48	0.48	0.05	0.46	0.46
Volume/Cap:	1.21	1.52	1.52	1.52	1.21	0.28	1.20	1.52	1.52	1.52	1.20	0.45
Level Of Service Module:												
Delay/Veh:	250.3	514	514.2	491.6	170	31.0	229.7	484	484.4	572.8	151	25.8
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.85	0.85	1.00	0.85	0.85	1.00	0.78	0.78	1.00	0.78	0.62
AdjDel/Veh:	250.3	437	437.1	491.6	144	26.4	229.7	378	377.8	572.8	118	16.0
Queue:	11	55	55	121	72	5	13	494	494	21	180	11

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Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.305
Loss Time (sec):	12	Average Delay (sec/veh):	169.2
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	3
Lanes:	2 0	1 1	0	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	429	1355	70	165	1298	3	27	211	404	183	166	113
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	489	1545	80	188	1480	3	31	241	461	209	189	129
Added Vol:	51	513	21	0	402	76	177	3	124	8	1	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	540	2058	101	188	1882	79	208	244	585	217	190	129
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	593	2261	111	207	2068	87	228	268	642	238	209	142
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	593	2261	111	207	2068	87	228	268	642	238	209	142
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.05	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	623	2374	116	207	2171	87	228	268	642	238	209	142
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180[illegible]
Adjustment:	0.90	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.98	0.8[illegible]
Lanes:	2.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0[illegible]
Final Sat.:	3246	3330	163	1676	3528	1499	1659	1746	1484	1684	1773	1507
Capacity Analysis Module:												
Vol/Sat:	0.19	0.71	0.71	0.12	0.62	0.06	0.14	0.15	0.43	0.14	0.12	0.0[illegible]
Crit Moves:		****		****					****	****		
Green/Cycle:	0.15	0.55	0.55	0.09	0.49	0.49	0.16	0.18	0.34	0.11	0.14	0.14
Volume/Cap:	1.26	1.31	1.31	1.31	1.26	0.12	0.87	0.83	1.28	1.31	0.87	0.7[illegible]
Level Of Service Module:												
Delay/Veh:	222.6	234	234.3	293.8	195	19.0	74.3	65.3	234.2	287.8	77.2	63.[illegible]
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0[illegible]
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8[illegible]
AdjDel/Veh:	222.6	183	182.7	293.8	152	11.8	74.3	55.5	199.1	287.8	65.6	53.[illegible]
Queue:	62	324	324	24	237	2	13	14	70	27	12	[illegible]

·DN mitigated

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rIG8                    Wed May 15, 1996 10:30:25                    Page 1-1
------------------------------------------------------------------------------
                  SEATTLE-TACOMA INTERNATIONAL AIRPORT
                        MASTER PLAN UPDATE EIS
          YEAR 2010 - DO-NOTHING (AUG) W. TERMINAL CON. TO 188/28
------------------------------------------------------------------------------
                   Level Of Service Computation Report
          1985 HCM Operations Method (Future Volume Alternative)
******************************************************************************
ersection #12 INTERNATIONAL BLVD/SR99 & SOUTH 160TH STREET
******************************************************************************
·le (sec):        180              Critical Vol./Cap. (X):          1.084
s Time (sec):      12              Average Delay (sec/veh):          59.9
imal Cycle:       180              Level Of Service:                    E
******************************************************************************
roach:      North Bound      South Bound      East Bound       West Bound
ement:      L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
-----------|---------------||---------------||---------------||---------------|
trol:         Protected        Protected        Protected        Protected
hts:           Include          Include          Include           Ignore
n. Green:    5   10   10      5   10   10      5    5    5      5    5    0
nes:        1  0  1  1  0    2  0  2  0  1    1  0  1  1  0    1  0  1  0  1
-----------|---------------||---------------||---------------||---------------|
ume Module:
se Vol:      116  936   70    407 1144   72    183  218   20     77  146  247
wth Adj:    1.14 1.14 1.14   1.14 1.14 1.14   1.14 1.14 1.14   1.14 1.14 0.00
tial Bse:    132 1067   80    464 1304   82    209  249   23     88  166    0
ded Vol:      38  616   21      0  376   43     40   48   80      8   20    0
serByVol:      0    0    0      0    0    0      0    0    0      0    0    0
tial Fut:    170 1683  101    464 1680  125    249  297  103     96  186    0
er Adj:     1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 0.00
F Adj:      0.93 0.93 0.93   0.93 0.93 0.93   0.93 0.93 0.93   0.93 0.93 0.00
? Volume:    183 1810  108    499 1807  134    267  319  111    103  200    0
uct Vol:       0    0    0      0    0    0      0    0    0      0    0    0
duced Vol:   183 1810  108    499 1807  134    267  319  111    103  200    0
3 Adj:      1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 0.00
? Adj:      1.00 1.05 1.05   1.05 1.05 1.00   1.00 1.05 1.05   1.00 1.00 0.00
nal Vol.:    183 1900  114    524 1897  134    267  335  116    103  200    0
-----------|---------------||---------------||---------------||---------------|
turation Flow Module:
t/Lane:     1800 1800 1800   1800 1800 1800   1800 1800 1800   1800 1800 1800
ljustment:  0.93 0.97 0.97   0.91 0.98 0.84   0.93 0.94 0.94   0.92 0.97 1.00
nes:        1.00 1.89 0.11   2.00 2.00 1.00   1.00 1.49 0.51   1.00 1.00 1.00
nal Sat.:   1676 3295  198   3262 3546 1507   1667 2503  867   1659 1746 1800
-----------|---------------||---------------||---------------||---------------|
pacity Analysis Module:
l/Sat:      0.11 0.58 0.58   0.16 0.53 0.09   0.16 0.13 0.13   0.06 0.11 0.00
it Moves:         ****       ****             ****                  ****
een/Cycle:  0.12 0.53 0.53   0.15 0.56 0.56   0.15 0.17 0.17   0.08 0.11 0.00
lume/Cap:   0.95 1.08 1.08   1.08 0.95 0.16   1.08 0.77 0.77   0.77 1.08 0.00
-----------|---------------||---------------||---------------||---------------|
evel Of Service Module:
lay/Veh:    96.2 78.6 78.6  118.4 35.5 14.2  132.9 58.4 58.4   77.5  144  0.0
lay Adj:    1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 1.00
rogAdjFctr: 1.00 0.78 0.78   1.00 0.76 0.62   1.00 0.85 0.85   1.00 0.85 0.85
jDel/Veh:   96.2 61.3 61.3  118.4 27.0  8.8  132.9 49.7 49.7   77.5  122  0.0
eue:          12  140  140     37   94    3     20   22   22      6   16    0
******************************************************************************

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MITIG8  S DN            Wed May 15, 1996 20:04:21                    Page 1-1
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                  SEATTLE-TACOMA INTERNATIONAL AIRPORT
                        MASTER PLAN UPDATE EIS
          YEAR 2010 - DO-NOTHING (AUG) W. TERMINAL CON. TO 188/28
------------------------------------------------------------------------------
                   Level Of Service Computation Report
          1985 HCM Operations Method (Future Volume Alternative)
******************************************************************************
Intersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET
******************************************************************************
Cycle (sec):      180              Critical Vol./Cap. (X):          1.585
Loss Time (sec):   12              Average Delay (sec/veh):         377.0
Optimal Cycle:    180              Level Of Service:                    F
******************************************************************************
Approach:    North Bound      South Bound      East Bound       West Bound
Movement:    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------
Control:       Protected        Protected        Protected        Protected
Rights:          Ignore           Ignore          Include           Ignore
Min. Green:   3    5    0      3    5    0      3    3    3      3    3    (
Lanes:       2  0  2  0  1    2  0  2  0  1    2  0  2  0  1    2  0  2  0  1
------------|---------------||---------------||---------------||---------------
Volume Module:
Base Vol:     558  771  246    125  780  116    184  529  452    515  689  79
Growth Adj:  1.14 1.14 0.00   1.14 1.14 0.00   1.14 1.14 1.14   1.14 1.14 0.0
Initial Bse:  636  879    0    143  889    0    210  603  515    587  785    (
Added Vol:     41  668   80     59  471   53    161  842   40     37  631   5
PasserByVol:    0    0    0      0    0    0      0    0    0      0    0    (
Initial Fut:  677 1547    0    202 1360    0    371 1445  555    624 1416    (
User Adj:    1.00 1.00 0.00   1.00 1.00 0.00   1.00 1.00 1.00   1.00 1.00 0.0
PHF Adj:     0.84 0.84 0.00   0.84 0.84 0.00   0.84 0.84 0.84   0.84 0.84 0.0
PHF Volume:   806 1842    0    240 1619    0    441 1720  661    743 1686    (
Reduct Vol:     0    0    0      0    0    0      0    0    0      0    0    (
Reduced Vol:  806 1842    0    240 1619    0    441 1720  661    743 1686    (
PCE Adj:     1.00 1.00 0.00   1.00 1.00 0.00   1.00 1.00 1.00   1.00 1.00 0.0
MLF Adj:     1.05 1.05 0.00   1.05 1.05 0.00   1.05 1.05 1.00   1.05 1.05 0.0
Final Vol.:   846 1934    0    252 1700    0    463 1806  661    780 1771    (
------------|---------------||---------------||---------------||---------------
Saturation Flow Module:
Sat/Lane:    1800 1800 1800   1800 1800 1800   1800 1800 1800   1800 1800 180
Adjustment:  0.92 0.99 1.00   0.91 0.99 1.00   0.91 0.98 0.84   0.92 0.99 1.0
Lanes:       2.00 2.00 1.00   2.00 2.00 1.00   2.00 2.00 1.00   2.00 2.00 1.0
Final Sat.:  3295 3582 1800   3279 3564 1800   3262 3546 1507   3295 3582 180
------------|---------------||---------------||---------------||---------------
Capacity Analysis Module:
Vol/Sat:     0.26 0.54 0.00   0.08 0.48 0.00   0.14 0.51 0.44   0.24 0.49 0.0
Crit Moves:  ****                  ****             ****        ****
Green/Cycle: 0.16 0.41 0.00   0.06 0.30 0.00   0.10 0.32 0.32   0.15 0.37 0.0
Volume/Cap:  1.59 1.33 0.00   1.33 1.59 0.00   1.35 1.59 1.37   1.59 1.35 0.0
------------|---------------||---------------||---------------||---------------
Level Of Service Module:
Delay/Veh:  590.8  264  0.0  313.3  582  0.0  312.3  581 310.2  592.4  285   0.
Delay Adj:   1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 1.00   1.00 1.00 1.0
ProgAdjFctr: 1.00 0.78 0.62   1.00 0.78 0.62   1.00 0.85 0.85   1.00 0.85 0.8
AdjDel/Veh: 590.8  206  0.0  313.3  454  0.0  312.3  494 263.7  592.4  242   0
Queue:        149  236    0     30  314    0     55  338   84    137  220
******************************************************************************

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SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
YEAR 2010 - DO-NOTHING (AUG) W. TERMINAL CON. TO 188/28

Trip Generation Report

Forecast for PM PEAK HOUR

Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
2	NAC TRUCKS	2120.00	M TONS CARGO	0.09	0.01	191	21	212	1.9
	Zone 2 Subtotal					191	21	212	1.9
3	LOT A	2910.00	ACCESS CARDS	0.01	0.02	29	58	87	0.8
	Zone 3 Subtotal					29	58	87	0.8
4	LOT B	4701.00	ACCESS CARDS	0.01	0.01	47	47	94	0.8
	Zone 4 Subtotal					47	47	94	0.8
5	CENTRAL LOTS	1420.00	Access Cards	0.02	0.06	28	85	113	1.0
	Zone 5 Subtotal					28	85	113	1.0
7	AOA ACCESS	2020.00	WEEKDAY TRIPS	0.02	0.02	40	40	80	0.7
	Zone 7 Subtotal					40	40	80	0.7
9	OFF-PARK #9	17.00	SHUTTLE TRIPS	0.72	0.72	12	12	24	0.2
	Zone 9 Subtotal					12	12	24	0.2
10	OFF-PARK #10	17.00	SHUTTLE TRIPS	0.72	0.72	12	12	24	0.2
	Zone 10 Subtotal					12	12	24	0.2
11	OFF-PARK #11	17.00	SHUTTLE TRIPS	0.72	0.72	12	12	24	0.2
	Zone 11 Subtotal					12	12	24	0.2
12	OFF-PARK #12	17.00	SHUTTLE TRIPS	0.72	0.72	12	12	24	0.2
	Zone 12 Subtotal					12	12	24	0.2
13	OFF-PARK #13	19.00	SHUTTLE TRIPS	0.72	0.72	14	14	28	0.3
	Zone 13 Subtotal					14	14	28	0.3
14	OFF-PARK #14	29.00	SHUTTLE TRIPS	0.72	0.72	21	21	42	0.4
	Zone 14 Subtotal					21	21	42	0.4
15	OFF-PARK #15	22.00	SHUTTLE TRIPS	0.72	0.72	16	16	32	0.3
	Zone 15 Subtotal					16	16	32	0.3
16	OFF-PARK #16	29.00	SHUTTLE TRIPS	0.72	0.72	21	21	42	0.4
	Zone 16 Subtotal					21	21	42	0.4
17	OFF-PARK #17	39.00	SHUTTLE TRIPS	0.72	0.72	28	28	56	0.5
	Zone 17 Subtotal					28	28	56	0.5
18	OFF-PARK #18	15.00	SHUTTLE TRIPS	0.72	0.72	11	11	22	0.2

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
YEAR 2010 - DO-NOTHING (AUG) W. TERMINAL CON. TO 188/28

Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Tota
	Zone 18 Subtotal					11	11	22	0.
19	OFF-PARK #19	22.00	SHUTTLE TRIPS	0.72	0.72	16	16	32	0.
	Zone 19 Subtotal					16	16	32	0.
20	WEYERHAEUSER	8.00	FLIGHTS PER DA	0.17	0.17	1	1	2	0.
	Zone 20 Subtotal					1	1	2	0.
21	GENERAL AVIA	22.00	FLIGHTS PER DA	0.25	0.25	6	6	12	0.
	Zone 21 Subtotal					6	6	12	0.
22	NAC EMPLOYEE	1460.00	EMPLOYEES	0.03	0.17	44	248	292	2.
	Zone 22 Subtotal					44	248	292	2.
23	T-PASSENGER	4803.00	PM PKHR TRIPS	0.53	0.47	2546	2257	4803	43.
	Zone 23 Subtotal					2546	2257	4803	43.
24	T-COURTESY	200.00	PM PKHR TRIPS	0.50	0.50	100	100	200	1.
	Zone 24 Subtotal					100	100	200	1.
25	T-TRANSIT	156.00	PM PKHR TRIPS	0.50	0.50	78	78	156	1.
	Zone 25 Subtotal					78	78	156	1.
26	T-OFF PARK	242.00	PM PKHR TRIPS	0.50	0.50	121	121	242	2.
	Zone 26 Subtotal					121	121	242	2.
27	T-EMPLOYEE	76.00	PM PKHR TRIPS	0.26	0.74	20	56	76	0.
	Zone 27 Subtotal					20	56	76	0.
28	SASA-MAINTEN	1651.00	EMPLOYEES	0.02	0.14	33	231	264	2.
	Zone 28 Subtotal					33	231	264	2.
29	SASA-OTHER	1170.00	PM PKHR TRIPS	0.30	0.70	351	819	1170	10.
	Zone 29 Subtotal					351	819	1170	10.
30	DMCTC	711.00	PM PKHR TRIPS	0.25	0.75	178	533	711	6.
	Zone 30 Subtotal					178	533	711	6.
31	FEDERAL DETE	234.00	PM PKHR TRIPS	0.26	0.74	61	173	234	2.
	Zone 31 Subtotal					61	173	234	2.
32	AVIATION BUS	1871.00	PM PKHR TRIPS	0.30	0.70	561	1310	1871	16.
	Zone 32 Subtotal					561	1310	1871	16.
33	NORTH LOT	5571.00	ACCESS CARDS	0.01	0.01	56	56	112	1
	Zone 33 Subtotal					56	56	112	1

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SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
TOTAL						4666	6415	11081	100.0

DO NOTHING ALTERNATIVE FORECAST
BY SMITH ENGINEERING AND MANAGEMENT

REVISED 2010 AUGUST PM PEAK HOUR FORECAST REFLECTING INCLUSION OF SOUTH ACCESS TO TERMINAL FROM S. 188'TH STREET - 28'TH AVENUE S. INTERSECTION IN DO NOTHING ALTERNATIVE STREET NETWORK

(Labled S-DN on Table 1)

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
2010 DO NOTHING AUG WITH CONNECT TERM-188/28 & 20% LNDG PAS RED

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #12 INTERNATIONAL BLVD/SR99 & SOUTH 160TH STREET S-DN 2

Cycle (sec):	180	Critical Vol./Cap. (X):	1.143
Loss Time (sec):	12	Average Delay (sec/veh):	73.6
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Ignore		
Min. Green:	5	10	10	5	10	10	5	5	5	5	5	0
Lanes:	1 0 1 1 0			1 0 2 0 1			1 0 1 1 0			1 0 1 1 0		
Volume Module:												
Base Vol:	116	936	70	407	1144	72	183	218	20	77	146	247
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.00
Initial Bse:	132	1067	80	464	1304	82	209	249	23	88	166	0
Added Vol:	38	532	21	0	345	43	40	48	80	8	20	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	171	1599	101	464	1649	126	248	296	103	95	187	0
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.00
PHF Volume:	184	1720	108	499	1773	135	267	319	111	103	201	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	184	1720	108	499	1773	135	267	319	111	103	201	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.05	1.05	1.00	1.05	0.00
Final Vol.:	184	1806	114	499	1862	135	267	335	116	103	211	0
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.93	0.97	0.97	0.94	0.98	0.84	0.93	0.94	0.94	0.92	0.97	1.00
Lanes:	1.00	1.88	0.12	1.00	2.00	1.00	1.00	1.49	0.51	1.00	2.00	0.00
Final Sat.:	1676	3285	207	1684	3546	1507	1667	2503	867	1659	3492	0
Capacity Analysis Module:												
Vol/Sat:	0.11	0.55	0.55	0.30	0.53	0.09	0.16	0.13	0.13	0.06	0.06	0.00
Crit Moves:		****		****			****				****	
Green/Cycle:	0.13	0.48	0.48	0.26	0.61	0.61	0.14	0.13	0.13	0.06	0.05	0.00
Volume/Cap:	0.86	1.14	1.14	1.14	0.86	0.15	1.14	1.02	1.02	1.02	1.14	0.00
Level Of Service Module:												
Delay/Veh:	77.2	113	113.1	141.9	24.3	11.3	163.4	96.4	96.4	138.4	176	0.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.73	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	77.2	88.2	88.2	141.9	17.7	7.0	163.4	81.9	81.9	138.4	149	0.0
Queue:	10	154	154	40	78	3	22	29	29	8	18	0

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
2010 DO NOTHING AUG WITH CONNECT TERM-188/28 & 20% LNDG PAS RED

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative) S-DN 2

Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.363
Loss Time (sec):	12	Average Delay (sec/veh):	255.5
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	3
Lanes:	1 0 1 1 0			1 0 2 0 1			1 0 1 0 1			1 0 0 1 0		
Volume Module:												
Base Vol:	429	1355	70	165	1298	3	27	211	404	183	166	113
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	489	1545	80	188	1480	3	31	241	461	209	189	129
Added Vol:	44	476	21	0	377	68	129	9	82	8	1	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	533	2020	101	188	1856	72	159	250	542	216	191	129
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	585	2220	111	207	2040	79	175	275	596	238	209	142
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	585	2220	111	207	2040	79	175	275	596	238	209	142
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	585	2331	116	207	2142	79	175	275	596	238	209	142
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.93	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.93	0.93
Lanes:	1.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	0.60	0.40
Final Sat.:	1676	3327	166	1676	3528	1499	1659	1746	1484	1684	992	674
Capacity Analysis Module:												
Vol/Sat:	0.35	0.70	0.70	0.12	0.61	0.05	0.11	0.16	0.40	0.14	0.21	0.21
Crit Moves:	****				****		****				****	
Green/Cycle:	0.26	0.60	0.60	0.11	0.45	0.45	0.08	0.17	0.43	0.06	0.15	0.15
Volume/Cap:	1.36	1.17	1.17	1.17	1.36	0.12	1.36	0.92	0.94	2.34	1.36	1.36
Level Of Service Module:												
Delay/Veh:	312.4	127	126.5	192.7	293	22.2	358.5	78.2	53.4	2738	328	328.4
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	312.4	98.7	98.7	192.7	229	13.8	358.5	66.5	45.4	2738	279	279.1
Queue:	73	232	232	19	287	2	23	16	32	111	44	44

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
2010 DO NOTHING AUG WITH CONNECT TERM-188/28 & 20% LNDG PAS RED

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative) S-DN 2

tersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET

:le (sec):	180	Critical Vol./Cap. (X):	1.573
ss Time (sec):	12	Average Delay (sec/veh):	398.8
imal Cycle:	180	Level Of Service:	F

proach:	North Bound			South Bound			East Bound			West Bound		
ement:	L	T	R	L	T	R	L	T	R	L	T	R
ntrol:	Protected			Protected			Protected			Protected		
ghts:	Ignore			Ignore			Include			Ignore		
. Green:	3	5	0	3	5	0	3	3	3	3	3	0
es:	2 0	2 0	1	1 0	2 0	1	1 0	2 0	1	2 0	2 0	1
ume Module:												
e Vol:	558	771	246	125	780	116	184	529	452	515	689	799
owth Adj:	1.14	1.14	0.00	1.14	1.14	0.00	1.14	1.14	1.14	1.14	1.14	0.00
tial Bse:	636	879	0	143	889	0	210	603	515	587	785	0
ed Vol:	39	561	34	50	348	75	214	744	39	16	586	47
sserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
itial Fut:	675	1440	0	193	1238	0	424	1347	555	603	1371	0
r Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Adj:	0.84	0.84	0.00	0.84	0.84	0.00	0.84	0.84	0.84	0.84	0.84	0.00
Volume:	804	1714	0	230	1473	0	504	1604	660	718	1632	0
uct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
uced Vol:	804	1714	0	230	1473	0	504	1604	660	718	1632	0
Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Adj:	1.05	1.05	0.00	1.00	1.05	0.00	1.00	1.05	1.00	1.05	1.05	0.00
al Vol.:	844	1799	0	230	1547	0	504	1684	660	754	1714	0
uration Flow Module:												
/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
ustment:	0.92	0.99	1.00	0.94	0.99	1.00	0.94	0.98	0.84	0.92	0.99	1.00
es:	2.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00	1.00
al Sat.:	3295	3582	1800	1693	3564	1800	1684	3546	1507	3295	3582	1800
acity Analysis Module:												
/Sat:	0.26	0.50	0.00	0.14	0.43	0.00	0.30	0.47	0.44	0.23	0.48	0.00
: Moves:	****				****		****				****	
en/Cycle:	0.16	0.35	0.00	0.09	0.28	0.00	0.19	0.33	0.33	0.16	0.30	0.00
ume/Cap:	1.57	1.45	0.00	1.45	1.57	0.00	1.57	1.42	1.31	1.42	1.57	0.00
:l Of Service Module:												
ay/Veh:	571.6	398	0.0	448.6	563	0.0	582.0	362	258.3	375.7	562	0.0
ay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
Del/Veh:	571.6	311	0.0	448.6	439	0.0	582.0	308	219.5	375.7	478	0.0
ue:	146	270	0	34	276	0	89	237	76	101	311	0

SEATTLE-TACOMA INTERNATIONAL AIRPORT
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2010 DO NOTHING AUG WITH CONNECT TERM-188/28 & 20% LNDG PAS RED

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative) S-DN 2

Intersection #18 INTERNATIONAL BLVD/SR99 & SOUTH 200TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.362
Loss Time (sec):	12	Average Delay (sec/veh):	175.8
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	7	7	3	7	7	3	3	3	3	3	
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	2 0	1	1 0	1 1	0
Volume Module:												
Base Vol:	94	491	119	343	1205	74	71	269	132	260	232	16
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.1
Initial Bse:	107	560	136	391	1374	84	81	307	150	296	264	18
Added Vol:	65	397	2	8	334	80	202	1093	146	2	446	
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	
Initial Fut:	172	957	138	399	1707	165	283	1400	297	299	711	19
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.9
PHF Volume:	183	1018	147	425	1816	175	301	1489	316	318	756	20
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	
Reduced Vol:	183	1018	147	425	1816	175	301	1489	316	318	756	20
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
MLF Adj:	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.0
Final Vol.:	183	1069	147	425	1907	175	301	1564	316	318	794	21
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.96	0.9
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.58	0.4
Final Sat.:	1693	3564	1515	1693	3564	1515	1693	3564	1515	1684	2712	72
Capacity Analysis Module:												
Vol/Sat:	0.11	0.30	0.10	0.25	0.54	0.12	0.18	0.44	0.21	0.19	0.29	0.2
Crit Moves:	****				****			****		****		
Green/Cycle:	0.08	0.26	0.26	0.22	0.39	0.39	0.17	0.32	0.32	0.14	0.29	0.2
Volume/Cap:	1.36	1.17	0.38	1.17	1.36	0.29	1.02	1.36	0.65	1.36	1.02	1.0
Level Of Service Module:												
Delay/Veh:	354.5	145	42.1	161.5	293	28.6	103.1	296	41.8	330.3	76.5	76.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	354.5	113	26.1	161.5	228	17.7	103.1	252	35.5	330.3	65.0	65.
Queue:	24	87	6	36	245	6	20	194	14	39	60	6

SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #38 MILITARY ROAD & SOUTH 188TH STREET S-DN 2

Cycle (sec):	180	Critical Vol./Cap. (X):	1.4[illegible]
Loss Time (sec):	12	Average Delay (sec/veh):	235.4
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	5	5	5	5	5	5	10	10	5	10	10
Lanes:	1 0	0 1	0	1 0	1 0	1	1 0	1 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	75	237	24	572	601	117	99	994	50	95	826	246
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	85	270	27	652	685	133	113	1133	57	108	942	280
Added Vol:	4	5	0	4	14	1	4	819	5	0	642	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	90	275	27	656	699	135	117	1952	62	108	1584	280
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	101	309	31	737	785	152	132	2193	69	122	1780	315
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	101	309	31	737	785	152	132	2193	69	122	1780	315
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.05	1.00	1.05	1.00
Final Vol.:	101	309	31	737	785	152	132	2303	73	122	1869	315
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.95	0.99	0.99	0.95	0.99	0.85	0.94	0.98	0.98	0.94	0.99	0.84
Lanes:	1.00	0.91	0.09	1.00	1.00	1.00	1.00	1.94	0.06	1.00	2.00	1.00
Final Sat.:	1701	1611	162	1701	1791	1522	1684	3437	109	1693	3564	1515
Capacity Analysis Module:												
Vol/Sat:	0.06	0.19	0.19	0.43	0.44	0.10	0.08	0.67	0.67	0.07	0.52	0.21
Crit Moves:		****		****				****		****		
Green/Cycle:	0.05	0.13	0.13	0.30	0.38	0.38	0.07	0.46	0.46	0.05	0.44	0.44
Volume/Cap:	1.17	1.46	1.46	1.46	1.17	0.27	1.19	1.46	1.46	1.46	1.19	0.47
Level Of Service Module:												
Delay/Veh:	220.8	445	445.3	422.5	142	29.7	222.7	412	411.6	500.8	145	27.4
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.85	0.85	1.00	0.85	0.85	1.00	0.78	0.78	1.00	0.78	0.62
AdjDel/Veh:	220.8	379	378.5	422.5	121	25.2	222.7	321	321.1	500.8	113	17.0
Queue:	10	50	50	112	67	5	13	401	401	19	167	11

MITIGATED SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #12 INTERNATIONAL BLVD/SR99 & SOUTH 160TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.055
Loss Time (sec):	12	Average Delay (sec/veh):	54.6
Optimal Cycle:	180	Level Of Service:	E

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Ignore		
Min. Green:	5	10	10	5	10	10	5	5	5	5	5	
Lanes:	1 0	1 1	0	2 0	2 0	1	1 0	1 1	0	1 0	1 0	1
Volume Module:												
Base Vol:	116	936	70	407	1144	72	183	218	20	77	146	24
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.0
Initial Bse:	132	1067	80	464	1304	82	209	249	23	88	166	
Added Vol:	38	532	21	0	345	43	40	48	80	8	20	
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	
Initial Fut:	170	1599	101	464	1649	125	249	297	103	96	186	
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.0
PHF Volume:	183	1719	108	499	1773	134	267	319	111	103	200	
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	
Reduced Vol:	183	1719	108	499	1773	134	267	319	111	103	200	
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0
MLF Adj:	1.00	1.05	1.05	1.05	1.05	1.00	1.00	1.05	1.05	1.00	1.00	0.0
Final Vol.:	183	1805	114	524	1862	134	267	335	116	103	200	
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.93	0.97	0.97	0.91	0.98	0.84	0.93	0.94	0.94	0.92	0.97	1.0
Lanes:	1.00	1.88	0.12	2.00	2.00	1.00	1.00	1.49	0.51	1.00	1.00	1.0
Final Sat.:	1676	3285	207	3262	3546	1507	1667	2503	867	1659	1746	180
Capacity Analysis Module:												
Vol/Sat:	0.11	0.55	0.55	0.16	0.53	0.09	0.16	0.13	0.13	0.06	0.11	0.0
Crit Moves:		****		****			****				****	
Green/Cycle:	0.12	0.52	0.52	0.15	0.56	0.56	0.15	0.18	0.18	0.08	0.11	0.0
Volume/Cap:	0.94	1.06	1.06	1.06	0.94	0.16	1.06	0.75	0.75	0.75	1.06	0.0
Level Of Service Module:												
Delay/Veh:	94.9	66.8	66.8	106.2	35.5	14.7	120.1	57.1	57.1	75.0	130	0.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.76	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	94.9	52.1	52.1	106.2	27.0	9.1	120.1	48.5	48.5	75.0	111	0.
Queue:	12	123	123	35	92	3	19	22	22	6	15	

MITIG8 *S DN Z* Wed May 15, 1996 16:01:54

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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET

Cycle (sec): 180 Critical Vol./Cap. (X): 1.262
Loss Time (sec): 12 Average Delay (sec/veh): 144.3
Optimal Cycle: 180 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	3
Lanes:	2 0	1 1	0	1 0	2 0	1	1 0	1 0	1	1 0	1 0	1
Volume Module:												
Base Vol:	429	1355	70	165	1298	3	27	211	404	183	166	113
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	489	1545	80	188	1480	3	31	241	461	209	189	129
Added Vol:	44	476	21	0	377	68	129	9	82	8	1	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	533	2021	101	188	1857	71	160	250	543	217	190	129
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	586	2221	111	207	2040	78	176	274	596	238	209	142
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	586	2221	111	207	2040	78	176	274	596	238	209	142
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.05	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	615	2332	116	207	2142	78	176	274	596	238	209	142
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.90	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.98	0.84
Lanes:	2.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	3246	3327	166	1676	3528	1499	1659	1746	1484	1684	1773	1507
Capacity Analysis Module:												
Vol/Sat:	0.19	0.70	0.70	0.12	0.61	0.05	0.11	0.16	0.40	0.14	0.12	0.09
Crit Moves:		****		****					****	****		
Green/Cycle:	0.16	0.56	0.56	0.10	0.50	0.50	0.13	0.17	0.32	0.11	0.15	0.15
Volume/Cap:	1.22	1.26	1.26	1.26	1.22	0.10	0.80	0.93	1.24	1.26	0.80	0.64
Level Of Service Module:												
Delay/Veh:	192.4	195	194.8	256.3	163	18.2	70.1	81.6	200.9	250.5	67.2	59.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	192.4	152	152.0	256.3	127	11.3	70.1	69.4	170.8	250.5	57.2	50.2
Queue:	56	287	287	22	212	2	10	16	59	25	11	7

MITIG8 *S DN Z* Wed May 15, 1996 15:54:56

MITIGATED SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
YEAR 2010 - DO-NOTHING (AUG) W. TERMINAL CON. TO 188/28

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET

Cycle (sec): 180 Critical Vol./Cap. (X): 1.493
Loss Time (sec): 12 Average Delay (sec/veh): 309.0
Optimal Cycle: 180 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	3	5	0	3	5	0	3	3	3	3	3	(
Lanes:	2 0	2 0	1	2 0	2 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	558	771	246	125	780	116	184	529	452	515	689	79
Growth Adj:	1.14	1.14	0.00	1.14	1.14	0.00	1.14	1.14	1.14	1.14	1.14	0.0
Initial Bse:	636	879	0	143	889	0	210	603	515	587	785	(
Added Vol:	39	561	34	50	348	75	214	744	39	16	586	47
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	(
Initial Fut:	675	1440	0	193	1237	0	424	1347	554	603	1371	(
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.0
PHF Adj:	0.84	0.84	0.00	0.84	0.84	0.00	0.84	0.84	0.84	0.84	0.84	0.0
PHF Volume:	804	1714	0	229	1473	0	504	1604	660	718	1633	(
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	(
Reduced Vol:	804	1714	0	229	1473	0	504	1604	660	718	1633	(
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.0
MLF Adj:	1.05	1.05	0.00	1.05	1.05	0.00	1.05	1.05	1.00	1.05	1.05	0.0
Final Vol.:	844	1800	0	241	1546	0	530	1684	660	754	1714	(
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.92	0.99	1.00	0.91	0.99	1.00	0.91	0.98	0.84	0.92	0.99	1.0
Lanes:	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	1.0
Final Sat.:	3295	3582	1800	3279	3564	1800	3262	3546	1507	3295	3582	180
Capacity Analysis Module:												
Vol/Sat:	0.26	0.50	0.00	0.07	0.43	0.00	0.16	0.47	0.44	0.23	0.48	0.0
Crit Moves:	****				****			****		****		
Green/Cycle:	0.17	0.40	0.00	0.06	0.29	0.00	0.12	0.32	0.32	0.15	0.35	0.0
Volume/Cap:	1.49	1.25	0.00	1.25	1.49	0.00	1.36	1.49	1.38	1.49	1.36	0.0
Level Of Service Module:												
Delay/Veh:	459.4	189	0.0	240.6	450	0.0	316.3	449	322.5	461.7	293	0.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	459.4	147	0.0	240.6	351	0.0	316.3	382	274.1	461.7	249	0.
Queue:	128	181	0	24	242	0	63	268	86	114	215	(

AR 040994

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
2010 DO NOTHING AUG WITH CONNECT TERM-188/28 & 20% LNDG PAS RED

Trip Generation Report

Forecast for PM PEAK HOUR

Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
2	NAC TRUCKS	2120.00	M TONS CARGO	0.09	0.01	191	21	212	2.2
	Zone 2 Subtotal					191	21	212	2.2
3	LOT A	2910.00	ACCESS CARDS	0.01	0.02	29	58	87	0.9
	Zone 3 Subtotal					29	58	87	0.9
4	LOT B	4701.00	ACCESS CARDS	0.01	0.01	47	47	94	1.0
	Zone 4 Subtotal					47	47	94	1.0
5	CENTRAL LOTS	1420.00	Access Cards	0.02	0.06	28	85	113	1.2
	Zone 5 Subtotal					28	85	113	1.2
7	AOA ACCESS	2020.00	WEEKDAY TRIPS	0.02	0.02	40	40	80	0.8
	Zone 7 Subtotal					40	40	80	0.8
9	OFF-PARK #9	13.60	SHUTTLE TRIPS	0.72	0.72	10	10	20	0.2
	Zone 9 Subtotal					10	10	20	0.2
10	OFF-PARK #10	13.60	SHUTTLE TRIPS	0.72	0.72	10	10	20	0.2
	Zone 10 Subtotal					10	10	20	0.2
11	OFF-PARK #11	13.60	SHUTTLE TRIPS	0.72	0.72	10	10	20	0.2
	Zone 11 Subtotal					10	10	20	0.2
12	OFF-PARK #12	13.60	SHUTTLE TRIPS	0.72	0.72	10	10	20	0.2
	Zone 12 Subtotal					10	10	20	0.2
13	OFF-PARK #13	16.20	SHUTTLE TRIPS	0.72	0.72	12	12	24	0.2
	Zone 13 Subtotal					12	12	24	0.2
14	OFF-PARK #14	23.80	SHUTTLE TRIPS	0.72	0.72	17	17	34	0.4
	Zone 14 Subtotal					17	17	34	0.4
15	OFF-PARK #15	17.60	SHUTTLE TRIPS	0.72	0.72	13	13	26	0.3
	Zone 15 Subtotal					13	13	26	0.3
16	OFF-PARK #16	23.20	SHUTTLE TRIPS	0.72	0.72	17	17	34	0.4
	Zone 16 Subtotal					17	17	34	0.4
17	OFF-PARK #17	31.80	SHUTTLE TRIPS	0.72	0.72	23	23	46	0.5
	Zone 17 Subtotal					23	23	46	0.5
18	OFF-PARK #18	12.00	SHUTTLE TRIPS	0.72	0.72	9	9	18	0.2

AR 040995

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
2010 DO NOTHING AUG WITH CONNECT TERM-188/28 & 20% LNDG PAS RED

Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Tota
	Zone 18 Subtotal					9	9	18	0.
19	OFF-PARK #19	17.60	SHUTTLE TRIPS	0.72	0.72	13	13	26	0.
	Zone 19 Subtotal					13	13	26	0.
20	WEYERHAEUSER	8.00	FLIGHTS PER DA	0.17	0.17	1	1	2	0.
	Zone 20 Subtotal					1	1	2	0.
21	GENERAL AVIA	22.00	FLIGHTS PER DA	0.25	0.25	6	6	12	0.
	Zone 21 Subtotal					6	6	12	0.
22	NAC EMPLOYEE	1460.00	EMPLOYEES	0.03	0.17	44	248	292	3.
	Zone 22 Subtotal					44	248	292	3.
23	T-PASSENGER	4082.60	PM PKHR TRIPS	0.53	0.32	2164	1306	3470	36.
	Zone 23 Subtotal					2164	1306	3470	36.
24	T-COURTESY	160.00	PM PKHR TRIPS	0.50	0.50	80	80	160	1.
	Zone 24 Subtotal					80	80	160	1.
25	T-TRANSIT	156.00	PM PKHR TRIPS	0.50	0.50	78	78	156	1.
	Zone 25 Subtotal					78	78	156	1.
26	T-OFF PARK	242.00	PM PKHR TRIPS	0.50	0.50	121	121	242	2.
	Zone 26 Subtotal					121	121	242	2.
27	T-EMPLOYEE	76.00	PM PKHR TRIPS	0.26	0.74	20	56	76	0.
	Zone 27 Subtotal					20	56	76	0.
28	SASA-MAINTEN	1651.00	EMPLOYEES	0.02	0.14	33	231	264	2.
	Zone 28 Subtotal					33	231	264	2.
29	SASA-OTHER	1170.00	PM PKHR TRIPS	0.30	0.70	351	819	1170	12
	Zone 29 Subtotal					351	819	1170	12.
30	DMCTC	711.00	PM PKHR TRIPS	0.25	0.75	178	533	711	7
	Zone 30 Subtotal					178	533	711	7
31	FEDERAL DETE	234.00	PM PKHR TRIPS	0.26	0.74	61	173	234	2
	Zone 31 Subtotal					61	173	234	2
32	AVIATION BUS	1871.00	PM PKHR TRIPS	0.30	0.70	561	1310	1871	19
	Zone 32 Subtotal					561	1310	1871	19
33	NORTH LOT	5571.00	ACCESS CARDS	0.01	0.01	56	56	112	1
	Zone 33 Subtotal					56	56	112	1

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
2010 DO NOTHING AUG WITH CONNECT TERM-188/28 & 20% LNDG PAS RED

ıe Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
'AL					4233	5413	9646	100.0

NORTH UNIT TERMINAL FORECAST
BY SMITH ENGINEERING & MANAGEMENT

REVISED 2010 AUGUST PM PEAK HOUR PROJECTION ATTEMPTING TRIP GENERATION AND DISTRIBUTION TREATMENT CONSISTENT WITH DO NOTHING

(Labled S-NUT 1 on Table 1)

SEATTLE-TACOMA INTERNATIONAL AIRPORT S-NUT-1
MASTER PLAN UPDATE EIS
YEAR 2010 - NUT ALT (AUGUST) - DN Land Use, Revised 4/25/96

Impact Analysis Report
Level Of Service

ersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
1 SOUTHBOUND SR509 RAMPS & SR518	D	28.0	0.864	E	42.1	1.012	+14.171 D/V
2 NORTHBOUND SR509 RAMPS & SR518	A	2.6	0.694	A	4.4	0.856	+ 1.724 D/V
11 INTERNATIONAL BLVD/SR99 & SOUT	D	35.5	0.834	E	46.7	1.013	+11.190 D/V
.2 INTERNATIONAL BLVD/SR99 & SOUT	E	44.3	1.015	F	128.4	1.267	+84.039 D/V
3 INTERNATIONAL BLVD/SR99 & SOUT	D	39.2	0.986	F	259.9	1.439	+220.684 D/V
14 INTERNATIONAL BLVD/SR99 & SOUT	C	24.1	0.784	D	37.8	1.040	+13.651 D/V
15 INTERNATIONAL BLVD/SR99 & SOUT	A	4.4	0.702	B	8.1	0.908	+ 3.780 D/V
16 INTERNATIONAL BLVD/SR99 & SOUT	F	121.2	1.267	F	449.9	1.579	+328.664 D/V
17 INTERNATIONAL BLVD/SR99 & SOUT	C	25.0	0.839	D	38.1	1.017	+13.124 D/V
18 INTERNATIONAL BLVD/SR99 & SOUT	D	37.4	0.847	F	195.7	1.402	+158.281 D/V
19 INTERNATIONAL BLVD/SR99 & KENT	E	45.8	0.902	F	117.4	1.208	+71.608 D/V
22 24TH AVE S/PERIMETER RD & S 15	D	27.5	0.595	E	43.6	0.924	+16.043 D/V
# 23 DES MOINES MEMORIAL DRIVE S &	C	15.2	0.690	C	16.4	0.690	+ 1.130 D/V
24 DES MOINES MEMORIAL DRIVE S &	B	7.0	0.465	B	7.1	0.471	+ 0.037 D/V
25 NORTHBOUND SR509 RAMPS & SOUTH	E	xxxxx	0.000	F	xxxxx	0.000	+ 0.000 V/C
# 26 SOUTHBOUND SR509 RAMPS & SOUTH	F	xxxxx	0.000	F	xxxxx	0.000	+ 0.000 V/C
# 27 AIR CARGO RD/PERIMETER RD & SO	B	8.3	0.386	B	14.9	0.711	+ 6.555 D/V
# 34 SOUTHBOUND SR509 & SOUTH 188TH	D	xxxxx	0.000	E	xxxxx	0.000	+ 0.000 V/C
# 36 DES MOINES MEMORIAL DRIVE S &	B	12.3	0.747	B	14.3	0.865	+ 2.011 D/V
# 37 28TH AVENUE SOUTH & SOUTH 188T	B	14.2	0.617	F	86.8	1.158	+72.534 D/V
# 38 MILITARY ROAD & SOUTH 188TH ST	F	86.9	1.170	F	283.3	1.534	+196.446 D/V
# 39 SOUTHBOUND I-5 RAMPS & SOUTH 1	D	28.2	0.871	F	126.6	1.166	+98.427 D/V
# 40 NORTHBOUND I-5 RAMPS & SOUTH 1	E	51.2	1.035	F	324.3	1.552	+273.066 D/V

SEATTLE-TACOMA INTERNATIONAL AIRPORT S-NUT-1
MASTER PLAN UPDATE EIS
YEAR 2010 - NUT ALT (AUGUST) - DN Land Use, Revised 4/25/96

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 41 DES MOINES MEMORIAL DRIVE S &	B	9.2	0.812	B	11.1	0.858	+ 1.877 D/V
# 42 DES MOINES MEMORIAL DR S & MAR	B	10.5	0.708	B	10.8	0.730	+ 0.348 D/V
# 43 28TH AVENUE SOUTH & SOUTH 200T	B	14.0	0.303	F	193.4	1.371	+179.327 D/
# 44 MILITARY RD & S 200TH ST/SOUTH	E	59.6	0.971	F	310.8	1.502	+251.213 D/
# 47 MILITARY ROAD & NORTHBOUND I-5	D	34.3	0.893	F	88.0	1.144	+53.694 D/V
# 50 28TH AVENUE SOUTH & SOUTH 192N	B	12.7	0.297	B	12.8	0.690	+ 0.157 D/V
# 51 SOUTHBOUND I-5 RAMPS & KENT-DE	F	131.3	1.267	F	198.0	1.387	+66.654 D/V
#153 20TH AVENUE SOUTH AND WESTBOUN	B	9.9	0.520	B	11.1	0.651	+ 1.268 D/V
#154 20TH AVENUE SOUTH AND EASTBOUN	B	11.4	0.516	B	13.4	0.716	+ 2.006 D/V
#155 20TH AVENUE SOUTH AND SOUTH 15	B	12.2	0.596	C	15.1	0.668	+ 2.896 D/V

[illegible] Report
[illegible] (Future Volume Alternative)

[illegible] & SOUTH 160TH STREET S-NUT I

[illegible] Critical Vol./Cap. (X):	1.267
Average Delay (sec/veh):	128.4
Level Of Service:	F

Approach:	[illegible]	[illegible]	[illegible]	South Bound			East Bound			West Bound		
Movement:	[illegible]	[illegible]	[illegible]	L	T	R	L	T	R	L	T	R
Control:	Protected Include			Protected Include			Protected Include			Protected Ignore		
Min. Green:	[illegible]	10	[illegible]	[illegible]	10	10	5	5	5	5	5	0
Lanes:	[illegible]			1 0	2 0	1	1 0	1 1	0	1 0	1 1	0
Base Vol:	[illegible]	[illegible]	70	407	1394	72	183	218	20	77	146	247
Growth Adj:	[illegible]	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.00
Initial Bse:	132	1352	80	464	1589	82	209	249	23	88	166	0
Added Vol:	94	609	24	0	414	40	37	55	138	9	20	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	226	1961	104	464	2003	122	246	304	161	97	186	0
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.00
PHF Volume:	243	2108	112	499	2153	132	264	327	173	104	200	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	243	2108	112	499	2153	132	264	327	173	104	200	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.05	1.05	1.00	1.05	0.00
Final Vol.:	243	2214	118	499	2261	132	264	343	181	104	210	0
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.93	0.97	0.97	0.94	0.98	0.84	0.93	0.93	0.93	0.92	0.97	1.00
Lanes:	1.00	1.90	0.10	1.00	2.00	1.00	1.00	1.31	0.69	1.00	2.00	0.00
Final Sat.:	1676	3316	177	1684	3546	1507	1667	2183	1152	1659	3492	0
Capacity Analysis Module:												
Vol/Sat:	0.15	0.67	0.67	0.30	0.64	0.09	0.16	0.16	0.16	0.06	0.06	0.00
Crit Moves:		****		****			****				****	
Green/Cycle:	0.14	0.53	0.53	0.23	0.62	0.62	0.12	0.12	0.12	0.05	0.05	0.00
Volume/Cap:	1.03	1.27	1.27	1.27	1.03	0.14	1.27	1.27	1.27	1.27	1.27	0.00
Level Of Service Module:												
Delay/Veh:	112.9	200	199.8	228.4	49.2	10.8	250.3	239	239.1	303.6	262	0.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	112.9	156	155.8	228.4	38.4	6.7	250.3	203	203.2	303.6	223	0.0
Queue:	17	268	268	52	136	3	28	53	53	12	22	0

Traffix 6.8.2803 (c) 1996 Dowling Assoc. Licensed to Smith Management and Eng

AR 040998

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
YEAR 2010 - NUT ALT (AUGUST)- DN Land Use, Revised 4/25/96

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET S-NUT I

Cycle (sec):	180	Critical Vol./Cap. (X):	1.439
Loss Time (sec):	12	Average Delay (sec/veh):	259.9
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	3
Lanes:	1 0	1 1	0	1 0	2 0	1	1 0	1 0	1	1 0	0 1	0
Volume Module:												
Base Vol:	189	1605	70	165	1548	3	8	42	84	183	86	113
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	215	1830	80	188	1765	3	9	48	96	209	98	129
Added Vol:	280	437	24	0	252	315	297	0	262	9	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	496	2266	104	188	2017	318	306	48	357	217	98	129
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	545	2490	115	207	2216	350	337	53	393	239	108	142
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	545	2490	115	207	2216	350	337	53	393	239	108	142
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	545	2615	120	207	2327	350	337	53	393	239	108	142
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.93	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.90	0.90
Lanes:	1.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	0.43	0.57
Final Sat.:	1676	3339	153	1676	3528	1499	1659	1746	1484	1684	697	916
Capacity Analysis Module:												
Vol/Sat:	0.33	0.78	0.78	0.12	0.66	0.23	0.20	0.03	0.26	0.14	0.15	0.15
Crit Moves:	****				****		****				****	
Green/Cycle:	0.23	0.59	0.59	0.09	0.46	0.46	0.14	0.16	0.39	0.09	0.11	0.11
Volume/Cap:	1.44	1.32	1.32	1.32	1.44	0.51	1.44	0.19	0.68	1.63	1.44	1.44
Level Of Service Module:												
Delay/Veh:	398.2	254	254.4	311.7	379	26.7	413.6	49.6	37.1	711.3	426	425.8
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	398.2	198	198.4	311.7	296	16.6	413.6	42.1	31.6	711.3	362	362.0
Queue:	77	408	408	25	372	12	48	2	17	47	36	36

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1985 HCM Operations Method (Future Volume Alternative)

Intersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET 5-NUT 1

Cycle (sec): 180 Critical Vol./Cap. (X): 1.579
Loss Time (sec): 12 Average Delay (sec/veh): 449.9
Optimal Cycle: 180 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	3	5	0	3	5	0	3	3	3	3	3	0
Lanes:	2 0	2 0	1	1 0	2 0	1	1 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	558	771	246	125	780	116	184	529	452	515	689	799
Growth Adj:	1.14	1.14	0.00	1.14	1.14	0.00	1.14	1.14	1.14	1.14	1.14	0.00
Initial Bse:	636	879	0	143	889	0	210	603	515	587	785	0
Added Vol:	32	644	89	61	446	49	144	859	29	35	637	57
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	668	1523	0	204	1336	0	354	1462	544	622	1423	0
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.84	0.84	0.00	0.84	0.84	0.00	0.84	0.84	0.84	0.84	0.84	0.00
PHF Volume:	796	1813	0	242	1590	0	422	1741	648	741	1694	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	796	1813	0	242	1590	0	422	1741	648	741	1694	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.05	1.05	0.00	1.00	1.05	0.00	1.00	1.05	1.00	1.05	1.05	0.00
Final Vol.:	835	1904	0	242	1670	0	422	1828	648	778	1778	0
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.92	0.99	1.00	0.94	0.99	1.00	0.94	0.98	0.84	0.92	0.99	1.00
Lanes:	2.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3295	3582	1800	1693	3564	1800	1684	3546	1507	3295	3582	1800
Capacity Analysis Module:												
Vol/Sat:	0.25	0.53	0.00	0.14	0.47	0.00	0.25	0.52	0.43	0.24	0.50	0.00
Crit Moves:	****				****			****		****		
Green/Cycle:	0.16	0.36	0.00	0.10	0.30	0.00	0.16	0.33	0.33	0.15	0.32	0.00
Volume/Cap:	1.58	1.48	0.00	1.48	1.58	0.00	1.57	1.58	1.32	1.58	1.57	0.00
Level Of Service Module:												
Delay/Veh:	581.0	424	0.0	472.7	572	0.0	581.8	571	263.0	582.4	556	0.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	581.0	331	0.0	472.7	446	0.0	581.8	486	223.6	582.4	473	0.0
Queue:	146	300	0	37	305	0	74	339	75	135	322	0

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Intersection #18 INTERNATIONAL BLVD/SR99 & SOUTH 200TH STREET 5-NUT 1

Cycle (sec): 180 Critical Vol./Cap. (X): 1.402
Loss Time (sec): 12 Average Delay (sec/veh): 195.7
Optimal Cycle: 180 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	7	7	3	7	7	3	3	3	3	3	
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	2 0	1	1 0	1 1	0
Volume Module:												
Base Vol:	94	491	119	343	1205	74	71	269	132	260	232	16
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.1
Initial Bse:	107	560	136	391	1374	84	81	307	150	296	264	18
Added Vol:	73	392	5	1	361	81	202	1159	155	7	462	[illegible]
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Initial Fut:	180	952	141	392	1735	165	283	1466	306	303	726	18
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.9
PHF Volume:	192	1012	150	417	1846	176	302	1560	325	323	772	19
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Reduced Vol:	192	1012	150	417	1846	176	302	1560	325	323	772	19
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
MLF Adj:	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.0
Final Vol.:	192	1063	150	417	1938	176	302	1638	325	323	811	20
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.96	0.9
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.59	0.4
Final Sat.:	1693	3564	1515	1693	3564	1515	1693	3564	1515	1684	2735	70
Capacity Analysis Module:												
Vol/Sat:	0.11	0.30	0.10	0.25	0.54	0.12	0.18	0.46	0.21	0.19	0.30	0.3
Crit Moves:	****				****			****		****		
Green/Cycle:	0.08	0.26	0.26	0.21	0.39	0.39	0.17	0.33	0.33	0.14	0.29	0.2
Volume/Cap:	1.40	1.16	0.39	1.16	1.40	0.30	1.02	1.40	0.65	1.40	1.02	1.0
Level Of Service Module:												
Delay/Veh:	395.9	142	42.3	159.3	336	29.1	103.5	338	41.5	372.8	76.5	76.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	395.9	111	26.2	159.3	262	18.0	103.5	288	35.3	372.8	65.0	65.
Queue:	26	85	6	35	270	6	20	221	14	43	61	6

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Intersection #38 MILITARY ROAD & SOUTH 188TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.534
Loss Time (sec):	12	Average Delay (sec/veh):	283.3
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	5	5	5	5	5	5	10	10	5	10	10
Lanes:	1 0 0 1 0			1 0 1 0 1			1 0 1 1 0			1 0 2 0 1		
Volume Module:												
Base Vol:	75	237	24	572	601	117	99	994	50	95	826	246
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	85	270	27	652	685	133	113	1133	57	108	942	280
Added Vol:	0	4	0	10	13	0	0	1008	1	0	729	4
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	86	274	27	662	698	133	113	2141	58	108	1671	284
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	97	308	31	744	784	150	127	2406	65	122	1877	319
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	97	308	31	744	784	150	127	2406	65	122	1877	319
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.05	1.00	1.05	1.00
Final Vol.:	97	308	31	744	784	150	127	2526	68	122	1971	319
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.95	0.99	0.99	0.95	0.99	0.85	0.94	0.98	0.98	0.94	0.99	0.84
Lanes:	1.00	0.91	0.09	1.00	1.00	1.00	1.00	1.95	0.05	1.00	2.00	1.00
Final Sat.:	1701	1611	162	1701	1791	1522	1684	3453	93	1693	3564	1515
Capacity Analysis Module:												
Vol/Sat:	0.06	0.19	0.19	0.44	0.44	0.10	0.08	0.73	0.73	0.07	0.55	0.21
Crit Moves:		****		****				****		****		
Green/Cycle:	0.05	0.12	0.12	0.28	0.36	0.36	0.06	0.48	0.48	0.05	0.46	0.46
Volume/Cap:	1.21	1.53	1.53	1.53	1.21	0.27	1.20	1.53	1.53	1.53	1.20	0.46
Level Of Service Module:												
Delay/Veh:	252.8	539	538.9	515.9	170	30.9	231.9	510	510.5	598.6	151	25.5
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.85	0.85	1.00	0.85	0.85	1.00	0.78	0.78	1.00	0.78	0.62
AdjDel/Veh:	252.8	458	458.1	515.9	145	26.3	231.9	398	398.2	598.6	118	15.8
Queue:	10	56	56	127	73	5	13	522	522	22	182	11

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Intersection #12 INTERNATIONAL BLVD/SR99 & SOUTH 160TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.171
Loss Time (sec):	12	Average Delay (sec/veh):	97.0
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Ignore		
Min. Green:	5	10	10	5	10	10	5	5	5	5	5	(
Lanes:	1 0 1 1 0			2 0 2 0 1			1 0 1 1 0			1 0 1 0 1		
Volume Module:												
Base Vol:	116	1186	70	407	1394	72	183	218	20	77	146	24
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.0
Initial Bse:	132	1352	80	464	1589	82	209	249	23	88	166	(
Added Vol:	93	587	21	0	409	40	37	55	137	9	20	(
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	(
Initial Fut:	225	1939	101	464	1998	122	246	304	160	97	186	(
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.0
PHF Volume:	242	2085	108	499	2149	131	264	326	172	104	200	
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	
Reduced Vol:	242	2085	108	499	2149	131	264	326	172	104	200	(
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0
MLF Adj:	1.00	1.05	1.05	1.05	1.05	1.00	1.00	1.05	1.05	1.00	1.00	0.0
Final Vol.:	242	2189	114	524	2256	131	264	343	180	104	200	
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.93	0.97	0.97	0.91	0.98	0.84	0.93	0.93	0.93	0.92	0.97	1.0
Lanes:	1.00	1.90	0.10	2.00	2.00	1.00	1.00	1.31	0.69	1.00	1.00	1.0
Final Sat.:	1676	3320	173	3262	3546	1507	1667	2187	1148	1659	1746	180
Capacity Analysis Module:												
Vol/Sat:	0.14	0.66	0.66	0.16	0.64	0.09	0.16	0.16	0.16	0.06	0.11	0.0
Crit Moves:		****		****			****				****	
Green/Cycle:	0.13	0.56	0.56	0.14	0.57	0.57	0.14	0.17	0.17	0.07	0.10	0.0
Volume/Cap:	1.11	1.17	1.17	1.17	1.11	0.15	1.17	0.94	0.94	0.94	1.17	0.0
Level Of Service Module:												
Delay/Veh:	151.6	126	125.6	164.5	91.2	13.8	180.8	74.3	74.3	112.1	192	0.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	151.6	97.9	97.9	164.5	71.1	8.6	180.8	63.1	63.1	112.1	163	0.
Queue:	19	210	210	44	174	3	23	29	29	7	18	

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Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.280
Loss Time (sec):	12	Average Delay (sec/veh):	165.4
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	3
Lanes:	2 0 1 1 0			1 0 2 0 1			1 0 1 0 1			1 0 1 0 1		
Volume Module:												
Base Vol:	189	1605	70	165	1548	3	8	42	84	183	86	113
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	215	1830	80	188	1765	3	9	48	96	209	98	129
Added Vol:	280	412	21	0	249	315	297	0	262	9	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	495	2242	101	188	2014	318	306	48	358	218	98	129
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	544	2463	111	207	2213	350	336	53	393	239	108	142
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	544	2463	111	207	2213	350	336	53	393	239	108	142
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.05	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	572	2587	116	207	2324	350	336	53	393	239	108	142
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.90	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.98	0.84
Lanes:	2.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	3246	3343	150	1676	3528	1499	1659	1746	1484	1684	1773	1507
Capacity Analysis Module:												
Vol/Sat:	0.18	0.77	0.77	0.12	0.66	0.23	0.20	0.03	0.26	0.14	0.06	0.09
Crit Moves:		****		****			****					****
Green/Cycle:	0.15	0.60	0.60	0.10	0.55	0.55	0.16	0.15	0.30	0.08	0.07	0.07
Volume/Cap:	1.19	1.28	1.28	1.28	1.19	0.42	1.28	0.20	0.89	1.75	0.83	1.28
Level Of Service Module:												
Delay/Veh:	174.5	210	210.3	271.0	139	18.0	251.8	50.9	59.0	935.7	84.9	289.1
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	174.5	164	164.1	271.0	109	11.2	251.8	43.3	50.1	935.7	72.2	245.7
Queue:	49	361	361	23	222	10	36	2	21	56	6	16

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Intersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.527
Loss Time (sec):	12	Average Delay (sec/veh):	320.5
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	3	5	0	3	5	0	3	3	3	3	3	[illegible]
Lanes:	2 0 2 0 1			2 0 2 0 1			2 0 2 0 1			2 0 2 0 1		
Volume Module:												
Base Vol:	558	771	246	125	780	116	184	529	452	515	689	79[illegible]
Growth Adj:	1.14	1.14	0.00	1.14	1.14	0.00	1.14	1.14	1.14	1.14	1.14	0.0[illegible]
Initial Bse:	636	879	0	143	889	0	210	603	515	587	785	[illegible]
Added Vol:	32	628	69	59	445	50	131	723	29	37	524	5[illegible]
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Initial Fut:	668	1507	0	202	1334	0	341	1326	544	624	1309	[illegible]
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.0[illegible]
PHF Adj:	0.84	0.84	0.00	0.84	0.84	0.00	0.84	0.84	0.84	0.84	0.84	0.0[illegible]
PHF Volume:	795	1794	0	240	1588	0	406	1579	648	743	1559	[illegible]
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Reduced Vol:	795	1794	0	240	1588	0	406	1579	648	743	1559	[illegible]
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.0[illegible]
MLF Adj:	1.05	1.05	0.00	1.05	1.05	0.00	1.05	1.05	1.00	1.05	1.05	0.0[illegible]
Final Vol.:	835	1884	0	252	1668	0	426	1658	648	780	1637	[illegible]
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180[illegible]
Adjustment:	0.92	0.99	1.00	0.91	0.99	1.00	0.91	0.98	0.84	0.92	0.99	1.0[illegible]
Lanes:	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	1.0[illegible]
Final Sat.:	3295	3582	1800	3279	3564	1800	3262	3546	1507	3295	3582	180[illegible]
Capacity Analysis Module:												
Vol/Sat:	0.25	0.53	0.00	0.08	0.47	0.00	0.13	0.47	0.43	0.24	0.46	0.0[illegible]
Crit Moves:	****				****			****		****		
Green/Cycle:	0.17	0.41	0.00	0.06	0.31	0.00	0.10	0.31	0.31	0.15	0.36	0.0[illegible]
Volume/Cap:	1.53	1.28	0.00	1.28	1.53	0.00	1.27	1.53	1.40	1.53	1.27	0.0[illegible]
Level Of Service Module:												
Delay/Veh:	506.0	212	0.0	262.9	496	0.0	244.2	496	353.3	507.4	214	0.[illegible]
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0[illegible]
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8[illegible]
AdjDel/Veh:	506.0	166	0.0	262.9	387	0.0	244.2	422	300.3	507.4	182	0.[illegible]
Queue:	134	204	0	27	280	0	44	278	89	125	172	[illegible]

NORTH UNIT TERMINAL FORECAST
BY SMITH ENGINEERING & MANAGEMENT

REVISED 2010 AUGUST PM PEAK HOUR PROJECTION REFLECTING HIGHER PEAK HOUR AIRPORT ACTIVITY UNDER NORTH UNIT TERMINAL ALTERNATIVE

(Labled S-NUT 2 on Table 1)

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE EIS
YEAR 2010 - NUT ALT (AUGUST) - INCR TERM PAT & DN CONSISTENCY

Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #12 INTERNATIONAL BLVD/SR99 & SOUTH 160TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.314
Loss Time (sec):	12	Average Delay (sec/veh):	154.6
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Ignore		
Min. Green:	5	10	10	5	10	10	5	5	5	5	5	
Lanes:	1 0 1 1 0			1 0 2 0 1			1 0 1 1 0			1 0 1 1 0		
Volume Module:												
Base Vol:	116	1186	70	407	1394	72	183	218	20	77	146	24
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.0
Initial Bse:	132	1352	80	464	1589	82	209	249	23	88	166	
Added Vol:	119	689	25	0	499	50	47	66	170	9	26	
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	
Initial Fut:	252	2041	105	464	2088	132	256	315	193	97	193	
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.0
PHF Volume:	271	2195	113	499	2245	142	275	338	207	104	207	
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	
Reduced Vol:	271	2195	113	499	2245	142	275	338	207	104	207	
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.0
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.05	1.05	1.00	1.05	0.0
Final Vol.:	271	2305	119	499	2357	142	275	355	218	104	218	
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.93	0.97	0.97	0.94	0.98	0.84	0.93	0.92	0.92	0.92	0.97	1.0
Lanes:	1.00	1.90	0.10	1.00	2.00	1.00	1.00	1.24	0.76	1.00	2.00	0.0
Final Sat.:	1676	3321	171	1684	3546	1507	1667	2044	1255	1659	3492	
Capacity Analysis Module:												
Vol/Sat:	0.16	0.69	0.69	0.30	0.66	0.09	0.16	0.17	0.17	0.06	0.06	0.0
Crit Moves:		****		****				****		****		
Green/Cycle:	0.15	0.53	0.53	0.23	0.61	0.61	0.13	0.13	0.13	0.05	0.05	0.0
Volume/Cap:	1.10	1.31	1.31	1.31	1.10	0.16	1.26	1.31	1.31	1.31	1.26	0.0
Level Of Service Module:												
Delay/Veh:	138.5	243	242.9	269.5	79.4	11.7	246.6	271	270.8	340.5	259	0.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	138.5	189	189.4	269.5	61.9	7.3	246.6	230	230.2	340.5	220	0.
Queue:	21	316	316	56	175	3	29	63	63	13	23	

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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.568
Loss Time (sec):	12	Average Delay (sec/veh):	348.2
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	3
Lanes:	1 0 1 1 0			1 0 2 0 1			1 0 1 0 1			1 0 0 1 0		
Volume Module:												
Base Vol:	189	1605	70	165	1548	3	8	42	84	183	86	113
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	215	1830	80	188	1765	3	9	48	96	209	98	129
Added Vol:	364	458	25	0	277	410	385	0	340	9	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	580	2288	105	188	2042	413	394	48	436	217	98	129
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	637	2514	115	207	2244	454	433	53	479	239	108	142
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	637	2514	115	207	2244	454	433	53	479	239	108	142
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	637	2640	121	207	2356	454	433	53	479	239	108	142
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.93	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.90	0.90
Lanes:	1.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	0.43	0.57
Final Sat.:	1676	3340	153	1676	3528	1499	1659	1746	1484	1684	697	916
Capacity Analysis Module:												
Vol/Sat:	0.38	0.79	0.79	0.12	0.67	0.30	0.26	0.03	0.32	0.14	0.15	0.15
Crit Moves:	****				****		****				****	
Green/Cycle:	0.24	0.58	0.58	0.09	0.43	0.43	0.17	0.18	0.43	0.08	0.10	0.10
Volume/Cap:	1.57	1.37	1.37	1.37	1.57	0.71	1.57	0.16	0.76	1.75	1.57	1.57
Level Of Service Module:												
Delay/Veh:	569.4	301	301.2	355.1	558	34.9	580.1	47.0	36.8	932.8	603	602.7
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.67	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	569.4	235	235.0	355.1	435	23.4	580.1	39.9	31.3	932.8	512	512.3
Queue:	113	455	455	27	470	19	76	2	21	55	44	44

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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.676
Loss Time (sec):	12	Average Delay (sec/veh):	575.9
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	3	5	0	3	5	0	3	3	3	3	3	[illegible]
Lanes:	2 0 2 0 1			1 0 2 0 1			1 0 2 0 1			2 0 2 0 1		
Volume Module:												
Base Vol:	558	771	246	125	780	116	184	529	452	515	689	79
Growth Adj:	1.14	1.14	0.00	1.14	1.14	0.00	1.14	1.14	1.14	1.14	1.14	0.0
Initial Bse:	636	879	0	143	889	0	210	603	515	587	785	[illegible]
Added Vol:	42	741	96	79	536	52	162	988	37	39	775	7
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Initial Fut:	678	1620	0	221	1425	0	372	1591	553	626	1561	[illegible]
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.0
PHF Adj:	0.84	0.84	0.00	0.84	0.84	0.00	0.84	0.84	0.84	0.84	0.84	0.0
PHF Volume:	807	1928	0	263	1697	0	443	1894	658	745	1858	[illegible]
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Reduced Vol:	807	1928	0	263	1697	0	443	1894	658	745	1858	[illegible]
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.0
MLF Adj:	1.05	1.05	0.00	1.00	1.05	0.00	1.00	1.05	1.00	1.05	1.05	0.0
Final Vol.:	847	2025	0	263	1781	0	443	1989	658	782	1951	[illegible]
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.92	0.99	1.00	0.94	0.99	1.00	0.94	0.98	0.84	0.92	0.99	1.0
Lanes:	2.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	2.00	2.00	1.0
Final Sat.:	3295	3582	1800	1693	3564	1800	1684	3546	1507	3295	3582	180
Capacity Analysis Module:												
Vol/Sat:	0.26	0.57	0.00	0.16	0.50	0.00	0.26	0.56	0.44	0.24	0.54	0.0
Crit Moves:	****				****		****				****	
Green/Cycle:	0.15	0.35	0.00	0.10	0.30	0.00	0.16	0.34	0.34	0.14	0.32	0.0
Volume/Cap:	1.68	1.60	0.00	1.60	1.68	0.00	1.68	1.66	1.29	1.66	1.68	0.0
Level Of Service Module:												
Delay/Veh:	741.8	599	0.0	643.8	734	0.0	757.9	699	237.7	708.8	734	0.
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.8
AdjDel/Veh:	741.8	467	0.0	643.8	572	0.0	757.9	594	202.1	708.8	624	0.
Queue:	172	395	0	48	381	0	91	424	73	154	424	[illegible]

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SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #18 INTERNATIONAL BLVD/SR99 & SOUTH 200TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.442
Loss Time (sec):	12	Average Delay (sec/veh):	222.2
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	7	7	3	7	7	3	3	3	3	3	3
Lanes:	1 0	2 0	1	1 0	2 0	1	1 0	2 0	1	1 0	1 1	0
Volume Module:												
Base Vol:	94	491	119	343	1205	74	71	269	132	260	232	164
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	107	560	136	391	1374	84	81	307	150	296	264	187
Added Vol:	78	492	7	1	457	81	203	1171	161	9	466	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	185	1051	142	392	1831	165	284	1477	311	306	730	187
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	197	1119	151	417	1948	176	302	1572	331	325	777	199
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	197	1119	151	417	1948	176	302	1572	331	325	777	199
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.00	1.00	1.05	1.05
Final Vol.:	197	1174	151	417	2045	176	302	1650	331	325	816	209
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.99	0.84	0.94	0.96	0.96
Lanes:	1.00	2.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.59	0.41
Final Sat.:	1693	3564	1515	1693	3564	1515	1693	3564	1515	1684	2738	701
Capacity Analysis Module:												
Vol/Sat:	0.12	0.33	0.10	0.25	0.57	0.12	0.18	0.46	0.22	0.19	0.30	0.30
Crit Moves:	****				****			****		****		
Green/Cycle:	0.08	0.27	0.27	0.20	0.40	0.40	0.17	0.32	0.32	0.13	0.28	0.28
Volume/Cap:	1.44	1.20	0.36	1.20	1.44	0.29	1.05	1.44	0.68	1.44	1.05	1.05
Level Of Service Module:												
Delay/Veh:	441.8	166	40.3	186.2	383	28.1	113.0	385	43.0	419.1	85.3	85.3
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	441.8	130	25.0	186.2	299	17.4	113.0	327	36.6	419.1	72.5	72.5
Queue:	29	103	6	38	311	6	21	239	15	46	65	65

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1985 HCM Operations Method (Future Volume Alternative)

Intersection #38 MILITARY ROAD & SOUTH 188TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.592
Loss Time (sec):	12	Average Delay (sec/veh):	337.8
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Include		
Min. Green:	5	5	5	5	5	5	5	10	10	5	10	1
Lanes:	1 0	0 1	0	1 0	1 0	1	1 0	1 1	0	1 0	2 0	1
Volume Module:												
Base Vol:	75	237	24	572	601	117	99	994	50	95	826	24
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	85	270	27	652	685	133	113	1133	57	108	942	28
Added Vol:	0	6	0	12	15	0	0	1162	1	0	888	[illegible]
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Initial Fut:	86	276	27	664	700	133	113	2295	58	108	1830	28
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.8
PHF Volume:	97	310	31	746	787	150	127	2579	65	122	2056	32
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	[illegible]
Reduced Vol:	97	310	31	746	787	150	127	2579	65	122	2056	32
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.0
MLF Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.05	1.00	1.05	1.00
Final Vol.:	97	310	31	746	787	150	127	2708	68	122	2158	32
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	180
Adjustment:	0.95	0.99	0.99	0.95	0.99	0.85	0.94	0.98	0.98	0.94	0.99	0.84
Lanes:	1.00	0.91	0.09	1.00	1.00	1.00	1.00	1.95	0.05	1.00	2.00	1.0
Final Sat.:	1701	1612	161	1701	1791	1522	1684	3459	87	1693	3564	151
Capacity Analysis Module:												
Vol/Sat:	0.06	0.19	0.19	0.44	0.44	0.10	0.08	0.78	0.78	0.07	0.61	0.2
Crit Moves:		****		****				****		****		
Green/Cycle:	0.05	0.12	0.12	0.28	0.35	0.35	0.06	0.49	0.49	0.05	0.48	0.4
Volume/Cap:	1.25	1.59	1.59	1.59	1.25	0.28	1.27	1.59	1.59	1.59	1.27	0.44
Level Of Service Module:												
Delay/Veh:	289.0	625	625.1	602.2	204	32.1	285.5	606	605.6	688.8	202	24.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.85	0.85	1.00	0.85	0.85	1.00	0.78	0.78	1.00	0.78	0.62
AdjDel/Veh:	289.0	531	531.4	602.2	173	27.3	285.5	472	472.3	688.8	158	14.9
Queue:	11	62	62	139	80	5	14	655	655	23	238	11

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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #12 INTERNATIONAL BLVD/SR99 & SOUTH 160TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.219
Loss Time (sec):	12	Average Delay (sec/veh):	123.9
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Include			Ignore		
Min. Green:	5	10	10	5	10	10	5	5	5	5	5	0
Lanes:	1 0 1 1 0			2 0 2 0 1			1 0 1 1 0			1 0 1 0 1		
Volume Module:												
Base Vol:	116	1186	70	407	1394	72	183	218	20	77	146	247
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	0.00
Initial Bse:	132	1352	80	464	1589	82	209	249	23	88	166	0
Added Vol:	119	689	25	0	499	50	47	66	170	9	26	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	251	2041	105	464	2088	132	256	315	193	97	192	0
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.00
PHF Volume:	270	2195	113	499	2245	142	275	338	207	104	207	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	270	2195	113	499	2245	142	275	338	207	104	207	0
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.00	1.05	1.05	1.05	1.05	1.00	1.00	1.05	1.05	1.00	1.00	0.00
Final Vol.:	270	2304	118	524	2358	142	275	355	218	104	207	0
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.93	0.97	0.97	0.91	0.98	0.84	0.93	0.92	0.92	0.92	0.97	1.00
Lanes:	1.00	1.90	0.10	2.00	2.00	1.00	1.00	1.24	0.76	1.00	1.00	1.00
Final Sat.:	1676	3323	170	3262	3546	1507	1667	2044	1255	1659	1746	1800
Capacity Analysis Module:												
Vol/Sat:	0.16	0.69	0.69	0.16	0.66	0.09	0.16	0.17	0.17	0.06	0.12	0.00
Crit Moves:		****		****			****				****	
Green/Cycle:	0.14	0.57	0.57	0.13	0.56	0.56	0.14	0.17	0.17	0.06	0.10	0.00
Volume/Cap:	1.18	1.22	1.22	1.22	1.18	0.17	1.22	1.02	1.02	1.02	1.22	0.00
Level Of Service Module:												
Delay/Veh:	185.1	159	159.4	196.1	131	14.4	211.7	90.3	90.3	138.4	223	0.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	185.1	124	124.3	196.1	102	8.9	211.7	76.7	76.7	138.4	190	0.0
Queue:	24	255	255	48	220	3	26	36	36	8	20	0

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SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #13 INTERNATIONAL BLVD/SR99 & SOUTH 170TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.360
Loss Time (sec):	12	Average Delay (sec/veh):	222.2
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Include			Include			Ovl			Include		
Min. Green:	3	7	7	3	7	7	3	3	3	3	3	3
Lanes:	2 0 1 1 0			1 0 2 0 1			1 0 1 0 1			1 0 1 0 1		
Volume Module:												
Base Vol:	189	1605	70	165	1548	3	8	42	84	183	86	113
Growth Adj:	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
Initial Bse:	215	1830	80	188	1765	3	9	48	96	209	98	129
Added Vol:	364	458	25	0	277	410	385	0	340	9	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	579	2288	105	188	2042	413	394	48	436	218	98	129
User Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	637	2514	115	207	2244	454	433	53	479	239	108	142
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	637	2514	115	207	2244	454	433	53	479	239	108	142
PCE Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.05	1.05	1.05	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	669	2640	121	207	2356	454	433	53	479	239	108	142
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.90	0.97	0.97	0.93	0.98	0.83	0.92	0.97	0.82	0.94	0.98	0.84
Lanes:	2.00	1.91	0.09	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Sat.:	3246	3340	153	1676	3528	1499	1659	1746	1484	1684	1773	1507
Capacity Analysis Module:												
Vol/Sat:	0.21	0.79	0.79	0.12	0.67	0.30	0.26	0.03	0.32	0.14	0.06	0.09
Crit Moves:		****		****			****					****
Green/Cycle:	0.16	0.58	0.58	0.09	0.51	0.51	0.19	0.18	0.34	0.08	0.07	0.07
Volume/Cap:	1.30	1.36	1.36	1.36	1.30	0.59	1.36	0.17	0.95	1.78	0.88	1.36
Level Of Service Module:												
Delay/Veh:	254.5	292	292.3	346.7	230	24.1	318.0	47.3	64.3	988.7	95.0	366.6
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.78	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	254.5	228	228.0	346.7	179	14.9	318.0	40.2	54.6	988.7	80.7	311.6
Queue:	71	448	448	26	291	16	53	2	27	58	7	19

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SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Level Of Service Computation Report
1985 HCM Operations Method (Future Volume Alternative)

Intersection #16 INTERNATIONAL BLVD/SR99 & SOUTH 188TH STREET

Cycle (sec):	180	Critical Vol./Cap. (X):	1.667
Loss Time (sec):	12	Average Delay (sec/veh):	467.1
Optimal Cycle:	180	Level Of Service:	F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Protected			Protected		
Rights:	Ignore			Ignore			Include			Ignore		
Min. Green:	3	5	0	3	5	0	3	3	3	3	3	0
Lanes:	2 0	2 0	1	2 0	2 0	1	2 0	2 0	1	2 0	2 0	1
Volume Module:												
Base Vol:	558	771	246	125	780	116	184	529	452	515	689	799
Growth Adj:	1.14	1.14	0.00	1.14	1.14	0.00	1.14	1.14	1.14	1.14	1.14	0.00
Initial Bse:	636	879	0	143	889	0	210	603	515	587	785	0
Added Vol:	42	741	96	79	536	52	162	988	37	39	775	74
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	678	1620	0	222	1425	0	372	1591	552	626	1560	0
User Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
PHF Adj:	0.84	0.84	0.00	0.84	0.84	0.00	0.84	0.84	0.84	0.84	0.84	0.00
PHF Volume:	807	1929	0	264	1697	0	443	1894	657	745	1858	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	807	1929	0	264	1697	0	443	1894	657	745	1858	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
MLF Adj:	1.05	1.05	0.00	1.05	1.05	0.00	1.05	1.05	1.00	1.05	1.05	0.00
Final Vol.:	848	2025	0	277	1782	0	465	1989	657	783	1951	0
Saturation Flow Module:												
Sat/Lane:	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Adjustment:	0.92	0.99	1.00	0.91	0.99	1.00	0.91	0.98	0.84	0.92	0.99	1.00
Lanes:	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00	1.00
Final Sat.:	3295	3582	1800	3279	3564	1800	3262	3546	1507	3295	3582	1800
Capacity Analysis Module:												
Vol/Sat:	0.26	0.57	0.00	0.08	0.50	0.00	0.14	0.56	0.44	0.24	0.54	0.00
Crit Moves:	****				****			****		****		
Green/Cycle:	0.15	0.40	0.00	0.06	0.30	0.00	0.10	0.34	0.34	0.14	0.38	0.00
Volume/Cap:	1.67	1.43	0.00	1.43	1.67	0.00	1.43	1.67	1.30	1.67	1.43	0.00
Level Of Service Module:												
Delay/Veh:	725.5	369	0.0	413.4	717	0.0	400.9	718	243.2	727.1	374	0.0
Delay Adj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ProgAdjFctr:	1.00	0.78	0.62	1.00	0.78	0.62	1.00	0.85	0.85	1.00	0.85	0.85
AdjDel/Veh:	725.5	288	0.0	413.4	559	0.0	400.9	610	206.7	727.1	318	0.0
Queue:	170	300	0	39	376	0	64	430	73	156	288	0

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Trip Generation Report

Forecast for PM PEAK HOUR

Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
2 NAC TRUCKS	2438.00	METRIC TONS	0.07	0.03	171	73	244	1.9
Zone 2 Subtotal					171	73	244	1.9
1 LOT B	6111.00	Access Cards	0.01	0.01	61	61	122	0.9
Zone 4 Subtotal					61	61	122	0.9
5 CENTRAL LOTS	177.00	PARKING SPACES	0.05	0.23	9	41	50	0.4
Zone 5 Subtotal					9	41	50	0.4
7 AOA ACCESS	2222.00	WEEKDAY TRIPS	0.02	0.02	44	44	88	0.7
Zone 7 Subtotal					44	44	88	0.7
8 MAINTENANCE	1210.00	EMPLOYEES	0.03	0.05	36	61	97	0.7
Zone 8 Subtotal					36	61	97	0.7
9 OFF-PARK #9	22.00	SHUTTLE TRIPS	0.72	0.72	16	16	32	0.2
Zone 9 Subtotal					16	16	32	0.2
10 OFF-PARK #10	22.00	SHUTTLE TRIPS	0.72	0.72	16	16	32	0.2
Zone 10 Subtotal					16	16	32	0.2
11 OFF-PARK #11	36.00	SHUTTLE TRIPS	0.72	0.72	26	26	52	0.4
Zone 11 Subtotal					26	26	52	0.4
12 OFF-PARK #12	36.00	SHUTTLE TRIPS	0.72	0.72	26	26	52	0.4
Zone 12 Subtotal					26	26	52	0.4
13 OFF-PARK #13	35.00	SHUTTLE TRIPS	0.72	0.72	25	25	50	0.4
Zone 13 Subtotal					25	25	50	0.4
14 OFF-PARK #14	38.00	SHUTTLE TRIPS	0.72	0.72	27	27	54	0.4
Zone 14 Subtotal					27	27	54	0.4
16 OFF-PARK #16	38.00	SHUTTLE TRIPS	0.72	0.72	27	27	54	0.4
Zone 16 Subtotal					27	27	54	0.4
17 OFF-PARK #17	51.00	SHUTTLE TRIPS	0.72	0.72	37	37	74	0.6
Zone 17 Subtotal					37	37	74	0.6
18 OFF-PARK #18	20.00	SHUTTLE TRIPS	0.72	0.72	14	14	28	0.2
Zone 18 Subtotal					14	14	28	0.2
19 OFF-PARK #19	29.00	SHUTTLE TRIPS	0.72	0.72	21	21	42	0.[illegible]

SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Zone #	Subzone	Amount	Units	Rate In	Rate Out	Trips In	Trips Out	Total Trips	% Of Total
	Zone 19		Subtotal			21	21	42	0.3
20	WEYERHAEUSER	7.00	FLIGHTS PER DA	0.17	0.17	1	1	2	0.0
	Zone 20		Subtotal			1	1	2	0.0
21	GENERAL AVIA	22.00	FLIGHTS PER DA	0.25	0.25	6	6	12	0.1
	Zone 21		Subtotal			6	6	12	0.1
22	NAC EMPLOYEE	1679.00	EMPLOYEES	0.03	0.17	50	285	335	2.5
	Zone 22		Subtotal			50	285	335	2.5
23	T-PASSENGER	6243.00	PM PKHR TRIPS	0.53	0.47	3309	2934	6243	47.4
	Zone 23		Subtotal			3309	2934	6243	47.4
24	T-COURTESY	260.00	PM PKHR TRIPS	0.50	0.50	130	130	260	2.0
	Zone 24		Subtotal			130	130	260	2.0
25	T-TRANSIT	203.00	PM PKHR TRIPS	0.50	0.50	102	102	204	1.5
	Zone 25		Subtotal			102	102	204	1.5
26	T-OFF PARK	315.00	PM PKHR TRIPS	0.50	0.50	158	158	316	2.4
	Zone 26		Subtotal			158	158	316	2.4
28	SASA-MAINTEN	2420.00	EMPLOYEES	0.02	0.14	48	339	387	2.9
	Zone 28		Subtotal			48	339	387	2.9
29	SASA-OTHER	1170.00	PM PKHR TRIPS	0.30	0.70	351	819	1170	8.9
	Zone 29		Subtotal			351	819	1170	8.9
30	DMCTC	711.00	PM PKHR TRIPS	0.25	0.75	178	533	711	5.4
	Zone 30		Subtotal			178	533	711	5.4
31	FEDERAL DETE	234.00	PM PKHR TRIPS	0.26	0.74	61	173	234	1.8
	Zone 31		Subtotal			61	173	234	1.8
32	AVIATION BUS	1871.00	PM PKHR TRIPS	0.30	0.70	561	1310	1871	14.2
	Zone 32		Subtotal			561	1310	1871	14.2
33	NORTH LOT	4275.00	PARKING SPACES	0.03	0.05	128	214	342	2.6
	Zone 33		Subtotal			128	214	342	2.6
38	T-EMPL SHUTT	24.00	PM PKHR TRIPS	0.50	0.50	12	12	24	0.2
	Zone 38		Subtotal			12	12	24	0.2
	OTAL					5651	7531	13182	100.0

SEATTLE-TACOMA INTERNATIONAL AIRPORT
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Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/C	Future LOS	Future Del/ Veh	Future V/C	Change in
# 12 INTERNATIONAL BLVD/SR99 & SOUT	E	44.3	1.015	F	154.6	1.314	+110.281 D/
# 13 INTERNATIONAL BLVD/SR99 & SOUT	D	39.2	0.986	F	348.2	1.568	+309.034 D/
# 16 INTERNATIONAL BLVD/SR99 & SOUT	F	121.2	1.267	F	575.9	1.676	+454.716 D/
# 18 INTERNATIONAL BLVD/SR99 & SOUT	D	37.4	0.847	F	222.2	1.442	+184.762 D/
# 37 28TH AVENUE SOUTH & SOUTH 188T	B	14.2	0.617	F	108.2	1.214	+93.966 D/V
# 38 MILITARY ROAD & SOUTH 188TH ST	F	86.9	1.170	F	337.8	1.592	+250.909 D/

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EXAMPLES OF FEIS INCONSISTENT ENCODING OF PERCENTAGE USE OF PATHS BETWEEN DO NOTHING AND NORTH UNIT TERMINAL ALTERNATIVES

PATH ENCODING FROM FEIS TRAFFIX INPUT FILES FOR ZONE 2 ON DO NOTHING (10DNAUG.IN) AND NORTH UNIT TERMINAL (10NUTAUG.IN)

FEIS DO NOTHING
10DN AUG.IN
ZONE 2
Most path splits 65%/35%

```
! Zones
!
(zone 2 (name NAC TRUCKS)
  (position 18 62)
  (links (w 134))
  (units M TONS CARGO
    (amount  2120.00)
    (rate 1 (in 0.09) (out 0.01))
  )
  (gate 2
    (percent 1 2.0)
    (path I 35.0 53 54 1 2 144 111 21 22 112 95 94 134)
    (path I 65.0 53 54 1 2 144 111 21 22 112 95 96 27 113 93 92 134)
    (path O 65.0 134 92 93 29 30 31 83 84 91 3 111 144 2 58 53)
    (path O 35.0 134 94 95 96 27 113 93 29 30 31 83 84 91 3 111 144 2 58 53)
  )
  (gate 4
    (percent 1 12.5)
    (path B 65.0 134 92 93 113 27 129 97 12 103 4 133 11 102)
    (path B 35.0 134 94 95 96 27 129 97 12 103 4 133 11 102)
  )
  (gate 6
    (percent 1 15.0)
    (path I 35.0 5 4 131 3 91 29 93 113 27 96 95 94 134)
    (path I 65.0 5 4 131 3 91 29 93 92 134)
    (path O 65.0 134 92 93 29 30 31 83 84 91 3 131 4 5)
    (path O 35.0 134 94 95 96 27 113 93 29 30 31 83 84 91 3 131 4 5)
  )
  (gate 7
    (percent 1 4.0)
    (path I 35.0 5 4 131 3 91 29 93 113 27 96 95 94 134)
    (path I 65.0 5 4 131 3 91 29 93 92 134)
    (path O 65.0 134 92 93 29 30 31 83 84 91 3 131 4 5)
    (path O 35.0 134 94 95 96 27 113 93 29 30 31 83 84 91 3 131 4 5)
  )
  (gate 13
    (percent 1 20.2)
    (path B 65.0 134 92 93 113 27 96 95 112 22 150 146)
    (path B 35.0 134 94 95 112 22 150 146)
  )
  (gate 28
    (percent 1 5.0)
    (path B 65.0 134 92 93 29 30 31 106 13 105 14 107 15 108 16 109 17 18 110 1
    (path B 35.0 134 94 95 96 27 113 93 29 30 31 106 13 105 14 107 15 108 16 10
  )
  (gate 30
    (percent 1 2.1)
    (path I 35.0 78 8 75 46 45 7 6 72 69 5 4 131 3 91 29 93 113 27 96 95 94 134
    (path I 65.0 78 8 75 46 45 7 6 72 69 5 4 131 3 91 29 93 92 134)
    (path O 65.0 134 92 93 29 30 31 83 84 91 3 131 4 5 69 72 6 7 45 46 75 8 78)
    (path O 35.0 134 94 95 96 27 113 93 29 30 31 83 84 91 3 131 4 5 69 72 6 7 4
  )
  (gate 31
    (percent 1 23.8)
    (path B 100.0 134 92 93 113 27 96 95 112)
  )
  (gate 32
    (percent 1 12.5)
    (path B 100.0 134 94 95 96 27 113)
  )
```

```
(gate 33
  (percent 1 2.9)
  (path I 35.0 114 36 35 68 65 62 59 56 57 2 144 111 21 22 112 95 94 134)
  (path I 65.0 114 36 35 68 65 62 59 56 57 2 144 111 21 22 112 95 96 27 113 93
  (path O 65.0 134 92 93 29 30 31 83 84 91 3 111 144 2 1 55 56 59 62 65 10 67
  (path O 35.0 134 94 95 96 27 113 93 29 30 31 83 84 91 3 111 144 2 1 55 56 59
```

FEIS DO NOTHING
ZONE 2 Ctc!
10 DN AUG.IN

FEIS NORTH UNIT TERMINAL
10NUT AUG.IN
ZONE 2 Paths
Most path splits 60%/40%

```
(zone 2 (name NAC TRUCKS)
  (position 18 62)
  (links (w 134))
  (units METRIC TONS
    (amount  2120.00)
    (rate 1 (in 0.07) (out 0.03))
  )
  (gate 2
    (percent 1 8.1)
    (path I 40.0 53 54 1 2 144 156 157 154 155 128 22 112 95 94 134)
    (path I 60.0 53 54 1 2 144 156 157 154 155 128 22 112 95 96 27 113 93 92 13
    (path O 40.0 134 94 95 112 22 128 155 154 153 161 156 144 2 58 53)
    (path O 60.0 134 92 93 113 27 96 95 112 22 128 155 154 153 161 156 144 2 58
  )
  (gate 4
    (percent 1 8.1)
    (path B 40.0 134 94 95 96 27 129 97 12 103 4 133 11 102)
    (path B 60.0 134 92 93 113 27 129 97 12 103 4 133 11 102)
  )
  (gate 6
    (percent 1 12.9)
    (path I 40.0 5 4 131 3 111 159 160 153 154 155 128 22 112 95 94 134)
    (path I 60.0 5 4 131 3 111 159 160 153 154 155 128 22 112 95 96 27 113 93 5
    (path O 40.0 134 94 95 112 22 128 155 154 158 159 111 3 131 4 5)
    (path O 60.0 134 92 93 113 27 96 95 112 22 128 155 154 158 159 111 3 131 4
  )
  (gate 7
    (percent 1 1.1)
    (path I 40.0 5 4 131 3 111 159 160 153 154 155 128 22 112 95 94 134)
    (path I 60.0 5 4 131 3 111 159 160 153 154 155 128 22 112 95 96 27 113 93 5
    (path O 40.0 134 94 95 112 22 128 155 154 158 159 111 3 131 4 5)
    (path O 60.0 134 92 93 113 27 96 95 112 22 128 155 154 158 159 111 3 131 4
  )
  (gate 13
    (percent 1 30.0)
    (path B 40.0 134 94 95 112 22 165 150 146)
    (path B 60.0 134 92 93 113 27 96 95 112 22 165 150 146)
  )
  (gate 28
    (percent 1 1.1)
    (path B 40.0 134 94 95 96 27 129 97 12 104 13 105 14 107 15 108 16 109 17
    (path B 60.0 134 92 93 113 27 129 97 12 104 13 105 14 107 15 108 16 109 17
  )
  (gate 30
    (percent 1 1.1)
    (path I 40.0 78 8 75 46 45 7 6 72 69 5 4 131 3 111 159 160 153 154 155 128
    (path I 60.0 78 8 75 46 45 7 6 72 69 5 4 131 3 111 159 160 153 154 155 128
    (path O 40.0 134 94 95 112 22 128 155 154 158 159 111 3 131 4 5 69 72 6 7
    (path O 60.0 134 92 93 113 27 96 95 112 22 128 155 154 158 159 111 3 131 4
  )
  (gate 31
    (percent 1 18.3)
    (path B 100.0 134 92 93 113 27 96 95 112)
  )
  (gate 32
    (percent 1 17.7)
    (path B 100.0 134 94 95 96 27 113)
  )
  (gate 33
    (percent 1 1.6)
```

AR 041009

```
(path 1 40.0 114 36 35 68 65 62 59 56 57 2 144 156 157 154 155 128 22 112 95
(path 1 60.0 114 36 35 68 65 62 59 56 57 2 144 156 157 154 155 128 22 112 95
(path 0 40.0 134 94 95 112 22 128 155 154 153 161 156 144 2 1 55 56 59 62 65
(path 0 60.0 134 92 93 113 27 96 95 112 22 128 155 154 153 161 156 144 2 1 5
```

FEIS NUT
10NUTAUG.IN
Zone 2 ctd.

EXAMPLES OF FEIS INCONSISTENT ENCODING OF PATHS TO USE CONGESTED INTERSECTIONS WITH DO NOTHING ALTERNATIVE BUT AVOID THEM IN NORTH UNIT TERMINAL ALTERNATIVE

PATH ENCODING FROM FEIS TRAFFIX INPUT FILES FOR ZONE 29 TO GATEWAYS 28 AND 29 FOR DO NOTHING ALTERNATIVE (10DNAUG.IN) AND NORTH UNIT TERMINAL ALTERNATIVE (1ONUTAUG.IN)

On the Do Nothing Alternative all trips between Zone 29 and Gates 28 and 29 will pass through node 18 which represents the intersection of Highway 99 with S. 200'th Street, an air quality evaluation intersection. On the North Unit Terminal Alternative, 50 percent of the trips between Zone 29 and Gate 28 and 100 percent of the trips between Zone 29 and Gate 29 are on paths which completely avoid node 18 (the Highway 99 - S. 200'th intersection).

FEIS 10DNAUG.IN
Zone 29 paths

```
(zone 29 (name SASA-OTHER)
  (position 24 40)
  (links (w 147))
  (units PM PKHR TRIPS
    (amount  1170.00)
    (rate 1 (in 0.30) (out 0.70))
  )
  (gate 1
    (percent 1 2.0)
    (path I 100.0 1 55 56 59 62 65 10 67 35 36 116 101 37 147)
    (path O 100.0 147 37 101 116 36 35 68 65 62 59 56 57 2 1)
  )
  (gate 2
    (percent 1 5.0)
    (path I 100.0 53 56 59 62 65 10 67 35 36 116 101 37 147)
    (path O 100.0 147 37 101 116 36 35 68 65 62 59 56 53)
  )
  (gate 3
    (percent 1 2.0)
    (path B 100.0 147 37 16 108 15 107 14 105 13 104 12 103 4 133 11 130 20)
  )
  (gate 4
    (percent 1 5.0)
    (path B 100.0 147 37 16 108 15 107 14 105 13 104 12 103 4 133 11 102)
  )
  (gate 6
    (percent 1 11.0)
    (path I 100.0 5 69 70 39 38 16 37 147)
    (path O 100.0 147 37 16 38 39 40 74 69 5)
  )
  (gate 7
    (percent 1 5.0)
    (path I 100.0 5 69 70 39 38 16 37 147)
    (path O 100.0 147 37 16 38 39 40 74 69 5)
  )
  (gate 8
    (percent 1 3.0)
    (path I 100.0 26 61 62 65 10 67 35 36 116 101 37 147)
    (path O 100.0 147 37 101 116 36 35 68 65 62 63 25 26)
  )
  (gate 14
    (percent 1 2.0)
    (path B 100.0 147 37 16 108 15 107 14 105 13 104 12 28)
  )
  (gate 15
    (percent 1 2.0)
    (path B 100.0 147 37 16 108 15 107 14 105 13 32)
  )
  (gate 16
    (percent 1 2.0)
    (path B 100.0 147 37 16 108 15 107 14 33)
  )
  (gate 18
    (percent 1 5.0)
    (path B 100.0 147 37 101 116 36 35 34)
  )
  (gate 20
    (percent 1 4.0)
    (path B 100.0 147 37 16 38 39 40)
  )
```

FEIS 10DN AUG.IN
Zone 29 Ctd.

```
  (gate 22
    (percent 1 4.0)
    (path B 100.0 147 99 50 17)
  )
  (gate 23
    (percent 1 3.0)
    (path B 100.0 147 99 50 43 149 41)
  )
  (gate 24
    (percent 1 2.0)
    (path B 50.0 147 99 50 43 18 44 49 48 47)
    (path B 50.0 147 99 50 17 18 44 49 48 47)
  )
  (gate 26
    (percent 1 2.0)
    (path B 100.0 147 99 50 43 149 41 42 140)
  )
  (gate 27
    (percent 1 8.0)
    (path B 100.0 147 99 50 43 148 142 139)
  )
  (gate 28
    (percent 1 4.0)
    (path B 50.0 147 99 50 17 18 110 143 19)
    (path B 50.0 147 99 50 43 18 110 143 19)
  )
  (gate 29
    (percent 1 2.0)
    (path B 50.0 147 99 50 17 18 110 143 19 51 8 52)
    (path B 50.0 147 99 50 43 18 110 143 19 51 8 52)
  )
  (gate 30
    (percent 1 27.0)
    (path I 50.0 78 8 75 46 45 7 6 72 73 40 39 38 16 37 147)
    (path I 50.0 78 8 75 46 47 48 49 44 18 43 50 99 147)
    (path O 50.0 147 37 16 38 39 71 72 6 7 45 46 75 8 78)
    (path O 50.0 147 99 50 43 18 44 45 46 75 8 78)
  )
```

All trips between Zone 29 and gates 28 and 29 pass through node 18 (intersection of Hwy 99 & S. 200th St) in Do Nothing encoding.

AR 041011

FEIS 10NUTAUG.IN
Zone 29 paths

```
(zone 29 (name SASA-OTHER)
  (position 24 40)
  (links (w 147))
  (units PM PKHR TRIPS
    (amount   515.00)
    (rate 1 (in 0.29) (out 0.71))
  )
  (gate 1
    (percent 1 2.0)
    (path O 100.0 147 37 101 116 36 35 68 65 62 59 56 57 2 1)
    (path I 100.0 1 55 56 59 62 65 10 67 35 36 116 101 37 147)
  )
  (gate 2
    (percent 1 5.0)
    (path O 100.0 147 37 101 116 36 35 68 65 62 59 56 53)
    (path I 100.0 53 56 59 62 65 10 67 35 36 116 101 37 147)
  )
  (gate 3
    (percent 1 2.0)
    (path B 100.0 147 99 50 17 109 16 108 15 107 14 105 13 104 12 103 4 133 11 1
  )
  (gate 4
    (percent 1 5.0)
    (path B 100.0 147 37 16 108 15 107 14 105 13 104 12 103 4 133 11 102)
  )
  (gate 6
    (percent 1 11.0)
    (path O 100.0 147 37 16 38 39 40 74 69 5)
    (path I 100.0 5 69 70 39 38 16 37 147)
  )
  (gate 7
    (percent 1 5.0)
    (path O 100.0 147 99 50 17 109 16 38 39 40 74 69 5)
    (path I 100.0 5 69 70 39 38 16 109 17 50 99 147)
  )
  (gate 8
    (percent 1 3.0)
    (path O 100.0 147 37 101 116 36 35 68 65 62 63 25 26)
    (path I 100.0 26 61 62 65 10 67 35 36 116 101 37 147)
  )
  (gate 13
    (percent 1 0.0)
    (path O 100.0 147 37 101 116 36 35 68 65 62 59 56 57 2 144 156 157 154 153 1
    (path I 100.0 146 151 152 153 161 156 144 2 1 55 56 59 62 65 10 67 35 36 116
  )
  (gate 14
    (percent 1 2.0)
    (path B 100.0 147 37 16 108 15 107 14 105 13 104 12 28)
  )
  (gate 15
    (percent 1 2.0)
    (path B 100.0 147 99 50 17 109 16 108 15 107 14 105 13 32)
  )
  (gate 16
    (percent 1 2.0)
    (path B 100.0 147 99 50 17 109 16 108 15 107 14 33)
  )
  (gate 18
    (percent 1 5.0)
    (path B 100.0 147 37 101 116 36 35 34)
```

FEIS 10NUTAUG.IN
Zone 29 Paths ctd.

```
  )
  (gate 20
    (percent 1 4.0)
    (path B 100.0 147 37 16 38 39 40)
  )
  (gate 22
    (percent 1 4.0)
    (path B 100.0 147 99 50 17)
  )
  (gate 23
    (percent 1 3.0)
    (path B 100.0 147 99 50 164 163 167 43 149 41)
  )
  (gate 24
    (percent 1 2.0)
    (path B 100.0 147 99 50 164 163 167 43 18 44 49 48 47)
  )
  (gate 26
    (percent 1 2.0)
    (path B 100.0 147 99 50 164 163 167 43 149 41 42 140)
  )
  (gate 27
    (percent 1 8.0)
    (path B 100.0 147 99 50 164 163 167 43 148 142 139)
  )
  (gate 28
    (percent 1 4.0)
    (path B 50.0 147 99 50 164 163 167 43 18 110 143 19)
    (path B 50.0 147 99 50 164 163 167 43 148 142 143 19)
  )
  (gate 29
    (percent 1 2.0)
    (path B 100.0 147 99 50 164 163 167 43 148 142 143 19 51 8 52)
  )
  (gate 30
    (percent 1 27.0)
    (path O 50.0 147 99 50 164 163 167 43 18 44 45 46 75 8 78)
    (path O 50.0 147 37 16 38 39 71 72 6 7 45 46 75 8 78)
    (path I 50.0 78 8 75 46 47 48 49 44 18 43 167 163 164 50 99 147)
    (path I 50.0 78 8 75 46 45 7 6 72 73 40 39 38 16 37 147)
  )
```

50% of trips between Zone 29 and gate 28 and 100% of the trips between Zone 29 and gate 29 avoid node 18 (Hwy 99 and S. 200'th St) in North Unit Terminal encoding.

AR 041012

15

SMITH ENGINEERING & MANAGEMENT

REC'D ANM-610
PLAN, PGM, & CAP BR
JUN - 6 1996
ANM-610

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)
California No. 938 (Traffic) Arizona No. 22131 (Traffic)

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.

TRAFFIC • TRANSPORTATION • MANAGEMENT
5311 Lowry Road Union City, CA 94587 tel 510 489 9477 fax 510 489 9478

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.

R1294

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

PUGET SOUND AIR POLLUTION CONTROL AGENCY
KING COUNTY • KITSAP COUNTY • PIERCE COUNTY • SNOHOMISH COUNTY

June 6, 1996

REC'D ANM-610
PLAN, PGM, & CAP BR
JUN - 7 1996
ANM-610

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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.

Dennis J. McLerran, Air Pollution Control Officer
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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:

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- 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.

<u>SeaTac Airport Vicinity Air Quality Monitoring Program Issues</u>

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.

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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

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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REC'D ANM-610
PLAN, PGM, & CAP BR
JUN 12 1996
ANM-610

May 30, 1996

17

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 Thei, EPA
Dennis McLerran, PSAPCA
Barbara Hinkle, Port of Seattle
Doug Brown, Ecology
Paul Carr, Ecology
Elizabeth Phinney, Ecology

17

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 commited 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

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REC'D ANM-610
PLAN, PGM, & CAP BR
JUN - 7 1996
ANM-610

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.

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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.

<u>Mitigation Measures</u>

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 (e) 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 3, 1996

RECD ANM-610
PLAN, FCM, & CAP BR
JUN - 6 1996
ANM 610

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

Dear Mr Ossenkop

I have recently learned that the EDMS model is unable to predict peak hour emission rates due to its deriving an average of an annual, an average of peak month, etc., and estimates a peak from the average rather than the peak of the peak. My questions are as follows:

1 Please verify whether this is true
2 If true, then what, if any, false annual operations was used for the 63 departure number in the final EIS
3 If not so, then how is the peak hour set up to handle fractional aircraft
4 If an annual average gives less than a whole airplane in the peak hour inventory, how much of the plane, if any, does the model estimate
5 Why is the tons per year inventory reduced in the final when annual average number of operations is unchanged between the draft and final
6 If the model accepts peak hour data separate from annual average, why are fractional numbers used in the inventory? Does the model truncate fractions?

Could you also give your explaination why the EDMS model seems to predict lower overall pollutant levels when airplane operations are increased?

Could you also answer my previous question regarding the one-hour levels of nitrogen dioxide from the EDMS run in the FEIS?

Thank you,

[signature]

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June 10, 1996

VIA FACSIMILE

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

Re: Follow up on Request for Information Related to the FAA's Draft General Conformity Determination for the Proposed Expansion of Sea-Tac

Dear Mr. Ossenkop:

This letter is in response to your letter of June 6, 1996, which indicates that the FAA will need additional time to respond to our request for certain air quality and traffic modeling information. Although you indicate that it may take several weeks to provide this information, we would like for you to proceed with your efforts. Thank you for your assistance.

Sincerely,

Thomas D. Roth

D-117

AR 041022

Final

MEMORANDUM OF AGREEMENT

AIR QUALITY MONITORING PROGRAM ACTIVITIES RELATING TO THE SEATTLE-TACOMA INTERNATIONAL AIRPORT VICINITY

Introduction

For a number of years, residents in the vicinity of Seattle-Tacoma International Airport (Sea-Tac) have expressed concerns over air pollution. Several studies and small-scale air pollutant sampling programs have been conducted by the Port of Seattle (Port), the State Department of Ecology (Ecology) and the Puget Sound Air Pollution Control Agency (PSAPCA). Because of ongoing concerns about air quality in the vicinity of Sea-Tac, the undersigned agencies have agreed to work together to gather additional air quality baseline data.

In April 1995, the Federal Aviation Administration (FAA) and the Port issued a joint Draft Environmental Impact Statement (EIS) for the proposed Master Plan Update Improvements at Seattle-Tacoma International Airport. In February, 1996 the FAA and Port issued the Final EIS, which incorporated a draft air quality conformity determination. These environmental documents address, among other issues, potential air quality impacts associated with various Master Plan Update improvement projects (facility developments and operational changes) to be phased-in between 1996 and 2020 as part of the long-range airport vision (Exhibit A, attached to this agreement).

The Final EIS considered the available Sea-Tac air quality information from previous studies, updated the baseline and projection year emission inventories for five "criteria" pollutants of concern, performed area-wide dispersion screening modeling for volatile organic compounds (VOC) and oxides of nitrogen (NOX) (both ozone precursors) and conducted localized traffic intersection modeling analyses for carbon monoxide (CO).

The Port and FAA have identified future project build-out and operational conditions that result in modeled exceedences of the federal standard for CO. However, no monitored air quality data for the Sea-Tac vicinity currently exists with which to interpret the FEIS' "worst case" modeling results, which may overstate actual future air quality problems. Also, because the Master Plan Update project phase(s) that cause the modeled CO exceedences do not occur until approximately 2010, the issue of specifying appropriate mitigation measures prematurely has been raised.

In comments submitted by PSAPCA, Ecology and the US Environmental Protection Agency-Region 10 (EPA) to the FAA on the FEIS draft conformity finding, it was noted that in order to demonstrate conformity with the Central Puget Sound State Implementation Plan (SIP), there must be firm commitments made at this time by the Port and FAA to either (1) mitigate the modeled standard exceedences for CO or (2) delay inclusion of certain projects until future environmental reviews are completed for those elements and firm commitments to new mitigation measures are made, if necessary. Several options for achieving this outcome were specified. The comments also recommended a funded 24-month Sea-Tac area air quality monitoring program to better determine baseline conditions at and around the Airport; to inform model interpretation; and to provide better ambient air quality information with which to respond to public air quality concerns.

As a result of these FEIS comments and related interagency discussions, the Port, FAA, Ecology, PSAPCA and the EPA all concur that a Sea-Tac air quality monitoring program be established, focused on the following concerns in priority order:

- Carbon monoxide (CO) concentrations, specifically at those roadway intersections modeled in the FEIS as creating future exceedences of the National Ambient Air Quality Standard for CO;
- Oxides of nitrogen (NOX) concentrations associated with aircraft departure backup queues;
- Ground-level residue deposition associated with aircraft fuel particle discharges;
- Ground level residue-related toxic substances; and
- "Fugitive dust " particulate matter concentrations associated with Sea-Tac construction activity sites and dirt haul routes.

The parties agree that this monitoring program is in support of quantifying pollutant levels and not for the purpose of supporting the proposed improvements at Sea-Tac Airport.

Sufficient funding totaling $195,000 already has been identified by the parties to this agreement to conduct special field monitoring activities for the first three items listed above (CO, NOX and fuel particle discharge-related residue) within the next 24 months. Whether or not to fund monitoring of toxic substances in the Sea-Tac vicinity will depend on the results from ground-level residue monitoring data collection and analysis. For purposes of fugitive dust emissions, the Sea-Tac vicinity monitoring program will rely on PSAPCA's existing regulatory, inspection and enforcement authority rather than formal in-field monitoring.

The initial CO saturation study monitoring will be conducted during the upcoming winter season (1996-97), with the ability to continue some CO measurements in winter 1997-98. The monitoring of NOX is projected to occur in summer/fall 1997, with fuel particle discharge residue measurements occurring seasonally between fall, 1996 and summer, 1997. All field monitoring activities and data analyses are scheduled for completion no later than June, 1998.

Public involvement from the surrounding community will be sought in the monitoring program to facilitate public understanding of the monitoring results and the implications for long-term Sea-Tac air quality monitoring. To this end, establishment of a special working group comprised of both agencies and community representatives is contained in the proposed program's scope (Exhibit B, attached to this agreement).

Purpose

This Memorandum of Agreement (MOA) establishes an air quality monitoring program in the Sea-Tac International Airport vicinity designed to achieve the following goals:

- Characterize actual monitored air quality conditions, via in-field measurements conducted by independent environmental agencies and their contractors, in the general vicinity of Sea-Tac International Airport;
- Utilize actual monitored air quality baseline information to improve future Sea-Tac vicinity modeling and monitoring efforts; and to help identify the need for and design of appropriate mitigation measures whenever criteria pollutant modeling forecasts, or as shown by actual measurements, exceed a National Ambient Air Quality Standard (NAAQS), e.g., for CO and/or particulate matter;

- Allow actual monitored air quality baseline information to be incorporated into future environmental reviews for Master Plan Update project elements projected to worsen air quality (listed in Exhibit A) and to enable making commitments to more specific long-term mitigation measures, if necessary;
- Enable agencies to reference actual monitored air quality baseline data for the Sea-Tac Airport vicinity when responding to future questions and information requests from the public;
- Secure funding commitments to complete Sea-Tac CO, NO_x and residue monitoring data collection and analysis within the next 24 months, by July 1, 1998; and
- Determine the scientific justification, if any, for Sea-Tac toxic emissions monitoring and secure appropriate funding commitments by fall, 1997.

The programmatic scope of the proposed air quality monitoring for the Sea-Tac Airport vicinity is contained in Exhibit B, attached to this agreement.

THEREFORE, THE UNDERSIGNED PARTIES AGREE:

1. Additional air monitoring in the vicinity of Seattle-Tacoma International Airport is desirable for purposes of more accurately describing existing air pollutant levels, interpreting modeled results, identifying longer range monitoring requirements, promoting appropriate mitigation measures to protect the NAAQS whenever necessary, and responding to public inquiries related to Sea-Tac vicinity air quality.
2. All parties will participate in the design, conduct and reporting of air quality measurement activities in the Sea-Tac area over the next 24 months according to an approved monitoring plan. It is specifically desired that Ecology, EPA and PSAPCA will provide independent expertise to the air quality monitoring and analysis activity, which can then be incorporated into project-level environmental reviews conducted under SEPA and NEPA by the Port and other initiating agencies. The participation commitments of each agency are enumerated below:
   - Ecology, as overall technical program coordinator, will in consultation with EPA and PSAPCA develop a detailed monitoring and analysis plan and participate in the funding, monitor siting, conduct, and analysis/review of the air measurements. Ecology also will provide a final summary report on monitoring and data analysis activities for agency and public distribution concerning the results of the air measurements and recommendations for future monitoring activities.
   - The EPA will assist with the plan scoping, funding, monitor siting, conduct and analysis and review of the air measurements;
   - PSAPCA will participate in the scoping of the air monitoring plan and analysis, including development of the monitoring framework, establishment of monitoring locations, coordination with transportation agencies, technical assistance regarding collected data, and tracking of regional surface travel growth and associated project-level modeling efforts;
   - The Port of Seattle will assist with funding for monitoring and will participate as an observer in the monitoring plan's design, implementation and outcomes reporting.
3. Ecology ($35K), EPA ($30K) and the Port ($130K) together will provide a total of $195,000.00 to complete field monitoring data collection and analysis for CO, NOX and aircraft fuel discharge residue. In addition, other in-kind (non-cash) contributions from PSAPCA and the other signatories to this agreement will be provided.
4. The Port agrees that it will not proceed with Master Plan Update elements which are projected to create future CO exceedences or further worsen projected CO levels until CO field monitoring data collection and analysis is completed and, if necessary, appropriate mitigation commitments are identified. The Port further agrees that new information on actual monitored CO and NO_x levels shall be incorporated into future Master Plan Update-related environmental reviews and

air quality conformity determinations. Construction-related dust prevention and management activities will be directed by the Port in accord with the protocol described in Exhibit C, attached to this agreement.

5. To the maximum extent possible, all new program, plan and project-level air quality analyses conducted in the Sea-Tac Airport vicinity will reference and/or incorporate data obtained from the actual field measurements, once they are available, to help refine modeling approaches and interpret new modeling results and to identify appropriate mitigation measures for identified NAAQS exceedence problems.

6. A decision by Ecology regarding whether a permanent CO monitor (or monitors) should be established near Sea-Tac as part of the permanent CO monitoring network will be made based on the data obtained from the CO saturation sampling. Funding of long-term monitoring for CO will be determined at the time permanent monitoring decisions are made.

This Memorandum of Agreement reflects agreement by the undersigned responsible officials:

Mic Dinsmore (signature)

Mic Dinsmore, Executive Director
Port of Seattle

Date

Win Granlund (signature) 10-1-96

Win Granlund, Board Chair
Puget Sound Air Pollution Control Agency

Date

Mary Riveland (signature) 9/27/96

Mary Riveland, Director
Washington State Department of Ecology

Date

Chuck Clarke (signature) 10/4/96

Chuck Clarke, Regional Administrator
US Environmental Protection Agency-Region X

Date

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Exhibit A

Seattle-Tacoma International Airport
Master Plan Update Improvements

The following airport improvement projects were identified by the Master Plan Update Final Environmental Impact Statement (Final EIS) to be phased in between 1996 and 2020. Based on the air quality analysis presented in the Final EIS, only the terminal and landside improvements planned to occur post 2010 could result in increasing the severity of exceedances of the NAAQS. As a result, before the Port could implement these project, additional analysis and requisite mitigation would be required. These projects were identified based on project purpose and need and are categorized by the four (A through D) purpose and needs. Based on the Final EIS, the following projects would not increase the severity or frequency of exceedances of the NAAQS:

A. **New Parallel Runway and associated operational procedures and taxiways** (1996-2000)

B. **Clearing and Grading off each runway end for runway safety area compliance** (1996-2000)

C **Extension of Runway 34R** (2011-2015)

D. **Terminal and Landside Improvements**

<u>1996-2000</u>

New Parallel Runway and associated operational procedures and taxiways
Clearing and Grading the requisite lengths off each runway end for runway safety area compliance
Improvements to the Main Terminal roadway and recirculation roads
Development of the Des Moines Creek Technology Campus
Construction of the new air traffic control tower
Expansion or redevelopment of the cargo facilities in the north cargo complex
Development of a new snow equipment storage facility
Expansion of Concourse A
Development of on-airport hotel
Expansion of the main parking garage
Development of a new parking garage at the Doug Fox lot
Site preparation at SASA site
Overhaul and/or replacement of the STS

<u>2001-2005</u>

Dual taxiway 34L
Expansion of the Main Terminal to the South
Improved access and circulation roadway improvements at the Main Terminal
Additional expansion of the main parking garage
Expansion of the existing north employee parking
Further expansion of Concourse A
Development of a new airport maintenance building
Continued expansion of the north cargo facilities

<u>2006-2010</u>

Expansion of the dual taxiways A and B
Construct first phase parking structure north of SR 518
Additional Expansion of north employee lot
Further expansion or redevelopment of north cargo complex
Upper roadway transit plaza at Main Terminal

Based on the Final EIS, the following terminal and landside projects could increase the severity or frequency of exceedances of the NAAQS. The primary improvement project that would alter surface transportation, and thus air quality, is the North Unit Terminal development and related projects. The North Unit Terminal is slated for construction between 2011 and 2015. However, several items that are related to this project would occur earlier, such as the relocation of the ARFF which is located on the future site of the new terminal. Therefore, to ensure that earlier projects do not prejudice the outcome of the North Unit Terminal, these projects are identified separately.

2006-2010

Construction of the North Unit Terminal and roadway system, including the main terminal by-pass roadway system
Relocate the ARFF for North Unit Terminal

2011-2020

Completion and further expansion of the North Unit Terminal, parking & roadways
Development of additional taxiway exits on 16L/34R
Expansion of north parking structure and north employee parking lot
Further development of cargo in SASA
Develop connections to the RTA system at the east side of the garage
Develop cargo/warehouse site north of SR518

EXHIBIT B

Programmatic Scope of Proposed Air Monitoring
Seattle-Tacoma International Airport

The parties agree that the following steps should be undertaken to scope a specific air pollutant monitoring plan to be undertaken in the vicinity of Seattle-Tacoma International Airport:

1. Establish the funding and staffing commitment levels available to conduct the air measurements. The air measurement plan should include the following:
   A. Development of an air monitoring work plan and definition of how the comparison of actual measurements to modeled data will be performed;
   B. Conduct of air measurements;
   C. Analysis of measurements;
   D. Conduct briefings for participating agencies; and
   E. Prepare a final report which responds to the goals of the effort.

2. The monitoring plan will be tailored such that it can be completed within the allocated funding and staffing levels and will reflect the following objectives:
   A. To interpret modeled data relative to measured data but not to conduct a model validation study;
   B. To use the measurements to improve:
      - Future modeling
      - Future monitoring
      - Mitigation of exceedances of the national ambient air quality standards
      - Responds to citizen comments and questions

3. The funding level will dictate the specifics of the air measurement plan. However, the following priorities will be placed on specific air measurements that can be achieved within the allocated resources (in order of highest to lowest priority):
   A. Carbon Monoxide - measurements at roadway intersections in the airport vicinity;
   B. Nitrogen Oxides - at ends of runways, near aircraft departure queues;
   C. Engine Exhaust Residue - under flight paths of aircraft;
   D. If residue testing indicates that aircraft related emissions are a dominant source of collected residue, the parties will discuss and seek funding for the conduct of a air toxics measurements, which could include canister samples in the flight pattern;
   E. Fugitive Dust - at construction sites and near haul routes in the vicinity of construction. No funding has been allocated to this pollutant issue. Compliance with fugitive dust standards will rely on PSAPCA's existing regulatory, inspection, and enforcement authority.

4. Upon definition of the allocation of resources by the participating agencies, a working group will be established that includes representation from the participating agencies and the local community to monitor the progress of the air measurements The Washington Department of Ecology will take the lead in coordinating the meeting schedule and agenda and will serve as the chair of the working group. The working group is being formed for the sole purpose of facilitating public understanding of the air monitoring results. The working group will be disbanded by December 31, 1998 or within 2 months of completion of the air monitoring effort.

Exhibit C.

Port of Seattle Construction Dust Prevention and Management Protocol

RUNWAY 34R SAFETY AREA IMPOVEMENT
CONSTRUCTION MITIGATION PROJECT CONTROLS

DRAWINGS:

Drawing STIA-9602-C-2.

6. VEHICLES DELIVERING MATERIALS TO OR HAULING MATERIAL, EXCEPT FOR BLAST PAD PAVING, SHALL ACCESS THE SITE FROM S. 188TH ST. VIA THE CONTRACTOR'S ACCESS ROUTE AS INDICATED ON THE DRAWING. THE CONTRACTOR SHALL CONSTRUCT IMPROVEMENTS THAT PROVIDES ACCESS TO THE SITE FROM S. 188TH ST., SEE SHEET C-6 AND C-32. THE LOCATION OF THE GATE WILL BE DETERMINED BY THE ENGINEER. VEHICLES DELIVERING MATERIALS OR HAULING MATERIAL TO THE BLAST PAD PAVING SHALL ACCESS THE SITE FROM S. 188TH ST. THROUGH GATE E-5 VIA THE CONTRACTOR'S ACCESS ROUTE AS INDICATED ON THE DRAWING. ANY GATE THE CONTRACTOR USES SHALL BE LOCKED AFTER ENTERING OR EXITING. THE CONTRACTOR SHALL PROVIDE SECURITY GUARDS AT THE GATES WHENEVER ANY OF THE UNMANNED GATES ARE USED BY THE CONTRACTOR OR AS DIRECTED BY THE ENGINEER. AT NO TIME SHALL A GATE BE LEFT OPEN AND UNATTENDED. SEE SPECIFICATION SECTIONS 01110 AND 01540 FOR ESCORT REQUIREMENTS. THESE GATES WILL BE USED BY PORT OF SEATTLE AND FAA PERSONNEL VEHICLES. GUARDS SHALL ALLOW ACCESS TO AND FROM THE AOA BY THESE PERSONS WITH THE APPROPRIATE ID/VEHICLE MARKINGS MEETING THE REQUIREMENTS OF SECTIONS 01110 & 01540 OF THE SPECIFICATIONS. SEE THE PHASING PLANS FOR COORDINATION AND SCHEDULING WITH OTHER CONTRACTORS CONCERNING ACCESS.

7. THE CONTRACTOR SHALL CONSTRUCT AND MAINTAIN AN ACCESS ROUTE FROM S. 188TH ST. TO THE EXISTING AIPPORT PERIMETER ROAD SEE SHEET C-6. THE LOCATION OF THE ACCESS ROUTE WILL BE APPROVED BY THE ENGINEER. THE ROADS DESIGNATED AS CONTRACTOR ROUTES WILL BE USED BY OTHER AIRPORT VEHICLES, CONTRACTORS AND THE GENERAL PUBLIC (ALONG PUBLIC ROADS). THE CONTRACTOR SHALL NOT INTERFERE WITH OTHER VEHICLE TRAFFIC AND SHALL YIELD TO EMERGENCY VEHICLES ALONG ANY OF THE AIRPORT OR PUBLIC ROADS. THE CONTRACTOR SHALL PROVIDE ALL FLAGGING, SIGNING, LIGHTING, ETC. REQUIRED BY THE CITY OF SEATAC, KING COUNTY, THE STATE OR THE PORT OF SEATTLE TO PROVIDE ALL REASONABLE SAFETY MEASURES TO PROTECT ALL PERSONS UTILIZING THE AOA PERIMETER ROAD. THE HAUL ROAD OR ALL PUBLIC ROADS USED BY THE CONTRACTOR. THE CONTRACTOR SHALL OBEY ALL VEHICULAR WEIGHT AND SPEED LIMITS ESTABLISHED IN SPECIFICATION SECTION 01110 OR AS POSTED ON PORT PROPERTY OR PUBLIC STREETS.

THE CONTRACTOR SHALL CONTINUOUSLY SWEEP AND WASH DOWN ALL ACCESS ROUTES TO THE CONSTRUCTION AREAS AND EXISTING ADJACENT PAVED AREAS AND AOA PAVEMENTS. THESE AREAS SHALL BE KEPT FREE OF DEBRIS AT ALL TIMES.

D-126 ANY DAMAGE ALONG THE CONTRACTOR ACCESS/HAUL ROUTES DUE TO THE CONTRACTORS USE SHALL BE REPAIRED IMMEDIATELY. AT THE COMPLETION OF THE PROJECT, ALL PAVEMENTS AND SURFACES ALONG THE ACCESS

ROUTES THAT WERE EXISTING AT THE START OF THE PROJECT SHALL BE RESTORED TO THEIR ORIGINAL CONDITION. THE CONTRACTOR SHALL REPAIR ANY DAMAGE TO THE HAUL ROAD DUE TO THEIR OPERATIONS. THE CONTRACTOR SHALL COORDINATE AND MEET THE CLEANING AND REPAIR REQUIREMENTS SET BY OTHER PUBLIC AGENCIES FOR USE OF THEIR ROADS FOR CONSTRUCTION RELATED WORK.

9. THE CONTRACTOR SHALL KEEP A WATER TRUCK ON SITE AT ALL TIMES DURING WORKING AND NON-WORKING HOURS AND SHALL MAINTAIN THE SITE FREE FROM DUST AND OBJECTIONABLE DEBRIS. DURING THE PERIODS OF TIME THAT THERE IS NO CONSTRUCTION ACTIVITY (BETWEEN WORK SHIFTS). THE WATER TRUCK MUST BE READY WITH ON-SITE CONTRACTOR'S PERSONNEL AVAILABLE TO RESPOND IMMEDIATELY TO A DUS PROBLEM AS IDENTIFIED BY AIRPORT OPERATIONS STAFF OR THE ENGINEER. AT NO TIME SHALL THERE BE MORE THAN A 10 MINUTE RESPONSE TIME TO CALLS CONCERNING DUST/DEBRIS PROBLEMS DURING WORK HOURS AND A 90 MINUTE RESPONSE TIME AT ALL OTHER TIMES ON A 24HOUR PER DAY BASIS. THE CONTRACTOR SHALL PROVIDE WHATEVER MEANS ARE NECESSARY TO PREVENT FOREIGN OBJECT DEBRIS (FOD) IN AIRCRAFT MOVEMENT AREAS ON A 24 HOUR BASIS. TRUCKS AND EQUIPMENT SHALL HAVE ALL LOOSE DIRT, ROCKS AND OTHER MATERIALS REMOVED WHEN ACCESSING THE AOA OR WHEN LEAVING A WORK AREA. THIS WILL BE CONTINUOUSLY MONITORED BY THE PORT AND IF THE CONTRACTOR'S METHO IS NOT REMOVING THE DEBRIS ADEQUATELY TO MEET SAFETY REQUIREMENTS, THE CONTRACTOR WILL BE REQUIRED TO IMPROVE THEIR METHOD OR UTILIZE A NEW METHOD AT NO ADDITIONAL COST TO THE PORT

10. THE CONTRACTOR SHALL PROVIDE TRUCK WASHES, RUMBLE STRIPS, STABILIZED CONSTRUCTION ENTRANCES, SHAKERS, OR WHATEVER MEANS AR NECESSARY TO PREVENT ANY FOREIGN MATERIAL FROM BEING DEPOSITED O PUBLIC ROADS. SEE SHEETS C-7, C-8, AND C-9, TESC PLAN.

SPECIFICATIONS:

DIVISION 1 - GENERAL REQUIREMENTS

Section 01110 - Operational Safety on Airports During Construction

PART 1 - GENERAL

1.11 REQUIREMENTS AND REGULATIONS AFFECTING THE CONDUCT OF THE WORK:

E. Debris:

RUNWAY 34R SAFETY AREA IMPOVEMENT CONSTRUCTION MITIGATION PROJECT CONTROLS

DRAWINGS:

Drawing STIA-9602-C-2.

6. VEHICLES DELIVERING MATERIALS TO OR HAULING MATERIAL, EXCEPT FOR BLAST PAD PAVING, SHALL ACCESS THE SITE FROM S. 188TH ST. VIA THE CONTRACTOR'S ACCESS ROUTE AS INDICATED ON THE DRAWING. THE CONTRACTOR SHALL CONSTRUCT IMPROVEMENTS THAT PROVIDES ACCESS TO THE SITE FROM S. 188TH ST., SEE SHEET C-6 AND C-32. THE LOCATION OF THE GATE WILL BE DETERMINED BY THE ENGINEER. VEHICLES DELIVERING MATERIALS OR HAULING MATERIAL TO THE BLAST PAD PAVING SHALL ACCESS THE SITE FROM S. 188TH ST. THROUGH GATE E-5 VIA THE CONTRACTOR'S ACCESS ROUTE AS INDICATED ON THE DRAWING. ANY GATE THE CONTRACTOR USES SHALL BE LOCKED AFTER ENTERING OR EXITING. THE CONTRACTOR SHALL PROVIDE SECURITY GUARDS AT THE GATES WHENEVER ANY OF THE UNMANNED GATES ARE USED BY THE CONTRACTOR OR AS DIRECTED BY THE ENGINEER. AT NO TIME SHALL A GATE BE LEFT OPEN AND UNATTENDED. SEE SPECIFICATION SECTIONS 01110 AND 01540 FOR ESCORT REQUIREMENTS. THESE GATES WILL BE USED BY PORT OF SEATTLE AND FAA PERSONNEL VEHICLES. GUARDS SHALL ALLOW ACCESS TO AND FROM THE AOA BY THESE PERSONS WITH THE APPROPRIATE ID/VEHICLE MARKINGS MEETING THE REQUIREMENTS OF SECTIONS 01110 & 01540 OF THE SPECIFICATIONS. SEE THE PHASING PLANS FOR COORDINATION AND SCHEDULING WITH OTHER CONTRACTORS CONCERNING ACCESS.

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D-126 ANY DAMAGE ALONG THE CONTRACTOR ACCESS/HAUL ROUTES DUE TO THE CONTRACTORS USE SHALL BE REPAIRED IMMEDIATELY. AT THE COMPLETION OF THE PROJECT, ALL PAVEMENTS AND SURFACES ALONG THE ACCESS

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9. THE CONTRACTOR SHALL KEEP A WATER TRUCK ON SITE AT ALL TIMES DURING WORKING AND NON-WORKING HOURS AND SHALL MAINTAIN THE SITE FREE FROM DUST AND OBJECTIONABLE DEBRIS. DURING THE PERIODS OF TIME THAT THERE IS NO CONSTRUCTION ACTIVITY (BETWEEN WORK SHIFTS), THE WATER TRUCK MUST BE READY WITH ON-SITE CONTRACTOR'S PERSONNEL AVAILABLE TO RESPOND IMMEDIATELY TO A DUST PROBLEM AS IDENTIFIED BY AIRPORT OPERATIONS STAFF OR THE ENGINEER. AT NO TIME SHALL THERE BE MORE THAN A 10 MINUTE RESPONSE TIME TO CALLS CONCERNING DUST/DEBRIS PROBLEMS DURING WORK HOURS AND A 90 MINUTE RESPONSE TIME AT ALL OTHER TIMES ON A 24HOUR PER DAY BASIS. THE CONTRACTOR SHALL PROVIDE WHATEVER MEANS ARE NECESSARY TO PREVENT FOREIGN OBJECT DEBRIS (FOD) IN AIRCRAFT MOVEMENT AREAS ON A 24 HOUR BASIS. TRUCKS AND EQUIPMENT SHALL HAVE ALL LOOSE DIRT, ROCKS AND OTHER MATERIALS REMOVED WHEN ACCESSING THE AOA OR WHEN LEAVING A WORK AREA. THIS WILL BE CONTINUOUSLY MONITORED BY THE PORT AND IF THE CONTRACTOR'S METHOD IS NOT REMOVING THE DEBRIS ADEQUATELY TO MEET SAFETY REQUIREMENTS, THE CONTRACTOR WILL BE REQUIRED TO IMPROVE THEIR METHOD OR UTILIZE A NEW METHOD AT NO ADDITIONAL COST TO THE PORT

10. THE CONTRACTOR SHALL PROVIDE TRUCK WASHES, RUMBLE STRIPS, STABILIZED CONSTRUCTION ENTRANCES, SHAKERS, OR WHATEVER MEANS ARE NECESSARY TO PREVENT ANY FOREIGN MATERIAL FROM BEING DEPOSITED ON PUBLIC ROADS. SEE SHEETS C-7, C-8, AND C-9, TESC PLAN.

SPECIFICATIONS:

DIVISION 1 - GENERAL REQUIREMENTS

Section 01110 - Operational Safety on Airports During Construction

PART 1 - GENERAL

1.11 REQUIREMENTS AND REGULATIONS AFFECTING THE CONDUCT OF THE WORK:

E. Debris:

1. Debris Control: When Airport roadways and public highways are used in connection with construction under this contract, 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 AOA 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 Engineer. If the Contractor is negligent in cleanup and Port forces are required to perform the work, the expense of said cleanup shall be paid by the Contractor.

2. No loose material or waste (FOD), capable of causing damage to aircraft or capable of being ingested into jet engines may be left in the working area on or next to runways, taxiways, ramps, or aprons. The Contractor shall direct special attention to all areas which are operational to aircraft during construction. These shall be kept clean and clear of all materials or debris at all time. Any food waste shall be promptly cleared to prevent attracting birds and animals.

F. Existing Airport Pavements and Facilities: The Contractor shall preserve and/or protect existing and new pavements and other facilities from damage due to construction operations. Existing pavements, facilities, utilities, or equipment which are damaged shall be replaced or reconstructed to original strength and appearance at the Contractor's expense. The Contractor shall take immediate action to replace any damaged facilities and equipment and reconstruct any damaged area which is to remain in service.

DIVISION 1 - GENERAL REQUIREMENTS
Section 01500 - Temporary Facilities & Controls

PART 3 - EXECUTION

3.02 NOISE CONTROLS.

A. At all times keep objectionable noise generation to a minimum by:

1. Equip air compressors with silencing packages.

2. Equip jackhammers with silencers on the air outlet.

3. Equipment that can be electrically driven instead of gas or diesel is preferred. If noise levels on equipment cannot reasonably be brought down to criteria, listed as follows, either the equipment will not be allowed on the job or use time will have to be scheduled subject to approval of the Engineer.

B. Objectionable noise received on neighboring (non-Port-owned) properties is defined as any noise exceeding the noise limits of State Regulations (WAC 173-60-040) or City ordinance, as stated below, or as any noise causing a public nuisance in residential area, as determined by the Port and community representatives, or by the nuisance provisions of local ordinances.

1. The noise limitations established are as set forth in the following table after any applicable adjustments provided for herein are applied:

	RECEIVING PROPERTY		
Noise Source	Residential	Commercial	Industrial
Airport	50 dBA	65 dBA	70 dBA

2. Between the hours of 10:00 p.m. and 7:00 a.m. on weekdays and 10:00 p.m. and 9:00 a.m. on weekends the noise limitations above may be exceeded for any receiving property by no more than:

   a. Five dBA for a total of 15 minutes in any one hour period; or

   b. Ten dBA for a total if 5 minutes in any one hour period; or

   c. 15 dBA for a total of 1.5 minutes in any one hour period.

C. In addition to the noise controls specified, demolition and construction activities conducted within 1,000 feet of residential areas may have additional noise controls required.

D. The Contractor's operation shall at all times comply with all County and City requirements.

3.03 DUST CONTROL.

Due to the type of work involved in this project, dust control will be extremely critical and continuously monitored. The Contractor shall provide whatever means is necessary to keep dust to an absolute minimum during working hours, non-working hours, and any seasonal shut down time periods. 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, the Contractor will be required to improve the method or utilize a new method a no additional cost to the Port.

The Contractor shall keep a vacuum sweeper truck and water truck on-site at all times during working and non-working hours and shall maintain the site free from dust and objectionable debris. The Contractor's access route along the airport perimeter road shall be swept and cleaned continuously. During the periods of time that there is no construction activity (between workshifts), the vacuum sweeper truck and water truck must be ready with on-site Contractor's personnel available to respond immediately to a dust or debris problem as identified by Airport Operations staff or the Engineer. At no time shall there be more than a 10 minute response time to calls concerning dust/debris problems during work hours and a 90 minute response time at all times on a 24 hour per day basis. The Contractor shall provide whatever means are necessary to prevent foreig object debris (FOD) in aircraft movement areas and provide construction area generated dust control on a 24 hour basis.

Trucks and equipment shall have all loose dirt, rocks and other materials removed when accessing the AOA or when leaving a work area. The Contractor shall be responsible fo the prevention and control of Foreign Object Damage (FOD). The Contractor shall develop and submit to the Port for review a positive method to meet these requirements, i.e., truck wash, rumble strips, shakers, etc. The method instituted will be continuously monitored by the Port and if the Contractor's method is not removing the debris adequately and controlling FOD, the Contractor will be required to improve the method or utilize a new method at no additional cost to the Port.

3.04 POLLUTION CONTROL:

Prevent discharge of contaminated water from the site from any source, including runoff, from entering onto adjacent areas and properties.

3.05 WATER CONTROL.

A. Provide as necessary to meet all Federal, State and local authority requirements and regulations.

B. Existing materials throughout the project area are moisture-sensitive. Control of stormwater runoff during the Contractor's operations will be essential.

C. Refer to Sections 01300 and 01565 for submittals required for Temporary Erosion and Sedimentation Controls.

D. The Contractor shall install such temporary piping, connections, manholes, catch basins or other improvements as required to ensure drainage and erosion control of each work area during construction.

3.06 SAFETY PROVISIONS:

B. The Contractor shall furnish flagmen to protect the public outside of Port property. The actions, equipment and position of flagmen when required, shall be the sole responsibility of the Contractor.

3.08 TRAFFIC CONTROL:

A. Public Safety Convenience: The Contractor shall conduct all operations with the least possible obstruction and inconvenience to the Port, its tenants and the public. The Contractor shall have under construction no greater amount of work than can be prosecuted properly with due regard to the rights of the Port tenants and the public.

1. Permit traffic to pass through the work area with least possible inconvenience and delay.

2. Maintain existing roadways and traffic routes within, and adjacent to, the work area.

3. Keep existing traffic signals, signing and lighting systems in operation as the work proceeds.

4. Maintain access to entrances, driveways, loading docks, buildings, etc., along the line of work. Provide temporary approaches and/or bridge crossings as necessary to maintain access.

5. Minimize "drop-offs" and provide temporary ramping, if required.

6. Provide anchored, steel plate covers over trenches as required to maintain traffic flow

7. Provide and maintain all walkways, access ramps, entrances and related facilities to meet the requirements of the Americans with Disabilities Act (ADA) of 1990.

B. Contractor Responsibility: The Contractor shall be responsible for providing adequate safeguards, safety devices, protective equipment and all other actions as necessary to protect the life, health and safety of the tenants, public, Port employees and other users of the Port facility, and to protect property, in connection with the performance of work covered by the Contract.

C. Traffic Control Devices:

1. The Contractor shall provide and maintain flaggers, signs and other traffic control devices as required to warn and protect the public, tenants and Port employees from injury or damage as a result of the Contractor's operation.

2. No work shall be done on or adjacent to any vehicular or pedestrian roadway/walkway until all necessary signs and traffic control devices are in place.

D. Conformance to Established Standards:

1. Flagging, signs and all traffic control devices shall conform to WAC 296-155-300, -05, -310 and -315 and specific regulation or requirements of the City of SeaTac.

2. Flaggers must meet the requirements of the State of Washington, Department of Labor and Industries (WAC 296-155-305). All workers engaged in flagging or traffic control shall wear reflective vests and hard hats.

E. Responsible Representative: The Contractor shall appoint one employee as the responsible representative in charge of traffic control and safety. The appointed representative shall have authority to act on behalf of the Contractor and shall be available, on call, twenty-four hours a day throughout the period of construction for the Contract. A twenty-four hour phone number shall be provided to the Engineer for use in case of an off-hour emergency. The Contractor shall provide immediate response to correct any and all deficiencies upon notificatic

DIVISION 1 - GENERAL REQUIREMENTS
Section 01565 - Temporary Erosion and Sedimentation Controls

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK.

A. This Section describes project required temporary erosion and sedimentation controls

B. In order to comply with the requirements of this section, the Contractor shall:

1. Develop and submit for approval a Contractor Erosion Control Plan (CECP)

2. Designate a Sedimentation and Erosion Control Representative (SEC) responsible of insuring compliance with the requirements of this Section.

3. Coordinate and schedule the installation of the controls, features, and best management practices (BMPs) identified in the Contractor Erosion Control Plan. Coordinate the erosion and sedimentation control work with the other contract work in order to provide continuous erosion and sedimentation control and protection.

4. Maintain the installed BMPs and controls for the duration of the project or as indicated in the contract documents.

5. Provide periodic inspection and response to ensure that the installed BMPs function during any and all storm events. Contractor shall be responsible for erosion and sedimentation control 24 hours a day, seven days a week, including holidays.

6. Remove all temporary controls at the end of the project or when no longer needed as determined by the Engineer.

C. Conduct project operations in accordance with the State National Pollution Discharge Elimination System (NPDES) permit for storm water discharges associated with construction activity.

D. No on-site grading or earthwork shall proceed until the Engineer has reviewed the Contractor's Erosion and Control Plan (CECP) and the requirements for erosion and sedimentation control have been implemented.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to this work as if specified in this section. Work and requirements related to this section are described throughout the contract documents, and in:

A. Section 01300 - Submittals

B. Section 01500 - Temporary Facilities and Controls

C. Section 02201 - Excavation and Embankment (FAA)

D. Section 02721 - Pipe for Storm Drains and Culverts (FAA)

E. Section 02722 - Manholes, Catch Basins, Inlets and Inspection Holes (FAA)

1.03 REFERENCES

A. Storm Water Management Manual for the Puget Sound Basin (Volumes I and II), Washington State Department of Ecology, dated July 1992.

B. WAC 173-201A Water Quality Standards for Waters of the State of Washington.

C. NPDES and State Waste Discharge Baseline General Permit for Storm Water Discharges Associated with Industrial Activities, dated November 8, 1992.

D. Waste Disposal Methods & Erosion/Sedimentation Control Methods - AGC Water Quality Manual, published by Associated General Contractors of Washington, dated October 1990.

1.04 PERMITS.

Conduct project operations in accordance with applicable sections of the NPDES permit for Sea-Tac International Airport.

Construction activities shall be conducted in such a manner as to meet all NPDES or other applicable regulations.

1.05 SEDIMENTATION AND EROSION CONTROL REPRESENTATIVE (SEC):

A. Responsible Representative: The Contractor shall designate one employee as the responsible representative in charge or erosion and sedimentation control. The Sedimentation and Erosion Control Representative (SEC) shall have authority to act on behalf of the Contractor and shall be available, on call, 24 hours a day throughout the period of construction. A 24 hour phone number shall be provided to the Engineer. The Contractor shall provide immediate response to c deficiencies.

B. Erosion Control Sediment: Within 30 days of the Notice of Award, the Contr Superintendent and Sedimentation and Erosion Control Representative shall attend a t hour presentation on erosion and sediment control. Contact Scott Tobiason at 439-66 presentation will take place during normal business hours at Sea-Tac Airport.

1.06 SUBMITTALS.

A. Submit the name of the Sedimentation and Erosion Control Representa per Section 01300 - Submittals.

B. Submit the Contractor Erosion Control Plan (CECP) in accordance wit Section 01300 - Submittals.

C. Submit manufacturer's literature on all manufactured items incorporate Contractor Erosion Control Plan.

D. Submit material samples for the following products:

1. Oil absorbent pads.

2. Geotextile fabric.

3. Erosion control cover material.

E. Submit additional materials samples requested by the Engineer.

1.07 CONTRACTOR'S EROSION CONTROL PLAN (CECP) FORMAT.

A. Develop and submit a Contractor Erosion Control Plan (CECP). The CE include all the erosion and sedimentation control features required by:

1. The project specifications.

2. The Temporary Erosion and Sedimentation Control Plan (TESCP) shown on the contract documents.

3. Storm Water Management Manual for the Puget Sound Basin (Vo and II). Washington State Department of Ecology, dated July 199

4. Regulatory agencies and such additional controls made necessary t Contractor's operation.

B. The Contractor Erosion Control Plan (CECP) shall consist of three parts:

1. Drawings—Showing the placement and phasing of the required an Contractor-selected controls. Phasing shall identify the erosion an sedimentation control methods during construction sequences.

2. A schedule—Coordinated with the required progress schedule, that details the installation of the controls.

3. A narrative description—Covering the implementation and maintenance of the erosion and sediment controls.

C. Select from the best management practices (BMPs) described in Volume II of Ecology's Storm Water Management Manual for the Puget Sound Basin, or other equivalent and appropriate BMPs to provide the protection required for the Contractor operations.

D. Detail maintenance and inspection procedures and schedules to be used of the life of the project in the CECP narrative.

E. The Contractor shall maintain a copy of the CECP and all references stated in Article 1.03 at the job site.

1.08 ADMINISTRATIVE REQUIREMENTS:

A. Applicability: The provisions of this section shall apply to Contractor, subcontractors at all tiers, suppliers, and all others who may have access to the work site by way of Contractor's activities.

B. Exclusion from Claims: Impacts caused by failure of Contractor, subcontractors and others on-site by way of Contractor's activities to comply, implement and maintain the provisions of this section shall not be cause for a claim of delay or increased costs to the Port.

PART 2 - PRODUCTS

2.01 GENERAL

All products used to construct the Contractor selected BMPs shall be suitable for such use and submitted to the Engineer for approval.

2.02 OIL ABSORBENT PADS.

Oil absorbent pads shall be 3M Brand Oil Sorbent as manufactured by Occupational Health and Safety Products Division/3M, St. Paul, Minnesota, or equal. The pads shall be sheets, approximately 18 inches by 18 inches thick, 3M Model No. T-156, or equal.

PART 3 - EXECUTION

3.01 GENERAL.

A. No grading or earthwork shall be started before the CECP is submitted and the Best Management Practice (BMPs) erosion and sedimentation control items are in place and functioning.

B. BMPs once installed shall be maintained for the life of the project or until their erosion and sediment control function has been completed.

C. BMPs shall be reviewed after each major storm event.

D. BMPs shall be maintained during all suspensions of work and all non-work periods.

3.02 CONTRACTOR EROSION AND SEDIMENTATION CONTROL REQUIREMENTS

The Contractor shall ensure that the following requirements are satisfied:

A. Clearing and Easement Limits: Clearing limits, sensitive/critical areas and their buffers, trees, drainage courses, and wetland areas shall be clearly delineated in the field.

B. Protection of Adjacent Areas: Extreme care shall be taken to prevent sediment deposition or contamination of the golf course property, wetland areas, existing drainage courses, or public streets. In the event that these areas suffer degradatio in the opinion of the Engineer, the Engineer may stop construction activities until the situation is rectified.

C. Timing and Stabilization of Sediment Trapping Measures: BMPs intended as sediment trapping measures shall be installed and functional before land disturbing activities take place.

D. Cut and Fill Slopes. Cut and fill slopes shall be constructed in a manner that will minimize erosion.

E. Controlling Off-Site Erosion: Properties and waterways downstream shall be protected from erosion due to increases in the volume, velocity and peak flow rate of storm water from the project site.

F. Stabilization of Temporary Conveyance Channels and Outlets: All temporary on-site conveyance channels shall be designed, constructed and stabilized to prevent erosion from the expected velocity of flow from a 2 year, 24 hour frequency storm for the developed condition.

G. Underground Utility Construction: The construction of underground utility lines shall be subject to the following criteria:

1. For any single trench excavation, no more than 500 feet of trench shall be opened at one time.

2. Where consistent with safety and space considerations, excavated material shall be placed on the uphill side of trenches.

3. Trench dewatering devices shall discharge into a sediment trap or sediment pond.

H. Construction Access Routes: Where construction vehicle access routes intersect paved roads, provisions shall be made to minimize the transport of sediments (mud or dust) onto the pave road. Where sediment has been transported onto a road surface the roads shall be cleaned thoroughly, and as a minimum, at the end of each day

Sediment shall be removed from roads by shoveling or sweeping and be transported and place within the fill area. Coordinate the sediment disposal area with Engineer. Street washing shall be allowed only after sediment has been removed.

The Contractor's access route along the airport perimeter road shall be swept and cleaned continuously

I. Removal of Temporary BMPs: All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Disturbed soil areas resulting from removal shall be permanently stabilized.

J. Dewatering Construction Sites: Dewatering devices shall discharge into a sediment trap or sediment pond.

K. Control of Pollutants Other Than Sediment on Construction Sites:

1. All pollutants other than sediment that occur on-site during construction shall be handled and disposed of in a manner that does not contaminate storm water
2. Fueling of Contractor's equipment: perform away from storm drain inlets in areas designated by the Contractor and reviewed by the Engineer.
3. Extreme care shall be taken to prevent fuel spills. Contractor's representative shall be present at all times when equipment is being fueled. In the event of a spill the Port of Seattle Fire Department shall be called by way of the Engineer.
4. Place oil absorbent pads and drip pans beneath the vehicle being fueled and under parked vehicles (overnight and otherwise).
5. Provide and maintain absorbent materials, shovels, and five gallon buckets at the fueling area for spill cleanup.
6. No vehicle maintenance other than emergency repair is to be performed on the project site. No engine fluids are to be stored on the project site.

L. Inspection and Maintenance: All temporary BMPs shall be inspected, maintained, and repaired as needed to ensure continued performance of their intended function. All maintenance and repair shall be conducted in accordance with the submitted plan. All on-site erosion and sediment control measures shall be inspected at least once every 7 days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24 hour period. An inspection report file shall be maintained.

M. BMPs identified in the CECP and the TESCP shall also apply to Contractor staging and equipment areas.

DIVISION 1 - GENERAL REQUIREMENTS

Section 01595 - Haul Routes and Disposal

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

The work of this section includes the requirements for the hauling and disposal of demolition debris, the hauling of Zone I, Zone II, and Zone III material to the project and the hauling of crushed aggregate, asphalt concrete pavement, and other constructic materials to the project site.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to this work as if specifie in this section. Work related to this section is described in:

A. Section 02050 - Demolition

B. Section 02201 - Excavation and Embankment (FAA)

C. Section 02222 - Crushed Aggregate Base Course (FAA)

D. Section 02513 - Asphalt Concrete Pavement

1.03 QUALITY ASSURANCE AND THE HAUL ROUTE SUPERVISOR:

The work of this section shall be under the direction of a Haul Route Supervisor. The Haul Route Supervisor shall be a supervisory person well-trained and experienced in handling excavated materials both with "on-highway" and "off-highway" equipment. The Haul Route Supervisor shall be completely familiar with the approved haul routes. The Haul Route Supervisor shall document all activities and answer all complaints regarding spillage, traffic violations, property damage claims, safety, equipment breakdowns, and the terms and conditions of required bonds and permits. The Haul Route Supervisor need not be a full-time employee dedicated to this project. The responsibilities may be shared with other project personnel provided the above-stated qualifications are satisfied.

1.04 SUBMITTALS:

A. General: Submittals shall be in accordance with Section 01300 - Submittals.

B. - Haul Route Supervisor: Submit the name of the Haul Route Supervisor in accordance with Section 01300 - Submittals.

C. Project Record Submittals:

1. Fill Material Borrow Site and Haul Route: Before any material is loaded at the fill material source borrow site, the Contractor shall submit the following information:

   a. Haul Route to the site and return.

   b. Copies of permits, agreements, or letter of understanding from regulatory agencies, towns, cities, or other governmental entities.

   c. Description, owner, vehicle number, and license number of each hauling vehicle.

   d. Each vehicle operator's name and driver's license number.

2. Haul Route Activities: For all haul activities provide documentation as to the quantity, date and excavation location of the material on a daily basis. This shall be included in a "Job-Site Field Report" prepared by the Haul Route Supervisor and signed by the Engineer and the Contractor's superintendent.

3. Project Completion: At project completion, provide:

   a. Copies of test reports.

   b. Copies of permits.

   c. Copies of correspondence from regulatory agencies.

   d. Vehicle log book(s).

   e. All other submittals and documents as required by this section.

1.05 JOB CONDITIONS

Once on the project site the vehicle operator shall conform to the agreed upon operational procedure established by the site operator and the Contractor. The procedure shall include but not be limited to, traffic control, turn-outs, turn-arounds, queue time, truck washing facilities, gate security, etc.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 BORROW SITE LOADING.

The material shall be loaded into the hauling vehicles under the direction of the Contractor's Haul Route Supervisor specified in Article 1.04 of this Section.

3.02 TRANSPORTATION OF WASTE MATERIALS:

The hauling vehicle shall proceed to the project site via the approved haul route. Any deviation from the approved haul route shall be approved by the Haul Route Supervisor.

3.03 PROJECT SITE UNLOADING.

Upon arriving at the project site, the operator shall conform to the operational procedures for unloading the material. After unloading the vehicle shall be washed, swept, or otherwise cleaned to the satisfaction of the Contractor and all regulatory agencies having jurisdiction. Refer to Section 01500 - Temporary Facilities and Controls and Section 01565 - Temporary Sedimentation and Erosion Control.

3.04 DOCUMENTATION

Documentation of haul activity shall include, but not be limited to:

1. Documentation as to the quantity, date, and excavation location of the material.
2. Copies of test reports
3. Copies of permits
4. Copies of correspondence from regulatory agencies.
5. A daily "Job-Site Field Report" prepared by the Engineer and signed by both the Resident Engineer and the Contractor's Superintendent

PROJECT DRAWINGS

A. DELETE Drawing STIA-9602-C-10 and
REPLACE with Drawing STIA-9602-C-10 REV. A

B. REVISE Note 6 on Drawing STIA-9602-C-1 to read as follows:

6. All construction traffic between the hours of 0700 and 1900, Monday through Saturday shall enter and exit the site from/ to the west on S. 188th Street via the Contractors access as indicated on the drawing. The Contractor shall construct improvements that provide access to the site from S. 188th Street. See sheet C-6 and C-32. The exact location of the gate will be determined by the Engineer. Construction traffic for the blast pad paving shall access the site from S. 188th Street through Gate E-5 via the Contractors access route as indicated on the drawing. All traffic shall enter/exit the site from/ to the west between 0700 and 1900 Monday through Saturday.

Any gate the Contractor uses shall be locked after entering or exiting or manned by a Port of Seattle gate guard. See Specification Sections 01110 and 01540 for specific requirements. These gates will be used by Port of Seattle and FAA

APPENDIX B
ATTACHMENT E

REVISIONS TO THE REVISED DRAFT CONFORMITY ANALYSIS

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REVISIONS TO MODELED SOURCES

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
SEATTLE-TACOMA INTERNATIONAL AIRPORT
AIR QUALITY ANALYSIS

A comprehensive review of the air quality input elements and modeling methodology used to prepare the Draft Supplemental EIS air quality analysis (and Revised Draft Conformity Analysis) has been completed. This review was initiated in response to comments provided by the EPA and their consultant SAIC, the Department of Ecology, the Puget Sound Air Pollution Control Agency, and the general public. Additionally, in response to specific comments related to data integrity, over 17,000 data elements used in the Emissions Dispersion Modeling System (EDMS) analysis were re-examined as a final step to ensure the quality of the data. This attachment describes the effect on air emissions resulting from the review and correction of various data elements for the Draft Supplemental EIS air quality analysis.

The EPA's consultant SAIC identified three key areas of concern with the Draft Supplemental EIS air quality conformity analysis: (1) the temporals and peak hour takeoffs assumptions used in determining annual operations; (2) the EDMS motor vehicle emission factors used, and (3) the estimate for construction emissions. As a result of the correction of the items identified by EPA and others identified through the quality assurance review, several other data elements were corrected. This review was conducted for both the Do-Nothing and "With Project" conditions for each forecast year.

Exhibit 1 identifies the revised data sources and the overall effect on emissions. A detailed technical memorandum that identifies the specific changes and effects on emissions and concentrations has been included in the FAA's Administrative Record and is available for public review during normal business hours at the FAA Offices in Renton Washington.

As the revised analysis shows, the resulting comparison of the Do-Nothing and "With Project" confirms that operational emissions will be lower in most cases for the "With Project" alternative. Combined operational and construction emissions from the project for pollutants subject to the conformity requirement will be less than the de-minimis levels established by the EPA in the general conformity regulation. Thus, there was no significant change to the analysis presented in the Draft Supplemental EIS Appendix B.

1. REVISIONS TO EMISSIONS INVENTORY

In general, correcting for the comments by the EPA's consultant and others resulted in an increase in emissions for both the Do-Nothing and "With Project" conditions over the emissions levels presented in the Draft Supplemental EIS. The following summarizes the corrections made and the effect on emissions.

1.1 *Temporals and Peak Hour Takeoffs (PHT)*: The EDMS model used to develop the emissions inventory requires the use of temporals to describe how the peak hour activity relates to average daily traffic, monthly traffic, and annual levels. The temporals used in the Draft

Supplemental EIS analysis reflected actual historic conditions. However, as a result, the annual forecast level of activity was not properly represented (it was under represented by 8-12%) in future years for both the Do-Nothing and "With Project" alternatives.

The hourly aircraft departure temporals have been increased to reflect the forecast level of aircraft operations. In addition, SAIC noted that the peak hour takeoff (PHT) levels were incorrectly input by a fraction for several aircraft. Accordingly, the PHT's have been revised to add to 64, the level of peak hour activity considered for the Draft Supplemental EIS analysis. For modeling purposes, the annual operations either equal or exceed the forecast level of aircraft operations based on the corrections to the temporals and PHT.

Combined, the corrections to temporals and PHT result in an increase in aircraft related emissions for both the Do-Nothing and "With Project" conditions. Because the Draft Supplemental EIS 2005 and 2010 "With Project" condition already considered the effect of a higher level of peak month average day activity for aircraft in comparison to the Do-Nothing, the increase in emissions is less "With Project" than for the Do-Nothing.

1.2 *EDMS Use of MOBILE5A Emission Factors*: The EPA's consultant noted that the Draft Supplemental EIS analysis for the year 2005 reflected conflicting surface vehicle emission factors between the Do-Nothing and "With Project" analysis. The EDMS Do-Nothing analysis reflected use of the year 2000 factors whereas the "With Project" reflected the year 2010 factors. As a result the Do-Nothing emissions were overstated relative to the "With Project".

In response, the year 2000 MOBILE5A surface vehicle emission rates have been used in the Final Supplemental EIS for both the 2005 Do-Nothing and "With Project" conditions. This change effects both roadway and parking lot related emissions, and increases the 2005 "With Project" emissions by 2,713 tons CO, 418 tons NOx, and 196 tons VOC.

1.3 *Construction Emissions*: In calculating the emissions from construction activities, three evaluations were performed: 1) emissions from vehicles using MOBILE5A emission factors (for on-road movements, including employees and material delivery); 2) emissions from earth movement activities (using time of operation and EPA emission factors) including activities associated with the embankment and movement of fill within the construction sites; and 3) use of other construction equipment for non-site preparation activities (using time of operation and EPA emission factors). A review of the Master Plan Update staging, as defined in Table 2-7 of the Supplemental EIS, shows that construction activity will be at a peak between 1999 and 2001. Further, the haul related to the Third Runway will be at its peak in year 2000. Therefore, year 2000 would result in the greatest quantity of construction emissions.

As is noted in the Final EIS and Supplemental EIS, a range of construction possibilities exist, and a final construction plan for the Third Runway will not be developed until contractor(s) are selected to supply the fill needed for the embankment. However, two scenarios were examined in the Final EIS/Supplemental EIS: Option 1: Maximum use of on-site material and Option 2: Maximum use of off-site material. To test the impact of alternative ways of completing the construction activities, four cases were evaluated. To avoid confusion with the options described above or the alternatives considered in the EIS, the construction cases were re-labeled as Case A through Case D.

	Construction Methods	Annual Tons		
		CO	NOx	VOCs
A	Maximum off-site sources (Option 2) using average annual trips, fill placement, construction employees, average terminal/landside construction	70	114	14
B	Maximum on site fill with movement from 2 on-site sources (Option 1, average hour off-site truck trips), fill placement, construction employees, average terminal/landside construction,	55	94	11
C	Maximum off-site material delivery (Option 2 - using 16 hours of peak hour truck trips) with all emissions occurring in Region, Maximum on-site material delivery (Option 1), fill placement, construction employees (Because this scenario overstates material needs by about 50%, this accounts for emissions by other construction equipment sources).	99	118	18
D	Maximum off-site fill (Option 2), accounting only for emissions in the Region, fill placement, construction employees, average terminal/landside construction (other equipment)	42	72	8

Case C was used as the basis of the construction emissions estimates in the Draft Supplemental EIS and the Updated Draft Air Conformity Analysis, because it represented the highest emissions of any of the four cases evaluated. In its comments, EPA questioned the use of this case because it did not specifically include any emissions from "other construction" equipment. As noted in the table above, Case C substantially overstates the amount of fill that will be needed for the entire Master Plan Update improvements, and the related emissions because it assumes two mutually inconsistent options for getting the needed fill: maximizing fill from both on-site and off-site sources at the same time. This case is not plausible, because if the Port actually maximized getting fill from on-site and off-site sources at the same time, it would obtain about 50% more fill than will be needed for project construction. By substantially overestimating the fill related emissions, this case already incorporates worst case assumptions without specifically accounting for "other construction" equipment.

Because Case A is the plausible case with the highest construction emissions, consideration was given to using it in the Final Supplemental EIS and Final Conformity Analysis. Nevertheless, with EPA's verbal concurrence, Case C was retained because it reflects the highest emissions of any case evaluated. This ensures that worst case assumptions are reflected in the Final EIS and Conformity Analysis.

1.4 *Other Corrections*: While performing quality assurance on the remainder of the data elements, additional errors were identified. Included was the omission of a sizable number of motor vehicles on a small roadway segment for the 2000 Do-Nothing condition. The other changes were minor and had little or no effect on emissions or dispersion. These changes include:

Roadway Volume, Link 1D - The review of over 4,000 EDMS roadway data input elements identified a sizable omission in roadway traffic volume for the 2005 Do-Nothing condition. This error identified the omission of approximately 8,000 vehicles in the peak hour for a small segment of SR518 (Link 1D) for the 2005 Do-Nothing condition. This change increases the Do-Nothing emissions by 462 tons of CO, 54 tons NOx, and 40 tons VOC.

Time-In-Mode - The 2000 "With Project" aircraft departure queue delay time was corrected to 2.35 minutes (versus 2.65, a difference of 0.3 minutes), the same as for the 2000 Do-Nothing condition. As there are no airfield project improvements proposed for the year 2000, the aircraft queue delay time is identical. This correction resulted in no identifiable change in "With Project" emissions.

Taxi-In/Out (B-757) - The 2000 Do-Nothing taxi-idle time-in-mode for the B-757, a medium sized jet aircraft, was corrected to 8.2 minutes (versus 8.9 minutes modeled for the heavy jet classification). This correction resulted in no change in emissions.

Departure Queue Geometry - The endpoint coordinates (the x/y coordinates for the queue endpoint extending away from the runway) were corrected for the 2005 "With Project" conditions, increasing the departure queue length by 150 meters. Since queue length has little effect on emissions (queue time is more important to emissions), this change had no effect on emissions.

Roadway Speeds and Volumes - Roadway traffic volumes and speeds were re-examined for consistency with the revised forecasts and traffic volumes. Except for Link 1D noted above, these changes focused on the existing and proposed terminal roadway links. Although speeds and volumes increase for some roadway segments (links), several roadway segments experience decreases in speed and volumes. The combined effect of the changes in speeds and volumes is an increase in roadway related emissions for both the Do-Nothing and "With Project" conditions.

Roadway Geometry - The existing and proposed terminal roadway link geometries (i.e., lengths, x/y coordinates) were also re-examined, resulting in several corrections to the 2005 and 2010 "With Project" conditions. The changes in roadway geometry added an additional 75 meters of distance traveled for the "With Project" conditions. These changes slightly increase the "With Project" emissions.

Parking Lot Volumes - Parking lot volumes (trips in and out) were re-examined, resulting in the correction of traffic volumes for many of the smaller off-site and on-airport parking lots. Overall, these changes resulted in an increase in emissions for both the Do-Nothing and "With Project" conditions.

Heating Plant Input and Temporals - Natural gas usage for the future years, Do-Nothing and "With Project", were increased slightly for consistency with the Draft Supplemental EIS forecasts. The hourly heating plant temporals were revised to '1' to be conservative. These changes result in a minor increase in emissions for both the Do-Nothing and "With Project" conditions.

Aircraft Fueling Input and Temporals - The Draft Supplemental EIS overestimated the usage of Jet-A fuel for both the Do-Nothing and "With Project" conditions. Other changes include the type of fuel modeled for one minor source (changed to include Jet-A fuel), and a revision of the hourly temporals to '1' to be conservative. These changes result in a decrease in VOC emissions for both the Do-Nothing and "With Project" conditions.

Surface Coating Input and Temporals - The Draft Supplemental EIS incorrectly included a vapor control emission factor for one source, for all alternatives, all scenarios. Also, to be conservative, the hourly temporals for this source were revised to '1'. These changes result in slightly higher VOC emissions for both the Do-Nothing and "With Project" conditions.

2. FINAL EMISSIONS INVENTORY -

Based on the complete re-evaluation (quality assurance) of the data used in the updated/revised Draft Conformity Analysis, a final emissions inventory was produced. Because some of the corrections affected the results of the EDMS dispersion analysis, the refined dispersion analysis was re-assessed as presented in Section 3 of this attachment.

Figure A presents the results of the total emission inventory by each source-type considered, which totals the operating and construction direct and indirect emissions. **Figure B** presents the respective operating related emissions that were used to derive the data presented in **Figure A**. Together, the operating and construction emissions reflect the quantifiable direct and indirect project emissions.

Although the corrections result in overall higher modeled emissions for both the Do-Nothing and "With Project" alternatives, the results are consistent with the Draft Supplemental EIS. **Figure A** shows that the total direct and indirect emissions from the proposed airport improvements (the projects) will be less than the de-minimis levels established by the EPA conformity rules in all years analyzed. (40 CFR 93.153(b)(2))

Figure C identifies the change in air emissions by project, excluding construction related emissions.

3. DISPERSION ANALYSIS

This section discusses the changes to the dispersion analysis that result from the changes in the emissions inventory discussed above. Because the project qualifies as de-minimis, the dispersion analysis is not required for the conformity analysis. This section refers to the discussion of air impacts in the Final Supplemental EIS and Final Conformity Analysis.

Figure E presents the results for the future Do-Nothing and "With Project" alternatives for CO and NO_2, including the addition of background levels and all revisions identified in **Exhibit 1**. As is shown, no exceedances of the 1-hour CO standard are expected at any of the receptor sites. In years 2005 and 2010, possible exceedances of the 8-hour CO standard were modeled for the Do-Nothing condition at Receptor 1 (southern portion of the existing main terminal). Three locations under the Do-Nothing condition could experience exceedances of the NO_2 standard: South 154th Street, the east side of South 188th Street, and the west side of South 188th Street.

"With Project" modeled CO levels, for both the 1-hour and 8-hour evaluation, would be below the NAAQS or in cases where the concentration is greater than the NAAQS, would be less than the Do-Nothing Alternative. As is shown in **Figure E**, future modeled CO concentrations could exceed the NAAQS, but the proposed Master Plan Update improvements could reduce CO levels at all sites relative to the Do-Nothing alternative. The "With Project" NO_2 modeled concentrations would either be less than the Do-Nothing in most cases, or for receptors that would experience a project related increase, the modeled concentrations would be less than the NAAQS.

1-Hour Carbon Monoxide Concentrations - For most receptor locations, the changes result in 1-hour CO concentrations equal to the Draft Supplemental EIS and FEIS. The exception is for 2005 "With Project" condition where concentrations are approximately 1 ppm higher than for the Draft Supplemental EIS due to the EDMS use of MOBILE5A emission factors. As for the Draft Supplemental EIS and FEIS, the modeling indicates that 1-hour CO concentrations would be well below the NAAQS standard of 35 ppm at all receptor locations.

8-Hour Carbon Monoxide Concentrations - The changes result in 8-hour CO concentrations that are equal for most receptors to the Draft Supplemental EIS concentrations. The exception is for the 2005 "With Project" condition where concentrations are 0 - 0.5 ppm higher than for the Draft Supplemental EIS. As for the Draft Supplemental EIS and FEIS, except in the terminal area, all modeled 8-hour CO concentrations would be well below the NAAQS of 9 ppm at all receptor locations. In the terminal areas, CO concentrations are due entirely to motor vehicle traffic on the terminal roadways. "With Project" the modeled 8-hour CO concentrations would be less than for the Do-Nothing condition and less than the CO standard.

Annual NO_2 Concentrations - The revisions result in changes in NO_2 concentrations ranging from 0 to 0.004 ppm depending on the receptor location. Nonetheless, all "With Project" NO_2 concentrations would be less than for the Do-Nothing condition, or are less than the NAAQS standard of 0.053 ppm. As for the Draft Supplemental EIS and FEIS, the highest NO_2 concentrations would be at receptor locations off the ends of the runways at South 154th Street and South 188th Street. All other receptor locations would be below the NO_2 standard.

As stated in the preamble to the general conformity regulations, the EPA has provided the technical judgment that it is inappropriate to look at modeling for specific receptors when determining the impacts of ozone or NO_2 emissions. (40 CFR Part 93, Subpart B, Federal Register, Volume 58, Number 228, November 30, 1993, page 63244):

> "The EPA believes that, as a technical matter, application of existing air quality dispersion models to assess project level emission changes for these regional scale pollutants [ozone and NO2] is generally not appropriate. That is, photochemical grid models are generally not sufficient to assess incremental changes to areawide ozone concentrations from emissions changes at a single or group of small sources. Emission changes should amount to some significant fraction of base emissions before photochemical grid modeling results can be interpreted with sufficient confidence that the results are not lost in the noise of the model and input data."

It is important to note that NO_2 is considered in the conformity analysis solely as a surrogate for NOx, which is an ozone precursor. NO_2 by itself is not subject to the conformity regulation because the regulations only apply to non-attainment and maintenance areas. The Puget Sound Region is attainment for NO_2 and there has never been an observed exceedance of the NO_2 NAAQS in the Region. As noted by EPA, ozone is clearly an areawide pollutant whose concentrations depend upon photochemical reaction and meteorological conditions. As articulated by the EPA in the conformity regulations noted above, it makes no sense to use dispersion modeling to estimate specific concentrations of ozone at local receptors.

Exhibit 1

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

REVISIONS TO MODELED SOURCES AND EFFECT ON EMISSIONS

	2000		2005		2010	
Modeled Source:	**Do-Nothing**	**"With Project"**	**Do-Nothing**	**"With Project"**	**Do-Nothing**	**"With Project"**
Aircraft Temporals	Increase	Increase	Increase	Increase	Increase	Increase
Aircraft Peak Hour Takeoffs (PHT)	Increase	Increase	Increase	Increase	Increase	Increase
Time-In-Mode	No Change	No Change	No Change	No Change	No Change	No Change
Taxi In/Out (B-757)	No Change	No Change	No Change	No Change	No Change	No Change
Departure Queue	No Change	No Change	No Change	No Change	No Change	No Change
EDMS Use of MOBILE5A	No Change	No Change	No Change	Increase	No Change	No Change
Roadway Volumes	No Change	Increase	Increase	Increase	Increase	Increase
Roadway Speeds	Increase	Increase	Increase	Increase	Increase	Increase
Roadway Geometry	No Change	No Change	No Change	Increase	No Change	Increase
Parking Lot Volumes	Increase	Increase	Increase	Increase	Increase	Increase
Heating Plant Input/Temporals	No Change	Increase	No Change	Increase	No Change	Increase
Tank Farm Input/Temporals	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease
Surface Coating Input/Temporals	No Change	No Change	Increase	Increase	Increase	Increase
Impact of Changes on DN/WP Emissions	Project improvements not as great as DSEIS.		Project improvements not as great as DSEIS.		Project improvements are greater than DSEIS.	

No Change/Increase/Decrease = Change in emissions relative to emissions in DSEIS

Source: Landrum & Brown, April, 1997

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APPENDIX C-1

FINAL SURFACE TRANSPORTATION REPORT

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SEATTLE - TACOMA INTERNATIONAL AIRPORT

Master Plan Update Supplemental EIS

Final Surface Transportation Report

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APPENDIX C-1

FINAL SURFACE TRANSPORTATION REPORT

I. INTRODUCTION

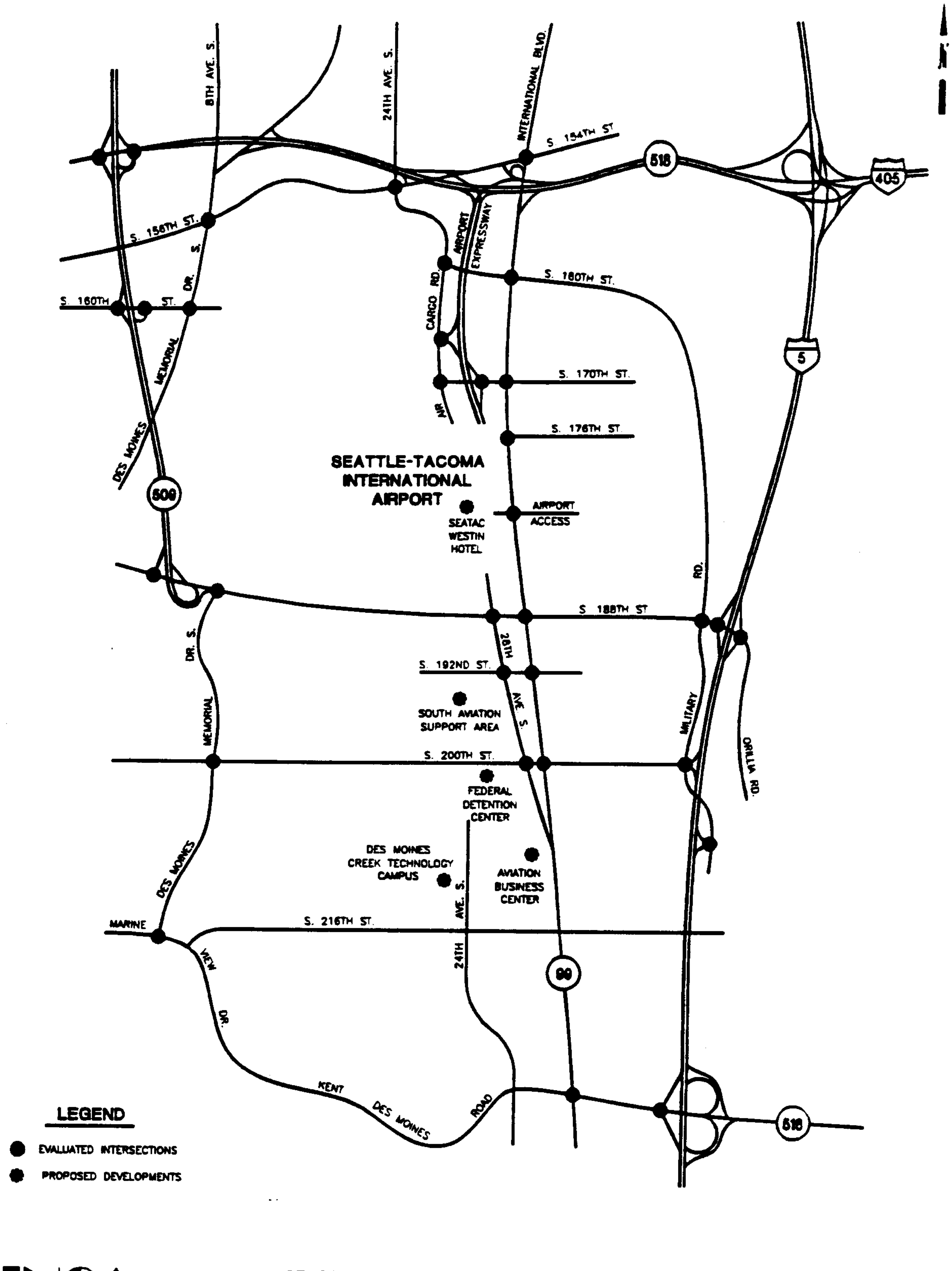
Seattle-Tacoma International Airport is located in the City of SeaTac, Washington, and serves as the regional airport for the Puget Sound area. The Airport is a sizable regional traffic generator with 1994 traffic volumes of approximately 72,400 vehicle trips during an annual average weekday, and 4,000 vehicle trips during the PM peak hour. **Exhibit C-1-1** shows the location of the Airport and the surrounding local surface transportation network.

In 1996, the Master Plan Update for the Seattle-Tacoma International Airport was completed. P&D Aviation, in coordination with the Port of Seattle, developed four alternatives that are described as follows:

- **Alternative 1, Do-Nothing** - No Airport facility improvements are planned to meet the future demand forecasts.
- **Alternative 2, Centralized Terminal** - Planned Airport improvements to include: construction of a 8,500 foot third dependent runway; expansion of the existing Main Terminal; expansion of both the North and South Satellites; expansion of the air cargo facilities; and other Airport facility improvements.
- **Alternative 3, North Unit Terminal** - Planned Airport improvements to include: construction of a 8,500 foot third dependent runway; expansion of the existing Main Terminal; construction of a North Unit Terminal and parking garage; expansion of the air cargo facilities; construction of a new State Route 518 interchange at 20th Avenue South; and other Airport facility improvements.
- **Alternative 4, South Unit Terminal** - Planned Airport improvements to include: construction of a 8,500 foot third dependent runway; expansion of the existing Main Terminal; expansion of both the North and South Satellites; construction of a South Unit Terminal and parking garage; expansion of the air cargo facilities; and other Airport facility improvements.

The Final EIS Surface Transportation Report[1] evaluated the surface transportation impacts associated with only the Preferred Alternative. Since the completion of the Final EIS, the Federal Aviation Administration (FAA) revised the aviation demand forecasts for this region, which generally was confirmed by the Port of Seattle. The new Port of Seattle forecasts are approximately 17 percent higher than the forecasts used in the Final EIS. The purpose of this report is to evaluate the surface transportation impacts associated with the Preferred Alternative and the future demand levels defined by the revised FAA aviation demand forecasts.

1 INCA Engineers, Inc., Seattle-Tacoma International Airport Master Plan Update EIS Final Surface Transportation Report, January 1996.



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SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

VICINITY MAP
EXHIBIT C-1-1

II. METHODOLOGY

A. Level of Service

Level of service (LOS) is a term used within the transportation discipline to describe the operating conditions at intersections, freeway ramp junctions, or along roadway segments. The level of service is described by a letter designation ranging from "A" through "F." The highest or best is LOS A which indicates little or no traffic congestion, while LOS F indicates severely congested traffic flow conditions.

The level of service for signalized, two-way stop controlled, and all-way stop controlled intersections is determined by the amount of delay experienced at the intersection. Delay is measured as the average time that each vehicle is stopped at the intersection. The level of service is determined from the length of the average delay experienced at the intersection during the peak hour. LOS A indicates very low levels of delay where most vehicles do not stop, while LOS F indicates delay levels in excess of one minute which is considered unacceptable to most drivers. Signalized, two-way stop controlled, and all-way stop controlled intersections were evaluated according to the methodologies presented in the 1994 Highway Capacity Manual (Transportation Research Board Special Report 209).

Signalized and two-way stop controlled intersections were previously evaluated in the Final EIS according to the level of service methodologies described in the 1985 Highway Capacity Manual (Transportation Research Board Special Report 209). All-way stop controlled intersections were previously evaluated according to the level of service methodologies presented in the Transportation Research Board Circular #373. The level of service evaluation methodologies have changed because new standards have been developed and adopted.

The level of service for freeway ramp junctions is determined by the calculated density of the freeway ramp junction influence area. Density is calculated in passenger cars per mile per lane. The freeway ramp junction influence area is defined as a 1,500 foot length of freeway either upstream from an off-ramp, or downstream from an on-ramp. LOS A indicates a very low density associated with low congestion levels, while LOS F indicates a very high density associated with high congestion levels. Freeway ramp junctions were evaluated according to the methodologies presented in the 1994 Highway Capacity Manual (Transportation Research Board Special Report 209).

Current aviation patterns at the Airport indicate that the airside weekday peak period occurs between 11:00 AM and 1:00 PM[2]. Current surface transportation patterns in the vicinity of the Airport indicate a minor weekday peak period between 11:00 AM and 1:00 PM, and a primary weekday peak period between 3:00 PM and 6:00 PM[3]. This time period reflects the heaviest traffic conditions of the day and the period of peak congestion for the local surface transportation system. The hour between 5:00 PM and 6:00 PM represents the hour of peak congestion for the surface transportation system. The level of service analysis for both intersections and freeway ramp junctions were performed during this peak hour.

[2] P&D Aviation, Technical report No. 4: Facilities Inventory, Revised August 12, 1994, p. 5-4.
[3] City of SeaTac Department of Public Works, Historical Average Daily Traffic Counts, 1994.

B. Future Traffic Volume Forecasts

The Puget Sound Regional Council (PSRC) is the Metropolitan Planning Organization for the Puget Sound area. The PSRC has adopted[4] the 1995 Metropolitan Transportation Plan (MTP) which represents the transportation plan for the entire Puget Sound area. The regional assumptions that influence transportation patterns in the Airport vicinity are described as follows:

- Construction of the Regional Transit Authority (RTA) system;
- Construction of the freeway and major arterial High Occupancy Vehicle (HOV) system; and
- Construction of the State Route 509 extension project to Interstate 5 (including South Access).

Traffic volumes were obtained from the MTP for base year 1990, and future years 2000, 2010, and 2020. Annual average growth rates were then calculated from the supplied traffic volumes and then applied to the 1994 existing traffic volumes to develop the future traffic volume forecasts. The growth trends obtained from the MTP were compared with the growth trends identified in neighboring Comprehensive Plans and were found to be consistent with one exception. The growth trends identified in the MTP for the Aviation Business Center (ABC) were less than those identified by the City of SeaTac. Therefore, the higher levels were included in addition to the growth trends forecast in the MTP (see Section VI-A of this report).

III. AIRPORT TRAVEL PATTERNS

The Airport is a sizable regional traffic generator with 1994 traffic volumes of approximately 72,500 vehicle trips during the average weekday. Eight categories of Airport traffic were quantified and identified in **Table C-1-1**. Each category is further defined in the following sections. This information was used to forecast the Airport related traffic volumes for each Alternative. The traffic volumes summarized in the following sections are different than those contained in the Final EIS due to the revised aviation demand forecasts, and to the additional traffic data received from the Port of Seattle and P&D Aviation that better quantified Airport related traffic. **Table C-1-2** and **Exhibit C-1-2** summarize the regional origin-destination patterns for Airport traffic.

Airport traffic has two major access routes to the terminal drive system: State Route 518 via the Northern Airport Expressway; and Interstate 5 via South 188th Street and International Boulevard / State Route 99. Current traffic counts indicate that approximately 70 percent of Airport traffic uses the Northern Airport Expressway to access the terminal drive system. While a number of routes exist to access the Sea-Tac from throughout the region, the typical access routes are:

- Airport passenger traffic from Tacoma: 1) Interstate 5 to South 188th Street, to International Boulevard, and then entering the Airport at South 180th Street; or 2) Interstate 5 to State Route 518, and then entering the Airport from the Northern Airport Expressway.
- Airport passenger traffic from Seattle: 1) Interstate 5 to State Route 518, and then entering the Airport from the Northern Airport Expressway; or 2) State Route 509 to State Route 518, and then entering the Airport from the Northern Airport Expressway.
- Airport passenger traffic from Bellevue: Interstate 405 to State Route 518, and then entering the Airport from the Northern Airport Expressway.

4 Puget Sound Regional Council, 1995 Metropolitan Transportation Plan: The Transportation Element of VISION 2020, the Region's Adopted Growth and Transportation Strategy, Adopted May 25, 1995.

Table C-1-1
Airport Traffic Summary

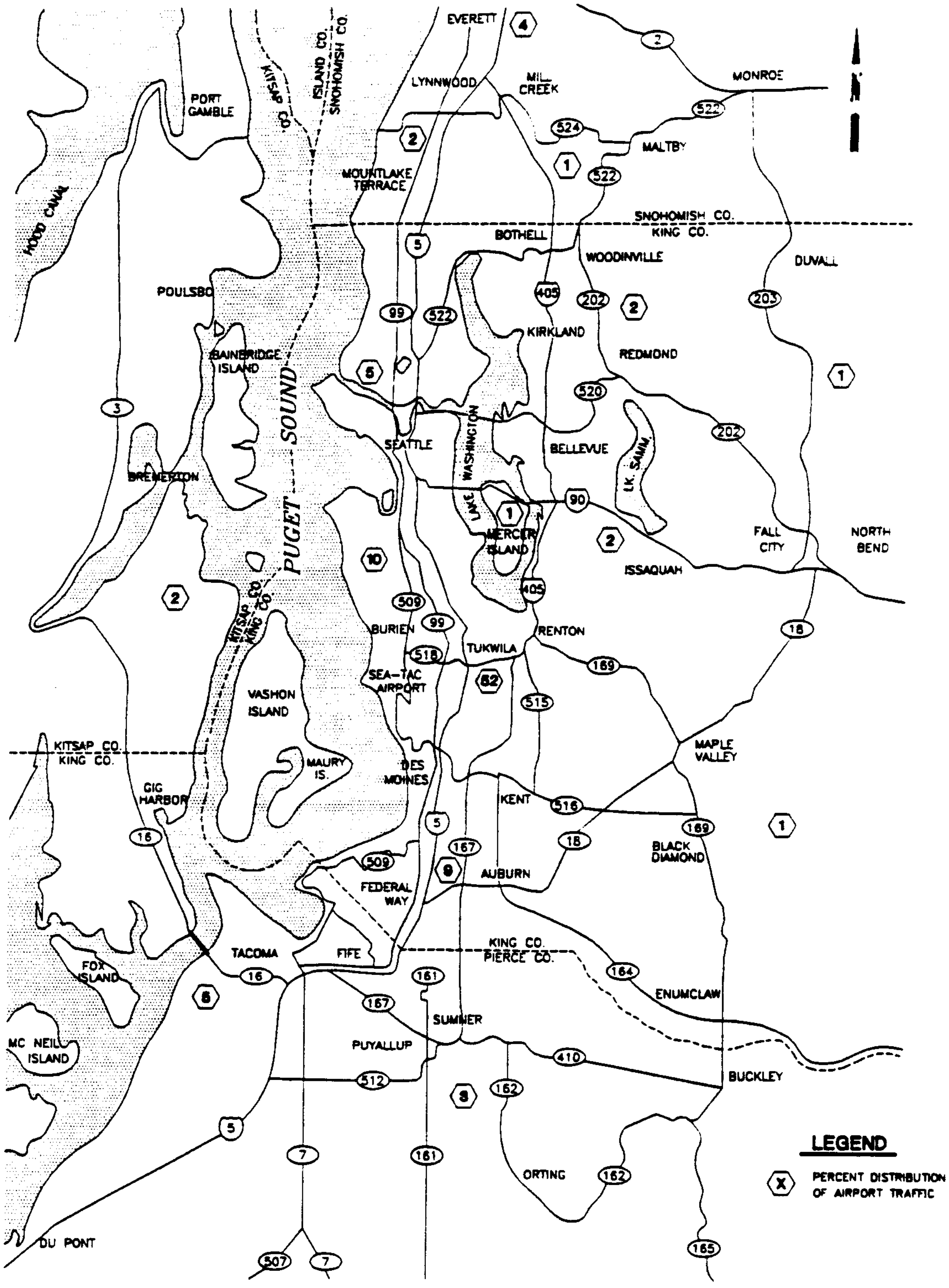
Airport Traffic Description	1994 Existing (AADT)	Do-Nothing Alternative			Preferred Alternative		
		2000 (AADT)	2005 (AADT)	2010 (AADT)	2000 (AADT)	2005 (AADT)	2010 (AADT)
Passenger	58,200	69,000	77,000	85,600	69,000	77,100	88,700
Passenger Off-Site Parking	880	2,100	3,540	5,280	1,040	1,180	1,320
Airport Employee	4,310	5,440	6,150	7,200	5,440	6,150	7,200
Air Cargo	4,170	5,200	6,340	7,490	5,200	6,340	7,490
Airfield Operations Area	1,460	1,690	1,840	1,900	1,690	1,840	2,010
General Aviation	100	100	100	100	100	100	100
Maintenance	3,190	6,080	6,270	6,270	3,190	4,730	6,270
Other	200	200	200	200	200	200	200
Totals	**72,510**	**89,810**	**101,440**	**114,040**	**85,860**	**97,640**	**113,290**

AADT = Annual Average Daily (Weekday) Traffic.

Table C-1-2
Airport Traffic Regional Origin-Destination Patterns Summary

Location(s)	Percent Distribution (%)
Airport Vicinity (SeaTac, Renton, Kent, Des Moines)	52%
West Seattle, Burien	10%
Federal Way, Auburn	9%
Seattle	5%
Tacoma, Gig Harbor	5%
Everett, Marysville	4%
Puyallup, Eastern Pierce County	3%
Bellevue, Issaquah	2%
Kirkland, Redmond, Woodinville, Duvall	2%
Lynnwood, Mountlake Terrace	2%
Vashon Island, Kitsap County	2%
Bothell, Mill Creek	1%
Mercer Island	1%
Northeast King County	1%
Southeast King County	1%
Total	**100%**

Source: PSRC 1995 Metropolitan Transportation Plan.



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MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

REGIONAL
O-D PATTERNS
EXHIBIT 2

AR 041070

A. Passenger

Passenger traffic consists of courtesy vehicles, on-site short and long term parking, taxis, and many other mode types. Passenger traffic represents approximately 80 percent of the total Airport traffic. Passenger traffic data was obtained from P&D Technologies5 and is summarized in Table C-1-3 by mode type, and in Table C-1-4 by access route. The current origin-destination patterns for passenger traffic are assumed to follow the origin-destination patterns published in the 1984 Departing Passenger Survey and Terminal Observations Report6 as summarized in Table C-1-5.

Table C-1-3
Passenger Traffic Mode Choice Summary

Passenger Mode of Access		1994 Existing	Do-Nothing Alternative			Preferred Alternative		
			2000	2005	2010	2000	2005	2010
Curb Side (Drop-Off/Pick-Up)	Arriving	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%
	Departing	33.0%	33.0%	33.0%	30.0%	33.0%	33.0%	30.8%
Courtesy Buses	Arriving	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
	Departing	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
Taxis	Arriving	4.7%	4.7%	4.7%	4.7%	4.35%	4.35%	4.35%
	Departing	4.7%	4.7%	4.7%	4.7%	4.35%	4.35%	4.35%
For-Hire Vans	Arriving	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	Departing	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
METRO Transit	Arriving	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
	Departing	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
RTA	Arriving	None	None	None	None	None	None	None
	Departing	None	None	None	None	None	None	None
Scheduled Buses	Arriving	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
	Departing	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%	2.6%
Short-Term Parking	Arriving	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%	26.0%
	Departing	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Long-Term Parking	Arriving	19.0%	16.0%	15.0%	14.0%	18.35%	18.35%	18.35%
	Departing	19.0%	16.0%	15.0%	14.0%	18.35%	18.35%	18.35%
Car Rentals	Arriving	17.1%	17.1%	16.1%	15.1%	17.1%	17.1%	17.1%
	Departing	17.1%	17.1%	16.1%	15.1%	17.1%	17.1%	17.1%
Off-Site Parking	Arriving	2.0%	4.0%	6.0%	8.0%	2.0%	2.0%	2.0%
	Departing	2.0%	4.0%	6.0%	8.0%	2.0%	2.0%	2.0%
Charter Buses	Arriving	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
	Departing	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%
Other Buses	Arriving	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
	Departing	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Total Forecast Daily Passengers	**Arriving**	**22,100**	**26,200**	**29,500**	**33,000**	**26,200**	**29,500**	**33,000**
	Departing	**21,900**	**26,200**	**29,500**	**33,000**	**26,200**	**29,500**	**33,000**
	Total	**44,000**	**52,400**	**59,000**	**66,000**	**52,400**	**59,000**	**66,000**

Source: P&D Aviation, ALPS Model Data.

5 P&D Technologies, *ALPS Model*, October - November, 1996.
6 P&D Aviation, Technical Report No. 4: Facilities Inventory, Revised August 12, 1994, p. 5-1.

Table C-1-4
Passenger Traffic Access Route Summary

Access Route		1994 Existing (AADT)	Do-Nothing Alternative 2000 (AADT)	Do-Nothing Alternative 2005 (AADT)	Do-Nothing Alternative 2010 (AADT)	Preferred Alternative 2000 (AADT)	Preferred Alternative 2005 (AADT)	Preferred Alternative 2010 (AADT)
Northern Airport Expressway (South of S. 170th St.)	Out	22,300	26,800	30,000	33,400	26,700	24,700	28,600
	In	18,400	22,500	25,300	28,300	22,500	22,500	27,200
	Total	40,700	49,300	55,300	61,700	49,200	47,200	55,800
International Blvd. / State Route 99 and South 180th Street	Out	6,800	7,700	8,500	9,400	7,800	6,400	7,000
	In	10,700	12,000	13,200	14,500	12,000	7,200	7,900
	Total	17,500	19,700	21,700	23,900	19,800	13,600	14,900
International Blvd. / State Route 99 and South 170th Street	Out	N/A	N/A	N/A	N/A	N/A	7,800	8,500
	In	N/A	N/A	N/A	N/A	N/A	8,500	9,500
	Total	N/A	N/A	N/A	N/A	N/A	16,300	18,000
Total Airport Passenger Traffic	Out	29,100	34,500	38,500	42,800	34,500	38,900	44,100
	In	29,100	34,500	38,500	42,800	34,500	38,200	44,600
	Total	58,200	69,000	77,000	85,600	69,000	77,100	88,700

AADT = Annual Average Daily (Weekday) Traffic.
Source: P&D Aviation, ALPS Model Data.

Table C-1-5
Passenger Traffic Origin-Destination Patterns Summary

Location(s)	Percent Distribution (%)
Seattle Central Business District (CBD)	27%
Immediate Airport Area	23%
Eastern King County	11%
Southern King County	9%
Northern King County	8%
Pierce County	9%
Snohomish County	4%
Kitsap County	4%
Other	5%
Total	**100%**

Source: 1984 Departing Passenger Survey and Terminal Observations Report[7].

[7] P&D Aviation, Technical Report No. 4: Facilities Inventory, Revised August 12, 1994, p. 5-1.

B. Passenger Off-Site Parking

There are several independently owned and operated off-site parking facilities located along the International Boulevard / State Route 99 corridor. These facilities allow passengers to park their private vehicles off-site, and take a courtesy shuttle both to and from the Airport terminal area. Based on passenger activity forecasts obtained from P&D Aviation[8], and the mode choice assumptions summarized in **Table C-1-3**, the number of off-site parking passenger vehicle trips on an average weekday were calculated and are summarized in **Table C-1-6**. Passenger off-site parking traffic does not include the courtesy shuttle trips associated with the off-site parking facilities. These trips are included with passenger traffic. Passenger off-site parking traffic accounts for less than two percent of the total Airport traffic. The origin-destination patterns for the passenger off-site parking traffic are assumed to follow the origin-destination patterns published in the 1984 Departing Passenger Survey and Terminal Observations Report[9] which are summarized in **Table C-1-5**.

Table C-1-6
Passenger Off-Site Parking Traffic Summary

Description	1994	Do-Nothing Alternative			Preferred Alternative		
	Existing	2000	2005	2010	2000	2005	2010
PM Peak Hour							
Arriving Passengers	1,584	2,173	2,425	2,699	2,190	2,452	2,734
Departing Passengers	973	1,466	1,708	1,979	1,410	1,622	1,856
Mode Choice Assumption	2.0%	4.0%	6.0%	8.0%	2.0%	2.0%	2.0%
Arriving Passenger Traffic (vph)	32	87	146	216	44	49	55
Departing Passenger Traffic (vph)	19	59	102	158	28	32	37
Total Passenger Traffic (vph)	51	146	248	374	72	81	92
Annual Average Daily							
Arriving Passengers	22,100	26,200	29,500	33,000	26,200	29,500	33,000
Departing Passengers	21,900	26,200	29,500	33,000	26,200	29,500	33,000
Mode Choice Assumption	2.0%	4.0%	6.0%	8.0%	2.0%	2.0%	2.0%
Arriving Passenger Traffic (vpd)	440	1,050	1,770	2,640	520	590	660
Departing Passenger Traffic (vpd)	440	1,050	1,770	2,640	520	590	660
Total Passenger Traffic (vpd)	880	2,100	3,540	5,280	1,040	1,180	1,320

vph = vehicles per hour; vpd = vehicles per day.
Source: Passenger forecasts provided by P&D Aviation.

8 P&D Technologies, *ALPS Model*, October - November, 1996.
9 P&D Aviation, Technical Report No. 4: Facilities Inventory, Revised August 12, 1994, p. 5-1.

C. Employee

Airport employee traffic represents approximately six percent of the total Airport traffic. The Port of Seattle currently owns and operates nine employee parking lots located in the Airport vicinity. Trip generation rates were developed for this analysis based on P&D Aviation's Airport Parking Systems Long-Range Analysis Report[10], the Port of Seattle's Commute Trip Reduction Program Report[11], the Port of Seattle's Parking Terminal Space Report[12], and the Port of Seattle's Yearly Parking Permits Report[13]. The trip generation information is summarized in **Table C-1-7**. Employee origin-destination patterns were determined from the Port of Seattle Commute Trip Reduction Report and are summarized in **Table C-1-8**. Approximately eighteen percent of Airport employee trips are within the City of SeaTac and these trips were distributed further as described in **Table C-1-9**.

Table C-1-7
Airport Employee Traffic Summary

Employee Parking Lot	1994 Existing	Do-Nothing Alternative			Preferred Alternative		
		2000	**2005**	**2010**	**2000**	**2005**	**2010**
Port of Seattle Employee Parking Requirements (Parking Spaces)							
A	750	1,517	1,517	1,517	N.A.	N.A.	N.A.
B	1,150	1.150	1,150	1,150	1,150	N.A.	N.A.
South	1,400	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
North	N.A.	1,300	1,300	1,300	3,518	5,919	6.663
5	184	184	184	184	N.A.	N.A.	N.A.
7	39	39	39	39	N.A.	N.A.	N.A.
8	68	68	68	68	N.A.	N.A.	N.A.
5th Floor	340	340	340	340	340	N.A.	N.A.
E / Carpool	177	177	177	177	177	177	177
Totals	**4,108**	**4,775**	**4,775**	**4,775**	**5,185**	**6,096**	**6,840**
Port of Seattle Employee Parking Traffic Summary (AADT Volumes)							
A	790	1,730	2,030	2,290	N.A.	N.A.	N.A.
B	1,210	1,310	1,310	1,730	1,210	N.A.	N.A.
South	1,470	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
North	N.A.	1,480	1,740	1,960	3,690	5,970	7,020
5	190	210	250	280	N.A.	N.A.	N.A.
7	40	40	50	60	N.A.	N.A.	N.A.
8	70	80	90	100	N.A.	N.A.	N.A.
5th Floor	360	390	450	510	360	N.A.	N.A.
E / Carpool	180	200	230	270	180	180	180
Totals	**4,310**	**5,440**	**6,150**	**7,200**	**5,440**	**6,150**	**7,200**
Employees	**10,270**	**12,960**	**15,240**	**17,100**	**12,960**	**15,240**	**17,100**

AADT = Annual Average Daily (Weekday) Traffic.

10 P&D Aviation, Sea-Tac International Airport Master Plan Airport Parking Systems Long-Range Analysis, July 1995.
11 Port of Seattle, Commute Trip Reduction Employee Program Report, August 30, 1994.
12 Port of Seattle, Parking Terminal Space Report, August 1995.
13 Port of Seattle, Yearly Parking Permits by Employer Report, August 1995.

Table C-1-8
Airport Employee Regional Origin-Destination Patterns Summary

Location(s)	Percent Distribution (%)
Marysville / Everett	2.4%
Mountlake Terrace / Lynnwood	3.6%
Bothell / Woodinville	1.2%
Seattle	9.1%
Kirkland / Bellevue / Redmond	4.5%
Issaquah / North Bend	0.5%
West Seattle / Burien	6.7%
Tukwila	6.0%
Renton	3.8%
SeaTac	17.8%
Normandy Park	2.2%
Kent	4.1%
Des Moines	2.4%
Federal Way	12.1%
Black Diamond / Maple Valley	9.6%
Gig Harbor	1.0%
Pierce County / Tacoma	5.5%
Sumner / Puyallup	3.3%
Auburn / Algona / Pacific	3.3%
Kitsap County / Bremerton	0.7%
Olympia	0.2%

Source: Port of Seattle Commute Trip Reduction Employer Program Report.

Table C-1-9
Airport Employee Origin-Destination Patterns Summary within City of SeaTac

City of SeaTac Sub-Area	Percent Distribution (%)
North SeaTac / Riverton Heights	14.7%
West of Airport	4.4%
Sea-Tac International Airport	0.0%
International Boulevard - North	27.3%
McMicken Heights / Bow Lake	18.9%
Angle Lake / Mansion Hill	19.2%
International Boulevard - South	4.5%
South Corridor / Aviation Business Center	3.4%
Southwest	5.0%
Southeast	2.6%

Source: City of SeaTac Comprehensive Plan.

D. Air Cargo

Air cargo traffic includes both air cargo employee traffic and air cargo truck traffic and represents approximately six percent of the total Airport traffic. Air cargo traffic was calculated from information contained in the Port of Seattle Air Cargo Road Survey[14], and supplemented with information obtained from the Air Cargo Operations Survey[15] found in the appendices. The trip generation information for air cargo traffic is summarized in **Table C-1-10**. Air cargo employee origin-destination patterns were assumed to follow the Airport employee origin-destination patterns summarized in **Tables C-1-8 and C-1-9**, and the origin-destination patterns for the truck traffic were derived from phone conversations with the air cargo handlers and are summarized in **Table C-1-11**.

Table C-1-10
Air Cargo Traffic Summary

Description	1994 Existing	Forecasts (Both Alternatives) 2000	2005	2010
Air Cargo Forecast Summary				
Annual Air Cargo (Metric Tons)	408,000	509,000	621,000	732,000
Average Daily Air Cargo (Metric Tons)	1,120	1,400	1,700	2,000
Average Daily Air Cargo (Pounds)	2,465,200	3,076,000	3,750,700	4,421,000
Average Daily Air Cargo Employees	880	1,100	1,340	1,580
Air Cargo Employee Traffic Summary				
Average Daily Air Cargo Employee Trips (vpd)	2,150	2,680	3,270	3,860
PM Peak Hour Air Cargo Employee Trips (vph)	174	217	265	313
Air Cargo Truck Traffic Summary				
Average Daily Air Cargo Truck Trips (vpd)	2,020	2,520	3,070	3,630
PM Peak Hour Air Cargo Truck Trips (vph)	117	144	176	208

vpd = vehicles per day; vph = vehicles per hour.

Table C-1-11
Air Cargo Truck Origin-Destination Patterns Summary

Location(s)	On-Site Air Cargo Trucks Percent Distribution (%)
North	8.8%
Seattle	67.0%
Eastside	6.6%
South	8.6%
SeaTac	7.3%
Tukwila	1.7%
Total	**100.0%**

Location(s)	Off-Site Air Cargo Trucks Percent Distribution (%)
Seattle	33.0%
SeaTac (N)	62.0%
SeaTac (S)	5.0%
Total	**100.0%**

14 Port of Seattle, Air Cargo Road Survey, 1994.
15 INCA Engineers, Air Cargo Operations Survey, April 1994.

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E. Airfield Operations Area

Typical Airfield Operations Area (AOA) traffic is generated by off-site sources such as flight kitchens and Port of Seattle independent contractors and consultants. AOA traffic represents approximately two percent of the total Airport traffic. There are three main gates that provide access to the AOA. These gates are Gate E-13, located off 28th Avenue South just north of South 188th Street; Gate E-20, located off Air Cargo Road just south of South 170th Street; and Gate E-28, located within the Air Cargo area. Monthly vehicle counts were obtained from the Port of Seattle Access Control System for each of these gates[16]. For purposes of this analysis it was assumed that all vehicles entering through Gate E-28 are associated with the on-site air cargo operations, and therefore are not included in the AOA traffic volumes. From this information it was determined that Gate E-13 handles approximately 43 percent, and Gate E-20 handles approximately 57 percent of the total AOA traffic listed in **Table C-1-12**. Origin-destination patterns are also summarized in **Table C-1-13**.

Table C-1-12
Airfield Operations Area (AOA) Traffic Summary

Description	1994 Existing	Do-Nothing Alternative			Preferred Alternative		
		2000	2005	2010	2000	2005	2010
Annual Aircraft Operations	353,100	409,000	445,000	460,000	409,000	445,000	474,000
Daily Aircraft Operations	970	1,120	1,220	1,260	1,120	1,220	1,300
AOA Daily Traffic (vpd)	1,460	1,690	1,840	1,900	1,690	1,840	2,010
AOA PM Traffic (vph)	146	169	184	190	171	187	201

vpd = vehicles per day; vph = vehicles per hour.

Table C-1-13
Airfield Operations Area (AOA) Origin-Destination Patterns Summary

Location(s)	Percent Distribution (%)
Seattle	18.2%
Eastside	6.8%
SeaTac Vicinity	7.2%
Southeast King County	8.6%
Southwest King County	8.6%
South (Tacoma)	21.4%
Off-Site Flight Kitchen (South 154th Street)	7.0%
Off-Site Flight Kitchen (South 160th Street)	11.9%
Off-Site Flight Kitchen (28th Avenue South)	10.3%
Total	**100.0%**

16 Port of Seattle, Monthly Statistical Data Report: Access Control.

F. General Aviation

General aviation traffic is defined as all traffic associated with general aviation activities at the Airport and represents less than one-half of a percent of the total Airport traffic. There are two types of general aviation facilities at the Airport: general aviation and Weyerhaeuser corporate aviation. Trip generation rates were based on Land Use 22 - General Aviation Airport from the Institute of Transportation Engineers Trip Generation manual[17]. The trip generation information is summarized in **Table C-1-14**, and origin-destination patterns were developed and summarized in **Table C-1-15**.

Table C-1-14
General Aviation Traffic Summary

Description	1994 Existing	Forecasts (Both Alternatives) 2000	2005	2010
General Aviation Traffic Summary				
Annual Aircraft Operations	10,300	10,300	10,300	10,300
Daily Aircraft Operations	28	28	28	28
Average Daily General Aviation Traffic (vpd)	74	74	74	74
PM Peak Hour General Aviation Traffic (vph)	13	13	13	13
Weyerhaeuser Corporate Aviation Traffic Summary				
Daily Aircraft Operations	5	5	5	5
Average Daily Corporate Aviation Traffic (vpd)	26	26	26	26
PM Peak Hour Corporate Aviation Traffic (vph)	4	4	4	4

vpd = vehicles per day; vph = vehicles per hour.

Table C-1-15
General Aviation Origin-Destination Patterns Summary

Location(s)	Percent Distribution (%)
Seattle	36.0%
Eastside	18.0%
Tacoma	46.0%
Total	**100.0%**

G. Aircraft Maintenance

Aircraft maintenance traffic is defined as all traffic associated with aircraft maintenance employees and represents approximately four percent of the total Airport traffic. Trip generation rates were derived from Appendix K of the South Aviation Support Area Final EIS[18], and from the Facilities Inventory report[19] and are summarized in **Table C-1-16**. Aircraft maintenance origin-destination patterns were assumed to follow the Airport employee origin-destination patterns summarized in **Tables C-1-8 and C-1-9**.

17 Institute of Transportation Engineers, Trip Generation: An Informational Report, 5th Edition, pp. 32 - 59.
18 The TRANSPO Group, Inc., South Aviation Support Area Final EIS: Appendix K, Transportation, June 16, 1992.
19 P&D Aviation, Technical Report No. 4: Facilities Inventory, pp. 4-12 - 4-17.

Table C-1-16
Aircraft Maintenance Facility Traffic Summary

Description	1994 Existing	Do-Nothing Alternative			Preferred Alternative		
		2000	2005	2010	2000	2005	2010
Maintenance Employees	1,650	3,150	3,250	3,250	1,650	2,450	3,250
Average Daily Traffic (vpd)	3,190	6,080	6,270	6,270	3,190	4,730	6,270
PM Peak Hour Traffic (vph)	139	265	273	273	139	205	273

vpd = vehicles per day; vph = vehicles per hour.

H. Other

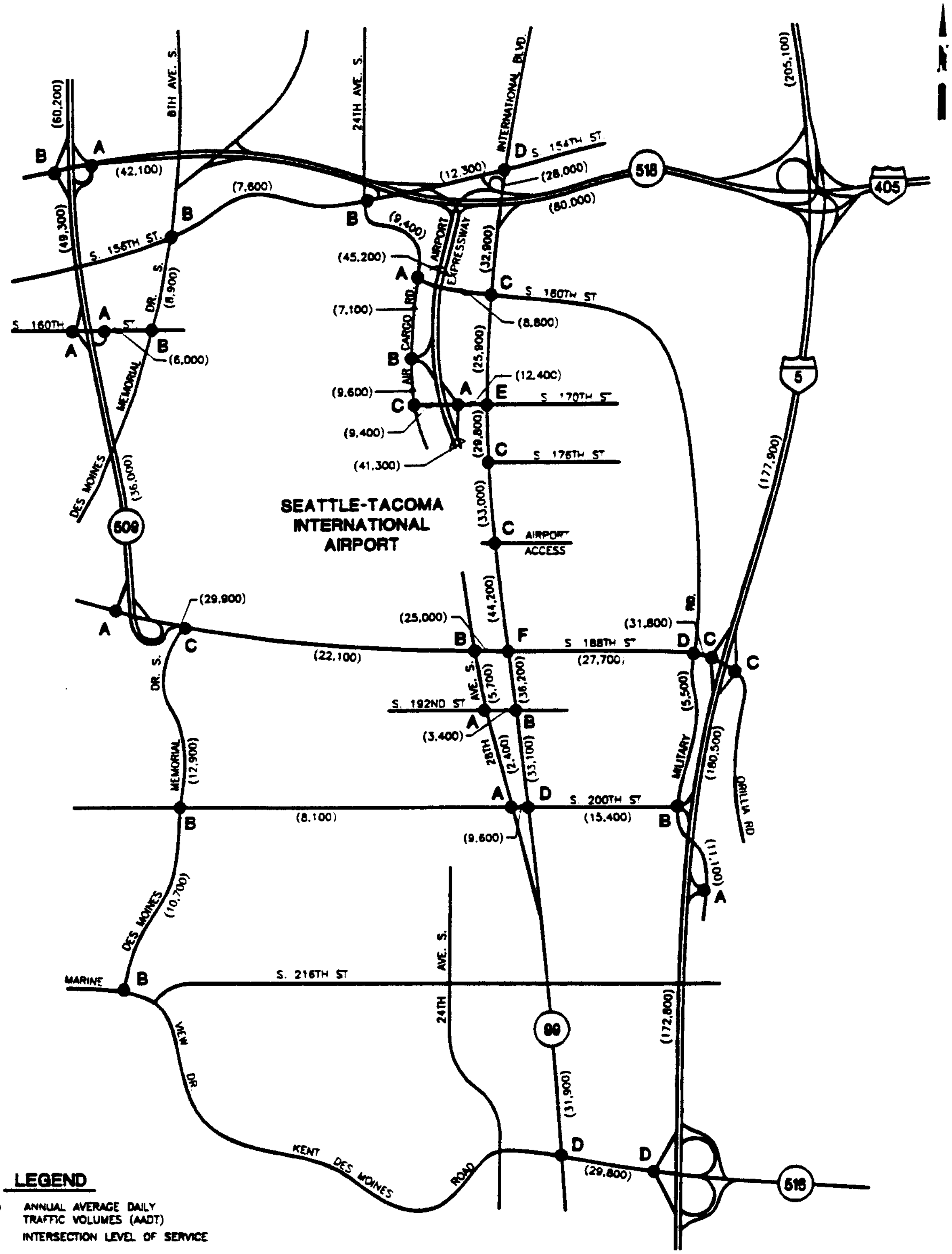
The remainder of the Airport traffic is categorized as other traffic and represents less than one-half of a percent of total Airport traffic. This traffic includes general deliveries to the Airport through the service tunnel, Port of Seattle Police traffic on the Airport perimeter roadways, and other miscellaneous vehicular trips.

IV. 1994 EXISTING CONDITIONS

A. Surface Transportation System

The Seattle-Tacoma International Airport is located south of State Route 518, north of South 188th Street, east of State Route 509, and west of Interstate 5 and International Boulevard / State Route 99. The Northern Airport Expressway connects the Airport's terminal drive system to State Route 518, and serves as the primary access route to the Airport. A southern access route to the Airport includes South 188th Street and International Boulevard / State Route 99. The surface transportation system is further defined in **Exhibit C-1-3** and below:

- Interstate 5 is a divided eight lane, north-south freeway, that serves as the primary regional corridor between Tacoma, Seattle, and Everett.
- State Route 518 is a divided four lane, east-west freeway, that provides regional access to State Route 509, the Northern Airport Expressway, and Interstate 5.
- Interstate 405 is a divided six lane, north-south freeway, that provides regional access to Seattle's Eastside from Interstate 5.
- State Route 509 is a divided four lane, north-south freeway, that provides access from West Seattle to State Route 518, and ends at South 188th Street. State Route 509 continues further south past South 188th Street as an undivided four lane principal arterial roadway.
- Northern Airport Expressway is a divided six lane, north-south expressway, that connects the Airport's terminal drive system with State Route 518 and serves as the Airport's primary access route. An interchange is also provided at South 170th Street/Air Cargo Road.
- International Boulevard / State Route 99 is an undivided five lane, north-south principal arterial roadway, that provides regional access from Seattle to Tacoma. Access to the Airport's terminal drive system is provided from a signalized intersection on International Boulevard / State Route 99.
- Kent-Des Moines Road (State Route 516) is an undivided four lane, east-west principal arterial, that provides regional access from Des Moines to Kent.



LEGEND

(X,XXX) ANNUAL AVERAGE DAILY TRAFFIC VOLUMES (AADT)

X INTERSECTION LEVEL OF SERVICE

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1994 EXISTING CONDITIONS
EXHIBIT C-1-3

- South 188th Street is an undivided four lane, east-west principal arterial roadway, that connects State Route 509, International Boulevard / State Route 99, and Interstate 5.
- South 200th Street is an undivided two lane, east-west principal arterial roadway, that connects State Route 509, International Boulevard / State Route 99, and Interstate 5.
- Des Moines Memorial Drive South is an undivided two lane, north-south minor arterial roadway, that provides access from Des Moines to SeaTac.
- Military Road is an undivided two lane, north-south minor arterial roadway, that provides access from Interstate 5 to Air Cargo Road.
- South 154th/156th Street is an undivided two lane, east-west minor arterial roadway, that connects Des Moines Memorial Drive South, Air Cargo Road, State Route 518, and International Boulevard / State Route 99.
- South 160th Street is an undivided two lane, east-west collector arterial roadway, that connects State Route 509 with Des Moines Memorial Drive South. South 160th Street is also an undivided four lane, east-west minor arterial roadway, that connects Air Cargo Road and International Boulevard / State Route 99.
- South 170th Street is an undivided four lane, east-west minor arterial roadway, that connects Air Cargo Road, the Northern Airport Expressway, and International Boulevard / State Route 99.
- Air Cargo Road is an undivided four lane, north-south minor arterial roadway, that provides access to the Northern Airport Expressway, the AOA, and the Airport's air cargo area. Traffic volumes indicate that approximately 10 to 20 percent of all vehicular traffic on Air Cargo Road are heavy vehicles.
- 28th Avenue South is an undivided two lane, north-south minor arterial roadway, that provides access to the Airport's AOA and the future South Aviation Support Area (SASA).

Existing 1994 traffic volumes were provided by the City of SeaTac, WSDOT, and collected by Traffic Data Gathering for INCA Engineers, Inc. These traffic volumes were then seasonally adjusted to reflect annual average daily traffic (AADT) conditions. WSDOT seasonal adjustment factors for permanent traffic recorder S-809[20] were used to adjust these volumes. The 1994 AADT volumes for several roadway links and freeway ramps in the Airport vicinity are summarized in **Exhibit C-1-3**. The 1994 AADT volumes were then compared to the City of SeaTac 1991-1992 traffic volumes[21], WSDOT 1992 traffic volumes[22], and the PSRC MTP base 1990 traffic volumes in order to ensure transportation conformity. Based on these comparisons, the 1994 AADT volumes were found to be a valid representation of area traffic volumes and consistent with other transportation planning activities.

Transit service in the Airport vicinity is provided by King County Department of Metropolitan Services (METRO). There are five routes that offer service to the Airport: Routes 174, 184, 191, 194, and 340[23]. Routes 174, 184, and 191 provide service along the International Boulevard / State Route 99 corridor between Federal Way and the Seattle Central Business District. Route 194 offers express service between Federal Way and the downtown Seattle Bus Tunnel. Route 340 provides service to Seattle's Eastside by making stops at Shoreline Park-and-Ride, Aurora Village Transit Center, Lake Forest Park, Kenmore, Bothell, Kirkland, Bellevue Transit Center, Renton, Southcenter Shopping Mall, the Airport,

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20 Washington State Department of Transportation, 1992 Annual Traffic Report, p. XIX.
21 City of SeaTac Department of Public Works and the TRANSPO Group, Inc., Comprehensive Transportation Plan, 1991.
22 Washington State Department of Transportation, 1992 Annual Traffic Report.
23 P&D Aviation, Technical Report No. 4: Facilities Inventory, Revised August 12, 1994, p. 5-10.

and the Burien Transit Center. Connections to the rest of the regional transit service are available at the Southcenter Shopping Center in Tukwila, and at the Burien Transit Center.

B. Level of Service Analysis

Several at-grade intersections and freeway ramp junctions in the Airport vicinity were analyzed for level of service ratings. The level of service results are shown in **Exhibit C-1-3** and summarized in **Tables C-1-17 and C-1-18**. The level of service analysis reports are also included in the appendices. The City of SeaTac has adopted a level of service standard[24] which is summarized as follows:

> **Policy 3.2A** - Establish a level of service (LOS) standard for intersection and roadways with LOS E or better as being acceptable on principal or minor arterials. LOS D or better should be considered acceptable on collector arterials and lower classification streets. The City's Director of Public Works, utilizing established criteria, shall be allowed to provide for exceptions to the LOS E standard along minor and principal arterials if future improvements are included in the City's adopted transportation plan. The City should also provide exceptions where the City determines improvements beyond those identified in the transportation plan are not desirable, feasible, or cost-effective. The recommended plan would require exceptions to the level of service policy at the following three intersections: S. 188th Street/International Boulevard; S. 200th Street/International Boulevard; and S. 188th Street/I-5 southbound ramps. The decision on any exceptions should be reflective of acceptable traffic engineering methodologies.

Most of the evaluated at-grade intersections are functioning at an acceptable level of service as defined by the level of service standard. The intersection of International Boulevard / State Route 99 and South 188th Street is functioning at an unacceptable level of service, however, the City of SeaTac has provided an exception to the level of service standard for this intersection.

The above mentioned level of service standard does not specifically apply to the evaluated freeway ramp junctions. However, the following four freeway ramp junctions are currently functioning at a level of service of LOS F:

- Southbound Interstate 5 Off-Ramp to Westbound State Route 518/Southcenter Boulevard
- Southbound Interstate 5 Off-Ramp to Northbound Interstate 405
- Southbound Interstate 5 On-Ramp from Eastbound State Route 518
- Southbound Interstate 405 Off-Ramp to Northbound Interstate 5/Southcenter Boulevard

24 City of SeaTac Department of Planning and Community Development, City of SeaTac Comprehensive Plan, Updated December 19, 1995, p. 3-5.

Table C-1-17
1994 Existing Conditions Intersection Level of Service Summary

Evaluated Intersection	1994 Existing Conditions	
	LOS	Delay (s)
Southbound State Route 509 Ramps & State Route 518	B	9.3
Northbound State Route 509 Ramps & State Route 518	A	2.7
International Boulevard / State Route 99 & South 154th Street	D	31.5
24th Avenue South / Perimeter Road & South 154th Street	B	10.2
Des Moines Memorial Drive South & South 156th Street	B	8.0
Southbound State Route 509 Ramps & South 160th Street	A	1.0
Northbound State Route 509 Ramps / 5th Place S & S 160th Street	A	3.1
Des Moines Memorial Drive South & South 160th Street	B	6.4
Perimeter Road / Air Cargo Road & South 160th Street	A	4.4
International Boulevard / State Route 99 & South 160th Street	C	22.0
Air Cargo Road & Southbound Airport Expressway Ramps	B	7.1
Air Cargo Road & South 170th Street	C	15.8
Northbound Airport Expressway Ramps & South 170th Street	A	1.8
International Boulevard / State Route 99 & South 170th Street	E	44.2
International Boulevard / State Route 99 & South 176th Street	C	19.6
International Boulevard / State Route 99 & South 180th Street	C	16.8
Southbound State Route 509 Off-Ramp & South 188th Street	A	4.4
Des Moines Memorial Drive South & South 188th Street	C	17.3
28th Avenue South & South 188th Street	B	13.1
International Boulevard / State Route 99 & South 188th Street	F	**
Military Road South & South 188th Street	D	25.3
Southbound Interstate 5 Ramps & South 188th Street	C	15.2
Northbound Interstate 5 Ramps & South 188th Street	C	24.9
28th Avenue South & South 192nd Street	A	3.5
International Boulevard / State Route 99 & South 192nd Street	B	13.9
Des Moines Memorial Drive South & South 200th Street	B	11.5
28th Avenue South & South 200th Street	A	1.8
International Boulevard / State Route 99 & South 200th Street	D	34.5
Military Road S & S 200th Street / Southbound I-5 Ramps	B	10.9
Military Road South & Northbound Interstate 5 Ramps	A	1.9
Des Moines Memorial Drive South & Marine View Drive	B	11.3
International Boulevard / SR 99 & Kent-Des Moines Rd. / SR 516	D	31.5
Southbound Interstate 5 Ramps & Kent-Des Moines Rd. / SR 516	D	37.6

** (g/C) * (V/C) is greater than one, calculation of delay is infeasible.

Table C-1-18
1994 Existing Conditions Freeway Ramp Junction Level of Service Summary

Freeway Ramp Junction	Level of Service	Density (pc/mi/ln)	Speed (mph)
Southbound I-5 Off-Ramp to Westbound SR 518 / Southcenter Blvd	F	**	**
Southbound I-5 Off-Ramp to Northbound I-405	F	**	**
Southbound I-5 On-Ramp from Westbound SR 518	D	28	50
Southbound I-5 On-Ramp from Eastbound SR 518	F	21	51
Northbound I-5 Off-Ramp to Northbound I-405 / Westbound SR 518	B	19	51
Northbound I-5 On-Ramp from Southbound I-405 (HOV Only)	C	23	50
Northbound I-5 On-Ramp from Southbound I-405	B	15	52
Northbound I-5 On-Ramp from Eastbound SR 518	B	16	51
Eastbound SR 518 Off-Ramp to Northbound I-5	C	26	49
Eastbound SR 518 Off-Ramp to Southbound I-5	B	20	52
Northbound I-405 On-Ramp from Southbound I-5	B	12	52
Northbound I-405 On-Ramp from Northbound I-5	D	28	50
Southbound I-405 Off- Ramp to Northbound I-5 / Southcenter Blvd	F	**	**
Southbound I-405 Off-Ramp to Northbound I-5 (HOV Only)	B	13	49
Westbound SR 518 On-Ramp from Northbound I-5	D	33	48
Westbound SR 518 Off- Ramp to Southbound I-5	E	37	48
Westbound SR 518 On-Ramp from Southbound I-5	B	19	52
Eastbound SR 518 Off-Ramp to Airport Expressway	A	1	52
Eastbound SR 518 On-Ramp from Airport Expressway	C	23	51
Eastbound SR 518 On-Ramp from International / SR 99	D	29	50
Westbound SR 518 Off-Ramp to Airport Expwy / SR 99 / S 154th St	B	15	50
Airport Expressway Off-Ramp to SR 99 / S 154th St	B	16	47
Westbound SR 518 On-Ramp from Airport Expressway / S 154th St	A	9	54

** Unstable Flow.

V. TRANSPORTATION IMPROVEMENT PROJECTS

Several Transportation Improvement Projects (TIP) are planned within the Airport vicinity between now and the year 2010. These projects are identified in the 1995 Metropolitan Transportation Plan[25], the Washington's Transportation Plan 1997-2016[26], the City of SeaTac Comprehensive Transportation Plan[27], the City of SeaTac 1996-2007 Transportation Improvement Program Project List[28], and the Six-Year Transit Development Plan[29]. These projects are summarized by time period and by jurisdiction. Several of these transportation improvement projects have been identified as the responsibility of the Port of Seattle. The Port of Seattle acknowledges its pro-rata responsibility for future transportation improvement projects, and will coordinate with the appropriate agencies to determine the appropriate contributions.

A. Year 2000 Transportation Improvement Projects

Several TIP projects are planned within the Airport vicinity for the time period between 1994 and the year 2000. The projects that effect the local surface transportation system are shown in **Exhibit C-1-4** and defined as follows:

- South 176th Street (SeaTac, Completed) - Widen roadway to five lanes between International Boulevard / State Route 99 and 32nd Avenue South, and to three lanes between 32nd Avenue South and 34th Avenue South.
- International Boulevard / State Route 99 and South 154th Street (SeaTac, Completed) - Modify intersection to improve traffic operations.
- International Boulevard / State Route 99 Phase I (SeaTac, Completed) - Widen roadway to six lanes (four general purpose lanes, one southbound HOV lane, and one two-way left-turn lane) with sidewalks and associated intersection improvements from South 170th Street to South 188th Street.
- South 200th Street (SeaTac, 1995-1997) - Widen roadway to three or five lanes with an urban cross-section (curb, gutter, sidewalk, bicycle lanes) and associated intersection improvements from International Boulevard / State Route 99 to Des Moines Memorial Drive South.
- International Boulevard / State Route 99 Phase II (SeaTac, 1995-1997) - Widen roadway to six lanes (four general purpose lanes, one southbound HOV lane, and one two-way left-turn lane) with sidewalks and associated intersection improvements from South 188th Street to South 200th Street.
- South 188th Street (SeaTac, 1995-1997) - Widen roadway to extend the eastbound right-turn lane from International Boulevard / State Route 99 to west of 28th Avenue South. Improvements to include curb, gutter, sidewalk, bicycle lanes, pavement reconstruction, and overlay.

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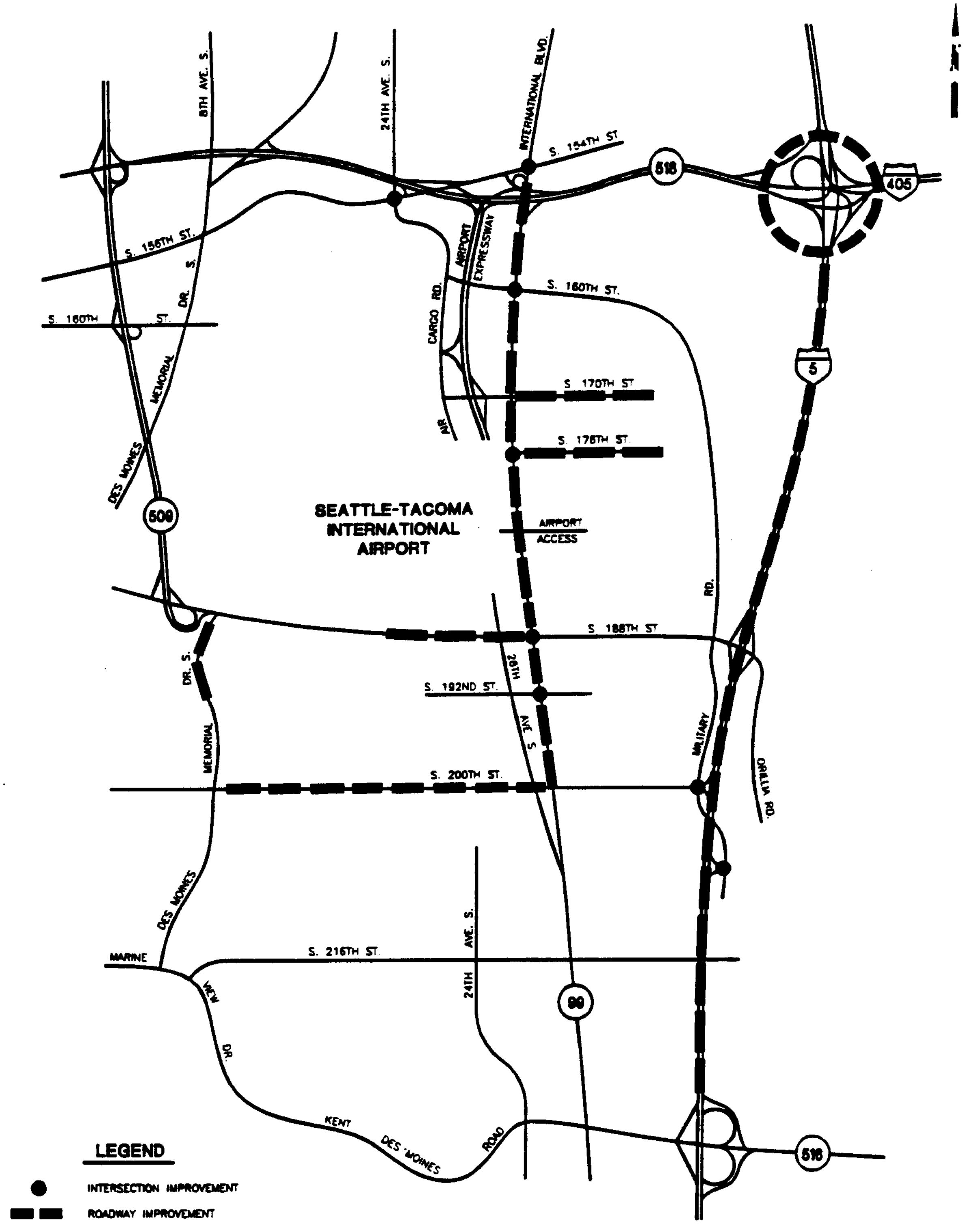
25 Puget Sound Regional Council, 1995 Metropolitan Transportation Plan: The Transportation Element of VISION 2020, the Region's Adopted Growth and Transportation Strategy, Adopted May 25, 1995.

26 Washington State Transportation Commission and Washington State Department of Transportation, Washington's Transportation Plan 1997-2016, April 1996.

27 City of SeaTac Department of Public Works and the TRANSPO Group, Inc., City of SeaTac Comprehensive Transportation Plan (1993-2003) Summary Report, pp. 31-35.

28 City of SeaTac 1997-2006 Transportation Improvement Program Project List, 1996.

29 King County Department of Metropolitan Services (METRO), Six-Year Transit Development Plan for 1996 - 2001, August, 1995.



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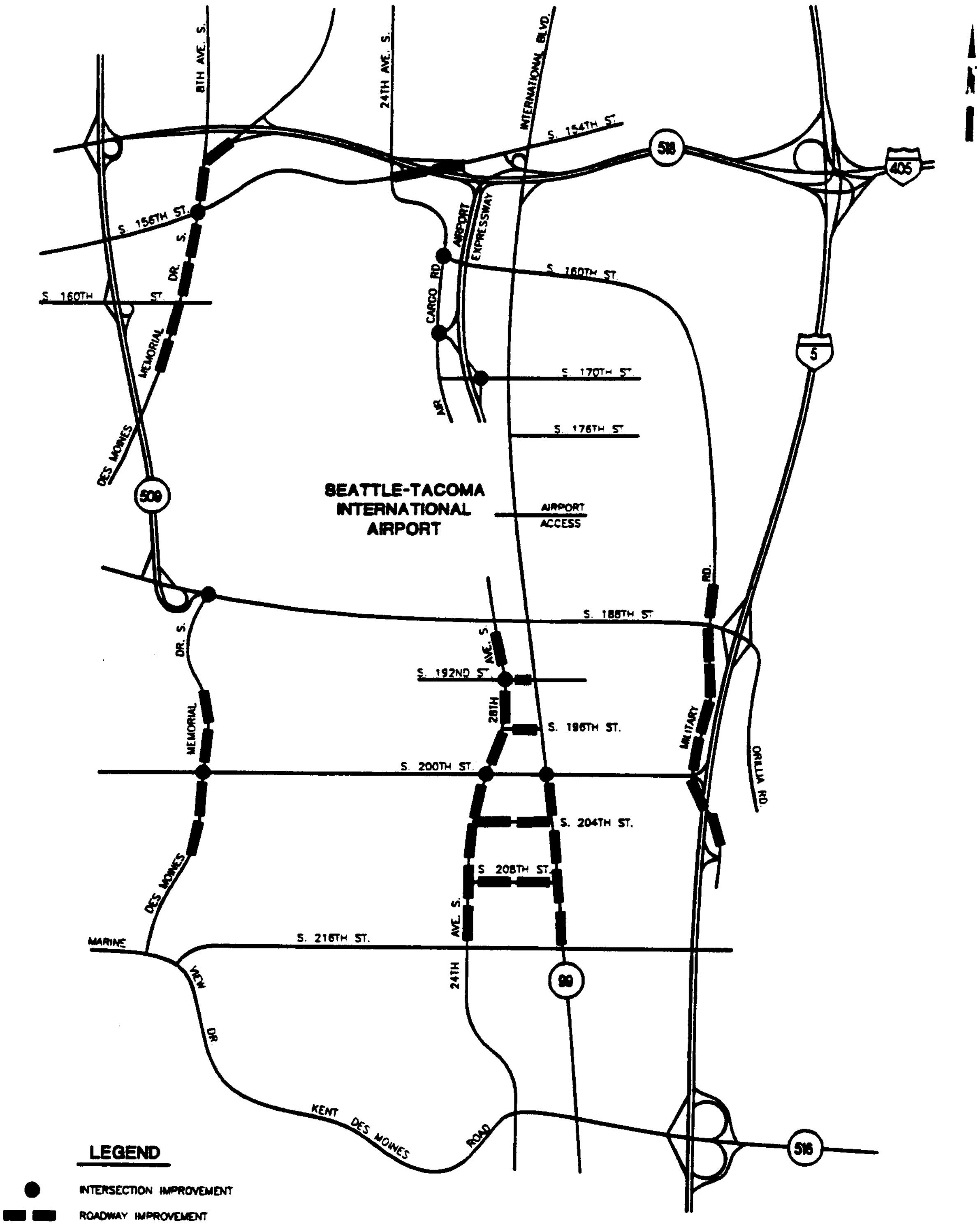
- South 170th Street (SeaTac, 1995-1997) - Reconstruct and widen roadway to 36 feet from International Boulevard / State Route 99 to 34th Avenue South. Improvements to includes curb, gutter, sidewalk, storm drainage, landscaping, street lighting, channelization, paving, and undergrounding of utility lines.
- South 154th Street and 24th Avenue South (SeaTac, 1996-1998) - Reconstruct and widen intersection to provide for left-turn and through-right movements on all approaches. Improvements to include channelization and signalization. The City of SeaTac has identified the Port of Seattle as the sole contributor for this project with an estimated cost of $462,800.
- Military Road South and South 200th Street / Southbound Interstate 5 Ramps (SeaTac, 1996-1998) - Reconstruct and widen intersection to provide a left-turn lane on the westbound approach, and a three lane (left, through, right) eastbound approach. Improvements to include channelization and signalization.
- Military Road South and Northbound Interstate 5 Ramps (SeaTac, 1996-1998) - Install traffic signal at intersection.
- Interstate 5 (WSDOT, 1996-1998) - Construct HOV and truck climbing lanes from Pierce County line to Tukwila. The reconstruction of the Interstate 5 and State Route 518 / Interstate 405 interchange is included.
- Des Moines Memorial Drive South (SeaTac, 1997-1999) - Reconstruct and widen roadway to 36 feet from South 188th Street to South 192nd Street. Improvements to includes curb, gutter, sidewalk, storm drainage, landscaping, street lighting, channelization, signal modification, paving, and undergrounding of utility lines.
- International Boulevard / State Route 99 Phase III (SeaTac, 1997-1999) - Widen roadway to six lanes (four general purpose lanes, one southbound HOV lane, and one two-way left-turn lane) with sidewalks and associated intersection improvements from South 152nd Street to South 170th Street. Improvements include intersection reconstruction, and traffic signal modification at South 160th Street.

B. Year 2005 Transportation Improvement Projects

Several TIP projects are planned within the Airport vicinity for the time period between the year 2000 and the year 2005. The projects that effect the local surface transportation system are shown in **Exhibit C-1-5** and defined as follows:

- 28th/24th Avenue South (SeaTac, 2000-2002) - Construct a four or five lane arterial roadway from South 188th Street to South 216th Street. Improvements include curb, gutter, sidewalk, storm drainage, bicycle lanes, street lighting, signalization, channelization, landscaping, utilities, undergrounding of utility lines, and paving.
- Military Road South (SeaTac, 2000-2002) - Reconstruct roadway to provide drainage and pedestrian facilities from South 188th Street to Interstate 5, south of South 200th Street.
- Des Moines Memorial Drive South (SeaTac, 2000-2002) - Reconstruct and widen roadway to 36 feet from State Route 518 to South 156th Street. Improvements to include curb, gutter, sidewalk, storm drainage, bicycle lanes, landscaping, street lighting, channelization, signalization, paving, and undergrounding of utility lines.



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- International Boulevard / State Route 99 Phase IV (SeaTac, 2000-2002) - Widen roadway to six lanes (four general purpose lanes, one southbound HOV lane, and one two-way left-turn lane) with sidewalks and associated intersection improvements from South 200th Street to South 216th Street.
- South 192nd Street (SeaTac, 2000-2002) - Reconstruct and widen roadway to three to five lanes from International Boulevard / State Route 99 to 28th/24th Avenue South. Improvements to include curb, gutter, sidewalk, bicycle lanes, landscaping, street lighting, channelization, signalization, paving, and undergrounding of utility lines.
- South 154th Street (SeaTac, 2000-2002) - Reconstruct and widen roadway to 36 feet from State Route 518 Off-Ramp to 24th Avenue South. Improvements to include curb, gutter, sidewalk, bicycle lanes, storm drainage, landscaping, street lighting, channelization, signalization, paving, and undergrounding of utility lines.
- Des Moines Memorial Drive South and South 188th Street (SeaTac, 2000-2002) - Reconstruct intersection to provide an eastbound right-turn lane, and dual northbound left-turn lanes. Improvements to include channelization and signalization.
- Des Moines Memorial Drive South and South 200th Street (SeaTac, 2000-2002) - Reconstruct and widen intersection to provide left-turn channelization on all approaches, and a right-turn lane on the westbound approach. Improvements to include channelization, signalization, and paving.
- South 170th Street and Northbound Airport Expressway Ramps (SeaTac, 2000-2002) - Install traffic signal at intersection. The City of SeaTac has identified the Port of Seattle as the sole contributor for this project with an estimated cost of $171,900.
- Air Cargo Road and Southbound Airport Expressway Ramps (SeaTac, 2000-2002) - Install traffic signal at intersection. The City of SeaTac has identified the Port of Seattle as the sole contributor for this project with an estimated cost of $171,900.
- South 196th Street (SeaTac, 2000-2002) - Construct a new three lane arterial roadway from International Boulevard / State Route 99 to 28th/24th Avenue South. Improvements to include curb, gutter, sidewalk, bicycle lanes, storm drainage, landscaping, street lighting, channelization, signalization, paving, and undergrounding of utility lines.
- Des Moines Memorial Drive South (SeaTac, 2003-2005) - Reconstruct and widen roadway to 36 feet from South 194th Street to South 208th Street. Improvements to include curb, gutter, sidewalk, bicycle lanes, storm drainage, landscaping, street lighting, channelization, signalization, paving, and undergrounding of utilities.
- South 204th Street (SeaTac, 2003-2005) - Widen roadway to three lanes from International Boulevard / State Route 99 to 28th/24th Avenue South depending on development within the Aviation Business Center. Improvements to include curb, gutter, sidewalk, bicycle lanes, storm drainage, landscaping, street lighting, channelization, signalization, paving, and undergrounding of utilities.
- South 208th Street (SeaTac, 2003-2005) - Widen roadway to three or five lanes from International Boulevard / State Route 99 to 28th/24th Avenue South depending on development within the Aviation Business Center. Improvements to include curb, gutter, sidewalk, bicycle lanes, storm drainage, landscaping, street lighting, channelization, signalization, paving, and undergrounding of utilities.

- Military Road South (SeaTac, 2003-2005) - Widen roadway to provide three travel lanes (two southbound and one northbound) from South 186th Street to South 188th Street. Improvements to include curb, gutter, sidewalk, storm drainage, street lighting, paving, and the widening of the southbound Interstate 5 off-ramp over-crossing.
- Des Moines Memorial Drive South (SeaTac, 2003-2005) - Reconstruct and widen roadway to 36 feet from South 156th Street to City Limits. Improvements to include curb, gutter, sidewalk, storm drainage, bicycle lanes, landscaping, street lighting, channelization, and paving.
- Air Cargo Road and South 160th Street (SeaTac, 2003-2005) - Install traffic signal at intersection. The City of SeaTac has identified the Port of Seattle as the sole contributor for this project with an estimated cost of $172,000.

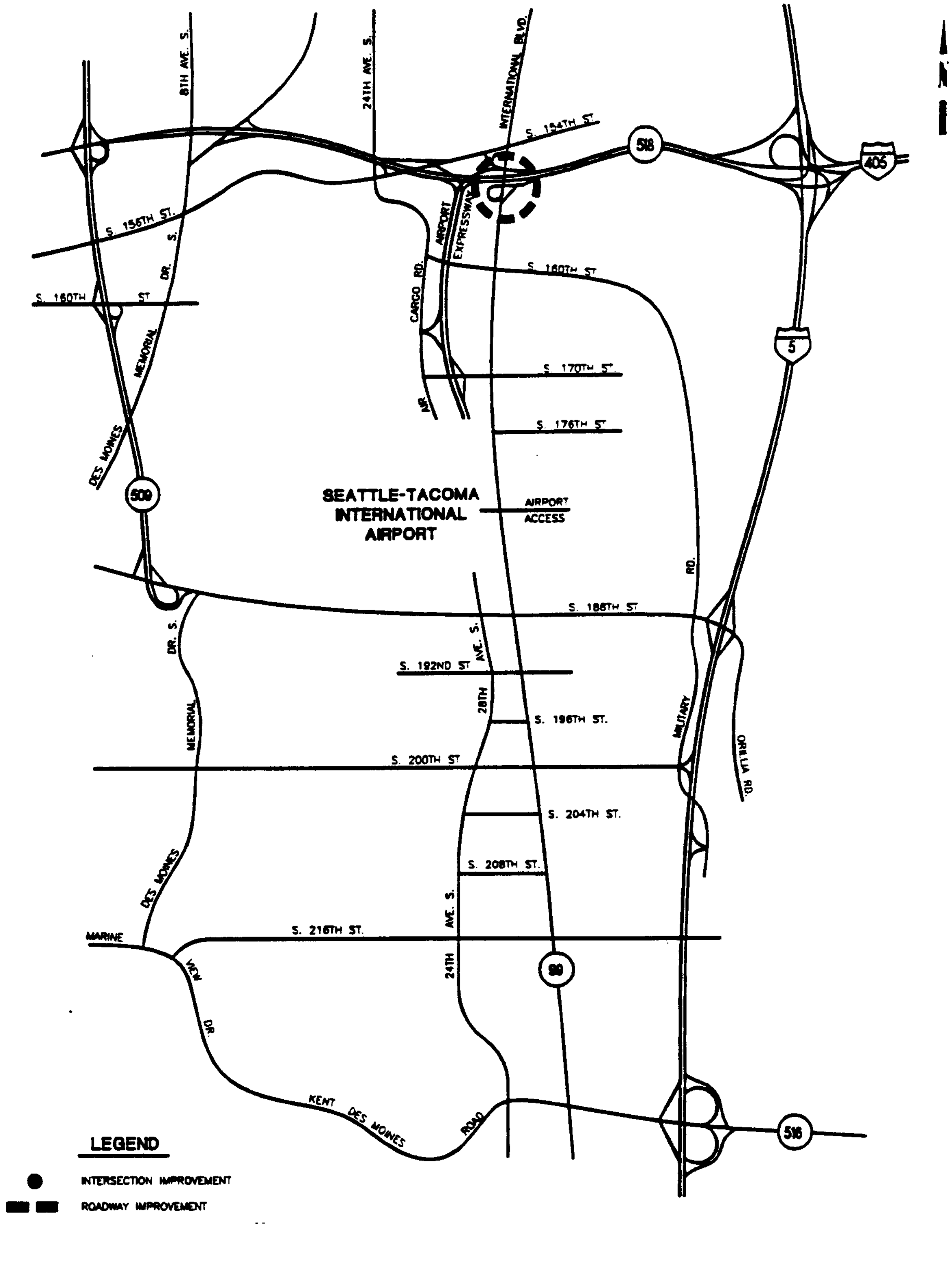
C. Year 2010 Transportation Improvement Projects

Several TIP projects are planned within the Airport vicinity for the time period between the year 2005 and the year 2010. The projects that effect the local surface transportation system are shown in **Exhibit C-1-6** and defined as follows:

- Interstate 5 Interchange at South 200th Street / Military Road (SeaTac, 2003-2006) - Possible removal of this interchange after completion of the Southern Airport Expressway. However, since the Southern Airport Expressway is planned to be completed after the year 2010 this project would not occur until after the year 2010.
- State Route 518 Interchange at International Boulevard / State Route 99 (SeaTac, 2003-2006) - Construct new southbound to eastbound loop ramp from International Boulevard / State Route 99 to State Route 518. Modify the International Boulevard / State Route 99 over-crossing of State Route 518 to provide for three southbound and two northbound lanes.
- Sea-Tac Airport Terminal Drive (SeaTac, 2003-2006) - Possible relocation of the terminal drive system intersection with International Boulevard / State Route 99 from South 180th Street to South 184th Street after the completion of the Southern Airport Expressway. Access to the terminal drive system from South 184th Street will be restricted to shuttle and transit vehicles only. However, since the Southern Airport Expressway is planned to be completed after the year 2010 this project would not occur until after the year 2010. The City of SeaTac has identified the Port of Seattle as the sole contributor for this project with an estimated cost of $3,976,000.

D. State Route 509 and South Access

Issues surrounding the State Route 509 extension project and the proposed Airport South Access have been discussed among the Port of Seattle and the surrounding southwestern King County communities for quite some time. State Route 509 was originally adopted by the Washington State Transportation Commission in 1957 as a limited-access highway between Seattle and Tacoma. Construction from the northern terminus began in the 1960s in South Seattle, and ended in the 1970s at South 188th Street. WSDOT did not finish the construction of the proposed highway due to rising costs, limited federal and state highway construction funds, and local government opposition to the project.



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In 1986 the Port of Seattle recommended the construction of a new South Access road to the Airport. King County determined that this proposal was in conflict with the limited capacity of the County's transportation network, and would not be pursued until further land use and transportation planning was completed.

In 1989 King County completed the SeaTac Area Update[30]. With the participation of WSDOT this plan recommended the extension of State Route 509 to Interstate 5 in the vicinity of South 210th/211th Street. A South Access roadway was also recommended as a five-lane arterial along the 28th/26th Avenue South corridor.

In 1989 the public and private sectors joined to form the South Access Steering Committee to analyze several alternatives to meet two objectives: improving Airport South Access, and providing arterial access to local properties for redevelopment. The South Access Roadway Study Final Report[31], completed in 1990, summarized the findings and recommendations of this Committee. This study recommended separate roadways to meet each objective: a limited access expressway connecting the Airport's terminal drive system with the regional highway system; and the 28th/24th Avenue South arterial project to accommodate the anticipated development levels in that corridor.

In 1990, the City of SeaTac, with joint sponsorship by the City, the Port of Seattle, and several private land owners, commenced a preliminary engineering study[32] for the 28th/24th Avenue South arterial project. The purpose of this study was to evaluate different boulevard alignments to service the anticipated development along the corridor in the Cities of SeaTac and Des Moines.

In 1991 the City of SeaTac began developing its Comprehensive Transportation Plan with series of technical papers and a summary report[33] officially adopted in January, 1994. This plan included both the 28th/24th Avenue South arterial project, and the proposed South Access roadway as a limited access expressway connecting the Airport's terminal drive system with Interstate 5. The City of SeaTac also adopted a policy[34] regarding the South Access roadway in this plan and is summarized as follows:

> **Policy 3.2B** - Proceed with environmental, feasibility, and funding studies to develop a new expressway or limited access arterial with multi-modal capability to provide a south access route between the Airport and Interstate 5 with connections serving SeaTac's Urban Center.

In 1992, WSDOT took the lead for several local agencies (Cities of SeaTac, Des Moines, King County, and the Port of Seattle) to begin the State Route 509 Extension/South Access Road Corridor Environmental Impact Study[35]. A technical Steering Committee, composed of representatives from member agencies, was organized to direct the EIS consultant team. An Executive Committee, composed of elected and appointed officials from member agencies, provided direction on policy decisions and will select the preferred corridor alignment. The corridor programmatic Draft EIS has been completed and was issued in December, 1995. Each of the "build" alternatives analyzed in the Draft EIS include the

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30 King County Planning and Community Development Division, SeaTac Area Update and Area Zoning, September 1989.
31 Entranco Engineers, Inc., Alpha Engineers, Inc., KJS Associates, Inc., South Access Roadway Study Final Report, June 1, 1990.
32 KJS Associates, Inc., 28th/24th Avenue South Arterial Project EIS Transportation Impact Study, January 1992.
33 City of SeaTac Department of Public Works and the TRANSPO Group, Inc., City of SeaTac Comprehensive Transportation Plan Summary Report (1993-2003), January 28, 1994.
34 City of SeaTac Department of Planning and Community Development, City of SeaTac Comprehensive Plan, Updated December 19, 1995, p. 3-7.
35 King County, SeaTac, Des Moines, Kent, State Route 509 Extension/South Access Road Corridor Study, November 1995.

extension of State Route 509 to Interstate 5, and the construction of the South Access roadway as a limited access expressway that connects the Airport's terminal drive system with State Route 509. A project level EIS is planned for completion in early 1998.

Over the past few years the Puget Sound Regional Council has been updating the Metropolitan Transportation Plan (MTP)[36]. The adopted 1995 MTP includes both the State Route 509 extension and South Access roadway projects to be completed by the year 2020.

All of these plans and studies were based on two general developments assumptions: the forecast passenger activity levels at the Airport; and the proposed urban development south of the Airport along the 28th/24th Avenue South corridor. These development assumptions are summarized by plan or study as follows:

- **SeaTac Area Update (1989)** - This plan forecasts a 190 acre business park along the 28th/ 26th Avenue South corridor which would generate approximately 30,000 to 50,000 average weekday trips. It was also assumed that 40 percent of Airport traffic would utilize the South Access roadway.
- **South Access Roadway Study (1990)** - This plan forecasts a 6 million gross square foot (gsf) business park along the 28th/24th Avenue South corridor which would generate approximately 60,000 to 80,000 average weekday trips. Airport activity levels were also forecast at 38 million annual passengers (MAP) by the year 2010. According to the report this would represent 149,000 average weekday trips, of which approximately 40 percent, or 59,600 average weekday trips, would utilize the South Access roadway.
- **City of SeaTac Comprehensive Transportation Plan (1994)** - This plan forecasts a 2-3 million gsf combined commercial/industrial/retail development along the 28th/24th Avenue South corridor which would generate approximately 34,000 average weekday trips. Airport activity levels were also forecast to increase by approximately 50 percent between 1991 and the year 2003.
- **Seattle-Tacoma International Airport Master Plan Update (1995)** - Airport activity forecasts developed for the Master Plan Update[37] Final EIS predict 30.6 MAP by the year 2010, and 38.2 MAP by the year 2020. The revised Airport activity forecasts[38] predict 27.4 MAP by the year 2000, 31.4 MAP by the year 2005, and 35.8 MAP by the year 2010. This level of activity is approximately 17 percent higher and would generate approximately 88,700 annual average weekday vehicle trips within the terminal area by the year 2010.

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36 Puget Sound Regional Council, 1995 Metropolitan Transportation Plan: The Transportation Element of VISION 2020, the Region's Adopted Growth and Transportation Strategy, May 25 1995.
37 P&D Aviation, Technical Report No. 5: Preliminary Forecast Report, 1994.
38 P&D Aviation, 1996.

Differences between these development assumptions have led to several different proposed alignments and configurations for the South Access roadway. These development assumptions will also continue to evolve with land use decisions concerning the South Aviation Support Area[39], the Des Moines Creek Technology Campus[40], and other local development as well as this Master Plan. However, there are two alternate options for the South Access roadway described as follows:

- The construction of two separate roadway facilities: the construction of a principal arterial along the 24th/28th Avenue South corridor to accommodate the forecast urban development; and the construction of a separate limited access expressway for the Airport to accommodate forecast Airport passenger activity.
- The construction of a combined facility along the 24th/28th Avenue South corridor to accommodate both the forecast urban development, and the forecast Airport passenger activity.

Until a preferred corridor alternative is selected from the State Route 509 Extension/South Access Road Corridor EIS, and the project-level analysis is begun, the exact alignment and configuration of both State Route 509 and South Access are unknown. For purposes of this study, the State Route 509 extension project and the South Access project are assumed to occur after the year 2010. This is considered outside of the planning horizon for this report. The Port of Seattle continues to support the construction of a South Access roadway. As a member of the State Route 509/South Access Steering Committee, the Port of Seattle will continue to pursue the development of a South Access roadway as a solution that meets local and regional transportation needs.

E. Transit Improvements

Several different transit improvement projects have been proposed throughout the Puget Sound region. These transit improvement projects have the potential to modify surface transportation patterns in the vicinity of the Airport. The following sections describe the transit improvement projects that impact the local surface transportation system.

Regional Transit Authority (RTA)

The Regional Transit Authority (RTA) is a proposed high capacity transit service to be constructed between the year 2010 and 2020. This proposed service includes the following:

- Light rail service along several regional corridors that would interconnect the Seattle Central Business District (CBD) with other regional centers.
- Commuter rail service between Everett, Mukilteo, Edmonds, Seattle, Tukwila, Kent, Auburn, Sumner, Puyallup, Tacoma, and Lakewood.
- Regional trunk bus routes along major corridors not served by rail, or in advance of light rail development.

The Metropolitan Transportation Plan (MTP) includes the proposed RTA system as described above. However, voters from King, Pierce, and Snohomish Counties initially did not approve the proposed RTA system in 1995. The proposed RTA system was then modified and approved by the voters in 1996. A Draft Implementation Plan is currently being prepared for the modified RTA system which includes light-rail service in the vicinity of the Airport by the year 2003. The proposed RTA system was not

39 Port of Seattle, South Aviation Support Area Final Environmental Impact Statement, March 1994.
40 CH2M Hill, Des Moines Creek Technology Campus Final Environmental Impact Statement, May 1995.

included in this evaluation because the MTP does not include the RTA system until after the year 2010. and the PSRC MTP has not been amended to include the modified RTA system. The assumption that the RTA would not be completed prior to the year 2010 is a more conservative assumption, and reflecting slightly higher congestion levels.

King County Department of Metropolitan Services (METRO)

According to the King County Department of Metropolitan Services (METRO) Six-Year Transit Development Plan[41] the existing transit service structure will be significantly modified into a "multi-centered" system by the year 2001. The existing system is strongly orientated towards the commuter market since most service connections and highest service frequency are provided during the weekday commuter rush hours. The proposed system would focus on a series of transit "hubs" so that more convenient connections can be made. According to this plan, both a community service area and an employment target area have been identified to include a transit "hub" proposed in the vicinity of the Airport. In addition, the State Route 99 corridor has been identified for transit speed and reliability improvements.

The City of SeaTac has also adopted two policies[42] addressing transit improvements within the City. These policies are stated as follows:

> **Policy 3.4A** - Work with METRO Transit to focus local transit service on major employment centers and feeder service to residential areas, including existing concentration areas and the future growth areas such as the Aviation Business Center.
>
> **Policy 3.4B** - Work with METRO Transit and adjacent jurisdictions to enhance east-west transit service and future multi-modes.

The PSRC 1995 Metropolitan Transportation Plan[43] includes the proposed METRO Transit improvements, therefore, the mode shift associated with these improvements are included in this analysis.

Personal Rapid Transit (PRT) System

The City of SeaTac is currently studying the feasibility of a Personal Rapid Transit (PRT) system that could provide access between parking lots, hotels, the Airport, and other local businesses in the SeaTac vicinity. The City of SeaTac published the Draft Feasibility Study[44] in 1997. At this time there is insufficient information to evaluate the effectiveness of this proposed system so it was not included in this analysis. However, the Port of Seattle is considering various Transportation Demand Management (TDM) efforts as described later in this report, and the PRT system could become part of the comprehensive TDM program.

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41 King County Department of Metropolitan Services (METRO), Six-Year Transit Development Plan for 1996 - 2001, August, 1995.

42 City of SeaTac Department of Planning and Community Development, City of SeaTac Comprehensive Plan, Updated December 19, 1995, p. 3-14.

43 Puget Sound Regional Council, 1995 Metropolitan Transportation Plan: The Transportation Element of VISION 2020, the Region's Adopted Growth and Transportation Strategy, May 25 1995.

44 BRW Inc., City of SeaTac Personal Rapid Transit Feasibility Project Draft Report, January 1997.

VI. FUTURE CONDITIONS

A. "Pipeline" Projects

Several other development projects are occurring during the same time period as the proposed Master Plan improvements. These projects include the following and are shown in **Exhibit C-1-1** and include the following:

- Sea-Tac Westin Hotel[45] - The proposed hotel is to be constructed within the existing terminal area on the north side of the Main Terminal. The hotel would include 384 rooms, 10,000 square feet of meeting space, and a restaurant. The proposed hotel was included in this surface transportation analysis as described in the Final Hotel EIS.
- Des Moines Creek Technology Campus (DMCTC)[46] - DMCTC is a proposed Research and Development/Mixed-Use project located on the northwest corner of 24th Avenue South and South 216th Street. Alternative 2, the Mixed Manufacturing/Research and Development/ Administrative Offices Emphasis, was included in this surface transportation analysis as described in the DMCTC Final EIS. Since the issuance of the Final EIS, the Port of Seattle and the City of Des Moines have discontinued this project. However, this project was included in this analysis since a similar type of commercial development is anticipated at this site.
- South Aviation Support Area (SASA)[47] - In 1993, a Final EIS was approved to develop a base maintenance facility, a "hush" facility, and a GSE facility. In addition, a total of 922,600 square feet of developable land was identified for commercial development. SASA, as defined by Alternative 2 in the SASA Final EIS, was included in this surface transportation analysis.
- Federal Detention Center[48] - A federal detention center is located on the southwest corner of 26th Avenue South and South 200th Street. This proposed development has been constructed and is included in this surface transportation analysis as described in the Federal Detention Center Final EIS.
- Aviation Business Center (ABC) - Significant urban development is anticipated in the ABC, located along the 28th/24th Avenue South corridor, according to the City of SeaTac Comprehensive Transportation Plan[49]. This plan forecasts significant commercial development (1,060,000 gsf of Office space, 84,000 gsf of Light Industrial space, 80,000 gsf of Retail space, and 480 Hotel/Motel Rooms) on the property outside of the proposed SASA development. This proposed development was included in the surface transportation analysis using appropriate ITE trip generation rates[50].

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45 Kato & Warren, Inc., Sea-Tac International Airport Hotel Final Environmental Impact Statement, 1995.

46 CH2M Hill, Des Moines Creek Technology Campus Final Environmental Impact Statement, May 1995.

47 Port of Seattle, South Aviation Support Area Final Environmental Impact Statement, March 1994.

48 U.S. Department of Justice, Federal Bureau of Prisons, Federal Detention Center Final Environmental Impact Statement, King County, Washington, November 1993.

49 City of SeaTac Department of Public Works and the TRANSPO Group, Inc., City of SeaTac Comprehensive Transportation Plan Summary Report (1993-2003), January 28, 1994.

50 Institute of Transportation Engineers, Trip Generation: An Informational Report, 5th Edition.

B. Evaluated Alternatives

Only two alternatives were evaluated in this report: the Do-Nothing Alternative and the Preferred Alternative. The Do-Nothing Alternative does not include any additional Airport facility improvements to meet the forecast demand levels. The Do-Nothing Alternative is also constrained because the existing Airport facilities can accommodate only 460,000 annual aircraft operations, whereas the year 2010 demand levels exceed this at 474,000 annual aircraft operations.

The Preferred Alternative includes several Airport facility improvements as defined by the North Unit Terminal Alternative. These improvements include the construction of a 8,500 foot third dependent runway, the expansion of the Main Terminal, the construction of the North Unit Terminal and parking garage, the expansion of the existing air cargo facilities, the construction of a new State Route 518 interchange at 20th Avenue South, and many other Airport facility improvements. The development assumptions used for the Preferred Alternative are summarized in Chapter 2 of the Supplemental EIS.

C. Year 2000 Future Conditions

Several at-grade intersections and freeway ramp junctions in the Airport vicinity were analyzed for level of service ratings for both the Do-Nothing and Preferred Alternatives. The level of service results are shown in **Exhibits C-1-7 and C-1-8**, and are summarized in **Tables C-1-19 and C-1-20**. The level of service analysis reports are also included in the appendices.

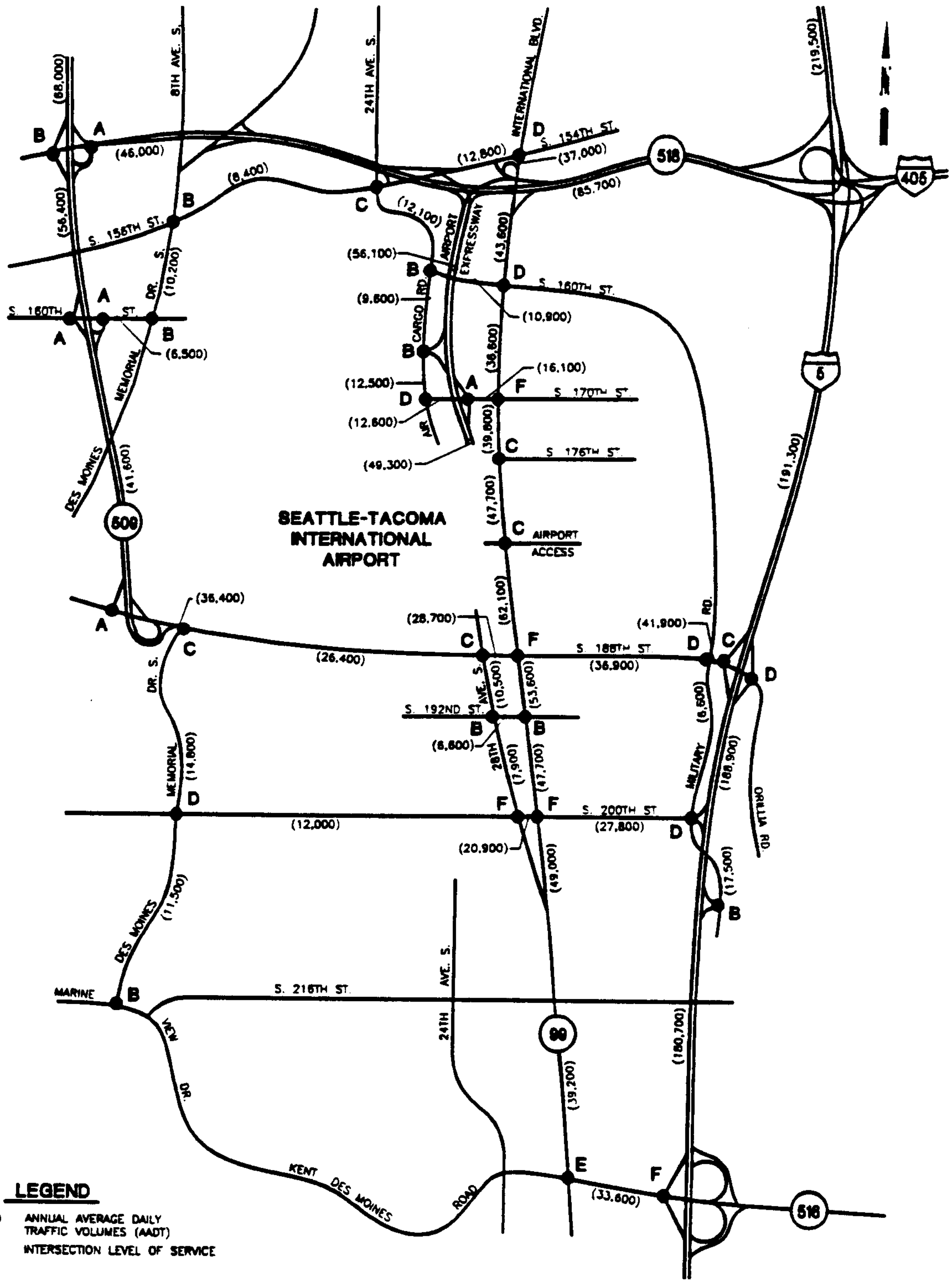
According to the adopted City of SeaTac level of service standard, a total of three intersections would be functioning at an unacceptable level of service. These include the following:

- International Boulevard / State Route 99 and South 170th Street
- 28th Avenue South and South 200th Street (Do-Nothing Alternative Only)
- Southbound Interstate 5 Ramps and Kent-Des Moines Road / State Route 516

The intersections of International Boulevard / State Route 99 and South 188th Street, and International Boulevard / State Route 99 and South 200th Street are also functioning at an unacceptable level of service, however, the City of SeaTac has provided an exception to the level of service standard for these intersections.

A total of six freeway ramp junctions would also be functioning at a level of service of LOS F. These include the following:

- Southbound Interstate 5 Off-Ramp to State Route 518 / Southcenter Boulevard
- Southbound Interstate 5 Off-Ramp to Northbound Interstate 405
- Southbound Interstate 5 On-Ramp from Westbound State Route 518
- Southbound Interstate 5 On-Ramp from Eastbound State Route 518 / Klickitat
- Northbound Interstate 5 On-Ramp from Eastbound State Route 518
- Southbound Interstate 405 Off-Ramp to Northbound Interstate 5 / Southcenter Boulevard



LEGEND

(X,XXX) ANNUAL AVERAGE DAILY TRAFFIC VOLUMES (AADT)

X INTERSECTION LEVEL OF SERVICE

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DO-NOTHING
EXHIBIT C-1-7

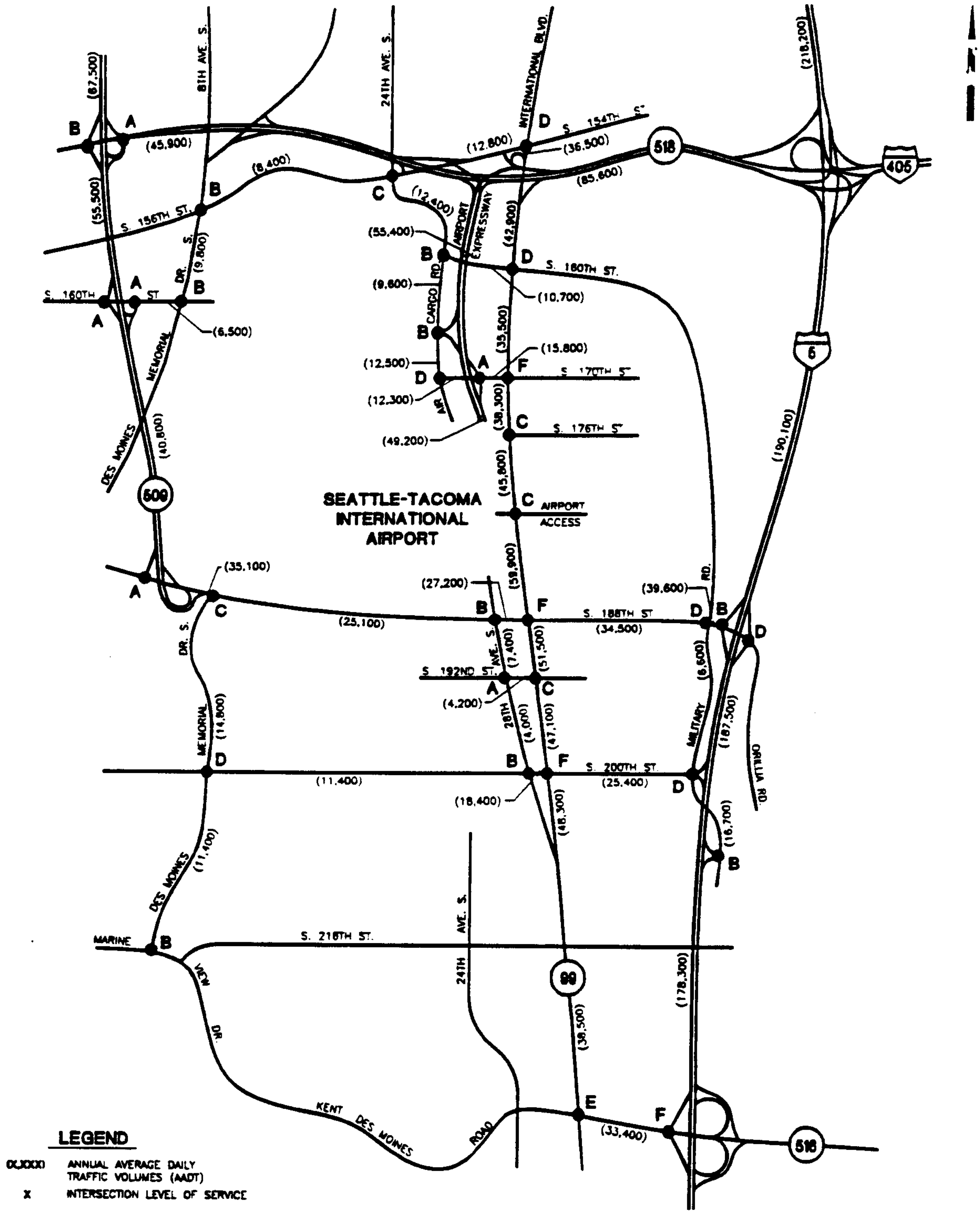

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Table C-1-19
Year 2000 Intersection Level of Service Summary

Evaluated Intersection	Do-Nothing Alternative		Preferred Alternative	
	LOS	Delay (s)	LOS	Delay (s)
Southbound State Route 509 Ramps & State Route 518	B	14.4	B	14.3
Northbound State Route 509 Ramps & State Route 518	A	2.7	A	2.6
International Boulevard / State Route 99 & South 154th Street	D	39.3	D	38.6
24th Avenue South / Perimeter Road & South 154th Street	C	19.7	C	21.2
Des Moines Memorial Drive South & South 156th Street	B	9.0	B	8.7
Southbound State Route 509 Ramps & South 160th Street	A	1.2	A	1.2
Northbound State Route 509 Ramps / 5th Place S & S 160th Street	A	3.8	A	3.7
Des Moines Memorial Drive South & South 160th Street	B	6.4	B	6.5
Perimeter Road / Air Cargo Road & South 160th Street	B	6.4	B	6.3
International Boulevard / State Route 99 & South 160th Street	D	32.9	D	32.1
Air Cargo Road & Southbound Airport Expressway Ramps	B	6.8	B	6.7
Air Cargo Road & South 170th Street	D	25.3	D	24.4
Northbound Airport Expressway Ramps & South 170th Street	A	2.3	A	2.3
International Boulevard / State Route 99 & South 170th Street	F	**	F	**
International Boulevard / State Route 99 & South 176th Street	C	16.4	C	16.3
International Boulevard / State Route 99 & South 180th Street	C	21.9	C	21.5
Southbound State Route 509 Off-Ramp & South 188th Street	A	4.3	A	4.3
Des Moines Memorial Drive South & South 188th Street	C	23.7	C	23.6
28th Avenue South & South 188th Street	C	15.3	B	14.4
International Boulevard / State Route 99 & South 188th Street	F	**	F	**
Military Road South & South 188th Street	D	36.8	D	35.4
Southbound Interstate 5 Ramps & South 188th Street	C	15.1	B	14.8
Northbound Interstate 5 Ramps & South 188th Street	D	38.2	D	34.8
28th Avenue South & South 192nd Street	B	8.5	A	4.2
International Boulevard / State Route 99 & South 192nd Street	D	25.5	C	19.9
Des Moines Memorial Drive South & South 200th Street	D	35.5	D	32.1
28th Avenue South & South 200th Street	F	644.0	B	14.7
International Boulevard / State Route 99 & South 200th Street	F	**	F	**
Military Road S & S 200th Street / Southbound I-5 Ramps	D	31.5	D	28.6
Military Road South & Northbound Interstate 5 Ramps	B	14.5	B	13.7
Des Moines Memorial Drive South & Marine View Drive	B	8.5	B	8.5
International Boulevard / SR 99 & Kent-Des Moines Rd. / SR 516	E	40.7	E	40.1
Southbound Interstate 5 Ramps & Kent-Des Moines Rd. / SR 516	F	**	F	**

** (g/C) * (V/C) is greater than one, calculation of delay is infeasible.

Table C-1-20
Year 2000 Freeway Ramp Junction Level of Service Summary

Freeway Ramp Junction	Do-Nothing Alternative			Preferred Alternative		
	LOS Rating	Density (pc/mi/ln)	Speed (mph)	LOS Rating	Density (pc/mi/ln)	Speed (mph)
SB I-5 Off-Ramp to SR 518/Southcenter	F	**	**	F	**	**
SB I-5 Off-Ramp to NB I-405	F	**	**	F	**	**
SB I-5 On-Ramp from WB SR 518	F	**	**	F	**	**
SB I-5 On-Ramp from EB SR 518/Klickitat	F	**	**	F	**	**
NB I-5 Off-Ramp to WB SR 518/NB I-405	C	26	51	C	25	51
NB I-5 On-Ramp from SB I-405 (HOV)	B	14	52	B	14	52
NB I-5 On-Ramp from SB I-405	B	17	51	B	17	51
NB I-5 On-Ramp from EB SR 518	F	**	**	F	**	**
EB SR 518 Off-Ramp to NB I-5	D	30	49	D	30	49
EB SR 518 Off-Ramp to SB I-5	C	22	52	C	22	52
NB I-405 On-Ramp from SB I-5	B	15	53	B	15	53
NB I-405 On-Ramp from NB I-5	D	32	49	D	32	49
SB I-405 Off-Ramp to NB I-5/Southcenter	F	**	**	F	**	**
SB I-405 Off-Ramp to NB I-5 (HOV)	B	13	49	B	13	49
WB SR 518 On-Ramp from NB I-5	D	33	48	D	34	48
WB SR 518 Off-Ramp to SB I-5	E	37	48	E	37	48
WB SR 518 On-Ramp from SB I-5	B	20	52	B	19	52
EB SR 518 Off-Ramp to Airport Expwy	A	2	51	A	2	51
EB SR 518 On-Ramp from Airport Expwy	C	25	50	C	25	50
EB SR 518 On-Ramp from SR 99	D	33	49	D	33	49
WB SR 518 Off-Ramp to Airport/SR 99	B	20	49	B	20	49
Airport Expwy Off-Ramp to SR 99/154th	B	12	45	B	12	45
WB SR 518 On-Ramp from Airport Expwy	A	8	54	A	8	54

** Unstable Flow.

D. Year 2005 Future Conditions

Several at-grade intersections and freeway ramp junctions in the Airport vicinity were analyzed for level of service ratings for both the Do-Nothing and Preferred Alternatives. The level of service results are shown in **Exhibits C-1-9 and C-1-10**, and are summarized in **Tables C-1-21 and C-1-22**. The level of service analysis reports are also included in the appendices.

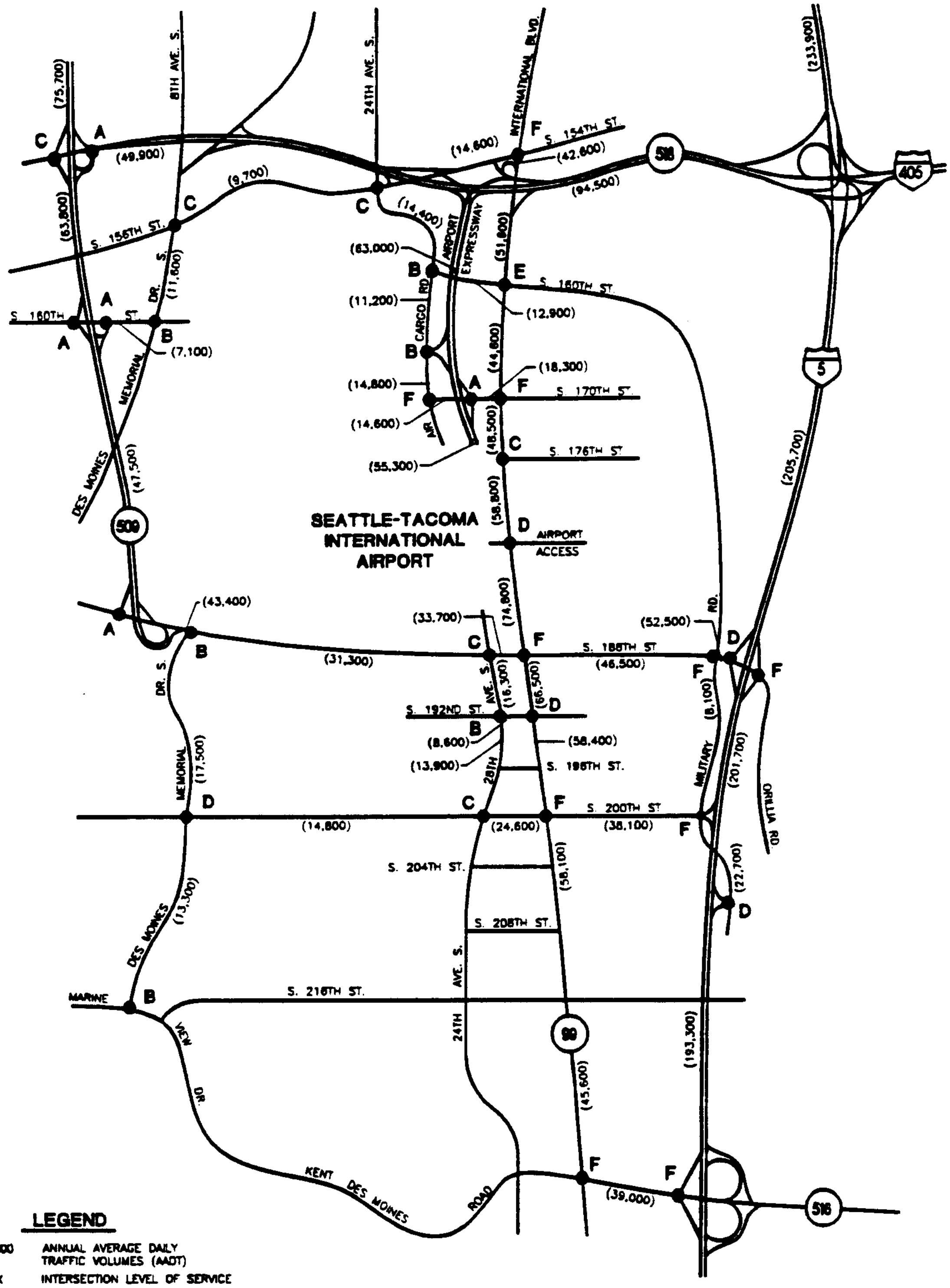
According to the adopted City of SeaTac level of service standard, a total of eight intersections would be functioning at an unacceptable level of service. These include the following:

- International Boulevard / State Route 99 and South 154th Street
- Air Cargo Road and South 170th Street
- International Boulevard / State Route 99 and South 170th Street
- Military Road South and South 188th Street
- Northbound Interstate 5 Ramps and South 188th Street
- Military Road South and South 200th Street / Southbound Interstate 5 Ramps
- International Boulevard / State Route 99 and Kent-Des Moines Road / State Route 516
- Southbound Interstate 5 Ramps and Kent-Des Moines Road / State Route 516

The intersections of International Boulevard / State Route 99 and South 188th Street, and International Boulevard / State Route 99 and South 200th Street are also functioning at an unacceptable level of service, however, the City of SeaTac has provided an exception to the level of service standard for these intersections (allowing the unacceptable level of service to be maintained).

A total of eleven freeway ramp junctions would also be functioning at a level of service of LOS F. These include the following:

- Southbound Interstate 5 Off-Ramp to State Route 518 / Southcenter Boulevard
- Southbound Interstate 5 Off-Ramp to Northbound Interstate 405
- Southbound Interstate 5 On-Ramp from Westbound State Route 518
- Southbound Interstate 5 On-Ramp from Eastbound State Route 518 / Klickitat
- Northbound Interstate 5 Off-Ramp to Westbound State Route 518 / Northbound Interstate 405
- Northbound Interstate 5 On-Ramp from Eastbound State Route 518
- Northbound Interstate 405 On-Ramp from Northbound Interstate 5
- Southbound Interstate 405 Off-Ramp to Northbound Interstate 5 / Southcenter Boulevard
- Westbound State Route 518 On-Ramp from Northbound Interstate 5
- Westbound State Route 518 Off-Ramp to Southbound Interstate 5
- Eastbound State Route 518 On-Ramp from International Boulevard / State Route 99 (Preferred Alternative Only)



LEGEND

00,000 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES (AADT)

X INTERSECTION LEVEL OF SERVICE

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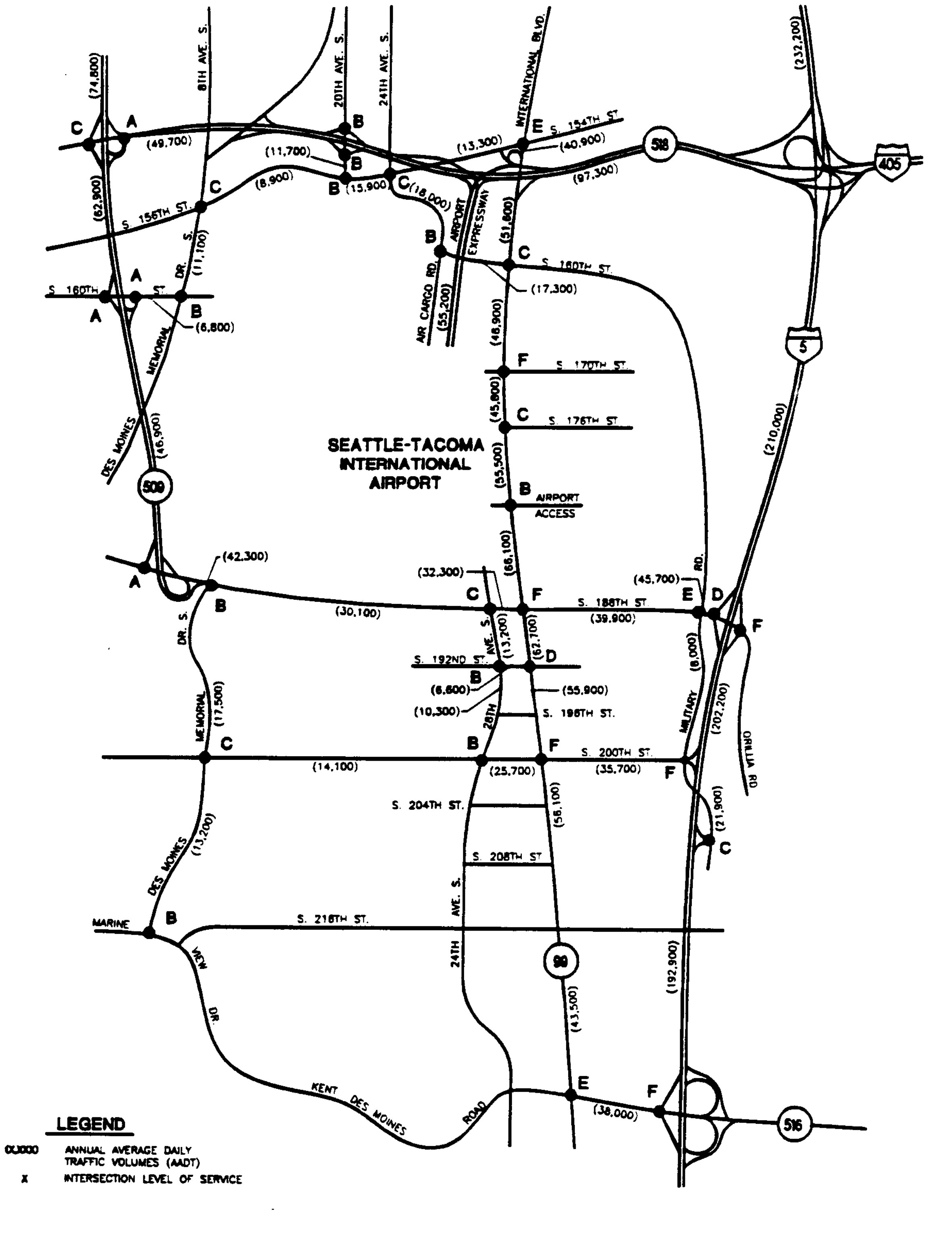

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Table C-1-21
Year 2005 Intersection Level of Service Summary

Evaluated Intersection	Do-Nothing Alternative		Preferred Alternative	
	LOS	Delay (s)	LOS	Delay (s)
Southbound State Route 509 Ramps & State Route 518	C	18.1	C	17.6
Northbound State Route 509 Ramps & State Route 518	A	3.5	A	3.1
20th Avenue South & Eastbound State Route 518 Ramps	N/C	N/C	B	10.9
20th Avenue South & Westbound State Route 518 Ramps	N/C	N/C	B	10.6
International Boulevard / State Route 99 & South 154th Street	F	**	E	44.8
24th Avenue South / Perimeter Road & South 154th Street	C	24.3	C	17.2
20th Avenue South & South 154th/156th Street	N/C	N/C	B	8.6
Des Moines Memorial Drive South & South 156th Street	C	18.5	C	18.0
Southbound State Route 509 Ramps & South 160th Street	A	1.3	A	1.3
Northbound State Route 509 Ramps / 5th Place S & S 160th Street	A	4.7	A	4.8
Des Moines Memorial Drive South & South 160th Street	B	6.5	B	6.3
Perimeter Road / Air Cargo Road & South 160th Street	B	11.4	B	12.3
International Boulevard / State Route 99 & South 160th Street	E	50.6	C	18.5
Air Cargo Road & Southbound Airport Expressway Ramps	B	9.0	N/C	N/C
Air Cargo Road & South 170th Street	F	48.4	N/C	N/C
Northbound Airport Expressway Ramps & South 170th Street	A	5.0	N/C	N/C
International Boulevard / State Route 99 & South 170th Street	F	**	F	**
International Boulevard / State Route 99 & South 176th Street	C	18.9	C	18.5
International Boulevard / State Route 99 & South 180th Street	D	31.8	B	10.9
Southbound State Route 509 Off-Ramp & South 188th Street	A	4.3	A	4.4
Des Moines Memorial Drive South & South 188th Street	B	12.8	B	12.6
28th Avenue South & South 188th Street	C	23.0	C	17.8
International Boulevard / State Route 99 & South 188th Street	F	**	F	**
Military Road South & South 188th Street	F	**	E	56.5
Southbound Interstate 5 Ramps & South 188th Street	D	29.6	D	25.6
Northbound Interstate 5 Ramps & South 188th Street	F	**	F	61.1
28th Avenue South & South 192nd Street	B	12.0	B	11.2
International Boulevard / State Route 99 & South 192nd Street	D	31.9	D	25.3
Des Moines Memorial Drive South & South 200th Street	D	31.1	C	24.0
28th Avenue South & South 200th Street	C	17.8	B	13.8
International Boulevard / State Route 99 & South 200th Street	F	**	F	**
Military Road S & S 200th Street / Southbound I-5 Ramps	F	**	F	**
Military Road South & Northbound Interstate 5 Ramps	D	27.0	C	22.0
Des Moines Memorial Drive South & Marine View Drive	B	9.3	B	9.2
International Boulevard / SR 99 & Kent-Des Moines Rd. / SR 516	F	**	E	50.5
Southbound Interstate 5 Ramps & Kent-Des Moines Rd. / SR 516	F	**	F	**

N/C The intersection is not constructed for this Alternative.
** (g/C) x (V/C) is greater than one, calculation of delay is infeasible.

AR 041105

Table C-1-22
Year 2005 Freeway Ramp Junction Level of Service Summary

Freeway Ramp Junction	Do-Nothing Alternative			Preferred Alternative		
	LOS Rating	Density (pc/mi/ln)	Speed (mph)	LOS Rating	Density (pc/mi/ln)	Speed (mph)
SB I-5 Off-Ramp to SR 518/Southcenter	F	**	**	F	**	**
SB I-5 Off-Ramp to NB I-405	F	**	**	F	**	**
SB I-5 On-Ramp from WB SR 518	F	**	**	F	**	**
SB I-5 On-Ramp from EB SR 518/Klickitat	F	**	**	F	**	**
NB I-5 Off-Ramp to WB SR 518/NB I-405	F	**	**	F	**	**
NB I-5 On-Ramp from SB I-405 (HOV)	B	16	52	B	16	52
NB I-5 On-Ramp from SB I-405	B	18	51	B	18	51
NB I-5 On-Ramp from EB SR 518	F	**	**	F	**	**
EB SR 518 Off-Ramp to NB I-5	D	33	49	E	36	49
EB SR 518 Off-Ramp to SB I-5	C	25	52	C	27	52
NB I-405 On-Ramp from SB I-5	B	18	52	B	18	52
NB I-405 On-Ramp from NB I-5	F	**	**	F	**	**
SB I-405 Off-Ramp to NB I-5/Southcenter	F	**	**	F	**	**
SB I-405 Off-Ramp to NB I-5 (HOV)	B	16	49	B	17	49
WB SR 518 On-Ramp from NB I-5	F	**	**	F	**	**
WB SR 518 Off-Ramp to SB I-5	F	**	**	F	**	**
WB SR 518 On-Ramp from SB I-5	C	22	51	C	22	51
EB SR 518 Off-Ramp to Airport Expwy	A	3	51	A	5	52
EB SR 518 On-Ramp from Airport Expwy	C	27	50	D	29	50
EB SR 518 On-Ramp from SR 99	E	36	48	F	**	**
WB SR 518 Off-Ramp to Airport/SR 99	C	23	49	B	20	50
Airport Expwy Off-Ramp to SR 99/154th	B	13	45	A	10	45
WB SR 518 On-Ramp from Airport Expwy	A	10	54	A	8	54
EB SR 518 Off-Ramp to 20th Ave S	N/C	N/C	N/C	B	18	50
EB SR 518 On-Ramp from 20th Ave S	N/C	N/C	N/C	B	17	51
WB SR 518 Off-Ramp to 20th Ave S	N/C	N/C	N/C	C	22	50
WB SR 518 On-Ramp from 20th Ave S	N/C	N/C	N/C	C	21	51

** Unstable Flow.
N/C Facility not constructed for this alternative.

E. Year 2010 Future Conditions

Several at-grade intersections and freeway ramp junctions in the Airport vicinity were analyzed for level of service ratings for the Do-Nothing and Preferred Alternatives. The level of service results are shown in **Exhibits C-1-11 and C-1-12**, and are summarized in **Tables C-1-23 and C-1-24**. The level of service reports are included in the appendices.

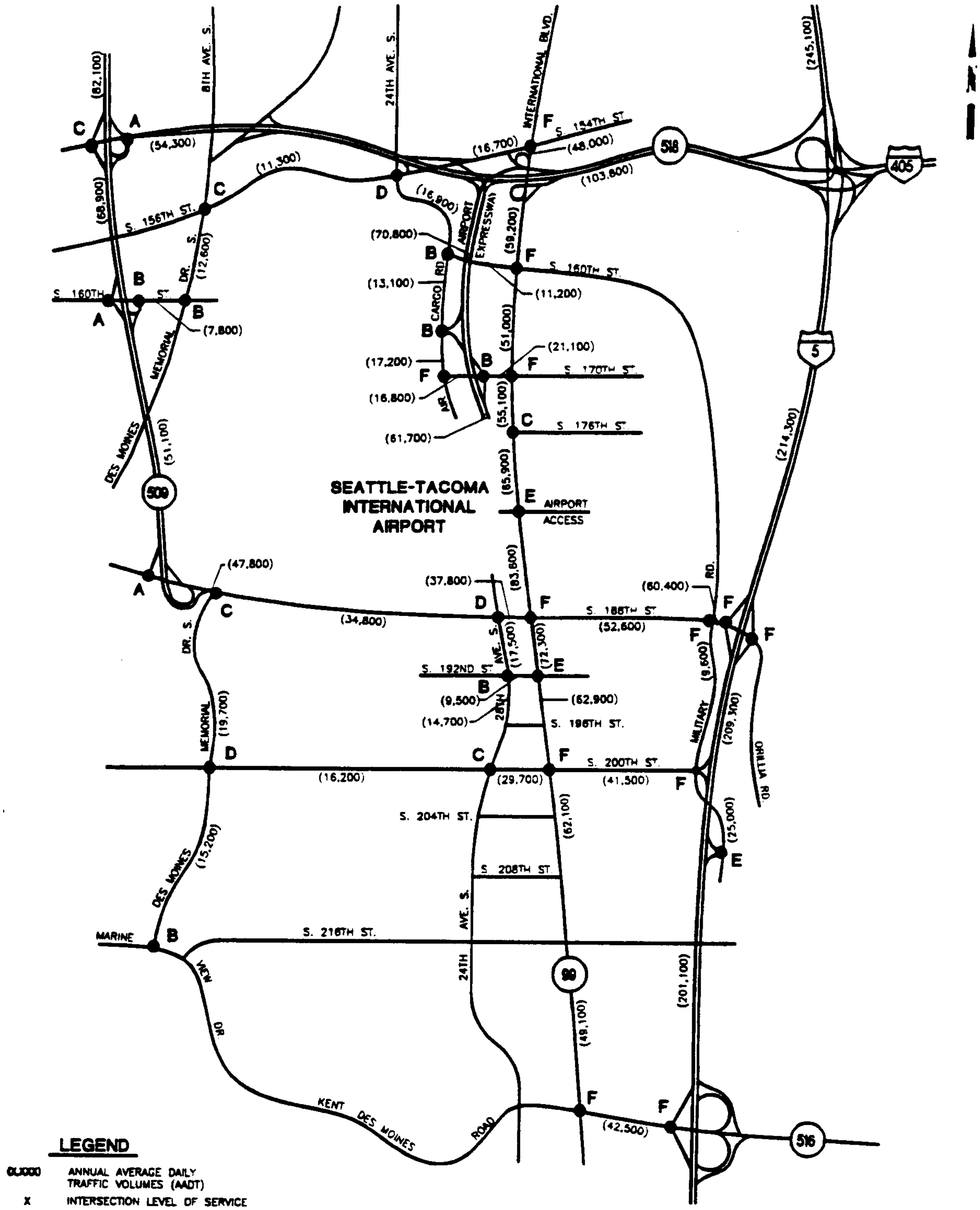
According to the adopted City of SeaTac level of service standard, a total of nine intersections would be functioning at an unacceptable level of service. These include the following:

- International Boulevard / State Route 99 and South 154th Street
- International Boulevard / State Route 99 and South 160th Street (Do-Nothing Alternative Only)
- Air Cargo Road and South 170th Street (Do-Nothing Alternative Only)
- International Boulevard / State Route 99 and South 170th Street
- Military Road South and South 188th Street
- Northbound Interstate 5 Ramps and South 188th Street
- Military Road South and South 200th Street / Southbound Interstate 5 Ramps
- International Boulevard / State Route 99 and Kent-Des Moines Road / State Route 516
- Southbound Interstate 5 Ramps and Kent-Des Moines Road / State Route 516

The intersections of International Boulevard / State Route 99 and South 188th Street, Southbound Interstate 5 Ramps and South 188th Street, and International Boulevard / State Route 99 and South 200th Street are also functioning at an unacceptable level of service, however, the City of SeaTac has provided an exception to the level of service standard for these intersections.

A total of twelve freeway ramp junctions would also be functioning at a level of service of LOS F. These include the following:

- Southbound Interstate 5 Off-Ramp to State Route 518 / Southcenter Boulevard
- Southbound Interstate 5 Off-Ramp to Northbound Interstate 405
- Southbound Interstate 5 On-Ramp from Westbound State Route 518
- Southbound Interstate 5 On-Ramp from Eastbound State Route 518 / Klickitat
- Northbound Interstate 5 Off-Ramp to Westbound State Route 518 / Northbound Interstate 405
- Northbound Interstate 5 On-Ramp from Eastbound State Route 518
- Northbound Interstate 405 On-Ramp from Northbound Interstate 5
- Southbound Interstate 405 Off-Ramp to Northbound Interstate 5 / Southcenter Boulevard
- Westbound State Route 518 On-Ramp from Northbound Interstate 5
- Westbound State Route 518 Off-Ramp to Southbound Interstate 5
- Westbound State Route 518 On-Ramp from Southbound Interstate 5
- Eastbound State Route 518 On-Ramp from International Boulevard / State Route 99

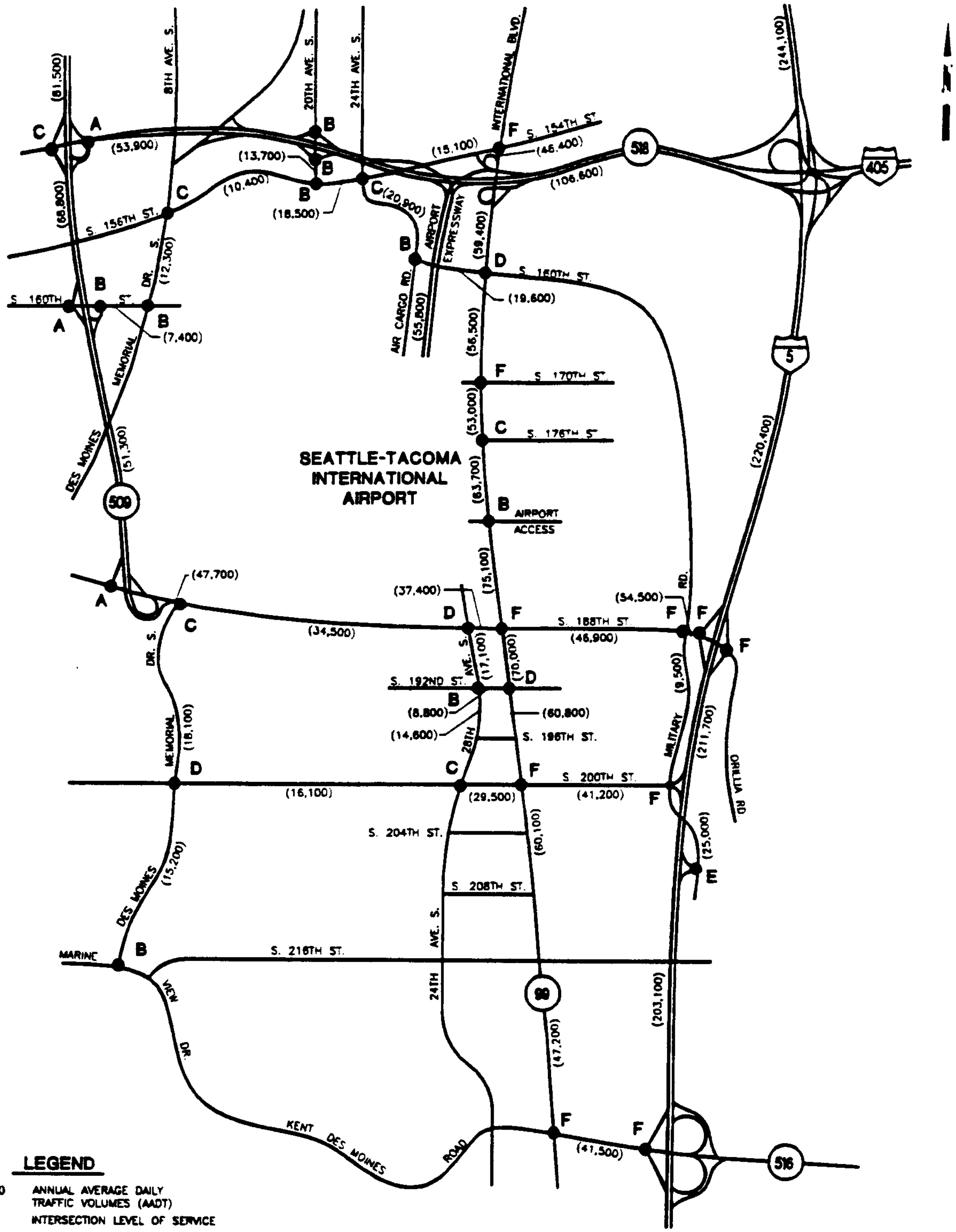


INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

YEAR 2010
DO-NOTHING
EXHIBIT C-1-11

AR 041108



LEGEND

00,000 ANNUAL AVERAGE DAILY TRAFFIC VOLUMES (AADT)

X INTERSECTION LEVEL OF SERVICE

INCA

INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

YEAR 2010
PREFERRED
EXHIBIT C-1-12

AR 041109

Table C-1-23
Year 2010 Intersection Level of Service Summary

Evaluated Intersection	Do-Nothing Alternative		Preferred Alternative	
	LOS	Delay (s)	LOS	Delay (s)
Southbound State Route 509 Ramps & State Route 518	C	18.5	C	17.8
Northbound State Route 509 Ramps & State Route 518	A	4.1	A	4.1
20th Avenue South & Eastbound State Route 518 Ramps	N/C	N/C	B	11.8
20th Avenue South & Westbound State Route 518 Ramps	N/C	N/C	B	11.0
International Boulevard / State Route 99 & South 154th Street	F	**	F	**
24th Avenue South / Perimeter Road & South 154th Street	D	39.6	C	24.5
20th Avenue South & South 154th/156th Street	N/C	N/C	B	9.6
Des Moines Memorial Drive South & South 156th Street	C	18.8	C	17.6
Southbound State Route 509 Ramps & South 160th Street	A	1.6	A	1.5
Northbound State Route 509 Ramps / 5th Place S & S 160th Street	B	5.6	B	5.8
Des Moines Memorial Drive South & South 160th Street	B	6.7	B	6.5
Perimeter Road / Air Cargo Road & South 160th Street	B	12.0	B	13.4
International Boulevard / State Route 99 & South 160th Street	F	**	D	31.6
Air Cargo Road & Southbound Airport Expressway Ramps	B	9.3	N/C	N/C
Air Cargo Road & South 170th Street	F	98.7	N/C	N/C
Northbound Airport Expressway Ramps & South 170th Street	B	5.1	N/C	N/C
International Boulevard / State Route 99 & South 170th Street	F	**	F	**
International Boulevard / State Route 99 & South 176th Street	C	24.5	C	22.7
International Boulevard / State Route 99 & South 180th Street	E	55.3	B	11.3
Southbound State Route 509 Off-Ramp & South 188th Street	A	4.4	A	2.4
Des Moines Memorial Drive South & South 188th Street	C	16.4	C	16.6
28th Avenue South & South 188th Street	D	31.6	D	28.6
International Boulevard / State Route 99 & South 188th Street	F	**	F	**
Military Road South & South 188th Street	F	**	F	**
Southbound Interstate 5 Ramps & South 188th Street	F	**	F	**
Northbound Interstate 5 Ramps & South 188th Street	F	**	F	**
28th Avenue South & South 192nd Street	B	12.3	B	11.9
International Boulevard / State Route 99 & South 192nd Street	E	47.2	D	38.6
Des Moines Memorial Drive South & South 200th Street	D	26.3	D	27.5
28th Avenue South & South 200th Street	C	21.4	C	22.3
International Boulevard / State Route 99 & South 200th Street	F	**	F	**
Military Road S & S 200th Street / Southbound I-5 Ramps	F	**	F	**
Military Road South & Northbound Interstate 5 Ramps	E	41.8	E	41.1
Des Moines Memorial Drive South & Marine View Drive	B	10.5	B	10.5
International Boulevard / SR 99 & Kent-Des Moines Rd. / SR 516	F	**	F	**
Southbound Interstate 5 Ramps & Kent-Des Moines Rd. / SR 516	F	**	F	**

N/C The intersection is not constructed for this Alternative.
** (g/C) x (V/C) is greater than one, calculation of delay is infeasible.

Table C-1-24
Year 2010 Freeway Ramp Junction Level of Service Summary

Freeway Ramp Junction	Do-Nothing Alternative			Preferred Alternative		
	LOS Rating	Density (pc/mi/ln)	Speed (mph)	LOS Rating	Density (pc/mi/ln)	Speed (mph)
SB I-5 Off-Ramp to SR 518/Southcenter	F	**	**	F	**	**
SB I-5 Off-Ramp to NB I-405	F	**	**	F	**	**
SB I-5 On-Ramp from WB SR 518	F	**	**	F	**	**
SB I-5 On-Ramp from EB SR 518/Klickitat	F	**	**	F	**	**
NB I-5 Off-Ramp to WB SR 518/NB I-405	F	**	**	F	**	**
NB I-5 On-Ramp from SB I-405 (HOV)	B	17	51	B	17	51
NB I-5 On-Ramp from SB I-405	B	19	51	B	19	51
NB I-5 On-Ramp from EB SR 518	F	**	**	F	**	**
EB SR 518 Off-Ramp to NB I-5	E	36	49	E	39	49
EB SR 518 Off-Ramp to SB I-5	C	27	52	D	30	52
NB I-405 On-Ramp from SB I-5	C	20	52	C	21	52
NB I-405 On-Ramp from NB I-5	F	**	**	F	**	**
SB I-405 Off-Ramp to NB I-5/Southcenter	F	**	**	F	**	**
SB I-405 Off-Ramp to NB I-5 (HOV)	B	19	49	C	20	49
WB SR 518 On-Ramp from NB I-5	F	**	**	F	**	**
WB SR 518 Off-Ramp to SB I-5	F	**	**	F	**	**
WB SR 518 On-Ramp from SB I-5	F	**	**	C	24	50
EB SR 518 Off-Ramp to Airport Expwy	A	5	51	A	7	52
EB SR 518 On-Ramp from Airport Expwy	D	29	50	D	31	49
EB SR 518 On-Ramp from SR 99	F	**	**	F	**	**
WB SR 518 Off-Ramp to Airport/SR 99	C	27	49	C	24	49
Airport Expwy Off-Ramp to SR 99/154th	B	14	45	B	11	45
WB SR 518 On-Ramp from Airport Expwy	B	12	53	A	10	54
EB SR 518 Off-Ramp to 20th Ave S	N/C	N/C	N/C	B	19	50
EB SR 518 On-Ramp from 20th Ave S	N/C	N/C	N/C	B	18	51
WB SR 518 Off-Ramp to 20th Ave S	N/C	N/C	N/C	C	23	50
WB SR 518 On-Ramp from 20th Ave S	N/C	N/C	N/C	C	22	51

** Unstable Flow.
N/C Facility not constructed for this alternative.

VII. IMPACTS AND MITIGATION

The purpose of this section of the surface transportation report is to identify and mitigate significant impacts on the local surface transportation system generated by the Preferred Alternative. In order to do this the calculated level of service for the Do-Nothing Alternative is compared to the calculated level of service for the Preferred Alternative. If the level of service degrades with the Preferred Alternative then there is an impact. However, in some cases the level of service for the Do-Nothing Alternative does not meet the level of service standard. In this instance the demand volumes for the Do-Nothing Alternative are evaluated to determine what improvements are necessary so that the intersection would operate at an acceptable level of service. These same improvements are then applied to the Preferred Alternative and the level of service is then recalculated. The revised level of service ratings for the Do-Nothing and Preferred Alternative are then compared to determine if there is an impact.

A. Year 2000 Future Conditions

The following intersections would not meet the level of service standard for the year 2000 Do-Nothing Alternative:

- International Boulevard / State Route 99 and South 170th Street - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the Do-Nothing Alternative demand volumes a potential improvement would include a signal modification to provide an eastbound right-turn phase overlap with the northbound left-turn movement. The level of service would improve to LOS D (average delay of 37.8 seconds) for the Do-Nothing Alternative and LOS D (average delay of 33.8 seconds) for the Preferred Alternative. No additional analysis is required since the level of service remains the same between the alternatives.
- 28th Avenue South and South 200th Street - this unsignalized intersection operates at LOS F (average delay of 644.0 seconds) for the Do-Nothing Alternative and LOS B (average delay of 14.7 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Southbound Interstate 5 Ramps and Kent-Des Moines Road / State Route 516 - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the Do-Nothing demand volumes a potential improvement would include the construction of eastbound and southbound high-capacity right-turn lanes. The level of service would improve to LOS C (average delay of 18.2 seconds) for the Do-Nothing Alternative and LOS C (average delay of 18.0 seconds) for the Preferred Alternative. No additional analysis is required since the level of service remains the same between the alternatives.

No impacts were identified for any of the evaluated intersections when the level of service results for the Do-Nothing Alternative were compared to the level of service results for the Preferred Alternative.

No impacts were identified for any of the evaluated freeway ramp junctions when the level of service results for the Do-Nothing Alternative were compared to the level of service results for the Preferred Alternative.

B. Year 2005 Future Conditions

The following intersections would not meet the level of service standard for the year 2005 Do-Nothing Alternative:

- International Boulevard / State Route 99 and South 154th Street - this intersection operates at LOS F (over capacity) for the Do-Nothing Alternative and LOS E (average delay of 44.8 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Air Cargo Road and South 170th Street - this intersection operates at LOS F (average delay of 48.4 seconds) for the Do-Nothing Alternative. Under the Preferred Alternative this intersection would be removed for the construction of the North Unit Terminal. No additional analysis is required since this intersection does not exist for the Preferred Alternative.
- International Boulevard / State Route 99 and South 170th Street - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the year 2000 analysis a potential improvement would include a signal modification to provide an eastbound right-turn phase overlap with the northbound left-turn movement. The level of service remains the same at LOS F (average delay of 65.0 seconds) for the Do-Nothing Alternative and improves to LOS E (average delay of 53.5 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Military Road South and South 188th Street - this intersection operates at LOS F (over capacity) for the Do-Nothing Alternative and LOS E (average delay of 56.5 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Northbound Interstate 5 Ramps and South 188th Street - this intersection operates at LOS F (over capacity) for the Do-Nothing Alternative and LOS F (average delay of 61.1 seconds) for the Preferred Alternative. According to the Do-Nothing demand volumes a potential improvement would include the reconstruction of the south leg to provide two northbound left-turn lanes and one northbound through-right turn lane, as well as the construction of dual eastbound left-turn lanes. The level of service improves to LOS D (average delay of 37.8 seconds) for the Do-Nothing Alternative and LOS C (average delay of 24.0 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Military Road South and South 200th Street / Southbound Interstate 5 Ramps - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the Do-Nothing demand volumes a potential improvement would include the construction of dual northbound left-turn lanes, and a signal modification to provide an eastbound right-turn phase overlap with the northbound left-turn movement. The level of service improves to LOS E (average delay of 44.5 seconds) for the Do-Nothing Alternative and LOS D (average delay of 39.8 seconds) for the Preferred Alternative. No additional analysis is required since the level of service is the same for both alternatives.
- International Boulevard / State Route 99 and Kent-Des Moines Road / State Route 516 - this intersection operates at LOS F (over capacity) for the Do-Nothing Alternative and LOS E (average delay of 50.5 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.

- Southbound Interstate 5 Ramps and Kent-Des Moines Road / State Route 516 - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the year 2000 analysis a potential improvement would include the construction of an eastbound and southbound high-capacity right-turn lane. The level of service would improve to LOS D (average delay of 27.6 seconds) for the Do-Nothing Alternative and LOS D (average delay of 28.0 seconds) for the Preferred Alternative. No additional analysis is required since the level of service is the same for both alternatives.

No impacts were identified for any of the evaluated intersections when the level of service results for the Do-Nothing Alternative were compared to the level of service results for the Preferred Alternative.

The freeway ramp junction level of service results for the Do-Nothing Alternative were compared to the results for the Preferred Alternative with the following results:

- Eastbound State Route 518 Off-Ramp to Northbound Interstate 5 - this freeway ramp junction operates at LOS D for the Do-Nothing Alternative and LOS E for the Preferred Alternative. However, the Preferred Alternative does not significantly impact this freeway ramp junction because the speeds remain the same at 49 mph, and the density is approximately the same at 33 pc/mi/ln and 36 pc/mi/ln.
- Eastbound State Route 518 On-Ramp from the Airport Expressway - this freeway ramp junction operates at LOS C for the Do-Nothing Alternative and LOS D for the Preferred Alternative. However, the Preferred Alternative does not significantly impact this freeway ramp junction because the speeds remain the same at 50 mph, and the density is approximately the same at 27 pc/mi/ln and 29 pc/mi/ln.
- Eastbound State Route 518 On-Ramp from International Boulevard / State Route 99 - this freeway ramp junction operates at LOS E for the Do-Nothing Alternative and LOS F for the Preferred Alternative. While there is a potential impact associated with the Preferred Alternative, there is a programmed transportation improvement scheduled for completion in the year 2006 that will mitigate this potential impact.

No impacts were identified for any of the remaining evaluated freeway ramp junctions when the level of service results for the Do-Nothing Alternative were compared to the level of service results for the Preferred Alternative.

C. Year 2010 Future Conditions

The following intersections would not meet the level of service standard for the year 2010 Do-Nothing Alternative:

- International Boulevard / State Route 99 and South 154th Street - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the year 2010 Do-Nothing demand volumes a potential improvement would include widening International Boulevard / State Route 99 to provide three travel lanes in each direction (not including HOV treatments), and the installation of an eastbound right-turn phase overlap with the northbound left-turn movement. The level of service would improve to LOS D (average delay of 31.1 seconds) for the Do-Nothing Alternative and LOS C (average delay of 23.8 seconds) for the Preferred Alternative. No additional analysis is required since the level of service remains the same for both alternatives.

- International Boulevard / State Route 99 and South 160th Street - this intersection operates at LOS F (over capacity) for the Do-Nothing and at LOS D (average delay of 31.6 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Air Cargo Road and South 170th Street - this intersection operates at LOS F (average delay of 98.7 seconds) for the Do-Nothing Alternative. Under the Preferred Alternative this intersection has been removed for the construction of the North Unit Terminal. No additional analysis is required since this intersection does not exist for the Preferred Alternative.
- International Boulevard / State Route 99 and South 170th Street - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the year 2010 Do-Nothing demand volumes a potential improvement would include widening International Boulevard / State Route 99 to provide three travel lanes in each direction (not including HOV treatments), the construction of a northbound right-turn lane, and the construction of dual northbound left-turn lanes. The level of service remains the same at LOS F (average delay of 61.6 seconds) for the Do-Nothing Alternative and improves to LOS D (average delay of 29.4 seconds) for the Preferred Alternative. No additional analysis is required since the level of service remains the same for both alternatives.
- Military Road South and South 188th Street - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the Do-Nothing demand volumes a potential improvement would include widening South 188th Street to provide three travel lanes in each direction, the reconstruction of the south leg to provide a northbound left-through and through-right lane, the reconstruction of the north leg to provide a southbound left-turn, left-through, through, and right-turn lanes, and a signal modification to provide split phasing in the north/south direction. The level of service improves to LOS E (average delay of 42.1 seconds) for the Do-Nothing Alternative and LOS D (average delay of 34.3 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Northbound Interstate 5 Ramps and South 188th Street - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the Do-Nothing demand volumes a potential improvement would include widening South 188th Street to provide three travel lanes in each direction, the reconstruction of the south leg to provide dual northbound left-turn lanes and a through-right turn lane, and the construction of dual eastbound left-turn lanes. The level of service improves to LOS D (average delay of 39.2 seconds) for the Do-Nothing Alternative and LOS D (average delay of 31.7 seconds) for the Preferred Alternative. No additional analysis is required since the level of service improves with the Preferred Alternative.
- Military Road South and South 200th Street / Southbound Interstate 5 Ramps - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the Do-Nothing demand volumes a potential improvement would include widening of the west leg to provide two eastbound through lanes, the construction of dual northbound left-turn lanes, and a signal modification to provide an eastbound right-turn phase overlap with the northbound left-turn movement. The level of service improves to LOS D (average delay of 33.4 seconds) for the Do-Nothing Alternative and LOS D (average delay of 32.8 seconds) for the Preferred Alternative. No additional analysis is required since the level of service remains the same for both alternatives.

- International Boulevard / State Route 99 and Kent-Des Moines Road / State Route 516 - this intersection operates at LOS F (over capacity) for the Do-Nothing and Preferred Alternative. According to the Do-Nothing demand volumes a potential improvement would include widening International Boulevard / State Route 99 to provide three travel lanes in each direction (not including HOV treatments), the construction of dual southbound left-turn lanes, and the installation of a westbound right-turn phase overlap. The level of service would improve to LOS D (average delay of 35.4 seconds) for the Do-Nothing Alternative and LOS D (average delay of 30.3 seconds) for the Preferred Alternative. No additional analysis is required since the level of service remains the same for both alternatives.
- Southbound Interstate 5 Ramps and Kent-Des Moines Road / State Route 516 - this intersection operates at LOS F (over capacity) for both the Do-Nothing and Preferred Alternative. According to the year 2000 analysis a potential improvement would include the construction of an eastbound and southbound high-capacity right-turn lane, and the construction of dual westbound left-turn lanes. The level of service would improve to LOS C (average delay of 21.4 seconds) for the Do-Nothing Alternative and LOS C (average delay of 21.7 seconds) for the Preferred Alternative. No additional analysis is required since the level of service remains the same for both alternatives.

No impacts were identified for any of the evaluated intersections when the level of service results for the Do-Nothing Alternative were compared to the level of service results for the Preferred Alternative.

The freeway ramp junction level of service results for the Do-Nothing Alternative were compared to the results for the Preferred Alternative with the following results:

- Eastbound State Route 518 Off-Ramp to Northbound Interstate 5 - this freeway ramp junction operates at LOS C for the Do-Nothing Alternative and LOS D for the Preferred Alternative. However, the Preferred Alternative does not significantly impact this freeway ramp junction because the speeds remain the same at 52 mph, and the density is approximately the same at 27 pc/mi/ln and 30 pc/mi/ln.
- Southbound Interstate 405 Off-Ramp to Northbound Interstate 5 (HOV) - this freeway ramp junction operates at LOS B for the Do-Nothing Alternative and LOS C for the Preferred Alternative. However, the Preferred Alternative does not significantly impact this freeway ramp junction because the speeds remain the same at 49 mph, and the density is approximately the same at 19 pc/mi/ln and 20 pc/mi/ln.

No impacts were identified for any of the remaining evaluated freeway ramp junctions when the level of service results for the Do-Nothing Alternative were compared to the level of service results for the Preferred Alternative.

D. Transportation Impact Fees

According to the City of SeaTac Comprehensive Transportation Plan[51] the City has adopted two new policies to raise funds for programmed transportation improvement projects. These include a parking tax and developer impact fees.

There are a significant number of commercial parking lots located within the City of SeaTac which are mostly associated with the Airport. This includes the privately owned commercial parking lots along International Boulevard / State Route 99, and the commercial parking lots operated by the Port of Seattle at the Airport. The City of SeaTac has adopted a parking tax to collect revenues from these commercial parking lots in order to fund the programmed transportation improvement projects. A total of $2.3 million was collected in parking tax revenues, of which $2.0 million was paid by the Port of Seattle. Essentially, this parking tax partially funds the programmed transportation improvement projects necessary to accommodate the continued growth of the Airport as defined by the Do-Nothing Alternative.

The City of SeaTac has also adopted a developer impact fee in order to offset the cost of transportation improvement projects necessary to accommodate the growth of new developments. The current City of SeaTac developer impact fee is defined as $773 per additional PM peak hour trip[52]. The difference in PM peak hour trips between the Preferred and Do-Nothing Alternatives would be considered additional PM peak hour trips. However, since the City of SeaTac can only collect impact fees for additional PM peak hour trips on their roadway facilities, the additional PM peak hour trips on the Airport Expressway will not be considered for the developer impact fee. The total PM peak hour trips generated by the Airport is summarized in **Table C-1-25** by alternative, type of Airport traffic, and access route for the future year 2010 condition.

Table C-1-25
Year 2010 PM Peak Hour Airport Traffic Summary

Airport Traffic	Do-Nothing Alternative			Preferred Alternative		
	Airport Expressway	Other Route	Total	Airport Expressway	Other Route	Total
Passenger	3,262	1,301	4,563	2,699	1,667	4,366
Off-Site Parking	N/A	374	374	N/A	92	92
Airport Employee	N/A	279	279	N/A	279	279
Air Cargo	N/A	521	521	N/A	521	521
Airfield Operations Area	N/A	190	190	N/A	201	201
General Aviation	N/A	17	17	N/A	17	17
Aircraft Maintenance	N/A	273	273	N/A	273	273
Other	N/A	20	20	N/A	20	20
Totals	**3,262**	**2,975**	**6,237**	**2,699**	**3,070**	**5,769**

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51 City of SeaTac Department of Public Works and the TRANSPO Group, Inc., City of SeaTac Comprehensive Transportation Plan Summary Report (1993-2003), January 28, 1994, p. 39.
52 City of SeaTac Department of Public Works and the TRANSPO Group, Inc., City of SeaTac Comprehensive Transportation Plan Summary Report (1993-2003), January 28, 1994, p. 40.

As shown by **Table C-1-25**, the Preferred Alternative generates less total traffic in the year 2010 but generates more trips on City of SeaTac roadway facilities. These additional 95 PM peak hour trips equates to a total developer impact fee of $73,435.00.

E. Transportation Demand Management

The purpose of Transportation Demand Management (TDM) strategies is to reduce the travel demand by either encouraging the use of high occupancy vehicles (i.e. transit and carpools), or discouraging single-occupant vehicle trips. TDM strategies typically target such groups as employees, or an urban area.

The Port of Seattle is currently a member of the SeaTac Transportation Partnership (STTP), a public-private transportation demand management association comprised of employers affected by the Commute Trip Reduction (CTR) Law. The purpose of the STTP is to provide a comprehensive effort towards the reduction of employee commute trips. The Port of Seattle has sponsored several successful programs and has received the Diamond Award (Commuter Challenge Program) in both 1994 and 1996 in recognition of their efforts. The Port of Seattle has been, and will continue to be, an active participant with the other STTP members in reducing employee vehicle trips to the Airport.

The Port of Seattle supports the proposed RTA system as a regional TDM measure, as well as the other TDM policies identified in the PSRC MTP. In addition, the Port has continued to be a supporter of regional TDMs, as well as identifying airport specific TDMs. No specific TDMs are identified as mitigation for the Master Plan Update improvements, as the proposed improvements reflect actions that would reduce congestion. While no specific TDMs are included in the plan, it is expected that the Port will continue to work with surrounding agencies on TDM efforts. Thus, the surface transportation efforts presented in this evaluation reflect higher congestion than could occur in the future with and without the proposed improvements. The Port of Seattle is currently considering the use of several additional TDM strategies described in P&D Aviation's International Boulevard Access Study and Travel Demand Management Mitigation Policies Report[53]. Two general types of TDM strategies were discussed in this report and are described as follows:

- Employee Based TDM Strategies - These TDM strategies aim to reduce peak hour traffic by reducing peak hour employee commute trips. These strategies can be implemented voluntarily or as part of the mandated CTR program.
- Regional or Areawide TDM Strategies - These TDM strategies aim to reduce the number of single-occupant vehicle passenger trips within the Terminal area. These strategies have the most potential benefit since passenger traffic represents approximately 80 percent of the total Airport traffic.

Several comments were received suggesting various TDM measures. While the Port of Seattle has not committed itself to any new TDM measures, the Port of Seattle will aggressively pursue TDM policies in order to reduce employee and passenger travel demand at the Airport.

[53] P&D Aviation, Seattle-Tacoma International Airport Master Plan International Boulevard Access Study and Travel Demand Management Mitigation Policies, July 1995.

VIII. CONCLUSION

The Seattle-Tacoma International Airport is expected to experience generally high passenger growth rates through the year 2010. In order to meet the future demand forecasts, the Master Plan for the Airport is currently being updated. Four identified Master Plan Update Alternatives were generated as part of this update process, with the North Unit Terminal being selected as the Preferred Alternative. This report analyzed the Preferred Alternative for impacts to the local surface transportation system and had the following conclusions:

- Total Airport traffic is expected to increase from approximately 72,400 vehicles per day in 1994, to approximately 114,000 vehicles per day for the Do-Nothing Alternative or approximately 113,300 vehicles per day for the Preferred Alternative in the year 2010. Based on these traffic forecasts it was determined that the Airport generates approximately 1.6 to 1.7 vehicles trips per day per passenger. The differences between the Do-Nothing Alternative traffic volumes and the Preferred Alternative traffic volumes are primarily associated with the different mode choice assumptions as described in **Table C-1-4**.
- Several transportation improvement projects located within the Airport vicinity have been identified as the responsibility of the Port of Seattle with an estimated cost of $4,954,600. The Port of Seattle acknowledges its pro-rata responsibility for future transportation improvement projects, and will coordinate with the appropriate agencies to determine the appropriate contributions.
- Until a preferred corridor alternative is selected from the State Route 509 Extension/South Access Road Corridor EIS, and the project-level analysis is begun, the exact alignment and configuration of both State Route 509 and South Access are unknown. The Port of Seattle continues to support the construction of a South Access roadway. As a member of the State Route 509/South Access Steering Committee, the Port of Seattle will continue to pursue the development of a South Access roadway as a solution that meets local and regional transportation needs.
- No significant surface transportation impacts have been identified for the Preferred Alternative for any of the evaluated intersections and freeway ramp junctions.

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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 2 - Appendices C-2 through F

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.

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APPENDIX D

ENVIRONMENTAL EVALUATION OF YEAR 2020 IMPACTS AND A FORECAST GREATER THAN THE NEW PORT OF SEATTLE FORECAST

The February, 1996 Final EIS (Volume 4 - Appendix R) presents a quantitative examination of several alternative forecasts, based on the Master Plan Update forecast. The purpose of that analysis was to disclose possible environmental impacts that could occur if aviation demand increased at a faster or slower rate than was anticipated. As is shown in Chapter 2 of this Supplemental Environmental Impact Statement, aviation demand has actually increased faster than was anticipated by the Master Plan Update. As a result, a new forecast has been prepared, which is the subject of this Supplemental EIS.

As is discussed in Chapters 1 and 2 of this Supplemental EIS, year 2020 was determined not to be reasonably foreseeable at this time. A number of reasons lead to this conclusion:

1. The aviation industry appears to be emerging from a decade of high volatility. These conditions appear related to the after effects of deregulation, with airline bankruptcies, airline consolidations, and vigorous air fare competition. These factors, combined with the economic conditions of the Puget Sound Region, have led to significantly greater growth in air travel demand than the nation's average. In a three year period, forecasts using virtually the same methodology, with varying base data, produced forecasts that varied by 17% for year 2010. This 17% variation (and the associated schedule acceleration of facilities) has resulted in the primary differences in environmental impact described in Chapter 5 of this document.
2. Although forecasts for near-term years may not match actual experience, typically those differences are relatively small. For more distant years, forecasting is much more uncertain. This uncertainty is inherent in the nature of forecasting and the nature of the air travel industry.
3. FAA guidance on the conduct of Master Plans states "the length of the short, intermediate and long-term activity forecasts should be decided. While 5-10-20 year timeframes are typical, there may be justification for using different time frames. In any event, the short-term forecast should support a capital improvement program, the intermediate-term a realistic assessment of needs, and the long-term a concept oriented statement of needs. The schedules of airport development that are directly related to forecast demand levels should be tied to such levels, rather than dates, because of the possibility of the forecasts being off target."[1/] The Master Plan Update for Sea-Tac was developed as recommended, with the schedule of development being related to demand. As a result, the new (higher) forecast shows that the schedule could be accelerated for certain airport improvements.
4. Airport master plans are typically undertaken every 7-10 years. However, airports that experience large unforeseen growth, typically conduct master plans (or other significant airport planning efforts) sooner, ranging from 3 to 5 years. Therefore, it is anticipated that a new master plan for Sea-Tac will be initiated soon after the year 2000. That future planning effort would generate new aviation forecasts and define the parameters for accommodating

1/ FAA Advisory Circular 150/5070-6A "Airport Master Plans", FAA, June 1985. Page 15.

forecast demand. As noted in the FAA guidance, the 1996 Master Plan Update has identified the Port's capital improvement plan, and provides a realistic assessment of needs for accommodating 15.7 million enplaned passengers, which is expected to now occur in year 2005. The plan also reflects the longer-term needs, associated with 19 million enplanements, in a more conceptual fashion.

5. Some of the environmental approvals identified by the Final EIS and this Supplemental EIS, may expire within the next 3-5 years. FAA Environmental Guidelines (FAA Order 5050.4A, Paragraph 102) states "Time Limitations for Environmental Documents b. With regard to approved final impact statements.....(1) If major steps toward implementation of the proposed action (such as the start of construction, substantial acquisition, or relocation activities) have not commenced within 3 years from the date of approval of the final statement, a written reevaluation of the adequacy, accuracy, and validity of the final statement shall be prepared...." The Clean Air Act Conformity rules specifically note that a conformity determination "lapses 5 years from the date of the final conformity determination" (40 CFR Part 51.857(a)).
6. Additional planning will be undertaken at Sea-Tac in the future, encompassing facility requirements and environmental impacts, based on forecasts of short-term, intermediate and long-term conditions. If these efforts are undertaken around the year 2000, it is anticipated that aviation industry conditions could stabilize, making air travel demand less volatile and forecasting less uncertain.

Although year 2020 has been determined to not be reasonably foreseeable, the FAA and the Port have prepared this appendix to extrapolate the impacts to the year 2020, based on information in this Supplemental EIS for earlier years. The following scenario's were considered and are listed in **Table D-1**:

- Case 1: new Port forecast and impacts, with an estimate of impacts in year 2020.
- Case 2: Aviation demand grows 10% faster than predicted by the new forecast, and that the Do-Nothing and "With Project" are capable of accommodating all of the passenger demand.
- Case 3: Aviation demand grows 10% faster than predicted by the new forecast, and that under the Do-Nothing alternative, aircraft operations and passenger levels are constrained (or for whatever reason, does not increase) beyond the new Port forecast for year 2010.

Aviation activity levels considered by these scenarios could be as follows:

TABLE D-1

SUMMARY OF ACTIVITY ASSOCIATED WITH TEST CASES

Operations	2000	2005	2010	2020
Do-Nothing				
New Forecast	409,000	445,000	460,000	460,000
Case 1	409,000	445,000	460,000	460,000
Case 2	449,900	460,000	460,000	460,000
Case 3	449,900	460,000	460,000	460,000
"With Project"				
New Forecast	409,000	445,000	474,000	n/a
Case 1	409,000	445,000	474,000	532,000
Case 2	449,900	489,500	521,400	585,200
Case 3	449,900	489,500	521,400	585,200

Enplanements	2000	2005	2010	2020
Do-Nothing				
New Forecast	13,700,000	15,700,000	17,900,000	n/a
Case 1	13,700,000	15,700,000	17,900,000	22,300,000
Case 2	15,070,000	17,270,000	19,690,000	24,530,000
Case 3	15,070,000	17,270,000	17,900,000	17,900,000
"With Project"				
New Forecast	13,700,000	15,700,000	17,900,000	n/a
Case 1	13,700,000	15,700,000	17,900,000	22,300,000
Case 2	15,070,000	17,270,000	19,690,000	24,530,000
Case 3	15,070,000	17,270,000	19,690,000	24,530,000

Table D-2 presents a summary of the probable key impacts of these cases. This assessment focused on the Preferred Alternative - Alternative 3 (North Unit Terminal), as the "With Project" as well as Alternative 1 (Do-Nothing). The extrapolation from the impacts presented in the Final and Supplemental EIS's was performed based on professional estimates of how the various environmental impacts would change in accordance with alternative aviation activity.

The Master Plan Update improvements were designed to accommodate 19 million annual enplanements. As is discussed in Chapter 2, it is anticipated that additional master plans will be undertaken for Sea-Tac in the future. Those plans would identify if and how activity beyond the 19 million enplanements would be accommodated. Thus, this analysis assumes that the "With Project" is limited to the improvements proposed by this Master Plan Update. Assumptions for improvements beyond this plan is speculative and would be the subject of future studies.

(A) Case 1: Current Forecast, Extrapolated through Year 2020

Extrapolating from the new Port forecast, activity in the year 2020 was estimated as listed in **Table D-1**. This case assumes that the unconstrained passenger demand could be accommodated by the Do-Nothing Alternative, through continued spreading of the peak periods. Based on the analysis documented in Chapter 5 of this Supplemental EIS, as well as the Final EIS, impacts in year 2020 were estimated:

- *Noise and Land Use:* As shown in **Table D-2**, with implementation of the proposed Master Plan Update improvements, the 2020 noise exposure impacts are likely to be about 14% greater than the 2010 "With Project" improvements, and about 30% greater than the Do-Nothing impacts. As is noted in Section 5-3 of the Supplemental EIS, noise impacts are anticipated to be less than current conditions in the future, whether or not the improvements are undertaken at Sea-Tac Airport. In the Do-Nothing condition, year 2020 impacts would be 63% less than current impacts. "With Project" impacts in year 2020 could be 53% of current conditions.

- *Air Quality:* An evaluation of the emissions inventory associated with year 2020 activity was evaluated in addition to the pollutant levels that could be experienced along International Blvd. As year 2020 aircraft operations would be the same as year 2010 in the Do-Nothing condition, the aircraft emissions inventory would be the same (2,014 tons of CO and 1,802 tons of NOx). In the "With Project" condition, year 2020 would accommodate more aircraft operations, yet with the improvements, operations would be more efficient. As a result, CO emissions would be decrease over Do-Nothing by about 108 tons (from 2,014 to 1,906 tons). NOx levels would increase by 200 tons.

Based on the dispersion results for year 2010, the impacts in year 2020 were estimated. As is shown, concentrations "With Project" would be equal to or lower than the Do-Nothing alternative.

- *Surface Transportation* - Impacts to the surface transportation system were considered. As described in Section 5-1, use of the regional roadway system is expected to grow each year in the future. **Table D-2** lists airport related traffic levels for each year, which is also expected to continue to grow in proportion to growth in passengers and aircraft operations. Regardless of the improvements undertaken at Sea-Tac Airport, intersections along International Boulevard in the immediate airport area are expected to operate at LOS D or worse (with most intersections operating at LOS F) by 2020. Improvements associated with the SR 509 Extension could alleviate congestion along International Boulevard, but that project would provide benefits to both the Do-Nothing and "With Project" alternatives.

- *Water Resources (Floodplains, Streams, Wetlands, etc.)*: As no other improvements are proposed by this Master Plan Update improvement program to address demand above 19 million enplaned passengers, no other impacts to water resources beyond that identified by the Final EIS would be expected.

- *Property Acquisition* - As no other improvements are proposed by the Master Plan Update improvement program to address demand above 19 million enplanements, no acquisition beyond that identified by the Final EIS would be expected.

- *Socio-Economic Impacts* - As activity levels grow, the level of personnel needed at the Airport would be expected to increase. While the aircraft operations levels would differ between the Do-Nothing and "With Project", all annual enplaned passengers would be accommodated. As the passenger levels would be the same, employment levels would be the same for the Do-Nothing and "With Project" in year 2020. It is anticipated that employment could increase from 392,330 jobs in 2010 to 488,770 jobs in 2020.

- *Earth/Fill Requirements* - As no other improvements are proposed to address demand above 19 million enplanements, no other earth/fill requirements beyond that identified by the Final EIS would be expected.

(B) Case 2: Demand Grows at a Faster Rate than Forecast

The second case reflects a greater growth in aviation demand than is presently forecast. To estimate the effects of a greater rate of growth over what is now forecast, this case considered a 10% greater growth. As a result of this elevated activity level assumption, aviation demand and associated delay and congestion would be substantially greater than now forecast - year 2000 average delay in the Do-Nothing would be approximately 17-18 minutes, and at 460,000 operations reach about 20 minutes. "With Project" the delay would be reduced to 5 minutes in 2000, 7 minutes in 2005, 9 minutes in 2010, and 14 minutes in 2020. Landside improvements would also be needed earlier in time; based on these forecasts, landside improvements could be needed about 5 years earlier than presented by the new forecasts in this Supplemental EIS.

This case assumes that the entire passenger demand could be accommodated by existing facilities through the year 2020 (at 24.5 million enplaned passengers). To accommodate this level of demand, extreme delay conditions would result. It should be noted that Case 3, which follows, examines conditions assuming that the Do-Nothing enplaned passenger levels could be constrained beyond about 17.9 million enplaned passengers. Assuming that the existing facilities can accommodate this demand, the following analysis was performed:

- *Noise and Land Use:* **Table D-2** lists the impacts associated with a forecast that could be 10% greater than the new Port of Seattle forecast described in Chapter 2 of the Supplemental EIS. Relative to Case 1, the Do-Nothing alternative with Case 2 would only differ in year 2000, where the existing airfield could accommodate more traffic. The "With Project" Case 2 could accommodate the demand and thus noise impacts would be greater. As the table shows, Case 2 noise related housing impacts would be as much as 16% greater than the new forecast examined by this Supplemental EIS. If demand were to grow faster than is now forecast, noise impacts would be expected to be greater. By 2020, "With Project" 65 DNL noise impacts could reach 17,470 people in contrast to 11,630 people in 2020 under the Do-Nothing.

- *Air Quality:* Based on the 10% higher activity levels, an emissions inventory was estimated. As is shown, the greater growth in aircraft activity, relative to the new Port forecast, would result in greater emissions in years 2000, and 2005 for the Do-Nothing alternative. As activity would reach the maximum capacity of 460,000 operations between 2005 and 2010, emissions would be the same as the new forecast. While activity levels would be greater "With Project" the emissions inventory would show aircraft contributing less pollution in comparison to the Do-Nothing, because the Master Plan Update improvements would provide substantial delay reduction.

  An extrapolation of the dispersion analysis shows that while concentrations at the intersections would be greater, the "With Project" levels would not exceed those of the Do-Nothing. It would be anticipated that, based on the worst-case weather and activity levels examined, that the concentrations at the most severely congested intersections could increase by 10% to as much as 40%.

- *Surface Transportation* - Using the 10% increase in the new Port forecast, the impacts on the airport and regional airport system were considered. **Table D-2** shows how the greater passenger demand could affect airport traffic levels. Regional traffic would be expected to be the same for the Do-Nothing and "With Project". Because most intersections along International Boulevard are operating at poor levels of service today, the greater levels of airport growth could degrade conditions. Regardless of the improvements undertaken at Sea-Tac Airport, intersections along International Boulevard in the immediate airport area are expected to operate at LOS D or worse (with most intersections operating at LOS F) by 2020. Similar to Case 2, improvements associated with the SR 509 Extension could alleviate congestion along International Boulevard, but that project would provide benefits to both the Do-Nothing and "With Project" alternatives.

- *Water Resources (Floodplains, Streams, Wetlands, etc.):* As no other improvements are proposed to address demand above 19 million enplanements, no other impacts to water resources beyond that identified by the Final EIS would be expected.

- *Property Acquisition:* As no other improvements are proposed to address demand above 19 million enplaned passengers, no acquisition beyond that identified by the Final EIS would be expected.

- *Socio-Economic Impacts:* If activity were to grow faster than now forecast, the level of personnel needed at the Airport would be expected to be greater. The level of employment would be expected to increase in direct proportion to the increase in enplaned passengers. As the Do-Nothing and "With Project" forecasts would be the same, the employment levels would be expected to be the same. Whereas the new forecasts anticipate 236,800 jobs in 2000, a 10% increase in enplanements would increase employment to 260,480 jobs. By 2010, jobs would be expected to reach 537,650.

- *Earth/Fill Requirements:* As no other improvements are proposed by the Master Plan Update improvements to address demand above 19 million enplanements, no other earth/fill requirements beyond that identified by the Final EIS would be expected.

(C) Case 3: Demand Grows at a Faster Rate than Forecast - is Constrained by Do-Nothing

A number of commentors on the Master Plan Update EIS questioned the assumption that the number of passengers served under the Do-Nothing alternative would be the same as the number served by the "With Project" alternatives. The February, 1996 Final EIS (Volume 4 - Appendix R) discussed the basis for that assumption. Also, in the event that that assumption proves incorrect, the Final EIS presented an analysis of potential impacts of higher forecasts under the "With Project" alternatives, and lower forecasts under the Do-Nothing alternative. Similar to that analysis, Case 3 in this Supplemental EIS analyzes the potential differences in impacts between a "With Project" alternative with a 10% higher forecast and a Do-Nothing alternative in which enplanements are held constant at the 2010 level under the Port's new forecast (17.9 million enplanements). The 17.9 million level was assumed, for analysis and comparison purposes, as the maximum level of passengers served at the Airport due to terminal and landside facility constraints, declining passenger activity due to increasing delay, or other factors. This assumption enables a contrast of the 10% higher forecast with a Do-Nothing unconstrained (Case 2) with a constrained Do-Nothing (Case 3). The following summarize the impacts:

- *Noise and Land Use:* Case 2 and Case 3 noise exposure conditions are identical, as both cases assume that "With Project" demand is 10% greater than now forecast, yet the Do-Nothing aircraft operations levels are constrained at 460,000.

- *Air Quality:* Similar to noise impacts, the aircraft emissions inventory for Case 3 would be the same as Case 2, as the aircraft activity levels of the two cases are the same. The intersection Carbon Monoxide concentration analysis shows that when passenger levels exceed the 17.9 million enplanement level, that the difference between the "With Project" and Do-Nothing pollutant levels could require institution of mitigation measures. The results of the existing and future 8-hour CO evaluation for the Final EIS and this Supplemental EIS show exceedance of the ambient air quality standards regardless of whether improvements occur at Sea-Tac. The results of the Case 3 test, show that 8-hour CO levels at the two intersections could exceed the AAQS and "With Project" concentrations would be greater than the Do-Nothing. If this condition occurred, at the South 188th Street intersection, mitigation should be considered to abate about 2 ppm, and at the South 170th Street intersection about 1 ppm in mitigation should be considered. This mitigation could be accomplished through alterations to the geometry of the intersections to add additional or high capacity turn-lanes, improved signalization or other measures that would be considered in the future planning processes.

- *Surface Transportation:* As noted previously, many of the intersections along International Boulevard are expected to continue to operate at a poor level of service in the future regardless of the improvements undertaken at Sea-Tac. Nevertheless, as shown in **Table D-2**, the amount of traffic to and from the Airport would be approximately 12-39% higher under the "With Project" alternative compared to the Do-Nothing alternative. In any event, mitigation of impacts through intersection and roadway improvements, transit improvements, demand management activities, and/or other measures should be considered in future planning processes.

- *Water Resources (Floodplains, Streams, Wetlands, etc.):* As no other improvements are proposed to address demand above 19 million annual enplanements, no other impacts to water resources beyond that identified by the Final EIS would be expected.

- *Property Acquisition:* As no other improvements are proposed to address demand above 19 million enplanements, no acquisition beyond that identified by the Final EIS would be expected.

- *Socio-Economic Impacts:* If the Do-Nothing condition were not able to accommodate the forecast passenger demand, economic conditions could suffer, particularly if the passenger demand were not satisfied within the region. By 2010, this could result in the loss of 39,230 potential jobs. By 2020, this could increase to a loss of 145,320 jobs (With Project 537,650 jobs versus Do-Nothing 392,330 jobs) or about 40% of the potential jobs.

- *Earth/Fill Requirements:* As no other improvements are proposed to address demand above the 19 million enplanements, no other earth/fill requirements beyond that identified by the Final EIS would be expected.

TABLE D-2
SUMMARY OF IMPACTS ASSOCIATED WITH ALTERNATIVE FORECAST ASSUMPTIONS

Aircraft Noise Impacts (65 DNL and greater noise exposure)

	Master Plan Update Forecast		New Port Forecast (SEIS)		10% Faster Growth (Case2)		10% Faster Growth (Case3)	
	Population	Housing	Population	Housing	Population	Housing	Population	Housing
1994 Existing	31,800	13,620	31,800	13,620	*31,800*	*13,620*	*31,800*	*13,620*
Alt 1 Do-Nothing								
2000	8,970	3,870	11,310	4,820	*12,940*	*5,510*	*12,940*	*5,510*
2005	n/a	n/a	10,450	4,450	*10,950*	*4,660*	*10,950*	*4,660*
2010	9,450	4,060	11,940	5,060	*11,940*	*5,060*	*11,940*	*5,060*
2020	10,800	4,610	*11,630*	*4,950*	*11,630*	*4,950*	*11,630*	*4,950*
Alt. 3 (North Unit Terminal)								
2000	9,890	4,020	11,310	4,820	*12,940*	*5,510*	*12,940*	*5,510*
2005	n/a	n/a	10,440	4,400	*12,120*	*5,110*	*12,120*	*5,110*
2010	9,860	4,190	13,220	5,520	*15,340*	*6,410*	*15,340*	*6,410*
2020	11,240	4,740	*15,060*	*6,350*	*17,470*	*7,370*	*17,470*	*7,370*

Aircraft Emissions Inventory - Annual Tons of Pollutants Emitted

	Master Plan Update Forecast		New Port Forecast (SEIS)		10% Faster Growth (Case2)		10% Faster Growth (Case3)	
	Carbon Monoxide	Nitrogen Oxides	Carbon Monoxide	Nitrogen Oxides	Carbon Monoxide	Nitrogen Oxides	Carbon Monoxide	Nitrogen Oxides
Alt 1 (Do-Nothing)								
2000	976	1,234	1,266	1,476	*1,393*	*1,624*	*1,393*	*1,624*
2005	n/a	n/a	1,672	1,626	*1728*	*1,681*	*1,728*	*1,681*
2010	1,245	1,525	2,014	1,802	*2,014*	*1,802*	*2,014*	*1,802*
2020	1,875	2,047	*2,014*	*1,802*	*2,014*	*1,802*	*2,014*	*1,802*
Alt. 3 (North Unit)								
2000	986	1,234	1,266	1,476	*1,393*	*1,624*	*1,393*	*1,624*
2005	n/a	n/a	1,524	1,613	*1,676*	*1,774*	*1,676*	*1,774*
2010	1,249	1,524	1,698	1,784	*1,868*	*1,962*	*1,868*	*1,962*
2020	1,833	2,006	*1,906*	*2,002*	*2,096*	*2,202*	*2,096*	*2,203*

TABLE D-2

SUMMARY OF IMPACTS ASSOCIATED WITH ALTERNATIVE FORECAST ASSUMPTIONS

Carbon Monoxide Concentrations at Receptor 2 (ppm) Note: AAQS 9 ppm

	Master Plan Update Forecast		New Port Forecast (SEIS)		10% Faster Growth (Case2)		10% Faster Growth (Case3)	
	International Blvd./S 188th	International Blvd./S. 170th	International Blvd./S 188th	International Blvd./S. 170th	International Blvd./S 188th	International Blvd./S. 170th	International Blvd./S 188th	International Blvd./S. 170th
Alt 1 (Do-Nothing)								
2000	12.18	9.31	19.1	13.0	*21.0*	*14.3*	*21.0*	*14.3*
2005	na	na	18.1	13.0	*19.9*	*14.3*	*19.9*	*14.3*
2010	11.55	8.96	18.3	13.2	*20.1*	*14.5*	*18.3*	*13.2*
2020	10.43	9.45	*22.8*	*16.4*	*25.1*	*18.1*	*18.3*	*13.2*
Alt. 3 (North Unit)								
2000	12.18	9.03	18.9	12.8	*20.8*	*14.1*	*20.8*	*14.1*
2005	na	na	17.8	12.3	*19.6*	*13.5*	*19.6*	*13.5*
2010	10.57	8.96	17.8	12.5	*19.6*	*13.8*	*19.6*	*13.8*
2020	10.22	9.10	*22.2*	*15.6*	*24.4*	*17.1*	*24.4*	*17.1*

Annual Average Daily Number of Vehicles Accessing Sea-Tac Airport (Total Airport Traffic - Table O-B-1)

	Master Plan Update Forecast	New Port Forecast (SEIS)	10% Faster Growth (Case 2)	10% Faster Growth (Case 3)
Alt 1 (Do-Nothing)				
2000	86,465	89,810	*100,240*	*100,240*
2005	n/a	101,440	*110,170*	*110,170*
2010	110,750	114,040	*124,500*	*111,000*
2020	120,300	*141,100*	*154,380*	*111,000*
Alt. 3 (North Unit)				
2000	83,645	85,860	*102,770*	*102,770*
2005	n/a	97,640	*109,470*	*109,470*
2010	105,140	113,290	*123,890*	*123,890*
2020	129,055	*140,420*	*153,750*	*153,750*

Wetland Impact (Acres)

	Master Plan Update FEIS		New Port Forecast (SEIS)		10% Faster Growth (Case 2 and 3)	
	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3
Wetlands Filled	1.7	10.4	1.7	12.23	1.7	12.23

Note: The Master Plan Update EIS wetland impacts reflect the information reported in the Final EIS. Subsequent refinement of that evaluation has identified 12.23 acres of wetland impact

Stream Relocations (Linear Feet)

	Master Plan Update FEIS		New Port Forecast (SEIS)		10% Faster Growth (Case 2 and 3)	
	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3
Relocation	2,200	6,100	2,200	6,100	2,200	6,100

TABLE D-2

SUMMARY OF IMPACTS ASSOCIATED WITH ALTERNATIVE FORECAST ASSUMPTIONS

Floodplain Impacts (Acres)

	Master Plan Update FEIS		New Port Forecast (SEIS)		10% Faster Growth (Case 2 and 3)	
	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3
Displaced Floodplain	0.00	7.2	0.00	7.2	0.00	7.2

Property Acquisition (total units of property)

	Master Plan Update FEIS		New Port Forecast (SEIS)		10% Faster Growth (Case 2)		10% Faster Growth (Case 3)	
	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3
Single Family	0	391	0	391	0	391	0	391
Apt/Condos	0	260	0	260	0	260	0	260
Business	0	105	0	105	0	105	0	105

Socio-Economic Impacts (Loss of Taxes - Property Taxes and Sales Taxes expressed in millions)

	Master Plan Update FEIS		New Port Forecast (SEIS)		10% Faster Growth (Case 2)		10% Faster Growth (Case 3)	
	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3
Lost Taxes	0	$2.4	0	$2.4	0	$2.4	0	$2.4

Socio-Economic Impacts (Total Jobs - not including construction jobs)

	Master Plan Update FEIS		New Port Forecast (SEIS)		10% Faster Growth (Case 2)		10% Faster Growth (Case 3)	
	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3
2000	205,690	205,690	236,800	236,800	260,480	260,480	260,480	260,480
2005	n/a	n/a	312,290	312,290	343,520	343,520	343,520	343,520
2010	335,344	335,344	392,330	392,330	431,560	431,560	392,330	431,560
2020	418,632	418,632	488,770	488,770	537,650	537,650	392,330	537,650

Amount of Earth/Fill Needed (Million Cubic Yards)

	Master Plan Update FEIS		New Port Forecast (SEIS)		10% Faster Growth (Case 2)		10% Faster Growth (Case 3)	
	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3	Alt 1	Alt 3
Fill Needed	2.4	23	2.4	23	2.4	23	2.4	23

Source: Synergy Consultants, Inc. - extrapolated from the *Supplemental* and *Final Environmental Impact Statement*; May 1997