TIE

Port of Seattle

SOUTH AVIATION SUPPORT AREA

Final Environmental Impact Statement

March 1994

Federal Aviation Administration
Seattle Airports District Office

Port of Seattle

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Final Environmental Impact Statement

Seattle-Tacoma International Airport
South Aviation Support Area
SeaTac, King County, Washington

Lead Agencies:

U.S. Department of Transportation
Federal Aviation Administration

and

The Port of Seattle

This statement addresses the environmental impacts associated with the construction of an aviation maintenance support area and associated Federal actions and is submitted for review pursuant to the public law requirements of Section 102(2) (C) of the National Environmental Policy Act of 1969.

For further information, contact:

Ms. Cayla Morgan
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, WA 98055-4056
(206) 227-2653

or

Ms. Barbara Hinkle
Port of Seattle
P.O. Box 1209
Seattle, WA 98111
(206) 728-3193

or

Ms. Geraldine Poor
Port of Seattle
P.O. Box 68727
Seattle, WA 98168-0727
(206) 248-6866

Public Review Locations

Boulevard Park Library
12015 Roseberg South
Seattle

Burien Library
14700 6th Avenue SW
Seattle

Foster Library
4205 South 142nd
Seattle

Valley View Library
17850 Military Road South
Seattle

Des Moines Library
22815 24th Avenue South
Des Moines

Tukwila City Hall
6200 Southcenter Blvd.
Tukwila

Normandy Park City Hall
801 SW 174th
Normandy Park

SeaTac City Hall
19215 28th Avenue South
SeaTac

Des Moines City Hall
21630 11th Avenue South
Des Moines

PIP Printing
21423 Pacific Highway South
SeaTac

Port of Seattle
Pier 66 Reception Desk
2201 Alaskan Way
Seattle

Port of Seattle
Aviation Communications Department
Reception
Third Floor
Seattle-Tacoma International Airport

Federal Aviation Administration
Seattle Airports District Office
Suite 250
1601 Lind Avenue SW
Renton

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES

LIST OF TABLES

Summary

1. SUMMARY

1.1 DESCRIPTION OF SCOPING PROCESS

The scoping period required by CEQ 1501.7 is intended to provide "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." Scoping is meant to focus the environmental review process on important issues and reduce the analysis of extraneous subjects.

The notice of intent was published in the *Federal Register* on September 11, 1991. The scoping notice was published in the *SEPA Register* on September 6, 1991. Written comments were accepted through October 31, 1991. A public meeting was held October 16, 1991 at the SeaTac Fire Department to explain the proposed project and take oral comments from interested individuals. Displays showing the project area and the identified elements of concern were available, and members of the Project team, including Port and FAA staff and consultants, were available to answer informal questions. Three people offered oral comments.

The majority of the written and oral comments focussed on the following elements of the environment: noise, air quality, contamination of soil and groundwater, transportation, land use, wetlands, and impacts to Des Moines Creek.

1.2 ALTERNATIVES STUDIED

In addition to No Action, three project alternatives representing a range of development intensities were examined. Alternative 1 would develop approximately 60 acres for aircraft line maintenance facilities. About 40 acres of the site would be available for non-aviation development. Alternative 2 would develop approximately 84 acres for aircraft line maintenance as well as a base maintenance complex. About 20 acres of the site could be used for non-aviation development. With Alternative 3, maximum site area of about 116 acres would be developed for aviation uses, including both line and base maintenance as well as some future expansion capability. Approximately 7 acres could be provided for non-aviation development. These alternatives are more fully described in Section 3 of this EIS. Alternative 2 was chosen as the preferred alternative because it is the minimum site development that could accommodate the program requirements for both line and base maintenance facilities, it allows for non-aviation development as a use buffer along 28th Avenue South, and it provides for extensive mitigation and enhancement in the areas of water quality, wetland/stream habitat, and noise control.

1.3 SUMMARY OF IMPACTS

See Table 1.3-1 for a summary of the impacts.

1.4 IDENTIFICATION OF MITIGATION MEASURES

See Table 1.3-1 for a summary of possible mitigation measures.

1.5 FINAL EIS

Volume I of the Final Environmental Impact Statement (Final EIS) contains the complete text of the Draft EIS with additions and changes made in response to comments. Significant changes appear with a line in the left margin.

1.6 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 action are consistent with the existing national environmental policies and objectives as set forth in Section 101 (a) of the National Environmental Policy Act of 1969.

Edward G. Tatum

Edward G. Tatum, Manager
Airports Division
Northwest Mountain Region
Federal Aviation Administration

Date: March 15, 1994

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS.[a]

Alternatives	Impacts	Mitigation Measures
Land Use		
No Action	None	None
Alternative 1	Construction. None Operation. An aviation maintenance facility would take up the site currently occupied by a school, vacated residential areas, a golf course, and undeveloped properties.	None
Alternative 2 (Preferred)	Construction. None. Operation. Slightly greater impacts than Alternative 1, corresponding with a slightly greater affected area.	None
Alternative 3	Construction. None. Operation. Largest area affected, so there are greater impacts than Alternatives 1 and 2.	None
Induced Socioeconomic Impacts		
No Action	There could be up to approximately 1,750,000 square feet of commercial development with 7,104 direct and indirect jobs produced by operation through 2003.	None

[a]Only the elements of the environment that have identified impacts are listed in the summary table. See Chapter 4 for a complete discussion of impacts.

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 1	Construction. There would be approximately 3,716 direct and indirect SASA-related construction jobs created. Operation. There would be a net beneficial impact of an additional 9,442 direct and indirect SASA-related operation jobs created under Alternative 1. There would also be increased tax revenues over No Action.	Encouraging contractors to purchase as many materials as possible within the City of SeaTac would increase local sales tax revenues.
Alternative 2 (Preferred)	Construction. 7,696 direct and indirect SASA-related construction jobs would be created. Operation. Beneficial employment impacts would result from Alternative 2 (7,984 new direct and indirect SASA-related operation jobs) by 2003. The tax revenue from Alternative 2 would be somewhat less than for Alternative 1.	Same as Alternative 1
Alternative 3	Construction. 9,374 direct and indirect SASA-related construction jobs would be created. Operation. 4,429 direct and indirect SASA-related operation jobs would be created. Total estimated tax revenues are lowest under this alternative.	Same as Alternative 1
Noise		
No Action	No aircraft-related noise would be produced by SASA. Vehicle traffic noise would be slightly more noticeable than today (1 to 2 dBA).	

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 1	<u>Construction</u>. Temporary truck and equipment noise would be produced. Construction noise is exempt from state and local noise standards. <u>Operation</u>. There would be no increase in noise from flight operations. Additional noise from taxiing to and from SASA would be minor. No additional residences would be impacted by noise levels greater than 65 Ldn.	<u>Construction</u>. Standard measures including limiting construction to daytime hours, using mufflers on engines, and using portable acoustic barriers would mitigate construction noise. <u>Operation</u>. No additional aircraft noise mitigation is anticipated beyond the rules and regulations already in place.
Alternative 2 (Preferred)	<u>Construction</u>. Similar to Alternative 1. <u>Operation</u>. Similar to Alternative 1.	A hush facility would be constructed to attenuate noise from engine runups.
Alternative 3	<u>Construction</u>. Similar to Alternative 1. <u>Operation</u>. Similar to Alternative 1.	Similar to Alternative 2
Air Quality		
No Action	No aircraft-related air emissions would be produced by SASA. Vehicle traffic emissions would exceed standards at several intersections.	None
Alternative 1	<u>Construction</u>. Dust would be produced by earth-moving activities. Heavy trucks and other equipment would slightly degrade local air quality. However, existing traffic would likely exceed construction emissions. <u>Operation</u>. Largest source of emissions would be generated by aircraft taxiing to SASA site. Modeling suggests that total SASA emissions would be a fraction of a percent of that currently produced at the airport. Vehicle traffic emissions would not significantly increase but would exceed standards at several intersections similar to No Action.	<u>Construction</u>. Standard measures, including lightly spraying exposed soils with water, would reduce dust emissions. <u>Operation</u>. Minimize aircraft run-up durations at all power settings. Minimize aircraft taxiing and queing times. For maintenance, solvents could be used that are less prone to evaporation.

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 2 (Preferred)	Construction. Similar to Alternative 1 but more dust would be generated. Operation. Similar to Alternative 1.	Similar to Alternative 1
Alternative 3	Construction. Similar to Alternative 1 but more dust would be generated. Operation. Similar to Alternative 1.	Similar to Alternative 1
[illegible]		
No Action	None	None
Alternative 1	Construction. Increased sediment loads in runoff, due to erosion would impact Des Moines Creek. Potential construction fuel spills and chemical releases during grading and construction could cause adverse water quality impacts. Relocation of the existing detention pond could adversely impact Des Moines Creek. Operation. Relocation of approximately 3,075 feet of stream bed could increase water temperatures and change oxygen levels. Stormwater runoff to Des Moines Creek would be less than existing conditions.	A net improvement in creek water quality is expected. Good construction practices, including erosion and spill control, would mitigate water quality impacts. Shade trees planted by relocated creek would decrease temperature. The Runoff Treatment Facility ponds would mitigate any large spill occurrences on the SASA site.
Alternative 2 (Preferred)	Construction. Fewer potential impacts than Alternative 1 and Alternative 3. Detention pond impacts would be same as Alternative 1. Operation. Similar to Alternative 1.	Similar to Alternative 1

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 3	Construction. Slightly increased erosion sedimentation impacts over Alternative 2. Creek relocation impacts would be slightly more than Alternative 2. Operation. Alternative 3 would have the greatest amount of roof surface of any of the alternatives, therefore, a greater potential for airborne pollutant runoff.	Similar to Alternative 1
No Action	None	None
Alternative 1	Construction. The fill of riparian fringe would occur, as well as the fill of seep wetlands which could alter groundwater discharge and eliminate forested wetland habitat. 2.2 total acres filled. Operation. Wetland impacts would occur during construction.	Minimization of wetlands impacts would be incorporated into design criteria. Filled wetlands would be replaced with greater acreage of new wetlands. Enhancement of existing degraded wetlands could be undertaken. See Appendix G for a conceptual discussion of the Natural Resources Mitigation Plan and Appendix D for the Des Moines Creek Mitigation Plan.
Alternative 2 (Preferred)	Construction. Fewer wetland area impacts than Alternatives 1 and 3 would require some fill and relocation of portion of Des Moines Creek. 1.9 total acres filled. Operation. Same as Alternative 1.	Similar to Alternative 1
Alternative 3	Construction. Large portions of Des Moines Creek to be filled, relocated, or culverted. More impacts than Alternatives 1 and 2. Fill of riparian fringe would result in loss of ability to improve water quality, and provide habitat and reduce flood flows. 2.2 total acres filled. Operation. Same as Alternative 1.	Similar to Alternative 1

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Earth		
No Action	None	None
Alternative 1	Construction. Potential erosion impacts caused by excavation. A partial interruption of groundwater flow to Des Moines Creek would occur with excavation. Operation. Fills associated with raising the site grade may cause the existing soils to settle and put pressure on the fills or retaining walls.	Dewatering would be required. During construction and operation of SASA, groundwater flow into Des Moines Creek would be directed to minimize flow. French drain systems to be modified to maintain groundwater flow to the Creek during construction and operation.
Alternative 2 (Preferred)	Construction. Same as Alternative 1. In addition, concrete rubble, etc. that is currently used as fill on the Seattle Christian School site would need to be removed. Operation. Same as Alternative 1.	Similar to Alternative 1
Alternative 3	Similar to Alternative 2	Similar to Alternative 2
Biotic Communities (Flora and Fauna)		
No Action	None	None
Alternative 1	Construction. Except for small stretch of stream channel, all existing wildlife habitat would be destroyed by clearing and grading necessary for construction. 3,075 feet of existing streambed would be relocated. Operation. Relocation of Des Moines Creek would provide better fishery habitat.	Proposed wetland restoration would provide new habitat. Net gain of 1,315 feet of open channel for Des Moines Creek.

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 2 (Preferred)	Same as Alternative 1. 2,280 feet of existing streambed would be relocated.	Net gain of 1,820 feet of open channel for Des Moines Creek.
Alternative 3	The larger site area would have greater adverse impacts on habitat. 3,075 feet of existing streambed would be relocated.	Net gain of 195 feet of open channel for Des Moines Creek.
Transportation		
No Action	In 1994, no new development would occur on the SASA site. LOS F conditions would exist at three study area intersections. As of February 1994, current status of the City projects is that implementation of some projects has been delayed pending justifying traffic demand and/or funding commitments. Three study area intersections would experience an increase in average vehicle delay of greater than 20 seconds. No construction traffic impacts are expected. In 2003, new development would generate 16,424 daily trips. No traffic generated by aviation-related uses. LOS F conditions would exist at nine study area intersections. Nine study area intersections would experience an increase in average vehicle delay of greater than 20 seconds.	City of SeaTac 1992-1997 TIP projects to be completed by 1993 assumed to be in place by 1994. SR 509 extension to I-5, South Access Expressway to airport, and realignment/widening of the 28th/24th Avenue South, between South 188th Street and South 216th Street assumed to be in place by 2003. Project would contribute to intersection modifications to improve LOS F intersections to LOS E or better.
Alternative 1	In 1994, impacts are identical to the No-Action Alternative. About 1,070 one-way truck trips per day are expected during earthwork activity causing LOS F at three intersections. In 2003, proposed uses would generate 16,530 daily trips. Aviation-related uses account for less than one percent of overall traffic generation. LOS F conditions at same nine intersections as No-Action Alternative. Same nine intersections would experience an increase in average delay of greater than 20 seconds, compared to existing conditions.	Same as No-Action Alternative. The retention of almost all excavated material at the airport should greatly reduce construction truck activity on local streets.

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 2 (Preferred)	In 1994, operation impacts identical to the No-Action Alternative, except the existing Alaska Airlines base maintenance activities currently located on Sea-Tac airport property north of South 188th Street, would be relocated to the SASA site displacing 1,000 parking spaces. Construction traffic impacts with Alternative 2 would be similar to, though less than, those described for Alternative 1. About 612 one-way truck trips per day during earthwork activity. In 2003, proposed uses would generate 12,133 daily trips. Aviation-related uses account for about 27 percent of overall traffic generation. LOS F at the same nine intersections as No-Action Alternative would experience an increase in average vehicle delay of greater than 20 seconds, compared to existing conditions.	Same as Alternative 1.

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 3	In 1994, operation impacts identical to Alternative 2. Construction traffic impacts with Alternative 3 would be much greater than those described for either Alternative 1 or Alternative 2. About 4,142 one-way truck trips per day during earthwork activity causing LOS F conditions at 6 intersections. In 2003, proposed uses would generate 6,654 daily trips. Aviation-related uses account for about 49 percent of overall traffic generation. The average vehicle delay is slightly lower at most intersections with Alternative 3 compared to all other alternatives in 2003. There would be LOS F at seven of the nine intersections identified for No-Action Alternative. The average vehicle delay would be slightly lower at most intersections with Alternative 3 compared to all other alternatives in 2003. Same nine intersections as No-Action Alternative would experience an increase in average vehicle delay of greater than 20 seconds, compared to existing conditions.	Same as Alternative 1. Earthwork activity would be conducted over longer time period or project grading could be modified to balance the cut and fill requirements. Temporary traffic signal and/or manual traffic control is needed at South 192nd Street/28th Avenue South during earthwork activity.
Aesthetics and Urban Design		
No Action	None	None
Alternative 1	Alternative 1 would have 350 foot setback from the eastern edge which would allow other uses to locate along 28th Avenue South or for existing vegetation to remain as screening.	Design features such as setbacks and plantings are to be incorporated into the project to mitigate height and bulk view impacts.

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Alternative 2 (Preferred)	A large retaining wall on the south end of the site would block views in Alternatives 2 and 3. A lesser degree of view impacts than Alternative 3 would be expected.	Design features including setbacks of buildings and sloped walls to mitigate height and bulk of wall. Plantings should also be incorporated in design.
Alternative 3	Larger project footprint than Alternatives 1 and 2, greatest potential changes in views. Alternative 3 would have no eastern setback.	Similar to Alternatives 1 and 2.
Light Emissions		
No Action	None	None
Alternative 1	Ramp flood lighting during operation could cause glare impacts to building occupants to the east.	Impacts could be mitigated by using directional shields on exterior light fixtures or by using low-intensity lighting.
Alternative 2 (Preferred)	Similar to Alternative 1	Similar to Alternative 1
Alternative 3	Similar to Alternative 1	Similar to Alternative 1
Recreation		
No Action	If the Port chose to extend the lease, the Tyee Valley Golf Course could remain in operation as an 18-hole course.	None
Alternative 1	Golf course would discontinue operation.	Future possibility of a 9-hole course.
Alternative 2 (Preferred)	Similar to Alternative 1	Similar to Alternative 1
Alternative 3	Similar to Alternative 1	Similar to Alternative 1

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Hazardous Materials and Waste		
No Action	None	None
Alternative 1	Construction. Buildings to be demolished may contain asbestos materials. Three transformers in the area may be removed and would be tested for PCB content. Operation. Wastewaters may inadvertently contain limited concentrations of metals, solvents, and oils.	Construction. Prior to demolition, structures should be inspected for any asbestos containing material which should be properly removed and disposed of prior to construction. Operation. Proper handling, disposal and transport of hazardous wastes would mitigate potential impacts. Airlines would be required to develop spill control and response plans. Wastewater would be discharged to Runoff Treatment Facility; any hazardous wastes would be disposed of separately to reduce potential contamination.
Alternative 2 (Preferred)	Similar to Alternative 1	Similar to Alternative 1
Alternative 3	Similar to Alternative 1	Similar to Alternative 1
Public Services and Utilities		
No Action	No SASA - attributable impacts.	None
Alternative 1	Existing services are generally adequate to serve SASA facility. Water and electricity systems would have to be upgraded.	None
Alternative 2 (Preferred)	Similar to Alternative 1	None
Alternative 3	Similar to Alternative 1	None

Table 1.3-1. Environmental impacts and mitigation measures for alternatives considered in the Port of Seattle South Aviation Support Area FEIS (continued).

Alternatives	Impacts	Mitigation Measures
Energy Supply and Natural Resources		
No Action	None	None
Alternative 1	Construction. Diesel fuel would be consumed during construction. Operation. Would consume electricity and natural gas; no significant impact to natural resources.	Decrease energy consumption during construction through adherence to prescribed maintenance. Build energy conservation measures into hangar design.
Alternative 2 (Preferred)	Similar to Alternative 1	Similar to Alternative 1
Alternative 3	Similar to Alternative 1	Similar to Alternative 1
Historic, Architectural, Archaeological and Cultural Resources		
No Action	None	None
Alternative 1	No inventoried historic properties have been identified on the proposed SASA site.	If archaeological remains were found during construction, work would stop; State Historic Preservation Office would be notified, and an archaeologist would survey the site.
Alternative 2 (Preferred)	Similar to Alternative 1	Similar to Alternative 1
Alternative 3	Similar to Alternative 1	Similar to Alternative 1

Purpose of and Need for the Action

2. PURPOSE OF AND NEED FOR THE ACTION

2.1 NEED FOR THE PROJECT

In 1942, the Port of Seattle voted to assume responsibility for a new major airport in the Puget Sound region. Nine hundred and six acres were acquired by the Port to build the Bow Lake Airport. Limited operations began in 1944, and by 1947, Northwest Orient Airlines and Western Airlines began offering commercial services. A passenger terminal was completed in 1949.

Over time, land acquisition rose to 2,400 acres and numerous improvements were made to what is now Seattle-Tacoma International Airport. Figure 2.1-1 shows the general vicinity and project site. The improvements included the building of an additional runway, a taxiway, and the addition of navigational aids. New mail, cargo, hangar, and fire station facilities were built. Utilities and support infrastructures were improved to keep up the growth of the airport.

Between 1959 and 1970, extensive additions and improvements were made to the passenger terminal and in 1965 the main terminal was remodeled. The restaurant, shops, cocktail lounge, and lobby were all altered.

From 1967 to 1973, $175 million was spent on expanding the terminal. Ticketing and baggage claim facilities, a two-level drive, supporting road service, two midfield satellite facilities, an automated subsurface transit system, and an 8-level public parking structure were built.

Since 1978, when the federal government deregulated the airline industry, the number of airlines using Sea-Tac International Airport has doubled. This has led to an increased demand for ticketing and baggage claim space. Due to the increase in international flights, the Federal Inspection Services (FIS) facilities were expanded in 1983.

The 1985 Update of the Airport Master Plan examined the need for facilities to support operations at Sea-Tac International Airport. Operations were forecasted to eventually reach approximately 20 million passengers annually. The Comprehensive Planning Review, presented to the Port Commission in 1988, projected an annual volume of 25 to 27 million passengers for the year 2000 with a corresponding 390,000 aircraft operations. This level of activity would lead to severe congestion at the airport as it is presently designed, specifically at the terminal area and the aviation support facilities. The latest activity forecast, recently completed for the Puget Sound Air Transportation Committee (PSATC), projects an annual passenger demand of 25.4 million in 2000 and 410,000 aircraft operations.

This increase in air passengers is putting pressure on the passenger terminal. While concourse and garage construction projects are already underway, more improvements are necessary, especially for international visitors. The proposed solution includes increasing

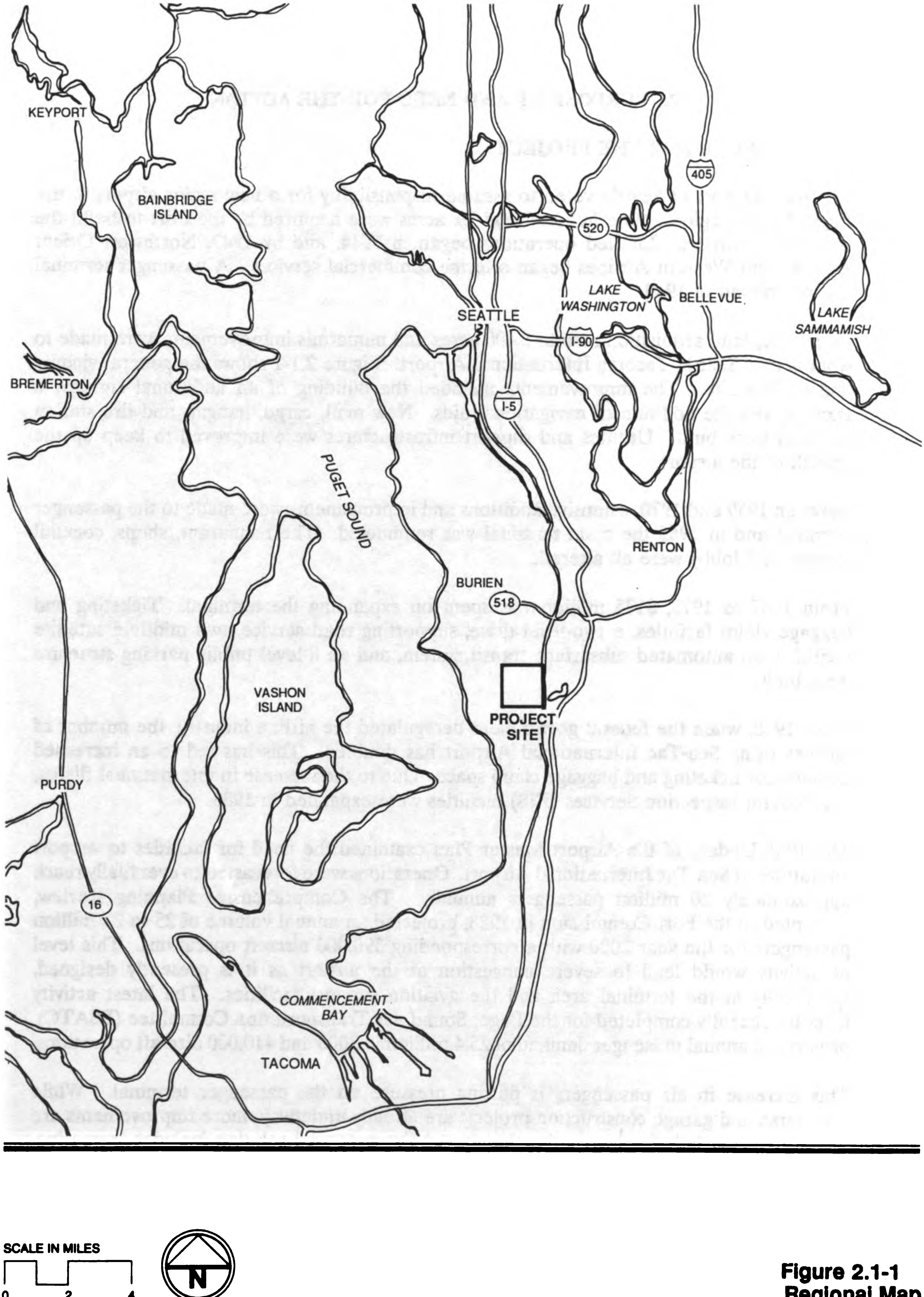


Figure 2.1-1
Regional Map

the number of international gates at the south end of the main terminal. Future expansion of the terminal to the south is shown in the 1985 Master Plan Update (Peat Marwick/TRA 1985) and reflected in the Sea-Tac Area Update. The current Terminal Development Plan Study supports the need for additional gates and expanded international facilities (e.g., customs, baggage handling). During design phases, the terminal development will be the subject of later environmental review. Please refer to the discussion of terminal development in Section 3.4.12. This construction would require the relocation of some or all of the existing line maintenance facilities used by Northwest, Delta, and Alaska airlines. These types of facilities need direct access to the airfield operating area.

Twice in the past four years, Sea-Tac International Airport has been requested to bid on locating a major base maintenance facility at the airport. The first request was made by Northwest Airlines who ultimately chose to locate elsewhere. A second request was made by Alaska Airlines. This request has prompted the Port to undertake the necessary planning and design to assure that a base maintenance facility can be accommodated at Sea-Tac International Airport.

As discussed in Section 3.3.5, Alaska Airlines has determined that they will not proceed with their maintenance base project at this time. As noted, in the past few years there have been two potential projects which could have resulted in siting an additional aircraft maintenance base at the Airport. As economic conditions for the airline industry improve, the Port expects that additional proposals of this type are likely to arise, particularly given the Airport's position as the primary airport for the Pacific Northwest and its strong role as an international trade and business center.

The Master Plan Update (1985) forecasted passenger numbers, cargo tonnage, and aircraft operations for short (approximately 1990) and long (approximately 2005) time frames. In 1990, the actual passenger volume was a third greater than the short-term projection. Cargo tonnage matched the projection. The actual number of aircraft operations in 1990 was 355,000. This was more than 50% greater than the Update estimate and even exceeded the long term projection of 300,000 annual operations. The current forecast is to reach 410,000 annual operations by the year 2000 and 447,000 in 2010. This forecast is based on meeting projected regional demand for aviation services and would be reached regardless of whether an additional runway is built at the Airport. This information was developed as part of the regional planning process and is supported by other forecasts, including the FAA's latest hub forecast.

As activity at the Airport increases, so does the scale of necessary support facilities. The consolidation of carriers within the industry has led to changes in the distribution of flights and the scale of operations at many airports. As the levels of service change for carriers at the Airport, their support facility needs change. All of the carriers that now have line maintenance facilities at the Airport have maintained sufficiently high levels of activity to justify their continued use. At least one other airline has increased service and indicated plans for further additions. As this growth occurs, additional demand for maintenance capability will develop for airlines which concentrate their activity at the Airport. Existing maintenance activities will require additional space and other airlines are likely to reach a level of operations where new line facilities are required. The 1985 Update set 50 acres as the long-term need for line maintenance area. That acreage was set on the basis of relocating the existing line maintenance facilities already at the Airport. With current forecasts of aircraft operations 50% higher, acreage requirements will increase, particularly as additional airlines reach the service levels which trigger new facilities.

Whatever regional decisions are reached regarding the development of additional airfield capacity, Sea-Tac International Airport will remain an important component of the aviation system. Effective planning requires that appropriate areas be prepared for the construction and operation of the facilities needed to meet projected growth. Preparation of an appropriate site is required in advance of projected facility need so that support operations can be established in coordination with demand and operational delays and costs avoided.

2.2 OBJECTIVES OF THE PROPOSED ACTION

The proposed action has three component objectives:

- To accommodate the existing line maintenance facilities that must be relocated prior to the expansion of the terminal facilities
- To accommodate future line maintenance expansion
- To accommodate major base maintenance facilities in response to existing and/or future market demands.

These objectives have similar function and location requirements and are proposed to be located in a development commonly referred to as the South Aviation Support Area (SASA). The discussion of alternatives and impacts associated with the development of SASA is intended to provide necessary understanding of the environmental implications of the proposal.

2.3 PROPOSED FEDERAL ACTIONS

Federal permits and approvals needed for the SASA facility would be similar for the three build alternatives.

2.3.1 Federal Aviation Administration Actions

The Port of Seattle proposes to construct an aviation maintenance support area at Seattle-Tacoma International Airport. From the FAA's perspective, the key actions the agency would have to take involve:

1) Decisions regarding project eligibility for Federal grant-in aid funds (See 49 U.S.C. app. 2201, et seq.) for:

   a. Land acquisition
   b. Site preparation
   c. Taxiway construction
   d. Wetland mitigation

2) Final approval of a revised airport layout plan (see P.L. 100-223, sec. 1090 (f); 49 U.S.C. app. 2210 (f)), and environmental approval (see 42 U.S.C. 4321-4347 and 40 CFR 1500-1508).

3) Certification of air quality conformance of the proposed SASA facility with applicable air quality limitations under National (section 176 (c)(1) of the Clean Air Act as amended [42 U.S.C. 7506 (c)]) and State ambient air quality standards.

4) Approval for and relocation/upgrade of existing instrument landing system (ILS) glide slope equipment for Runway 34R [see 49 U.S.C. 1348(b)].

5) A finding that the proposed project is reasonably necessary for use in air commerce or in the interests of national defense [see 49 U.S.C. App. section 1349(a)].

2.3.2 U.S. Army Corps of Engineers Actions

The Corps of Engineers would be responsible for permitting work on SASA that involves Des Moines Creek. They are the responsible federal agency which processes permits under the Clean Water Act (Section 404) and Rivers and Harbors Act (Section 10). The Corps also initiates the process for a water quality certification (Section 401 of the Clean Water Act) which is coordinated with the Washington Department of Ecology.

The Port has consulted with the Corps and appropriate agencies and has included their comments and concerns in the relocation design of Des Moines Creek. A plan view of the design is included as Appendix 0.

The Port will apply for an individual permit and go through the full Section 404 process, including and analysis of alternatives to the proposal that would completely avoid, or have less impacts to, wetlands.

During review of the permit applications, the Corps contacts other Federal, State, and local agencies such as the State Departments of Ecology, Fisheries, and Wildlife, and the U.S. EPA, U.S. Fish and Wildlife Service, and National Marine Fisheries Service for input and comments on the proposed action. Depending on permit procedures, adjacent property owners and the public may also be contacted and allowed an opportunity for review during a public hearing.

2.4 PROPOSED PORT OF SEATTLE ACTIONS

- Airport Layout Plan Update
- Adoption of Final EIS
- Application for applicable permits
- Construction of preferred alternative as identified in the Final EIS.

2.5 PROPOSED STATE AND LOCAL ACTIONS

State and local permits and approvals needed for the SASA facility would be similar for the three development alternatives. State and local actions would require completion of the SEPA review process.

2.5.1 Department of Ecology Actions

The Washington Department of Ecology oversees and administers several permit/approval programs. Their applciability to the SASA project is described below:

- National Pollutant Discharge Elimination System (NPDES) permit
- Water Quality Certification
- Temporary Modification of Water Quality Criteria
- Coastal Zone Management Certification
- Dam Safety Approval
- Reservoir Storage Permit.

The Port of Seattle already has an active NPDES permit governing the operation of their IWS facility. However, because the new SASA site would increase the volume of storm water runoff and likely carry with it added pollutants, Ecology would need to review, update, and possibly reissue the NPDES permit.

Ecology also administers permits under the Clean Water Act section 401. This permit is required for any activity that may result in a discharge to State waters. Permit approval is granted on condition that the activity complies with federal and state law regarding discharges to surface waters.

Any project affecting water quality generally requires authorization from Ecology allowing a temporary modification of the State's water quality standards. Affected water quality not only includes modifications to water temperature, pH, turbidity, and dissolved oxygen, but also to aesthetic values such as smell, taste, and sight.

Ecology reviews CZMP consistency through the Corps of Engineers Section 404/Section 10 permit process. The Port, as applicant, has determined that the SASA project and mitigation are outside the boundary of the area regulated under the CZMP. This determination will be reviewed by Ecology during the Corps of Engineers process.

The proposed SASA Storm Water Management Facility and IWS would detain more than 10 acre-feet of water. Construction of the facility would require dam safety approval. Plans and specifications of the facility must be reviewed and approved by Ecology before construction. Ecology would also inspect the construction.

Related to the dam safety approval is the reservoir storage permit. Generally, this permit is only required for those surface water impoundments where water will be stored for a beneficial use such as drinking water or irrigation. In the case of the SASA facility, water would only be stored to prevent excessive storm water runoff from entering Des Moines Creek. However, there would be times when the detention facility would be holding a substantial amount of water, and therefore Ecology has indicated that they would like to review the project under this permit's requirements. Because of the temporary nature of the storage, Ecology would undergo a shortened review process and issue a letter of approval instead of going through the normal full permit review.

2.5.2 Washington Department of Fisheries Actions

According to the Hydraulic Code of 1949 (RCW 75.20.100), any work performed within the high-water mark of state waters or that will use, divert, or change the natural flow of state waters must obtain a Hydraulic Project Approval (HPA) permit from the Washington Department of Fisheries. This law provides protection for fish and fish habitat. Generally, the Department of Fisheries may only make recommendations for areas inside of the high-water mark. However, if potential impacts have been documented in an EIS, they may also require mitigation measures or protection for areas outside the high-water mark, citing authority from SEPA. Because of the proposed work in Des Moines Creek, an HPA permit would be required.

2.5.3 Department of Community Development - Office of Archaeology and Historic Preservation (OAHP) Actions

Section 106 of the National Historic Preservation Act requires that projects which receive federal funding or require a federal permit be reviewed for possible impacts to historic and archaeologic resources. This review is coordinated with the FAA, as part of its review (see Appendix J). It is also part of the Corps of Engineers Section 404 permit process and OAHP approval is given in the form of a letter to the Corps.

2.5.4 Puget Sound Air Pollution Control Agency (PSAPCA) Actions

PSAPCA is the regional air pollution control agency having jurisdiction over King County. PSAPCA requires a Notice of Construction permit for projects that erect certain types of equipment, such as process or material handling equipment, that releases some air contaminant to the outside air, or control devices that prevent or control emissions of any air contaminant. For example, in the case of SASA, painting equipment used to paint planes would release organics and would therefore likely require a Notice of Construction permit approval. This permit would be the responsibility of the particular airlines which would locate facilities on the SASA site.

PSAPCA would also decide if a Prevention of Significant Deterioration (PSD) permit would be needed. If a PSD permit is needed, PSAPCA would initiate the process with Ecology who reviews and issues the PSD permit. This permit is required for facilities that emit over 100 tons of a regulated air pollutant. For the SASA project, organic air pollutants would be the most likely contaminants that may require a PSD permit.

2.5.5 Local Permit Actions

Local land use and construction permits would be issued by the Port or the City of SeaTac, depending on the project element or jurisdiction. These two agencies have agreed to close coordination in permit processing. Local permits would also be the responsibility of the airlines locating facilities on the SASA site.

Local permits needed for the SASA project include the following:

- Building permit
- Clearing and Grading permit
- Demolition permit.

Alternatives, Including the Proposed Action

3. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

3.1 DESCRIPTION OF THE ALTERNATIVES

In response to the growth of the airport and the need for aircraft support facilities, the Port of Seattle proposes to prepare an area for maintenance hangars and related activities. This EIS analyzes three "build" alternatives and the required No-Action Alternative. Alternatives 1, 2, and 3 have varying levels and types of aircraft maintenance. The Port would grade, pave, and extend utilities to the site. The airlines that lease the space would typically build the structures.

It is important to note that the establishment of a maintenance facility at Sea-Tac International Airport would not increase the number of flights. Individual aircraft that are due for maintenance are routed for regularly scheduled flights to Sea-Tac International Airport. Certain maintenance activities are normal and routine and take place at most major airports. The SASA proposal, in and of itself, is a response to current and forecasted airport operations.

3.1.1 Typical Maintenance Activities

Airlines schedule their aircraft for a regular maintenance that varies depending on the type and age of the plane (Table 3.1-1). There are four levels of maintenance checks: A, B, C, and D. These checks involve increasing levels of inspection, refitting, time, and expense.

Table 3.1-1 Time intervals (hours of flight time) between maintenance checks.

Aircraft	A	B	C	D
707	90	450	1,500	14,000
727	80	400	1,600	16,000
737	125	750	3,000	20,000
747	300	--	3,600	25,000
757	400	--	4,000	5 years
767	400	--	4,000	5 years

The "A" check is a primary inspection to determine the basic condition of the airplane.

The "B" check includes tasks done for the "A" check along with specific operational checks, filter servicing, and limited lubrication.

"C" checks involve an even greater level of inspection. The check involves certain operational and functional checks and must be done in a maintenance facility.

The "D" check is a major structural inspection. All removable panels and doors are removed. All aircraft systems are operationally and functionally checked to conform with manufacturer's specifications. "D" checks must be done in a base maintenance facility.

Aircraft maintenance generally consists of two categories: line maintenance and base maintenance. Line maintenance activities have a short turn-around time and can include restocking supplies and cleaning and refurbishing the interior of an aircraft. Some line maintenance activities do not need a hangar and can be done at the terminal gate. If a major problem is discovered, the airplane is pulled out of operations and may be taken to a base maintenance facility.

Base maintenance activities, scheduled and unscheduled, can take anywhere from a few days to several weeks. Typical activities can include major engine maintenance, stripping and repainting the exterior of the airplane, metal plating, and thorough checks of an aircraft to ensure its general airworthiness. Base maintenance requires heavier equipment than line and is done within an enclosed area with spill containment.

3.1.2 Operations and Noise

Operations on the SASA site would operate under existing regulations and agreements, most notably the Noise Mediation Agreement (1990). The aviation base maintenance facilities built under the SASA proposal would primarily serve Stage 3 aircraft. Stage 3, in comparison to Stage 2 aircraft, are quieter and more efficient. By the year 2000, the Port expects to have nearly 100% Stage 3 operations.

As the Port agreed in the Noise Mediation Agreement, a hush facility to reduce engine maintenance noise would be provided should a decision be made to build a new base maintenance facility at Sea-Tac International Airport (Alternatives 2 and 3).

Aircraft requiring maintenance would taxi between the SASA site and the passenger loading gates. Within the site, all aircraft movement would be with the use of tugs to minimize noise. For example, aircraft would be pushed away from the hangars and towed to the hardstands.

Current noise abatement regulations would not change, with the exception of adding a run-up location in the hush facility under Alternatives 2 and 3. Idle power engine runs would occur on the hardstand or taxiway of the SASA site. Wide-body aircraft (747, 767, DC-10, or L1011) would perform any run-ups higher than idle power at the existing run-up locations outside the SASA site at the main airport. All runups higher than idle power on the SASA site would be conducted in a hush facility under Alternatives 2 and 3. Under Alternative 1, narrow-body aircraft would perform any run-ups higher than idle power at the existing run-up locations outside the SASA site at the main airport.

3.1.3 Project Phasing

Table 3.1-2 lists the original phasing assumptions for each alternative, based on a program of expedited rapid implementation. 1994 was chosen as the first horizon year in which to project operational impacts of a new base maintenance facility. By 2003, the line maintenance facilities to the south of the terminal would be relocated to the SASA site. Use of the areas set aside for future maintenance facilities and for non-aviation development would be determined by market demand. Since the original development schedule was prepared, development of base maintenance has been delayed, resulting in a slower rate for program implementation. If the project is approved, current projections call for site work to begin with creek mitigation/enhancement and storm water facility construction to start in 1995 and major site development in 1997. Line maintenance would be the initial activity put in operation. Refer to Section 3.3.5 for additional discussion.

Table 3.1-2. Phasing assumptions.

	Alternative 1	Alternative 2	Alternative 3
1994	--	New base maintenance	New base maintenance
2003	Relocated line maintenance	Relocated line maintenance	Relocated line maintenance
2003+	Facilities as needed	Facilities as needed	Facilities as needed

3.1.4 Commercial Development Assumptions

The primary goal of this EIS is to analyze the impacts of the aviation support development on the environment. To better assess the cumulative impacts of SASA and other development on shared resources, the EIS makes assumptions about the background development in the area. These assumptions are summarized in Table 3.1-3.

3.2 INITIAL ALTERNATIVES CONSIDERED BUT REJECTED

3.2.1 Site Alternatives

Several criteria were used in assessing the suitability of various airport locations. They included:

1. Capability for direct aircraft access to the taxiway/runway/terminal system
2. Efficiency with respect to airport operations

Table 3.1-3. 2003 Site Development Assumptions.

Land Use Type	Amount of Development Assumed: No Action	Alternative 1	Alternative 2	Alternative 3
Aviation Facilities				
Line Maintenance[1]	--	100 employees	100 employees	100 employees
Base Maintenance[1]	--	--	1,500 employees	1,500 employees
Office[2]	1.00 million gsf	1.53 million gsf	606,000 gsf	--
Light Industrial[2]	200,000 gsf	--	--	--
Hotel/Motel	480 rooms	350 rooms[3]	350 rooms[3]	350 rooms[3]
Retail[2]	80,000 gsf	25,000 gsf	25,000 gsf	18,300 gsf

[1] The number of employees shown for the Aviation Facilities use represent the net increase over existing employment levels.
[2] Office, Light Industrial, and General Retail are expressed in terms of total gross square feet of floor area.
[3] Assumes that 50% of the planned 700-room hotel on the Highline School District property would be developed by the year 2003.

3. Minimization/mitigation of adverse environmental impacts
4. Sufficient area to accommodate anticipated facilities
5. Compatibility with FAA regulations and guidelines
6. Compatibility with other airport area planning and land use
7. Feasible construction cost.

The following is a review of the airport siting options that were considered.

3.2.1.1 Northeast

The area north of the terminal between the airfield and the north access freeway has long been designated for the development of air cargo, aviation maintenance, and other support facilities. It has excellent airfield access; is compatible with adjoining uses, airport facilities, and operations; and would be relatively low cost to develop. Since the airport was established, this area has been intensively developed, particularly for air cargo development but has also included United Airlines' maintenance facilities. There is no longer sufficient space in the northeast area to accommodate any of the aircraft maintenance facilities proposed for location in the SASA area. The existing facilities in the northeast area also require direct airfield and terminal access for aircraft loading and cargo equipment handling, so their relocation would not free additional space. The limited space remaining in this area is expected to be used for additional air cargo facilities, as planned, to maintain the efficiencies that result from co-location of cargo facilities.

3.2.1.2 North

This area is infeasible for the SASA project because SR 518, a wide, limited-access freeway, passes along the north boundary of the airfield. Developable area would have to be located north or east outside the runway safety zones. Aircraft access is not feasible because any aircraft maintenance development would require a long and very expensive bridge, (Approximately four times the length of the proposed SASA bridge) in order to connect with the airfield. Aircraft taxiing distances would typically be nearly twice as far as for the proposed SASA location. Additionally, much of the land use in the vicinity is residential and recreational. Building hangars in this area would lead to more noise impacts than at the proposed site. Existing topography would also require greater volumes of grading and filling, together with higher costs.

3.2.1.3 West

Earlier planning studies considered some development of the west side of the airfield for potential aircraft maintenance and air cargo facilities. Previous work was relatively broad in scope, examining area requirements but not addressing operational limits in specific detail. Current analysis of facility needs and increased operating activity projections indicate that this area is not a feasible site for the SASA project for several reasons.

Area on the west side of the airport is limited by safety clearances from the runways and taxiways to the east and SR 509 and topography to the west. Previous planning documents (e.g. the 1985 Master Plan Update), identified approximately 60 acres for potential development of maintenance, air cargo, and general/corporate aviation. This was a planning study that looked primarily at the passenger terminal needs and addressed general areas and locations for other airport activities but did not examine detailed layout or operating requirements for most facilities. Continued use of the West Ramp taxiways, fire training pit, and runoff treatment system together with height limits imposed by radar equipment (discussed below) restrict the available area even further. To create additional area on the west side, costly and extensive fill would be required, with all material imported to the site and consequent traffic impacts. The west side of the airport cannot feasibly accommodate the 80-100 acres that the SASA program needs for line and base maintenance facilities.

Operationally, transfer movements of low-priority aircraft between a west side maintenance area and the passenger terminal could not be accomplished without unacceptable delays in operations. Such transfers involve the crossing of two active runways. In other words, aircraft would be crossing in front of landing and departing aircraft. Depending on wind direction and the resulting pattern of aircraft movement, some transfers would have to move in the opposite direction of aircraft on the taxiways. Because aircraft takeoffs and departures have a higher priority, transfer movements must be delayed until there are gaps available in the flight stream to ensure adequate safety margins and avoid unacceptable flight delays. With increased activity at the airport, adequate intervals are infrequent to non-existent, particularly during peak periods for operations. This problem is most acute for movements from line maintenance facilities to terminal areas during the early morning and other peak hours when several aircraft must be moved from the maintenance area within a short time span in order to meet operating schedules. This condition will become more severe in the future as future operations increase and new technology allows shorter intervals between landings. Previous planning studies have identified the difficulties involved in moving between the west side and the terminal area across the runways. Movement of aircraft by towing (rather than under power) is preferred and encouraged for noise abatement and air emissions reduction, although it is slower than taxiing under power. The time required for towing compounds the delay problems. Access to the proposed southeast site does not cross active runways. Taxiway interference would be low and could be further reduced by the addition of a parallel link similar to the existing north end of the airport.

Discussions with airlines reinforce the severity of the problem for a west side location. In order to quantify this delay, airport operations with a west side SASA site were simulated using the Airport Machine computer model (FAA validated). Assumptions for this modeling included typical annual mix of Sea-Tac weather conditions relating to visibility and wind direction. Along with a west side maintenance area, a new taxiway was assumed to be built between the passenger terminal area and the west side. It would be dedicated solely to maintenance area aircraft to reduce the interference with taxiing flight operations. Assumptions related to number of operations were the same as used in the SASA noise study, a total of about 50 daily inbound and outbound SASA-area movements and 420,000 total annual airport operations (year 2003).

Results show that the construction of a west side maintenance facility would increase total airfield delays by 5.2%, or an increase of 6,200 hours annually. Based on an average operating cost derived for the Sea-Tac fleet, this would cost airlines about $8.8 million annually. The average operating cost estimate of $1,440/hour for the Sea-Tac fleet mix was derived in 1990. It includes cost of fuel, aircraft operating costs and flight crew salaries. It does not include aircraft depreciation or maintenance costs. Most of the delays would occur in good weather conditions where separation between arriving aircraft is minimized. North-flow operations showed more delays due to proximity of the facility to runway departure areas.

Use of the area on the west side is further restricted because of structure height limits imposed by the radar equipment sited there. The specific limits are sloped and vary with distance from the radar site. The Aircraft Surveillance Radar (ASR) is the primary air traffic control radar for both Sea-Tac Airport and Boeing Field. It is critical to all aircraft operations and is located on the west side opposite the north end of the terminal. The Airport Surface Detection Equipment radar (ASDE) is used to monitor movement of aircraft and other equipment on the runways, taxiways, and in the vicinity of the terminal. It is particularly important during periods of low visibility (fog or precipitation) and at night. The ASDE is located across from the passenger terminal on the west side in order to provide the best view of movement areas around the terminal buildings. Depending on structure height, building locations on the west side would be restricted to avoid shielding aircraft movement areas from the ASDE. Reflections of both ASDE and ASR signals by west side structures would also be of concern if they interfered with radar tracking of aircraft. This factor could also limit building location.

An additional consideration for the west side of the airport is its potential use for construction of a dependent runway as an addition to regional aviation capacity. The current recommendation of the multi-party Flight Plan project is that such a runway should be a major element of the regional aviation program. Final decisions on such development will not be made until additional project-specific design studies and Environmental Impact Statement are prepared.

3.2.1.4 Southwest

Aircraft maintenance development in this location would have to be located west of the safety zones for the existing runways. This area is not feasible as a location for SASA for several reasons. There are major ponds and wetlands in the area which would result in more severe impacts with the extensive bridging and filling that would be required. Bridging to cross South 188th Street and site regrading would be more extensive and costly than for the proposed location. Acquisition of land and displacement of existing businesses would be very costly. Adjoining land use would be primarily residential and subject to increased noise impacts. As previously noted, there would be operational difficulties for aircraft movements to the west side of the airfield.

3.2.1.5 Southeast

This is the area proposed for development of the proposed SASA project. While costly to develop because of site grading and construction of the taxiway bridge, it would be less costly than other alternatives where sufficient space could be created. The site has sufficient area and the location is operationally satisfactory (relatively close to terminal, short bridge, no runway crossings). The adjacent land has commercial zoning (actual or potential) and would be more compatible with SASA development and less impacted than residential areas would be. Most of the property is already in Port ownership (primarily through noise remedy buyout) so additional acquisition costs would be relatively low. Grading and filling can be balanced to minimize site import/export of fill. The southeast area is the only feasible location for the proposed type and scale of development at the airport.

3.2.1.6 Other Airports

Location of the proposed facilities at some other airport was not considered because the purpose of the project is to provide for the maintenance needs of aircraft operating at Sea-Tac Airport. There is a sufficient volume of aircraft operations that the capability for on-site line maintenance is a necessity. In the case of a maintenance base, the siting decision will be based on market conditions, operating needs, and financial considerations. Such siting is a user decision made by the airline. The Port cannot direct that the base go to any other specific airport. The Port supports the Sea-Tac Airport location for a maintenance base because of the high economic development benefits that would be derived from the project. See Section 4.3, Induced Socioeconomic Benefits, for further discussion of these impacts. This is consistent with the major Port purpose of fostering regional economic growth. Figure 3.2-1 shows the project site.

3.3 ALTERNATIVES SELECTED FOR FURTHER STUDY

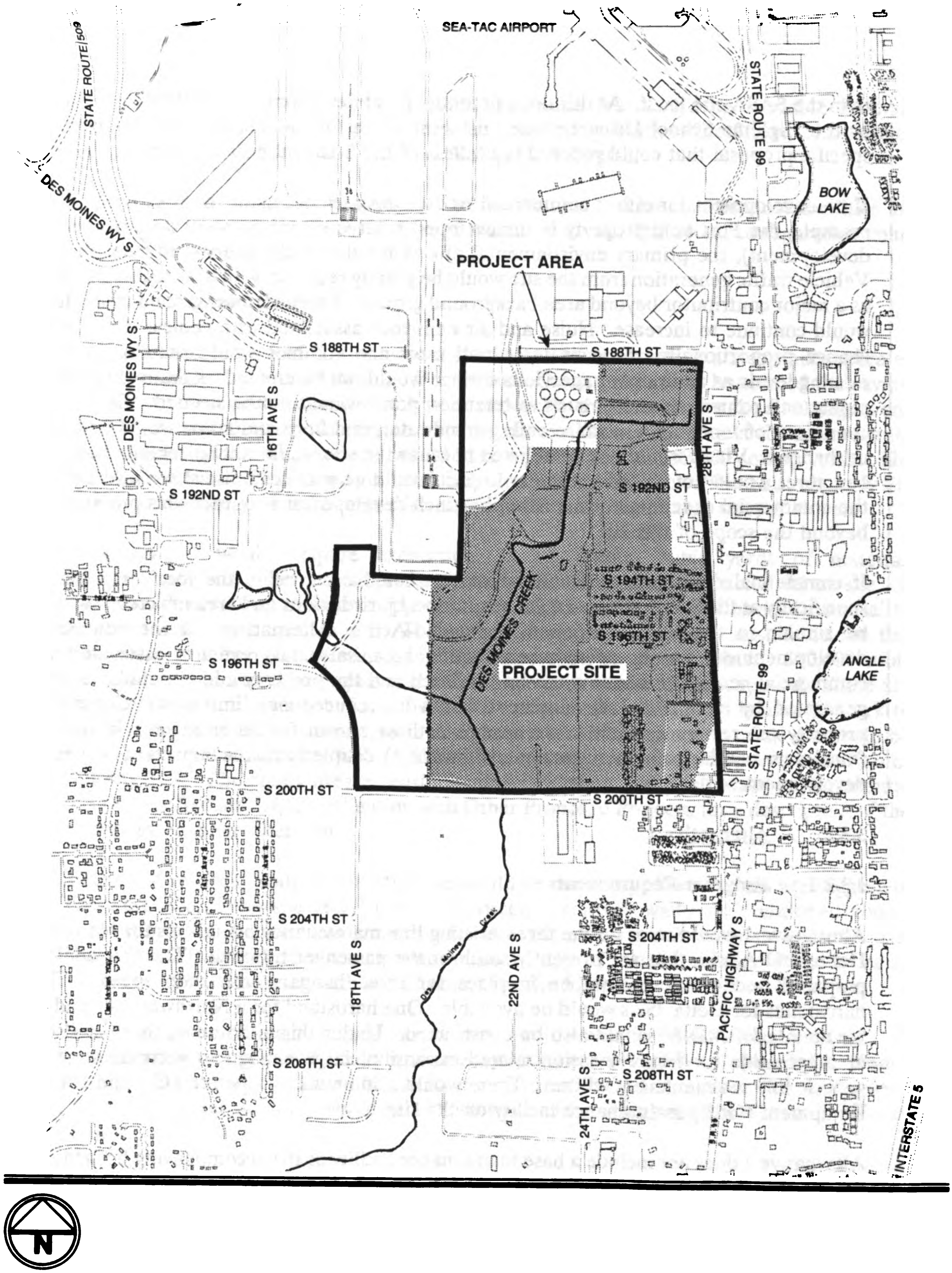
3.3.1 No-Action Alternative

Under the No-Action Alternative, the South Aviation Support Area would not be developed now or in the near future. Specifically, a base maintenance facility would not be built, the line maintenance hangars for Northwest, Delta, and Alaska would not be relocated to this area, and no site preparation would occur for an area reserved for future aviation uses. This alternative would impair relocation of existing hangars and improvements to airport terminal facilities.

This is not to say that no aviation uses would ever be developed here. Neither is it a confirmation that commercial, or any other type of development, would occur here. Since there are no other specific development proposals, the No-Action Alternative essentially maintains existing conditions. Any future development proposal would be subject to separate environmental review.

For the evaluation of impacts in this EIS, the project alternatives (including the No-Action Alternative) have been framed to consider the "worst case" cumulative and synergistic impacts that might occur with an estimated level of site development for other uses. If aviation development of the SASA site is delayed or does not occur (i.e. No-Action), then the worst-case (i.e., greatest impact) assumption would be commercial development as permitted under existing zoning. It appears unreasonable to assume no commercial development in the overall south SeaTac area over the ten-year time frame considered in this EIS. However, such commercial development might not occur specifically on the SASA site property controlled by the Port of Seattle.

The projections for commercial development in the south SeaTac area by 2003 are based on growth projections by the Puget Sound Regional Council, an estimate of area development demand, and the efforts by King County and the City of SeaTac to promote commercial development in the area, including zoning of areas for commercial development. Local jurisdictions have also been planning for roadway and other transportation projects to serve area and regional growth. These include the 28th/24th Arterial and SR-509 Extension projects and are described in Section 3.4 of this EIS. A moderate level of commercial buildout has been included in the No-Action alternative to ensure that potential impacts associated with no aviation development of SASA are considered. It should be recognized, however, that there is considerably more acreage and potential commercial development capacity in the area under the current zoning. The projected level of commercial development in the area could be accommodated at nearby locations other



SCALE IN FEET

0 600 1,200

Figure 3.2-1
SASA Project Site and Area

than the SASA site itself. At this time, potential hotel development on the property owned by the Highline School District at the northeast corner of the SASA site is the only site-specific proposal that could proceed regardless of the SASA alternative chosen.

If no development for either commercial or aviation uses occurs at the SASA site (if, for example, the Port held property in undeveloped reserve rather than allowing commercial development), the primary environmental effects for the SASA site would be as follows. Vehicle traffic generation from the site would be greatly reduced, with only the hotel project as a major contributor beyond area background growth. Areawide background traffic levels would continue to increase. Noise and air emissions associated with vehicle traffic would change proportionally. Stormwater runoff rates and volumes would remain similar to existing levels as additional impervious surface would not be created. Additional drainage piping and control structures such as retention ponds would not be needed. Existing site conditions of topography, surface and groundwater, and flora and fauna would be largely unchanged. Views would not be affected because the site would not be regraded and new structures would not be built. Similar impacts could be produced elsewhere in the area if the commercial development occurred, but such development is outside this proposal and beyond the scope of this EIS.

If commercial development similar to that assumed occurred in the local area but not specifically at the SASA site, tax revenues for local jurisdictions and area job creation would be similar to the levels described in the No-Action Alternative. If the commercial development did not occur anywhere in the area, sales tax revenues associated with commercial construction would not be produced and the property and leasehold revenues generated by commercial development would be reduced or eliminated. Commercial property tax revenues would more resemble those shown for Alternative 3 in this EIS (maximum aviation/minimum commercial buildout), coupled with the impacts of no aviation development as described under No-Action.

3.3.2 Alternative 1

3.3.2.1 Program Requirements

Alternative 1 would relocate the three existing line maintenance operations for Northwest, Delta, and Alaska that are presently south of the passenger terminal. The site would be prepared and utilities would be in place for three hangars with shop space. Three hardstands for Delta 757's would be available. One hardstand for a Northwest 747 and one for an Alaska MD-80 would also be constructed. Under this alternative, there is also an area set aside for future aviation-related expansion, large enough to accommodate two generic line maintenance facilities. There would also be a Port-operated Ground Services Equipment (GSE) maintenance facility on the site.

Alternative 1 does not include a base maintenance facility or the accompanying hush facility. See Section 3.3.3, Alternative 2 for a description of these facilities.

Under Alternative 1, approximately 1,835,300 square feet would be available for non-aviation-related development within the area bounded by South 192nd Street, 28th Avenue South, South 200th Street and the Tyee Valley Golf Course.

See Figure 3.3-1 for an illustrative view of Alternative 1. Line maintenance facilities are identified for each airline in the figures of the alternatives. The actual configuration could change with final design.

3.3.2.2 Site Preparation

Topographically, the SASA site, located southeast of the airport, is a steep hill separated from the airport by a deep ravine. Des Moines Creek runs at the bottom of the ravine. The site would require extensive earth work to develop the platform for the site hangars and hardstands, and to bridge the ravine for the taxiway that would connect the maintenance area to the airport. Alternative 1 would have a paved area of 193,600 square yards. The maximum slope of the finished grade of each alternative would be 0.7%. This relatively flat surface is necessary because large aircraft have difficulty negotiating steeper slopes.

Alternative 1 would require excavation of 2.2 million cubic yards of material. Approximately 1.3 million cubic yards of that would be used as compacted fill on site. It may also be necessary to import approximately 80,700 cubic yards of backfill material to construct reinforced earth walls. The material available on site is unsuitable for this purpose as it is fine-grained with a high moisture content. Approximately 810,600 cubic yards of material would be surplus and would have to be removed and disposed. There are two general options available for a disposal site; the material could be hauled by truck to an approved off-site disposal site, or it could be stored on Port property. One site could be at the south end of Runway 34R. A later use may be a proposed safety area extension of Runway 34R. The safety area extension would be the subject of separate environmental review. See Section 3.4, Coordination with Other Proposed Projects, for a description of the runway safety area extension.

A series of retaining walls around the site would be necessary. Two designs are suggested. The west side of the site could use a reinforced earth-type wall. As mentioned above, selected soil would have to be imported because the native soil is unsuitable for this use. The west walls would have a maximum height of approximately 60 feet. These types of walls could be constructed with a 1:12 batter for the full height without set-back tiers.

The total square footage of reinforced earth wall would be 115,000 square feet. A permanent tieback pile wall would be necessary on the east site of the proposed site. Under Alternative 1, the east walls would also have a maximum height of 60 feet. The total square footage of the tieback walls would be 154,600 square feet. The tieback walls would be near vertical.

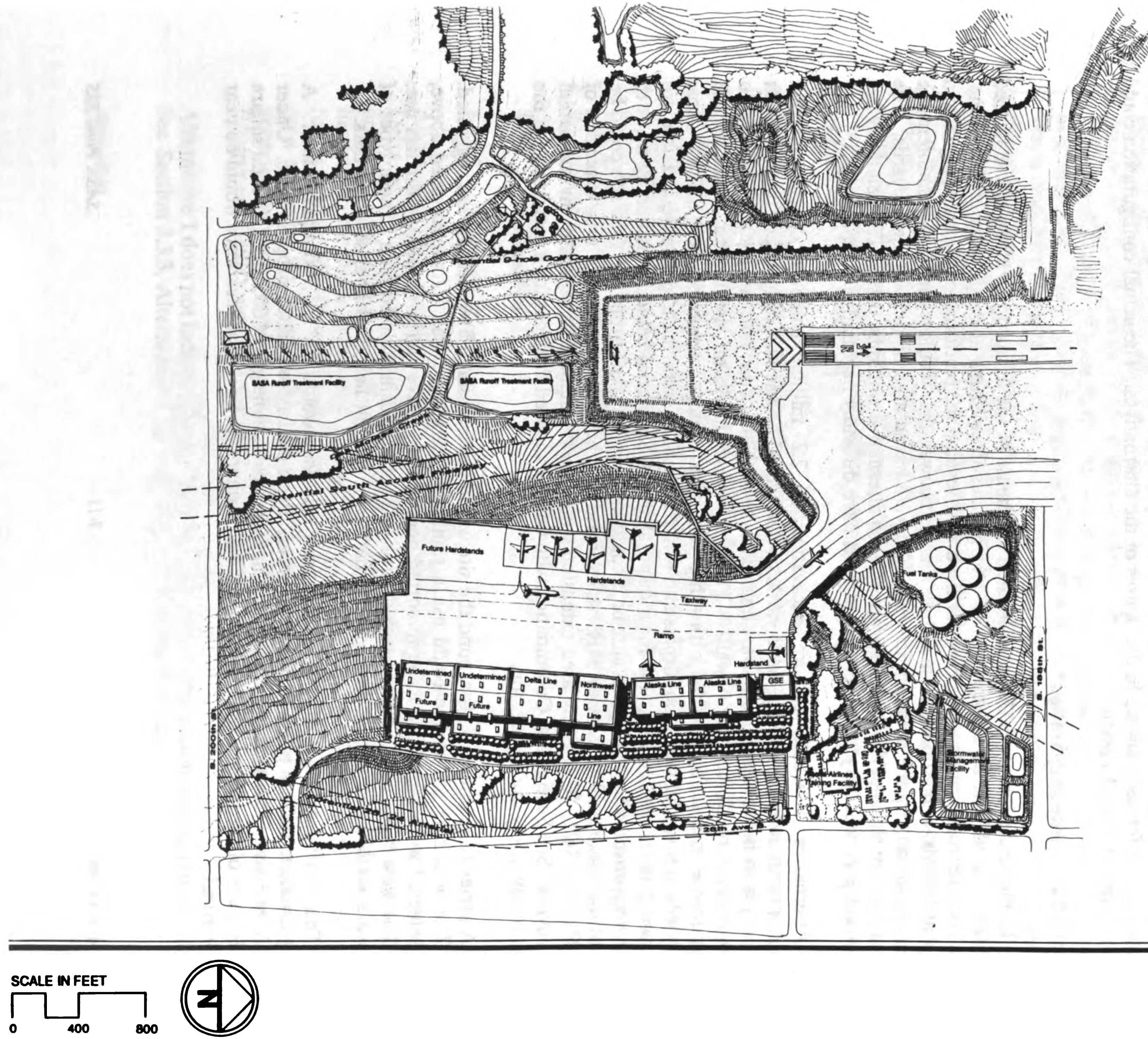


Figure 3.3-1
Alternative 1

All alternatives propose relocating portions of Des Moines Creek. Generally, the relocation requires movement of the streambed west of its present location. All stream sections filled would be replaced. This design creates more open stream with fewer culverted portions than currently exists on the site.

Under Alternative 1, there would be a net increase of 1,315 feet of streambed. The new channel would be constructed prior to the loss of the existing stream. It would be planted with grasses and appropriate wetland and riparian vegetation as soon as possible so the vegetation would become established before the stream is actually diverted to the new bed.

3.3.2.3 Infrastructure

SASA Runoff Treatment Facility

Sea-Tac International Airport has an industrial waste system (IWS) that serves all the apron areas, some parking areas, and other miscellaneous facilities. The estimated area served by the IWS is over 300 acres. The existing system is a three-celled lagoon system that detains runoff and routes it through a treatment facility that removes fuel and oil before discharging the runoff through an 18-inch pipe that is connected to the Midway Sewer District Treatment Plant discharge pipe.

The existing IWS treatment system is at capacity, so an auxiliary Runoff Treatment Facility (referred to as the SASA IWS in the Draft EIS) would be necessary for the SASA development. The proposed location is north of South 200th Street and east of the runway lighting of 34R. The areas of the SASA site that would require this type of treatment include all the proposed paved surfaces that would be used by automobiles or aircraft. These surfaces are the hardstands, taxiways, and parking lots. Under Alternative 1, the total area draining to the SASA Runoff Treatment Facility would be approximately 50.4 acres of the total 63 acres.

The preliminary design of the SASA Runoff Treatment Facility lagoon system is sized to detain the runoff associated with a 100-year storm event that lasted seven days; this equals approximately 10 inches of precipitation. The design also assumes that, since the majority of the area would be paved and impervious, no infiltration would occur and the facility would treat the entire volume of runoff. Under Alternative 1, the rate of flow from the treatment facility for the peak 100-year, 7-day flow would be 21.5 cubic feet per second (cfs).

Under all build alternatives, a two-celled, covered pond system would provide detention to hold the runoff before it would be routed to the new treatment facility. The storage capacity of the ponds differs with each alternative. Under Alternative 1, the ponds would needs to store 40.2 acre-feet of runoff.

The treatment would consist of oil and fuel separation from the runoff, most likely using a flocculation and air flotation process similar to the existing facility. The maximum discharge capacity of the system would be 10 cfs for all alternatives. This volume is within the Port's current agreement with the Midway Sewer District.

Utilities

Public utilities, including water, sanitary sewer, and power, would be provided at the SASA site. The proposed water system would consist of 16-inch ductile iron pipe that would be arranged in a loop within the project area. Water mains would be extended from the existing Port of Seattle lines located north of the project area.

Gravity sewer collection lines would be placed in a utility corridor east of the main hangars on the site. A new gravity sewer line following 28th Avenue South would connect project lines with the existing Midway Sewer District facilities.

Franchise utilities, including electric power, natural gas, telephone, and cable TV could be provided to the site. Electric power would be provided by the Port to the tenants through underground power lines owned and maintained by the Port. The Port would purchase power in bulk from Puget Power. Metered connections would be installed at each tenant facility. Improvements to the local Puget Power supply connections and the Port distribution system could be necessary.

Telephone and cable TV lines would be located in a common trench with the power lines. The individual utility companies would be responsible for bringing off-site lines to serve the project.

Storm Water Management Facility

A new regional storm water management facility is proposed to provide mitigation of storm water runoff impacts. The facility would consist of a system of three ponds. The ponds would be north of the Alaska Airlines Training Facility. Their function would be to 1) replace the storage volume and detention characteristics of the Tyee storm water detention facility that would be removed under the proposal, 2) provide water quality enhancement functions, 3) detain SASA storm water runoff from the building rooftops, and 4) provide a replacement channel that would have the equivalent conveyance and storage of the existing 100-year floodplain of Des Moines Creek. All runoff from the SASA facility that could potentially be contaminated with fuel or petroleum products would be routed to the Runoff Treatment Facility discussed previously.

The aboveground pond system would occupy nearly 7.5 acres southwest of the South 188th Street/28th Avenue South intersection. Two of the ponds would be less than an acre each. The third pond would have a storage volume of 35 acre-feet. Using earth berms instead of structural walls to retain the water is preferred due to cost considerations.

Service and Access Roads

All build alternatives would feature a two-lane roadway with a drainage ditch. The roadway would circle the perimeter of the site. A security fence would run outside of the road. There would be two levels of security gates. Entries to the internal access road from the realigned 28th/24th Avenue South would be gated. All entrances to the Airport Operating Area (AOA) from the access road would also have gates. Crash gates would provide emergency access to the site.

Automobile Parking

Alternative 1 would require 801 parking spaces. Parking would be located on the east side of the site and would have grades ranging from 0.5 to 6%. The steeper grades in the parking area would help to minimize the necessary height for the east retaining wall. As noted above, parking lot drainage would be routed to the new Runoff Treatment Facility.

3.3.2.4 Cost Estimate

The total cost of construction for Alternative 1 is estimated to be approximately $76.8 million. See Table 3.3-1 for a further breakdown of site development costs.

Table 3.3-1. Preliminary site development cost estimate.

	Alternative 1	Alternative 2	Alternative 3
Mobilization	3,900,200	5,040,600	5,985,200
Site Work	22,370,100	22,314,000	28,877,000
Retaining Walls	12,047,600	22,128,300	13,870,800
Taxiway & Hardstands	17,057,600	21,145,000	36,872,300
Utilities	5,665,700	6,470,800	7,192,100
Roadway & Parking	1,147,300	1,481,500	1,884,800
Roadway Connections	312,500	312,500	312,500
Erosion Control	100,800	104,000	185,600
Landscaping	401,300	573,300	573,300
Retention Pond	2,000,000	2,000,000	2,000,000
Hush Facility	--	2,000,000	2,000000
Net Sum	65,003,000	84,010,000	99,753,600
Contingency (10%)	6,500,300	8,401,000	9,975,360
Washington State Sales Tax	5,350,246	6,888,820	8,179,795
Total Probable Cost of Construction	$76,833,500	$99,299,800	$117,908,800

3.3.2.5 Option 1A

Under Option 1A, the southern part of the site that is not presently owned by the Port would not be acquired for the SASA project. That land would be left undeveloped for possible future commercial development. The environmental impacts associated with that future development are not analyzed in this document; each proposal would be subject to separate environmental review.

Option 1A would only allow the relocation of the existing Northwest, Delta, and Alaska line maintenance facilities. There would not be an area set aside for future support facilities. Like Alternative 1, there would not be a base maintenance facility or a hush facility.

Site preparation under Alternative 1 would involve grading, extending utilities, and paving the project footprint, including the area left for future aviation-related development. There would obviously be less site preparation work done under Option 1A.

A qualitative assessment of the environmental impacts of developing the SASA proposal under Option 1A is presented in this document. In most cases, the impacts of Option 1A are slightly less than those for Alternative 1. It is important to note that the operational impacts of Alternative 1 and Option 1A are the same for the 1994 and 2003 horizon years. This is because the amount of commercial development that could potentially take place under either the Alternative or its Option would be the same under those horizon years. It is true that Option 1A may potentially have more commercial development than Alternative 1 in the distant future. However, for the planning horizon being analyzed in this document, it is unlikely that the amount of potential commercial development that could take place on the site would not have adequate space in the area left for that type of development by Alternative 1.

See Figure 3.3-2 for an illustrative view of Option 1A.

3.3.3 <u>Alternative 2 - The Preferred Alternative</u>

3.3.3.1 Program Requirements

Like Alternative 1, implementation of Alternative 2 would allow the relocation of the three existing line maintenance facilities now located south of the passenger terminal. This alternative would also include the construction of a base maintenance facility comparable to one that was envisioned by Alaska Airlines. There is also an area set aside under this alternative for future expansion of the base maintenance facility. A "hush facility" for noise attenuation during engine runups is included under this alternative. A hush facility is a walled area that is sound treated to minimize noise leaks to the outside. A GSE facility would also be built under this alternative. Additional aircraft ramps in front of each hangar are not included.

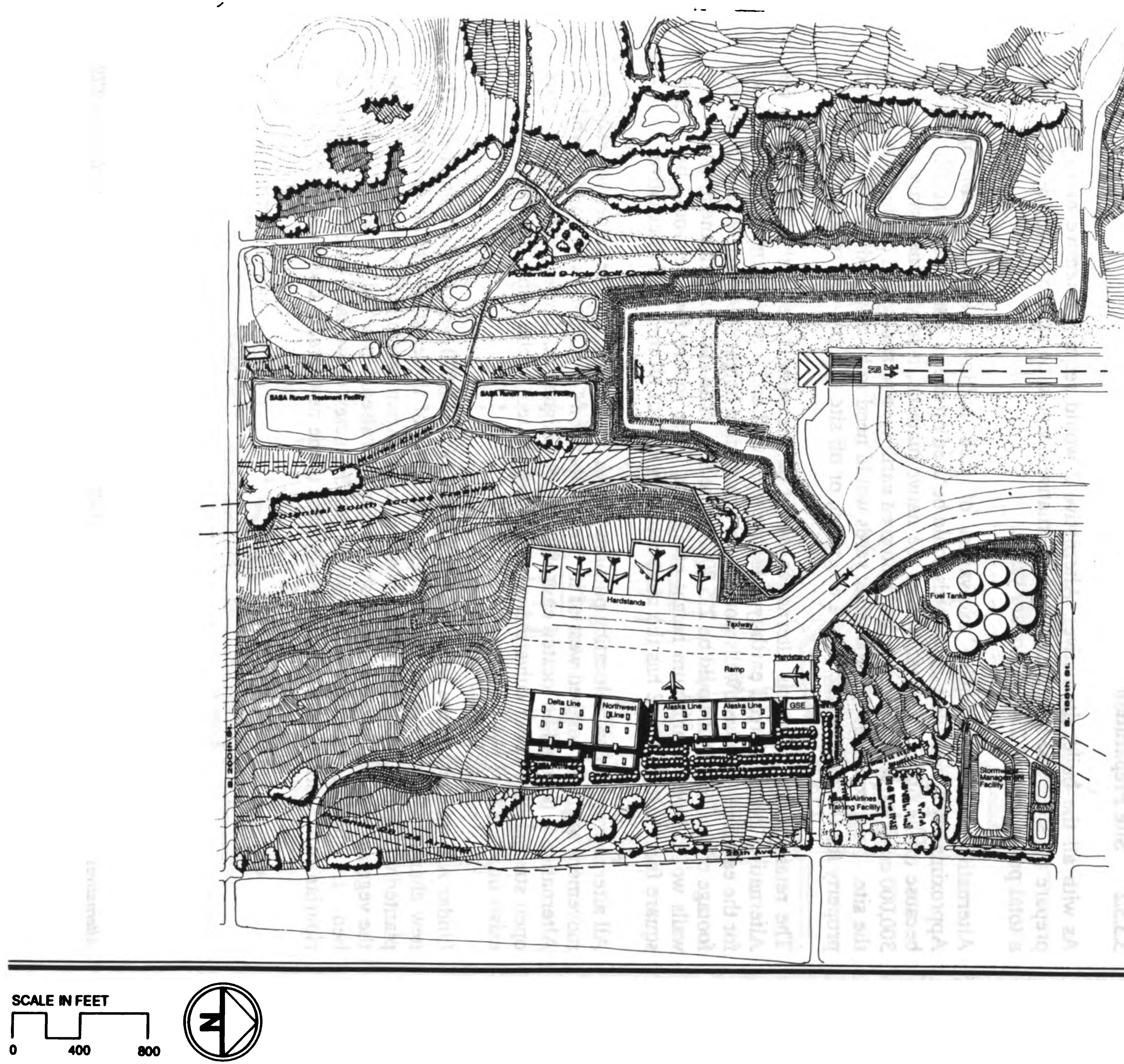


Figure 3.3-2
Option 1A

Alternative 2 would allow 922,600 square feet of developable land for possible future commercial development within the area bounded by South 192nd Street, 28th Avenue South, South 200th Street and the golf course.

See Figure 3.3-3 for an illustrative view of Alternative 2.

3.3.3.2 Site Preparation

As with all the build alternatives, Alternative 2 would require extensive earth work to prepare the site. The finished area of Alternative 2 would be approximately 84 acres with a total paved area of 270,000 square yards.

Alternative 2 would require excavation of 2.38 million cubic yards of material. Approximately 2.16 million cubic yards could be used on site as compacted backfill. Again, because of the unsuitable condition of the native material, it may be necessary to import 300,000 cubic yards to construct the reinforced earth-type retaining wall on the west side of the site. Approximately 220,000 cubic yards would need to be disposed of, either on Port property for the runway safety area extension, or off site to a pre-approved disposal site.

The retaining walls for this alternative would be the same type as those described for Alternative 1; a reinforced earth-type for the west wall and a permanent tieback pile wall for the east side. The west walls would have a maximum height of 90 feet. The total square footage of the west wall would be 225,700 square feet. The eastern permanent tieback pile walls would have a maximum height of 63 feet. The square footage would be 147,000 square feet. Alternative 2 has the most retaining wall of all the build alternatives.

All alternatives propose relocating portions of Des Moines Creek. The relocation requires movement of the streambed west of its present location for Alternatives 1 and 3, while in Alternative 2, it would be located east of its present alignment. For each alternative, more open stream, with fewer culverted portions, are created by the relocation than currently exists on the site.

Under Alternative 2, there would be a net gain of about 1,800 feet of new streambed. The new channel would be constructed prior to the loss of the existing stream. It would be planted with grasses and appropriate wetland and riparian vegetation as soon as possible so the vegetation would become established before the stream is actually diverted to the new bed. In addition to stream relocation, about 3.5 acres of wetland would be created as riparian shrubs and forested wetlands adjacent to the new stream channels.

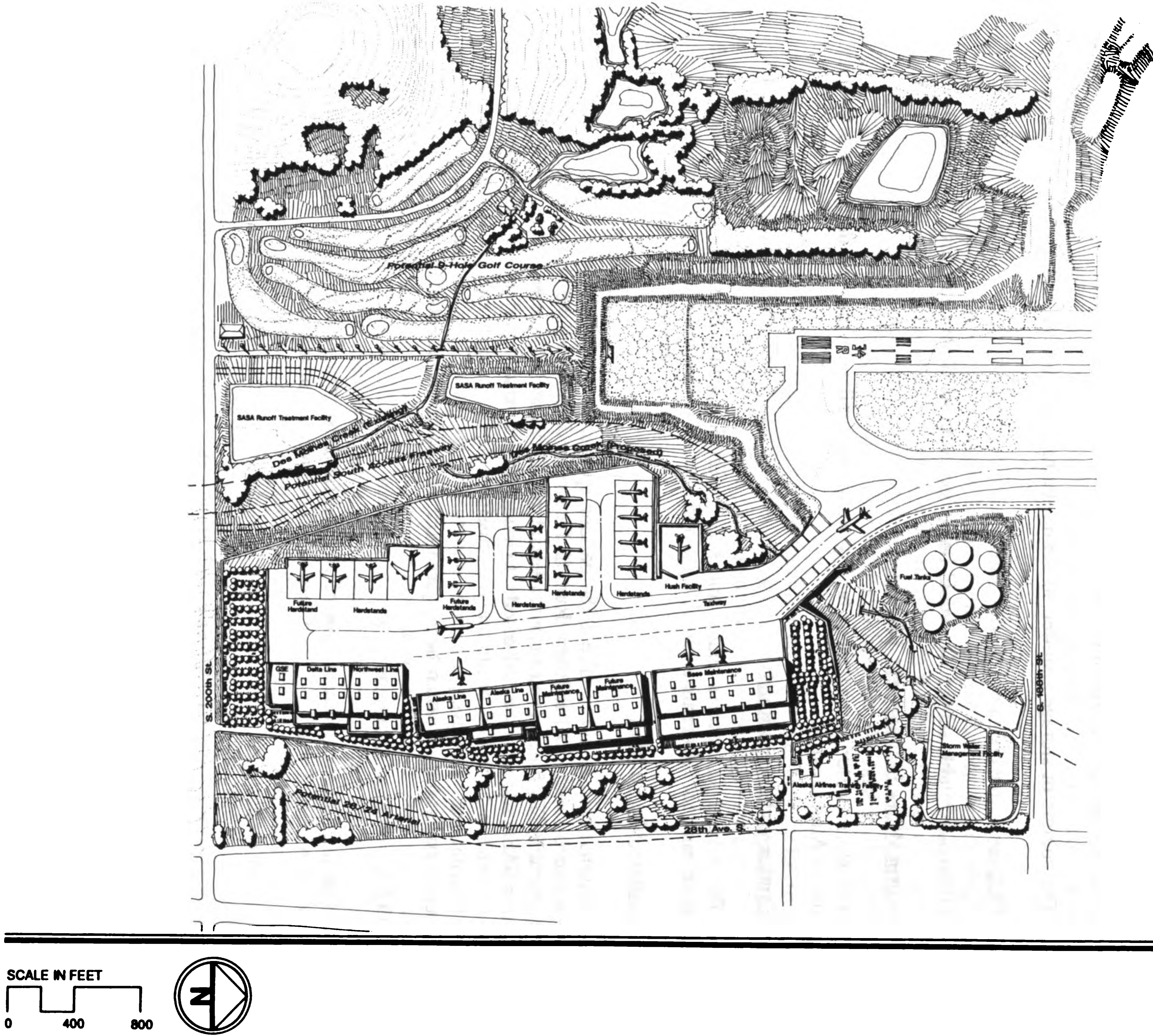


Figure 3.3-3
Alternative 2

3.3.3.3 Infrastructure

Runoff Treatment Facility

Under Alternative 2, the total area draining to the SASA Runoff Treatment Facility would be approximately 62 acres. The rate of flow under this alternative would be 26.5 cfs for the peak 100-year, 7-day storm event.

The volume of storage required to detain the runoff would be 49.4 acre-feet.

Utilities

Utilities available on the site would be similar to those described above for Alternative 1.

Storm Water Management Facility

The storm water management facility would be similar to the one described previously under Alternative 1.

Service and Access Roads

The service and access roads, and security fencing would be similar to that described previously for Alternative 1.

Automobile Parking

Alternative 2 would require 1,284 parking spaces. As noted above, parking lot drainage would be routed to the new Runoff Treatment Facility. If additional parking space is warranted by future aviation, commercial, or office uses in the area, the surface parking on the SASA site could be converted into multi-story structured parking. The Port and the City of SeaTac have had preliminary discussions on the subject and on potential financing alternatives. However, a parking structure is not part of the current proposal and any conversion to such would be subject to additional environmental review.

3.3.3.4 Cost Estimate

The total cost of construction of Alternative 2 is estimated to be approximately $99.3 million. See Table 3.3-1 for a further breakdown of construction costs.

3.3.4 Alternative 3

3.3.4.1 Program Requirements

Alternative 3, like the other build alternatives, would allow the existing Northwest, Delta, and Alaska line maintenance hangars with their associated hardstands to be relocated to the new site. Alternative 3 would also accommodate a base maintenance facility. Nine hardstands for MD-80's could be provided. Alternative 3 provides a ramp in front of each hangar bay.

Alternative 3 also allows for future base maintenance facility expansion with three MD-80 hardstands. Finally, area would be available for another hangar facility large enough to house three 767's. One 757 hardstand and four 767 hardstands could also be accommodated. The future aviation uses are not included in the 2003 impact analysis for this alternative. These uses would likely be developed after the 2003 horizon year chosen for analysis (see Table 3.1-2). Alternative 3 would also have a hush facility and a GSE facility.

Alternative 3 leaves 316,300 square feet of developable land that could be used for future commercial development. The Port would be willing to entertain proposals regarding the right to develop over the proposed surface parking areas on the east side of the site.

See Figure 3.3-4 for an illustrative view of Alternative 3, and Figure 3.3-5 for cross section views of all three alternatives.

3.3.4.2 Site Preparation

Alternative 3 would require the most extensive earth work of all the alternatives. The finished area would be approximately 116 acres with a total paved area of 324,700 square yards. Instead of a bridge structure, a tunnel would be built to accommodate the South Access roadway.

Alternative 3 would require excavation of 2.5 million cubic yards of material. Approximately 3.7 million cubic yards could be used on site as compacted backfill. Again, because of the unsuitable condition of the native material, it may be necessary to import 158,500 cubic yards to construct the reinforced earth-type retaining wall on the west side of the site. Approximately 1,352,700 cubic yards would need to be borrowed from an off-site source.

The retaining walls for this alternative would be the same type as those described for Alternative 1: a reinforced earth-type for the west wall and a permanent tieback pile wall for the east side. The west walls would have a maximum height of 78 feet. The total square footage of the west walls would be 141,000 square feet. The eastern permanent tieback pile walls would be have a maximum height of 25 feet. The square footage would be 80,000 square feet.

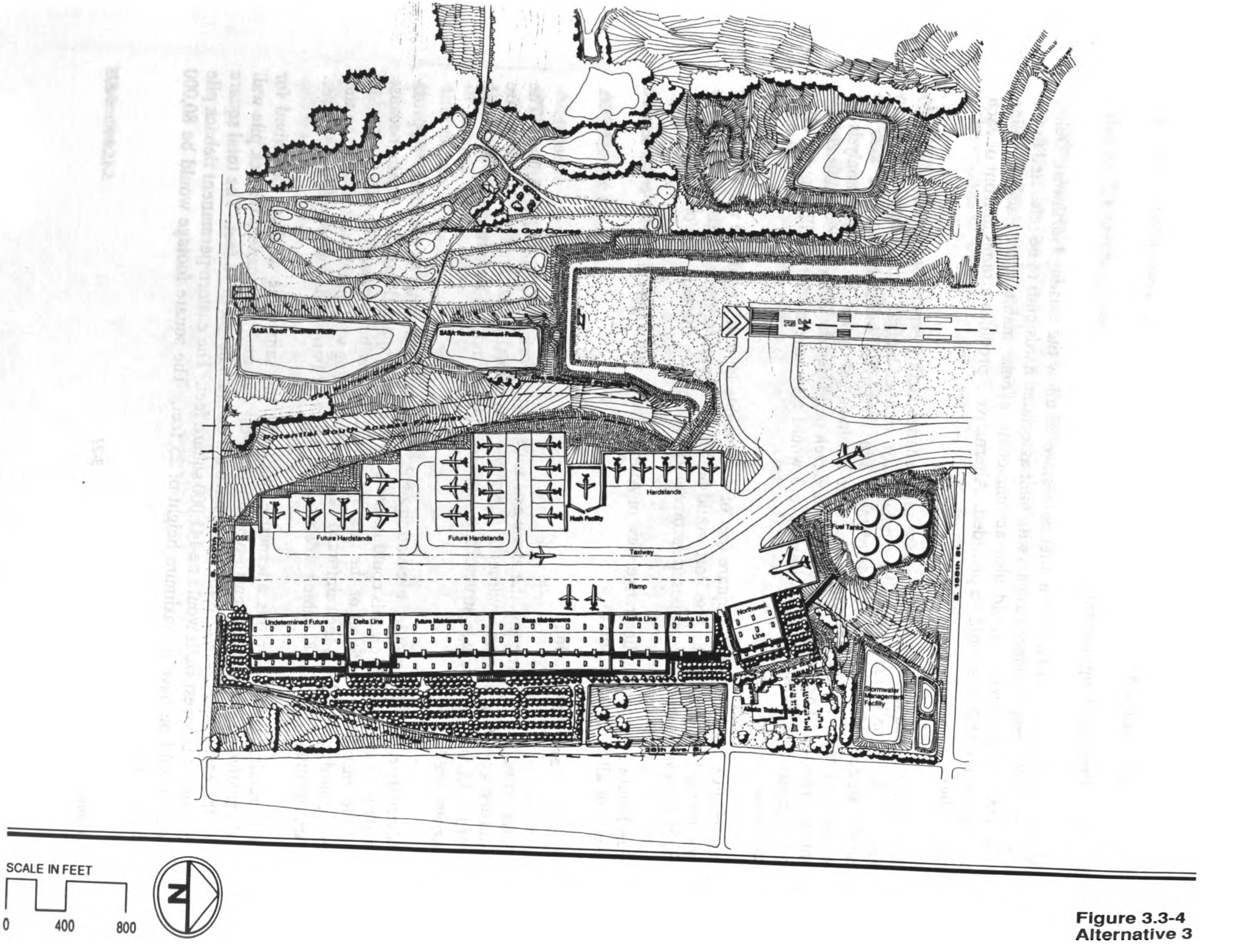
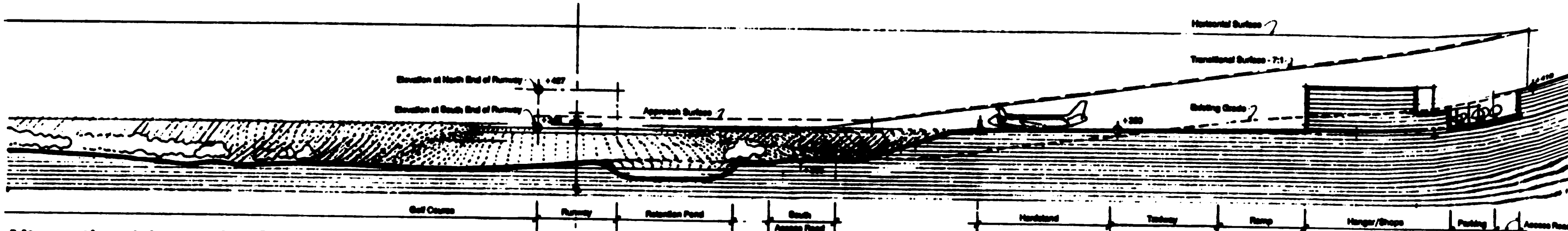
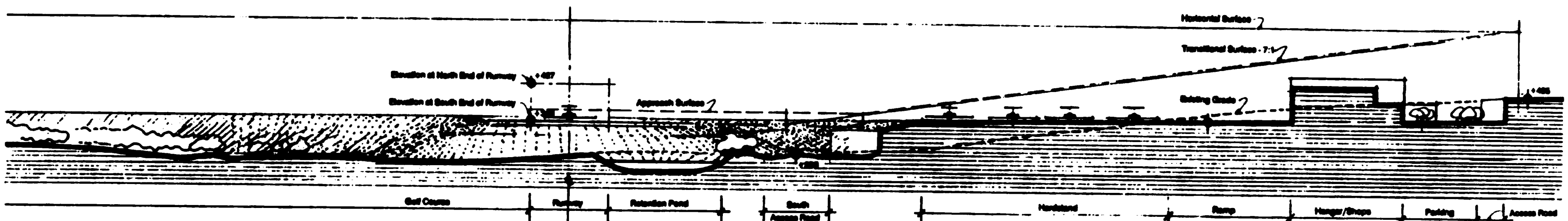


Figure 3.3-4
Alternative 3



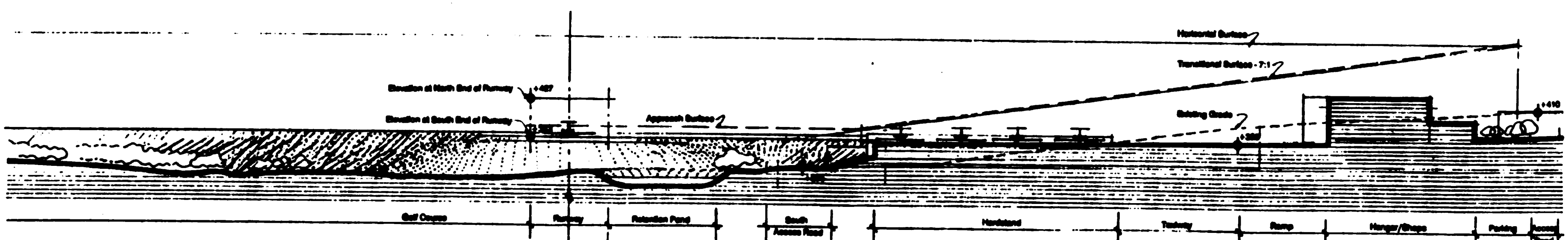
Alternative 1 (same for Option IA)

EAST-WEST THROUGH SITE - LOOKING NORTH



Alternative 2

EAST-WEST THROUGH SITE - LOOKING NORTH



Alternative 3

EAST-WEST THROUGH SITE - LOOKING NORTH

Figure 3.3-5
Alternatives 1, 2 & 3
Cross Sections

All alternatives propose relocating portions of Des Moines Creek. Generally, the relocation requires movement of the streambed west of its present location. All stream sections filled would be replaced. This design proposes about 1,700 feet of culvert to pipe the creek through a tunnel.

Under Alternative 3, there would be a net gain of 195 feet of new streambed. The new channel would be constructed prior to the loss of the existing stream. It would be planted with grasses and appropriate wetland and riparian vegetation as soon as possible so the vegetation would become established before the stream is actually diverted to the new bed. Most of the affected stream would be placed in a five-foot diameter culvert that would run under the north portion of the site.

3.3.4.3 Infrastructure

__Runoff Treatment Facility__

Under Alternative 3, the largest of the build alternatives, the total area draining to the SASA Runoff Treatment Facility would be approximately 90.3 acres. The peak flow rate under this alternative would be 38.6 cfs for the peak 100-year, 7-day storm event.

The volume of storage required to detain the runoff from the site would be 71.9 acre-feet.

__Utilities__

Utilities available on the site would be similar to those described above for Alternative 1.

__Storm Water Management Facility__

The storm water management facility would be similar to the one described previously under Alternative 1.

__Service and Access Roads__

The service and access roads, and security fencing would be similar to that described previously for Alternative 1.

__Automobile Parking__

Alternative 3 would require 1,554 parking spaces. As noted above, parking lot drainage would be routed to the new Runoff Treatment Facility.

3.3.4.4 Cost Estimate

The total cost of construction of Alternative 3 is estimated to be approximately $117.9 million. See Table 3.3-1 for a further breakdown of construction costs.

3.3.5 Update on Maintenance Base Development

On June 26, 1992, Alaska Airlines announced a reduction in planned capital spending including cancellation of their proposed new aircraft heavy maintenance base. They indicated, however, that the project could be restarted at some time in the future as, and if, economic conditions improve and their aircraft fleet grows. In preparing this EIS, the Alaska Airlines maintenance base proposal has been used as an example of the type and scale of development that could occur on part of the SASA site. Cancellation of the Alaska Airlines proposal does not, however, mean that the SASA project is not needed or that the development evaluated in this EIS will not occur. There is still a demand for relocation of line maintenance facilities. Continued provision of area for additional aircraft maintenance and support activities is also needed. The scope of the Alaska Airlines project remains a reasonable example for the scale and impact of the maintenance base component of the SASA program.

The most likely result of the Alaska Airlines decision is to alter the sequence and rate of development of the SASA project. Construction of line maintenance facilities would likely precede maintenance base development. Site construction would probably start from one to two years later than originally planned. Both the overall scope and primary elements of the SASA development program are unchanged, the Preferred Alternative (Alternative 2) remains the same, and appropriate mitigation elements would be carried out. As described in this EIS, the northern part of the site would be developed first, including the proposed grading and filling, taxiway connection and bridge, creek/wetland relocation and enhancement, and storm water control and treatment. Aircraft hangars, maintenance shops, aircraft hardstands, and vehicle parking of similar scale would be constructed. The timing and extent of potential commercial development in the designated portions of the SASA study area would not be affected by variation of the SASA program sequence.

Because the overall scope of the SASA program remains the same, the environmental impacts of complete project buildout as described in the EIS remain essentially unchanged. Insofar as the sequence of development could change and the start of site construction could be delayed, the timing of some of the impacts would also shift. In general, because the EIS considers base maintenance as the first stage of development for the Preferred Alternative (Alternative 2), the impacts discussed represent the worst case since major construction and increased employment occur early in the development sequence. With line maintenance relocation as the initial phase, SASA development would start by relocating existing activities and growth-related impacts would arise more slowly. To the degree that employment growth would occur later, the SASA contribution to area traffic would also be delayed. This would provide additional time in which the various area roadway and high-capacity transit projects now in various stages of planning could be implemented, further reducing the potential SASA impacts. As the runup hush facility is linked with maintenance base development, its construction could be later in the SASA program. Aircraft runups would continue to use the existing airfield runup locations as described until the time that a hush facility is added. In general, the initial development of the Preferred Alternative (Alternative 2) would generate the impacts described for the buildout of Alternative 1/Option 1A. Displacement of the golf course would be delayed until the construction start. However, the runway safety area project could displace the golf course as early as 1994.

As noted above, when line maintenance facilities are the initial phase of SASA Preferred Alternative (Alternative 2), the scale of development, operations, and impacts would be very similar to those described for Alternative 1, the line maintenance alternative. In a number of the tables in this EIS, data are presented for a 1994 level of SASA operation. These data represent the impacts of the initial phase of SASA (now anticipated to occur several years later). The data listed under Alternative 2 represent the case in which a major maintenance base is the phase 1 development; the data under Alternative 1 best represent the case in which phase 1 is development of line maintenance facilities. For example, Tables 4.4-8 & 4.4-11 (noise), 4.5-3 (air quality), and 4.12-1 (transportation), among others, should be interpreted this way.

No significant difference in impacts is anticipated in the event that line maintenance facilities are located at the northern part of the SASA site. The development footprint would be unchanged. The same range of aircraft types would be handled. The scale of aircraft hangars, shops, hardstands, etc. would remain the same and dimensions of the taxiway and connecting bridge would not change. The location of the runup hush facility would not move. The basic arrangement of buildings and pavement is determined by the physical constraints of the site and operational requirements for aircraft movement, regardless of the type of aircraft maintenance that is performed.

3.4 COORDINATION WITH OTHER AREA PROPOSALS

3.4.1 Introduction

The SASA development would occur in an area in which several other major projects are proposed. As shown on Figure 3.4-1, other projects in the immediate vicinity of SASA are in various stages of conceptualization and approval. The following projects relate to the current South Aviation Support Area proposal:

- South Access Roadway
- SR 509 Extension
- Runway Safety Area Extension
- 28th/24th Avenue South Arterial
- South 200th Street Widening
- King County Regional Justice Center Alternative Site

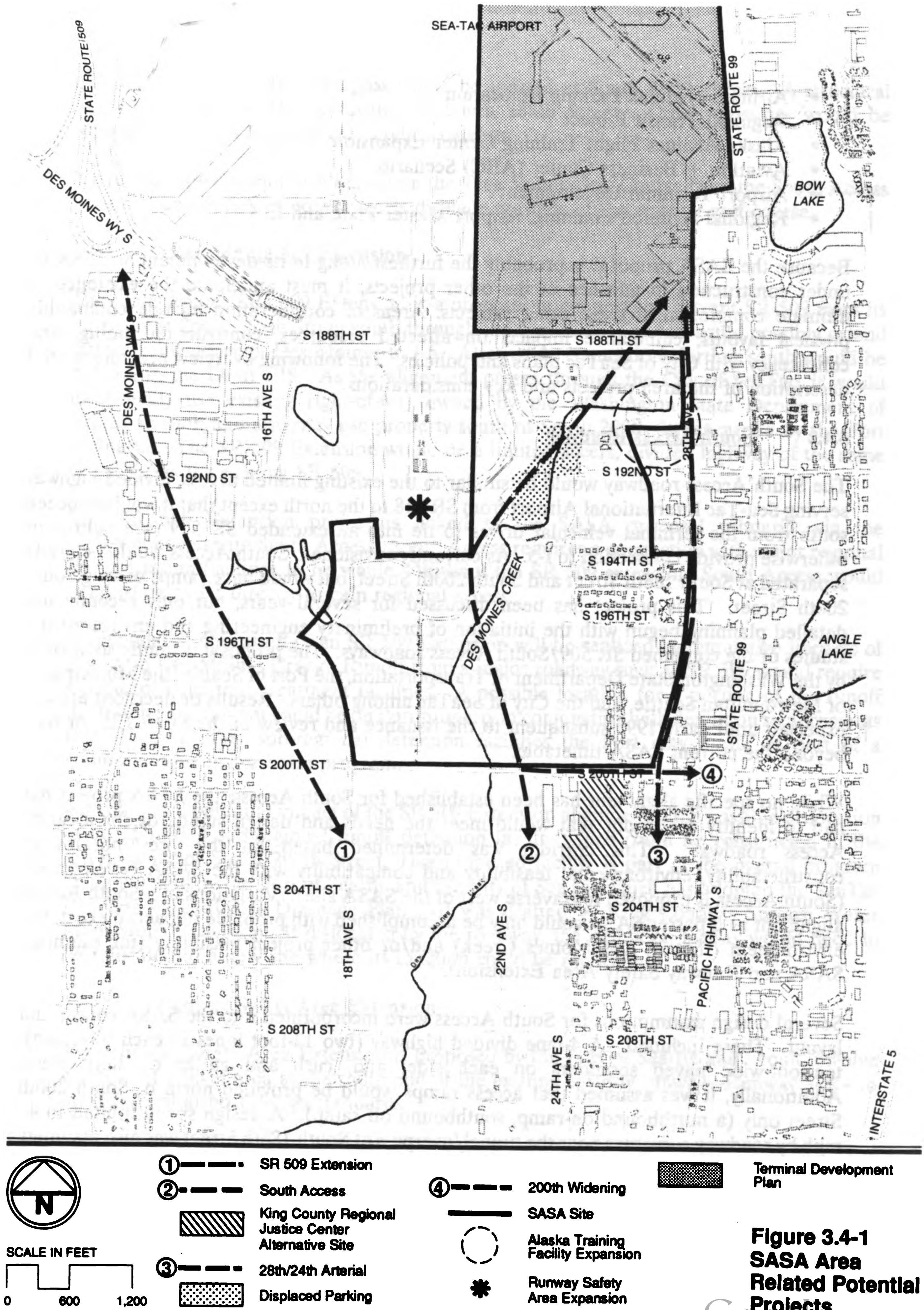


Figure 3.4-1 SASA Area Related Potential Projects

- Airline Personnel Parking Relocation
- Regional Transit Project
- Alaska Airlines Flight Training Center Expansion
- Aviation + Business Center (ABC) Scenario
- Airport Terminal Development
- Regional Aviation Planning, Airport Master Plan, and EIS.

Because the SASA proposal is probably the furthest along in its development and may be under construction in advance of the other projects, it must anticipate the existence or ultimate completion of these other projects. Areas of consideration include compatible physical layouts, cumulative impacts on affected resources, construction timing, and consistency with City of SeaTac plans and policies. The following overview provides a brief description of the area projects and key considerations.

3.4.2 South Access Roadway

The South Access roadway would be similar to the existing limited access, divided highway serving Sea-Tac International Airport from SR 518 to the north except that it would proceed south from the terminal vehicular drives to tie into an extended SR 509 (see below) or otherwise provide connection to I-5. As currently envisioned, South Access would be grade separated at South 188th Street and South 200th Street, but would have ramps serving South 200th Street. This project has been discussed for several years, but only recently has detailed planning begun with the initiation of preliminary engineering and environmental studies of the combined SR 509/South Access roadways. The proposal is jointly sponsored by the Washington State Department of Transportation, the Port of Seattle, the Municipality of Metropolitan Seattle, and the City of SeaTac among others. Results or decisions are not expected until early 1995 subsequent to the issuance and review of the Draft EIS, or well beyond the current SASA timetable.

While no specific alignment has been established for South Access, the SASA project has had to identify a corridor that would meet the needs and design standards for a South Access roadway. This corridor was determined based on the presumptions of constructability, environmental feasibility and compatibility with the SASA development (South Access is proposed to traverse west of the SASA site). Variations in a South Access alignment as it passes SASA could only be accomplished with probable impacts on cost, the environment (that is, Des Moines Creek) and/or other project feasibility (for example, SASA and Runway Safety Area Extension).

Several design assumptions for South Access were incorporated into the SASA conceptual layout. These included: A 4-lane divided highway (two 12-foot lanes in each direction); ten-foot-wide paved shoulders on each side; and, curb and gutter on both sides. Additionally, it was assumed that access ramps would be provided north of South 200th Street only (a northbound on-ramp, southbound off-ramp). A design speed limited to 45 mph by roadway curvature near the tunnel/overpass at South 188th Street was also assumed.

A proposed 23-foot clear overpass would be located at South 200th Street. A structural tunnel underpass would be located at South 188th Street. Creek crossings would be accomplished with "bottomless" arched culverts.

There could be a cumulative impact on the Tyee Valley Golf Course from the South Access Roadway and SASA as both projects displace portions of the existing golf course.

3.4.3 State Route 509 Extension

The State Route (SR) 509 Extension is a proposal to connect the current SR 509 from its terminus at South 188th Street south through the City of SeaTac and could possibly extend farther south through Des Moines to I-5. Alternative connections further south would be defined in the Draft EIS. As the alignment passes through the City of SeaTac, it would most likely use existing right-of-way owned by the Washington State Department of Transportation and also may use property south of South 200th Street owned by the Port of Seattle. The SR 509 Extension would be a limited access, divided highway of the same character as the existing SR 509.

The SR 509 Extension project is linked to the SASA proposal primarily via the interconnection with South Access. South Access requires a connection with major regional transportation facilities to be viable. Without the SR 509 extension, South Access would need to tie to I-5 directly to gain regional access.

A secondary implication of an SR 509 Extension will be realized in cumulative impacts of runoff on Des Moines Creek. Runoff from a major roadway such as SR 509 would require significant detention/treatment facilities. A possible location for a portion of the runoff detention requirement could be on Port property in conjunction with detention requirements for SASA or other sub-regional detention facilities the Port may locate as part of a comprehensive upper basin program.

An additional potential impact of the SR 509 Extension alignment is the possible dislocation of an identified sub-regional runoff detention facility which could be constructed in the future south of South 200th Street. This proposed facility is part of the overall program being pursued by the Port of Seattle and the City of SeaTac which has adopted the SeaTac Business Park Master Drainage Plan that was drafted by King County's Surface Water Management Division. If dislocated by the roadway, the detention facility would need to be relocated to a new site where its function could be replicated.

3.4.4 Runway Safety Area Extension

The Runway Safety Area Extension is proposed by the Port of Seattle and would involve creation of a level area at the south end of the existing easterly runway—Runway 34R—to meet federal airport design standards.

The project involves the placement of approximately 501,000 cubic yards of fill material off the southern end of Runway 34R effectively creating a safety area extension of approximately 450 feet. Most of the proposed extension area is currently developed as part of the Tyee Valley Golf Course.

The toe of the slope of the Runway Safety Area Extension could potentially compete with the SASA and the South Access roadway due to the size of the fill involved. To assure that all projects have adequate space, the Port is proposing sidewall retained sections where required (versus normally sloped fill) for both SASA and the Runway Safety Area Extension.

There could be a cumulative impact on the Tyee Valley Golf Course from the Runway Safety Area Expansion and SASA as both projects displace portions of the existing golf course.

Further description of the Runway Safety Area Extension project and SEPA compliance will be forthcoming from the Port of Seattle as part of the Master Plan (see Section 3.4.14).

3.4.5 28th/24th Avenue South Arterial

A consortium consisting of the cities of SeaTac and Des Moines, the Port of Seattle, King County, Equitable Capital Group, the Christian Faith Center, and Alaska Airlines is studying alternative boulevard alignments to serve existing and expected local access traffic generated through the anticipated development of the cities of SeaTac and Des Moines. The alternative designs must anticipate the potential development of the Aviation Business Center in the City of SeaTac north of South 212th Street, and the potential business park development by the City of Des Moines, west of 24th Avenue South, adjacent to South 216th Street.

The eastern edge of the SASA site has been developed around "Alternative 3" of the proposed arterial. As currently proposed, route alternatives follow the 28th Avenue South corridor between South 188th and South 196th, then vary among the 28th/26th/24th Avenue South or South 216th Street. A full boulevard section is proposed. Each of the alternatives would impact the SASA project in a different way through the amount of land required for the roadway and the actual alignment. Commitment by City of SeaTac to a different alternative prior to SASA receiving approval would result in reworking the SASA proposal to accommodate the selected alignment.

The project Final EIS was published in May 1993. This project is currently in preliminary design.

3.4.6 City of SeaTac South 200th Street Widening

If South Access is built as now envisioned, it would intersect with South 200th Street and require widening of South 200th Street to accommodate increased volumes. The SASA project has anticipated this new right-of-way requirement by off-setting its southern boundary. Widening South 200th Street along the south side of its present right-of-way would be difficult due to the presence of wetlands.

This project is not currently in any phase of design or environmental analysis.

3.4.7 King County Regional Justice Center/Federal Detention Center

One of the alternative sites for the new King County Regional Justice Center is located in the City of SeaTac on a site bounded by South 200th Street on the north, 26th Avenue South on the east, South 204th Street on the south, and proximity of 24th Avenue South on the west. This site is immediately south of the proposed SASA project.

The main concern would be the control of noise levels from SASA at the Justice Center. Correctional detention facilities are considered as residential settings for purposes of noise impacts, and as such, have lower threshold criteria. While the Port has embarked on a noise abatement program in this area, including the acquisition of noise-impacted residences, the reintroduction of a sensitive "residential" receptor is of concern. The most likely impact of SASA would result from moving aircraft to and from their parking pads at the SASA facility. This could occur during late night hours or in the early morning and may not always involve a tug tow, thereby requiring powering up to levels sufficient to move the aircraft.

General engine testing would probably not be the cause of concern as the SASA site (Alternatives 2 and 3) would contain a hush facility where engines can be run-up in a relatively enclosed environment. Alternative 1 does not have such a facility and runups would be done on existing airport locations.

A Draft EIS for this project was issued in January 1992, with the Final EIS released in March 1992. The King County Council selected a site in Kent in June 1992. A bond measure was passed in November 1992 to secure funding.

In November 1993, this same land parcel was the subject of a NEPA environmental impact statement (EIS) for a Federal Detention Center (FDC). The FDC is proposed by the Federal Bureau of Prisons as a 500-unit short-term detention facility designed to house individuals awaiting trial, awaiting sentencing, or having other business before the federal courts in the region. The proposed FDC would be staffed by approximately 225 employees who would provide 24-hour supervision. The Bureau has selected this site for the FDC and has begun design work. Impacts from SASA would be similar to those discussed above for the Regional Justice Center.

3.4.8 Employee Parking Relocation

There currently exists approximately 1,500 airline/airport employee parking spaces on remote lots in the vicinity of South 192nd Street and 26th Avenue South. Most spaces are to be moved to the north end of the airport to a site previously identified and reviewed in a separate SEPA document, the Port of Seattle's Parking and Facilities Expansion Project EIS. While under construction, interim parking will be used as needed. These could include use of the parking garage, leasing of area lots, or temporary development of unused lots.

3.4.9 Regional Transit Project

A Regional Transit Authority (RTA) was formed in 1993, made up of transit agencies in King, Pierce, and Snohomish counties who are working together to develop the Regional Transit Project. The project will include major expansion of existing bus service, more bus and carpool facilities, and either a bus or rail rapid transit system.

One of the rail alternatives under consideration includes an alignment that would use an electric, light-rail system to provide service to south Seattle, Sea-Tac International Airport, the City of SeaTac, Des Moines, Federal Way, and Fife along the SR 99/I-5 corridor. Light-rail system stations would be located every 1 to 2 miles. Implementation of the project could reduce parking and traffic impacts due to SASA. The current estimated completion date is 2020.

The RTA may ask for a public vote on the RTP as early as November 1994. The first stations would not open before 2000, with the estimated completion of the system around 2020.

3.4.10 Alaska Airlines Flight Training Center Expansion

The Alaska Airlines Flight Training Center, located at South 192nd Street and 28th Avenue South may be expanded. Alaska Airlines has proposed leasing/buying an additional five acres of property to expand the current building and associated activities. The SASA proposal, in particular the Storm Water Management facility design, has set aside five acres around the current training center for such an expansion.

3.4.11 Aviation + Business Center (ABC) Scenario

During development of the Sea-Tac Area Update, South Access Roadway projects, and ABC Zoning (see Section 4.1, Land Use), various conceptual schemes for extensive commercial development of approximately 200 acres were prepared by private property owners and development interests. The area involved overlapped and extended south of the SASA site. These concepts ranged from fully commercial development to integrated commercial and aviation uses sharing sites and structures. None of these concepts have resulted in specific development proposals. Any such projects that might be proposed in the future would be subject to separate environmental review.

3.4.12 Airport Terminal Development

Expansion of the passenger terminal, including aircraft gates, passenger waiting areas, passenger services, etc. has been identified throughout the range of planning studies for Sea-Tac Airport. Other support facilities such as customs and immigration clearance and baggage handling are also recognized as needing to grow as passenger flow increases. There will be significant increases in passenger numbers at the airport over the next ten years and beyond, regardless of whether additional airfield capacity is constructed. The timing and design of specific proposals for terminal improvements reflect the projected level of operations at the airport, with the goals of passenger handling efficiency and achieving a high level of service and convenience for the traveling public. Likewise, ground transportation improvements, including parking, access roadways, and transit systems are planned and implemented as necessary to meet aviation service levels. These landside facilities, however, are not the determinants of either market demand for aviation or the operational capacity of the airport.

At this time, specific project and design proposals for expanded terminal facilities have not been prepared. The Port Commission has not authorized any development program and there are no designs or construction plans currently being prepared. The Terminal Development Plan (TDP), a recent planning evaluation of terminal expansion, evaluates potential options in light of projected passenger flows, operating activities, and desired quality of service. The Gateway 2000 design study and the current program of improvements for Concourses B, C, and D provide additional guidance towards the scale and design of future terminal additions. Insofar as the proposed SASA project would assist in accommodating future passenger terminal improvements, potential environmental impacts of such terminal construction can be reviewed, albeit at a general level since no specific terminal development project is currently proposed.

Because the potential terminal expansion areas are already a part of the developed airport operating area and are already paved and/or have buildings in place, additional terminal development would be unlikely to have any significant impact on earth, water, or habitat elements of the environment. Site grading would be minimal and storm water runoff and groundwater flows would continue in existing patterns. Noise and air quality would be proportional to the volume of passengers and cargo moving through the airport. However, projected increases in the number of flights will reflect market demand and are not caused by improvements to the terminal. Airport noise is projected to decrease from current conditions because of the continued fleet change to quieter Stage 3 aircraft and the provisions of the noise mediation agreement. Noise impact mitigation through the Noise Remedy Program would continue. Aircraft emissions rates would also improve with the continued replacement of older aircraft. Reduction in terminal-area congestion would also aid in reducing aircraft idling emissions.

With the projected growth in passenger flows through the airport, additional parking and access facilities would also be needed. The Parking Facilities Expansion studies discuss a variety of parking improvements, including the current expansion of the main terminal parking garage, and evaluate environmental impacts, including noise, air quality, traffic, and associated mitigation measures. Any other parking and access projects that might be proposed and considered in the future would be subject to appropriate environmental reviews. In addition, as noted elsewhere in this part of the EIS, the Port is cooperating with other state and local agencies in the planning and evaluation for area and regional roadway projects to serve both the airport and other land use development. The Port is also participating with Metro and others in high capacity transit and transportation demand management studies that are underway. Land use would not change on the site. However, an increase in passenger numbers and use of the airport could induce the local development of additional hotels, motels, long-term parking, and other types of land uses associated with airports. Historical/cultural and recreational facilities would not be affected. Utility requirements could increase but basic public services would probably not be significantly changed and would be handled by airport departments. As and when the Port Commission authorizes project studies for additions to the terminal, appropriate detailed environmental assessments would be prepared.

3.4.13 Regional Aviation Planning, Airport Master Plan, & EIS

Several recent or ongoing studies have addressed the future regional demand for air travel and the airport facilities that will be needed after the year 2000. These include: the Flight Plan project & EIS (completed in 1990-92); the Sea-Tac Airport Master Plan Update and EIS (1993-96); the Puget Sound Regional Council's (PSRC) Major Supplemental Airport Feasibility Study (1994-96).

The Flight Plan project and its EIS were conducted jointly by the PSRC and the Port. The purpose of Flight Plan was to identify a regional airport system which would meet the needs of the Puget Sound Area to the year 2020 and beyond. The project examined the operational and technical elements (including forecasts of future passengers and operations, capacity, delay, airspace, airport accessibility, demand management, etc.), economic and financial elements, institutional elements, and environmental elements of a wide range of regional airport system alternatives. A programmatic environmental impact statement was prepared. Based on this work, the Flight Plan committee recommended that detailed plans and a project-specific EIS be prepared for adding a new runway at Sea-Tac International Airport and that commercial airline service be pursued at one or more supplemental airport(s), possibly at an existing facility(ies) in the region.

The Flight Plan EIS (*The Flight Plan Project, Final Environmental Impact Statement*, Puget Sound Regional Council and Port of Seattle, October, 1992) addresses the environmental impacts of the broad range of regional airport system alternatives. Included in the alternatives are expansion of Sea-Tac Airport and/or establishment of new commercial airline service at other new or other existing airports. In addition to physical expansion of the airport system, system management operational improvements were also examined. The full range of potential environmental impacts were considered at the programmatic level, including noise, air quality, transportation, land use, public service & utilities, flora & fauna, earth, energy, and public safety. The Flight Plan EIS considers impacts from the present through the year 2020. Forecasts of aircraft operations and passenger volumes used in this EIS for the SASA Project are consistent with those of the Flight Plan EIS.

The Flight Plan Project, Final Environmental Impact Statement (Puget Sound Regional Council and Port of Seattle, October, 1992) is hereby incorporated by reference. Copies of the Flight Plan EIS have been available since October 1992 and continue to be available for public review and reference during normal business hours at a number of locations, including the following:

- Aviation Planning Department, Rm. 301, Main Terminal, Seattle-Tacoma Intl. Airport
- Seattle Airport District Office, FAA, 1601 Lind Ave. SW, Renton, WA
- Boulevard Park Library, 12015 Roseburg Ave. S, Seattle, WA
- Burien Library, 14700- 6th Ave. SW, Burien, WA
- Des Moines Library, 21620 -11th Ave. S, Des Moines, WA
- Seattle Public Library, 1000 Fourth Ave., Seattle, WA
- Valley View Library, 17850 Military Rd. S, SeaTac, WA
- White Center Library, 11220 - 6th Ave SW, Seattle, WA

(For other libraries and locations, please contact Ms. Gerry Poor, (206) 248-6866)

Following the Flight Plan project, the Port adopted a similar resolution and initiated work towards the detailed studies and EIS as part of an update of the Sea-Tac Airport master plan. The PSRC updated the Regional Airport System Plan (RASP) by including a modified version of the Flight Plan recommendation. The RASP now provides for development of both an additional runway at Sea-Tac Airport and a new "major supplemental airport." The PSRC's Major Supplemental Airport Feasibility Study will review and analyze potential sites for an additional airport to serve future regional air service capacity requirements. As described above, the Sea-Tac Master Plan Update (MPU) and accompanying EIS result directly from the Flight Plan project. The Port has also conducted or participated in various independent planning studies as needed since the last Master Plan Update in 1985. A number of these studies (e.g., the Terminal Development Plan, the 28th/24th Arterial and SR509/South Access EISs) are discussed elsewhere in this section. The new MPU and EIS will consider all of the relevant previous planning work (including the SASA project, roadways, etc.), the detailed information required for evaluation of a third runway, and additional projects that are brought forth during the master planning effort. The Update will set the foundation for the future development of both airside and landside facilities. The MPU EIS will broadly evaluate the cumulative range of impacts for the conceptual development packages proposed in the Master Plan, as well as evaluate the specific project impacts of a third runway. The MPU & EIS program will lead to a decision by the Port Commission regarding the airport's long range development plans and whether to construct a third runway. The MPU and EIS are currently anticipated to be completed in time to allow the Port Commission to take action in Spring, 1996.

Since implementation of the SASA program of development would occur over a period of years, it is possible that projects considered through the Master Plan process may be developed during the same time frame. As a part of this environmental evaluation, the potential SASA impacts have been reviewed to consider whether the addition of Master Plan projects would be likely to result in significant cumulative impacts. Because the multi-year MPU and its EIS have only just commenced, it is not possible at this point either to describe the complete range of airport improvements that may be considered or to assess their potential environmental impacts in complete detail. The analysis contained in this EIS reflects the best information available at this time for the level of detail available.

Concerns have been expressed that other airport development projects, particularly the potential third runway, would have a strong interaction with the SASA project and could lead to significant cumulative impacts. These concerns have been addressed in this EIS in Chapters 3 and 4 and in the responses to comments on the Draft EIS in Chapter 6 (particularly the general responses). Additionally, in reviewing the cumulative impact potential, the separation between the SASA project and other airport programs has been recognized. The SASA site is a distinct area separate both from the airport terminal complex and particularly from the potential third runway site. The latter is located in a separate drainage basin and is more than three-quarters of a mile from the SASA site. Operationally, neither project requires or triggers the other. Neither do the respective development areas interfere with one another.

The potential for cumulative impacts will be evaluated again in the MPU EIS over the full range of elements of the environment. Once the MPU process has progressed, sufficient environmental information will be developed and available to allow a comprehensive evaluation of cumulative impacts. This second review will ensure that all of the projects proposed for the airport, both those already planned such as SASA and those additional ones which are further examined through the MPU process, are considered as a cumulative whole. Appropriate mitigation for any significant cumulative impacts would then be identified.

3.5 PROPERTY BOUNDARIES

Figures 3.5-1 through 3.5-6 show the existing property ownership, ownership under the No-Action Alternative, and ownership under each of the build alternatives, including Option 1A.

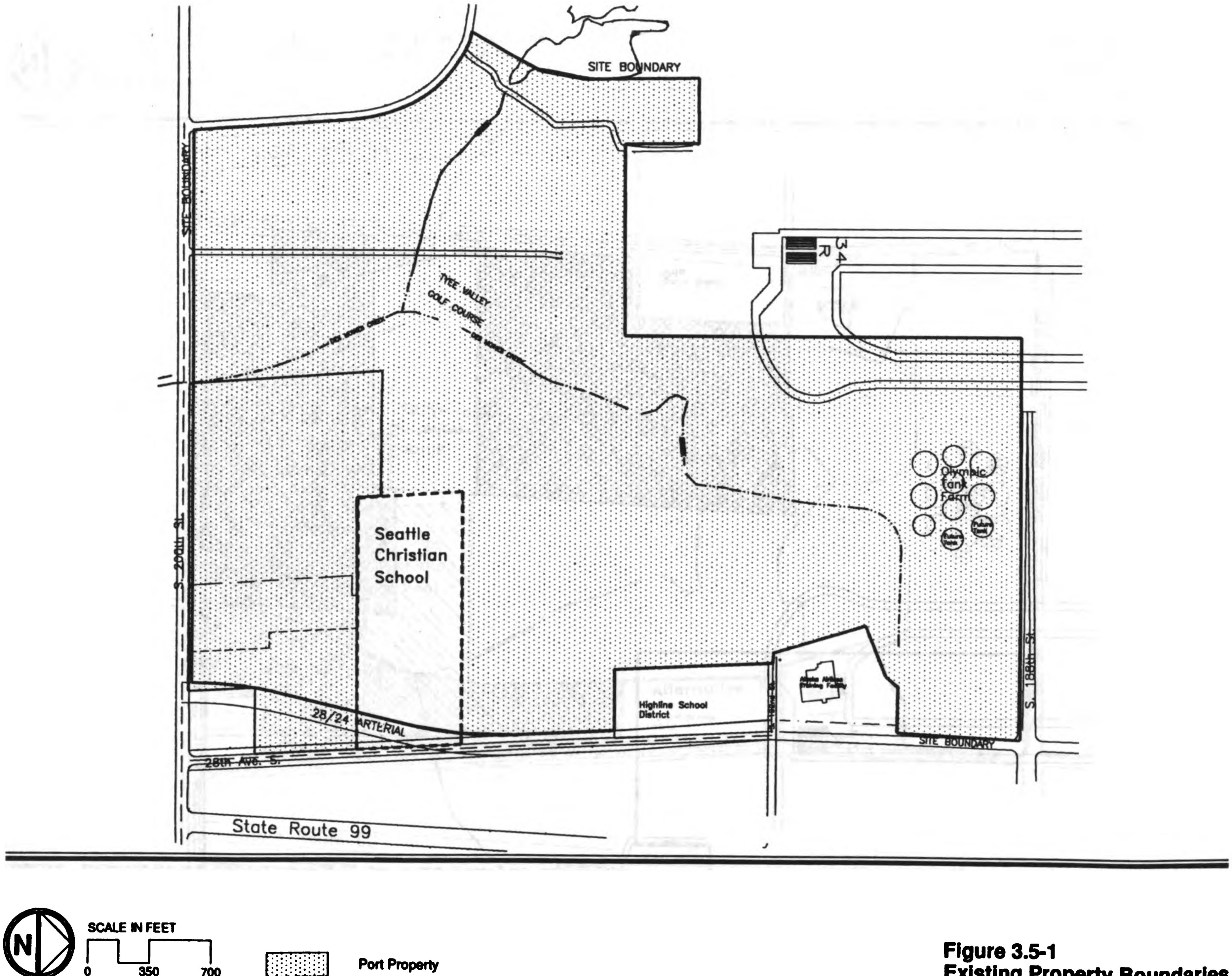


Figure 3.5-1
Existing Property Boundaries

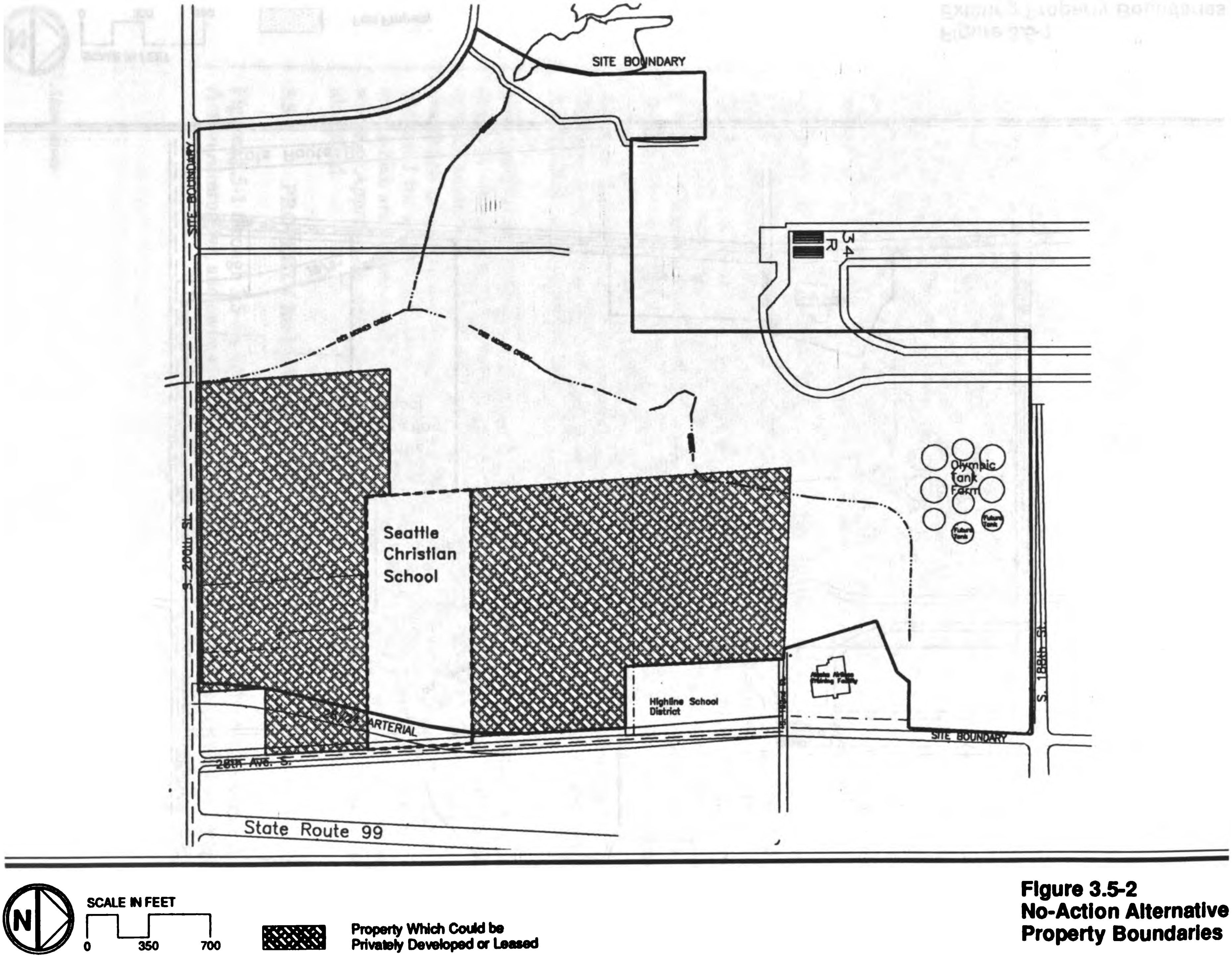
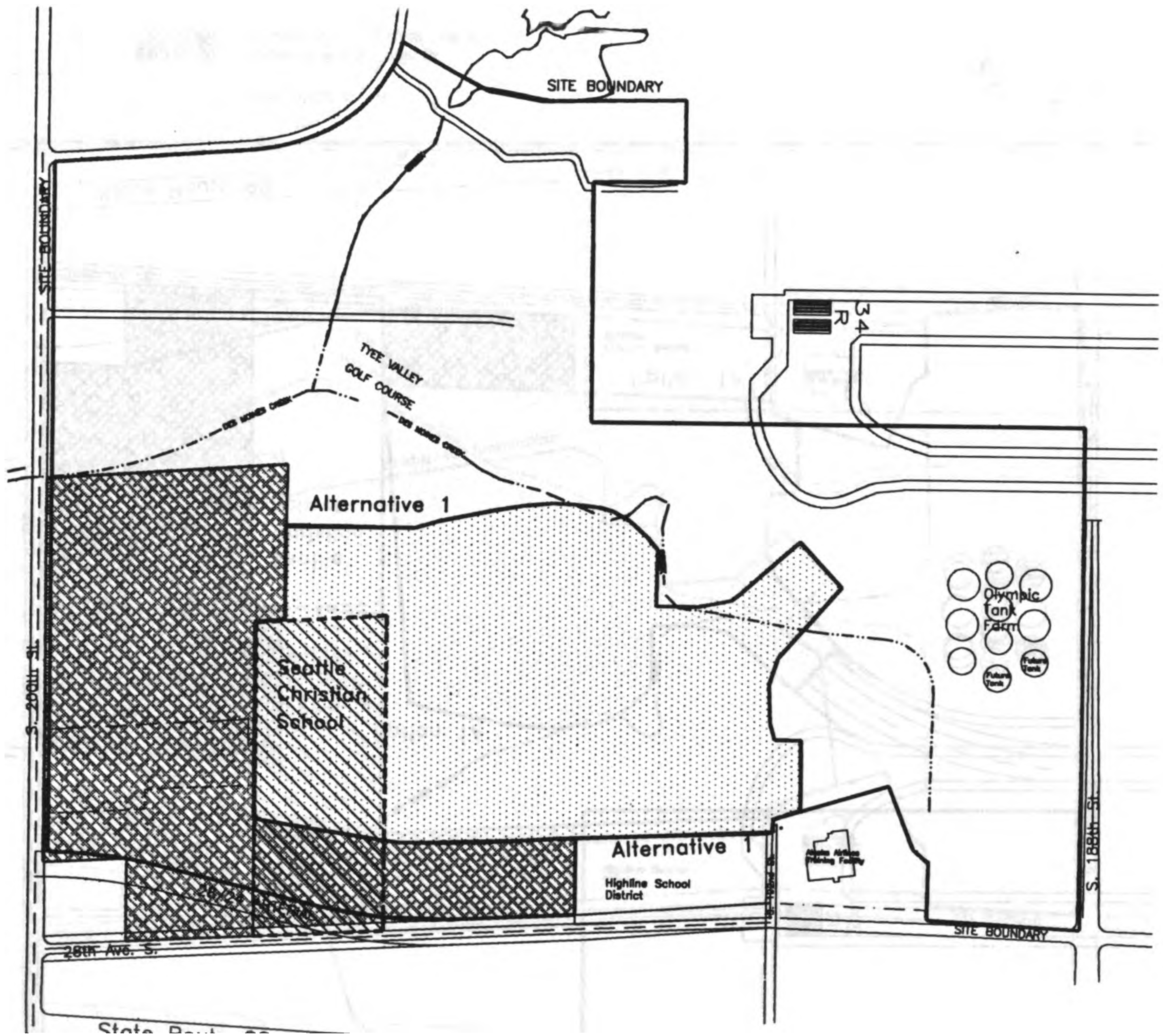


Figure 3.5-2
No-Action Alternative
Property Boundaries


SITE BOUNDARY
TYEE VALLEY
GOLF COURSE
DES MOINES CREEK
Alternative 1
Seattle
Christian
School
Olympic
Tank
Farm
Future
Tank
Alternative 1
Highline School
District
S. 200th St.
S. 188th St.
28th Ave. S.
SITE BOUNDARY
34
R

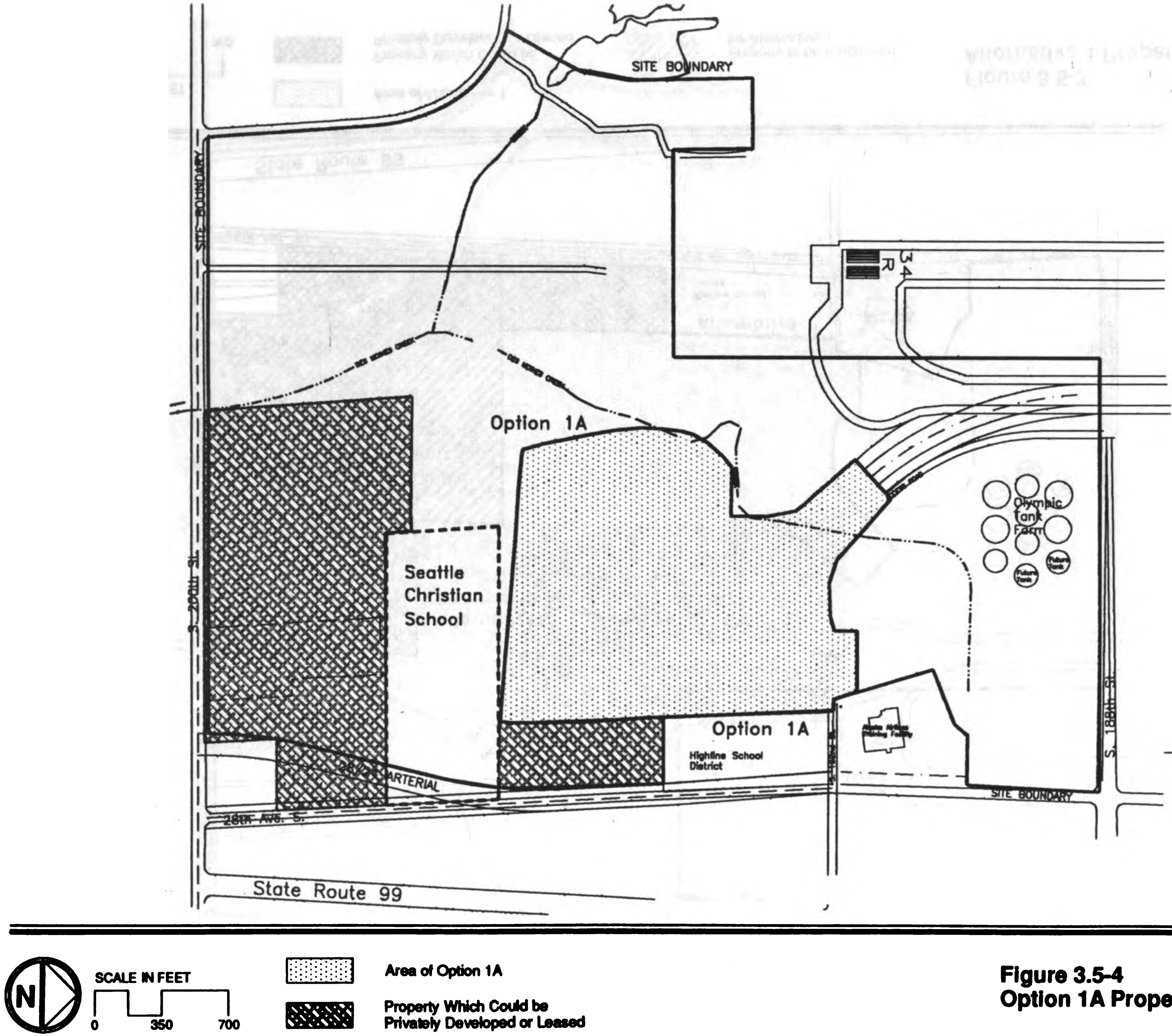


Figure 3.5-4
Option 1A Property Boundaries

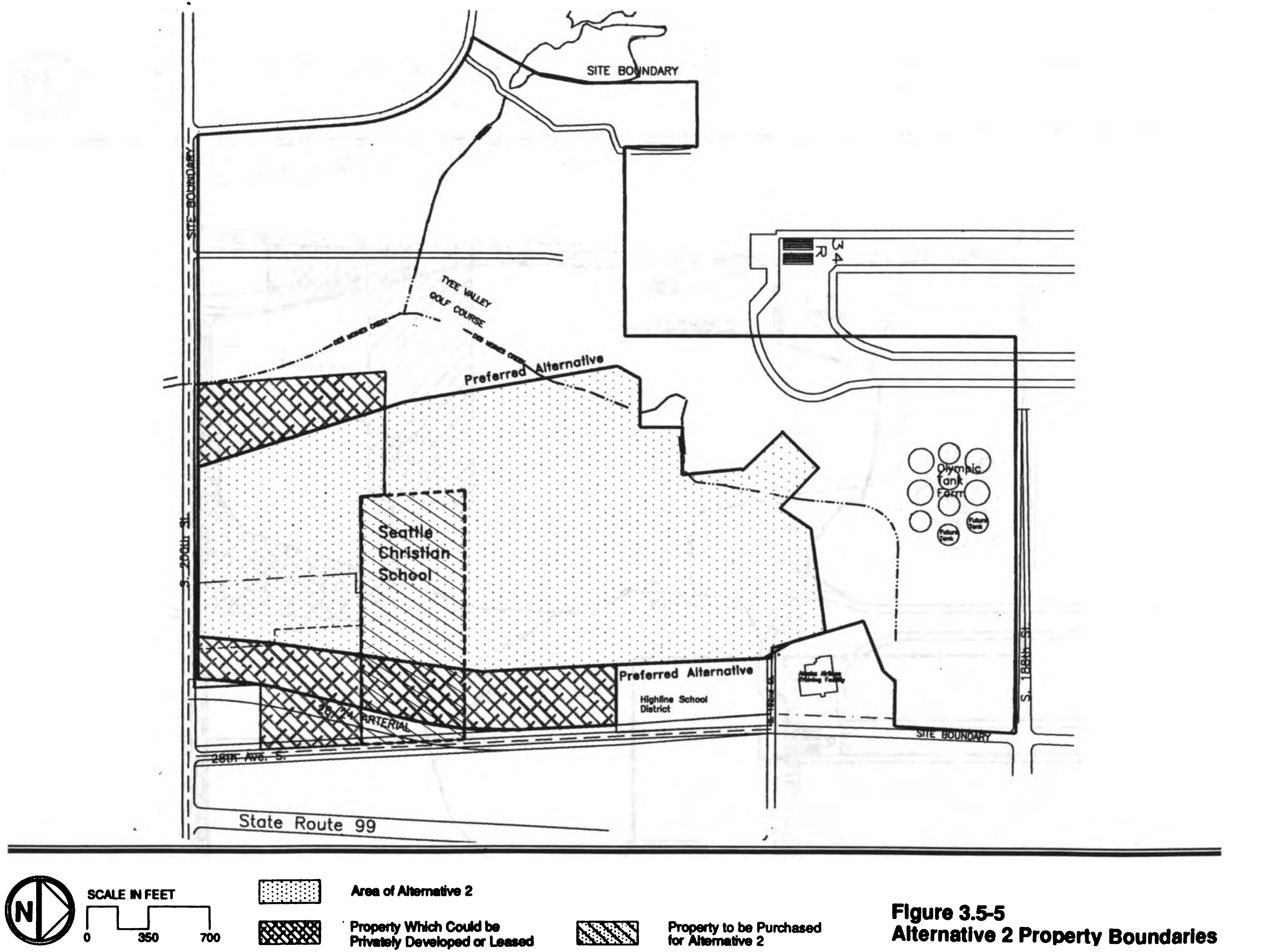


Figure 3.5-5
Alternative 2 Property Boundaries

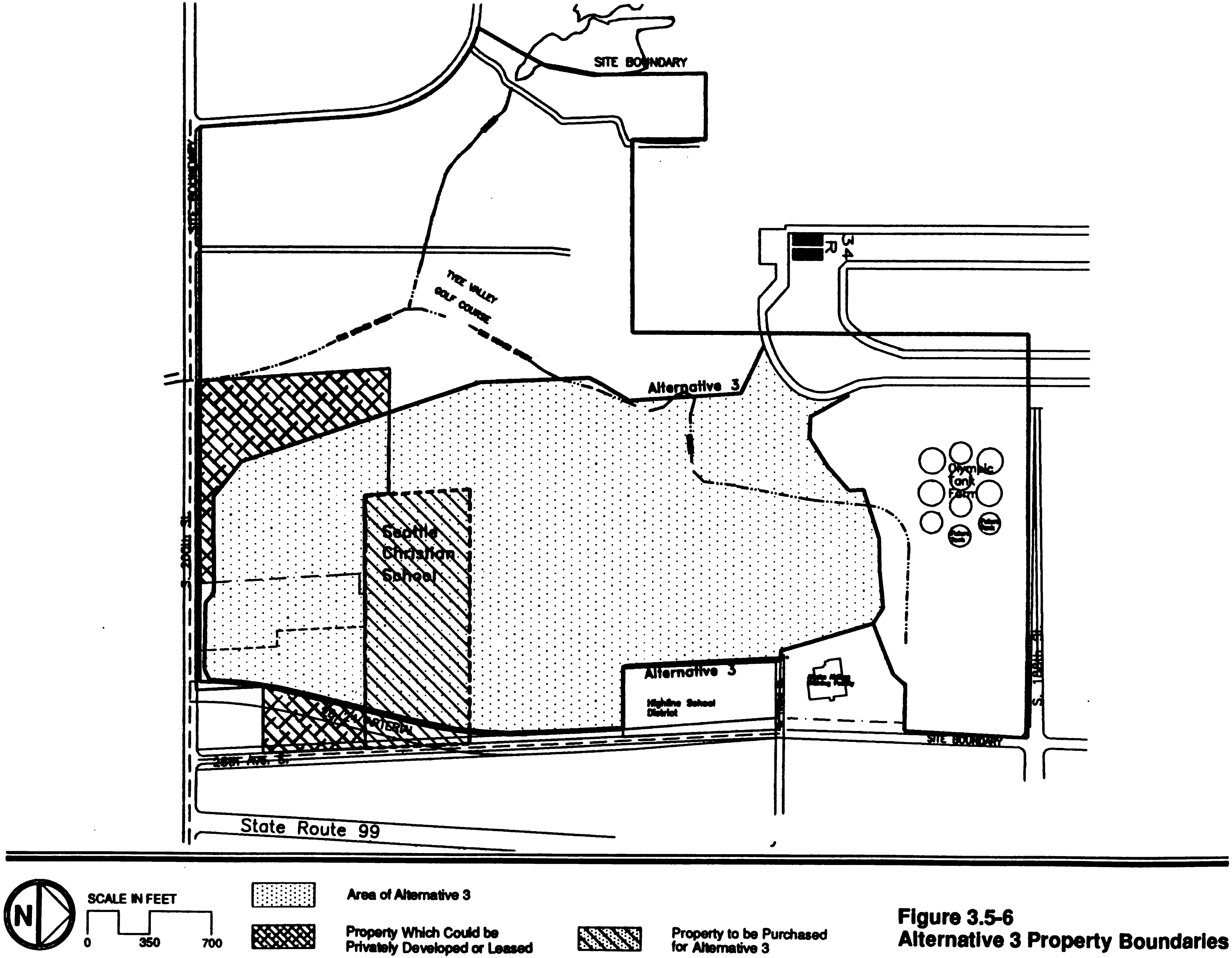


Figure 3.5-6
Alternative 3 Property Boundaries

Affected Environment and Environmental Consequences

4. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4.1 LAND USE

This section examines the relationship between the current land uses in the area, the proposed land uses under the current proposal and the consistency of each with local and regional plans and policies. Information for this section was obtained from site visits, the City of SeaTac Department of Planning and Community Development, and a variety of local and regional planning documents.

4.1.1 Affected Environment

The project site is within the City of SeaTac and is approximately 247 acres. Site boundaries include Sea-Tac International Airport to the northwest, South 188th Street to the north, 28th Avenue South on the east, South 200th Street on the south and 18th Avenue South to the west. The site stretches along the western slope of a broad hill and extends down and across the valley of Des Moines Creek. The terrain slopes west and north toward the airport and the flight path of arriving and departing aircraft. Access to the area occurs primarily along 28th Avenue South and South 192nd Street. A portion of site area in the south is approached from South 200th Street and the northwestern part is served to some extent by airport maintenance drives. Regional traffic approaches the site from I-5 and SR 99 to the east or from SR 509 to the west.

With the exception of the Tyee Valley Golf Course which occupies the Des Moines Creek valley, most of the uses within the site are located along the hillside between 28th Avenue South and 24th Avenue South. A large part of this area is also vacant. See Figure 4.1-1 for the generalized land uses in the area.

The northeastern-most corner of the site contains eight large aviation fuel tanks, an airport employee parking lot, several acres of vacant land and two uses which, though west of 28th Avenue South, are not part of the site. These are the Alaska Airlines Flight Training Center and the former Angle Lake School building which now houses offices for the City of SeaTac and several private companies.

Further south and adjacent to the school is a nearly vacated residential neighborhood called Lowe's Terrace. Like several other neighborhoods near flight paths at Sea-Tac, residents and many of the houses here have been relocated pursuant to the Port's Noise Remedy Acquisition Program. Lowe's Terrace is now nearly vacant as a result of the Noise Remedy Program.

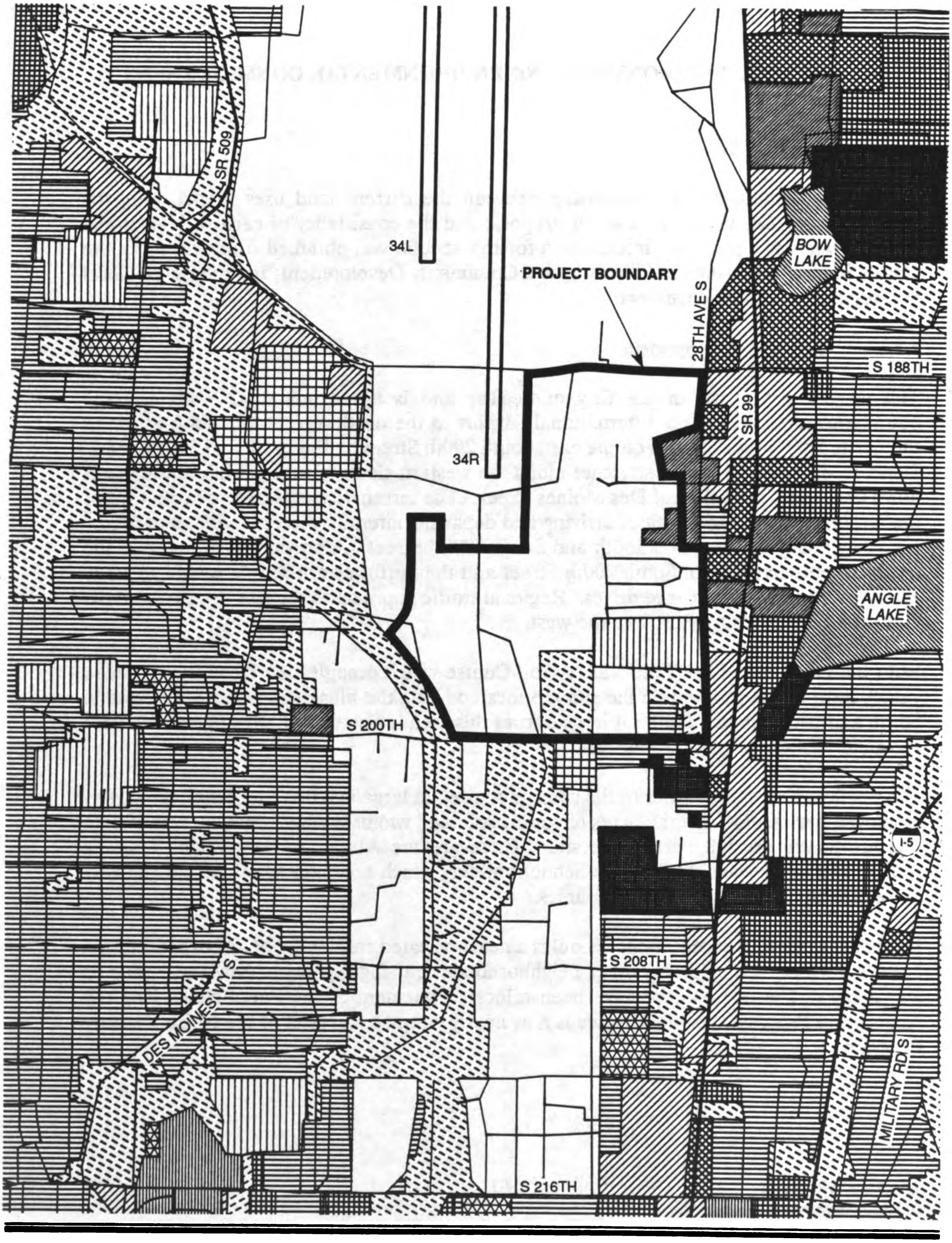


Figure 4.1-1a
Generalized Land Use

- Single-Family Residential
- Multi-Family Residential
- Mobile Home Park
- Hotels, Motels
- School
- Hospital; Nursing Home
- Church
- Government Services
- Office; Professional
- General Retail
- Manufacturing/Light Industry
- Park; Open; Cemetery
- Water Recreation
- Airport

Source: 1991 Sea-Tac Part 150 Update, generalized 1990 land use coverage based on information provided by the City of Sea-Tac and City of Des Moines. Partially updated 2/92 in the project vicinity.

N

SCALE IN FEET

0 750 1,500

Figure 4.1-1b
Generalized Land Use Map Legend

Next to Lowe's Terrace is the Seattle Christian School situated on a 16-acre parcel of land. The school is a K-12 private institution which is in session during the standard academic year. Plans are underway to move academic activities to a new facility.

Located in the southeast corner of the site is a second residential neighborhood called Olympus Homes. The Port has plans to relocate the last of these as part of the Noise Remedy Acquisition Program.

Tyee Valley Golf Course fills the balance of the site. It is located west of 24th Avenue South. The course has 18 holes and extends from South 200th Street north to the toe of the slope which supports Runway 34R. The runway lines up directly with the center of the course. Two branches of Des Moines Creek run through the center of the course. The golf course club house is situated at the northeast corner near Lowe's Terrace and is approached via a drive off of South 192nd Street.

Uses surrounding the site range from airport and industrial uses to commercial and residential. Airport runways, taxiways, maintenance facilities and terminals are perched on a plain north of the site. On the far side of the valley, north and west of the site, industrial and commercial activities predominate. Port-owned properties directly bordering on the site are vacant except for several storm water detention ponds. Southwest of the site is an extensive residential district. Like Lowe's Terrace and Olympus Homes, large portions of this area have been vacated as a result of the Port's Noise Remedy Acquisition Program. Most of the properties south of the site are completely vacant except for the small warehouse/commercial structures, which house various businesses, immediately south of the SASA site across South 200th Street.

Most of the neighboring land uses significant to this analysis are located in the corridor between 28th Avenue South and International Boulevard (SR 99). This land is mostly in commercial/retail use with residential pockets. In the southeast quarter there are several warehousing buildings and residential neighborhoods consisting of permanent and mobile homes. At the southeastern-most corner of the site are two utilities structures - an office and maintenance base for Water District #75 and the "Swept Wing" substation for Puget Sound Power and Light Company. These are expected to remain indefinitely.

East of 28th Avenue South and, for the most part, fronting on International Boulevard are a succession of small and large commercial businesses and office buildings. These include the following: mini storage, car rental, automotive parts, restaurants, etc. These businesses are dependent on automobile access and consequently substantial space is given over to parking.

Just north of South 194th Street is a small grouping of homes which front on 28th Avenue South. Across the street is the Angle Lake Elementary School building. The facility is currently used as office space for the City of SeaTac as well as a number of small businesses. Longer term intentions for the property are to redevelop it for a commercial use, possibly as a hotel. North of the school, across South 192nd Street is the Alaska Airlines training facility. This is a fairly new building having been constructed during the last five years.

4.1.2 Applicable Plans and Policies

Under Washington State Law, the portions of the SASA site owned by the Port and utilized for airport purposes come under the exclusive jurisdiction of the Port of Seattle. Certain adjacent properties which lie within the City of SeaTac are governed by City zoning and has been zoned by that agency as "Aviation Business Center," a zoning classification which allows uses compatible with those outlined in this document.

Despite the Port's jurisdiction over most of the site, planning by local agencies is relevant. The City of SeaTac voted to incorporate in 1989. It subsequently modified and/or adopted by reference many of King County's policies and zoning codes. The City is also in the process of developing its own comprehensive plan and zoning code as required by the State Growth Management Act.

Current land use plans and policies pertaining to the site include the following:

- Port of Seattle's Jurisdictional Authority (RCW 14.08.330)
- Port of Seattle Planning Documents for Seattle-Tacoma International Airport
- City of SeaTac Municipal Code and Adopted Documents as amended
  - SeaTac Communities Plan (1976)
  - Highline Communities Plan (1977) and Area Zoning (1981)
  - King County Comprehensive Plan (1985)
  - King County Zoning Code (Ordinance No. 90-1019) (1990)
  - SeaTac Area Update (1989) And Area Zoning (1989)
- Aviation Business Center Ordinances
- Washington State Growth Management Act (1990, 1991)

These plans and policies are a result of extensive planning efforts conducted over the last twenty years by several government authorities and are intended to guide the growth and development of the City of SeaTac as well as Sea-Tac International Airport.

4.1.2.1 Port of Seattle's Jurisdictional Authority - (RCW 14.08.330)

RCW 14.08.330 provides an airport operator such as the Port of Seattle with exclusive jurisdiction over its properties utilized for airport purposes.

4.1.2.2 Port of Seattle Planning Documents for Sea-Tac International Airport

Various airport planning documents have been prepared over the years by the Port of Seattle. These documents discuss such planning issues as forecasts of airport activity, potential uses for airport property, anticipated facility needs, airport layout possibilities, operational patterns, and other matters associated with planning for the development and function of the airport. Some studies represent broad overviews, others are focussed on more specific elements of the airport. Examples of planning studies include:

- SeaTac Communities Plan (1976)
- Master Plan Update for Sea-Tac International Airport (1985)
- Comprehensive Planning Review and Airspace Update Study (1988)
- Landside Access Program, Parking Facilities Expansion Project (1987, 1988)
- Comprehensive Planning Framework Update (1989)
- Terminal Development Program (1992).

These studies and others are some of the information used in evaluating more specific proposals as particular facility needs and programs are identified. As changes occur in the aviation industry, in demand forecasts for aviation services, and in local conditions, airport planning elements are reevaluated as necessary. This EIS for the SASA project, together with the supporting technical and background information, will become part of the collected body of planning information for the airport.

4.1.2.3 City of SeaTac Municipal Code and Adopted Documents as Amended

<u>SeaTac Communities Plan</u> (attached to Ordinance 2883 as an addendum to the King County Comprehensive Plan).

The SeaTac Communities Plan (STCP) was a policy plan produced by a joint planning effort by King County and the Port of Seattle, and partially funded by the FAA. The plan addressed Sea-Tac International Airport's relationship to surrounding communities with the goal of compatibility, and a number of policies were recommended to guide overall development in the area.

The STCP was subsequently adopted as an addendum to the King County Comprehensive Plan in 1985, and the plans and policies contained therein revised with the adoption of the SeaTac Area Update in 1989. Updated plans and policies of the STCP may be found in Appendix A of the SeaTac Area Update (STAU). Refer to the discussion of the STAU which follows.

<u>Highline Communities Plan</u> (attached to Ordinance 3530 as an addendum to the King County Comprehensive Plan).

The Highline Communities Plan (HCP) addressed issues in the entire Highline community planning area and followed the general land use concept for the SeaTac area developed in the 1976 STCP.

The HCP used four different land use designations to identify properties owned and operated by the Port of Seattle for properties related to airport operations. These designations were: Airport Facility, Air Terminal-Related Business, Light Manufacturing, and Airport Open Use. Under this plan, a number of policies were recommended to guide overall development in the area.

The HCP was subsequently adopted as an addendum to the King County Comprehensive Plan in 1985, and the plans and policies contained therein revised with the adoption of the SeaTac Area Update in 1989.

Updated plans and policies of the HCP may be found in Appendix D of the SeaTac Area Update.

King County Comprehensive Plan (1985)

The 1985 King County Comprehensive Plan (KCCP) describes how King County should develop over the next 20 years and applies urban, transitional, or rural designations to all of unincorporated King County. Its policies address issues such as resource protection, land use, and public facilities, and provide a base for more specific policies in community plans. The KCCP directs growth to occur in established activity centers and recognizes the following urban activity centers in the vicinity of Highline: Burien, SeaTac, Skyway, White Center, and the cities of Tukwila and Des Moines.

King County Zoning Code (Ordinance No. 90-1019((1990)

This is the general purpose land use and zoning code developed by King County that covered the Sea Tac area prior to incorporation as a city. This code was subsequently adopted and amended by the City of SeaTac and has been included.

SeaTac Area Update (1989) and Area Zoning (1989)

The SeaTac Area Update (STAU) was appended to Ordinance 8996 as Attachment "A" and consequently was adopted as an "amplification and augmentation" of the KCCP. As such, it constitutes "official county policy for the geographic area defined therein" (This includes the SASA site and hence would govern if the site were not owned by the Port and utilized by the Port for aviation purposes). The update consolidates much of the preceding planning effort as contained in the SeaTac Communities Plan, the Highline Communities Plan and the King County Comprehensive Plan (old and updated policies are compared in Appendix A of the document). Four issues precipitated the creation of the Area Update:

1. The acquisition of homes by the Port of Seattle under its Noise Remedy Acquisition Program.

2. The lack of resolution for the proposed North SeaTac Park.

3. The proposal to build a veterans National Cemetery on land jointly owned by the Port, county and state.

4. The growing need to address transportation improvements in the area.

The County prepared the plan with the technical assistance and staff support of the Port of Seattle. Two advisory bodies, the Citizens Advisory Committee and a Technical Advisory Committee, also participated.

The update establishes some 83 policies and eight special recommendations which fall under ten general land use headings ranging from Urban Activity Center to Natural and Cultural Resources. Many of these policies are pertinent to development of the SASA site including several of those in the chapters on Urban Activity Center, Airport Area, Commercial/Industrial Transportation and Natural Resources. The Commercial/Industrial chapter is particularly significant in that it proposes and defines the qualities of a "Business Park" area which would include much of the SASA site.

Accompanying the SeaTac Area Update is the Area Zoning. This companion document acts to implement the Update Plan by translating land use designations and plan policy into specific zoning classifications and development conditions. The bulk of this document is made up of maps indicating pre-existing, new, and potential zone classifications along with explanations of the changes.

4.1.2.4 Aviation Business Center Ordinances (1991)

Of the planning documents produced by the City and County this is perhaps the most important in that, if the site is not utilized by the Port for aviation purposes it would define the applicable zoning.

Under the SeaTac Area Update, the site was zoned Airport Open Use (AOU), Business Park (MP) or potential Business Park. The ABC classification recognized the unique qualities of the area as well as the potential for a concentration of certain activities and established a new, more compatible zoning to take the place of MP in this locality.

ABC zone development standards that would have the most significance with respect to the three SASA build alternatives are as follows:

- Building Setbacks - none are required
- Landscaped Buffer - required to conceal service areas
- Building Height - to be consistent with FAA regulations
- Parking Requirements - Unchanged, as directed by the Zoning Code for the particular use
- Lot Coverage - the maximum lot coverage for buildings and parking areas together is 75% or 85% where certain incentive criteria are met
- Landscaping of Parking Areas - at least 5% of the parking area is to be landscaped including two trees and one landscaped island for every 12 parking spaces provided.

Each of the SASA alternatives is compatible with these requirements. At least some setback is provided for all buildings even though none is required. More than sufficient area is provided both for landscaped buffer of service areas and for parking area landscaping. Building heights are all between 71 and 47 feet below the FAA Part 77 transitional surface. Required parking exceeds, for programmatic reasons, what would be required for manufacturing use (the greater of 1 space/1,000 square feet of building area or 1 space per three employees at maximum shift). Lot coverage for the entire project site would be quite low.

4.1.2.5 Washington State Growth Management Act (1990 and 1991)

The State of Washington adopted the Growth Management Act (GMA) in 1990. The GMA requires that all cities and counties in the state prepare updated comprehensive plans for their jurisdictions by 1993. The act further stipulates that the comprehensive plans will be coordinated amongst each other and will designate future growth areas for all development which is to occur in the state for the next 20 years. A specific component of the GMA is the provision for Urban Growth Boundaries. The SASA site is currently located within the Urban Growth Boundary for the City of SeaTac and its use is permitted according to current City of SeaTac zoning.

4.1.3 Construction and Operation Impacts

4.1.3.1 No-Action Alternative

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place on the site would be subject to separate environmental review.

4.1.3.2 Build Alternatives

Construction impacts for each of the build alternatives would be essentially the same in character. Any real difference would be in terms of the degree of impact. The largest footprint (Alternative 3) has the greatest degree of impact.

Construction impacts on surrounding land use would be felt primarily due to disruption caused by increased truck traffic on local streets during the excavation/grading phase of the project. A specific discussion of this impact is contained in Section 4.12, Transportation. Potential noise and air quality impacts on surrounding land uses are discussed in Sections 4.4 and 4.5, respectively. While general isolation of the site from extensive adjacent development would suggest that land use impacts during construction would be minimal, there are adjacent current uses that would experience disruption from construction. These are the office uses in the Angle Lake school building, the Alaska Airlines Flight Training Center and the Tyee Valley Golf Course. For specific impacts on the golf course, see Section 4.15, Recreation.

There would be no significant impacts to the surrounding land uses if the SASA site were put into use as proposed. Residential land uses currently on the site would eventually be relocated and the buildings demolished under the Port's Noise Remedy Acquisition Program. Seattle Christian School facilities would be relocated and their vacated facilities demolished. While the proposal would constitute a transition, the new use is consistent with current area land use plans.

4.1.3.3 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area land use. Construction of an additional runway at Sea-Tac airport would likely result in the acquisition of approximately 100 acres of property on the west side of the airport, including approximately 250 residences. This area would be converted from residential to airport use. The potential runway site is separated from the SASA site. The Master Plan EIS will examine whether changes in the boundaries of the airport's Noise Remedy Program would result.

Other airport terminal and facility development is generally anticipated to occur on existing airport property designated for airport uses. Construction of regional roadway improvements south of the airport would also result in the conversion of airport, residential, and/or commercial property to public roadway use. Areas involved would depend on route alignment decisions which have not yet been made. A roadway corridor EIS, which will provide additional land use evaluation, is being prepared under the direction of the Washington Department of Transportation. In general, while parts of some potential project sites are adjacent, they do not overlap. If construction of more than one project occurred simultaneously, construction-related impacts could happen over a wider area at the same time. The potential for cumulative impacts on land use will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13) in accordance with appropriate land use plans and policies.

4.1.4 Mitigation Measures

Measures to address impacts to noise, recreation, transportation, etc., are discussed in the pertinent sections.

4.2 SOCIAL IMPACTS

The principal social impacts to be addressed are those associated with relocation or other community disruption that may be caused by the proposal. No homes other than those already being acquired by the Noise Remedy Acquisition Program would be relocated for the SASA proposal. See Section 4.3, Induced Socioeconomic Impacts, for a discussion of these types of disruptions.

4.3 INDUCED SOCIOECONOMIC IMPACTS

4.3.1 Affected Environment

The City of SeaTac was incorporated on February 28, 1990 and is a non-charter code city with a Council-Manager form of government. The City's population is estimated to be 22,830 (City of SeaTac 1992 Budget). The City's socioeconomic character is influenced by the presence of Sea-Tac International Airport, which is operated by the Port of Seattle and is located entirely within City limits. The Port currently owns 2,433 acres within the City; 1,997 acres are in airfield use and 436 acres are in noise impact zones (Tim Watson, Port 1991). The airport employs approximately 12,950 people.

One impetus for the City's incorporation was a desire for increased local control over public safety, land use, and transportation matters. Since incorporation, the City has indicated a desire to encourage denser and more pedestrian-friendly development, and to create an Aviation Business Center encompassing a mix of land uses. The City and owners of property south of the airport have undertaken efforts to plan such a mixed-use development in the South Access area, between South 192nd and 208th Streets and west of 28th Avenue South.

The environment directly affected by the SASA project is the area between South 192nd and 200th Streets, west of 28th Avenue South, including the Tyee Valley Golf Course. This area was primarily residential, but airport development, noise, commercial growth and other factors have rendered the area inappropriate for residential uses. The area is now in transition to other uses, and currently has a mix of airport, utility, commercial and residential land uses.

Existing development in the SASA project site is limited to the former Angle Lake School, owned by the Highline School district and currently serving as SeaTac City Hall, the Seattle Christian School, part of the Tyee Valley Golf Club and fewer than 10 occupied single-family residences. The remainder of the project site comprises vacant land or vacant houses and serves as a noise buffer for the airport.

Other areas which would be affected by the SASA project include the property immediately adjacent to the project site (west of 28th Avenue South) and the property east of the project site, between 28th Avenue South and SR 99/International Boulevard. The Puget Power and Light Swept Wing Substation, Water District 75, the Washington State Association of Water/Wastewater Districts, and two single-family houses constitute the existing development in the area located adjacent to the project's southeast boundary. The area east of the project site, between 28th Avenue South and SR 99/International Boulevard, includes three hotels, two office buildings, three automobile businesses, a self-storage facility, a gas station, airport parking, an apartment building, and a vacant lot.

The City's vision for this area calls for the integration of City and local government facilities, hotel, office, parking, retail, light industrial, aviation, and other use types, as delineated in the Aviation Business Center ordinance enacted in August 1991. The No-Action Alternative analyzes the fiscal impacts of such a mixed-use development, assuming that none of the SASA alternatives are constructed.

4.3.1.1 Housing

Within the proposed SASA site boundaries there are currently fewer than 10 occupied single-family units, only two of which are owner-occupied. The rental properties are owned by the Port and private firms or individuals; Port-owned properties were purchased as part of the Noise Remedy Program.

Across 28th Avenue South to the east, there are several single-family homes. On International Boulevard, between South 192nd Street and South 200th Street, there is also an apartment building (Viewporter Apartments) with 104 units. Most of the apartment units are singles, with some doubles; information on the vacancy rate for the apartment building was not available.

The FAA regards unmitigated residential housing as an incompatible land use within the 65 LdN noise contour (FAA 1988). Since the mid-1970s, the FAA has funded the Port's noise mitigation program, which is designed to provide the airport's closest neighbors with the maximum possible relief from present and future aircraft noise. Most of the SASA project site falls within the designated noise impact acquisition area. As of December 1991, the Port has purchased all but 5 of the units within the Lowe's Terrace, Rickard Heights and the Olympus Homes developments. Eleven of the units purchased by the Port are currently leased under limited rental agreements, but the Port intends to demolish these units. The rental units owned by the private developer are leased on a month-to-month basis.

The City of SeaTac has a total of 10,189 housing units with an overall vacancy rate of 5.67% (Washington State Office of Financial Management 1991). The number of occupied housing units on the SASA project site represents less than two-tenths of one percent (0.17%) of the total housing stock in the City.

4.3.1.2 Employment

There are a total of 76 people currently employed on the SASA project site, including 56 jobs at the Seattle Christian School. The remaining jobs are at the Tyee Valley Golf Club (20 total full-time equivalents; 10 permanent and 20 seasonal employees).

Airport Investment Realty (6 jobs), GMI/VATA/R&S Consulting (3 jobs), City of SeaTac City Hall (approximately 45 jobs), and the Alaska Flight Training Center (121 jobs) constitute the immediately adjacent employment.

Also off-site, there are two businesses with a total of 18 jobs located in the Water District building on 28th Avenue South. Across the street from the SASA site, between 28th Avenue South and SR 99/International Boulevard, there are 11 businesses with a total of 537 employees. Details on employers in these areas are shown in Table 4.3-1.

4.3.1.3 Revenue Summary

The City of SeaTac's first full year of operations was 1991, and the City is still in a transitional mode, gradually increasing staffing levels and functions. The City's revenues and expenditures are allocated among 10 funds. The largest of these are the general, city street, arterial street and surface water management funds, which account for 91% of all City monies. The City's general fund accounts for 64% of total City revenues and expenditures. Table 4.3-2 summarizes 1992 budgeted revenues for the City's general fund.

As Table 4.3-2 shows, the City's major revenue sources are property and sales taxes. The City also receives lesser amounts of revenue from excise taxes, including leasehold and real estate excise taxes, and from licenses and permits, intergovernmental sources, charges for service, fines and forfeits and miscellaneous items. Revenue issues specific to the SASA proposal are discussed below.

Property tax issues. Property taxes constitute the City's largest revenue source. The City, state, and other local jurisdictions levy property taxes on the City's assessed value (AV) base. The City's 1990 per capita AV was $77,684; in 1991 it is estimated to be $72,098.

This is about average for cities in King County; the 1990 per capita AV for King County cities was $75,643; for the county as a whole it was $68,458 (WDR 1990).

Table 4.3-1. City of SeaTac 1991 employment.

Business	Employees	
SASA Project Site		
Seattle Christian School	56	
Tyee Valley Golf Club (10 permanent, 20 seasonal)	20	
Subtotal		76
Area Along 28th Avenue South not in SASA site		
Alaska Airlines Flight Training Center	121	
Airport Investment Realty	6	
City of SeaTac city Hall	45	
GMI/VATA/R&S Consulting	3	
WA State Association of Water/Wastewater districts	3	
Water District 75	15	
Subtotal		193
Area Between 28th Avenue South & SR 99		
Airport Plaza Building	50	
Airways Truck & Leasing/Isuzu	150	
Auto Sport Imports	5	
Chevron Gas Station	10	
Comfort Inn	25	
Hampton Inn	30	
Horizon Air	200	
National Car Rental	25	
Sandstone Inn/Airport Parking	35	
U-Lock Self Storage	3	
Viewporter Apartments	4	
Subtotal		537
Sea-Tac International Airport		12,950
All Other		16,244
Total City of SeaTac		30,000

Sources: Berk & Associates, Inc. telephone survey (November-December 1991), Office of Financial Management estimate (April 1, 1991), and Flight Plan Forecast Study (1990)

Table 4.3-2. Summary of 1992 budgeted revenues.

Revenue Category	Budget
Beginning fund balance	$2,350,000
Taxes	
Property tax	5,842,600
Sales tax	4,080,000
Excise taxes	
Leasehold	250,000
Real estate	107,300
Gambling	145,000
Licenses and Permits	469,700
Intergovernmental	896,560
Charges for Services	337,700
Fines and forfeits	558,700
Miscellaneous	193,450
Total	$15,231,010

Source: City of SeaTac 1992 Budget

Table 4.3-3. 1991 tax rates for Levy Code 2231

Region	Amount
State	$3.38348
Highline School District (#401)	3.26263
King County	1.73030
Port of Seattle	0.32332
City of SeaTac	3.10157
Fire District 24	3.10157
Library	0.48921
Emergency Medical Services	0.19911
Total	$12.83061

Source: King County Assessor's Office

The city encompasses 30 property tax levy codes. The SASA project area is contained entirely within levy code 2231. Table 4.3-3 shows the breakdown of the various 1991 tax rates for this levy code.

As Table 4.3-3 shows, in 1991 the City's property tax receipts were based on a rate of $3.10157 per thousand dollars of assessed value. The City intends to maintain this rate in 1992, despite significant shifts in its AV base (Galen Kidd, City of SeaTac). Table 4.3-4 shows that the City's AV base decreased from $1,773,526,125 in 1990 (for 1991 taxes) to $1,655,746,870 in 1991 (for 1992 taxes), or a decrease of 7.2%. (This is an estimate from the King County Assessor's Office as of December 1991. The final AV will change before it is certified in early 1992). The decrease in the city's AV base is due to a $120 million (17%) drop in the AV of state public service (SPS) properties in the City of SeaTac. SPS properties include airlines and other utilities operating in Washington.

Table 4.3-4. Changes in City of SeaTac assessed value base: 1990-1991 regular and SPS properties

1990 Assessed Value		
	SPS Property	$692,087,388
	Regular Property	1,081,438,737
	Total	$1,773,526,125
1991 Assessed Value (Est.)		
	SPS Property	572,319,114
	Regular Property	1,083,427,756
	Total	$1,655,746,870

Source: King County Assessor's Office
Note: Total 1991 AV is an estimate only; roll will change prior to certification.

Under RCW 84.12 the State Department of Revenue annually assesses the value of all airlines operating in Washington for property tax purposes. The Department determines the total market value of each company's real (land and buildings) and personal (planes and equipment) property, then apportions total system value "within and without" the state. These adjusted values then become part of the local jurisdiction's assessed value base. In 1991, the value of the City of SeaTac's SPS real property increased slightly; SPS personal property lost $122 million in value.

This assessed value change reflects operating changes taking place within many of the airlines doing business at Sea-Tac International Airport. Such changes include Air San Juan and Coastal Airlines going out of business; and significant decreases in value experienced by Delta, Eastern, United, US Air, Burlington Air, Amerijet, and Evergreen International. The Department of Revenue anticipates that there may be additional decreases in the City's assessed value base in future years. Such decreases would be attributable to continuing restructuring in the airline industry, and shifts in the route structures of various carriers serving Sea-Tac. Reductions in the amount of air time such carriers spend in Washington may lower the portion of a company's overall value which can be attributed to the state, and therefore to the City of SeaTac.

Assessed Values and Property Tax Collections in the Project Area. Total 1990 AV in the project area is $17,464,501. However, a major portion of this AV base is exempt from property tax assessments. As shown in Table 4.3-5, $11,577,834 or 66% of the area's AV base is owned by the Port, the Seattle Christian School, and the Highline School District. All of these entities are exempt from property taxes. In addition, recent property acquisitions by the Port in this area will reduce the area's 1991 taxable AV base by $1,053,145 (for 1992 taxes). In 1991, these newly acquired Port properties paid total property taxes of $12,487.

Table 4.3-5. Assessed values and property tax collections in the project area.

Property Type	1991 Assessed Value	Total 1991 Property Tax	1991 Est. City Share
Privately Owned	$4,833,522	$62,016	$14,984
Recently Acquired	1,053,145	8,585	3,265
Port-Owned	8,588,820	exempt	
Seattle Christian School	2,100,462	exempt	
Highline School District	888,552	exempt	
Total	**$17,464,501**	**$70,601**	**$18,249**

Source: King County Assessor's Office
Notes: 1. Properties recently acquired by the Port will be exempt from 1992 tax collections.
2. The assessed value of these properties has been lowered to reflect the removal of property for right-of-way for the proposed South Access Highway and the proposed 28th/24th arterial.

The total taxable AV base in the area for 1992 tax collections is estimated to be $4,833,522. Total property tax payments to the City on this taxable base are estimated to be about $15,000 in 1992.

Leasehold revenues. Publicly owned property, including property owned by the Port, is not assessable for property taxes. Such property may, however, generate leasehold excise taxes. The leasehold tax is imposed on private parties which lease or rent publicly owned property. The revenue base is the amount of annual contract rent or lease payment; the tax rate levied is 12.84%. Of this amount, the state receives 6.84%, incorporated cities receive 4%, and counties receive 2%.

The Port of Seattle has land leases, square footage leases, and concession leases at Sea-Tac International Airport, all of which are subject to leasehold taxes. In 1992, the City projects leasehold tax revenues of $250,000 from airport leases.

Sales Tax. Sales tax is levied on taxable sales within the City at a total rate of 8.2%. Of this amount, the City receives a net of 0.8415%. Sales tax receipts are the second largest revenue source for the City of SeaTac; the City is budgeting $3.8 million in sales tax revenue for 1992.

In 1990, per capita taxable retail sales in the City (all retail sales in the City divided by population) were approximately $12,873. The per capita sales tax generated from these retail sales for the period January to October 1991 are estimated at $146. The City's retail sales are higher than the statewide average of $1,006 and the countywide average of $1,411, but not as high as some other King County cities, e.g., Auburn ($19,583), Kent ($33,449) and Renton ($24,040) (State Department of Revenue).

4.3.2 Construction and Operation Impacts

4.3.2.1 Methodology for Construction and Operational Employment Impacts

The aggregate employment impacts associated with the aviation maintenance facilities and commercial development proposed for the SASA site were calculated based on the number of existing and new operational jobs, and new construction jobs which would be created under each alternative, and then estimating the induced and indirect effects of these new jobs on the Puget Sound regional economy. Each job that is created has a ripple effect on the regional job base. New jobs require increased goods and services from other firms, and thus indirectly affect the hiring of additional people at supplier firms. In addition, new employees contribute to the local economy through their consumer purchases. These indirect and induced impacts on the regional economy can be captured by impact multipliers.

All multipliers used in this analysis are based on data from the Washington State input-output model, adjusted to more accurately reflect the Puget Sound regional economy (Bourque 1987). For example, the input-output model impact multipliers for jobs in the aerospace sector (2.05) and services sector (1.55) were reduced by 15% to take into accoun onomic activity that occurs outside the Seattle-Tacoma region. Data from a model calle PLAN (Impact Analysis for Planning), and adjusted for the greater Seattle regio mates the multiplier for the aircraft sector at 1.49. By reducing the statewide inp ut multipliers, we arrive at more conservative estimates to describe activity within t t Sound region.

Operational Jobs Multipliers

ct multipliers are used to estimate the indirect and induced effects of either addin nating jobs from the regional economy. Two different multipliers were used for A project to reflect the different types of proposed development: 1.74 for avi ty jobs, and 1.32 for commercial development jobs. It is estimated that each new ocated in the aviation maintenance facility would create 0.74 additional indirect induced jobs in the regional economy, while new jobs created in the proposed commercial development would generate 0.32 indirect and induced jobs. Aviation-related jobs generate over twice as many indirect and induced jobs because they tend to require more capital equipment and pay higher wages than jobs in the service sector. Exactly where in the regional economy the indirect and induced job impacts of the SASA project would occur is not known due to the lack of information about either the type of new jobs to be added to the aviation maintenance facilities or the proposed commercial development.

Construction Jobs Multipliers

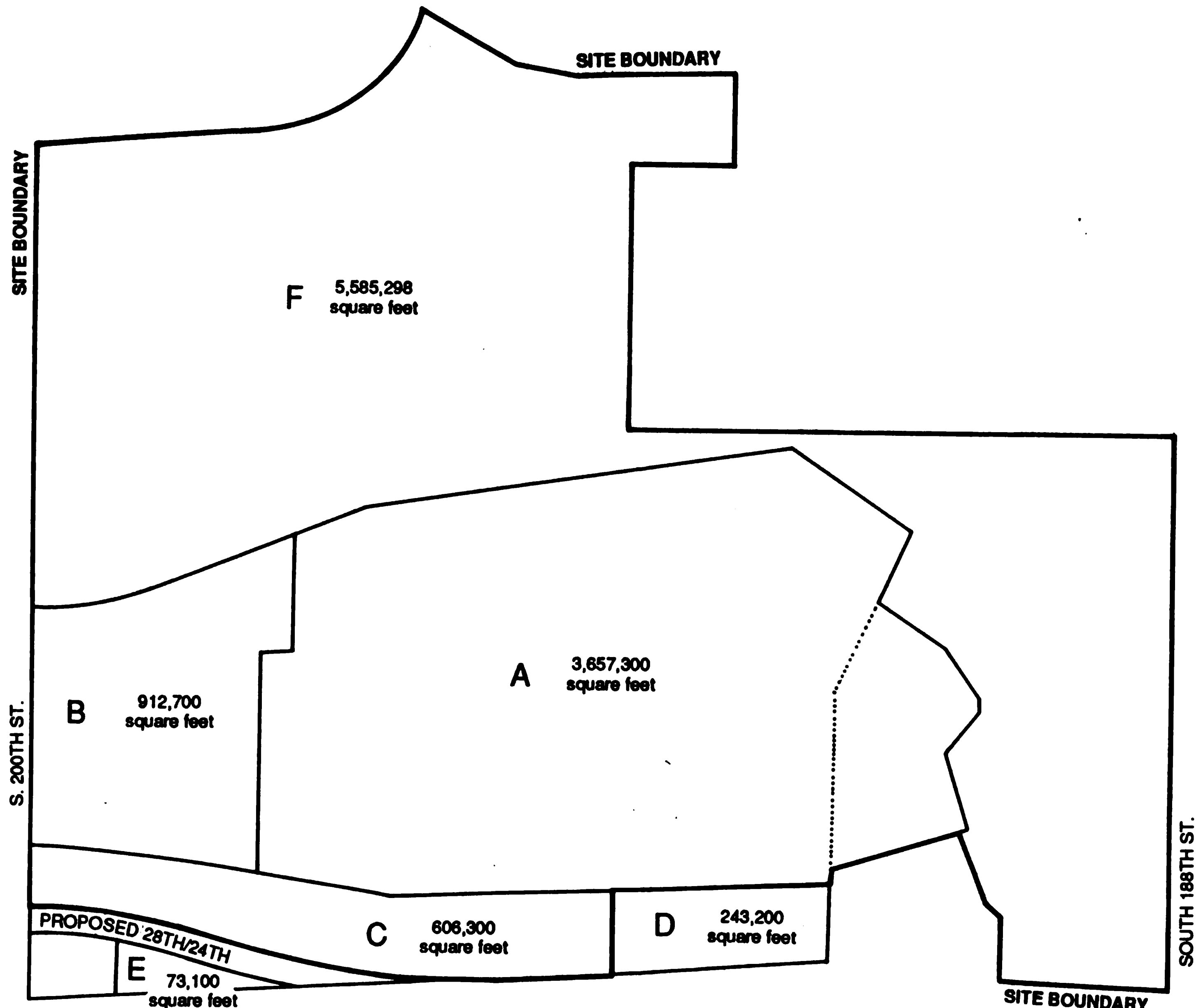
Direct construction and indirect and induced jobs generated by a construction project can be estimated using the state input-output model. The statewide construction jobs multiplier is 38.2 total direct and indirect jobs created per $1 million in construction costs. Of this total, 17.3 jobs are direct and 20.9 are indirect or induced. Those multipliers were reduced by 15% to arrive at a total construction job multiplier of 32.5; 14.7 direct and 17.3 indirect/induced jobs per $1 million in construction expenditures. These regionally adjusted multipliers were then applied to estimated construction costs for commercial and SASA developments under each alternative.

Earnings Multipliers

Earnings multipliers from the input-output model were also applied to construction expenditures in order to estimate the indirect and induced impact of such outlays. The same methodology used in modifying the jobs multipliers was also used on the statewide earnings multipliers; the construction multiplier of 1.74 was reduced by 15% to 1.48, and the aeronautics multiplier of 1.45 was reduced to 1.23. The modified construction multiplier was then applied to the commercial construction and SASA site preparation cost estimates. The modified aeronautics multiplier was applied to the SASA facility construction costs.

4.3.2.2 Methodology for Revenue Estimates

The property tax estimates for the No-Action Alternative and Alternatives 1, 2, and 3 are based on the 5 areas shown in Figure 4.3-1, and their corresponding assessed values. Since the original analysis, portions of Areas B, C, E, and F have been acquired by the Port. The impact of this change has been noted where appropriate. Although properties in areas D and E in Figure 4.3-1 are not within the SASA site, they are within the socio-economic impact area. For comparison with the No-Action Alternative, these properties have been included in the analysis. The square footages and assessed values of all of the areas in the project impact area have been adjusted to reflect right-of-way takings for the 28th/24th Avenue South arterial and the proposed South Access Roadway. All of the assessed values discussed in this section are adjusted figures, and all are in 1991 dollars. The methodology used for these adjustments is detailed in Appendix A.



Source: TRA; King County Assessor's Office.

NOT TO SCALE

Figure 4.3-1
SASA Project Areas
Adjusted Land Square Footage

The magnitude and mix of commercial development is assumed to vary by alternative. Development under the No-Action Alternative is based upon the City's transportation plan assumptions. It includes 1,067,000 square feet of office, and a mix of hotel, retail and industrial uses. Alternative 1 and Option 1A assume 1,533,000 square feet of office development, or a land-to-building ratio of 1.0 on the property available for commercial development, and hotel and retail development adjacent to the SASA site. Alternative 2 assumes 606,000 square feet of office development, or a 1.0 land-to-building ratio on the land available for commercial uses, and the same hotel and retail uses adjacent to the SASA site. Alternative 3 assumes no on-site commercial development; adjacent hotel and retail uses are assumed to be the same as in Alternatives 1, Option 1A, and Alternative 2.

In each alternative, it is assumed that the first phase of the hotel development (294,000 square feet) proposed for the Highline School District (former Angle Lake School) site will become operational in 1995, and that 25,000 square feet of retail development will become operational in 1996. In Alternative 1, Option 1A, and Alternative 2, it is assumed that the first office and industrial development projects will be completed in 1995, with additional development coming on line annually thereafter.

A range of estimated assessed values for new construction by use type, and specific to the south SeaTac area, was obtained from the Commercial Appraisal Section of the King County Assessor's Office. To be conservative, the low end of the range was assumed for each use, except for hotel, where it was assumed that all hotel development would be of the Class A, full-service type. To be conservative, no adjustments to the AV base were assumed beyond those due to changes in taxable status and to the value of new construction.

Also, to be conservative, no additions to the property tax base for any alternative were assumed for on-site personal property, such as cranes or other heavy equipment. In fact, such equipment is likely to be an integral part of the SASA facility, and will be included in the City's personal property tax base.

Given these phasing and AV assumptions, total annual assessed values were estimated for each alternative for the period 1992 -2003. Annual property tax payments were calculated and summed to arrive at a total property tax revenues estimate (in 1991 dollars) for each alternative. Detail tables may be found in Appendix A.

Sales tax revenues were estimated for three types of construction: commercial development; SASA site preparation; and SASA facility construction. Estimates of commercially related sales tax revenues were based on an assumption that construction costs would equal assessed values for each use type. This is likely to result in conservative estimates of total sales tax revenues. SASA site-related sales tax revenues are based on estimated site development construction costs listed in Table 3.3-1.

Table 4.3-6 shows estimated site development costs for Alternatives 1-3. SASA facility-related construction costs and associated sales tax revenues are estimated very roughly on Alaska Airlines' estimated project cost of $50 million for the first phase of the proposed base maintenance facility. Given that the first phase of the base is proposed to comprise about 890,000 square feet, it was assumed that each 900,000 square feet of proposed base maintenance facility development would cost about $50 million. It was also very roughly assumed that 900,000 square feet of relocated line maintenance facilities would cost about 75% of the cost of base maintenance facilities of the same size. Estimated facility costs and associated sales tax revenues for each alternative are shown in Table 4.3-6.

Table 4.3-6. Cost and development assumptions by alternative.

	Alternative 1	Alternative 2	Alternative 3
SASA Development (sq ft)			
NW/Alaska/Delta	827,225	827,225	827,225
Hush Facility/Ground Veh. Maint.	81,750	81,750	81,750
Base Maintenance		889,500	889,500
Future Base Maint. Expansion		871,200	871,200
Other Future			660,525
TOTAL SQUARE FEET	908,975	2,669,675	3,330,200
Site Development			
Capital Cost Estimate	$76,833,500	$99,299,800	$117,908,800
Assumed Facility Construction Cost			
Relocated Line Maintenance	$37,500,000	$37,500,000	$37,500,000
Base Maintenance		$50,000,000	$50,000,000
Future Base Maint. Expansion		$50,000,000	$50,000,000
Other Future			$33,000,000
TOTAL ASSUMED COST	$37,500,000	$137,500,000	$170,500,000
Sales Tax[1] on Both Categories			
-S/T Site Development	$5,330,246	$6,888,820	$8,179,795
-S/T Facility Construction	$3,075,000	$11,275,000	$13,981,000
Total Sales Tax	$8,405,246	$18,163,820	$22,160,795

1 Sales tax rate is 8.2%.
Note: Capital cost estimates prepared by W & H Pacific. Program estimates prepared by TRA.

Leasehold revenues for the SASA site were provided by Port Aviation Finance Department staff, given capital cost estimates for each alternative. Table 4.3-7 summarizes Port lease revenue estimates based on site improvements financed with 30-year revenue bonds at 7.2% interest, and projected leasehold tax collections. The Port plans to spread the cost of SASA site improvements among all airport lessees, since all would benefit. Table 4.3-7 shows the total and the portions allocated to the SASA site under each alternative. Leasehold revenues under Alternative 1 and Option 1A would be very similar, reflecting the fact that SASA development assumptions are identical for both alternatives, and Option 1A has slightly lower site development costs.

Table 4.3-7. Projected leasehold revenues for SASA alternatives.

	Annual Lease Amount		Tax	
	Total	SASA Share	Total 12.84%	City Share 4%
No-Action	$0	$0	$0	$0
Alternative 1	7,888,527	621,642	1,012,887	315,541
Alternative 2	10,495,350	2,159,662	1,347,603	419,814
Alternative 3	10,659,784	2,455,276	1,368,716	426,391

It is assumed that the Highline School District property would remain in public ownership, with the land leased for hotel development. Such a lease would likely generate leasehold revenues. However, there is insufficient information available to estimate such revenues; therefore, they are not included in leasehold revenue estimates under any of the alternatives.

It is further assumed that the hotel development itself will be taxed as personal property, and the estimated value of phase 1 of the proposed development is included in the taxable AV base for each alternative.

Revenues specific to the City of SeaTac include the City's share of property taxes and leasehold tax revenues. The City may also receive up to .8415% in sales tax revenues on total SASA and commercial construction anticipated for the project area. (This net percentage is based on the City's .85% less the state's 1% administrative fee.) Sales tax revenues received by the City are dependant upon the magnitude of construction purchases which take place within City limits. To be conservative, no sales tax revenues are assumed to accrue to the City.

4.3.2.3 No-Action Alternative

The socioeconomic analysis for the No-Action Alternative assumes that if none of the SASA alternatives are implemented, the project area will be developed in accordance with the

City's Aviation & Business Center concept and zoning for the site. The assumed magnitude and mix of development type assumed is based on land use assumptions for the year 2003 provided by the City. These assumptions are being used in the development of its Citywide transportation plan. These assumptions are shown in Table 4.3-8.

Table 4.3-8. SASA project area No-Action land use assumptions of the year 2003 (in square feet).

TAZ[a]	Light Industrial	Office	Hotel/Motel	Retail	Total
30		67,000			
37	150,000	500,000		40,000	
38	50,000	500,000	403,000	40,000	
Total	200,000	1,067,000	403,000	80,000	1,750,000
Percent of Total	11.4%	61%	23%	4.6%	100%

Source: City of SeaTac; TRANSPO
Note: Hotel/motel development assumption based on 480 rooms
[a]TAZ = Transportation Analysis Zone

Independent of these assumptions, a recent study performed by Mundy & Associates (January 1992) analyzed market demand and absorption for office, industrial park and hotel development in the project area for the period 1991-2003. The Mundy study shows that the overall level of development assumed by the City, and used in the No-Action Alternative, is reasonable, falling near the high end of the range, as shown in Table 4.3-9.

Table 4.3-9. Market demand study estimated cumulative absorption 1991-2003 SASA project area.

	Type of Development			
	Office	Industrial Park	Hotel	Retail
Total Low Projection	339,000	408,000	625,000	15,000
Percent of Total	24%	29%	45%	1%
High Projection	502,000	613,000	750,000	60,000
Percent of Total	26%	32%	39%	3%

Source: Mundy & Associates, January 1992
Notes: 1. Industrial Park category includes a variety of "clean" uses such as office/warehouse, distribution, light manufacturing, retail and services, and high-tech "flex" space.
2. "Low" hotel development estimate is based on a projected year 2003 demand for 1,000 rooms and the assumption that half of these will be in full-service hotels and half will be in hotels/motels. "High" hotel estimate assumes all 1,000 rooms will be in full service hotels.

In addition to market demand issues, actual absorption rates over the period will be a function of zoning, property availability, marketing efforts and other factors. Property owners and the City have indicated their intention to take steps to encourage high quality, non-speculative, aviation-related development on the site. Such intervention could have a significant effect on market demand and absorption levels.

The major difference between the Mundy study findings and the development assumptions provided by the City is in the proportional mix of uses. As shown in Table 4.3-8, the No-Action Alternative assumes that 61% of all development will be in office uses; 23% in hotel/motel; and about 11% in light industrial. In contrast, the Mundy study (Table 4.3-9) concludes that 40-45% of development will be hotels/motels; 24-26% will be office; and 29-32% will be industrial park uses. A more detailed comparison of the City's and Mundy & Associates' assumptions may be found in Appendix A.

The socio-economic analysis of the No-Action Alternative is based upon the City's land use assumptions. However, given differences in the mix of development between the No-Action Alternative and that projected by the Mundy study, a sensitivity analysis was conducted to test the effect of varying development assumptions on revenue projections. The results of this sensitivity analysis suggest that both property and sales tax revenues under the No-Action Alternative could be overstated. For example, using Mundy's high estimate of development results in a total property tax revenue estimate of $11,713,941, with City revenues estimated at $2,831,636, or 11% lower than the No-Action estimate. Using Mundy's low estimate results in a total property tax revenue estimate of $9,537,386 and City property tax revenues estimated at $2,305,493, or 27% lower than the No-Action Alternative.

Because the No-Action Alternative assumes 2 to 3 times more office development (which has a relatively high value) than the Mundy study, sales tax revenues projected under the No-Action alternative may also be overstated.

Revenue and Employment Impacts

Construction and operation impacts are shown in Table 4.3-10. As noted earlier, this table is based on a slightly different mix of ownerships than are currently in effect. The table as presented would still be valid if the Port were to sell the properties it has recently acquired in Areas B, C, E and F. If the current ownership patterns are maintained, the Port could lease these properties for commercial development. In that case, property tax revenues would be somewhat lower than shown, and leasehold revenues would be higher.

4.3.2.3 Alternative 1

Alternative 1 is defined as relocated line maintenance facilities of approximately 827,225 square feet, plus 81,750 square feet of other supporting facilities on the SASA site. The commercial portion of Alternative 1 comprises 1,533,000 square feet of office development, 294,000 square feet of hotel, and 25,000 square feet of retail development, for total assumed commercial development of 1,852,000 square feet. This development is assumed to be located in areas B, C, D and E, as shown in Figure 4.3-1. These areas encompass approximately 1,835,300 square feet of land.

Revenue and Employment Impacts

Construction and operation impacts are shown in Table 4.3-10. As noted earlier, this table is based on a slightly different mix of ownerships than are currently in effect. The table as presented would still be valid if the Port were to sell the properties it has recently acquired in Areas B, C, E and F. If the current ownership patterns are maintained, the Port could lease these properties for commercial development. In that case, property tax revenues would be somewhat lower than shown, and leasehold revenues would be higher.

Option 1A

The difference between Alternative 1 and Option 1A is that Option 1A includes a portion of the Seattle Christian School property located in Area A. There is no difference in the amount of commercial development proposed under the two alternatives, since Alternative 1 already assumes over 100,000 square feet more development than the No-Action Alternative (1,852,000 versus 1,750,000 square feet). The effect of Option 1A would therefore be to spread the assumed commercial development over a larger land base.

As with Alternative 1, if the Port maintains its current ownership, properties in Areas B, C, E and F could be leased by the Port for commercial development. This would result in somewhat lower property tax revenues and higher leasehold revenues.

Due to reduced site preparation costs, Option 1A assumes a slightly lower construction cost than Alternative 1. This would result in proportionately lower estimates of construction employment, sales tax on the site preparation component, and leasehold tax revenues for Option 1A. Operational employment and sales tax on the commercial development would be the same under both options. Property tax revenues would be slightly higher under Option 1A.

The 1990 assessed value of the incremental Seattle Christian School property is $1,569,576. Under Christian School ownership, this property is tax-exempt. Option 1A assumes that the property is sold for commercial development and becomes taxable in 1993, generating an additional $20,139 in total annual property tax revenues. The City's share of this total is approximately $4,868 annually.

Table 4.3-10. Construction and operation impacts for all alternatives—totals for years 1991-2003 (in 1992 dollars).

	No Action	Alternative 1	Alternative 2	Alternative 3
Development and Cost Estimates				
SASA Development (sq ft)[1]		908,975	2,669,675	3,330,200
SASA Site Development Cost[2]		$76,833,500	$99,299,800	$117,908,800
SASA Facility Cost Assumptions[3]		$37,500,000	$137,500,000	$170,500,000
Commercial Development (sq ft)				
On SASA Site		1,533,000	606,000	0
In Project Impact Area		319,000	319,000	319,000
Total Commercial Development[4]	1,750,000	1,852,000	925,000	319,000
Estimated Assessed Value of Commercial Development[5]	$157,770,000	$181,885,000	$89,185,000	$28,585,000
Construction Impacts				
Aviation-Related Employment[6]				
SASA Site Development				
Direct Jobs		1,129	1,460	1,733
Indirect/Induced Jobs		1,368	1,768	2,099
SASA Facility Construction				
Direct Jobs		551	2,021	2,506
Indirect/Induced Jobs		668	2,448	3,035
Subtotal				
Direct Jobs		1,681	3,481	4,240
Indirect/Induced Jobs		2,035	4,215	5,134
Commercial-Related Employment				
SASA Site Commercial				
Direct Jobs		2,254	891	0
Indirect/Induced Jobs		2,729	1,079	0
Project Area Commercial				
Direct Jobs		420	420	420
Indirect/Induced Jobs		509	509	509

Table 4.3-10. Construction and operation impacts for all alternatives—totals for years 1991-2003 (in 1992 dollars) (continued).

	No Action	Alternative 1	Alternative 2	Alternative 3
Subtotal				
Direct Jobs	2,319	2,674	1,311	420
Indirect/Induced Jobs	2,808	3,238	1,588	509
Earnings Multipliers[7]	$75,729,600	$132,809,880	$122,097,704	$109,432,024
Sales Tax Revenues[8]				
SASA Site Development	$0	$5,330,246	$6,888,820	$8,179,795
SASA Facility Development	$0	$3,075,000	$11,275,000	$13,981,000
SASA Site Commercial		$12,570,600	$4,969,200	$0
Project Area Commercial	$12,937,140	$14,914,570	$7,313,170	$2,343,970
Total Estimated Revenues	$12,937,140	$35,890,416	$30,446,190	$24,504,765
Operational Impacts				
Operational Employment[9]				
Direct Jobs	5,541	7,358	5,738	3,045
Indirect/Induced Jobs	1,563	2,084	2,246	1,384
Total Operational Employment	7,104	9,442	7,984	4,429
Property Tax Revenues-All Jurisdictions[10]	$13,129,006	$14,146,475	$7,638,382	$3,457,030
Leasehold Revenues-All Jurisdictions[11]		$9,115,983	$12,128,427	$12,318,444
City Property Tax Revenues	$0	$483,000	$1,560,000	$2,100,000
Subtotal City Revenues	$3,173,703	$3,902,660	$3,406,443	$2,935,674

Notes and Sources:

1. SASA programmatic requirements for each alternative prepared by TRA.

2. Site development cost estimates prepared by W & H Pacific.

3. Facility cost estimated based on the following assumptions: 900,000 square feet of base maintenance facilities estimated to cost approximately $50 million (per Alaska Airlines); additional 900,000 square feet of base maintenance (in Alts 2 & 3) to cost an additional $50 million; 600,000 square feet of "other future" base maintenance (Alt 3) to cost two-thirds of $50 million or $33 million; 900,000 square feet of relocated line maintenance (Alts 1, 2 & 3) to cost 75% of $50 million or $37.5 million.

4. Commercial development assumptions in the no-action alternative were provided by the City of SeaTac and TRANSPO, for use in the City's transportation plan. Commercial development on the SASA site in Alts 1 & 2 is based on a 1.0 land-to-building ratio on available land. Development shown in the project impact area outside the SASA site represents 294,000 square feet of hotel development on the current Highline School District site and 25,000 of retail development across 28th Avenue from SASA.

5. The estimated assessed value of commercial development is based on 1990 assessed values (for 1991 taxes) and is in 1991 dollars. Average AV by use type for the area was provided by the King County Assessor's Office, Commercial Appraisal Division.

6. Source: *Washington State Input-Output Study for 1982*, Philip Bourque 1987; multipliers adjusted for regional economy. Construction multipliers used = 14.7 direct jobs per million in construction expenditure.

7. Earnings multiplier measures the effect on the regional economy from indirect purchases and induced spending attributable to construction activities.

8. Sales tax rate is 8.2%. SASA site development costs were provided by W & H Pacific. SASA commercially-based tax estimates are based on estimated assessed values (as proxy for construction cost estimates) in 1991 dollars; these are likely to significantly understate actual revenues which will accrue over the planning period.

9. Source: Port of Seattle; Berk & Associates, Inc. calculations based on adjusted Washington State Input-Output model multipliers.

10. Annual property tax revenues are summed for the period 1994-2003. Rates are based on 1991 tax rates.

11. Leasehold revenue calculations prepared by the Port of Seattle. Leasehold rates are 12.84% total; 4% to the City.

4.3.2.4 Alternative 2 - The Preferred Alternative

Alternative 2 is defined as relocated line maintenance facilities of 827,225 square feet, 81,750 square feet of supporting facilities, 889,500 square feet of base maintenance facilities, and 871,200 square feet for future facility expansion. The commercial portion of Alternative 2 comprises 606,000 square feet of office development, 294,000 square feet of hotel, and 25,000 square feet of retail development, for total assumed commercial development of 925,000 square feet. This development is assumed to be located in areas C, D, and E, as shown in Figure 4.3-1. These areas encompass approximately 922,600 square feet of land.

The potential for coordinated joint development opportunities may exist in the air space over a portion of the aviation development. The air rights over this development would be owned by the Port and could potentially be leased or donated for additional aviation-related commercial development. Such actions would constitute a separate proposal; the impact of such joint development options cannot be assessed at this time.

Revenue and Employment Impacts

Construction and operation impacts are shown in Table 4.3-10.

4.3.2.5 Alternative 3

Alternative 3 is defined as the same number of square feet of aviation development as in Alternative 2, plus 660,525 square feet of other future base maintenance facilities. The commercial portion of Alternative 3 comprises 294,000 square feet of hotel development and 25,000 square feet of retail development. This development is assumed to be located in areas D and E in Figure 4.3-1, and to encompass 316,300 square feet of land.

There is the same opportunity for coordinated joint development opportunities may exist in the air space over a portion of the aviation development as was discussed for Alternative 2.

Revenue and Employment Impacts

Construction and operation impacts are shown in Table 4.3-10.

4.3.2.6 Development Sequence

In the case where initial SASA development is for line maintenance then followed by base maintenance, the overall development projected for 2003 for the different alternatives remains the same. Regardless of development sequence, the SASA footprint remains the same and the area available and timing for potential commercial development are unchanged. Initial line maintenance development of the Preferred Alternative (Alternative

2) would result in effects similar to the buildout of Alternative 1/Option 1A. The employment increase (direct and indirect) associated with the maintenance base development would be delayed. Sales tax revenues from SASA construction would be delayed by several years and would shift to match the building sequence. Additional leasehold tax revenues would also be delayed. Economic impacts of potential commercial development would match the schedule in which it is developed.

4.3.2.7 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area socioeconomics. Approximately 250 residential properties would need to be acquired and converted to airport use if a runway is constructed. However, the area affected would be well separated from the SASA site. Since the anticipated acquisition area is essentially residential, direct employment would not be significantly reduced. Property tax revenues generated from the residences removed and paid to governments, utilities, or other taxing districts would cease. Construction employment and taxes generated during runway or other airport project construction would add to that generated by SASA if the projects are implemented during the same time period. These revenues cannot yet be defined because planning for such projects has not sufficiently advanced.

Construction of regional roadway improvements south of the airport would also result in similar patterns of revenue impact with the conversion of airport, residential, and/or commercial property to public roadway use. Magnitudes of the revenues involved would depend on route alignment decisions which have not yet been made. Other development on existing airport property could add leasehold tax revenues, depending on facility use. Over the long term, tax revenues generated from airport activity would grow as passenger volume through the airport increases. The potential for cumulative impacts on socioeconomics will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.3.3 Mitigation Measures

As no significant impacts have been identified, no mitigation measures would be required under any of the alternatives.

The City's share of sales tax associated with SASA site development and facility construction costs is dependant on the magnitude of retail sales recorded within City limits. To assure that the City receives as much sales tax revenue as possible, the Port and the City should work together to encourage vendors to purchase as many materials as possible within the City; and to ensure that purchases made in the City are correctly coded as such on reports submitted to the Department of Revenue.

4.3.3.1 Induced Terminal Development Impacts

Since the proposed SASA project would allow space for the existing passenger terminal to be enlarged, potential impacts of such terminal construction can be reviewed, albeit at the general level, since it is not a direct action of this proposal.

Expansion of the passenger terminal, including aircraft gates, passenger waiting areas, passenger services, etc. has been identified throughout the range of planning studies for Sea-Tac Airport. At this time, specific project and design proposals for expanded terminal facilities have not been prepared.

Because the potential terminal expansion areas are already a part of the developed airport operating area and are already paved and/or have buildings in place, additional terminal development would be unlikely to have any significant impact on earth, water, or habitat elements of the environment. Site grading would be minimal and storm water runoff and groundwater flows would continue in existing patterns. Noise and air quality would be proportional to the volume of passengers and cargo moving through the airport. However, projected increases in the number of flights will reflect market demand and are not caused by improvements to the terminal. Airport noise is projected to decrease from current conditions because of the continued fleet change to quieter Stage 3 aircraft and the provisions of the noise mediation agreement. Noise impact mitigation through the Noise Remedy Program would continue. Aircraft emission rates would also improve with the continued replacement of older aircraft. Reduction in terminal-area congestion would also aid in reducing aircraft idling emissions.

With the projected growth in passenger flows through the airport, additional parking and access facilities would also be needed. The Parking Facilities Expansion studies discuss a variety of parking improvements, including the current expansion of the main terminal parking garage, and evaluation of environmental impacts, including noise, air quality, traffic, and associated mitigation measures. Any other parking and access projects that might be proposed and considered in the future would be subject to appropriate environmental reviews. In addition, as noted elsewhere in this part of the EIS, the Port is cooperating with other state and local agencies in the planning and evaluation for area and regional roadway projects to serve both the airport and other land use development. The Port is also cooperating with Metro and others in high capacity transit and transportation demand management studies that are underway. Land use would not change on the site. However, the increase in passenger numbers and use of the airport could induce the local development of additional hotels, motels, long-term parking, and other types of land uses associated with airports. Historical/cultural and recreational facilities would not be affected. Utility requirements could increase, but basic public services would probably not be significantly changed and would be handled by airport departments. As and when the Port Commission authorizes project studies for additions to the terminal, appropriate detailed environmental assessments would be prepared. In addition, potential impacts, including cumulative impacts, that might result from further terminal development will be reexamined in the airport's Master Plan Update and EIS (refer also to Sections 3.4.12 and 3.4.13).

4.4 NOISE

The purpose of this section is to 1) provide a brief introduction to noise, 2) discuss applicable noise impact criteria, 3) present the existing noise activities and regulations at Seattle-Tacoma International Airport, 4) analyze the elements of the SASA project that have noise impact potential, and 5) recommend potential mitigating measures to lessen impacts.

4.4.1 Noise Background

4.4.1.1 Introduction to Noise

The following discussion presents a brief introduction to sound and noise. It includes measures of sound (sound metrics), characteristics of environmental sound such as amplitude and duration variations, loudness of sounds, and the effects of noise on people. Additional discussion is contained in Appendix B, *FAA Noise Information*.

Characteristics of Sound

A person's ability to perceive a specific sound depends upon the magnitude and character of the sound, as differentiated from all other sounds in the environment. A number of qualitative descriptions may be used to describe the subjective attributes of a sound, such as: magnitude (loud or faint), frequency content (high pitched hiss, low rumble, or tonal), intermixing of tones (harsh or melodic), time variation (intermittent, fluctuating, steady or impulsive), and duration (long or short). Each of these is important in rating the character of sounds. Each is discussed briefly below.

Sound Magnitude

The decibel (dB) is the unit used to measure the magnitude of a sound level. Unlike the scales of length and temperature, which are linear scales, the sound level scale is logarithmic. Thus, the level of a sound which has 10 times the sound pressure of a reference sound is 10 decibels greater than the reference sound, and a sound that has 100 times (or 10 x 10) the sound pressure of the reference sound is 20 dB greater (10 dB + 10 dB). Zero decibels corresponds to the threshold of hearing.

The use of the logarithmic decibel scale requires somewhat different arithmetic than we are accustomed to using with linear scales. For example, if two similar but independent noise sources operate simultaneously, the measured sound pressure level would be twice the level of either source operating alone. Combination of two equal sources results in a 3 dB increase in the sound level. For example, 60 dB + 60 dB is 63 dB, not 120 dB. This increase of 3 decibels, is judged by most people to be just noticeable.

If the two sound sources produce individual levels that are different by 10 dB or more, then adding the two together produces a level that is not significantly different from the level produced by the louder source operating alone. Most people perceive the loudness, or noisiness, of a sound to double each time the sound level increases by 10 decibels. For example, a sound level of 70 dB following a sound level of 60 dB would be judged twice as loud as the 60 dB sound. The metric L_{max} is the loudest decibel level of a noise event.

Frequency Weighting

The A-weighted scale on standard sound level meters has been used extensively to measure the magnitudes of sounds of all types. It approximates the frequency response of human hearing and is highly correlated with the effects of noise on people. Because of its universality, it was adopted by EPA and other government agencies for the description of sounds in the environment.

The zero value on the A-weighted sound level scale (0 dBA) approximates the smallest sound pressure that can be detected by a human. The average sound level of a whisper at a l-meter distance is approximately 40 dBA; the sound level of a normal voice speaking 1 meter away is approximately 57 dBA; a shout, 1 meter away, is approximately 85 dBA.

Time Variation of Sound Level

Generally, the magnitude of sound in the environment varies over time. A fluctuating noise source can be characterized several different ways including its maximum or average levels. If a sound were of sufficient magnitude to intrude on an individual's activities, e.g., conversation, thinking, watching television, etc., its duration would affect the resulting degree of annoyance. Similarly, it might be anticipated that the number of times such an event recurred also would affect the degree of annoyance. Thus, there is good reason to expect that a measure of duration is important in characterizing the effects of noise.

Both magnitude and duration factors are included in calculations of sound exposure which adds up all of the sound occurring in a stated time period or during a specific event. The logarithmic form - Sound Exposure Level (SEL) - is read from integrating sound level meters and is the quantity that best describes the totality of a single noise event such as an airplane flyby, or a car or train passby. SEL combines both decibel level and noise event duration and has a value greater than the L_{max}.

The equivalent sound level (L_{eq}) is simply the average value of the sound exposure during a stated time period. It is often used to describe sounds with respect to their potential for interfering with human activity, e.g., speech interference. The L_{eq} for peak traffic hour is used by the Federal Highway Administration (FHWA) to measure and evaluate road noise impacts from vehicles.

A special form of Leq is the day-night sound level (L_{dn}). L_{dn} is calculated by averaging all the sound exposure during daytime (7:00 am - 10:00 pm) plus 10 times the sound exposure occurring during the nighttime (10:00 pm - 7:00 am). The multiplication factor of 10 applied to the nighttime sound is often referred to as applying a penalty of 10 dB to noises that occur at night. The L_{dn} was developed by EPA for use in describing environmental noise and estimating its potential effects on humans. Note that increased sound duration or number of events increases the value of L_{dn} logarithmically.

In 1980 a Federal Interagency Committee on Urban Noise published *Guidelines for Considering Noise in Land Use Planning and Control*. This committee included the EPA, Department of Housing and Urban Development, Department of Transportation, Department of Defense, and the Veterans' Administration. The report suggested that land use compatibility guidelines designate noise zones below L_{dn} 65 dB as compatible for residential use.

The FAA has combined the suggestions of the Interagency Committee and others in its table of land use compatibility with Yearly Day-Night Average Sound Levels (yearly L_{dn}). Yearly L_{dn} is a designation for L_{dn} values that are based on annualized data as used in FAA's FAR Part 150 Regulation for airport noise mitigation. Criteria for noise impact in Part 150 are reproduced in Table A-1 in the *Technical Appendix - Noise* (Appendix C). Those criteria suggest that areas where the yearly L_{dn} is less than 65 dB are considered compatible for residential use.

Sleep/Speech Disturbance

There is a large body of research documenting the effect of noise on sleep disturbance, but the long-term effects of sleep disturbance are not conclusively known. The FAA Report, Aviation Noise Effects (Report FAA-EE-85-2) provides a compendium of aviation-related noise research. It is clear that sleep is essential for good physical and emotional health. Noise can interfere with sleep, even when the sleeper is not consciously awakened, and nighttime operations will interfere with the sleep of some people. Thus, sleep disturbance is one of the factors contributing to aircraft noise annoyance.

The variability in the way individuals react to noise makes it impossible to accurately predict how any one individual will respond to a given noise. However, when the community is considered as a whole, trends emerge which relate noise to annoyance. In identifying levels for interference, the EPA's publication titled Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (550/9-74-004), states:

Although speech-interference has been identified as the primary interference of noise with human activities and is one of the primary reasons for adverse community reactions to noise and long-term annoyance, the 10 dB nighttime weighting (and, hence, the term L_{dn}) is applied to give adequate weight to all of the other adverse effects on activity interference.

Because it combines the primary characteristics of environmental noise into a single measure, L_{dn} provides an adequate and widely accepted indicator of community annoyance to aircraft noise. EPA, in the aforementioned report, states:

> This formula of equivalent level (L_{dn}) is used here to relate noise in residential environments to chronic annoyance by speech interference and in some part by sleep and activity interference.

FAA's Aviation Noise Effects document also states that 72 dBA at the exterior of a residence with windows closed will typically result in an interior sound level of 55 dBA. These values are identified as providing acceptable sleeping conditions. These same values are expected to provide an environment where, "Communication is satisfactory in normal voice, 1 to 2 feet; raised voice, 3 to 6 feet. Telephone use slightly difficult." Generally, normal voice effort becomes inadequate as the indoor noise level exceeds about 65 dBA (corresponding to an outdoor level of about 85 dBA).

Hearing Damage

FAA's Aviation Noise Effects document also states that scientific studies show that, although high noise levels can potentially damage hearing, there is no danger (under normal circumstances) of hearing damage due to the levels of aircraft noise in a community surrounding an airport.

Non-Auditory Health Effects

The fact that airport noise above a certain level annoys airport neighbors is generally accepted, but whether or not that noise causes any physical or mental damage is far less established. FAA's Aviation Noise Effects contains a review of some of the pertinent studies dealing with the non-auditory effects of aircraft noise on people.

Most studies on this subject found that there is little reliable evidence on the relationship between noise exposure and human physiological or behavioral effects (other than hearing damage). In fact, many of the studies directly contradict each other on the cause and effect upon mortality rates, birth defects and incidents of cardiovascular problems. While a cause and effect relationship has not been proven, experiments have shown that noise should be viewed as a risk factor. Further research is necessary giving special attention to critical groups, such as pregnant women, children, older people, and people with cardiovascular diseases.

4.4.1.2 Noise Impact Criteria

Noise levels generated by aircraft are regulated solely by the federal government through FAA's aircraft certification process. Local regulation of aircraft noise associated with flight operations is preempted by federal regulations. However, there are local (King County) and federal criteria (Federal Aviation Administration) for noise that can be used for evaluating aircraft noise impacts for the project. These are described below. For the present project, these criteria provide useful reference points for assessing noise impacts.

King County Noise Ordinance

Maximum permissible environmental noise levels are shown in Table 4.4-1.

Table 4.4-1. Maximum permissible environmental noise levels (dBA).

	Land Use Zone of Receiving Property		
Land Use Zone of Noise Source	Residential	Commercial	Industrial
Residential	55	57	60
Commercial	57	60	65
Industrial	60	65	70

Source: King County Noise Ordinance - Chapter 12.88 Environmental Sound Levels
The maximum permissible levels are:

- Reduced by 10 decibels at night (10 pm to 7 am) when the receiving land use zone is residential.
- Reduced by 5 decibels for sounds that are periodic or contain pure tones.
- Increased by 15 dBA for up to a total of 1.5 minutes in any one hour period.
- Increased by 10 dBA for up to a total of 5 minutes in any one hour period.
- Increased by 5 dBA for up to a total of 15 minutes in any one hour period.

Sounds created by aircraft in flight and traffic on public roads are exempt.

Sounds from engine testing and maintenance are exempt between the hours of 7:00 am and 10:00 pm. A special exemption is provided between 6:00 am and 7:00 am for aircraft regularly scheduled to depart between 7:00 am and 8:30 am. Sea-Tac International Airport Schedule of Rules and Regulations No. 4, described in Section 4.4.3.2, also regulates engine testing times. Relevant portions of the King County noise ordinance are attached in Appendix C.

Federal Aviation Administration

Federal Aviation Regulation (FAR) Part 150 - Airport Noise Compatibility Planning

FAR Part 150 is FAA's program for achieving airport noise compatibility. Hundreds of studies under this program have been conducted at airports across the country since 1984.

FAA defines noise compatible land uses as those where noise effects such as speech and sleep interference annoyance are generally acceptable either by actual use or by special noise insulation in buildings. For Part 150 studies, FAA has established 65 dB L_{dn} as the exterior noise level criterion for Part 150 studies. FAA considers all uses exposed to noise below this level to be "noise compatible." FAA Order 1050.1D, Policies and Procedures for Considering Environmental Impacts, also indicates that single event levels, in terms of Sound Exposure Level (SEL) or Maximum A-weighted Sound Level (Lmax) are important for investigating noise sensitive sites for possible soundproofing projects.

The 65 dB L_{dn} criterion for exterior noise includes a consideration of outdoor activities with residential use and the need for communication and sleep. Between 65 and 75 dB L_{dn}, home construction must provide noise level reductions (NLR) of 20 to 30 dB respectively to maintain 45 dB L_{dn} indoors. Normal home construction provides an NLR of 15-20 dB. In commercial and manufacturing uses, where there are generally no outdoor noise-sensitive activities, the criterion level for exterior noise increases to 70 or 75 dB L_{dn}.

Federal Highway Administration (FHWA)

The FHWA has its own criteria for evaluating the impact of motor vehicles noise. These are presented in Table 4.4-2.

4.4.2 Affected Environment

Seattle-Tacoma International Airport currently handles more than 16 million passengers each year and more than 350,000 aircraft operations (takeoffs plus landings) annually. Based on forecasts of travel demand over the next six to eight years, these figures are expected to grow to 25 million passengers and 410,000 operations annually using the existing airport facilities.

As a major commercial and international airport, Sea-Tac International Airport generates significant amounts of noise from aircraft operations. Since the early 1970s, major noise remediation programs have been in place at the airport, with primary focus on noise control and purchase or retrofit sound insulation of incompatible land uses (primarily residential) in the surrounding communities. In 1990, a mediated consensus agreement established a timetable for phasing out older, noisier aircraft, leading to a significant reduction in overall aircraft noise generated by aircraft operations.

The SASA project would not generate a significant increase in flight operations at Sea-Tac International Airport. The relocation of existing line maintenance hangars would accommodate the same activities that exist currently. If Alaska Airlines or another base maintenance facility were constructed, aircraft would be routed on regularly scheduled flights to the maintenance base at Sea-Tac International Airport. No additional flights are anticipated.

Table 4.4-2. Highway noise abatement criteria.

Activity Category	Leq Noise Level	Description of Activity Category
A	57	Lands on which serenity and quiet (Exterior) are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	Picnic areas, recreation areas, (Exterior) playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72	Developed lands, properties, or (Exterior) activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52	Residences, motels, hotels, public (Interior) meeting rooms, schools, churches, churches, libraries, hospitals, and auditoriums.

Source: U.S. Department of Transportation, Federal Highway Administration, Federal-Aid Highway Program Manual, Vol. 17, Ch.7, Sec3, Table 1.

4.4.2.1 Similar Noise Studies

There have been several previous studies of the aircraft noise impacts of Sea-Tac International Airport. In 1976, the first comprehensive study was carried out as part of the Sea-Tac/Communities Plan and became the basis for the airport's Noise Remedy Program. In the early 1980s, the noise contour modeling was updated using FAA's Integrated Noise Model (INM) and newer forecasts of aviation activity. This work was incorporated in the airport's first noise study carried out under the provisions of FAR Part 150. Issued in 1985, this study resulted in extension and modification of the Noise Remedy Program. In 1989, airport noise contours were again modeled, using the latest version of the INM and updated forecasts of operations.

An update of the Part 150 program is currently underway. This update incorporates current operations forecasts, flight tracks (4-Post Plan), and provisions of the 1990 Noise Mediation Agreement for the airport. This agreement includes a curfew on night operations of Stage raft and a schedule for conversion from Stage 2 to Stage 3 aircraft for the fleet serving Tac International Airport. This Stage 2 phase out is similar to but more rigorous than hase out now mandated at the federal level.

e past studies have considered the potential effect of both aircraft taxiing and ntenance runups on the annual average L_{dn} noise contours for the airport. These uations have shown taxiing and run-up activities do not significantly increase the noise ours.

2.2 Existing Noise Programs

e Noise Abatement program at Sea-Tac International Airport has several elements which ate directly to noise reduction at the source (the airport). These address ground noise trictions, aircraft fleet mix, operating procedures, etc. Several of these provisions are cussed below.

rrently, turbojet operations at Sea-Tac International Airport are a mixture of Stage 2 and age 3 aircraft. These designations refer to FAA certification based on noise levels rescribed in 14 CFR Part 36, Appendix C, Section 36.5a2). Generally speaking, Stage 2 rcraft are older and have noisier engines, while Stage 3 aircraft either have newer chnology engines, or have been retrofitted to meet the Stage 3 noise criteria. Given the oise Budget allocations from the Noise Mediation Agreement, there will be a steady rogression to an all Stage 3 fleet around the year 2001. This transition can already be seen n the improvement from 42.4% Stage 3 operations in 1990 to 55.7% in 1991.

The Nighttime Limitations program, which went into effect October 1, 1990, phases out Stage 2 (the noisiest) aircraft during the nighttime hours. Effective October 1, 1992, no Stage 2 aircraft may operate between midnight and 6 am. Over the following three years the restricted hours expand until they encompass 10 pm to 7 am by October 1, 1995.

The Noise Budget program leads Sea-Tac International Airport steadily toward a fleet composed entirely of Stage 3 (the quietest) aircraft, thereby reducing noise over the next 10 years. The budget defines the maximum amount of noise airlines are allowed to make each year at Sea-Tac International Airport. The maximum amount of noise consists of a noise allocation for individual airlines plus an unused amount retained in a "noise fund," allocated by the Airport under special circumstances. The Port monitors each airline and reports the findings in the Noise Abatement Office quarterly report. Any airline exceeding its annual allocation is subject to a fine.

The additional maintenance facility proposed by Alaska Airlines would accommodate the new Stage 3 737-400s and MD-90 aircraft being delivered to the airline between 1992 and 1997. Alaska's fleet currently consists of more than 60 Boeing 727, 737, and McDonnell Douglas MD-80 aircraft (a mixture of Stage 2 and 3 aircraft). Thus, no Stage 2 flights would be added by the maintenance base and the Noise Mediation Agreement phase out of Stage 2 aircraft would proceed as planned.

In addition to the Noise Abatement program, which works to reduce noise at its source, the Port also has an extensive Noise Remedy program aimed at mitigating noise received by noise sensitive land uses, particularly single-family residential, in the airport vicinity. Developed with local government and citizens as part of the Sea-Tac/Communities Plan in the mid 1970s, the major elements of the program have included the buyout of more than 1,000 noise impacted residences and relocation of occupants; soundproofing of homes, more recently put into operation with a goal of about 10,000 residences; and transaction assistance for the sale of residences which are difficult to market because of their proximity to the airport. Application of the program is focussed on the areas most severely impacted by aircraft noise in accordance with FAA guidelines and requirements.

The Port has a full-time staff administering the program, which is funded with both FAA grants and airport revenues and is incorporated into the airport's FAR Part 150 program. Since its inception, the elements and implementation of the Noise Remedy program have been adjusted and updated to ensure more efficient and equitable operation, most recently through the Noise Mediation Agreement. As part of the current update of the FAR Part 150 program, several additional noise mitigation measures are being discussed with citizens and local jurisdictions. These measures consider how to deal with mobile homes and with other noise sensitive land uses such as schools, churches, and hospitals.

4.4.3 Aircraft Noise Analyses

For the present study, a total of nine L_{dn} contours for the following cases were produced:

- 1991 Existing conditions,
- 1993 No-Action, and Alternatives 1, 2 and 3, and
- 2003 No-Action, and Alternatives 1, 2 and 3.

In addition, SEL contours and A-weighted maximum level (L_{max}) contours for the worst case aircraft departure and the worst case runups in 1991, 1993, and 2003 were produced. In the future build alternatives involving runups at SASA, worst case SEL and L_{max} run-up contours were evaluated for both SASA and the existing run-up locations.

The present analyses used the NOISEMAP 5.2 noise prediction program to develop noise contours for all aircraft operations at Seattle-Tacoma International Airport. NOISEMAP, developed under contract to the United States Air Force, is one of two FAA-approved models for aircraft noise prediction. The modeled aircraft operations included flight operations, run-up operations, and taxiing operations. NOISEMAP permits the user to combine the modeling of airborne (flight) operations and ground-based (runups and taxiing) operations into a single set of noise exposure contours or to disaggregate the components into separate contours for each category of operation.

4.4.3.1 Flight Operations

Aircraft flight modeling data (in the form of INM input files) were converted through a direct "translation" process to NOISEMAP format to facilitate the modeling of ground-based aircraft operations. Although small differences may be detectable compared to the INM noise exposure contours, the conversion from INM to NOISEMAP has only a very minor effect on the noise contours.

The FAA's standard for the computation of aircraft noise in the vicinity of non-military airports is the INM. To ensure compliance with this standard, the FAA sponsored a detailed comparison of the alternative aircraft noise computation program NOISEMAP 5.1 with the INM 3.8. The analysis of these two programs suggests the following conclusions:

1. Except for some areas within 1000 to 2000 feet of runways, NOISEMAP 5.1 with the SAE lateral attenuation algorithms invoked and INM 3.8 produced essentially identical results. Comparability depends, however, upon use of identical input information including identical aircraft noise and performance data.

2. For areas strongly influenced by start of takeoff roll noise, NOISEMAP and INM computed values can differ, but proper development of the aircraft noise and performance input database necessary for NOISEMAP eliminates these differences or makes them acceptably small.

3. The selection of a contouring program can have more significance on resultant contour shape than the choice of using INM or NOISEMAP as the noise level computational method. In other words, both NOISEMAP and INM compute similar noise levels at grid points, but how these grid point values are turned into contours can significantly affect resultant contour shape.

The input file for existing aircraft noise contours for Seattle-Tacoma International Airport was used for baseline conditions. This input file is from the latest airport noise exposure update study (FAR Part 150) which is currently underway. In addition to the existing case, the Port provided input files with projected operations and fleet mixes for 1993 and 2003. These projections are based on existing operations and current forecasts for future aircraft operations and fleet mix, including the effects of federal regulations and the airport's mediated noise agreement. The SASA project would not affect those operations nor would it cause a significant number of additional flight operations.

4.4.3.2 Run-up Operations

In order to check the operation of a jet engine, airlines must runup the engines at certain power settings. Airport regulations limit the time and location of these runups. These regulations are very restrictive at night (10 pm to 7 am), but allow all runups during the day in four run-up locations which are located directly east of the runways, two each at the north and south ends. The north pads are used in north flow operating conditions (31% of the year) and the south pads in south flow (69% of the year). A Port survey of current run-up activity indicated that the northern-most of both the two southerly and two northerly run-up locations, i.e., S2 and N2, were used almost exclusively. Therefore, all runups that occur outside of the hush facility were modeled at these two locations. Figure 4.4-1 depicts these two run-up locations labeled as "North Existing" and "South Existing." Throughout the remainder of the text, S2 and N2 are referred to as the south and north run-up pads, respectively.

During the Noise Mediation Project (1989-1990), an evaluation of the number of runups and contribution to overall airport noise was made as part of modeling ground noise. As a result of the analysis, noise from maintenance runups was determined not to be a significant contributor to the overall noise at the airport. At that time, it was determined that, on an average, not more than one runup occurred between 10 pm and 7 am nightly. Runups are, however, often heard by and are a source of complaints from airport area residents. Most maintenance runups are performed during the day by the two largest carriers at Sea-Tac International Airport, Alaska and United Airlines. The total runups for these two carriers range from as few as six per week to twelve per week. While these may be significant as single noise events, they do not occur often enough to significantly affect the overall airport noise exposure.

As the Port committed to in the Noise Mediation Agreement, a hush facility to reduce engine maintenance run-up noise would be provided should a decision be made to build a heavy maintenance base at Sea-Tac International Airport (Alternative 2 or 3). The more specific the design for the particular aircraft types that will use it, the greater the noise attenuation provided by the hush facility is likely to be. Noise reductions of 10 dB are generally considered to be readily achievable. Some of the newest facilities have reached up to 20 dB of noise reduction for specific aircraft types. The predominant aircraft types anticipated for the SASA are narrow-body aircraft (Boeing 737, 757, 727, and MD-80/90). Thus, the SASA hush facility would be designed for narrow body aircraft usage. For the purposes of this analysis, it is assumed that the hush facility would provide at least 10 dBA attenuation. Attenuation due to the propagation of sound over the ground and through the air can have a significant effect on the performance of the hush facility. A more precise quantification of these effects was studied and is included in Appendix M.

With the hush facility, current noise abatement regulations for runups would not change. Aircraft at the SASA site would have first priority for use of the hush house. However, all

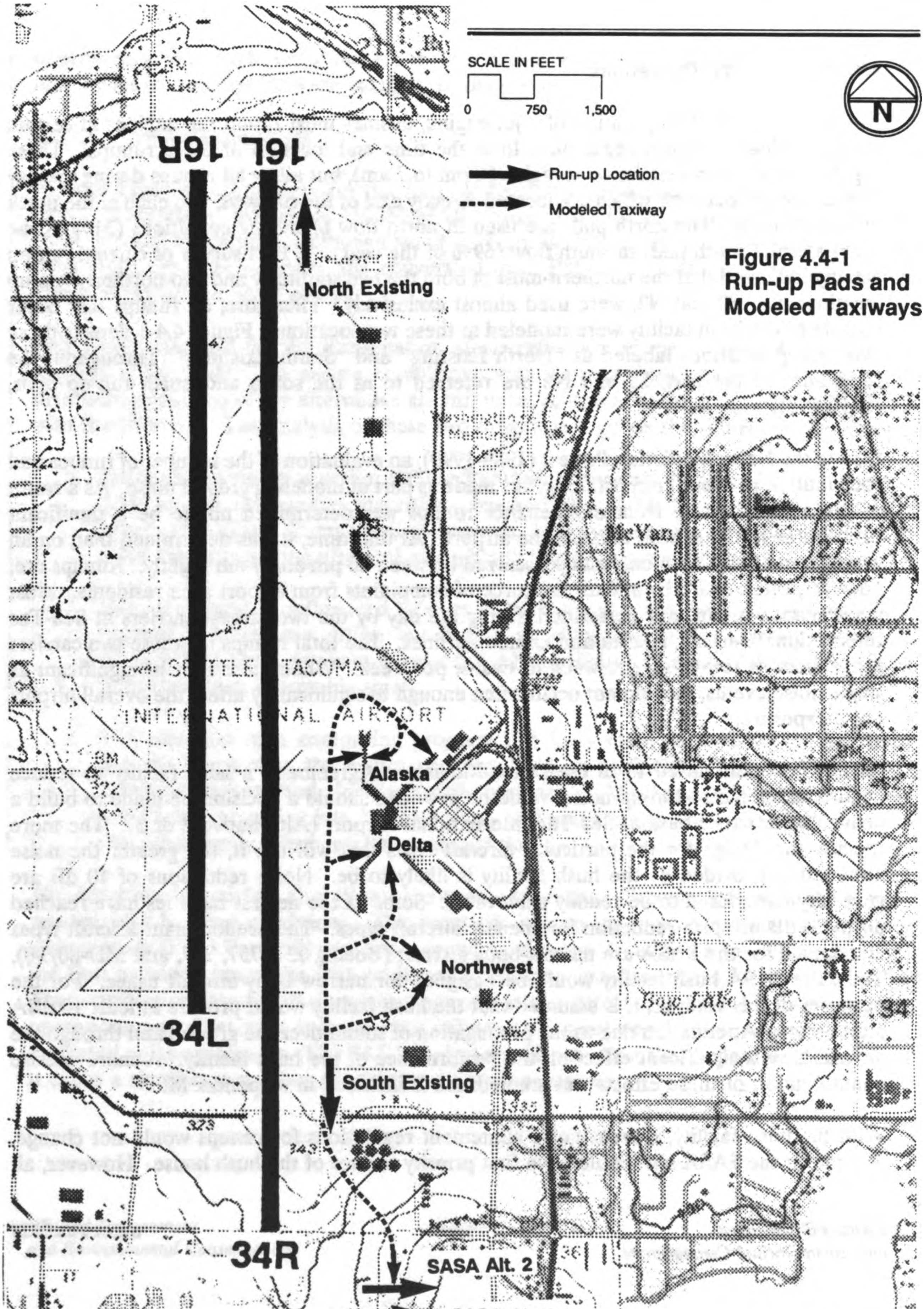


Figure 4.4-1
Run-up Pads and Modeled Taxiways

narrow-body aircraft would be encouraged to use the hush facility in order
usage and to reduce run-up noise impacts. Wide-body aircraft (747, 767, DC-
and other aircraft not using the SASA facility would perform runups above i
the existing airport run-up locations. For those alternatives not including a
(No-Action and Alternative 1), all runups would occur at the existing locations.
idle power engine runs would occur at the hardstands or ramp areas outside
hangars, a situation that exists on current ramp and gate areas.

Run-up Modeling Procedure

Aircraft run-up operations were modeled using the NOISEMAP noise prediction p
Noise data were obtained from a companion program to NOISEMAP, OMEGA
selection of the most appropriate noise profile for each modeled aircraft was based
upon data provided by Boeing and McDonnell Douglas. Operations data obtained f
air carriers conducting run-up operations at Seattle-Tacoma International Airpo
furnished by the Port of Seattle. These data included duration, number, time, and
settings each aircraft type. In addition to providing information on existing operatio
Port furnished projections for future operations including changes in fleet mix and n
of operations.

All runups in the existing case, future No-Action, and future Alternative 1 cases we
sumed to occur at the existing run-up locations. All wide-body aircraft runups were m
at the existing run-up locations in all cases. In future build Alternatives 2 and 3, ru
some or all of the narrow-body aircraft of Alaska Airlines, Delta Airlines, and No
Airlines were assumed to occur at SASA in the hush facility. The actual operati
used in the modeling process is described in Section 4.4.4.2. All runups above i
occurring at SASA in future alternatives were assumed to be performed by n
aircraft and were assumed to take place in the hush facility. This facility was
be a four-sided open-roofed structure that would provide omni-directional noi
of 10 dB. The proposed run-up enclosure was examined in greater detail
The assumptions included in this analysis are based upon the results of

Existing Agreements on Sea-Tac Aircraft Run-up Noise

Both the "Sea-Tac International Airport Schedule of Rules and Reg
"Final Package of Mediated Noise Abatement Actions for Seattl
Airport Agreed to by the Mediation Committee on March 31, 19
aircraft run-up noise. Applicable sections of these documents sta

No aircraft engine runup shall be conducted between the hours
am except as follows:

a. All engines runs require approval of the Airport Supervisor

b. Aircraft that are regularly scheduled to depart between the hours of 7:00 am and 8:30 am shall be allowed to runup as necessary between the hours of 6:00 am and 7:00 am.

c. Engine runs necessary for engine checks at idle power or, if absolutely necessary, a runup above idle not to exceed a total of two (2) minutes duration during this designated quiet period shall be allowed.

All aircraft runups with a engine thrust level higher than idle power will either be conducted in a hush facility (a noise insulated structure) designed to attenuate engine noise or will be conducted at the four current runway locations.

All aircraft backing (push back) is done with auxiliary towing vehicles. No power backs using engine thrust are permitted.

All Stage 2 aircraft will be either eliminated or converted to the quieter Stage 3 limits as directed by FAA Noise Policy Act and the Port of Seattle aircraft noise reduction program.

4.4.3.3 Aircraft Taxiing Operations

Should SASA facilities be put into operation, aircraft would generally taxi under engine power between their hangar at the SASA site and the passenger loading gates. For aircraft movement only within the SASA site, movement would be with the use of tugs to reduce noise. For example, aircraft would be pushed away from the hangars and towed to their hardstands. The nighttime taxiing event estimate of 12% was developed from a review of the SASA Official Airline Guide data.

<u>Taxiing Modeling Procedure</u>

Taxiing operations to and from SASA were modeled in the future build alternatives. Using NOISEMAP, aircraft taxiing operations were modeled as "dummy" flight operations departing from short "dummy" runways and proceeding at an altitude of approximately one foot above ground level along "flight-tracks" that followed the taxiways utilized by the modeled aircraft. Modeling the taxiing aircraft as "airborne" enabled them to maneuver (turning off of runways, for instance), but from a modeling standpoint was equivalent to having them roll along the taxiways. NOISEMAP's lateral attenuation algorithm was invoked for all taxiing operations. The algorithm for aircraft near the ground is based upon SAE AIR 1751, "Prediction Method for Lateral Attenuation of Airplane Noise during Takeoff and Landing."

Noise data for the taxiing aircraft were obtained from the INM Database Version 9. The lowest available power setting in the database for each modeled aircraft was used after being adjusted to match the SEL values for taxiing aircraft from Table D-1 of Appendix B of the 1989 Seattle-Tacoma International Airport Noise Exposure Map Update. These SEL values represent a combination of measured and estimated values and reflect typical taxi speed and thrusts for the modeled aircraft.

4.4.3.4 Other Sources of Ground Operations Noise

The Mediation Agreement identified seven possible sources of noise from aircraft operations while the aircraft are still on the ground. These are shown in Table 4.4-3.

Table 4.4-3. Summary of noise levels from ground operations.[a]

Source Type	Lmax (dBA)	Relative to Runup (dB)
Departure Roll	90	NA
Thrust Reversal on Arrival	90	NA
Taxiing Into Position	70	NA
Power Push-Back	79	NA
Taxi	75	-10
Runup	85	0
On-Board Power Units (APU)	60	-25

Source: The Parry Company

[a] All values referenced to 3,000 feet.

The first three source types in the table are not applicable to SASA because they occur only at the runway and are contained within the flight L_{dn} contours. Power push-backs are no longer permitted at the airport. All aircraft are pushed-back with auxiliary vehicles.

The last column in the table has been created using the run-up noise value as a reference. From that column it can be seen that only aircraft taxiing is within 10 dBA of run-up noises and that source is specifically addressed previously in this section. The noise from APUs is 25 dBA below run-up noise and below the noise of aircraft engine idle power, and thus is not significant.

4.4.4 Operational Scenarios

Noise from aircraft operations was evaluated for a total of nine scenarios:

- 1991 Existing
- 1993 No-Action, and Alternatives 1, 2, and 3, and
- 2003 No-Action, and Alternatives 1, 2, and 3.

Each scenario is comprised of aircraft flight operations and aircraft ground operations. Aircraft *flight* operations are identical for each of the four scenarios within each of the future years (e.g., flight operations are identical within all four 1993 scenarios). Numbers of operations and the aircraft fleet mix change between years. The *ground* operations include aircraft runups and, in some cases, aircraft taxiing. Unlike flight operations, run-up operations vary among scenarios within each of the modeled future years. In addition to varying numbers of run-up operations and different aircraft fleet mixes, the locations of the runups vary depending upon the scenario. Modeled taxiing operations vary according to the projected runups at SASA for each scenario.

The **1991 Existing** scenario documents present operations at Sea-Tac. Except for minor changes, this is the same case documented in the current Sea-Tac Noise Exposure Map (NEM) Update. As stated above, aircraft noise was evaluated using a different program than was used for the NEM to better facilitate this study's focus on aircraft ground noise (see Section 4.4.3.1). All runups in the Existing scenario are assumed to occur at the current run-up locations to the east of Runway 16L-34R. Since only aircraft taxi noise to and from SASA was evaluated in this study, taxi noise was not a component of the Existing scenario.

The **No-Action** scenarios document the no-action cases for the future years 1993 and 2003. Since SASA does not exist in these scenarios, runups are modeled at the existing run-up locations and taxi noise to SASA is not included in the No-Action scenarios.

Alternative 1 in each of the future years is a scenario in which SASA is built, but no runups are conducted there. Runups in these cases continue to take place at the existing run-up locations, but taxiing to SASA for maintenance is included in the modeled operations.

Alternative 2 and **Alternative 3** include runups both at the existing locations and at SASA in both future years. In addition, taxiing operations to and from SASA are modeled in each scenario.

The remainder of this section discusses, in turn, the modeled operations for the flight, runup, and taxiing components of each scenario.

4.4.4.1 Flight Operations

The Port of Seattle provided operations data in the form of noise model input files for the years 1991, 1993, and 2003. The airport was modeled to be in a "south flow" (i.e. with aircraft departing to the south and arriving from the north) 69% of the time and in a "north flow" (with departures to the north and arrivals from the south) 31% of the time in all scenarios. Overall, the noise exposure from modeled flight operations decreases from the Existing scenario to the 1993 cases, and decreases again in the 2003 cases due to fleet mix changes to quieter aircraft and the stage 2 nighttime curfew in the future scenarios. The flight operations, along with runups at the existing run-up locations, provided data for the baseline noise levels for each year. This study focused on the changes in noise exposure that would be caused by the use of SASA in each of the future build alternatives.

4.4.4.2 Run-up Operations

Run-up operations data were obtained through questionnaires that had been completed by Alaska, American, Delta, Northwest, and United Airlines. The completed questionnaires provided information on the number of run-ups, duration, aircraft types, time of day, and power settings. These data were used to model the existing case and served as a baseline for the future scenarios. Based on conversations with the airlines, the Port also provided projections for run-up operations in the future years. In addition, the Port has kept a log of all nighttime runups since 1991.

The run-up data were divided into two categories, line maintenance and base maintenance. Line maintenance runups are conducted at Sea-Tac by all five of the airlines named above. The number of line maintenance run-up operations would not be affected by the SASA project. Additional base maintenance runups will take place only if SASA is constructed and a maintenance base such as that proposed by Alaska Airlines locates at Sea-Tac. Thus, base maintenance runups are included only in the future build scenarios. The two categories of runups are discussed separately in the following sections.

Line Maintenance Runups

The line maintenance data provided to the Port by the airlines were compiled and sorted by aircraft type and power setting. The different power settings utilized by the various airlines were then grouped into three categories: high-power (takeoff power), mid-power (typically 65% to 85%) and low-power (idle). A sensitivity analysis was conducted to determine the relative noise exposure created by runups at the various power settings. The results indicated that although high-power runups cause the loudest noise levels in residential areas, low-power and mid-power runups make a significant contribution to overall noise exposure since they often occur for longer durations.

Table 4.4-4 provides the compiled line maintenance run-up operations data used for the 1990 and 1993 scenarios. The table shows the average number of minutes per month that each aircraft type conducts runups in each of the three power-setting categories. In some cases, when two versions of the same aircraft equipped with different engines exist, they are listed separately. Table 4.4-5 provides the similar information used in modeling the 2003 scenarios.

Table 4.4-4. 1991 and 1993 line maintenance runups (average minutes per month).

Aircraft	Low-Power	Mid-Power	High-Power
B727	151.3	48.5	35.0
B737 (JT8D)	64.0	4.0	23.0
B737 (CFM56)	600.0	78.0	12.0
B747	481.0	59.3	16.7
B757 (RB211)	10.0	15.0	2.0
B757 (P&W)	268.0	133.5	22.0
B767	12.3	11.5	10.0
DC10	139.0	66.3	15.2
L1011	2.3	4.0	7.5
MD11	20.0	0.0	25.0
MD80	94.0	62.5	43.0
	1841.7	482.6	211.4

Table 4.4-5. 2003 line maintenance runups (average minutes per month).

Aircraft	Low-Power	Mid-Power	High-Power
B737 (CFM56)	724.8	85.8	56.9
B747	477.0	63.2	16.7
B757 (P&W)	345.3	163.0	34.0
B757 (RB211)	15.0	22.5	3.0
B767	12.3	11.5	10.0
DC10	139.0	66.3	15.2
L1011	2.3	4.0	7.5
MD11	20.0	0.0	25.0
MD80	94.0	62.5	43.0
MD90	72.2	11.7	24.2
	1901.8	490.6	235.4

Table 4.4-6 displays the information on nighttime runups provided by the Port. A total of 38 nighttime runups, or an average of 3.1 per month, by seven different aircraft types occurred during the year 1991. Each of the logged nighttime runups was assumed to consist of two minutes at high power and two minutes at low power. These data were used along with the information from the questionnaires completed by the airlines to compute percentages of nighttime runups for each aircraft type. These percentages were then applied to the run-up operations figures to determine the number of nighttime runups for each of the scenarios.

Table 4.4-6. 1991 nighttime runups.

Aircraft	Annual Night Runups
B727	12
B737	11
B747	1
B757	4
DC10	6
L1011	2
MD80	2

Base Maintenance Runups

Base maintenance runups were modeled only in Alternatives 2 and 3 of the future (1993 and 2003) scenarios. Table 4.4-7 shows the modeled operations for each of these years. The runups, all by Alaska Airlines, were assumed to all occur during the daytime.

Table 4.4-7. Base maintenance run-up operations (average number per week).

Aircraft	1993	2003
B737-400	1	2
MD90	1.5	3

Each runup consists of 24 minutes at 100% power and 24 minutes at idle (or equivalent shorter periods).

Run-up Locations

In the Existing and the No-Action scenarios, all runups occur at the existing run-up pads. The locations, however, where runups occur in each of the future build scenarios is dependent upon each of the airlines. Alaska Airlines is assumed to use SASA for all base maintenance runups in the 1993 and 2003 Alternative 2 and 3 scenarios. Alaska Airlines, Delta Airlines, and Northwest Airlines are assumed to use SASA for narrow-body line maintenance runups only in 2003 Alternatives 2 and 3 with the balance of their runups at the existing locations. American Airlines and United Airlines are assumed to perform all runups at the existing run-up pads. The locations of runups in the various scenarios are summarized as follows:

- **1991 Existing:** 69% at existing south pad and 31% at existing north pad

- **1993 No-Action and Alternative 1:** 69% at existing south pad and 31% at existing north pad

- **1993 Alternatives 2 and 3:** all line maintenance, 69% at existing south pad and 31% at existing north pad;

  Alaska Airlines base maintenance, at SASA

- **2003 No-Action and Alternative 1:** 69% at existing south pad and 31% at existing north pad

- **2003 Alternatives 2 and 3:** all American Airlines and all United Airlines maintenance and Alaska Airlines, Delta Airlines and Northwest Airlines *wide-body aircraft only* maintenance, 69% at existing south pad and 31% at existing north pad;

  Alaska Airlines, Delta Airlines and Northwest Airlines *narrow-body aircraft only* maintenance at SASA.

Table 4.4-8 displays the average daily total duration of all runups at each run-up location.

Table 4.4-8. Average daily duration of all runups by location (average minutes per day).

	1991 Existing	1993 No-Action & Alternative 1	1993 Alternatives 2 & 3	2003 No-Action & Alternative 1	2003 Alternatives 2 & 3
North Pad	25.9	25.9	25.9	26.8	16.3
South Pad	57.6	57.6	57.6	59.6	36.2
SASA	0.0	0.0	17.1	0.0	68.3
Totals	83.5	83.5	100.6	86.4	120.8

All runups at the existing north and south run-up pads occur with the aircraft parallel to the runways and heading into the prevailing wind. The south pad is used when the prevailing wind is from the south and the north pad is used when the prevailing wind is from the north. Runups at SASA would occur only in future Alternatives 2 and 3. All runups at SASA would take place within a run-up enclosure. Because the run-up enclosure would be large enough to accommodate only narrow-body aircraft (such as B727, B737, B757, and MD80/90), all runups of wide-body aircraft (such as B747, B767, DC10, MD11, and L1011) would occur at the two existing run-up pads in all scenarios.

4.4.4.3 Taxiing Operations

Aircraft taxiing operations to and from SASA were modeled for future year build cases. Aircraft taxiing operations data are based upon the same assumptions about the projected use of SASA as the run-up operations data:

- No taxiing operations were modeled for 1991 Existing, 1993 No-Action, or 1993 Alternative 1
- Only taxiing related to Alaska Airlines base maintenance was modeled for Alternatives 2 and 3 in 1993
- No taxiing operations were modeled for 2003 No-Action
- Only taxiing related to line maintenance for Alaska Airlines, Delta Airlines and Northwest Airlines was modeled for 2003 Alternative 1
- Taxiing related to line maintenance for the above airlines plus base maintenance for Alaska Airlines was modeled for 2003 Alternatives 2 and 3.

Twelve percent of all aircraft taxiing operations were assumed to occur at night. Table 4.4-9 summarizes the modeled aircraft taxiing operations. In addition to the operations information, the Port provided information on taxiways that would be utilized by the various airlines conducting maintenance operations at SASA. Each airline's taxiing operations were distributed evenly upon the taxiways shown for that particular airline. The taxiways, as used in the noise model, are displayed in Figure 4.4-1.

Table 4.4-9 Summary of aircraft taxiing operations (daily round-trips to/from SASA).

	Alaska Airlines		Delta Airlines			Northwest Airlines			
Scenario	MD80/90	B737-400	B757	B767	L1011	B757	B747	DC10	A320
1991 Existing	--	--	--	--	--	--	--	--	--
1993 No-Action & Alt. 1	--	--	--	--	--	--	--	--	--
1993 Alternative 2 & 3	0.20	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003 No-Action	--	--	--	--	--	--	--	--	--
2003 Alternative 1	30.00	15.00	1.40	0.40	0.20	1.00	0.50	0.10	0.40
2003 Alternatives 2 & 3	30.40	15.30	1.40	0.40	0.20	1.00	0.50	0.10	0.40

4.4.4.4 Single Events

In addition to computing overall noise exposure (described in terms of L_{dn}), potential noise impacts caused by "single event" aircraft operations at Sea-Tac Airport were examined. For each scenario, the worst-case runup and aircraft departure were determined and the noise impact of these individual events was quantified using the SEL and L_{max} descriptors (See section 4.4.1.1 for a discussion of these metrics). ("Worst case" in terms of the L_{max} descriptor refers only to the sound level of a particular single event. For the SEL descriptor, the duration of the event, as well as the sound level, were considered in determining the worst case.) In the 1991 Existing case and all of the 1993 scenarios, the loudest commercial aircraft operating at Sea-Tac Airport on a routine basis is the Boeing 727. In the 2003 scenarios, with the phaseout of Stage 2 727s, the loudest commercial aircraft to routinely use Sea-Tac Airport will be the Boeing 747. Takeoff noise SEL contours for these two aircraft were computed and appear in section 4.4.5.3.

The worst-case runup in the 1991 Existing scenario, and in all of the 1993 scenarios, is the Boeing 727 at takeoff power for thirty minutes. Because this extreme event occurs only about three times per year, SEL contours for the same aircraft and power setting at a more typical duration of ten minutes were also developed. These runups would take place only at the two existing run-up pads.

The worst-case runup in all of the 2003 scenarios is the Boeing 747 at 100% power for two minutes and 80% power for three minutes. These runups would also occur only at the existing run-up pads.

The worst-case runups that would take place at SASA in both the 1993 and the 2003 scenarios would be conducted by McDonnell-Douglas MD80 aircraft. As with the Boeing 727, the worst case is a thirty minute runup at takeoff power. Because of the very infrequent nature of this event (three times per year), SEL contours for a more typical ten-minute long runup at takeoff power were also computed. These SASA runups would take place in the hush facility.

4.4.5 <u>Construction and Operation Impacts</u>

4.4.5.1 Construction Noise

There would be temporary periods of truck and equipment noise during construction at the site. The typical noise levels associated with construction equipment generally range from 68 to 98 dBA at 50 feet according to studies performed by the EPA.

Construction noise would occur during daytime hours and noise could create annoyance and speech interference during the day. The noise could affect residences on nearly all sides of the project. Construction noise is exempted from the State noise regulation. The King County noise ordinance has provisions for daytime construction noise to exceed the standard.

Estimates of noises from construction equipment are shown in Table 4.4-10 below. Construction activities are classified as Clearing, Excavation & Earth Moving, Grading and Compacting, Paving, Landscaping (includes cleanup), Stationary and Impact Equipment, and miscellaneous other Equipment. These activities use different sets of equipment and have different noise levels. Principal types of construction equipment likely to be used and their typical noise levels at 50 feet are also presented in Table 4.4-10. Noise levels will be reduced by at least 6 dBA for every doubling of distance beyond the 50 foot distance values shown. Thus, at 100 feet and 200 feet, the resulting levels would be at least 6 and 12 dB lower respectively.

Table 4.4-10. Typical maximum noise levels for construction (dBA).

Activity	Equipment	(dBA)	Activity	Equipment	(dBA)
Clearing			**Paving**		
	Bulldozer	80		Paver	86-88
	Front Loader	72-84		Truck	83-94
	Dump Truck	83-94		Tamper	74-77
	Jack Hammer	81-98	**Landscaping**		
	Crane w/Ball	75-87		Backhoe	72-93
Excavation/Earth Moving				Bulldozer	80
	Bulldozer	80		Truck	83-94
	Backhoe	72-93		Front Loader	72-84
	Front Loader	72-84		Dump Truck	83-94
	Dump Truck	83-94		Paver	86-88
	Jack Hammer	81-98	**Materials Handling**		
	Scraper	80-93		Concrete Mixer	75-85
Grading/Compacting				Cranes	75-85
	Grader	80-93	**Stationary**		
	Roller	73-75		Pumps	68-73
Impact Equipment				Generators	72-82
	Wrenches	80-90	**Other**		
	Vibrators	70-80		Saws	73-83
	Compressors	75-85			

Source: "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," NTIS 300.2, USEPA, December 1971.

The EPA estimated overall sound levels for construction projects using these maximum noise levels and equipment mix, usage factors, and background noise levels. Those estimates yielded Leq's between 71 and 89 dBA at locations 50 feet from the construction.

Maximum levels and Leq's at noise-sensitive locations several hundred feet from the site would be 20 to 30 dBA lower.

4.4.5.2 Operation Noise - Aircraft

<u>L_{dn} Contours</u>

The traditional manner of assessing aircraft noise impacts is to compare the L_{dn} contours for the No-Action case to the L_{dn} contours for the various project alternatives. Counts of population are conducted in those areas where the contours differ. Because there would be no significant increase in flight operations as a result of SASA and because run-up and taxiing noise contributes insignificantly to Seattle-Tacoma International Airport's noise exposure, there is almost no difference between the No-Action and build L_{dn} contours. There are no people added to or subtracted from the L_{dn} contours as a result of the SASA project.

Figures 4.4-2, 4.4-3 and 4.4-4 are the 1991 existing conditions, 1993 No-Action, and 2003 No-Action noise contours, respectively. These figures show that the L_{dn} contours get smaller from 1991-2003 as a result of the Port's aircraft noise reduction program.

Figures 4.4-5 and 4.4-6 compare the L_{dn} contours for No-Action and Alternatives 2 and 3 for 1993. Because there are no run ups at SASA in Alternative 1, the Alternative 1 L_{dn} contours for 1993 are the same as the 1993 No-Action contours. As runups begin at the SASA hush facility, the 75 dBA L_{dn} contour increases only slightly in the area east of SASA. There is no change in the 65 dBA L_{dn} contour in the area east of SASA. No people are added to or removed from the L_{dn} noise contour areas.

Figures 4.4-7 and 4.4-8 compare the L_{dn} contours for No-Action and Alternatives 2 and 3 for 2003. Because there are no runups at SASA in Alternative 1, the Alternative 1 L_{dn} contours for 2003 are the same as the 2003 No-Action contours. Because runups that result from line maintenance are shifted to the SASA hush facility from the north and south run-up pads, the contours decrease in the areas east of the north and south run-up pads. The 75 dBA L_{dn} contours increase only slightly in the area east of SASA because of the increased use of the hush facility. There is no change in the 65 dBA L_{dn} contour in the area east of SASA. No people are added to or removed from the L_{dn} noise contour areas.

Data from tables 4.4-11 A-E display noise levels (L_{dn}) calculated for representative noise-sensitive receptor locations shown in Figure 4.4-9. These data indicate that the project does not generate new areas of incompatible use noise exposure above the federally adopted 65 dBA L_{dn} contour level.

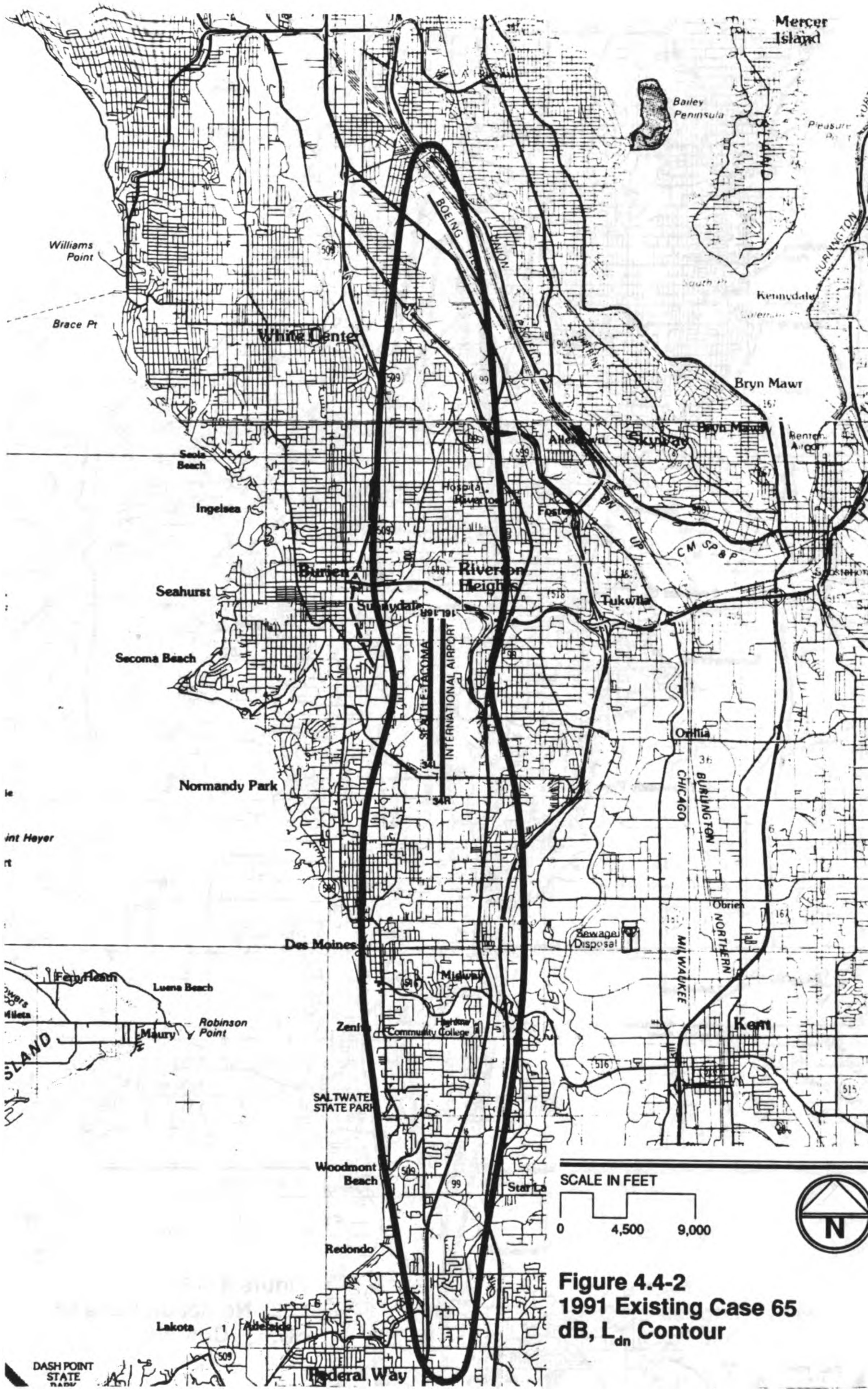


Figure 4.4-2
1991 Existing Case 65 dB, L_{dn} Contour

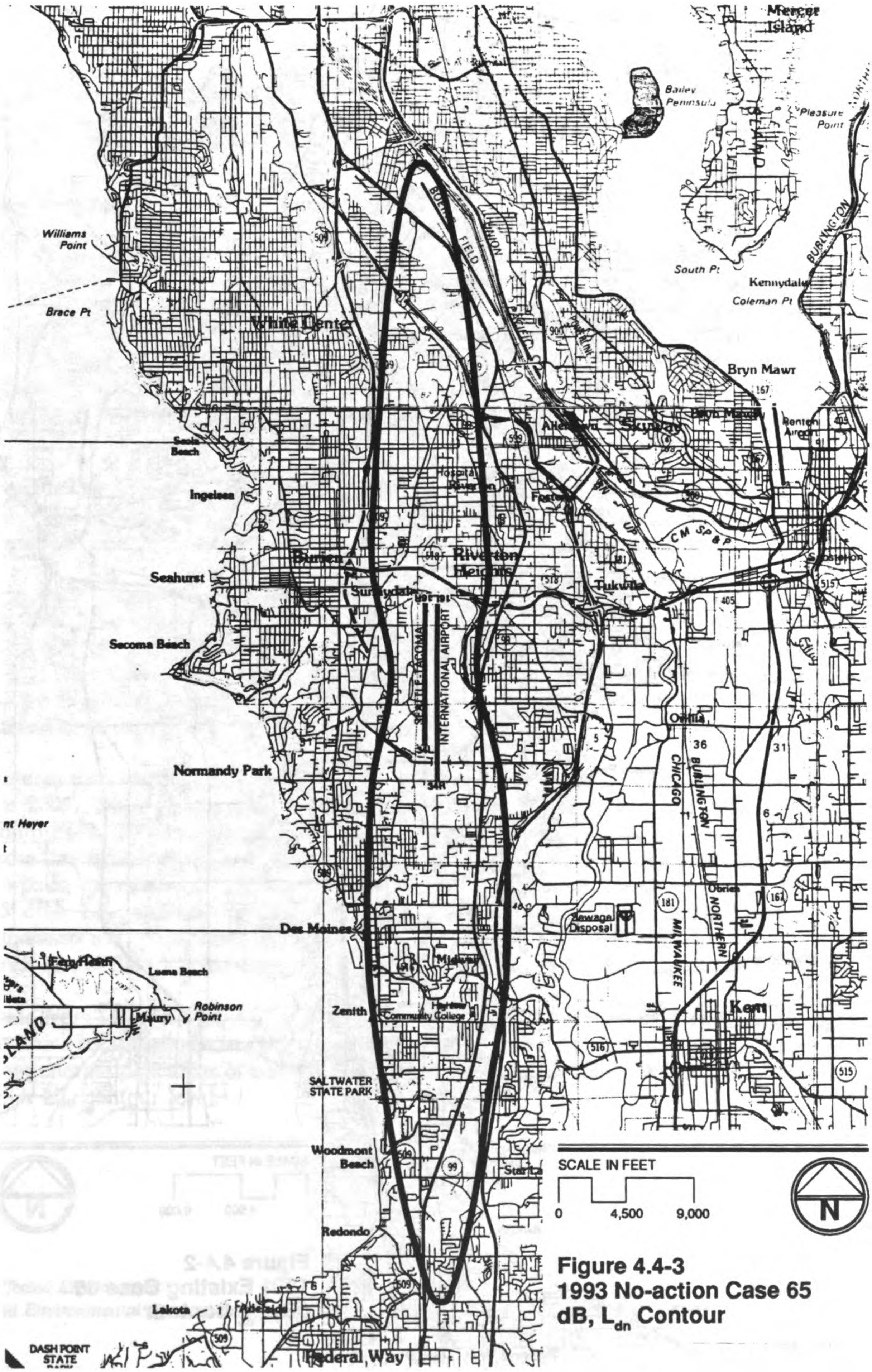


Figure 4.4-3
1993 No-action Case 65 dB, L_{dn} Contour

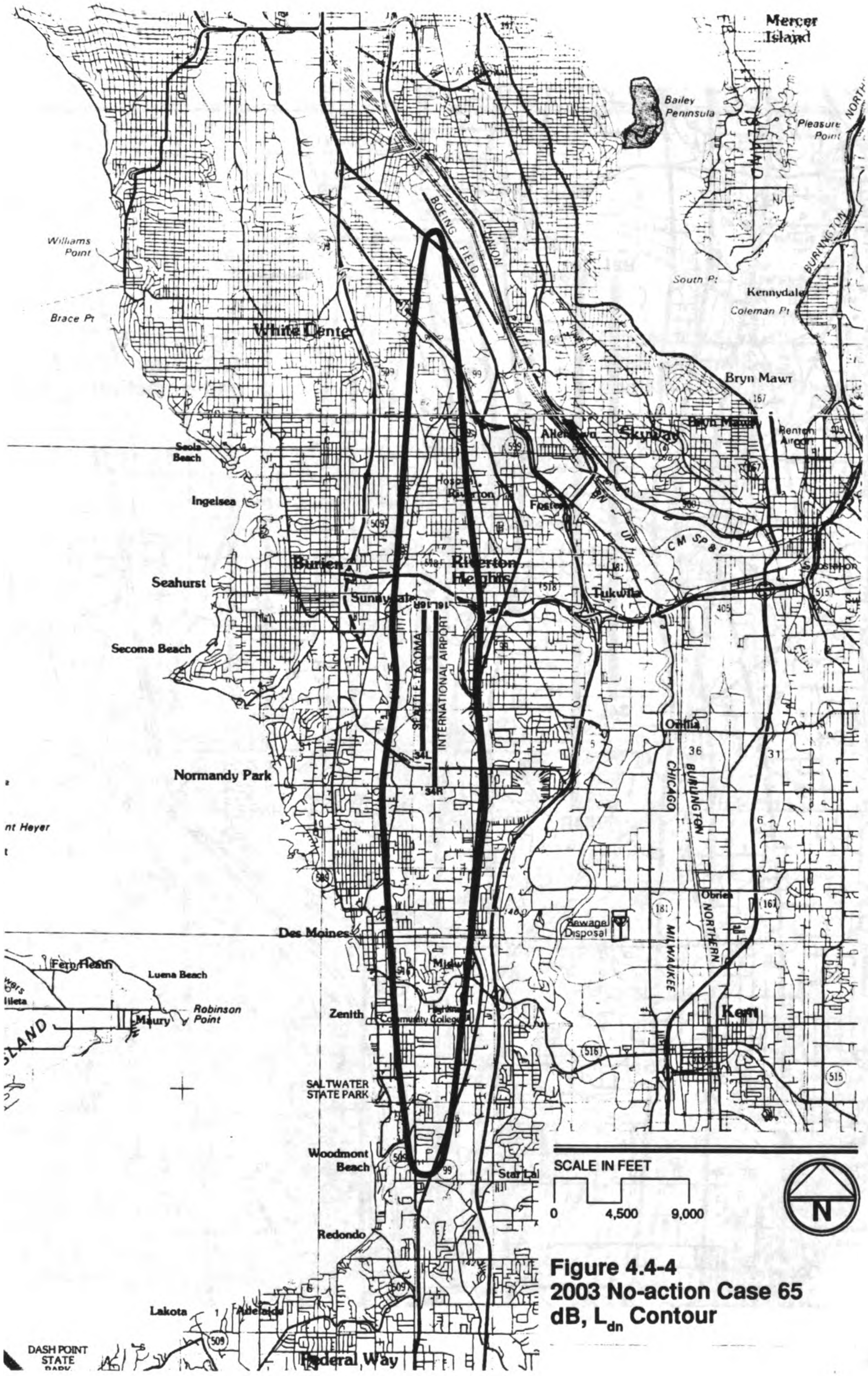


Figure 4.4-4
2003 No-action Case 65 dB, L_{dn} Contour

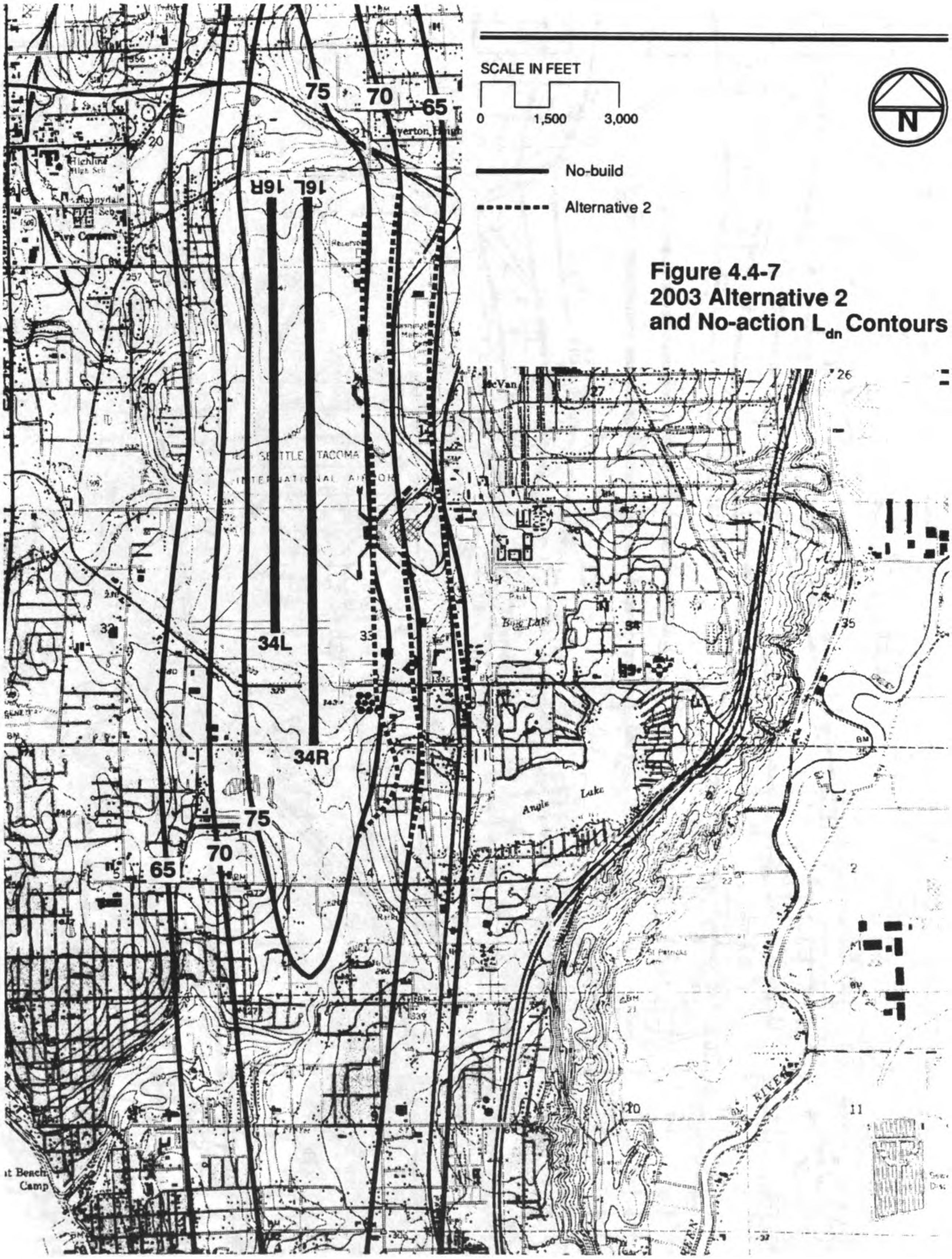


Figure 4.4-7
2003 Alternative 2
and No-action L_{dn} Contours

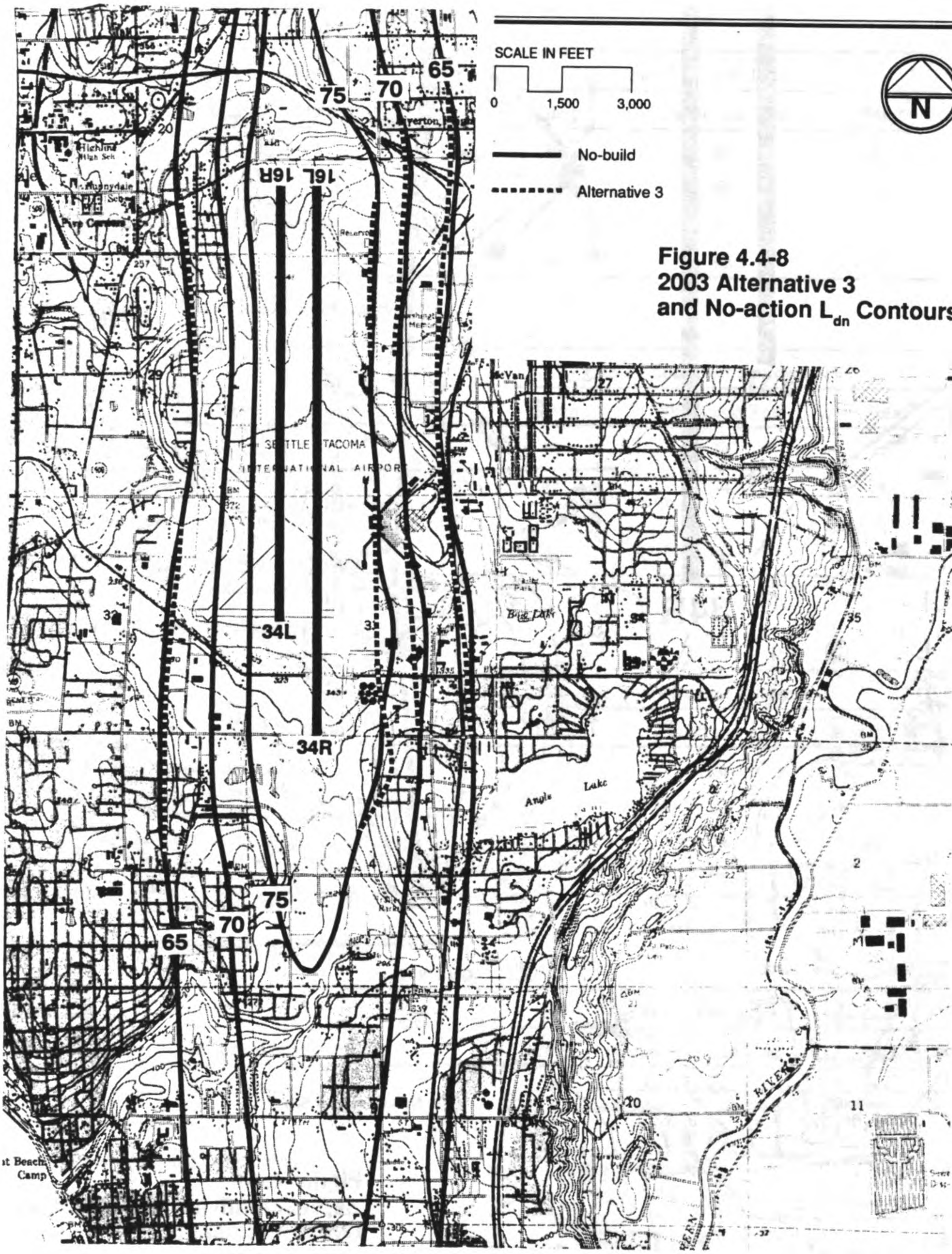


Figure 4.4-8
2003 Alternative 3
and No-action L_{dn} Contours

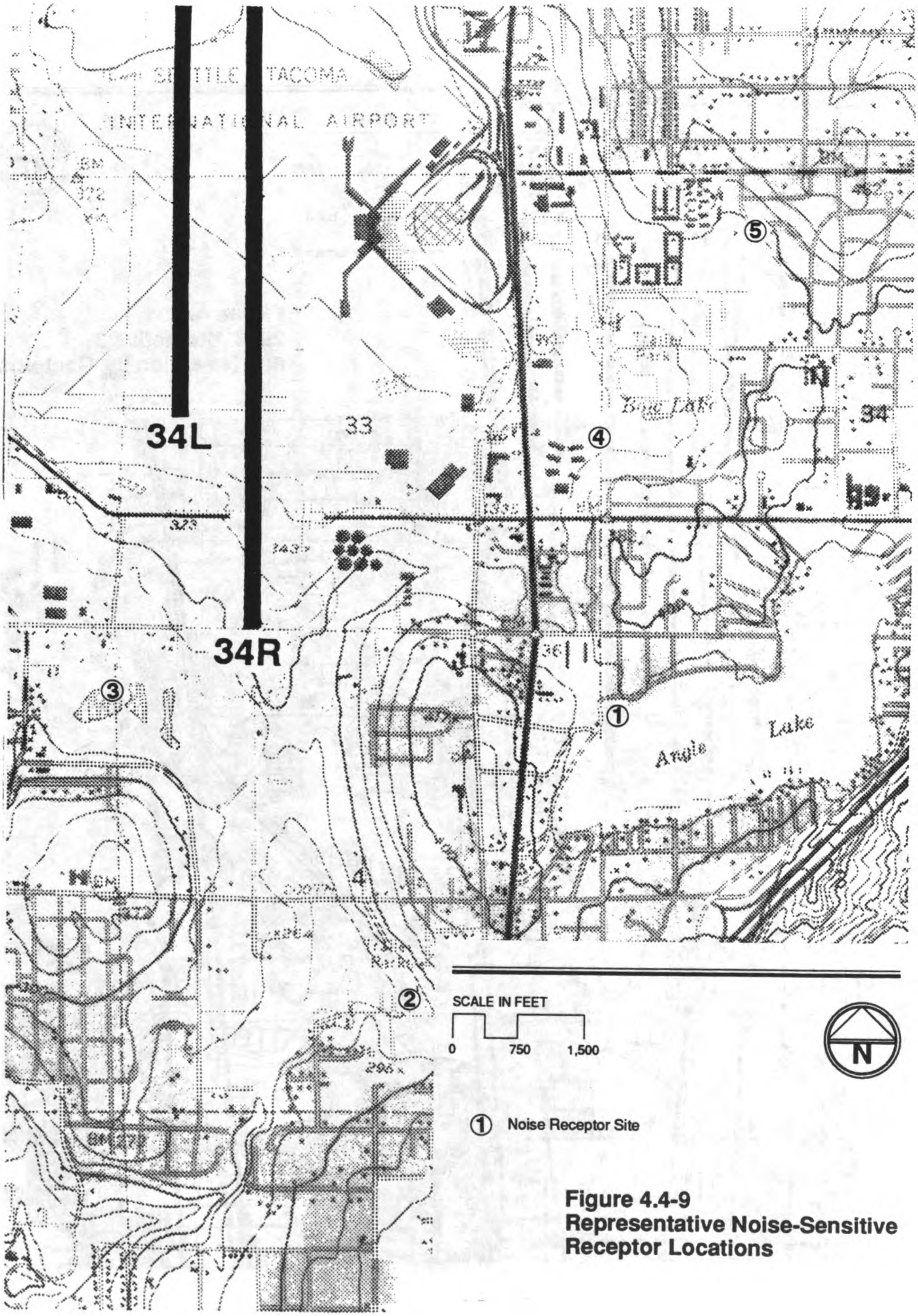


Figure 4.4-9
Representative Noise-Sensitive Receptor Locations

Table 4.4-11A. Noise exposure, dB L_{dn}.

Operational Scenarios	Site 1 - Angle Lake		
	Runup	Flight and Taxi	Total
1993 No Action & Alternative 1	46	66	66
1993 Alternatives 2 & 3	47	66	66
2003 No Action & Alternative 1	46	63	63
2003 Alternatives 2 & 3	48	63	63

Table 4.4-11B. Noise exposure, dB L_{dn}.

Operational Scenarios	Site 2 - Southeast Residential		
	Runup	Flight and Taxi	Total
1993 No Action & Alternative 1	45	74	74
1993 Alternatives 2 & 3	47	74	74
2003 No Action & Alternative 1	46	70	70
2003 Alternatives 2 & 3	49	70	70

Table 4.4-11C. Noise exposure, dB L_{dn}.

Operational Scenarios	Site 3 - Southwest Residential		
	Runup	Flight and Taxi	Total
1993 No Action & Alternative 1	50	76	76
1993 Alternatives 2 & 3	50	76	76
2003 No Action & Alternative 1	50	73	73
2003 Alternatives 2 & 3	45	73	73

Table 4.4-11D. Noise exposure, dB L_{dn}.

Operational Scenarios	Site 4 - Bow Lake		
	Runup	Flight and Taxi	Total
1993 No Action & Alternative 1	54	65	65
1993 Alternatives 2 & 3	54	65	65
2003 No Action & Alternative 1	53	62	63
2003 Alternatives 2 & 3	47	62	63

Table 4.4-11E. Noise exposure, dB L_{dn}.

Operational Scenarios	Site 5 - Hills Above Bow Lake		
	Runup	Flight and Taxi	Total
1993 No Action & Alternative 1	49	58	59
1993 Alternatives 2 & 3	49	58	59
2003 No Action & Alternative 1	48	56	57
2003 Alternatives 2 & 3	42	56	56

Maximum A-weighted Sound Level (L_{max}) Contours

L_{max} contours are useful for quickly identifying areas that would be subjected to noise levels that might interfere with sleep and speech. Figures 4.4-10 and 4.4-11 are the worst case L_{max} contours for the north and south run-up pads in 1991 and 1993. These contours were generated by a Boeing 727 being runup at full power. Figures 4.4-12 and 4.4-13 are the worst case L_{max} contours for Alternatives 2 and 3 in 1993 and 2003. These contours were generated by a McDonnell Douglas MD-80/MD-90 being runup at full power. Figures 4.4-14 and 4.4-15 are the worst case L_{max} contours for the north and south run-up pads in 2003. These contours were generated by a Boeing 747 being runup at full power. All of these figures show L_{max} contours levels of 50, 55, 60, and 65 dBA.

Comparison to the King County Noise Ordinance Levels. As previously described, the King County Noise Ordinance sets a series of noise levels that are useful for comparison with the projected SASA noise levels. For example, taking into account the exclusions for aircraft operations, the maximum permissible noise levels in the Ordinance for the period of 10 pm to 6 am can be compared to the run-up noise levels.

As described in Table 4.4-1 above, the maximum permissible noise levels in the Ordinance are reduced by 10 dB during the night and increased by some dB amount in relation to the total duration of a noise event. Application of these factors results in Table 4.4-12 which can then be compared to the L_{max} levels in Table 4.4-13.

If the total duration of runups were to exceed 15 minutes in any one-hour period at night (10 pm to 6 am), areas within the 50 dBA L_{max} contour would be exposed to levels above those contemplated in the Ordinance. If the total duration of runups were to be greater than 5 minutes but less than 15 minutes in any one-hour period, areas within the 55 dBA L_{max} contour would be exposed to levels above the Ordinance. If the total duration of runups were greater than 1.5 minutes but less than 5 minutes in any one-hour period, areas within the 60 dBA L_{max} contour would be exposed to levels above the Ordinance. If the total duration of runups were to total 1.5 minutes per hour at night, areas within the 65 dBA L_{max} contour would be exposed to levels above the Ordinance.

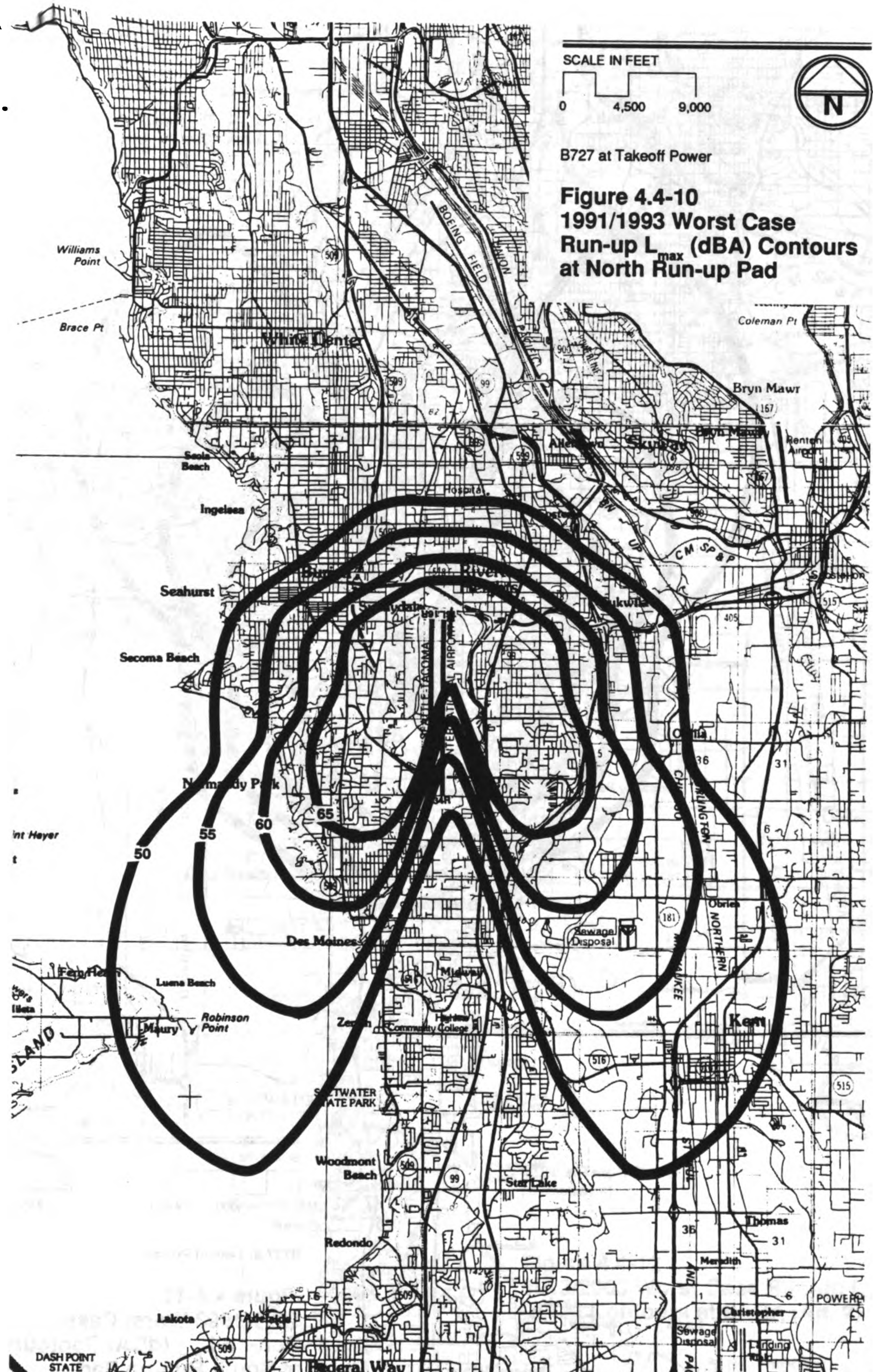


Figure 4.4-10
1991/1993 Worst Case Run-up L_{max} (dBA) Contours at North Run-up Pad

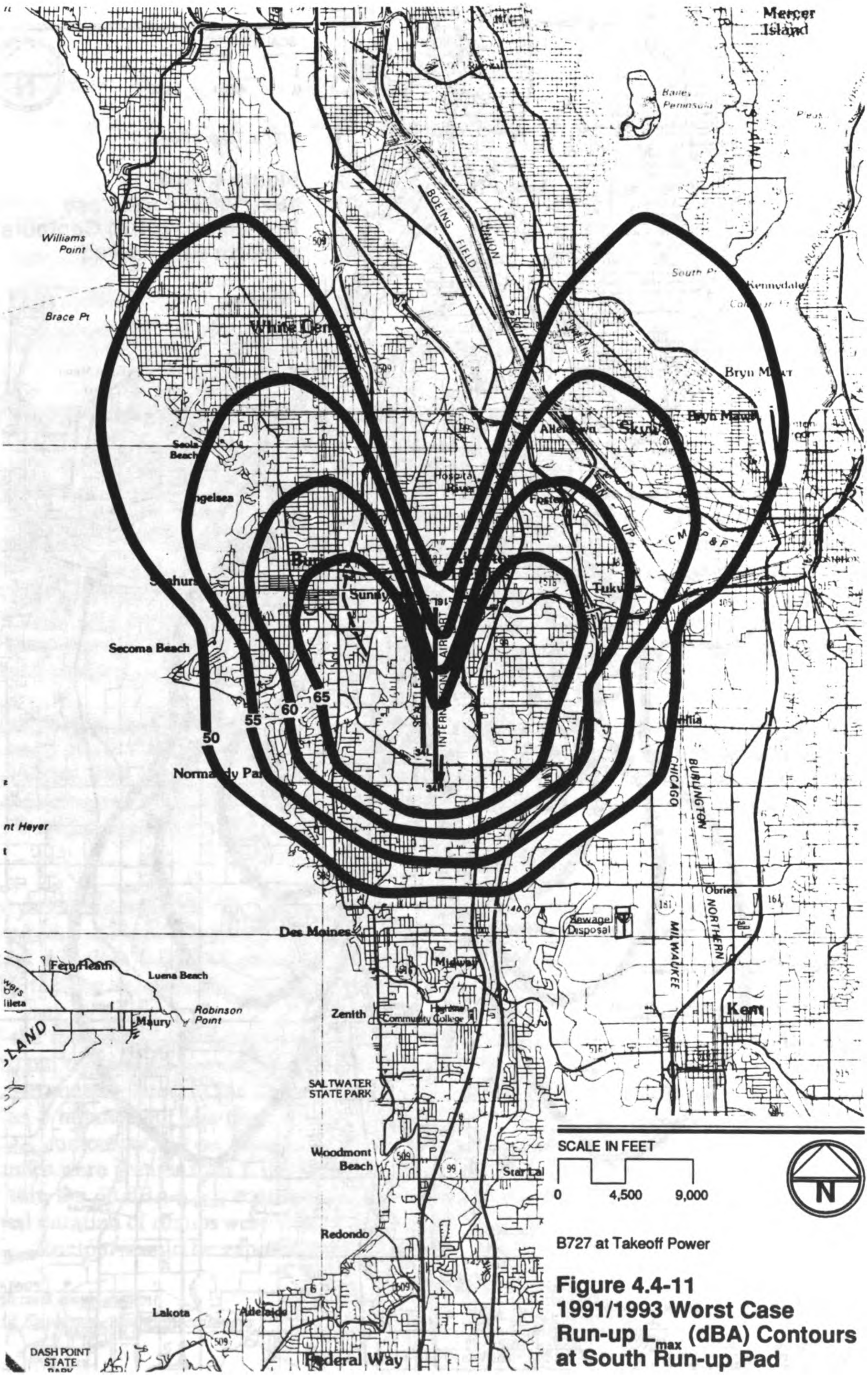


Figure 4.4-11
1991/1993 Worst Case Run-up L_{max} (dBA) Contours at South Run-up Pad

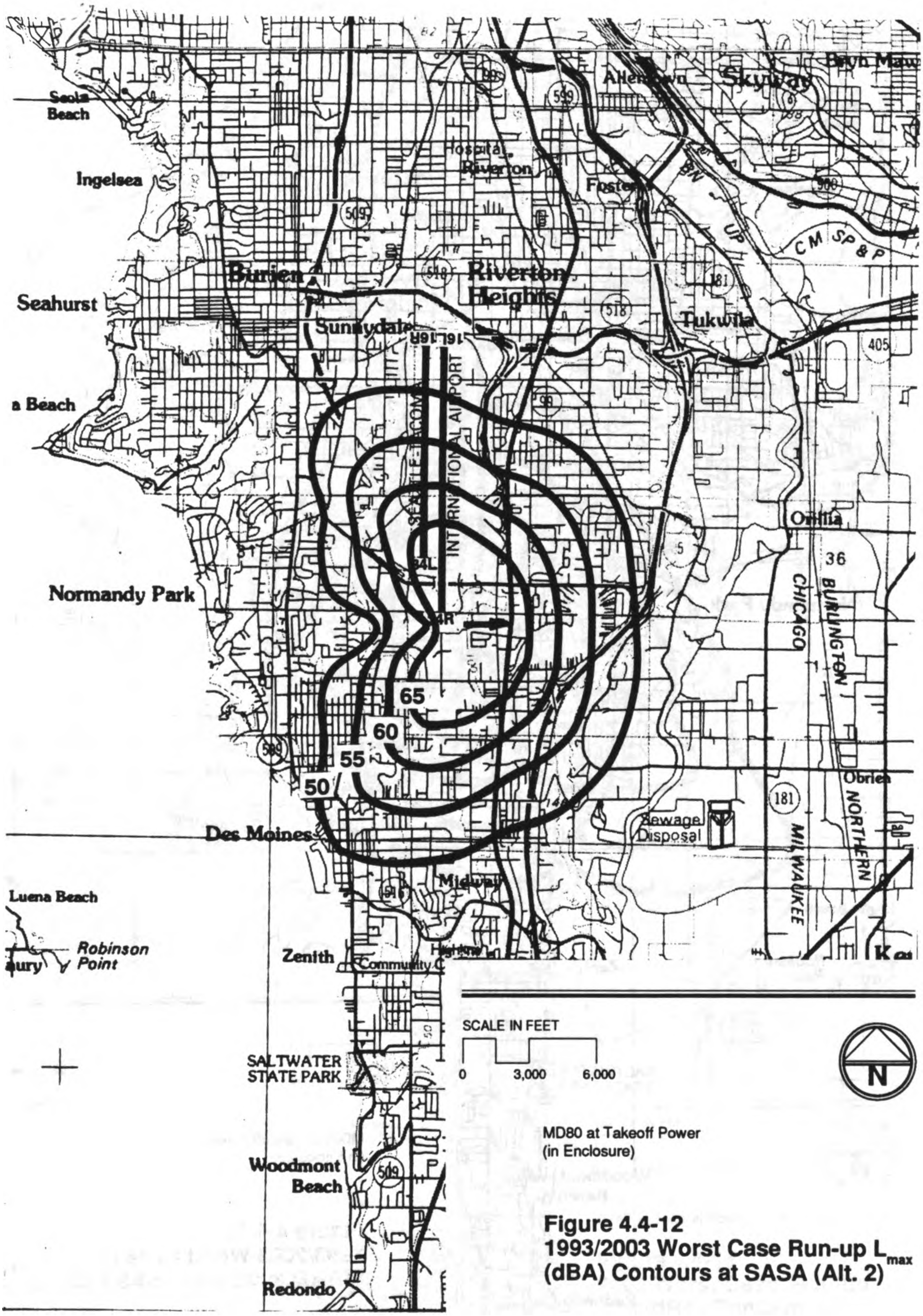


Figure 4.4-12
1993/2003 Worst Case Run-up L_{max} (dBA) Contours at SASA (Alt. 2)

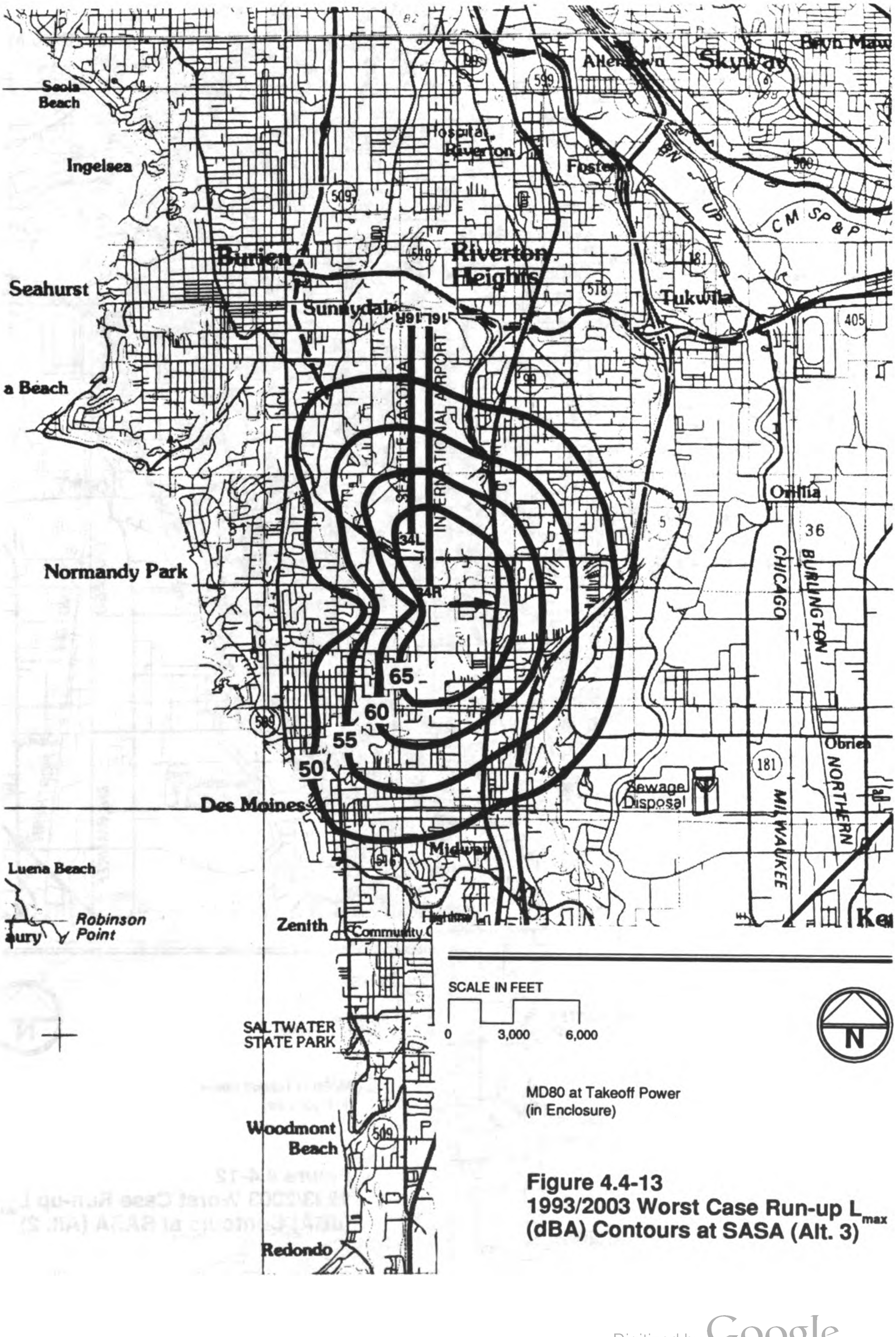
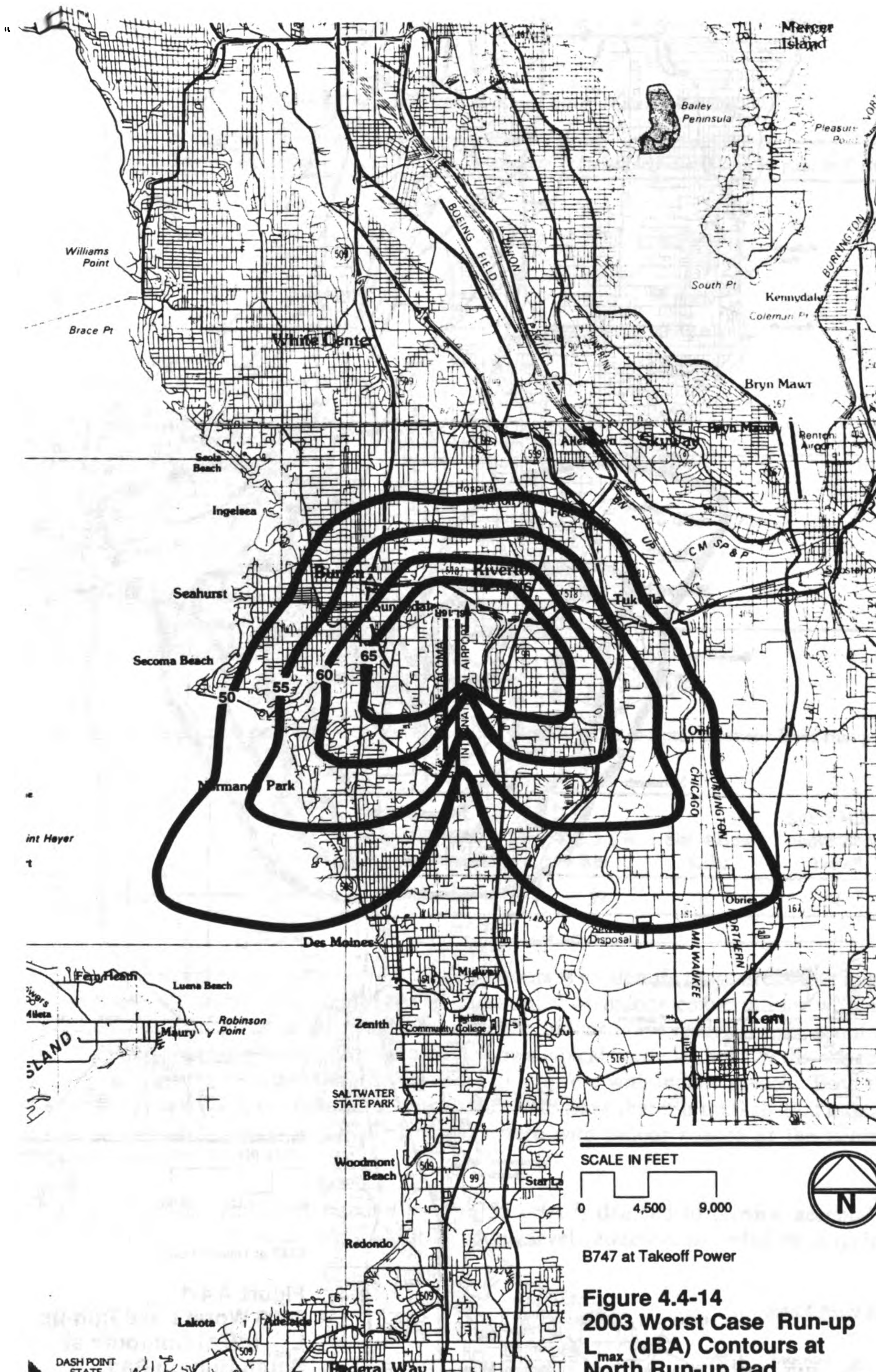


Figure 4.4-13
1993/2003 Worst Case Run-up L_{max} (dBA) Contours at SASA (Alt. 3)



B747 at Takeoff Power

Figure 4.4-14
2003 Worst Case Run-up L_{max} (dBA) Contours at North Run-up Pad

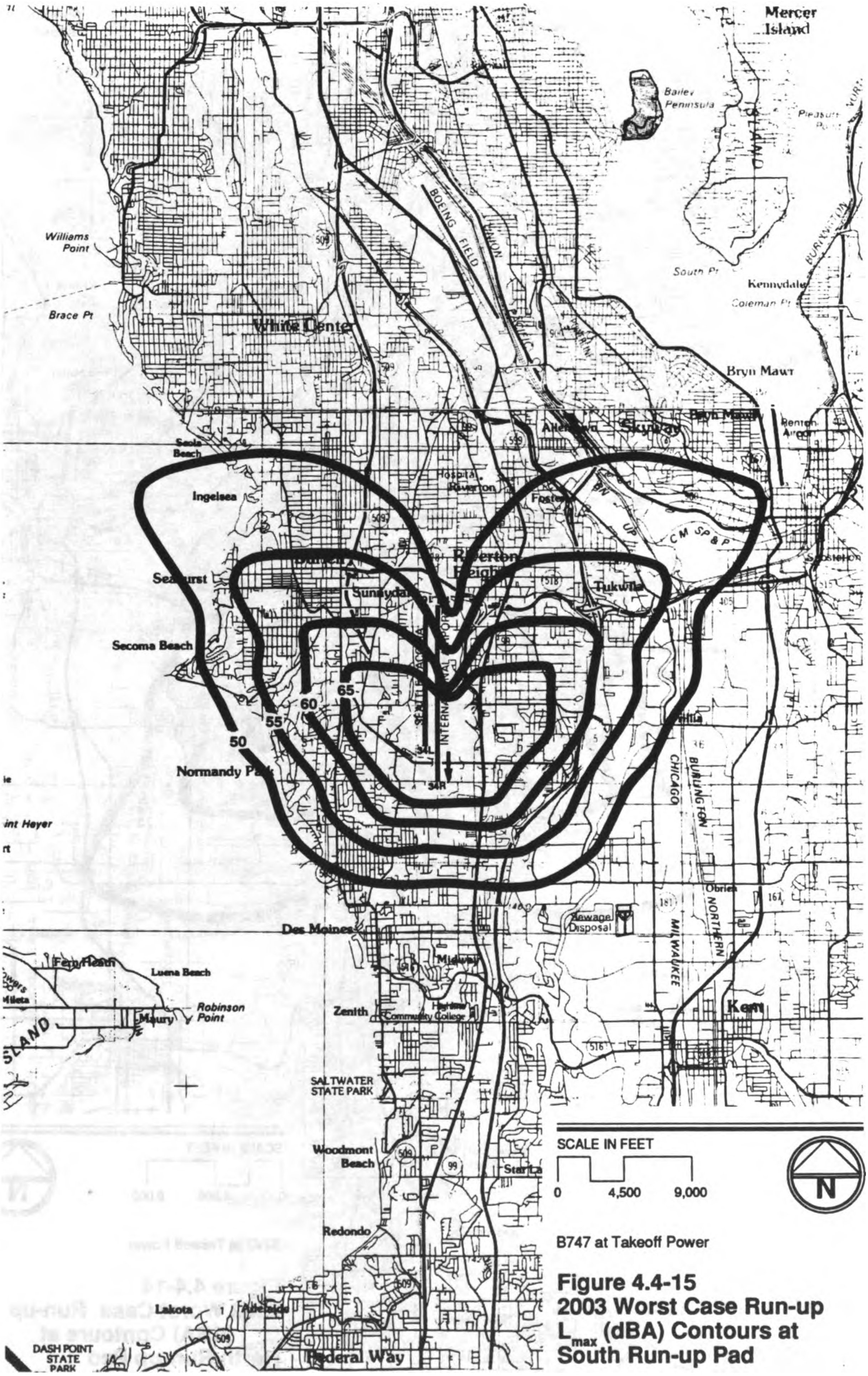


Figure 4.4-15
2003 Worst Case Run-up L_{max} (dBA) Contours at South Run-up Pad

Table 4.4-12. **Maximum permissible noise levels of the King County Noise Ordinance.**

Total Time of Exposure per Hour	Maximum Permissible Noise Level 10 p.m. to 6 a.m.
Industrial to Residential	
More than 15 minutes	50 dBA
Greater than 5 and up to 15 minutes	55 dBA
Greater than 1.5 and up to 5 minutes	60 dBA
Up to 1.5 minutes	65 dBA
Industrial to Commercial[1]	
More Than 15 minutes	65 dBA
Greater than 5 and up to 15 minutes	70 dBA
Greater than 1.5 and up to 5 minutes	75 dBA
Up to 1.5 minutes	80 dBA

NOTE: Hotels are assumed to be commercial land uses.

Table 4.4-13. **Maximum noise dBA levels (worst case) at representative receptor locations from runups in hush facility.**

	Site 1 Angle Lake	Site 2 SE Res.	Site 3 SW Res.	Site 4 Bow Lake	Site 5 Hills above Bow Lake
1993 and 2003 Alternatives 2 & 3	63	68	59	61	54

Speech Interference. Another use of the L_{max} contours is to identify those areas that might be subjected to speech interference during a runup. For indoor conversations within a room, normal voice effort is not adequate when the indoor noise level exceeds about 65 dBA. Because the noise level reduction provided by a typical house is about 20 dB, the run-up noise would have to exceed 85 dBA in order to interfere with indoor speech. Both the L_{max} contours and the specific point data in Table 4.4-13 show that it is unlikely that aircraft runups in the hush facility at SASA would interfere with indoor speech at the nearest sensitive receptors.

Sleep Interference. An interior sound level of 55 dBA is deemed to provide acceptable sleeping conditions. Considering the 20 dB sound level reduction provided by a typical home, the exterior sound level associated with acceptable sleeping conditions is 75 dBA. Both the L_{max} contours and the data in Table 4.4-13 show that it is unlikely that aircraft runups in the hush facility at SASA would interfere with sleep at the nearest sensitive receptors.

Sound Exposure Level (SEL) Contours

SEL contours allow for the comparison of single events such as a departure off of one runway versus another or, in this case, the comparison of departure SEL contours to run-up SEL contours. It was stated earlier in this section that SEL contours are influenced by the loudness and the duration of an event. Therefore, SEL contours for a source that has the same L_{max} will grow in size as the duration increases. The SEL value is greater than the L_{max} and it is incorrect to say, for example, that an event with an SEL of 95 is 95 decibels loud. This is an important point to understand with respect to SEL contours for aircraft runups. A runup for a given power setting, will generally produce the same L_{max} at a given distance regardless of the duration of the event. SEL contours on the other hand grow as the duration increases. This correlates well with the fact that most people become more annoyed at a particular noise source as it continues at the same sound level over time. A common complaint regarding aircraft runups is, "they seem to go on for a long time with no let up."

Worst-Case Runup SEL Contours. Figures 4.4-16 and 4.4-17 present the 1991 and 1993 worst case run-up and departure SEL contours for north and south flow, respectively. The departure SEL contours are provided for the purposes of comparison. It is clear from the L_{dn} contours that departure noise dominates noise environment in the vicinity of Sea-Tac International Airport. These contours depict the SELs that would result from a 727 runup at full power for 30 minutes and a 727 departure. Because the runups at the existing north and south sites are not attenuated by a hush facility, they generate the worst case run-up SEL contour. Although this is clearly the worst case SEL for 1991 and 1993, it is important to point out that the Port run-up survey indicated that this worst case runup would occur only three times per year and would not be permitted at night.

Figures 4.4-18 and 4.4-19 present SEL run-up contours for 1991 and 1993 that are more typical of the worst case runup. These contours were generated by a 727 runup at full power for 10 minutes. Based on the Port run-up survey, these runups occur 8 times per month.

Figures 4.4-20 and 4.4-21 present the 2003 worst case run-up and departure SEL contours for north and south flow, respectively. These contours depict the SELs that would result from a 747 runup at full power for 2 minutes plus 3 minutes at 80 percent power and a 747 departure. Because stage 2 B727s do not operate in 2003 and runups at the existing north and south sites are not attenuated by a hush facility, the 747 generates the worst case run-up SEL contour. Although this is clearly the worst case SEL for 2003, it is important to point out that the Port run-up survey indicated that this worst case runup would occur 6 times per month.

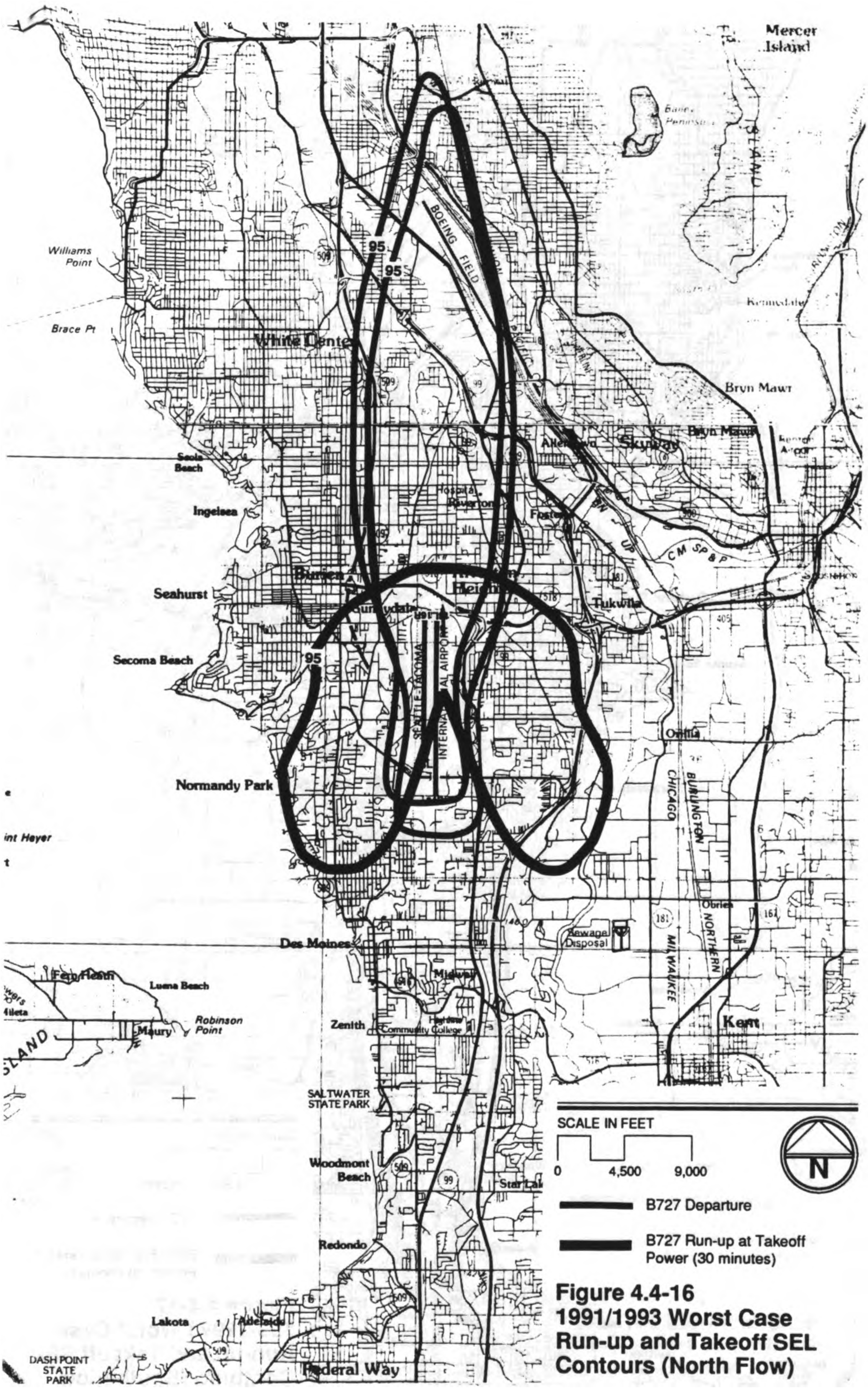


Figure 4.4-16
1991/1993 Worst Case Run-up and Takeoff SEL Contours (North Flow)

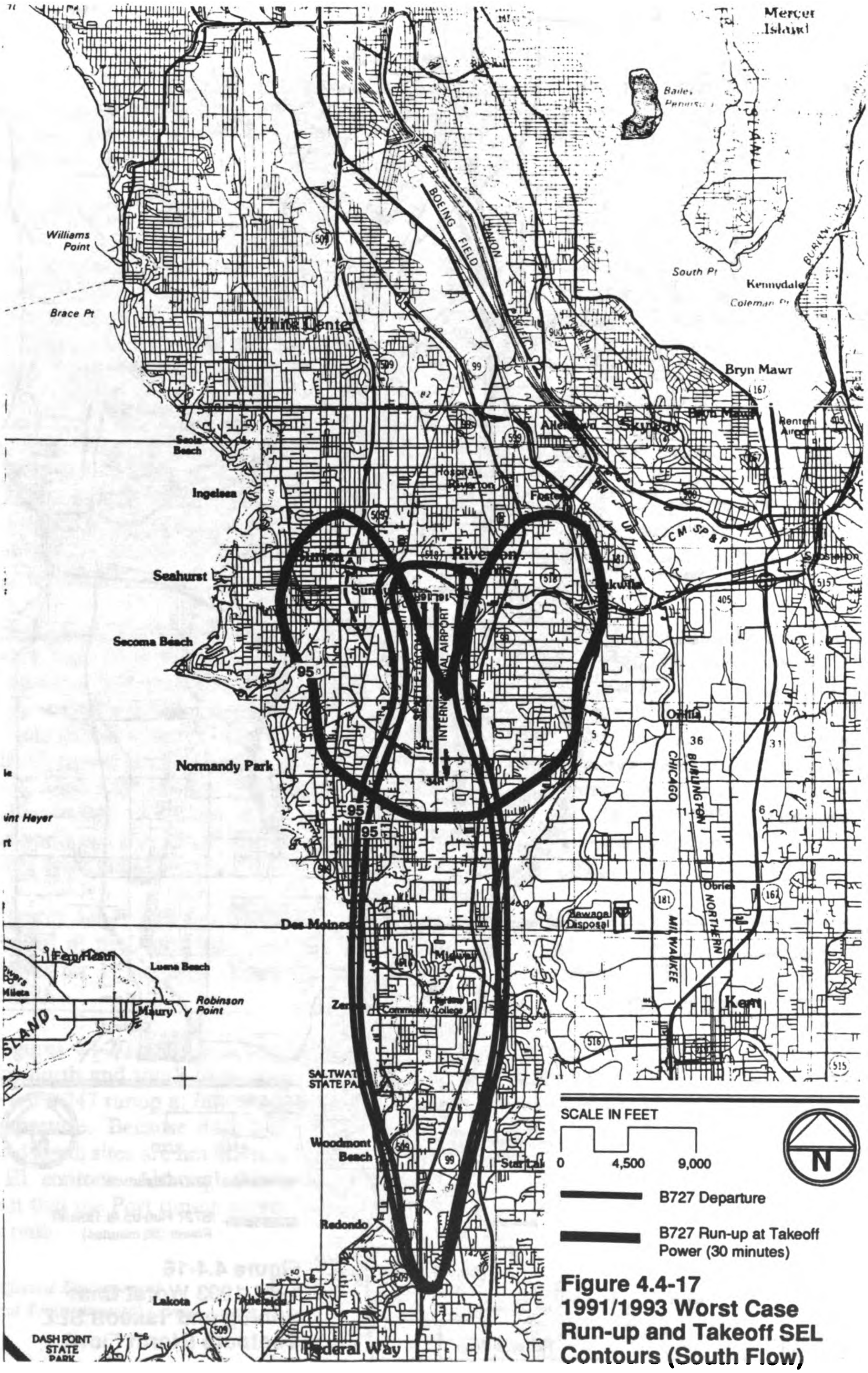


Figure 4.4-17
1991/1993 Worst Case Run-up and Takeoff SEL Contours (South Flow)

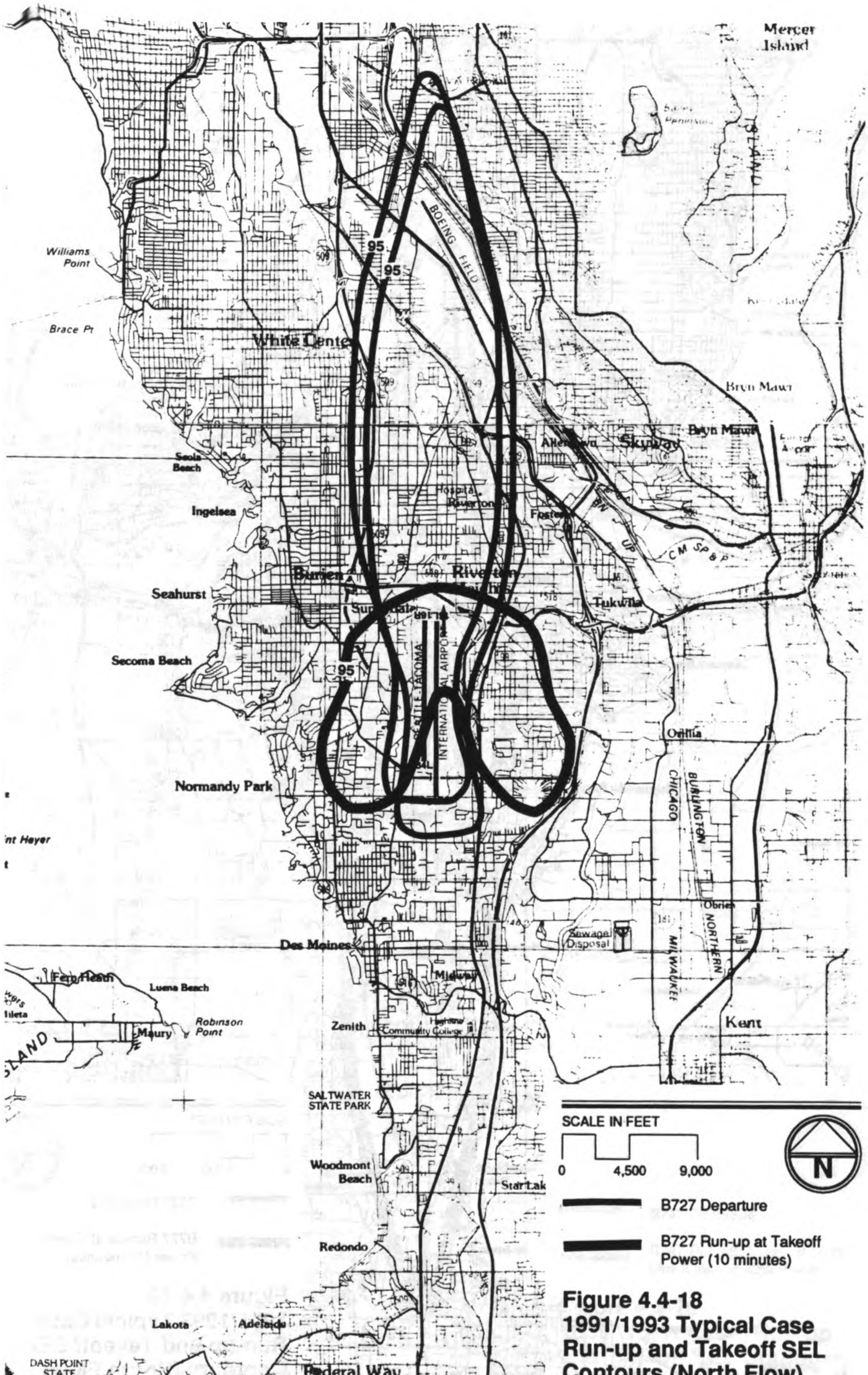


Figure 4.4-18
1991/1993 Typical Case Run-up and Takeoff SEL Contours (North Flow)

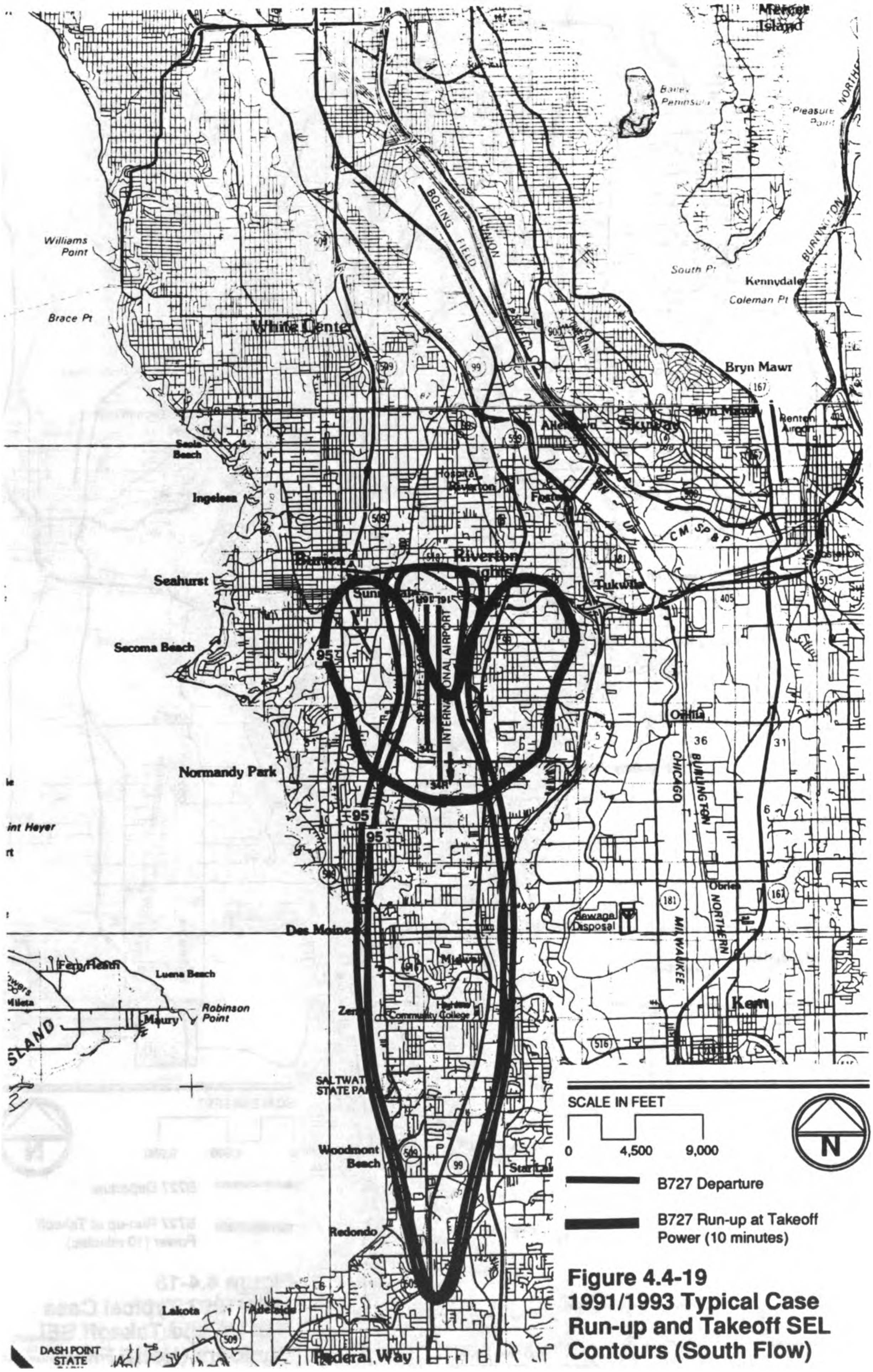


Figure 4.4-19
1991/1993 Typical Case Run-up and Takeoff SEL Contours (South Flow)

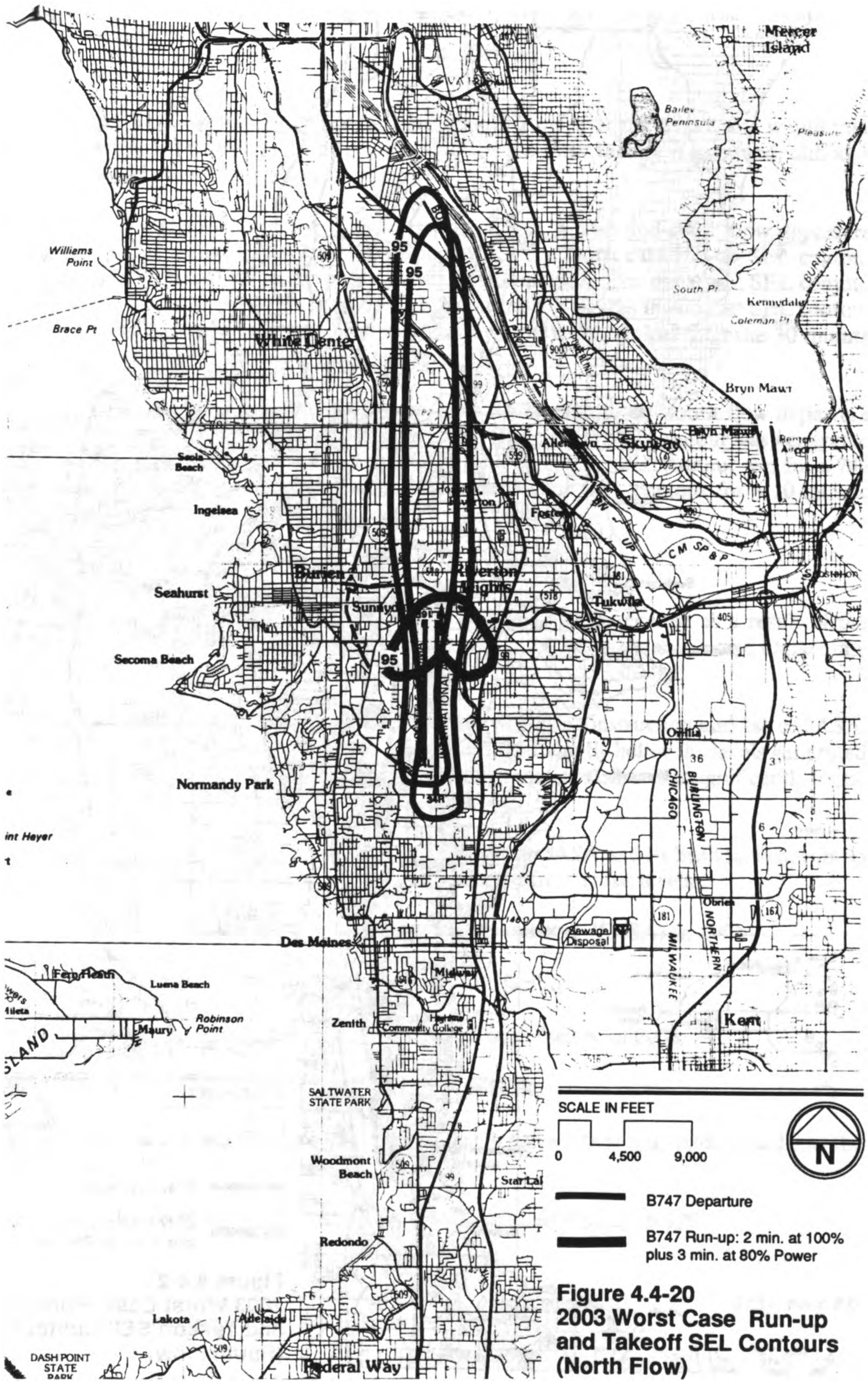


Figure 4.4-20
2003 Worst Case Run-up and Takeoff SEL Contours (North Flow)

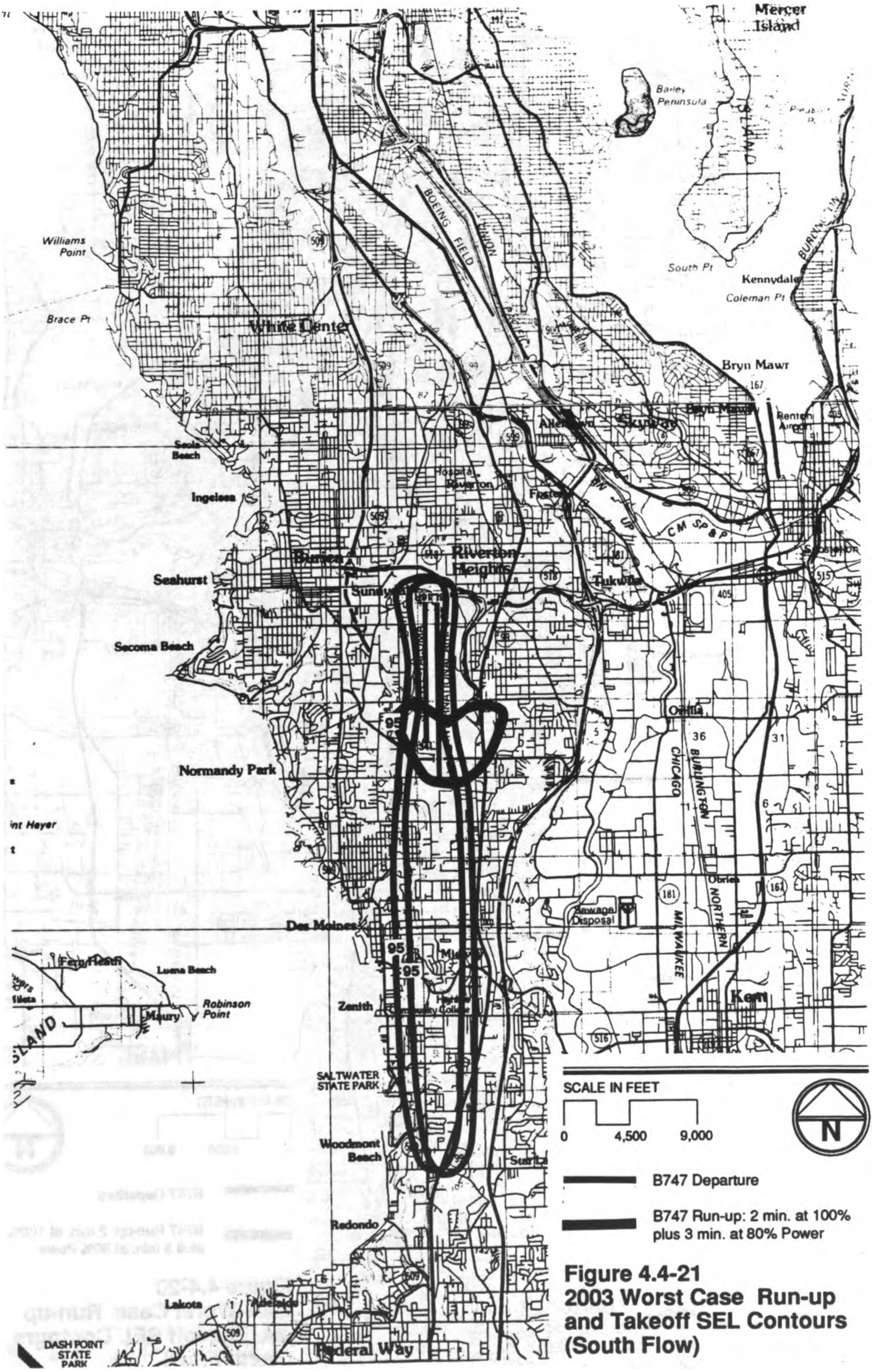


Figure 4.4-21
2003 Worst Case Run-up and Takeoff SEL Contours (South Flow)

Worst-Case SEL Contours at SASA. All high power runups at the SASA site would take place in the hush facility. A 10 dBA reduction for the hush facility is assumed, although actual reduction could be greater.

Figures 4.4-22 and 4.4-23 are the 1993 worst case SASA run-up and south flow departure SEL contours for Alternatives 2 and 3, respectively. The worst case run-up SEL contour was generated by an MD80 runup at full power for 30 minutes. The departure SEL contour was for a 727 departing from Runway 16L. In addition, the figures include an SEL contour for an MD80 full-power 10 minute runup. This event is more typical than the 30 minute runup which occurs about three times per year.

Figures 4.4-24 and 4.4-25 are the 2003 worst case SASA runup and south flow departure SEL contours for Alternatives 2 and 3, respectively. The run-up SEL contour was generated by an MD80 runup at full power for 30 minutes. The departure SEL contour was for a 747 departing from Runway 16L. These figures also depict the SEL contour for a 10 minute runup at full power.

Summary of Operation Impacts—Aircraft

Flight Noise Impacts. Flight operations would not significantly change as a result of the construction and use of SASA. Therefore, there would be no changes in noise impact due to flight operations.

Taxi Noise Impacts. Taxiing patterns would change with the construction and use of SASA. Because noise levels generated by taxiing aircraft are significantly below the levels generated by flight and run-up operations, the additional taxiing noise contributes insignificantly to the noise environment near Sea-Tac International Airport.

Run-up Noise Impacts. With the construction and use of SASA and its hush facility, run-up activities would change in the following three ways to affect noise levels:

- New run-up operations would occur in a new location (SASA) in 1993
- The additional runups would occur in a hush facility
- All narrow-body runups would occur in the hush facility in 2003.

The effects on noise levels from these changes would be:

- Noise levels in the vicinity of the existing north and south run-up pads would stay the same in 1993
- Noise levels in the vicinity of SASA would increase slightly in 1993

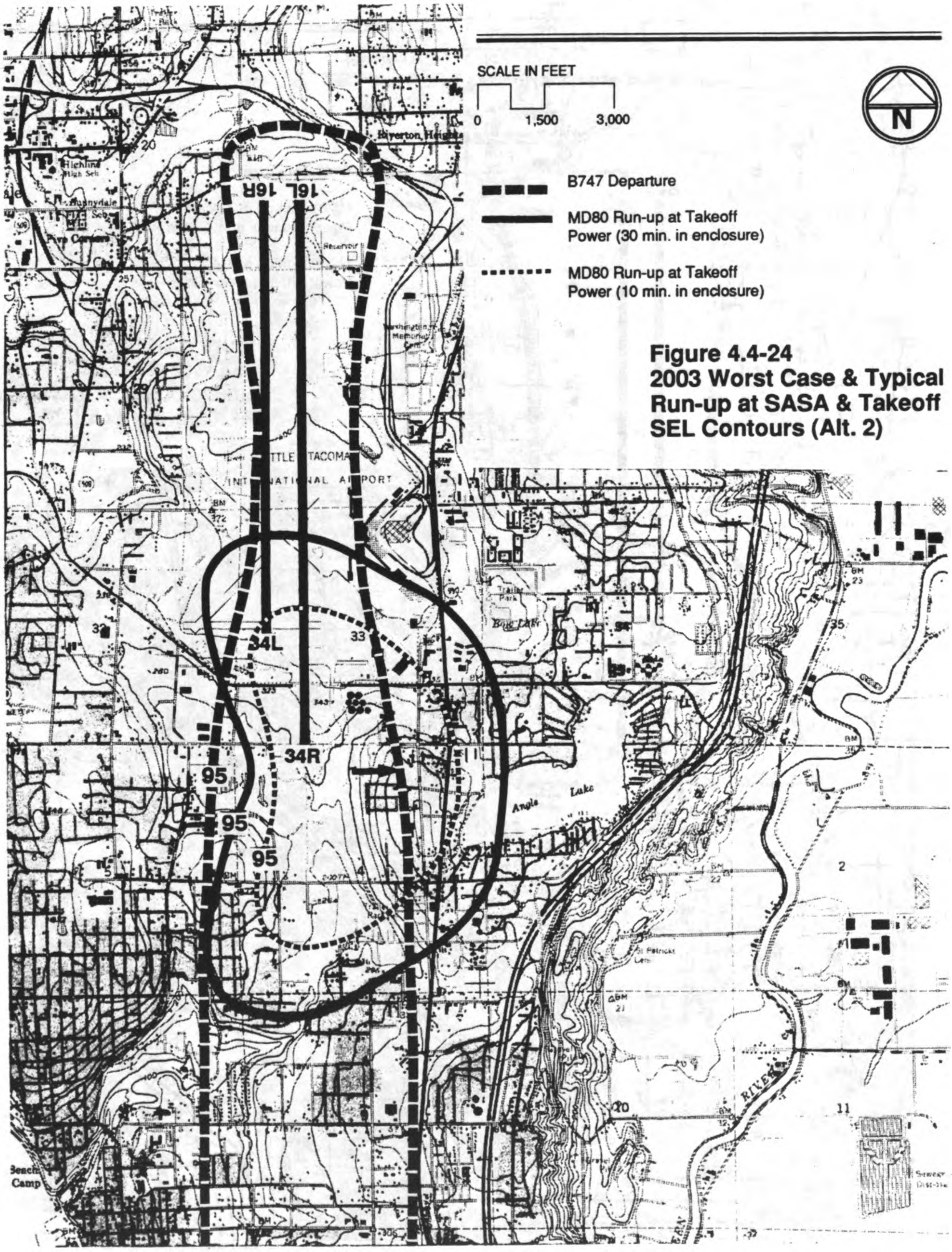


Figure 4.4-24
2003 Worst Case & Typical Run-up at SASA & Takeoff SEL Contours (Alt. 2)

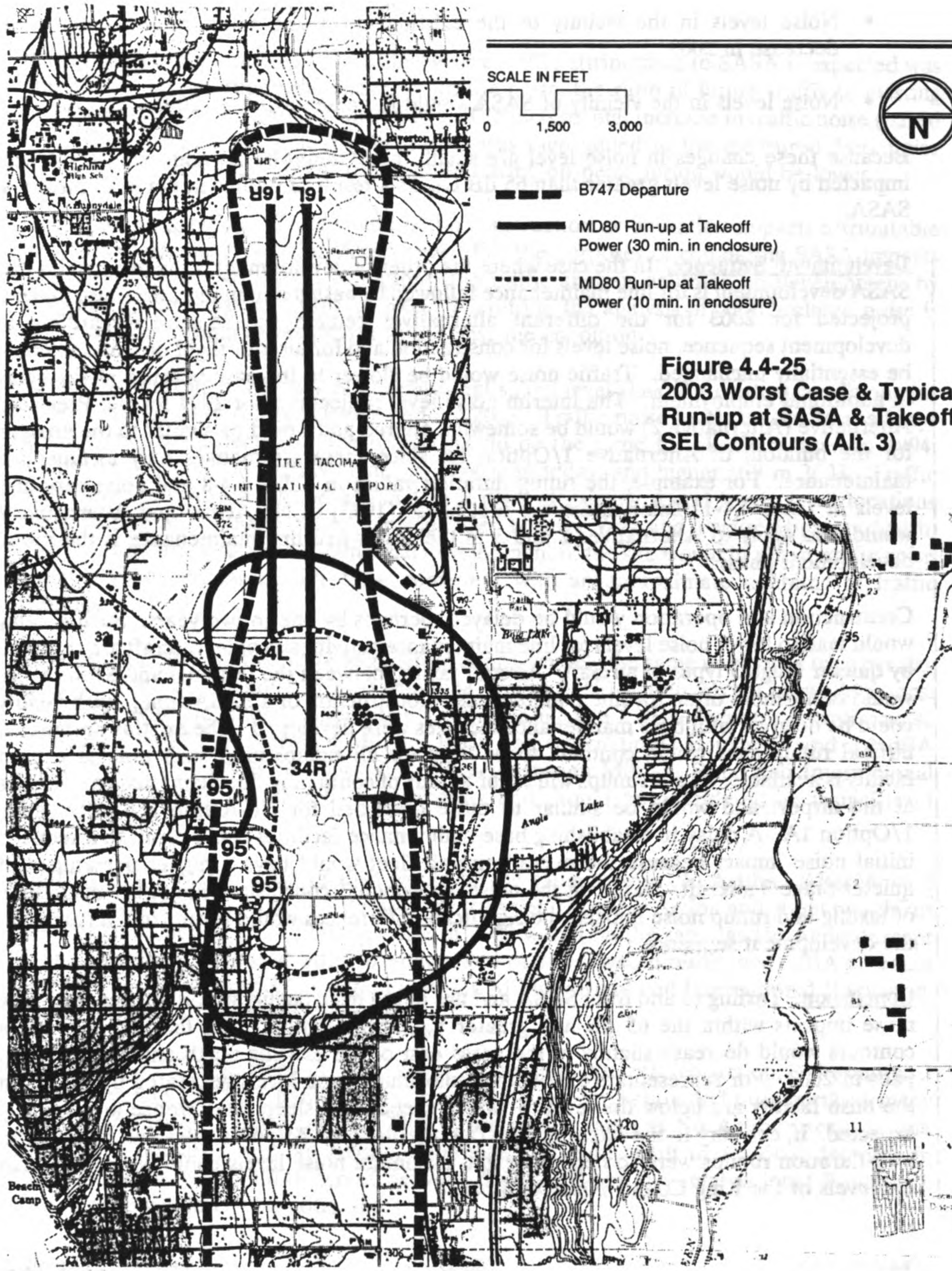


Figure 4.4-25
2003 Worst Case & Typical Run-up at SASA & Takeoff SEL Contours (Alt. 3)

- Noise levels in the vicinity of the existing north and south run-up pads would decrease in 2003
- Noise levels in the vicinity of SASA would increase slightly in 2003.

Because these changes in noise level are small, there would be no additional residences impacted by noise levels greater than 65 dB L_{dn} as a result of runups in the hush facility at SASA.

Development Sequence. In the case where the order of development is reversed and initial SASA development is for line maintenance followed by base maintenance, the noise impacts projected for 2003 for the different alternatives remain the same. Regardless of development sequence, noise levels for construction and for aircraft flight operations would be essentially unchanged. Traffic noise would be slower to increase because of the delay in additional employment. The interim noise level projections for 1993 for the Preferred Alternative (Alternative 2) would be somewhat altered and would be similar to the analysis for the buildout of Alternative 1/Option 1A since these alternatives only include line maintenance. For example, the runup duration values in Table 4.4-8 and noise exposure levels in Table 4.4-11 listed under the first phase (1993) of No Action and Alternative 1 would also apply to Alternatives 2 and 3 in the case when line maintenance is the initial development phase.

Construction and operation would be delayed, perhaps by one to two years. Such a delay would lead to lower noise levels for line maintenance activities as older aircraft are replaced by quieter Stage 3 types of aircraft. Aircraft taxiing between the terminal and SASA areas would occur more often for line maintenance. Construction of a SASA runup hush facility could be delayed until base maintenance facilities were developed. The existing designated airfield runup sites would continue to be used for all runups until such time as a hush facility is available. These runups will occur as part of continuing line maintenance activities at the airport and would be similar to those described for No-Action and Alternative 1/Option 1A. A delay in establishing base maintenance facilities could result in a reduced initial noise impact because the overall aircraft fleet would have a higher percentage of quieter Stage 3 aircraft. Based on the noise assessment's conclusions about the magnitude of taxiing and runup noise impacts, no significant differences would result from a change in the development sequence.

Conclusion. Taxiing to and from SASA and use of the hush facility would not generate new noise impacts within the 65 dB and greater L_{dn} noise contours. In fact, the L_{dn} noise contours would decrease slightly in the areas east of the existing north and south run-up pads in 2003. For representative receptors, maximum noise levels generated by runups in the hush facility are below the levels at which speech and sleep interference are typically expected. If, contrary to the intent of Sea-Tac International Airport's rules and regulations, long-duration runups were to occur at night, maximum noise levels could be greater than the levels of the King County Noise Ordinance.

4.4.5.3 Operation Noise - Vehicles

Peak period traffic noise at 16 locations where traffic attributable to SASA is expected was measured. To determine the change in traffic noise, the ratio of future traffic to existing traffic was determined for each alternative. The incremental increase in traffic noise (based on a 3 dB increase per doubling of traffic) was then added to the measured 1991 noise levels. It should be noted that traffic noise during off-peak period would be lower.

No-Action Alternative. There would be no construction or operation impacts attributable to SASA under the No-Action Alternative. For the purposes of comparing SASA impacts with the probable No Action conditions, the traffic analysis assumed no development by 1994 and commercial land uses by 2003. Therefore, the analysis of traffic-related noise is based on commercial development as the baseline condition.

Table 4.4-14 displays the peak hour equivalent sound level (L_{eq}) for existing conditions (as measured), for 1994 (all scenarios), and for 2003. Traffic noise levels on the 16 roadways likely to be most-affected by the project would be the same for all alternatives in 1994. Sound levels would be slightly higher in 1994 than today, and higher still in 2003. Traffic noise levels are forecast to be within 1 or 2 dBA of existing sound levels at all locations except along South 200th Street between Des Moines Way and Pacific Highway South. Traffic noise attributable to commercial development of the site would increase traffic noise about 3 dBA compared with 1994, consistent with an approximate doubling of traffic volumes.

Alternative 1. Alternative 1 would generate approximately the same number of trips per day as No Action. Traffic noise in 2003 would be similar to No Action, except in two locations. Compared with No Action, Alternative 1 would result in a 1 dBA decrease in traffic noise on South 176th Street between Military Road and International Boulevard and a 1 dBA increase in traffic noise on South 200th Street between Military Road and International Blvd. This change would not be noticeable, and should be considered an insignificant impact.

Alternative 2. Traffic noise in 1994 would be the same as with No Action. Alternative 2 would generate about three-fourths as many trips per day as No Action and about two-thirds as many peak period trips. Traffic noise in 2003 would be the same as No Action except in one location. Compared with No Action, Alternative 2 would result in a 1 dBA decrease in traffic noise on South 176th Street between Military Road and International Boulevard. This change would not be noticeable.

Alternative 3. Traffic noise in 1994 would be the same as with No Action. Alternative 3 would generate less than half as many trips per day as No Action and one-fourth as many peak period trips. Traffic noise in 2003 would be the same as No Action except in one location. Compared with No Action, Alternative 3 would result in a 1 dBA decrease in traffic noise on South 176th Street between Military Road and International Boulevard. This change would not be noticeable.

Table 4.4-14. Leq levels 50 feet from centerline

Arterial Segment	1991 Existing Conditions	1994 All Scenarios	2003 No Action	2003 Alternative 1	2003 Alternatives 2 and 3
1. South 216th Street from Marine View Drive to SR 99	75	76	77	77	77
2. South 200th Street from Des Moines Way to SR 99	67	68	71	71	71
3. South 200th Street from SR 99 to Military Road	68	69	67	68	67
4. South 188th Street from Des Moines Way to SR 99	74	74	73	73	73
5. South 188th Street from SR 99 to 42nd Avenue South	74	74	74	74	74
6. South 188th Street from 42nd Avenue South to Military Road	74	74	74	74	74
7. South 176th Street from SR 99 to Military Road	67	67	68	67	67
8. Military Road from South 176th Street to South 188th Street	73	74	74	74	74
9. Military Road from South 188th Street to South 200th Street	70	70	70	70	70
10. Des Moines Way from SR 509 to South 200th Street	71	71	72	72	72
11. Des Moines Way from South 205th Street to South 188th Street	71	72	72	72	72
12. SR 99 from South 216th Street to South 208th Street	77	77	77	77	77
13. SR 99 from South 208th Street to South 200th Street	77	77	77	77	77
14. SR 99 from South 200th Street to South 188th Street	77	77	77	77	77
15. SR 99 from South 188th Street to Sea-Tac entrance	77	77	77	77	77
16. SR 99 from Sea-Tac entrance to South 176th Street	76	77	77	77	77

4.4.5.4 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area noise levels. Airport operations and resulting noise levels included in this EIS are based on overall airport demand forecasts which are consistent with those used in the Flight Plan Project and its EIS. The noise contours presented in the Flight Plan EIS describe the noise impact of aircraft operations out to the year 2020. As stated in the Flight Plan Final EIS (p. 4-20), at "Sea-Tac with a new third dependent Air Carrier Runway, the total 2020 population within the 65 Ldn noise contour is estimated to be 22,000 people. The contours are similar to the No Action alternative until 2020 where the No Action alternative contours are larger. This is because with the addition of the new dependent air carrier runway, the airport would operate more efficiently, with fewer operations anticipated to spread into the early morning or nighttime hours as is forecast with the No-Action alternative." The implementation of other identified airport projects would not significantly affect these levels over the SASA study period. The potential for future changes in the airport's Noise Remedy Program boundaries during the later time frame will be examined in the Master Plan EIS.

Vehicle traffic estimates also include similar projections of future airport activity. A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for noise impacts of regional transportation improvements south of the airport. Areas involved would depend on route alignment decisions which have not yet been made. However, this SASA EIS assumed that the corridor would be developed, therefore the vehicular noise forecasts include the associated traffic levels. Construction activity associated with other airport projects which might occur at the same time as SASA construction could generate additional construction equipment noise but this would probably come from separated locations. Planning for such other projects has not yet progressed to the point that their construction noise impacts can be estimated. The potential for cumulative impacts on noise levels will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.4.6 Mitigation Measures

4.4.6.1 Construction

The Contractor should conduct operations in conformity with all applicable laws and regulations governing construction noise, as well as ordinances enacted or adopted by local authorities for the purposes of controlling construction noise and noise nuisance. Controls to be exercised by the Contractor could include, but have not limited to the following:

General time restrictions

No construction operations should be performed within 1,000 feet of any occupied dwelling unit on Sundays, legal holidays, and between the hours of 10:00 p.m. and 7:00 a.m. on other days, without the approval of the Port.

No pile driving or blasting operations, if required, should be performed within 3,000 feet of any occupied dwelling unit on Sundays, legal holidays, and between the hours of 8:00 pm and 8:00 am on other days, without the approval of the Port.

Noise control devices should be no less effective than those provided on original equipment. Exhausts should be muffled. Equipment should comply with pertinent equipment noise standards of the EPA.

If a specific noise complaint occurs during construction, the Contractor should implement one or more of the following, as directed by the Airport Supervisor:

- Locate stationary construction equipment as for from nearby noise sensitive properties as possible.

- Shut off idling equipment.

- Re-schedule construction operations to avoid periods of noise annoyance.

- Notify nearby residents whenever extremely noisy work will be occurring.

- Install temporary or portable acoustic barriers around stationary construction noise sources.

- Place material stockpiles between crushing or screening operations and the affected dwelling.

4.4.6.2 Operation

No significant increase in aircraft flight operations would result from SASA. No significant noise impacts are expected to result from taxiing and runup noise due to the use of SASA. Therefore, no additional aircraft noise mitigation measures are needed beyond 1) the rules and regulations already in place; and 2) use of the planned hush facility for Alternatives 2 and 3.

4.5 AIR QUALITY

4.5.1 Affected Environment

4.5.1.1 Climate

Because the prevailing air currents are from the Pacific Ocean, the general meteorological conditions of the Puget Sound area are typical of a marine climate. The relatively cool summers, mild winters, and precipitation characteristic of a marine climate are enhanced by the presence of Puget Sound. The Cascade Range to the east serves as a partial barrier to the temperature extremes of the continental climate of eastern Washington.

Two major meteorological patterns dominate local weather. In late spring, an eastern Pacific high pressure region (or "ridge") is located off the Washington-Oregon coasts. This ridge forces Pacific storms well north of Washington, resulting in dry, stable weather conditions in Puget Sound. The dry season and temperatures peak toward the end of July and beginning of August. Winds are relatively light and are frequently from the north and northwest during summer. Local wind regimes such as the upslope-downslope daily flows in mountainous terrain and the onshore-offshore breeze along shorelines are more noticeable than in winter, largely because weather systems are relatively mild and because of increased sunshine.

During winter months, a relatively stationary low pressure region often develops in the Aleutian Islands; this low regularly sends Pacific storms through British Columbia and Puget Sound. This pattern is responsible for the cloudy, rainy winters for which Puget Sound is noted. Winds are generally from the south but are strongly influenced by local terrain. These seasonal wind patterns have an effect on air pollution dispersion near the airport because aircraft take off into the wind.

Due to the reduced solar heating of the land in winter, night-time inversions often last until late in the day and, on occasion, for several days. It is during these very stable atmospheric conditions that high concentrations of wood-burning and engine exhaust pollutants are recorded, because these pollutants are emitted near ground level and little vertical dispersion occurs.

The frequency of occurrence and severity of ground level inversions varies from year to year. The National Weather Service issues an Air Stagnation Advisory when poor atmospheric dispersion conditions exist and are forecast to persist for 24 hours or more. There are rarely more than 3 or 4 such advisories per year, and some winters pass without any Air Stagnation Advisories issued.

Some air pollutants are only a problem during certain seasons. Carbon monoxide, for example, is a regulated pollutant emitted by incomplete combustion. Because engines operate less efficiently when cold, carbon monoxide emissions increase during colder months of the year. The frequent stable atmospheric conditions observed during the winter compound the problem of higher emission rates by reducing pollutant dispersion in the atmosphere. These factors are responsible for the higher concentrations during the November-through-February "carbon monoxide season."

4.5.1.2 Regulatory Overview

Three agencies have air quality jurisdiction in the project area: the United States Environmental Protection Agency (EPA), the Washington Department of Ecology (Ecology), and the Puget Sound Air Pollution Control Agency (PSAPCA). Although their regulations are similar in stringency, each agency has established its own standards (Table 4.5-1). Unless the state or local agency has adopted a more stringent standard, the EPA standards apply.

Some of the federally defined "criteria" pollutants listed in Table 4.5-1 are subje types of standards. "Primary" standards are designed to protect health with an margin of safety, while "secondary" standards are established to protect the publi from any known or anticipated effects associated with these pollutants, such a corrosion, or damage to vegetation.

4.5.1.3 Existing Air Quality

Aircraft and automobiles are probably the primary air pollution sources in the proj At times, woodstoves and fireplaces may also be a significant source of emissions.

Carbon monoxide is the pollutant emitted in the greatest quantity by engines. pollutants generated by engines include particulate matter (PM10) and the ozone pre hydrocarbons and nitrogen oxides. Sulfur oxides and nitrogen dioxide are both em space heating and motor vehicles, but concentrations of these pollutants are gene high except near large industrial facilities. These pollutants have not been measure project area, but it is unlikely that concentrations are high here.

Ecology and PSAPCA maintain a network of air quality monitoring stations through Puget Sound area. In general, these stations are located where there may be air problems, and so are often near urban areas or close to specific large air pollution Other stations located in more remote areas provide an indication of regional or back air pollution levels.

<u>Carbon Monoxide</u>

Carbon monoxide (CO) is the product of incomplete combustion and is genera transportation sources and other fuel burning activities (like space heating). monoxide is usually the pollutant of greatest concern related to transportation because it is the pollutant emitted in the greatest quantity for which short-term standards exist. Short-term standards (as opposed to annual average standards) ar the controlling, or most restrictive air pollution standards. There are two air standards for carbon monoxide: a one-hour average standard of 35 parts per million and an eight-hour average standard of 9 ppm. These levels may be exceeded only on year without violating the standard.

Carbon monoxide is a pollutant whose impact is usually very localized. The highest a concentrations of carbon monoxide occur near congested roadways and intersections periods of low temperatures, light winds, and stable atmospheric conditions. Becau impact occurs so close to the source, it is not possible to extrapolate carbon mo concentrations from regional data or distant monitoring stations.

Ecology and EPA recently declared the entire Everett-Seattle-Tacoma metropolita non-attainment for carbon monoxide. This does not mean that the entire area e carbon monoxide standards. Instead, the large geographic area designated non-attai

Table 4.5-1. Ambient air quality standards.

Pollutant	National Primary	National Secondary	Washington State	Puget Sound
Total Suspended Particulate Matter (TSP)				
Annual Geometric Mean ($\mu g/m^3$)			60[a]	60[a]
24-hour Average ($\mu g/m^3$)			150[b]	150[b]
Inhalable Particulate Matter (PM_{10})				
Annual Arithmetic Mean ($\mu g/m^3$)	50	50	50	50
24-hour Average ($\mu g/m^3$)	150[c]	150[c]	150[c]	150[c]
Sulfur dioxide (SO_2)				
Annual Average (ppm)	0.03[a]		0.02[a]	0.02[a]
30-day Average (ppm)				0.04[a]
24-hour Average (ppm)	0.14[b]		0.10[b]	0.10[a]
3-hour Average (ppm)		0.50[b]		
1-hour Average (ppm)			0.25[d]	0.25[d]
1-hour Average (ppm)			0.50[b]	0.40[b]
5-minute Average (ppm)				1.00[e]
Carbon Monoxide (CO)				
8-hour Average (ppm)	9[b]		9[b]	9[b]
1-hour Average (ppm)	35[b]		35[b]	35[b]
Ozone (O_3)				
1-hour Average (ppm)	0.12[c]	0.12[c]	0.12[c]	0.12[c]
Nitrogen Dioxide (NO_2)				
Annual Average (ppm)	0.05[a]	0.05[a]	0.05[a]	0.05[a]
Lead (Pb)				
Quarterly Average ($\mu g/m^3$)	1.5[a]	1.5[a]		1.5[a]

$\mu/g/m^3$ = micrograms per cubic meter; ppm = parts per million

[a] Never to be exceeded

[b] Not to be exceeded more than once per year

[c] Standard attained when expected number of days per year with maximum hourly average above this limit is equal to or less than one.

[d] Not to be exceeded more than twice in seven days

[e] Not to be exceeded more than once in eight hours

is a reflection of the fact that vehicles from the entire metropolitan area are contrit to high concentrations at some locations. Regional planning will be necessary to r carbon monoxide emissions. The State of Washington has prepared the Implementation Plan (SIP) for EPA approval. This plan addresses air pollutant contr proposes methods for reaching attainment status.

Carbon monoxide monitors are located in downtown Seattle and Tacoma, but are muc far away to be representative of conditions in SeaTac. In order to provide a bas comparison with future alternatives, existing carbon monoxide concentrations attribu to traffic were calculated based on existing traffic conditions using the same proce applied to future alternatives (described below).

Ozone

Ozone is a highly reactive form of oxygen created by sunlight-activated che transformations of nitrogen oxides and volatile organic compounds in the ambien Unlike carbon monoxide, ozone problems tend to be regional in nature becaus chemical reactions which produce ozone in the atmosphere occur over a period of During the lag time between emission and ozone formation, ozone precursors ca transported far from their sources. Transportation sources are one of a number of so which produce the precursors to ozone formation.

Until 1987, the Seattle-Everett-Tacoma region was officially designated "nonattainmen ozone because pollution levels exceeded the limit set by the ambient standard. Be monitoring data from the several years prior to 1987 indicated that ozone levels ha exceeded ambient standards, EPA designated the area as attaining the ozone standa 1987. The SIP will also address ozone nonattainment area.

During the summer of 1990, ozone concentrations exceeded the 0.12 ppm ambient star several times at monitoring stations in Enumclaw and Lake Sammamish State Park. result of these violations and model predictions of additional exceedances, Ecology and recently redesignated King, Snohomish and Pierce counties as nonattainment for o The non-attainment designation requires the state to develop a plan to reduce emission bring ozone concentrations back into attainment.

Nitrogen Oxides

Nitrogen oxides (NO and NO_2) result from the high temperature oxidation of nit present in the air. Nitrogen dioxide is a gas that can color plumes brown, red or ye In the presence of moisture, nitrogen oxides can form particles by coalescing, red visibility and contributing to acid deposition. Nitrogen dioxide, like sulfur dioxide, is a bronchoconstrictor that can cause irritation and injury to the lungs.

An annual average NAAQS for nitrogen dioxide exists (0.05 ppm); however, beca is also an ozone precursor, the 1990 CAAA requires that major NO_x sourc reductions similar to VOC sources. The State of California has a 1-hour average dioxide limit of 0.12 ppm.

Nitrogen oxides (NO_x), measured as nitrogen dioxide (NO_2) as required by the I emitted primarily from fuel combustion sources such as boilers, turbines and au engines. The primary sources of NO_2 from the Airport are the combustion of heat and aircraft testing and flight operations. PSAPCA data indicate that the NO_2 sta 0.05 ppm has never been violated in the Puget Sound region.

Hydrocarbons

In gaseous form, hydrocarbons are not a criteria pollutant. They include a wide v compounds resulting from the release of unburned fuel or incomplete fuel con Hydrocarbons can be divided into alkanes, alkenes, alkynes, and cyclics which aromatic or non-aromatic. Like carbon monoxide, they are products of inc combustion.

Volatile organic compounds (VOC) are gaseous hydrocarbons of low molecular VOC's react with oxidizing agents present in the atmosphere pollutants in the atm to produce photochemical smog. As a result, VOC's are stringently regulated in tho that do not meet the ozone NAAQS.

Hydrocarbons can also take the form of liquid or solid aerosols. Aerosols with d ranging from 0.1 to 3 microns are of particular concern from a human health st because they can enter the small passageways in the lungs. The chemical compo the particulate is also a determinant factor of their effect upon human health. Be their chemical composition, some hydrocarbons are air toxics regulated under s federal laws. Particulates with diameters less than ten microns are also criteria po

The exact composition of the aircraft hydrocarbon emissions and possible toxicity been studied. A 1983 study conducted for the United States Air Force (Spicer et identified numerous organic species in jet engine exhaust. These emission depending on the mode of engine operation (i.e., idle, 30% thrust, 80% thrust), b fuel, and by engine type. In each case, olefins were found to be the dominant hydrocarbon species in the engine exhaust. Aromatics, paraffins and aldehydes next most abundant species, but varied considerably depending on fuel and thrust Some of the species in jet exhaust are listed as hazardous air pollutants under Ti the 1990 Clean Air Act.

Particulate Matter

Total suspended particulate (TSP) is the "total" amount of particulate matter susp the air, which usually consists of particles up to about 75 micrometers in diamete

1987, there were federal, state, and local regulations limiting TSP. In 1987 the feder suspended particulate matter standards were replaced with standards based on the f of the total suspended particulate matter less than or equal to about 10 microme diameter (PM10). This is the important size fraction of particulate matter in te potential health impacts, because particles this size can be inhaled deeply into the lung.

PM10 is generated by industrial activities and operations, residential fuel combustion s like residential wood burning, motor vehicle engines, and other sources. Such s occasionally cause high PM10 levels in the Puget Sound region, and several areas in S and Tacoma have been declared nonattainment areas because PM10 concentr sometimes exceed health standards. SeaTac is outside the PM10 nonattainment are

4.5.1.4 Recent Air Quality Inventory

A comprehensive inventory of air pollution sources and concentrations has never attempted in the vicinity of the airport. As a first step in characterizing and quan emissions related to the airport, Ecology conducted a screening level assessm emissions and concentrations from airport sources (Ecology, 1991a). This study utiliz FAA's Emissions and Dispersion Modeling System (EDMS) computer model for airp quality. It is important to note that emission rates used for aircraft were based c technology engines; similarly, the discussion of the types of hydrocarbons in engine ex were based on relatively old and generic information rather than recent tests o technology engines.

Nonetheless, Ecology's report revealed that the major emission sources at Se International Airport are aircraft engines and automobiles. By comparison, ground su vehicles, fuel storage and refueling, and the boilers at the terminal are relatively sources of air pollutants. Emission rate data from that report are used herei comparison with data developed for SASA.

In addition to the Ecology study, aircraft emissions for Sea-Tac Airport have also forecast as part of the Flight Plan Project, the regional aviation planning program led b Puget Sound Regional Council and the Port (Mestre Greve and P&D 1992). The F Plan air quality study also used the EDMS model. A compilation of the results c Ecology and Flight Plan studies shows that aircraft-related emissions will decrease ove next 10 years, including the addition of SASA-associated emissions at the highest proj level (Alternative 2 or 3). This comparison is shown in Table 4.5-2.

4.5.2 <u>Construction and Operation Impacts</u>

4.5.2.1 Approach

The proposed South Aviation Support Area would relocate and intensify activities currently take place at the south end of Sea-Tac International Airport. Therefore, S

Table 4.5-2. Total aircraft engine emissions for 1991 and with and without SASA Alternatives 2 or 3 i
(tons per day).

	Year		
Emission	1991	2000 Without SASA	2000 With
CO	9.4	6.3	6.5
NOX	5.6	3.3	3.6
SO2	0.5	0.3	0.3
HC	3.8	2.1	2.2

emissions are expected to be similar to those that are characteristic of the ar section addresses the sources of air pollutant emissions associated with the prop characterizes the change in emissions expected with each alternative. A brief disc the three primary sources of emissions is followed by a discussion of the impacts a with each of the future alternatives.

Automobile Emissions

Consistent with the recommendations of air quality regulatory agencies, the a traffic-related pollutants focuses on carbon monoxide concentrations. These conce were determined in two steps. First, carbon monoxide emissions from tra calculated. Second, an air pollution computer model was used to disperse the em the air to determine concentrations.

Traffic pollutant emission rates were estimated using the U.S. Environmental P Agency's Mobile4.1 model (USEPA 1991). Mobile4.1 predicts vehicle emissions the specific traffic situations. Mobile4.1 accounts for the gradual replacement technology vehicles with vehicles with less polluting engines. Due to federal l passed in the 1970s, newer vehicles have had to meet more stringent tailpipe standards. Thus, the emission rates calculated by Mobile4.1 are lower for t scenario (2003) than for the existing (1991) or interim (1994) conditions bec program assumes older, more polluting vehicles will be replaced over time by nev efficient vehicles.

The CALINE3 dispersion model (California Department of Transportation, 1979) to estimate carbon monoxide concentrations near 21 intersections in the proj CALINE3 is a traditional modeling approach used nationally to assess trans impacts. CALINE3 was configured to simulate a 1 meter per second (about 2 m carrying pollution from the road to receptors located 10 feet from the curbs an from each intersection. Carbon monoxide concentrations at such locations would worst-case CO levels caused by traffic, which is consistent with the objective of the standard to prevent human exposure to unsafe air pollution. However, it is unl people actually spend much time at such locations very near roads, so it is possible one would be exposed to these worst-case concentrations.

An average peak-hour travel speed of 10 mph was assumed. A background concen of 5 ppm was added to the calculated 1-hour concentrations to account for other s of carbon monoxide in the project area.

Because the traffic analysis focused on peak-hour traffic conditions and because CA is a short-term predictive model, the modeling calculated peak 1-hour carbon mo concentrations. Regulatory agencies, however, recommend that impact analyses fo the 8-hour average concentration, because it is usually the controlling or limiting air standard for traffic-related air pollution. Eight-hour average concentrations are lowe peak-hour values because the average traffic volume is lower and becaus meteorological conditions usually change over an eight-hour period. Because of fluctu in wind directions, for example, traffic exhaust is not carried in the same dir continuously. For this analysis, peak-hour carbon monoxide concentrations were con to 8-hour concentrations using a factor of 0.7.

Modeling Sensitivity & Characteristics

In evaluating the results of the air quality modeling and forecasts, recognition o assumptions used in the models and the sensitivity of the results to these inputs is nece The inputs to the air quality models were prepared using conservative assumptions a weather, emissions factors, and other parameters.

The air quality modeling analysis performed for this EIS was by nature an investigati the possible impacts from alternative "worst case" scenarios. The analysis was base guidance published by the EPA, and was intended to be a screening-level review of pos air quality impacts from traffic. Use of worst case assumptions provides a means locating possible trouble spots, but does not necessarily yield a completely "reali assessment. The analysis reported does, however, provide an adequate review of the rela impacts of the proposed project, and that analysis shows the project-related traffic w have a minor impact.

The models employed in the analysis are sensitive to the assumed conditions and w intended to provide a worst case assessment. For example, the Mobile4.1 emission fa model was configured to calculate vehicle emission rates based on a temperature of 32.6 and an average travel speed of 10 mph. These factors (among others) led to a carl monoxide emission rate of 45.75 grams/mile (rounded to 46 g/mi). At the modeled locat near the intersection of 28th Avenue South with South 188th Street, this led to a calcula CO concentration of 9.8 ppm over an 8-hour period. To indicate the sensitivity Mobile4.1 to these assumptions, the model was rerun assuming 40° F and 12 mph, wh produced an emission rate of 35.57 g/mi. (The formerly assumed temperature was bas on EPA guidance, the latter is the temperature now recommended by the Puget Sound Pollution Control Agency (PSAPCA) based on their analysis of when carbon monoxi

problems are most likely to occur.) Because concentrations calculate
dispersion model are directly proportional to the emission source stre
two assumptions would result in a predicted 8-hour concentration
approximate 0.1 ppm attributable to the proposed project also would
percentage contribution to the total concentration would remain about the
with only slightly different assumptions, the projected CO concentration w
ambient standard, and the contribution to local CO levels due to the propo
remain minor.

Another conservative assumption used in the analysis was the use of a "pe
of 0.7 to convert from a model-calculated 1-hour concentration to an 8-hou
This adjustment factor is used to account for changes in meteorological c
variations in traffic patterns over periods longer than are addressed by the
The use of 0.7 is recommended by the EPA for screening-level impact
where site-specific monitoring data are not available (Schewe et al. 1990)
recommends using site specific-data whenever possible, and typical persiste
during actual CO episodes in the Puget Sound region ranged from 0.51 to
that the actual meteorological persistence in the project area were lower t
0.7, the resulting 8-hour CO concentration also would be lower.

A final factor which probably led to conservative results was the assumpti
of vehicles in hot start and cold start operating modes used in the Mobi
applied the percentages used in the EPA emissions testing procedure, whi
approach in lieu of site-specific data. The emissions modeling is very
factors, and more directly applicable information about the percentages o
already warmed up when they reach the study area might lead to lower e
rates. This would result in lower calculated ambient concentrations.

In summary, the modeling presented in the EIS was a worst case ana
EPA-recommended approach to a screening level evaluation. That ana
traffic related to the proposed project would have a minor impact on lo
a maximum impact of about 0.1 ppm in 1994 (compared with no action
analysis indicates the possibility of an 8-hour ambient CO level above
should not play a major role in deciding the fate of the project for two
proposed project contributes only about 1% to the total ambient CO con
the factors used in the modeling were intentionally based on cons
assumptions. While these can provide a good indication of the rel
alternatives, they may overstate the actual impact of the proposal. E
the underlying assumptions would lead to a calculated concentration
8-hour standard. In the case when the initial SASA development is
maintenance facilities, traffic levels and resulting air emissions would b
for all alternatives and best characterized by the values reported for
Preferred Alternative (Alternative 2), there would be no significant
relative to No Action.

Aircraft Emissions

SASA would not attract additional aircraft traffic to Sea-Tac International A
Therefore, the only change in aircraft engine emissions would result from the add
taxiing to a farther repair area and the additional capacity of the maintenance fa
Aircraft emissions are regulated at the federal level by the EPA and FAA. To ca
engine emissions, the number (and type) of aircraft expected at SASA was estimated
number of taxiing aircraft and the number of engine run-ups was also estimated
typical fuel consumption for each activity and each type of aircraft was then multip
published pollutant emission rates (EPA 1991).

Although the best available information regarding engine emission rates and SASA a
levels was used, it is important to note that the engine emissions are only estimates.
estimates are put into context by comparing SASA emissions with those Ecology esti
for Sea-Tac International Airport (which are also screening level estimates).

Maintenance Emissions

Two levels of aircraft maintenance, line maintenance and base maintenance, would
at SASA. Line maintenance is a low intensity aircraft servicing that also occurs a
terminal between aircraft arrivals and departures. Aircraft are cleaned, de-iced, refu
and lubricated as needed. Emissions occur with the evaporation of cleaning chemic
fueling, but the emission rates are low.

Although one might expect evaporative emissions from the refueling to be significan
actual emissions are minimal because jet engine fuel does not evaporate as readily a
gasolines used in automobiles and light planes. Benzene is a toxic air contam
associated with both gasoline and jet fuels, but primarily the former.

A base maintenance facility provides much more extensive maintenance capability.
base maintenance facility, aircraft can be repainted and engines removed and repa
Emission sources include adhesives and sealants, cleaning fluids, paints and solvents,
lubricants and fuels.

Evaporative emissions from base maintenance depend on the volatility of the mate
being used, how they are applied, air temperature, and other factors. Thus, the emiss
from SASA would depend on the activities which take place and which chemicals are u
It is impossible to quantify the emissions at this time.

When specific proposals are developed, each airline would need to obtain a Notic
Construction permit from PSAPCA if they have significant air emissions. This pe
process requires the applicant to identify the activities that will occur, the pollutants that
be emitted and their expected emission rates, and the measures that will be implemen
to minimize emissions. The applicant must also demonstrate that the facility's emissions
not exceed health-protecting ambient standards at neighboring properties.

Because the project area is part of the Puget Sound ozone nonattain
emission restrictions are triggered if volatile hydrocarbon emissions exc
Exceeding this threshold would require the facility to undergo an addi
called New Source Review. In this process, the proponent must re
similar facilities across the country and implement the processes
technology that result in the lowest emissions. Furthermore, the tota
facility would have to be "offset" by reducing emissions elsewhere i
area. In fact, there would be a net reduction in emissions of volatile
because the emissions must be offset by an additional 10 percent.

Field Measurements of Carbon Monoxide

Following the air quality modeling work described here, the Port, with
has initiated a preliminary program of field measurements of certain
in the vicinity of the airfield. While the study program is not comple
data are available. To date, CO measurements have been made at a
locations on four separate days including both north and south fl
Continuous composite samples over six to seven hour periods were
including the ends of the runways, adjacent to the main terminal,
Boulevard (SR-99), several sites close to the airport boundary (includ
site), and a residential site well west of the airport (in Normandy P
included periods of high activity by both aircraft on the airfield a
roadways.

For a total of 40 samples over the full suite of sampling locations, C
less than 1.7 parts per million (ppm) to 7.3 ppm, with an overall
Averages at individual locations ranged from 3.4 ppm (the residen
(northeast corner of the airfield). At the SASA site, the average was
while not necessarily representing worst case conditions, these result
model predictions and reinforce the conservative nature of the ass
example, the 5 ppm general background level used in modeling is hi
average of field data which included aircraft and vehicle operations.

4.5.2.2 No-Action Alternative

There would be no construction or operation impacts attributable to
Action Alternative. Aircraft maintenance would continue at Sea-Tac
to any other type of development that could take place on the site
separate environmental review. No additional aircraft engine emission
other than those from flight operations at the airport and maintenance
with the line maintenance facilities.

No additional aircraft engine emissions would be generated other t
operations at the airport and maintenance activities associated with
facilities.

For the purposes of comparing SASA impacts with the probable No Action condit traffic analysis assumed no new development by 1994 and commercial land uses Therefore, the analysis of traffic-related air quality assumes commercial developme baseline condition.

Table 4.5-3 displays the highest calculated 8-hour carbon monoxide concentratior intersection. Table 4.5-3 indicates that calculated concentrations for the N Alternative in 1994 approach or exceed the 8-hour standard of 9 ppm at all inte evaluated; by 2003, a substantial decrease in tailpipe emission rates is expected t concentrations such that these areas would meet the standard.

4.5.2.3 Alternative 1

Construction Impacts

During site preparation, heavy equipment would excavate about 2.2 million cubic material, use about 1.3 million cubic yards for fill, and import about 81,000 cubic material. Dust resulting from earth moving would contribute to concentrations of su particulate matter. Construction contractor(s) would have to comply with the PS Regulation 1 Section 9.15, requiring reasonable precautions be taken to av emissions. This may include applying water or suppressants during dry weather, ar other measures to prevent the transport of dirt and dust from the construction a nearby roads. Fugitive dust impacts would be limited both in area and duration.

Construction equipment, material hauling, and construction activities can affect tra in the area near a project, especially when construction on existing roads delays est traffic flows. If construction significantly reduces average travel speeds in the stu emissions from general traffic would increase.

Construction would require the use of heavy trucks and smaller equipment generators and compressors. These engines would emit air pollutants that would co slightly to the degradation of local air quality, but emissions from existing traffic se the project area would likely exceed construction equipment emissions. If aspha is used, hydrocarbon emissions from the hot asphalt would be released during pa

Operation Impacts

By 2003, three line maintenance facilities would be operational at SASA. Part o would be developed with other commercial uses that are not aviation oriented.

Traffic. Table 4.5-3 indicates 1994 carbon monoxide concentrations with Alte would be less than existing concentrations and less than or equal to No concentrations at all intersections evaluated (Figure 4.5-1). Concentrations would by almost 4 ppm at the intersection of South 188th Street and SR99/Inte Boulevard. The decrease is due to lower emission rates from newer vehicles and

Action conditions, the
cial land uses by 2003.
ial development as the

concentration at each
for the No-Action
at all intersections
expected to reduce

llion cubic yards of
,000 cubic yards of
tions of suspended
ith the PSAPCA's
en to avoid dust
eather, and taking
uction area onto
luration.

ffect traffic flow
elays established
the study area,

oment such as
ould contribute
affic sources in
asphalt paving
ng paving.

rt of the site
d.

lternative 1
No Action
uld decrease
nternational
and

Table 4.5-3. 8-hour carbon monoxide concentrations (ppm).

Intersection	1991 Existing	199 No Action	Alt. 1	Alt. 2[2]
1. S.200th & Des Moines Way S	8.2	7.1	7.1	7.
2. S.200th & Pacific Hw S	13.3	11.0	11.0	11.
3. S.200th & Military Rd	9.2	8.8	8.2	8.
4. Orilla & Northbound I5 ramps	12.9	10.6	10.6	10.
5. Orilla & Southbound I5 ramps	13.3	11.1	11.1	11.
6. Orilla & Military Rd	12.5	10.8	10.8	10.
7. S.188th & 42nd Ave S	12.2	10.3	10.3	10.
8. S.188th & International Blvd	16.1	13.0	9.2	9.
9. S.188th & 28th Ave S.	11.6	9.7	9.7	9.
10. 12th Pl S & Des Moines Way S	12.8	10.8	10.8	10.
11. S.176th & International Blvd	13.6	11.7	11.7	11.
12. S.176th & Military Rd	8.6	7.9	7.9	7.
13. S.216th & Marine View Dr	12.5	10.6	10.6	10.
14. S.216th & Pacific Hw S	12.6	11.1	11.1	11.
15. S.208th & Pacific Hw S	13.7	11.3	11.3	11.
16. Airport Entrance & Int. Blvd	14.1	11.8	11.8	11.
17. SR 509 & Des Moines Way S	12.0	10.2	9.8	9.
18. 28th Ave & SASA access	NA	NA	NA	N/
19. S.200th & 28th Ave S.	7.3	6.4	6.4	6.
20. S.192nd & 28th Ave S.	5.3	5.0	5.0	5.
	1991	200		
1. S.200th & Des Moines Way S	8.2	5.7	5.7	5.
2. S.200th & Pacific Hw S	13.3	7.4	7.5	7.
3. S.200th & Military Rd	9.2	5.5	5.5	5.
4. Orilla & Northbound I5 ramps	12.9	7.2	7.1	7.
5. Orilla & Southbound I5 ramps	13.3	6.9	6.9	6.
6. Orilla & Military Rd	12.5	6.9	7.0	6.
7. S.188th & 42nd Ave S	12.2	7.1	7.1	7.
8. S.188th & International Blvd	16.1	7.7	8.0	7.
9. S.188th & 28th Ave S.	11.6	6.6	6.6	6.
10. 12th Pl S & Des Moines Way S	12.8	7.1	7.1	7.
11. S.176th & International Blvd	13.6	7.8	7.8	7.
12. S.176th & Military Rd	8.6	6.0	6.0	5.
13. S.216th & Marine View Dr	12.5	7.8	7.7	7.
14. S.216th & Pacific Hw S	12.6	7.6	7.6	7.
15. S.208th & Pacific Hw S	13.7	7.6	7.8	7.
16. Airport Entrance & Int. Blvd	14.1	7.8	7.8	7.
17. SR 509 & Des Moines Way S	12.0	7.1	7.1	7.
18. 28th Ave & SASA access	NA	5.0	5.5	5.
19. S.200th & 28th Ave S.	7.3	6.9	6.7	6.
20. S.192nd & 28th Ave S.	5.3	4.6	4.8	4.

1 Compared with No Action.
2 For first phase development of major base maintenance For development of line use Alt. 1 values.

continuation/expansion of the regional inspection and maintenance program. Yea carbon monoxide concentrations would also be less than existing concentrations intersections. Calculated differences in 2003 carbon monoxide compared with t Action scenario are small, with the largest increase (0.5 ppm) occurring at the inter of the SASA access road with 28th Avenue South. All calculated 8-hour average monoxide concentrations are less than the 9 ppm ambient standard.

Aircraft. Operations at SASA would be a relocation of line maintenance operation would occur regardless of SASA development. Any increase would be proportiona flight operations at the airport and would not depend on SASA. Engine runups continue to occur in the current locations and would not be relocated. Aircraft would emit air pollutants while taxiing between SASA and Sea-Tac International and during engine tests. Table 4.5-4 summarizes calculated daily emissions related t sources. The results indicate that the taxiing aircraft would be a larger source of en than the intermittent engine tests, and that the total engine emissions from SASA w a fraction of a percent of the emissions Ecology calculated from Sea-Tac Intern Airport. It should be noted that this comparison is made solely to put SASA emissi perspective; operations at SASA would be a relocation of line maintenance operation would occur regardless of SASA development. Any increase would be proportiona flight operations at the airport and would not depend on SASA. Engine runups continue to occur elsewhere in the current locations and would not be rel Furthermore, these calculations are based on existing engine technology. Emissio been gradually decreasing as engine technology (and fuel efficiency) have been imp It is therefore quite possible that SASA emissions would be lower than these estin

Using the results of air quality studies by Ecology (using the EDMS computer mod the Flight Plan project, total aircraft emissions for existing conditions and for the ye can be compared. Table 4.5-2 shows this comparison, including assumption of the ma SASA development (Alternative 2 or 3) for the year 2000. For all four of the air elements shown, there is a 30% to 40% reduction even with the SASA developmen reduction results primarily from the shift from older aircraft to a newer technology fle lower emission rates.

Maintenance. Line maintenance that occurs at SASA would also generate emission atmosphere. These emissions would result from the evaporation of cleaning materi lubricants used in routine maintenance. The emission rate is expected to be very sm would be simply a relocation of activities now sited elsewhere at the airport. P permit requirements would ensure that air quality standards are met.

4.5.2.4 Alternative 2 - The Preferred Alternative

Construction Impacts

Construction impacts would be similar to those identified for Alternative 1 except site is larger and more earth-moving would occur with Alternative 2. About 2.5 n

:e Program. Year 2003
g Concentrations at all
ompared with the No-
ring at the intersection
3-hour average carbon

n ce operations which
e proportionate with
igine runups would
d. Aircraft engines
ternational Airport
ions related to these
source of emissions
om SASA would be
-Tac International
SASA emissions into
e operations which
proportionate with
ine runups would
ot be relocated.
Emissions have
been improving.
hese estimates.

iter model) and
or the year 2000
of the maximum
the air quality
lopment. This
ology fleet with

nissions to the
materials and
ery small, and
t. PSAPCA

ept that the
5 million

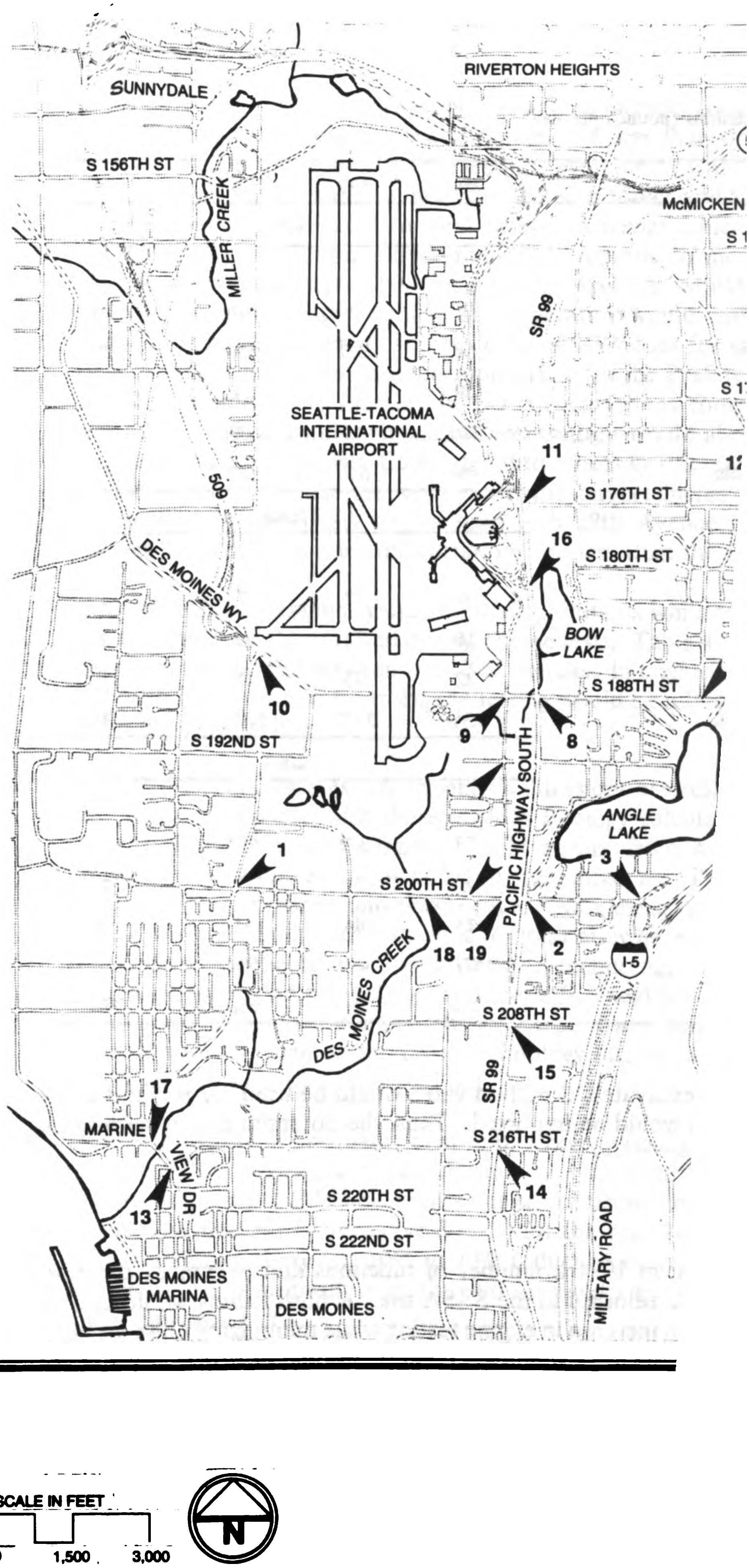


Table 4.5-4. Aircraft engine emissions (pounds per day).

	HC	CO	NOX	S
		1994		
Alternatives 2 & 3				
Hush House Engine Emissions	213	734	526	[illegible]
Outdoor Idle Engine Emissions	58	372	554	[illegible]
Taxiing Engine Emissions	29	91	11	
Total Engine Emissions	300	1,197	1,090	[illegible]
% of 1991 Sea-Tac Emissions	4%	5%	10%	[illegible]
		2003		
Alternative 1				
Outdoor Idle Engine Emissions	6	22	7	
Taxiing Engine Emissions	16	51	11	
Total Engine Emissions	22	73	18	
% of 1991 Sea-Tac Emissions	0.3%	0.3%	0.2%	0.
		2003		
Alternatives 2 & 3				
Hush House Engine Emissions	58	372	554	[illegible]
Outdoor Idle Engine Emissions	6	22	7	
Taxiing Engine Emissions	13	44	11	
Total Engine Emissions	77	439	571	[illegible]
% of 1991 Sea-Tac Emissions	1%	2%	5%	[illegible]

cubic yards of earth would be excavated, 2 million yards would be used for fill, anc 223,000 cubic yards of material would be imported. Thus, the potential dust gener greater that with Alternative 1.

Operation Impacts

Under the phasing assumptions, in 1994 a number of functions and personnel cu located at Sea-Tac Airport would relocate to the SASA site. A hush facility would constructed, which would allow an increase in engine testing while minimizing noise i By 2003, three line maintenance facilities would also be operational at SASA. Par site east of SASA (fronting 28th Avenue South) would be developed with other com uses that are not oriented toward aviation.

Traffic. Table 4.5-3 indicates 1994 carbon monoxide concentratio
would be less than existing concentrations and less than or equal
trations at all but one of the intersections evaluated. Concentratio
almost 4 ppm at the intersection of South 188th Street and SR99/Int
The decrease is due to lower emission rates from newer vehicles and c
of the regional inspection and maintenance program. If the project
the line maintenance facilities first, the 1994 values would be low
employment and resultant vehicle trip generation would not occur u
of maintenance base facilities. The Table 4.5-3 values for carbon m
1994, Alternative 1, would also be appropriate for the Preferred Alte
and there would be no increase in CO concentrations compared wi
case. Year 2003 carbon monoxide concentrations would also be less
trations at all intersections. Calculated differences in 2003 carbon mo
the No Action scenario are small, with the largest increase (0.3 p
intersection of the SASA access road with 28th Avenue South.
average carbon monoxide concentrations are less than the 9 ppm ar

Aircraft. Aircraft engines would emit air pollutants while taxiing be
Tac International Airport and during engine tests. Table 4.5-4 summ
emissions related to these sources. The increase in engine tests with
and hush facility would mean engine testing would be a larger source
relatively brief taxiing.

Table 4.5-4 also indicates that jet engine emissions at SASA would d
and 2003. Compared with the emissions Ecology calculated from
Airport, SASA engine emissions would shrink from 4-10 percen
emissions to 1-5 percent of Sea-Tac engine emissions. This compar
put the SASA emissions into perspective; SASA emissions would, in
testing that would otherwise continue to occur elsewhere at the airpo
calculations are based on existing engine technology. Emissions
decreasing as engine technology (and fuel efficiency) have been imp
quite possible that SASA emissions would be lower than these esti
reduction would occur as the older technology engines associated w
B737-100/200 aircraft are phased out.

Using the results of air quality studies by Ecology (using the EDMS
the Flight Plan project, total aircraft emissions for existing condition
can be compared. Table 4.5-2 shows this comparison, including assum
SASA development (Alternative 2 or 3) for the year 2000. For all
elements shown, there is a 30% to 40% reduction even with the SA
reduction results primarily from the shift from older aircraft to a newe
lower emission rates.

Maintenance. Line maintenance that occurs at SASA would also ge
atmosphere. These emissions would result from the evaporation of

lubricants used in routine maintenance. The emission rate is expected to be very sm[...]
would be simply a relocation of activities now sited elsewhere at the airport.

The base maintenance facility associated with Alternative 2 is likely to be a larger of emissions than the line maintenance. Paint stripping, repainting, and solvents u cleaning aircraft and engine parts are likely to be the primary sources of emissions.] the permitting process, PSAPCA would ensure that these emissions would meet air standards through the use of best available control technology.

4.5.2.5 Alternative 3

Construction Impacts

Construction impacts would be similar to those identified for Alternative 1, except tl site is larger and more earth-moving would occur with Alternative 2. About 2.5 ı cubic yards of earth would be excavated, 3.7 million yards would be used for fill, anc 1.3 million cubic yards of material would be imported. Thus, the potential dust gen is greater than that with Alternative 1.

Operation Impacts

Under the phasing assumptions, in 1994 a number of functions and personnel cu located at Sea-Tac International Airport would be relocated to the SASA site. A facility would also be constructed, which would allow an increase in engine testing minimizing noise impacts. By 2003, three line maintenance facilities would a operational at SASA. A building site for a future base maintenance facility would a constructed, but its development would be the subject of a future environmental eval Commercial development would be limited to a hotel in the northeast corner of the si a parcel for commercial development in the southeast corner of the site.

Traffic. Table 4.5-3 indicates 1994 carbon monoxide concentrations with Altern would be less than existing concentrations and less than or equal to No concentrations at all but one of the intersections evaluated (see Figure Concentrations would decrease by almost 4 ppm at the intersection of South 188th and SR99/International Boulevard. The decrease is due to lower emission rates from vehicles and continuation/expansion of the regional inspection and maintenance pr If the project is phased to construct the line maintenance facilities first, the 1994 would be lower because increased employment and resultant vehicle trip generation not occur until the later buildout of maintenance base facilities. Year 2003 monoxide concentrations would also be less than existing concentrations at all interse Calculated differences in 2003 carbon monoxide compared with the No-Action scena small, with the largest increase (0.4 ppm) occurring at the intersection of South 188th with SR99/International Boulevard. All calculated 8-hour average carbon mo concentrations are less than 9 ppm ambient standard.

Aircraft. Aircraft engines would emit air pollutants while taxiing bet Tac International Airport and during engine tests. The level of airc the same as with Alternative 2. Table 4.5-4 summarizes calculated d to these sources. The increase in engine tests with the maintenance would mean engine testing would be a larger source of emissions th taxiing.

Table 4.5-4 also indicates that jet engine emissions at SASA would d and 2003. Compared with the emissions Ecology calculated from Airport, SASA engine emissions would shrink from 4-10 percen emissions to 1-5 percent of Sea-Tac engine emissions. This compari put the SASA emissions into perspective; SASA emissions would, in testing that would otherwise continue to occur elsewhere at the airport calculations are based on existing engine technology. Emissions decreasing as engine technology (and fuel efficiency) have been impr quite possible that SASA emissions would be lower than these esti reduction would occur as the older technology engines associated wi B737-100/200 aircraft are phased out.

Using the results of air quality studies by Ecology (using the EDMS the Flight Plan project, total aircraft emissions for existing conditions can be compared. Table 4.5-2 shows this comparison, including assum SASA development (Alternative 2 or 3) for the year 2000. For all f elements shown, there is a 30% to 40% reduction even with the SAS reduction results primarily from the shift from older aircraft to a newer lower emission rates.

Maintenance. Line maintenance that occurs at SASA would also gen atmosphere. These emissions would result from the evaporation of c lubricants used in routine maintenance. The emission rate is expected would be simply a relocation of activities now sited elsewhere at the

The base maintenance facility is likely to be a larger source of em maintenance. Paint stripping, repainting, and solvents used in cleani parts are likely to be the primary sources of emissions. During th PSAPCA would ensure that these emissions would meet required stan of best available control technology.

4.5.2.6 Detailed Concentration Modeling

In addition to the projections of total emissions, air quality concent using the EDMS computer model (in screening and refined modes). modeling effort was to examine the effect of relocating certain aircraf from existing sites to the hush facility at the SASA site. Carbon mo focus of the study because the site is in a regional non-attainment a

Levels were also projected for other pollutants, including NO_x and particulates. Wh site is also in an ozone non-attainment area, the EDMS model does not directly p ozone levels. Therefore, ozone levels are not included in these results.

Aircraft operations were assumed to be the peak departure hour in north flow conc for the initial screening and the examination of maximum one-hour emission levels. assumption simulated the maximum impact on the SASA site. Airport activity for 200 modeled at the same levels of flight operations and aircraft runups used in Section Operational Scenarios, including the projected fleet mix of Stage 3 aircraft.

In addition to aircraft operations, roads from South 160th Street to South 200th Stre including SR 99/International Boulevard, 28th Avenue South, and the airport servic access drives were included using the same peak hour traffic levels used in Section Transportation and other area traffic studies. Emissions from the airport parking g and heating plant were also included. The assumption regarding weather conditions the same used for the Ecology study; air temperature of 40°F, wind speed meter/second, and stability class E. These conditions minimize air mixing and dispe Note these conditions were selected to maximize the estimated impact. Hourly and variation in operations and runup activity, together with a range of weather condi would lead to lower concentrations then reported here. This reduction was confirm the refined-mode runs.

A series of model runs were made using a full cycle of wind directions at 10 d increments to determine which direction led to the highest emission concentrations fro combined runway/queue and hush facility plumes. Further characterization o magnitude and direction of the hush facility emission plume was modeled measurement point (receptor) grids with 100 and 30 meter spacing. Based on the r of these screening runs, two receptor locations were selected for more detailed moc (Figure 4.5-2). Point B is 500 meters downwind of the hush facility for wind coming an azimuth of 20° relative to the runway orientation. Based on annual weather data is the most common wind direction for wind from the north. Point C is 500 m downwind from an azimuth of 320°. This direction produces the maximum combinati emissions from the hush facility. The distance of 500 meters was selected to keep the m measurement points within the SASA site and airport property, and upwind of public a Since lower emissions concentrations would occur further downwind from the recep calculations for the 500 meter distance represent an upper limit with a safety ma Impacts would be lower in public areas.

Two scenarios were examined: (1) all runups at the existing runup pads, and (2) wide- aircraft runups at the existing pads and narrow-body runups at the new SASA hush fa The first scenario simulates the No-Action Alternative, Alternative 1, and Option 1A. second scenario simulates Alternatives 2 and 3. In consultation with the FAA, runups modeled in the EDMS using runway queues located at the runup pad locations. To ca the full range of runup power settings, both idle power and full power runups were mod Intermediate power levels were modeled as full power. Runups were modeled as ru

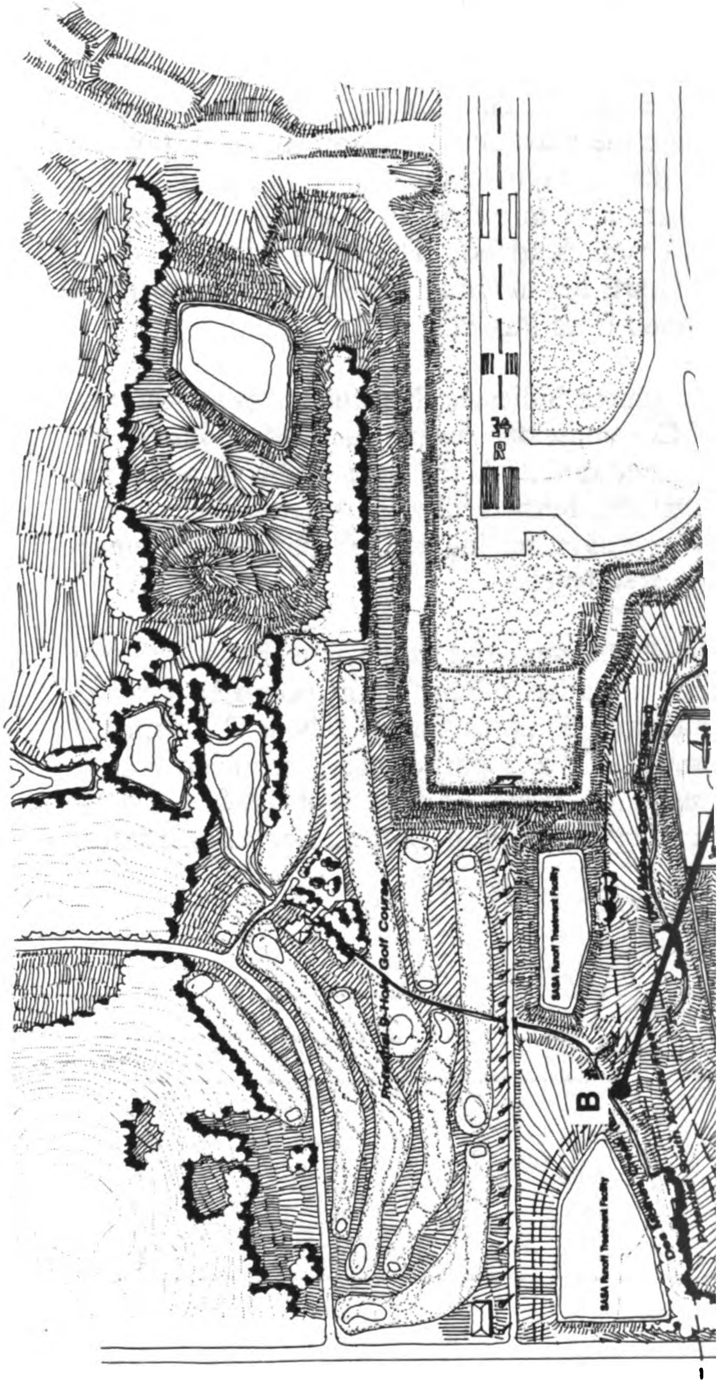
s. While the
'ectly predict

w conditions
levels. This
for 2003 was
'ection 4.4.4,

h Street and
service and
ection 4.12,
king garage
litions were
;peed of 1
dispersion.
y and daily
conditions,
›nfirmed in

10 degree
ns from the
ion of the
eled using
the results
l modeling
ming from
r data, this
;00 meters
›ination of
the model
blic areas.
receptors,
ty margin.

wide-body
sh facility.
ı 1A. The
nups were
'o capture
modeled.
as runway



queue times of equivalent duration. For full power runups, EDMS *queuing* emission rates were reset to match the equivalent full power rates. A full day's *average* runup activity for aircraft with high emission rates (e.g., 747 for wide-body aircraft, 757 for narrow-body aircraft) was used. Runup durations totaled approximately 24 *minutes* at full power and 64 minutes at idle power for No Action, with 24 minutes each of idle and full power added for the build alternatives.

The model was run in refined mode for Points B and C. The refined modeling included a full year's airport and runup activity to generate the maximum emission concentrations at the receptor points. The complete Ecology file of 1990 weather data was used. Both locations were modeled for the No-Action Alternative to provide a baseline and then the model was run again with the relocated SASA runups added. The EDMS output values were converted from grams per cubic meter to parts per million using PSAPCA conversion factors. Regulatory standards were also obtained from PSAPCA.

Review of the EDMS breakdown by emission source indicates that under both scenarios, the runway departure queue dominates the CO emissions during the peak hours when queues develop. Projected emission levels dropped rapidly to the sides of the plume in the high stability, worst-case conditions. Note that the hush facility is likely to redirect the engine exhaust flow; this redirection could increase mixing and dispersion of runup emissions which could further reduce the projected levels.

Table 4.5-5 lists the results of the dispersion analysis compared with established air quality standards. The two reference locations are shown relative to Point A, the proposed location of the hush facility. Neither the 1-hour CO standard (35 ppm) nor the 8-hour CO standard (9 ppm) were exceeded. For other pollutants (NO_x and particulates), modeled results indicate that baseline levels are will below regulatory limits. Addition of the SASA hush facility slightly increases emissions but does not lead to violations of the accepted standards.

Table 4.5-5. Air emissions concentrations for the SASA site.

Pollutant	Standard	Point B No SASA	Point B With SASA	Point C No SASA	Point C With SASA
CO	1-hour = 35[a]	7.8	7.8	6.7	6.7
	8-hour = 9	1.0	1.0	1.5	1.5
NO_x	Ann. Avg. = 0.05[a]	0.013	0.021	0.007	0.008
TSP	24-hour = 150[b]	6.5	6.5	6.2	6.2
	Ann. Ave. = 60	0.7	0.7	0.3	0.3

a parts per million
b micrograms per cubic meter

Note: All values calculated using the EDMS model in refined mode. All standards and conversion factors obtained from PSAPCA 1991 Air Quality Data Summary.

In the case where initial SASA development is for line maintenance followed by base maintenance, the air quality impacts projected for 2003 for the different alternatives remain the same. Regardless of development sequence, air quality impacts from construction and aircraft flight operations would be essentially unchanged. The interim SASA air quality projections for 1993 would be somewhat altered and would be similar to the analysis for the buildout of Alternative 1/Option 1A. Because the increase in employment associated with the maintenance base would be delayed, interim traffic volumes and resultant emissions would be lower. Traffic and emissions generated by potential commercial development would not change.

Specifically, in the case when the initial SASA development is for relocation of line maintenance facilities, traffic levels and resulting air emissions would be essentially the same for all alternatives and best characterized by the values reported for Alternative 1. For the Preferred Alternative (Alternative 2), there would be no significant increase in emissions relative to No Action. The Table 4.5-3 values for carbon monoxide shown under 1994, Alternative 1, would also be appropriate for the Preferred Alternative and there would be no increase in CO concentrations compared with No Action for this case.

4.5.2.8 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area air quality. Emissions from aircraft and vehicle operations included in this EIS are based on overall forecasts of airport activity over the study period and would not be significantly affected by other identified airport projects. These forecasts are consistent with those used in the Flight Plan Project and its EIS. The air quality information presented in the Flight Plan EIS describes the impact of airport operations out to the year 2020. For rough comparison with the Year 2000 values in Table 4.5-2 of this EIS, the Flight Plan EIS shows that with a new dependent runway, Sea-Tac would operate with 26 tons/day CO emissions, 8.1 tons/day NOx emissions, and 4.5 tons per day HC. These represent between 1.3-1.6% of the regional vehicle emissions of each type. Further note that relative to the Flight Plan "No Action alternative", air quality impacts are less, due to a more efficiently operating airport. Creation of additional long-term capacity at Sea-Tac airport might allow some operational increase to occur sooner than would otherwise happen. This would not alter the air quality analysis contained in this EIS for the SASA project.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for air quality impacts of regional transportation improvements south of the airport. An assumption was made for the purpose of this SASA EIS that this roadway corridor would be developed. Thus, the air quality forecasts include the associated traffic levels. Construction activity associated with other airport projects which might occur at the same time as SASA construction could generate additional construction equipment emissions but this would probably come from separated locations. Planning for other projects has not yet progressed to the point that their construction emissions can be estimated. The potential for cumulative impacts on air quality will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13). Additional review of project and cumulative impacts will be provided through determinations of air quality conformity by agencies with jurisdiction. Therefore, no ultimate significant cumulative impacts are anticipated.

4.5.3 Mitigation Measures

4.5.3.1 Construction

A number of measures could be taken to reduce dust emissions during construction:

- During dry weather, contractors would implement a watering program at the site to reduce emissions.

- To reduce soil deposits on roads (and subsequent dispersion of dust) from construction vehicles leaving the site, the construction equipment should be cleaned prior to leaving the site. Soil that does escape the construction area on exiting vehicles could be reduced with an effective street-cleaning effort. Trucks carrying dry soil from the site could be covered.

- The paving of roads and parking lots should be undertaken in a timely manner to reduce exposed soil surface. Areas that might be exposed for prolonged periods could be paved, planted with a vegetation ground cover or covered with gravel.

Emissions from construction equipment and trucks can be reduced by using new and/or well-maintained equipment. Avoiding prolonged periods of vehicle idling and engine-powered equipment would also reduce emissions.

The trucking of material to and from construction areas and construction activities that would obstruct traffic could be controlled or scheduled to minimize traffic congestion during peak travel times. This would minimize secondary air quality impacts caused by reduced travel speeds.

4.5.3.2 Operations

<u>Vehicle Emissions</u>

Control of vehicle emissions and attainment of air quality standards will be supported by applicable elements of the Washington air quality SIP. Measures include continuation and expansion of the vehicle inspection program, use of oxygenated fuels, etc.

Attainment of air quality standards would be supported by implementation of applicable provisions of the Washington air quality SIP.

<u>Aircraft Emissions</u>

The following mitigation measures could be adopted to reduce aircraft engine emissions:

- Promote use of newer aircraft types with lower emissions rates
- Minimize aircraft run-up durations at all power settings
- Minimize aircraft taxiing and queuing times. This would probably require new, or wider taxiways. Taxiway improvements designed to reduce delays are already underway at the airport.

<u>Aircraft Maintenance</u>

As a result of air pollution problems in southern California, a number of emission control strategies have been developed that could also be applied at SASA. For example, paint stripping and the cleaning of parts with solvents can be a significant source of VOC's. Progress in reducing VOC emissions has been achieved using solvents that are less prone to evaporation. Similar progress has been made in reducing VOC emissions from painting by using low solvent paints, changing techniques used to apply paint to achieve a higher transfer efficiency, and treating the air exhausted from painting areas. These general approaches are investigated and evaluated in a cost-benefit analysis that is part of the permit process. Ultimately, PSAPCA would determine a control strategy that would become part of the airline's air permit.

4.6 WATER QUALITY

4.6.1 <u>Affected Environment - Water Quality</u>

The entire project is within the Des Moines Creek watershed; thus, all affected water is a part of the Des Moines Creek system.

The Des Moines Creek watershed includes several large developed areas including parts of Sea-Tac International Airport, the City of SeaTac, and the City of Des Moines. Developed areas range from: 1) highly impervious areas (mostly pavement and rooftops) found around the airport and commercial development along SR 99 to 2) areas with a moderate amount of impervious surfaces such as the residential areas in the City of SeaTac. Tyee Valley Golf Course and the Sea-Tac International Airport clear zone are relatively undeveloped. The Des Moines Creek watershed extends from the northern parts of Sea-Tac International Airport at the headwaters to the mouth at Des Moines Beach Park on Puget Sound.

Des Moines Creek is a Class AA (extraordinary) stream as defined in the Water Quality Standards for the State of Washington (WAC 173-204). Class AA streams are expected to meet the standards in Table 4.6-1.

Table 4.6-1. State of Washington water quality standards for freshwater (WAC 173-204).

Parameter	Class AA	Class A	Class B
Dissolved Oxygen (mg/L)	9.5	8.0	6.5
Temperature (°C)	16.0	18.0	21.0
pH	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5
Turbidity (NTU* over background)	5	5	10
Fecal Coliform Bacteria (geometric mean, organisms/100 ml)	50	100	200

*Nephelometric Turbidity Units

Over the past twenty years, a considerable number of studies have addressed the water quality of Des Moines Creek and many of these studies suggested that the Creek often does not meet Class AA water quality standards.

4.6.1.1 Past Water Quality Monitoring

The only reported water quality monitoring of Des Moines Creek was conducted monthly by Metro in 1973 and 1974 (Metro 1989). At that time the water quality often exceeded state water quality standards for fecal coliform (bacteria from human and animal wastes). Fecal coliform levels were elevated at monitoring stations just downstream of the proposed SASA site with a very high range of 1,800 to 16,000 organisms/100 ml. In addition, other parameters not covered by the state water quality standards (such as nitrogen and suspended sediment) were often elevated. Further downstream, high concentrations of heavy metals (lead, copper, and zinc) were found in stream samples at some locations during storm runoff.

4.6.1.2 Recent Water Quality Monitoring

The combination of old monitoring data, urban land use information, and water quality data for a similar creek would indicate that Des Moines Creek may have existing water quality problems for some types of pollutants.

A base line water quality monitoring study was conducted as a part of this environmental impact analysis (see Appendix D). For the one storm event monitored in the study, the water quality in Des Moines Creek and its tributaries was better than predicted by the water quality estimates above.

The base line monitoring study assessed water quality throughout the watershed for one typical storm event. Fecal coliform levels were consistently above water quality criteria throughout the watershed. Metals were generally below EPA freshwater chronic criteria, and other conventional parameters measured were generally at low levels. Runoff from airport runways was generally cleaner than any other water measured. Some nutrients were slightly elevated downstream of the golf course, indicating some fertilizer contamination may be occurring. Although one monitoring event cannot adequately characterize the water quality of a watershed, overall the water quality of Des Moines Creek and its tributaries appears to be better than the water quality reported for studies of similar watersheds (EPA 1983).

4.6.1.3 Land Use Studies and Water Quality Estimates

Several studies have indirectly examined the watershed's water quality based on a general knowledge of urban watersheds (Metro 1989; King County Public Works 1990a). Many additional studies have been conducted on watersheds throughout the country; they indicate some general relationships between activities in a watershed and the resulting water quality of that watershed (EPA 1983). Generally, it has been found that more urbanized watersheds have poorer water quality than undeveloped watersheds. Specific polluting activities common to urban areas such as automobile maintenance have also been associated with poor water quality.

Table 4.6-2 shows pollutant loading rates expected from general land uses based on National Urban Runoff Program (NURP) studies from around the country, including the Bellevue, Washington area (EPA 1983). These loading rates were applied to the Des Moines Creek watershed areas in residential and commercial land uses resulting in pollutant load estimates in tons per year.

Commercial areas tend to have higher pollutant loads than residential areas. These pollutant loads can be directly related to the higher amounts of impervious surface and greater number of polluting activities found in commercial and industrial areas (Schueller 1987).

Table 4.6-2. Annual urban runoff loads for different land uses assuming 40 inches of rain per year (EPA 1983).

Parameter	Residential: NURP Load (lbs/ac/yr)	Residential: Des Moines Watershed (1359 ac) Load (in tons/yr)	Commercial: NURP Load (lbs/ac/yr)	Commercial: Des Moines Watershed (997 ac) Load (in tons/yr)*
Total Suspended Solids	479.3	325.68	1,272.4	634.29
Biochemical Oxygen Demand	31.4	21.34	85.4	42.57
Chemical Oxygen Demand	217.9	148.06	580.4	289.33
Total Phosphorous	1.1	0.75	3.0	1.50
Soluble Phosphorous	0.4	0.27	1.1	0.55
Total Kjeldahl Nitrogen	5.1	3.47	13.4	6.68
Nitrate and Nitrite-Nitrogen	2.3	1.56	6.1	3.04
Total Copper	0.1	0.07	0.3	0.15
Total Lead	0.5	0.34	1.3	0.65
Total Zinc	0.5	0.34	1.4	0.70

* The area only includes the 2,356 acres of the watershed above South 200th Street

Based on the known effects of urbanization, it can be assumed that the commercial areas contribute most of the pollutant load to Des Moines Creek, and that the water quality of the Creek is probably degraded due to this urbanization. Studies of the land use in the Des Moines Creek watershed show that the upper watershed of the Creek around the SASA site has a high proportion of highly impervious commercial and industrial areas (Metro 1989). Of the 2,356 acres in the watershed north of South 200th Street, 997 acres (42%) are in either commercial or light industrial use. This includes some very densely developed areas around the airport and along SR99/International Boulevard; these areas consist of virtually 100% impervious surfaces. Pollutant loads calculated for these commercial areas, which cover 42% of the land area, are found to contribute approximately 67% of the pollutants expected in Des Moines Creek (Table 4.6-2).

More detailed estimates of the effects of urban areas on water quality were made by King County Public Works (KCPW 1990a). KCPW included detailed computer models of the pollutants washed off from developed areas in the upper Des Moines Creek watershed. According to the model used in this study, areas with commercial and industrial usage represent 65% of the watershed's area but contribute 70% of its pollutants.

The upper Des Moines Creek watershed also contains the Tyee Valley Golf Course. Golf courses are known to contribute to specific water quality problems. The use of fertilizers and pesticides on golf courses can produce elevated levels of nutrients and organic chemicals in runoff. The amount and concentration of these chemicals in golf course runoff depends on an array of factors including, but not limited to: frequency of application, application techniques, condition of the course, amount and intensity of rainfall, soil conditions, type of grasses, native vegetation buffers, and depth to shallow groundwater. Under some conditions, the golf course near the SASA site could be contributing to water quality problems in the Creek.

4.6.1.4 Pollutant Spills

Three jet fuel spills have occurred near Des Moines Creek since 1973. The volume of the first spill in 1973 is uncertain, but Ecology records indicate that the spill killed some fish in the Creek (personal communication Ecology 1991a). The largest spill occurred in 1985 when 30,000 gallons of jet fuel bypassed the spill containment system at the main bulk fuel tank farm and contaminated the Creek as far downstream as the Des Moines Sewage Treatment Plant (Metro 1991). This spill also resulted in mortality of fish and other aquatic life. In April 1986, another spill of 5,000 to 7,000 gallons of jet fuel occurred at the Northwest Airlines fuel tank farm (Metro 1989). The aquatic life in the Creek appears to have recovered somewhat from the more recent spills, but it is uncertain if the Creek's fish, aquatic insects, and plants have returned to their previous composition and abundance.

4.6.1.5 Existing Water Quality Treatment

Due to the fuel spills and general concerns about water quality in Des Moines Creek, efforts have been made to improve the quality of runoff that might enter the Creek. Sea-Tac International Airport has operated and maintained an industrial wastewater system (IWS) since 1952. The IWS consists of a series of indoor and outdoor drains and catch basins that receive wash water and storm water in areas where contamination from airport operations is common. This water is piped to three IWS treatment ponds (on airport property) with a combined capacity of approximately 4.6 million cubic feet (Port of Seattle 1988). The ponds were designed to treat runoff and wash water from a 225-acre area up to the 100-year 7-day rainfall event (approximately 10 inches of rain over a 7-day period). However, the existing contributing area is nearly 262 acres, making the system's runoff capacity somewhat lower.

The IWS removes pollutants through primary treatment (settling of solids and skimming of light oil fractions). After treatment, the water is pumped into an 18-inch-diameter pipe that connects with the Des Moines Sewage Treatment Plant outfall pipe and then discharges offshore in Puget Sound (Port of Seattle 1988). The IWS is operated under a National Pollutant Discharge Elimination System (NPDES) permit which requires that discharges not exceed an average oil and grease concentration of 10 mg/L and never exceed 15 mg/L of oil and grease. Operating records indicate that the IWS is usually discharging water with a concentration around 5 mg/L of oil and grease, and the system has never exceeded the permit limits (Port of Seattle 1988). The discharge rate must be below 9.3 cubic feet per second (cfs) which is near the maximum capacity of 10 cfs available with the 18-inch-diameter discharge pipe. At this time, the capacity of the pipe is the major factor limiting the capacity of the IWS.

Other systems that help prevent degradation of water quality in Des Moines Creek include spill control berms around the tank farm and a recently constructed detention/spill control pond. The berms around the tank farm provide required spill control. During an extremely large spill these berms might be overtopped or bypassed. An instream stormwater detention pond was constructed on the Tyee Valley Golf Course in 1988. It can be used to limit the spread of any spills (Metro 1989). See Section 4.6.2.1, below, for a description of the detention pond.

The Tyee Pond has a capacity of 1.05 million cubic feet which is large enough to hold a moderate-sized spill as well as all the incoming stream base flow for 24 hours. This would allow sufficient time for clean up and removal of the spill. Under intense storm conditions (2-year, 24-hour storm) the pond would be able to retain all stream flow for approximately four hours. The pond is equipped with a hydrocarbon sensor connected to an alarm system. The pond outfall must be closed manually.

The pond also provides some biofiltration treatment of base flows in the creek and reduces peak flows in the Creek during storms. Reductions in peak flows limit downstream erosion and sedimentation which adversely affect fish habitat. Other ponds on the west side of the golf course probably also provide water quality improvements to the Creek. These permanent ponds provide settling of solids and biological uptake and filtration of pollutants by algae and emergent wetland plants.

4.6.2 Affected Environment - Hydrology

Changing hydrologic characteristics of the SASA project site would also affect flows farther downstream. Mitigation techniques need to consider not only the effect of development on local runoff rates and volumes, but also changes in the hydrology of Des Moines Creek.

Two hydrologic computer models have been generated to evaluate impacts from SASA development. The first model describes and evaluates site-specific impacts such as site runoff rates and volumes. The second model evaluates impacts to Des Moines Creek, and downstream fisheries, and defines mitigation measures. The first model study area, called the "simulation area," is a region common to all SASA alternatives. The second model study area is the Des Moines Creek watershed, focused primarily on the east branch whose headwaters come from Bow Lake. In this section, the affected environment for each of the models will be described and model input parameters summarized.

4.6.2.1 Watershed Description

Figure 4.6-1 shows the SASA simulation area located in the 3,700 acre Des Moines Creek watershed. The watershed is highly urbanized and includes the cities of Des Moines, Normandy Park, SeaTac, and Burien. Sea-Tac International Airport occupies approximately 20% of the watershed and is the watershed's dominant hydrological influence. The area directly southeast of the airport, once residential, has largely been purchased by the Port as part of the Noise Remedy Program. The Tyee Valley Golf Course occupies the area immediately south of the airport. The remainder of the watershed is mixed residential, commercial, and industrial uses.

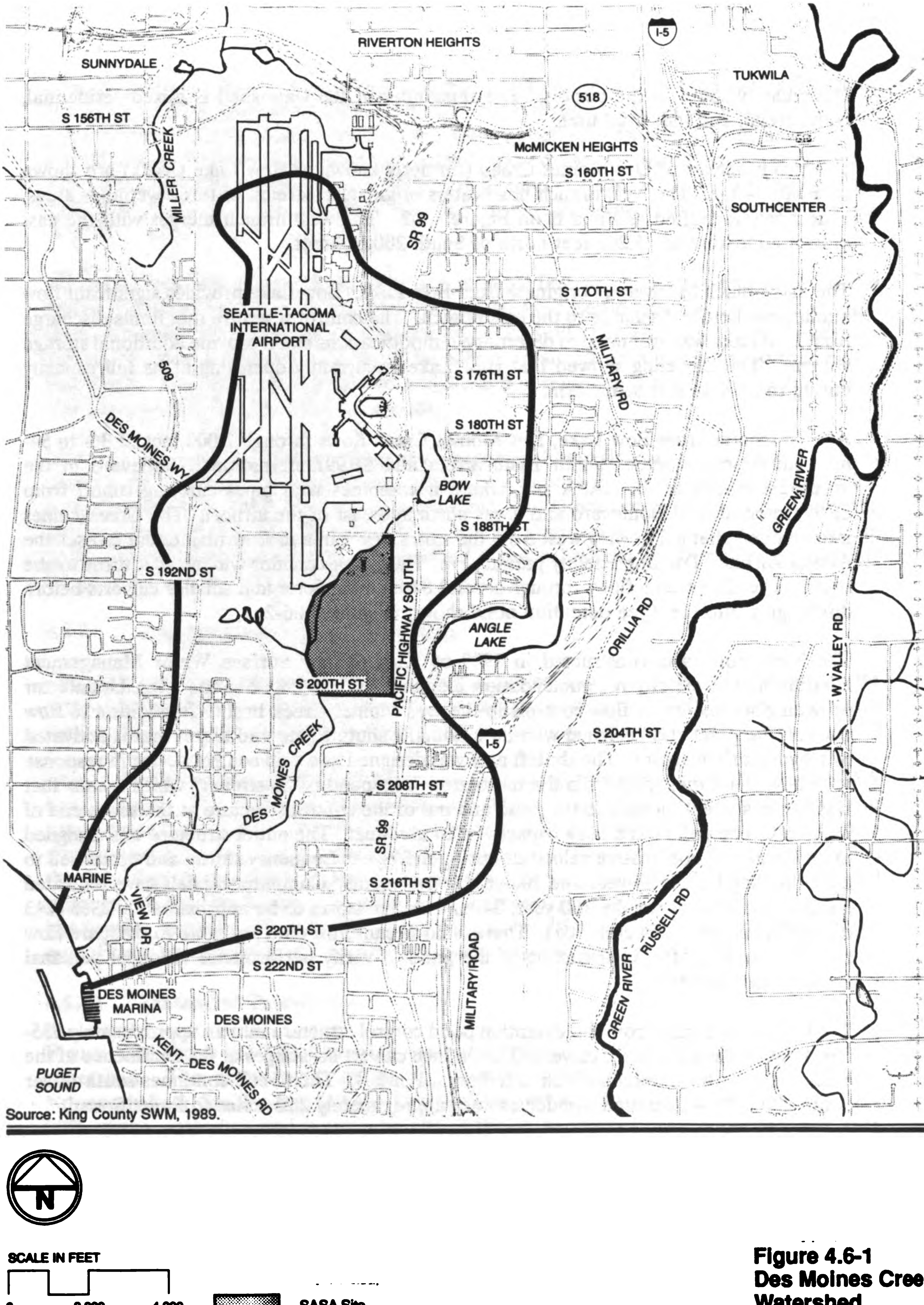
The two branches of Des Moines Creek (formerly known as Bow Lake Creek) are shown on Figure 4.6-2. The west branch headwaters originate upstream of three wetlands areas, collectively identified as Pond B on Figure 4.6-2. The west branch merges with the east branch approximately 1,200 feet north of South 200th Street.

The east branch headwaters originate from Bow Lake. Bow Lake provides significant flow attenuation before discharge to the east branch. The control structure that limits discharge from Bow Lake was evaluated to determine if modifications could provide additional storage volume. The modeling showed that Bow Lake is currently operating at its full capacity during the 100-year design storm.

After discharge from Bow Lake, Des Moines Creek flows through 2,000 feet of 36- to 54-inch storm sewers under South 188th Street and SR99/International Boulevard to the northwest corner of the SASA site, where it combines with pipes carrying runoff from SR99/International Boulevard and areas north and east of the airport. The Creek comes into an open channel flowing west from the storm sewer in a narrow ravine that crosses the Alaska Airlines Training Facility parking lot. The creek corridor widens as it turns to the south. The Creek then flows through several 84-inch diameter and smaller culverts before discharging into the Tyee detention pond shown in Figure 4.6-2.

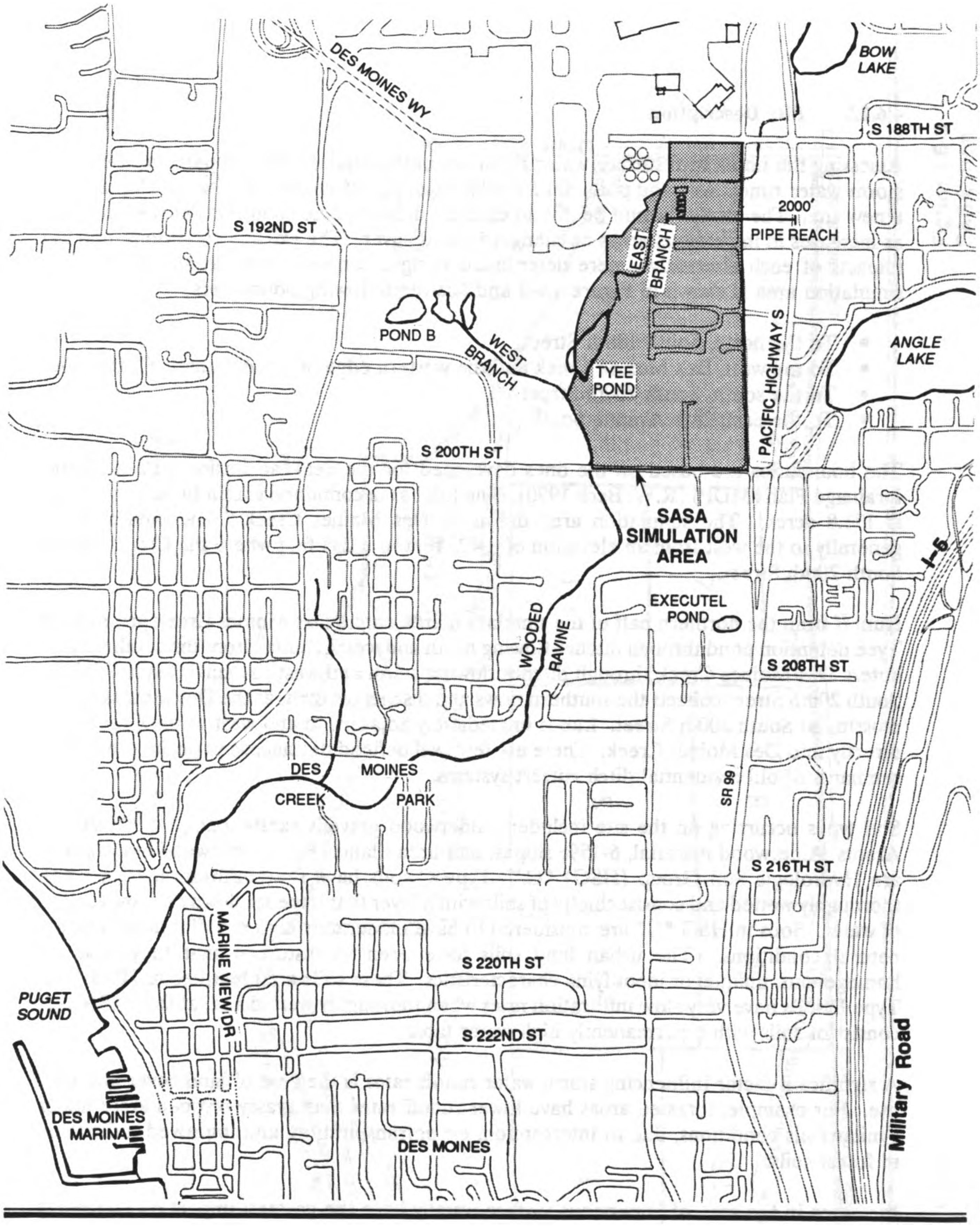
The Tyee Pond was constructed in 1989 by King County Surface Water Management Division as the priority recommendation identified in the 1988 SeaTac Area Update for providing surface water flow controls in the Des Moines Creek basin. In addition to flow control, the pond was designed with an automatic shutoff gate and alarm that is activated by a hydrocarbon sensor. The shutoff gate was designed as a spill control device in response to two large jet fuel spills from the tank farm. The pond is "in-stream" which means that Des Moines Creek flows into the pond and out of the control structure at the south end of the pond. The pond has a peak capacity of 24 acre-feet. The outlet structure was designed to limit flows to non-erosive velocities during the 2-year frequency storm, and optimized to limit flooding for the 25-year and 100-year storm events. Computer models have indicated a reduction in flows for the 100-year, 24-hour design storm to be approximately 23% (243 cfs to 188 cfs) (R.W. Beck 1990a). There is no stream flow data available to compare flow rates before and after construction of the pond to verify performance (Bloedel personal communication 1992).

The Creek discharges from the detention pond control structure into an approximately 535-foot-long, 36-inch-diameter culvert. The 36-inch culvert discharges at the confluence of the creek with the west branch which is fed from Pond B. The Creek continues south under South 200th Street through wooded ravines approximately 2.25 miles to Puget Sound.



Source: King County SWM, 1989.

Figure 4.6-1
Des Moines Creek
Watershed



NOT TO SCALE

Figure 4.6-2
Des Moines Creek

4.6.2.2 Site Description

Assessing the impacts to surface water runoff volumes requires the comparison of existing storm water runoff with the potential for additional runoff created by the development of a new site. The change would be due to changes in hydrologic conditions at the site, such as increases in impervious areas or changes in land cover. The existing conditions, and the impacts of each alternative, were determined using a computer simulation model. The simulation area is shown in Figure 4.6-3 and has the following boundaries:

- To the north, South 188th Street
- To the west, Des Moines Creek and the western edge of the Alternative 3 footprint
- To the south, South 200th Street
- To the east, 28th Avenue South

The boundaries are based on the ones developed for the Sea-Tac Business Park Master Drainage Plan (MDP) (R.W. Beck 1990). The total area contained within these boundaries is 171.8 acres. The simulation area drains to Des Moines Creek. The land slope is generally to the west from an elevation of ±425 feet to ±235 feet where the Creek crosses South 200th Street.

Runoff from the northern half of the simulation area enters Des Moines Creek prior to the Tyee detention pond through ditches flowing north and west. Runoff from the southern half enters Des Moines Creek through ditches flowing south and west. A culvert system along South 200th Street collects the southern flows and discharges them at the Des Moines Creek crossing at South 200th Street. Lands immediately adjacent to and west of the Creek flow directly into Des Moines Creek. There are few well defined drainageways onsite other than remnants of old residential ditch culvert systems.

Soil types occurring on the site include: Alderwood gravelly sandy loam, 6-15% slopes; Arents, Alderwood material, 6-15% slopes; and urban land. Both Alderwood associations are Hydrologic Soil Group (HSG) "C." Type C soils have slow infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water. Soils in HSG "C" are considered to have moderately high runoff potential under natural conditions. The urban land soils have been so disturbed that they have no homogenous, unique, or identifying characteristics. These soils are identified as HSG "D." Type D soils have very slow infiltration rates when thoroughly wetted and, at the SASA site, consist of soils with a permanently high water table.

A significant factor influencing storm water runoff rates is the type of land cover and land use. For example, forested areas have lower runoff rates than grassy or open areas under similar soils conditions, due to interception, evapotranspiration, and improved infiltration in forest soils.

Increases in the area of impervious surface usually have the greatest impact on increasing storm water runoff rates and volumes. There are several acres of existing impervious

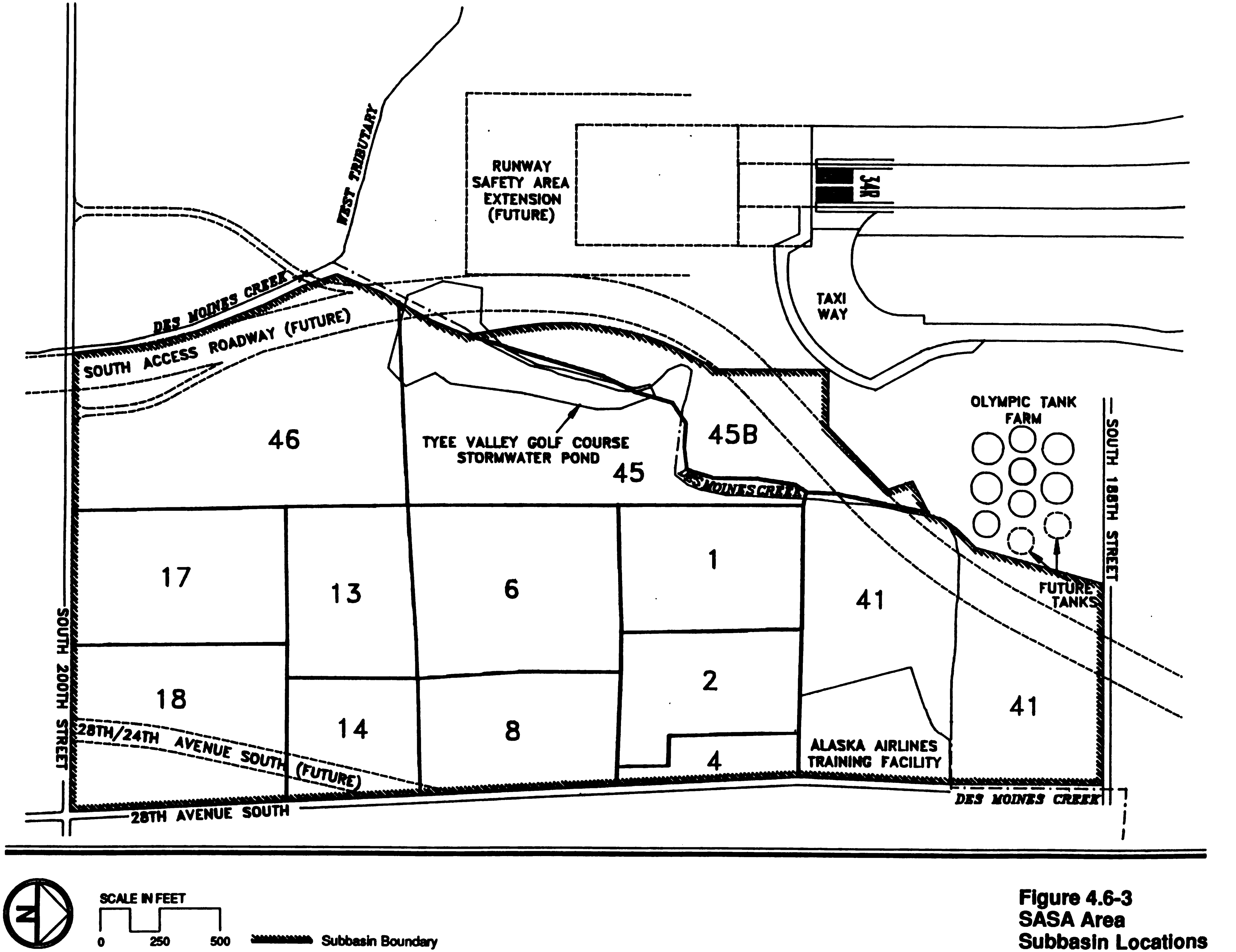


Figure 4.6-3
SASA Area
Subbasin Locations

surface on the SASA site. The majority are remnants of the residences that were purchased by the Port under the Noise Remedy Program. Other existing impervious surfaces include a large vacated parking lot near South 200th Street, roadways and parking lots serving the Tyee Valley Golf Course, and parking lots for airport facilities.

4.6.2.3 Storm Water Modeling Parameters

Land use, vegetation, soil type, slope, and presence of drainage facilities all affect the hydrologic properties of a drainage basin. These properties of a drainage basin can be summarized in three parameters necessary for computer modeling. The parameters include pervious curve number, travel time, and impervious area. Each of these are described below:

- Pervious Curve Number - This parameter relates runoff to precipitation and takes into account soil type, land use and soil cover. All being equal, a larger curve number generates increased runoff volumes.

- Travel Time - Travel time is defined as the amount of time it takes for the most hydraulically distant point in a basin to contribute runoff to the basin hydrograph (runoff versus time). If two basins are equal in all respects except for travel time, the basin with the longer travel time will generate a smaller peak flow.

- Impervious Area - Impervious areas are a function of the degree of basin development. Industrial, commercial, and high density residential areas are largely impervious and contribute greater amounts of runoff than fields and forest, which contain no impervious areas.

The methods, areas, and assumptions for determining these parameters for the SASA subbasins are similar to those used in the MDP. Data from the MDP was used where applicable.

4.6.3 Construction and Operation Impacts - Water Quality

4.6.3.1 No-Action Alternative

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place would be subject to separate environmental review.

4.6.3.2 Alternative 1

Construction Impacts

Sediment. Increased sediment loads in runoff would be the principal change in water quality caused by construction. Clearing, grading, and disturbance of soils promotes erosion by water which then carries the soil (sediment) to receiving waters such as Des Moines

Creek. Sedimentation of creeks can degrade aquatic habitats. The amount of sediment leaving a site is determined by six major factors:

- Amount and erosive force of precipitation
- Susceptibility of the soil type to erosion
- Steepness of terrain
- Distance and length of slope to a receiving water
- Type of vegetation or other soil cover
- Sediment and erosion controls used (Ecology 1991b).

Also, the overall amount of soil being cleared, graded, or otherwise disturbed determines the amount of soil available for erosion.

The site is located on Alderwood and Arents soils which are moderately susceptible to soil erosion. The site is gently to steeply sloping with some slopes as steep as 30%. Generally the slopes are 8 to 14%. Alternative 1 would occupy the smallest area of any of the build alternatives and would disturb the least amount of soil. Although these factors would indicate a low erosion rate, the site is very close to Des Moines Creek. This makes it likely that the construction of Alternative 1 would adversely impact the Creek with increases in sediment.

Alternative 1 would require some relocation of portions of Des Moines Creek from its present course. The construction of the new stream course, as well as filling of the present stream bed, would allow additional sediment to enter runoff and stream flows. The degree of potential impact can be gauged by the length of stream relocated. Alternative 1 would relocate 3,075 feet of existing stream bed.

Additionally, Alternative 1 includes a storm water management facility to the north of the site and a runoff treatment facility west of the site. Construction of both of these facilities would present further opportunities for sedimentation of the Creek.

Alternative 1 would include standard sediment and erosion control practices required by King County (KCPW 1990c). These practices are described in Section 4.6.5, Mitigation Measures.

Construction Spills and Chemicals. Grading and construction of Alternative 1 would require many kinds of heavy equipment that are prone to minor spills and leaks. The most critical area of concern would be runoff from any on-site refueling or fuel storage areas.

Fertilizers and pesticides would be used during any landscaping activity necessary at the site. These chemical applications can contaminate surface waters through storm water runoff. Usually ground covers and landscape plants are fertilized at the time of installation. However, modern fertilizers tend to release nutrients slowly over a period of months, making it less likely to heavily contaminate storm water runoff during the initial application.

Operation Impacts

Storm Water Runoff. In non-industrial urban areas the most common source of pollutants in surface waters is storm water (Schueller 1987). Pollutants become deposited on impervious surfaces through liquid leaks, airborne deposition, and wear of materials such as tires and automobile parts. Storm water washes off these surfaces and carries the pollutants to streams, lakes, and other receiving waters.

Approximately 86% of the storm water runoff from the SASA site for Alternative 1 would be collected and transported to the runoff treatment facility. The location of the proposed SASA runoff treatment facility and storm water management facility is shown on Figure 4.6-4. The runoff treatment facility would remove most of the pollutants from the runoff and discharge the treated water offshore into Puget Sound. All paved surfaces including hardstands, taxiways, maintenance areas, and parking lots would drain to the runoff treatment facility. Only roof runoff would enter Des Moines Creek through the storm water management facility.

Roof runoff is generally considered the cleanest fraction of storm water runoff from urban sites. For example, King County storm water regulations do not require that roof runoff go through water quality facilities such as grassed swales and wet ponds (KCPW 1990c). However, roof runoff from the SASA proposal would travel through a water quality pond and a biofiltration area in all build alternatives (see Section 4.6.5, Mitigation Measures).

Although roof runoff is relatively clean, airborne pollutants present in urban environments settle onto roof surfaces and are eventually washed away by runoff. Alternative 1 would have 12.81 acres of roof. Generally, the greater the amount of roof area, the greater the amount of pollutants present in the runoff from those areas. Table 4.6-3 presents a comparison of the various alternatives based on a conservative estimate of the pollutant load of suspended sediment (or particulates) discharged to the storm water management facility from roofs. These pollutant loads would be reduced by treatment in the water quality pond and biofiltration area in the facility.

Stream Relocation. Stream relocation could cause some changes to the quality of water flowing through the stream. The most likely impacts would be from the temporary loss of shade which would increase temperatures in the stream. However, much of the existing stream would be in and near the present golf course where there is little or no shading from adjacent vegetation. It is therefore likely that plantings along the relocated stream banks would provide as much shade as presently exists.

Another potential impact could be caused by reduced stream length which would reduce opportunities for oxygenation of the creek water. However, the relocation proposed for Alternative 1 would include an increase in overall stream length. The existing creek segment is 3,075 feet long and the proposed segment is 4,390 feet long. The relocation would have sufficient riffles to maintain at least existing levels of oxygenation.

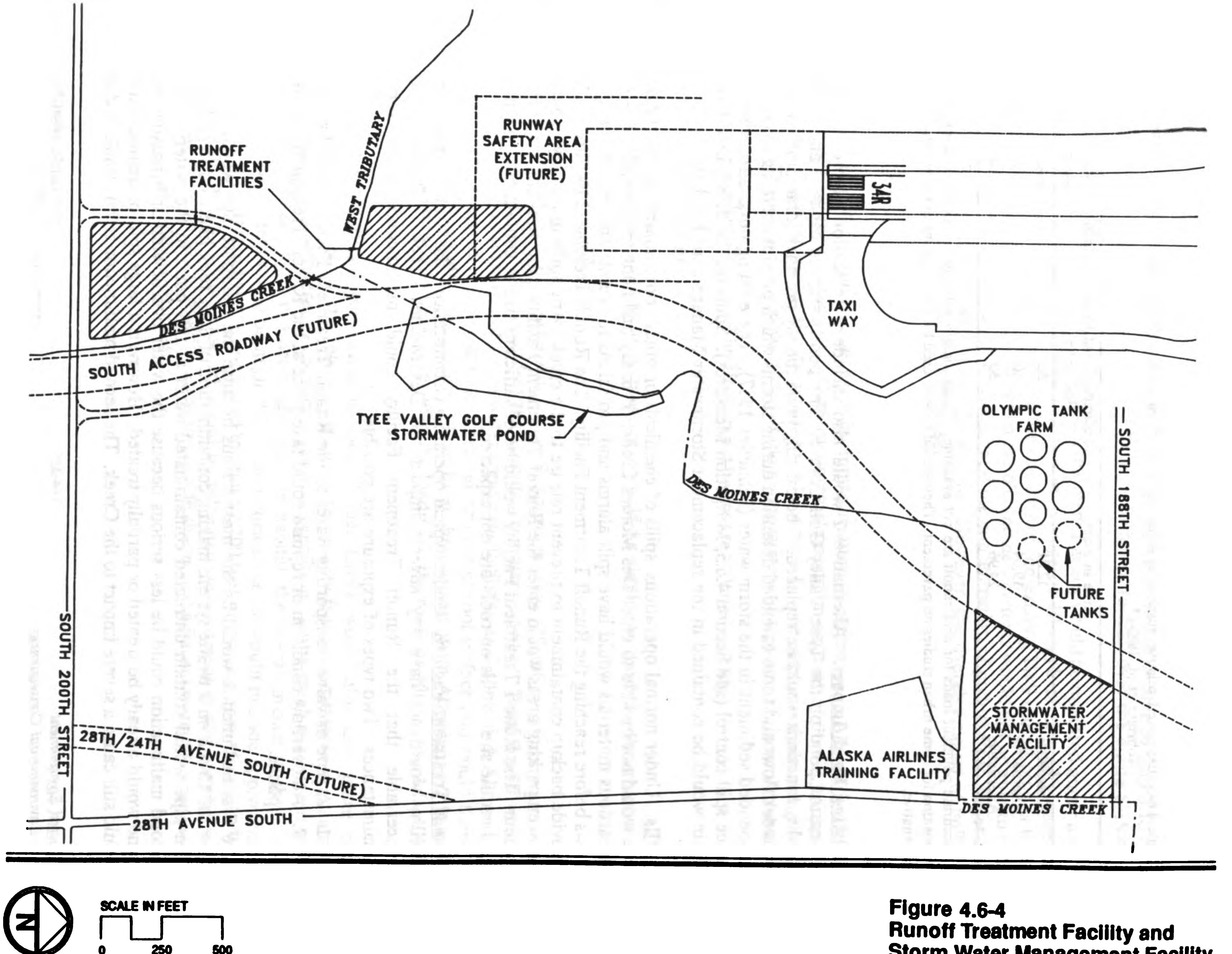


Figure 4.6-4
Runoff Treatment Facility and Storm Water Management Facility

Table 4.6-3. Estimated relative suspended sediment loads from roof runoff for all construction alternatives (Kobriger et al. 1983).*

	Area in acres	Sediment Load Rate (lbs/ac/yr)	Relative Sediment Load (lbs/yr)
Alternative 1	12.81	50	640
Alternative 2	19.04	50	952
Alternative 3	24.96	50	1,248

* Accurate pollutant loads for roof runoff are not available. These loads are based on relatively low rates of deposition for some urban studies on pavement. They should only be used for comparisons of the effects of each alternative.

Existing Pond Impact. Alternative 1 would also include a relocation of the existing detention pond on the Tyee Valley Golf Course. The pond's storage capacity and water quality functions would be replaced. The existing pond mainly provides some biofiltration of creek flows and some extended detention during storms which provides settling of coarse suspended sediment in the storm water (Schueller 1987). The existing pond also provides some spill control (see Section 4.6.5, Mitigation Measures). Spills on the SR99/Bow Lake basin would be contained in the replacement Stormwater Management Facility.

Spills. Under normal operations, spills of chemicals or other contaminants on the SASA site would not be able to enter Des Moines Creek. Primary maintenance operations using hazardous materials would have spill alarms and provisions for cutoff and containment of flows before reaching the Runoff Treatment Facility. The Runoff Treatment Facility would provide backup containment to prevent release to the creek. Any spills in taxiways, roads, or even parking areas would enter the Runoff Treatment Facility collection and treatment system. The Runoff Treatment Facility would be of sufficient size to contain any potential spill on the site. Spills on roofs are not expected.

Runoff Treatment Facility. Under typical operating circumstances, the Runoff Treatnent Facility would not have any adverse impacts on Des Moines Creek. However, it is conceivable that the Runoff Treatment Facility could malfunction under some circumstances. Two types of exposure are possible:

1. A pipe or valve transporting water to the Runoff Treatment Facility could break.
2. An overflow condition or rupture could take place at the Runoff Treatnent Facility ponds.

The first malfunction would be the most serious because the transport pipe would travel over the Creek on a trestle system making contamination of the Creek likely during a leak. The pipe would contain untreated contaminated water at this point in the system. The second malfunction could be less serious because the water overflowing or bypassing the pond would already be treated or partially treated. However, a large spill of treated water would still cause a severe impact to the Creek. The second malfunction is very unlikely due to the size of the Runoff Treatment Facility ponds which would be able to hold 3.18 million cubic feet of water (or all the runoff from 10 inches of rainfall over the entire SASA site).

It is anticipated that the SASA Runoff Treatment Facility would be operated under a permit similar to the existing IWS which allows an average of 10 mg/L of oil and grease to be released to Puget Sound. Because the capacity of the existing IWS outfall pipe is limited, the new combined discharge rate from the old and new systems would not be able to exceed 10 cfs. Therefore, the rate of discharge and the concentration of pollutants to Puget Sound would not increase above the existing system. However, the overall amount of pollutants discharged to the Sound might increase.

Option 1A

Under Option 1A, the area set aside for future aviation maintenance in Alternative 1 would not be developed by the Port. Construction and operation impacts of the SASA proposal would be similar to, but slightly less than, Alternative 1. The impacts of any other type of development that could occur there would be the subject of separate environmental review.

4.6.3.3 Alternative 2 - The Preferred Alternative - Water Quality

Construction Impacts

The construction impacts of Alternative 2 would be similar to those for Alternative 1.

Operation Impacts

Storm Water Runoff. Under Alternative 2, approximately 77% of the storm water runoff from the site would be treated in the Runoff Treatment Facility. Roof runoff would be treated by the same type of storm water treatment facilities as described in Alternative 1. However, Alternative 2 would have a greater amount of roof surface and would therefore produce more runoff. The pollutant load from the roof runoff in Alternative 2 has been estimated to be somewhat greater than the load from the roofs of Alternative 1 (see Table 4.6-3).

Stream Relocation. Relocation of Des Moines Creek would also take place under Alternative 2. The most likely impacts to water quality from relocation of a stream are increased water temperatures and changes in oxygenation. If the creek is replaced with a similar channel length, character, and riparian habitat, the overall impact to these water quality parameters would be negligible. The relocated creek would provide approximately 4,100 feet of stream habitat, compared to about 2,200 feet of existing open channel. While nearly all of the existing channel would be relocated, replacement of the channel would include revegetation of riparian areas to provide shade, and adjacent wetlands which would provide water quality benefits.

__Existing Pond Impact__. As with Alternative 1, this alternative would require the relocation of the existing Tyee Pond. The Pond's water quality benefits and storage capacity would be replaced. The impacts to the Pond would be identical to Alternative 1.

__Spills__. Spills of chemicals or other contaminants would not be able to reach Des Moines Creek under normal operations. Primary maintenance operations using hazardous materials would have spill alarms and provisions for cutoff and containment of flows before reaching the Runoff Treatment Facility. The Runoff Treatment Facility would provide backup containment to prevent release to the creek. Any spills in taxiways, roads, or even parking areas would enter the Runoff Treatment Facility collection and treatment system. All of the likely areas for spills would be connected to the Runoff Treatment Facility where they could be captured and treated.

__Runoff Treatment Facility.__ The Runoff Treatment Facility under this alternative is identical to Alternative 1. The possibility of a valve or pipe malfunction does exist but is unlikely. The water quality impacts from such a malfunction would be severe. Due to the large size of the Runoff Treatment Facility ponds, overflows or bypasses of the ponds are also very unlikely. The water quality impacts in such a situation might be less severe because water would be partially treated at this point in the system.

Similar to the other alternatives, impacts to Puget Sound from the Runoff Treatment Facility discharge would not greatly increase over existing levels because the rate and concentration of discharges would most likely remain the same. However, the overall amount of pollutants discharged to the Sound might increase.

4.6.3.4 Alternative 3 - Water Quality

__Construction Impacts__

__Sediment Impacts__. Alternative 3 would disturb the greatest amount of soil of any of the alternatives, creating more potential erosion. Alternative 3 would also entail complicated grading and construction techniques similar to Alternative 2 which could prolong the period of unstabilized soils.

Alternative 3 would require the relocation of 3,375 feet of Des Moines Creek which is the same as Alternative 1 but more than Alternative 2. Filling and movement of the creek would create further sedimentation impacts to surface waters. Other sedimentation problems might be caused by construction of the Storm Water Management Facility and Runoff Treatment Facility as described under the other alternatives.

__Construction Spills and Chemicals__. The amount and type of potential spills from construction equipment would be the same as that described for the other alternatives. The level of potential impacts from fertilizer and pesticide use is also approximately the same as in the other alternatives.

Operations Impacts

Storm Water Runoff. Approximately 78% of the storm water runoff from this alternative would be treated by the Runoff Treatment Facility. This would include runoff from all of the more contaminated areas proposed on the site including parking lots. The other 22% of the runoff would be from roofs and would be treated by the same type of storm water facilities described under the other alternatives. Alternative 3 would have the greatest amount of roof surface of any of the alternatives and would therefore create the greatest pollutant load discharged to the water quality pond of the Storm Water Management Facility (see Table 4.6-3).

Stream Relocation. Relocation of portions of Des Moines Creek would also take place under Alternative 3, although the changes in the stream course are somewhat different from the other alternatives. As described for the other alternatives, if the Creek is replaced with the same channel length, character, and riparian habitat, the overall impact to water quality would be negligible. The total length of the existing stream segment is 3,075 feet. The relocated stream would have approximately 3,270 feet of open channel with a 900-foot-long culvert near the existing tank farm. Strictly in terms of water quality, the culvert would add no additional impacts to the water in Des Moines Creek. The rest of the stream would be planted and constructed so that temperature and oxygenation would be at least the same as the existing stream.

Existing Pond Impacts. As in the other construction alternatives the existing detention facility on the Tyee Valley Golf Course would be relocated to north of the SASA site. The impacts to the pond would be identical to those described for Alternative 1.

Spills. Spills of chemicals and other contaminants would not enter Des Moines Creek under. Primary maintenance operations using hazardous materials would have spill alarms and provisions for cutoff and containment of flows before reaching the Runoff Treatment Facility. The Runoff Treatment Facility would provide backup containment to prevent release to the creek. Any spills in taxiways, roads or even parking areas would enter the Runoff Treatment Facility collection and treatment system. All of the likely areas for spills would be connected to the Runoff Treatment Facility where the spills could be captured and treated.

Runoff Treatment Facility. The Runoff Treatment Facility under this alternative is identical to that in the other alternatives. Potential impacts from unlikely spills or malfunctions are described in Alternative 1 and are the same for this alternative. Only minor impacts to Puget Sound are possible from the Runoff Treatment Facility discharge because the concentration of pollutants and rate of discharge for the Runoff Treatment Facility would not increase above the existing IWS levels. However, the overall amount of pollutants delivered to the Sound might increase under Alternative 3.

4.6.4 Construction and Operation Impacts - Hydrology

Development of the SASA site would change the hydrologic properties of the site. Compaction of soils and paving of areas for taxiways, hangers, buildings, and parking lots would greatly increase the amount of impervious surfaces and decrease infiltration and evapotranspiration by native vegetation. Filling wetlands, depression storage, floodplains, and stream overbank areas would decrease detention and flow attenuation. The unmitigated effect of SASA development would be to greatly increase runoff flows and volumes to Des Moines Creek.

Much of the runoff from the constructed SASA facilities would enter the proposed Runoff Treatment Facility, with only the roofs of buildings contributing runoff indirectly to Des Moines Creek through the Storm Water Management Facility. Table 4.6-4 summarizes drainage areas to the Runoff Treatnent Facility and to the Storm Water Management Facility necessary to mitigate removal of the Tyee Pond.

Table 4.6-4. The Runoff Treatment Facility and Storm Water Management Facility basin areas.

Alternative	Footprint Area	Area to Runoff Treatment Facility	Area to Storm Water Management Facility
1	55.9 acres	43.1 acres	12.8 acres
2	84.7 acres	65.7 acres	19.0 acres
3	111.6 acres	86.6 acres	25.0 acres

Table 4.6-4 shows the area draining to the proposed storm water management facility and eventually Des Moines Creek is much smaller than the total area draining to Des Moines Creek prior to site disturbance.

The simulation area model was run for each alternative under pre- and post-development conditions. Appendix E gives a sample output for each alternative generated under the 2-year design storm. A summary of the results for all storm events is presented in Table 4.6-5. Table 4.6-5 shows simulation area runoff rates and volumes to Des Moines Creek for all design storms with each alternative. Percentage increases in runoff rates and volumes between pre-existing and post-site development are also shown. Negative numbers indicate a decrease between existing and developed conditions. Impacts for each alternative are described in detail following the table.

4.6.4.1 No-Action Alternative - Hydrology

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place on the site would be subject to separate environmental review.

Table 4.6-5. Summary comparison of runoff rates and volumes.

Design Storm	Alternative	Runoff Rate (cfs)			Runoff Volume (Acre-Feet)		
		Exist	Future	Increase	Exist	Future	Increase
2-Year 24-Hour	1	33.3	31.1	-6.6%	14.2	12.3	-13.4%
	2	33.3	31.6	-5.1%	14.2	11.5	-19.0%
	3	33.3	27.8	-16.5%	14.2	9.7	-31.7%
10-Year 24-Hour	1	62.5	53.8	-13.9%	24.9	20.7	-16.9%
	2	62.5	52.2	-16.0%	24.9	18.6	-25.3%
	3	62.5	44.7	-28.5%	24.9	15.6	-37.3%
25-Year 24-Hour	1	79.6	66.9	-16.0%	31.2	25.5	-18.3%
	2	79.6	63.8	-19.8%	31.2	22.7	-27.2%
	3	79.6	54.2	-31.9%	31.2	18.9	-39.4%
100-Year 24-Hour	1	104.1	85.5	-17.9%	40.2	32.4	-19.4%
	2	104.1	80.2	-23.0%	40.2	28.5	-29.1%
	3	104.1	67.5	-35.2%	40.2	23.6	-41.3%

4.6.4.2 Alternative 1 - Hydrology

The proposed Alternative 1 footprint is 55.9 acres. Of the altered area, approximately 95% is impervious surfaces. The remaining 5% of the area would be occupied by slope runouts and landscaping. Of the total footprint area, runoff from 77.1% would be diverted to the Runoff Treatment Facility, treated, and discharged into Puget Sound. Rainfall on the remaining 22.9% of the area would be collected on rooftops and diverted to a single detention pond through a storm drain system. The detention pond would discharge to Des Moines Creek.

Alternative 1 would result in a net loss of 3.0 acres in impervious surfaces draining to Des Moines Creek. The effect of the reduction in impervious area and diversion of flows to the Runoff Treatment Facility would be a reduction in site runoff to Des Moines Creek. Table 4.6-5 shows net decreases in runoff rates and volumes for all design storms.

Although a decrease in runoff quantities is expected for Alternative 1, flows could increase in Des Moines Creek downstream of the existing Tyee Pond. This is because the flow attenuation and detention/spill control properties of the Tyee Pond that currently detains flow from the SASA footprint area would be altered by construction of the proposal. The 24 acre-feet of existing storage in the pond would be lost. In addition, Alternative 1 development would require relocation of approximately 3,375 feet of Des Moines Creek in the reach from 28th Avenue South to the confluence of the east and west branches. Floodplain storage in this reach would be lost without mitigation.

Table 4.6-6 shows the degree of flow attenuation currently provided by the Tyee Pond and expected increase in flows from existing conditions that could result from Alternative 1 development without mitigation.

Table 4.6-6. Alternative 1 - expected increase in Des Moines Creek flows downstream of Tyee Pond.

Storm Event	Existing Inflow (cfs)[1]	Existing Outflow (cfs)[1]	Percent Attenuation	Increase Expected Without Mitigation (cfs)[2]
2-Year	75	52	31%	21
10-Year	142	78	45%	55
25-Year	183	94	49%	76
100-Year	243	188	23%	36

[1] From Sea-Tac Business Park Master Drainage Plan (R.W. Beck 1990)
[2] Location at confluence of east and west branches of Des Moines Creek

Option 1A

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place on the site would be subject to separate environmental review.

4.6.4.3 Alternative 2 - The Preferred Alternative - Hydrology

The proposed Alternative 2 footprint is 84.7 acres. Of the altered area approximately 95% would be impervious surfaces. The remaining 5% of the area would be occupied by slope runouts and landscaping. Like Alternative 1, runoff from 77.6% of this area would be diverted to the Runoff Treatment Facility, treated and discharged into the Puget Sound. Rainfall on the remaining 22.4% of the area would be collected on rooftops and diverted to the proposed detention pond of the Storm Water Management Facility.

Alternative 2 would result in a 2.4 acre net loss in impervious surface within the simulation area. The effect of the reduction in impervious area and diversion of flows to the Runoff Treatment Facility would be a reduction in site runoff to Des Moines Creek. Table 4.6-5 shows net decreases in runoff rates and volumes from the simulation area for all design storms.

Although a decrease in runoff quantities are expected for Alternative 2, flows would increase in the reach of Des Moines Creek downstream of the existing Tyee Pond due to the proposed SASA facility. The 24-acre-feet of existing storage in the Pond would be lost. In addition, Alternative 2 development would require relocation of 2,575 feet of Des Moines Creek; 800 feet less than Alternative 1. Floodplain storage in this reach would be lost without mitigation.

Table 4.6-7 shows the degree of flow attenuation currently provided by the Tyee Pond and expected increase in flows that could result from development of Alternative 2 without mitigation. Comparison with Table 4.6-6 shows a decrease in flows for all storms up to 5 cfs for the 100-Year design storm, therefore Alternative 2 would have slightly less storm water runoff impacts than Alternative 1.

Table 4.6-7. Alternative 2 - expected increase in Des Moines Creek flows downstream of Tyee Pond.

Storm Event	Existing Inflow (cfs)[1]	Existing Outflow (cfs)[1]	Percent Attenuation	Increase Expected Without Mitigation (cfs)[2]
2-Year	75	52	31%	21
10-Year	142	78	45%	54
25-Year	183	94	49%	73
100-Year	243	188	23%	31

[1] From Sea-Tac Business Park Master Drainage Plan (R.W. Beck 1990)
[2] Location at confluence of east and west branches of Des Moines Creek

4.6.4.4 Alternative 3 - Hydrology

The proposed Alternative 3 footprint is 111.6 acres. Of the altered area approximately 95% would be impervious surfaces. The remaining 5% of the area would be occupied by slope runouts and landscaping. Runoff from 77.6% of the area would be diverted to the Runoff Treatment Facility, treated and discharged into the Puget Sound and the remaining 22.9% of the area would be collected on rooftops and diverted to a proposed detention pond and subsequently Des Moines Creek.

Alternative 3 would result in a 3.9 acre net loss in impervious surfaces. Alternative 3 would result in the largest decrease in runoff rates and volumes and therefore would produce the least downstream impacts.

Like Alternatives 1 and 2, Alternative 3 would produce increased flows in the reach of Des Moines Creek downstream of the existing Tyee Pond without appropriate mitigation. The flow attenuation and detention/spill control properties of the Tyee Pond that currently details flow from the SASA footprint area would be altered by encroachment and filling. The 24-acre-feet of existing storage in the pond would be lost. In addition, Alternative 3 development would require relocation of approximately 3,375 feet of Des Moines Creek in the reach from 28th Avenue South to the confluence of the east and west branches, including placing a 900-foot reach in a culvert under the site. Floodplain storage in this reach, especially within the culvert, would be lost without mitigation.

Table 4.6-8 shows the degree of flow attenuation currently provided by the existing Tyee Pond and expected increase in flows that could result with its removal and development of Alternative 3 without mitigation. Comparison with Tables 4.6-5 and 4.6-6 show a decrease in unmitigated flows for all storms up to 18 cfs (comparing Alternatives 1 and 2) for the 100-Year Design Storm. Alternative 3 would have slightly less surface water impacts than Alternatives 2, which would have slightly less impact than Alternative 1.

Table 4.6-8. Alternative 3 - expected increase in Des Moines Creek flows downstream of Tyee Pond.

Storm Event	Existing Inflow (cfs)[1]	Existing Outflow (cfs)[1]	Percent Attenuation	Increase Expected Without Mitigation (cfs)[2]
2-Year	75	52	31%	18
10-Year	142	78	45%	46
25-Year	183	94	49%	64
100-Year	243	188	23%	18

[1] From Sea-Tac Business Park Master Drainage Plan (R.W. Beck 1990)
[2] Location at confluence of east and west branches of Des Moines Creek

4.6.4.5 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area water quality and hydrology. The site under consideration for the runway is located within the Miller Creek basin and is separated from the area of the SASA site. Impacts are not expected to be additive. Development of an additional runway on the west side of the airport could alter existing runoff patterns and could require the construction of additional storm water piping and treatment and/or control systems. However, it is most likely that storm water would drain into Miller Creek basin. Engineering has not been completed to provide a detailed estimate of impacts to water quality. Permits (e.g. NPDES, Corps of Engineers Sections 10/404), would be required for such a runway.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for water quality impacts of regional transportation improvements south of the airport. Areas involved, including portions of the Des Moines Creek basin, would depend on route alignment decisions which have not yet been made. Planning or design for other airport projects has not yet progressed to the point that their impacts on water quality and hydrology can be estimated. The permit review and approval processes would include further detailed examination of the design and impacts of such projects. Compliance with the requirements of permitting agencies would mitigate identified water quality impacts. Therefore, no ultimate significant cumulative impacts are anticipated. The potential for cumulative impacts on water quality and hydrology will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.6.5 Mitigation Measures - Water Quality

4.6.5.1 Runoff Treatment Facility

Under all the build alternatives, the production of chemical wastes and other contaminants at the airport would increase. The pollutants would be removed by primary treatment (settling in ponds). The ponds for the Runoff Treatment Facility would be 3.18 million cubic feet in capacity which is large enough to capture all the runoff from 10 inches of rain over the largest proposed site footprint without any discharge to the outfall pipe.

The new Runoff Treatment Facility would discharge to the existing 18-inch-diameter outfall pipe from the existing IWS which eventually discharges offshore in Puget Sound. This pipe is currently operating near capacity during storms. The new ponds would be large enough so that discharge from the new Runoff Treatment Facility could be metered out over a long period of time. In this way, the existing 18-inch-diameter discharge pipe would be able to convey discharges from both systems.

As with all treatment systems, the Runoff Treatment Facility would not be 100% efficient in removing pollutants. It is anticipated that the proposed Runoff Treatment Facility would be operated under an NPDES permit similar to the one for the existing IWS. The average allowable discharge concentration for the existing IWS is 10 mg/L oil and grease, and the maximum allowable discharge concentration is 15 mg/L oil and grease.

Traditional methods of storm water treatment at industrial sites allow discharge of storm water directly to streams and lakes after treatment (KCPW 1990c). In comparison, the storm water treatment at the SASA site would be extremely thorough. Parking lots are known for relatively high levels of contaminants but traditionally are allowed to discharge runoff to streams after relatively low-level treatment (such as passage through a grass-lined swale). Runoff from parking lots on all the construction alternatives at the SASA site would be routed to the Runoff Treatment Facility.

The extremely large ponds for the new Runoff Treatment Facility would also have the capacity to control very large spills at the SASA site.

4.6.5.2 Roof Storm Water Runoff Treatment

Although roof runoff is considered relatively clean (KCPW 1990c) it would be passed through the storm water management facility or into wetlands before discharging downstream. (See Appendix E for detailed description of the storm water management facility.) The roof runoff would enter the wetpond cells or wetlands of the new facility where dense wetland vegetation would be established. Wetlands provide excellent biofiltration treatment of storm water runoff (Kobriger et al. 1983). This portion of the pond would also provide some detention that would aid in the removal of suspended sediment from the runoff.

4.6.5.3 On Site Spill Control Procedures

By far, the most effective means of maintaining water quality is to prevent contaminants from entering runoff (City of Seattle 1989); therefore, all operations at the SASA site would be required to establish spill control and response plans. These plans generally include daily practices for preventing small spills, identifying personnel responsible for different aspects of spill control and maintenance of spill control facilities, emergency response phone numbers, and emergency procedures. Further, equipment and facilities should be available on site to clean up large spills as well as to contain and limit small daily spills. Tanks and other on site facilities that hold used fluids and other contaminants should be readily accessible and regularly cleaned. Small and large chemical storage areas should include spill containment curbs or berms.

4.6.5.4 Sediment and Erosion Controls

Sediment and erosion controls would greatly limit the amount of sediment which enters Des Moines Creek. Construction contractors would be legally bound to follow a sediment and erosion control plan. The sediment and erosion controls would include those strategies required by King County (KCPW 1990c) and Ecology (Ecology 1990). Erosion and sediment controls might include, but would not be limited to: summer construction, silt fences, hay bales, brush barriers, gravel filter berms, inlet protection, sediment traps, sediment basins, mulching, matting, plastic covers, vegetative buffers, topsoil preservation, surface roughening, terracing, swales, riprap, and gabions.

4.6.5.5 Stream Relocation

Some or all of the stream segment extending from the Alaska Airlines Training Facility parking lot to the Tyee Pond would be relocated under each of the three build alternatives. The relocated segments would be designed to replace all of the functions lost by filling the existing stream corridor. Most of these functions do not directly pertain to water quality, and other aspects of the relocation are discussed in the various mitigation sections of this document. However, the specific water quality impacts on temperature, sedimentation, and oxygenation would be addressed in the design of the relocated segments.

Water temperature and oxygen content are two water quality parameters critical to fisheries habitat. Shading by vegetation is an important factor controlling stream temperature, and nearly the entire length of the relocated streambanks will be planted with native trees and shrubs to provide shade and minimize temperature variations. Design of the creek channel with riffles and weirs will provide turbulence and oxygenation. Oxygenation is usually determined by the amount of turbulence in a stream. The creek bed would be designed so that adequate riffles are provided to create turbulence.

During construction of the creek relocation, erosion and sedimentation could be a serious problem. The construction should be phased so that sedimentation is minimized. The proposed creek channel, bed, and plantings would be constructed and allowed to stabilize prior to the diversion of stream flow into the new channel. Once the creek flows are completely diverted from the existing creek, the filling of the old creek and grading of the site could begin. All sediment-laden runoff would be diverted away from the new stream channel into temporary erosion control structures.

4.6.5.6 Storm Water Management Pond

Similar to the stream relocation, several functions would be replaced by a new storm water management pond which are not entirely applicable to water quality and which are discussed in other natural environment sections. The existing Tyee Pond provides several water quality functions for Des Moines Creek including settling of coarse sediments during storms, reduction of erosive flows which cause downstream sedimentation, and tertiary spill control for the tank farm.

Most of these functions would be replaced or augmented at the proposed storm water management facility north of the main SASA footprint. The new pond would be a three-celled system with a 40-45 acre feet capacity. The first two cells would be an in-line facility densely vegetated with wetland plants. Wetlands are well known for their excellent water quality functions (Kobriger et al. 1983) and these wetlands would be improvement over minor biofiltration provided by the existing pond. The second cell would be off-line and would provide detention for large stormflows replacing the detention characteristics of the old pond. All the cells together would provide the same settling times for suspended sediments and the same reductions in peak flows as the original Tyee Pond.

Primary spill control would not be provided by the new pond. While in-stream spill control is less desirable than controlling spills prior to entering natural waterways, inclusion of a spill detector and flow control mechanism could provide secondary containment of spills from the Bow Lake/SR99 basin.

4.6.5.7 Biofiltration of Runway Runoff

Although recent water quality tests of runway runoff (see Appendix D) indicated the runoff was relatively clean, converting the runway drainage system from a closed pipe system to open swales might provide some water quality benefits to Des Moines Creek. Properly constructed grass swales provide biofiltration of runoff. Because the existing topography west of the main runway creates a natural depression, the drainage could be easily redirected to this area. The constructed swale could run south from near the existing IWS pond along the west side of the golf course and into the existing ponds on that side of the course. This route would create a swale approximately 1,400 feet long. Swales over 200 feet in length generally provide excellent water quality benefits (Schueler 1987). The swale would have to be carefully planted to discourage bird use.

4.6.6 Mitigation Measures - Hydrology

Mitigation of storm water runoff impacts would be accomplished by collecting and detaining runoff from the new site in a replacement pond with detention characteristics similar to the existing detention pond, and designing a replacement channel that provides equivalent conveyance and floodplain storage.

The new regional storm water detention facility is proposed to limit peak flow rates in Des Moines Creek at the location of the confluence of the west branch with Des Moines Creek. Existing flow rates for the 2-year, 10-year, 25-year, and 100-year design storm events were modeled. The proposed pond has a total depth of 13 feet, with 1 foot of freeboard, providing a maximum volume of 45-acre-feet. The new pond would reduce runoff rates from the SASA footprint area to a level below existing conditions and replace the volume of storage lost from the existing pond.

In each of the alternatives, the amount of storm water runoff would decrease. This is due to the large area of drainage basin that would be removed from the watershed and diverted to the Runoff Treatment Facility and little if any increase in impervious area. The opportunity to decrease flows below existing conditions is available. This could be done to provide smaller storm flows and increase habitat for fisheries in the Creek. Refer to the Natural Resources Mitigation Plan (Appendix G) for a discussion of storm water runoff mitigation measures.

The 24-acre-feet of storage currently provided in the existing storm water pond would increase to approximately 40 or 45 more feet to reduce 2-year storm flows and provide a greater degree of treatment.

The remaining pond storage proposed is necessary to adjust for changes in rates caused by a the new pond location. Some inflows from the south runway area that discharge into the Creek would no longer be attenuated by the existing pond. The proposed pond would be required to reduce upstream flows to a greater extent to provide the desired downstream flow rates.

The proposed Storm Water Management Facility provides advantages over the existing pond. By moving the pond upstream, a greater length of stream would be protected from peak flows that could damage fish habitat, improving the area of potential fish habitat. The pond volume could be increased to provide an even greater degree of protection from peak flows and velocities over existing conditions as previously described.

In addition to the flow reduction benefits of the detention pond, the presedimentation and biofiltration storm water pond would be located upstream from the proposed pond to provide benefits to water quality. Additional rate reduction benefits would be realized in the water quality pond.

The proposed stream relocation would be designed to provide storage and conveyance for the 100-year storm flow. See Appendix G for a discussion of the mitigation design.

4.7 WETLANDS

This section describes wetland conditions, project impacts, and proposed mitigation measures on the SASA site. To further document these studies and analysis, a more detailed *Wetlands Discipline Report* and *Natural Resources Mitigation Plan* have been prepared and are included as Appendices F and G, respectively.

4.7.1 Affected Environment

4.7.1.1 General Site Conditions

The proposed SASA site lies mostly on an upland hilltop southeast of the site and is separated from Sea-Tac International Airport by the small valley created by Des Moines Creek. Des Moines Creek flows across the northern portion of the project site from the northeast corner and then generally follows the edge of the project site south to South 200th Street. In the northeast corner of the golf course, the creek passes through an airport parking lot. Further downstream, Des Moines Creek is bordered by the Tyee Valley Golf Course, which covers much of the valley and part of the hillside.

The project site has been subject to a variety of disturbances which have altered the natural environment. Stream realignment, fill, grading, runoff from parking lots and other impervious surfaces, golf course and yard maintenance, and other types of human intrusion have contributed to the degradation of the project site.

Wetland areas have been identified using aerial photographs, the King County Area Soil Survey (Snyder et al. 1973), and the Sea-Tac Wetland Management Plan (Butler and Associates and Sheldon and Associates 1991) and field delineations (David Evans and Associates). These areas are documented by direct field examination using the routine method in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (Federal Interagency Committee on Wetland Delineations 1989). Included in the survey are areas impacted by SASA and potential wetland mitigation sites outside of the project footprint.

The wetlands were rated using the Ecology Four-Tier System (Ecology 1991c). Wetland functions were determined using a modified Reppert System (Reppert et al. 1979) and professional judgement. This functional analysis was based on field observations of topography, hydrology, vegetation characteristics, and wildlife usage.

Except for a small isolated wetland, wetlands found within the project site are adjacent to Des Moines Creek (Figure 4.7-1). To facilitate discussion of wetland and riparian areas associated with Des Moines Creek, the stream is divided into four segments which are currently separated by culverts. An isolated wetland occurs in a forested area near the City of SeaTac City Hall. Several other small wetlands, which occur just outside the boundaries of the project site, may be avoidable during filling.

A tributary stream to Des Moines Creek and its headwater pond occur west of the project site (see Figure 4.7-1). The disturbed condition of the wetlands surrounding these two areas present opportunities for enhancement which could be used as mitigation for wetland losses within the project area.

4.7.1.2 Des Moines Creek - Section A

Des Moines Creek emerges on the project site from a culvert that drains from Bow Lake, located approximately 0.75 miles northeast. Section A (see Figure 4.7-1) of the Creek begins at the end of the culvert from Bow Lake and extends through a narrow vegetated corridor in the middle of a parking lot.

A narrow riparian fringe occurs on both sides of the stream. Black cottonwood and willow trees provide a dense overstory with understories dominated by grasses. These areas are considered riparian areas, because typically they did not exhibit hydric soil characteristics. Areas that possessed some wetlands characteristics are generally less than 10-feet wide (see *Wetlands Discipline Report*, Appendix F).

Similar to wetlands, these riparian fringe areas provide important functions (Table 4.7-1). During high-flow periods, riparian vegetation slows flow rates and improves water quality through sediment deposition and nutrient absorption. This vegetation also provides cover for wildlife that use the stream (see Section 4.10, Biotic Communities). However, the small size of the riparian fringe, and the lack of significant buffers, limit the ability of these areas to perform the previously discussed functions.

4.7.1.3 Des Moines Creek - Section B

Section B begins after the creek turns south; at this point, a vegetative hillside becomes its eastern border. The western edge remains a parking lot. At this point, the stream, including the riparian fringe, widens to about 25 feet. Approximately 500 feet south of the start of Section B, seep wetlands extend up the eastern hillside. These seep wetlands cover about 1.09 acres.

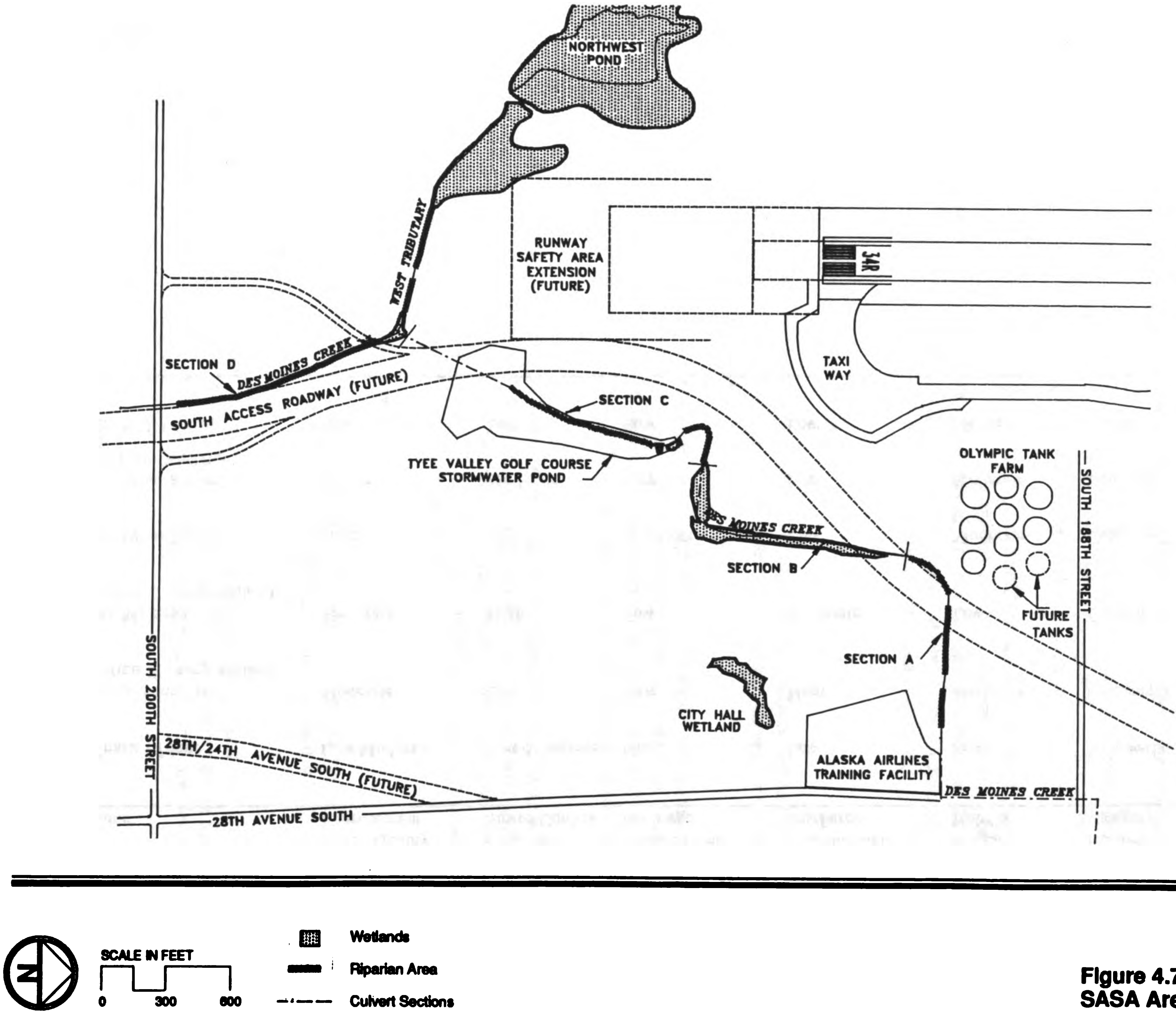


Figure 4.7-1
SASA Area Wetlands

Table 4.7-1. Functions performed by wetlands and riparian fringe on the SASA site.

Name	Water Quality Improvement	Flood & Storm Control	Groundwater Recharge	Groundwater Discharge	Wildlife Habitat	Ecology Category
Riparian fringe	Low-Moderate	Low-Moderate	None	Low	Low	Non-wetland
Des Moines Creek Section B - seep wetland	Moderate	Low	Low	High	Moderate	Category 3
Des Moines Creek Section C - seep wetland	Moderate	High	Low	Moderate	Low	Category 3
Northwest Ponds	High	High	Moderate	Low	Moderate-High	Category 2
Des Moines Creek Tributary Wetland	Moderate	Moderate	Low	Low	Moderate	Category 2
City Hall Wetland	Low	Low	Low	Low	Moderate	Category 3

The riparian fringe is dominated by red alder trees with lady fern, field horsetail, and grasses common in the understory. Seep wetlands also have an overstory of red alder with an understory of field horsetail, slough sedge, and watercress. Portions of the seep area are dominated by field horsetail and Himalayan blackberry vines rooted in nearby upland areas.

The riparian fringe area provides the same benefits as those along Section A. However, because the stream is contiguous to a much larger forested upland, the potential for use by wildlife is greater than the isolated fringe areas of the Section A.

The seep wetlands serve two major functions, as a wildlife habitat and as a source of high-quality groundwater for the stream. As a source for high quality water to Des Moines Creek, this wetland maintains summer flows and provides quality cool water, important for downstream fish. This wetland supports wildlife similar to that in the surrounding uplands, except that some amphibian species may utilize this area (see Section 4.10, Biotic Communities).

4.7.1.4 Des Moines Creek - Section C

Section C of the Creek flows through a storm water detention facility located on the Tyee Valley Golf Course (see Figure 4.7.1). This section ends at the culvert that controls the water retained in the Tyee Pond.

This section of the Creek, with its riparian fringe, is approximately 10 feet wide. Black cottonwood saplings and small willow shrubs dominate this area. Soft rush, burreed, reed canary grass, foxtail, and creeping buttercup are common in open areas and as understory plants. Some small seep areas occur in the detention facility and are dominated by soft rush and grasses.

The riparian fringe provides the same benefits as those identified for Section A. Some wildlife might utilize the stream even though the adjacent uplands are sparsely vegetated except for mowed lawn grasses. The seep wetlands are small (0.05 acres) and provide only a minimal source of groundwater to the stream. Little wildlife habitat is provided by the soft rush and grasses that occur on these seep areas.

4.7.1.5 Des Moines Creek - Section D

Section D of Des Moines Creek lies within the Tyee Valley Golf Course from the point where the culvert outlet from the detention pond daylights to the point where the stream flows under South 200th Street.

Section D of the stream and the adjacent riparian fringe are about 15-25 feet wide. Scattered trees, including red alder, black cottonwood, and willows occur along the riparian fringe. Slough sedge, burreed, reed canarygrass, and creeping buttercup are dense in open areas, but sparser in the shaded areas.

The riparian fringe provides the same benefits as those identified for Section A. Some wildlife might utilize the stream even though the adjacent upland area is either a sparsely vegetated golf course or a highly disturbed narrow strip of forest adjacent to a short portion of this stream section.

4.7.1.6 Northwest Ponds (Pond B)

There are three ponds west of the project site; they are included in this discussion because they are potential wetland mitigation areas. These ponds are connected to Des Moines Creek through a tributary that flows across Tyee Valley Golf Course. The ponds are also collectively known as Pond B. Soils and hydrology suggest that several of the fairways adjacent to the ponds were at one time wetlands. Willow and spiraea shrubs dominate the north and west edges of the ponds with red alder and black cottonwood trees dominating the southern side.

These ponds provide significant flood storage and water quality benefits for runoff entering Des Moines Creek. The relatively large size of the ponds and long retention time enhance these functions. The ponds include forest, shrub, emergent and open water plant communities, and consequently provide relatively high-quality habitat for an urban area. However, the portion currently used as a golf course provides little wildlife habitat, except for the geese that forage and rest on these fairways.

4.7.1.7 Des Moines Creek Tributary

The off-site tributary that connects the northwest ponds to Des Moines Creek is a slow-moving relatively level channel densely vegetated by emergent and shrub vegetation. The wetland area associated with the tributary is highly disturbed. The vegetation along this tributary channel is cut back during routine maintenance of the golf course. In addition, fertilizers from the golf course may contribute nutrients to the stream, degrading the water quality.

The tributary wetland supports a variety of emergent plants including smartweed, cattail, slough sedge, creeping buttercup, burreed, reed canary grass, duckweed, speedwell, and some grasses. A few willow and red alder trees occur along the wetland edge. Soils are saturated organic mucks. The wetland areas are about 20-35 feet wide and possess all three wetland criteria; hydrology, soil, and vegetation.

This wetland functions to reduce storm flows, enhance water quality, and provide a small amount of wildlife habitat. During high-flow periods, the emergent riparian vegetation slows flow rates and improves water quality by promoting sediment deposition and nutrient absorption. However, the narrow width of the fringe wetland limits its ability to perform these functions. The emergent vegetation and ponded portions of the stream provide habitat for waterfowl and fish (see Section 4.10, Biotic Communities). Other wildlife use is limited by the lack of significant plant cover adjacent to the stream.

4.7.1.8 City Hall Wetland

There is a small (0.60 acres), isolated wetland within the project site just west of the SeaTac City Hall at the corner of 28th Avenue South and Southwest 192nd Street. Red alder trees dominate the canopy with Douglas spirea, horsetail, and slough sedge common in the understory.

Due to its small size, lack of open water, and isolation, this wetland does not provide the significant ecological functions, such as water quality and supply, typically associated with wetlands. The wildlife value of this wetland is similar to that of the adjacent forested upland.

4.7.2 Construction and Operation Impacts

Each alternative would require clearing, cutting and filling to develop a level site at the grade of the existing runways and taxiways of Sea-Tac International Airport. In this process, wetland and riparian fringe areas would be filled. In addition, the relocation of Des Moines Creek across the project site would be required. The taxiway connecting SASA with Sea-Tac International Airport would require a 260-foot length of arch culvert which would shade the creek. Due to its location on the project site, filling of the City Hall wetland would occur.

Filling of the stream and wetland areas would be subject to Section 404 the Clean Water Act jurisdiction administered by the U.S. Army Corps of Engineers (Corps). Section 404 permits are subject to review and comment by other regulatory agencies including the EPA, Ecology, and the National Marine Fisheries Service (NMFS). Additional regulations affecting development in or near wetlands include the City of SeaTac Sensitive Areas Ordinance, Hydraulic Project Approval from the Department of Fisheries, and Section 402 of the Clean Water Act which covers discharges from airports into wetlands.

4.7.2.1 No-Action Alternative

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place on the site would be subject to separate environmental review.

4.7.2.2 Alternative 1

Construction

Alternative 1 is the smallest support facility proposed. The taxiway bridge from the end of the Sea-Tac International Airport runway to the SASA site would cross Des Moines Creek about 40 feet above the existing stream elevation. The channel would remain undisturbed and open under the bridge. Although no riparian vegetation would be removed, some would die under the approximately 250-foot-wide bridge that would shade 0.15 acres of wetland.

The stream would be culverted under portions of SASA and the proposed South Access Roadway. Portions of Des Moines Creek, its riparian fringe, and associated seep wetlands would be filled and relocated, including all or most of sections A, B, and C (Table 4.7-2). Filling of riparian fringe would result in loss of its ability to improve water quality, reduce flood flows, and provide wildlife habitat. Fill of seep wetlands could alter groundwater discharge and would eliminate forested wetland habitat.

Table 4.7-2. Approximate wetland and riparian fringe area acreages and amounts filled under the SASA alternative.

	Des Moines Creek				
	Section A (0.1 acres)	Section B (1.1 acres)	Section C (0.3 acres)	City Hall (0.6 acres)	Total (2.2 acres)
Alternative 1	0.2	1.1	0.3	0.6	2.2
Alternative 2	0	1.0	0.3	0.6	1.9
Alternative 3	0.2	1.1	0.3	0.6	2.2

Shading of riparian fringe by the proposed bridge linking SASA and Sea-Tac International Airport would result in some changes in the plant community. Plant species intolerant of shade would die. In some areas, through natural colonization, they would be replaced by more shade-tolerant plants. However, the shade-tolerant plant community would have less plant cover and vegetative structure. The shaded riparian fringe would retain its water quality and flood control functions.

The City Hall wetland would be filled. Since it is small and isolated, it does not perform many of the functions typically associated with wetlands, and filling would result in only minor losses of wildlife habitat.

Operation

The major operational impacts of the proposed development would be the change in water sources to Des Moines Creek and associated wetlands. However, these changes are not expected to alter wetland vegetation or wetland functions; they are, therefore, addressed in Section 4.6, Water Quality.

Option 1A

Under Option 1A, the area set aside for future aviation maintenance in Alternative 1 would not be developed by the Port. Construction and operation impacts of the SASA proposal would be similar to, but slightly less than, Alternative 1. The impacts of any other type of development that could occur there would be the subject of separate environmental review.

4.7.2.3 Alternative 2 - The Preferred Alternative

Construction

Alternative 2 would impact about 1.9 acres of wetland. A portion of the stream channel would be culverted under the South Access route and the taxiway with bottomless arch culverts. About 1.3 acres of riparian fringe associated with Des Moines Creek would be filled and relocated. Fill of the riparian fringe would result in the loss of its ability to improve water quality, reduce flood flows, and provide wildlife habitat. Fill of small seep areas associated with Des Moines Creek Section C could result in a reduction in groundwater discharge to the Creek.

The City Hall wetland would be filled (0.60 acres). This would result in the loss of habitat for small mammals, amphibians and songbirds, but result in an overall minor impact as described in Alternative 1.

Operation

Operation impacts would be similar to those described for Alternative 1.

4.7.2.4 Alternative 3

Construction

Under Alternative 3, the taxiway connecting SASA to the airport would be built on fill. A long portion of the stream channel could be culverted under the edge of the support facility and taxiway.

Much of Des Moines Creek would be filled, relocated, and/or culverted. Section B would be culverted. Fill of seep wetlands could alter groundwater discharge and would eliminate forested and some emergent wetland habitat. The riparian fringe of Des Moines Creek Sections A, B, and C would be filled and relocated. Fill of riparian fringe would result in loss of its ability to improve water quality, reduce flood flows, and provide wildlife habitat.

In this alternative, the City Hall wetland would also be filled. These impacts are identified above in Alternative 1.

Operation

Operation impacts would be similar to those described for Alternative 1.

4.7.2.5 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area wetlands. The site under consideration for the runway is located within the Miller Creek basin, is separated from the area of the SASA site, and does not have shared wetlands. Development of an additional runway on the west side of the airport could impact Miller Creek and wetlands. Should such impacts be identified in the Master Plan EIS, appropriate mitigation and preservation measures would be developed in consultation with resource agencies.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for wetland impacts of regional transportation improvements south of the airport. Areas involved, including portions of the Des Moines Creek basin, would depend on route alignment decisions which have not yet been made. Planning for other airport projects has not yet progressed to the point that their impacts on wetlands can be estimated. Permit review and approval (e.g. Corps of Engineers Sections 10/404) will establish mitigation requirements to be met as part of such projects. Therefore, no ultimate significant cumulative impacts are anticipated. The potential for cumulative impacts on wetlands will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.7.3 Mitigation Measures

The nature of the project site and the proposed development—if any build alternative is selected—make avoidance of wetland impacts impossible. Minimization of project impacts and provision for compensatory mitigation have been key design criteria. Compensatory mitigation would replace filled wetlands and wetland functions on or adjacent to the SASA site. Compensatory mitigation has been detailed as part of the *Natural Resource Mitigation Plan* (Appendix G). Refer also to Appendix O for additional information about wetland mitigation.

Compensatory mitigation goals for the project include a net increase in wetland functions including the ability to improve water quality and slow storm flows. A range of measures have been proposed to accomplish these goals, including: relocation of portions of Des Moines Creek, replacement of filled wetlands, development of storm water quality and detention facilities, and stream restoration of portions of Des Moines Creek.

Stream and wetland mitigation would replace the functions and area of wetland and riparian fringe that is filled. Table 4.7-3 lists impacted areas and proposed mitigation. Design of the relocated stream and wetlands would result in an increase in the ability of these areas to perform the functions identified. Seep wetland areas filled would be relocated with drainage

Table 4.7-3. Project impacts to wetlands and potential mitigation (approximate acreage).

		Mitigation			
	Impact Area Filled	Stream Relocation	Seep Wetland Relocation	Restoration- N.W. Pond	Wetland Buffer Restoration Tributary
Alternative 1	1.5	1.3	0.3	1.0	1.0
Alternative 2	1.9	0.4	3.10	1.0	0.5
Alternative 3	1.8	0.7	0.3	2.0	1.0

systems conveying the high-quality groundwater from the developed site to reach Des Moines Creek.

4.7.3.1 Des Moines Creek Relocation

Des Moines Creek and associated wetlands would be relocated east of its current location (Figure 4.7-2). Approximately 2,200 feet of stream length and 0.26 acres of channel would be filled and replaced with similar or improved habitat. The stream relocation is designed to improve storm water detention, water quality, and fisheries habitat. The design will also take into account the need to minimize habitat and attraction of waterfowl and other flocking birds that represent a safety risk to aircraft.

The stream relocation incorporates dense riparian fringe vegetation, increased width, naturalized barriers, and constricted outlets to improve storm water detention in the riparian fringe wetlands. During flood flows, streams overflow their banks into the riparian fringe. Dense emergent or woody growth in the riparian fringe slows flow rates. Growth of planted vegetation would result in a more dense vegetative cover along the wetland fringe. Wider riparian fringe included in the design would result in slower flood flows. Naturalized barriers, such as tree stumps or log weirs, also slow peak flows. Constricted outlets, and in-stream constrictions limit outflow and allow the riparian fringe to retain flood waters.

The same components of the stream relocation design that improve its ability to slow storm flows improve water quality. Storm flows contain the highest levels of pollutants that are typically associated with sediment particles. As the water slows in the riparian fringe, the sediment and associated pollutants are deposited and removed from the water column.

Thus, the increase in riparian fringe size, amount of vegetation, placement of naturalized barriers, and constriction of outlets would improve the ability of the relocated stream and its riparian wetlands to improve water quality. In addition, the creation of a water quality and detention pond in the proposed Storm Water Management Facility would decrease the amount of sediments and pollutants entering the stream (see Section 4.6, Water Quality).

To increase fisheries habitat, the relocated stream design would incorporate shade-producing stream side trees and shrubs, emergent vegetation, and naturalized barriers in the riparian

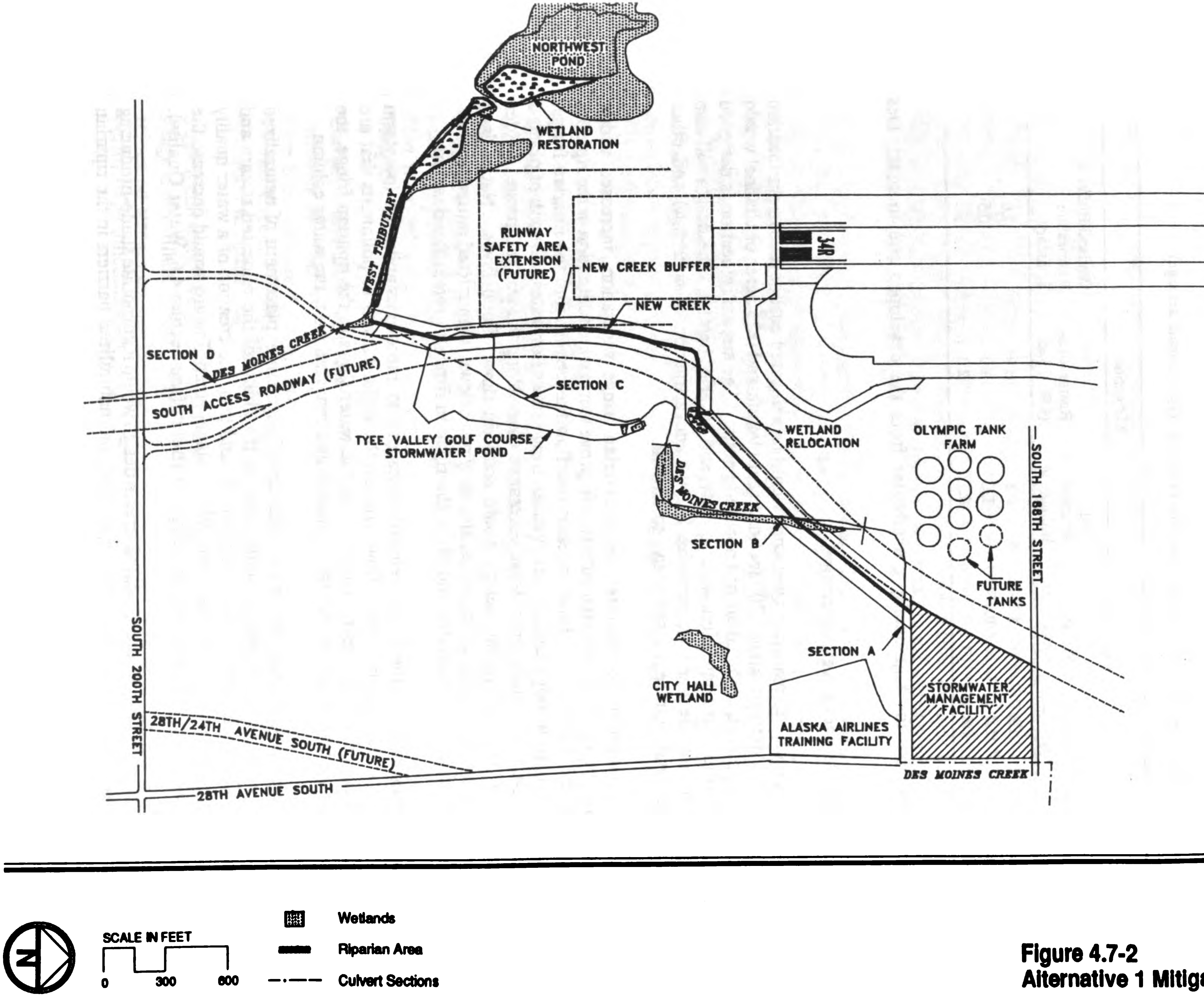


Figure 4.7-2
Alternative 1 Mitigation

fringe. Large saplings would be strategically planted alongside the stream to ensure rapid shading of portions of the stream. Additional plantings of trees and shrubs would ensure shading of much of the stream channel within 5 years. Emergent vegetation would be planted along the stream side to provide important habitat for juvenile fish and aquatic invertebrates. Aquatic invertebrates are an important food source for fish. Log weirs, tree stumps and other habitat features would provide habitat for adult fish (see Section 4.10, Biotic Communities).

Plant diversity and structure in the riparian fringe would increase because of the additional native plant species included in the mitigation design. Establishing vegetated and undisturbed buffers up to 50-feet wide along the relocated stream would increase cover for wildlife that utilize the stream and wetland areas.

4.7.3.2 Seep Wetland Relocation

About 3.0 acres of wetland would be created adjacent to the relocated Des Moines Creek channel. This wetland would replace forested and riparian wetlands, with forested, shrub and emergent systems within the Des Moines Creek floodplain. Seep water would be collected from the SASA site and allowed to resurface in these wetlands adjacent to Des Moines Creek. In addition, water from rooftops could also be directed to the wetland.

Soils from the existing wetland or from off-site sources would be used in the new wetland. Seeds, roots, stolons, and stems would be transported in the soil allowing for rapid colonization of the new wetland site. In addition, the soil contains existing wetland micro-flora including bacteria, fungi, and algae, which would continue to colonize.

4.7.3.3 Wetland Restoration

Restoration of degraded wetland areas adjacent to the Northwest ponds, and the tributary connecting it to Des Moines Creek, could replace lost wetland habitat. As outlined in the *Natural Resource Mitigation Plan* (Appendix G), the wetland area on the east edge of the ponds, currently used as fairways, could be restored to a scrub-shrub wetland, dominated by red-osier dogwood and willow.

Restoration of the Des Moines Creek tributary could replace lost wildlife habitat. Eliminating the mowing of the riparian fringe and wetland vegetation along the tributary could result in rapid restoration of these areas. In addition, buffers up to 50 feet wide could be planted with native vegetation including Pacific hawthorn, willow, red alder, red-osier dogwood, and vine maple. This vegetated buffer, extended down the lower portion of Des Moines Creek, could provide an opportunity for future biotic enhancement between South 200th Street and the area adjacent to the Northwest ponds.

Alternative 1

Alternative 1 would require relocation of the stream and riparian fringe, as identified in the *Natural Resource Mitigation Plan* (Appendix G). Stream relocation would replace filled riparian fringe and wetland areas with about 1.3 acres of riparian wetland. In addition, as identified in the description of the stream relocation, wetland functions would improve (see Figure 4.7-2).

In addition to this stream relocation, relocation of the seep wetland and restoration of approximately 2 acres of wetland is recommended. The seep wetland would replace the same amount of wetland area filled. Wetland restoration could occur adjacent to the Northwest ponds and the Des Moines Creek tributary.

Alternative 2 - The Preferred Alternative

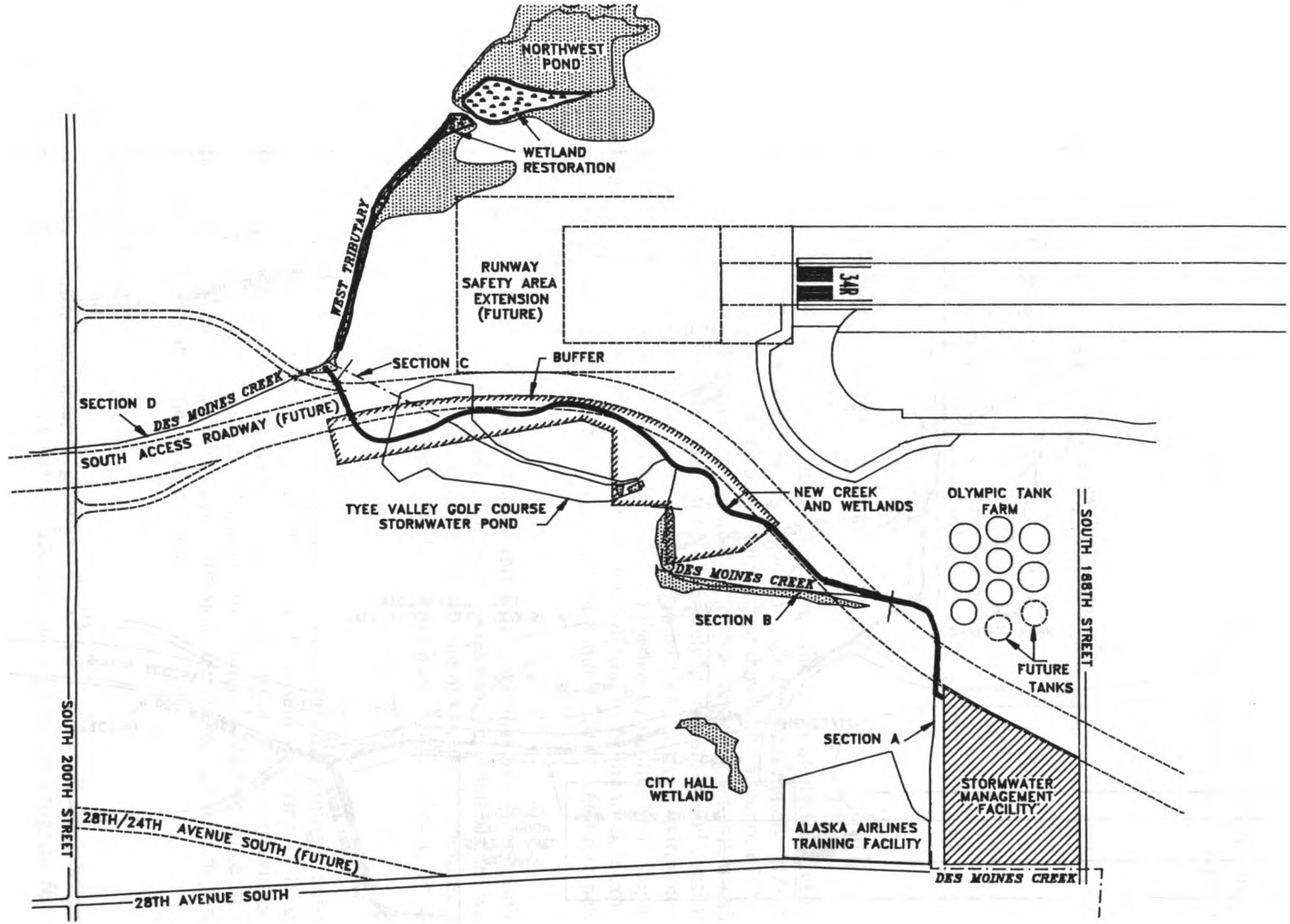
Alternative 2 would require relocation of the stream and riparian fringe (Figure 4.7-3), as well as wetlands impacted by the SASA project. Stream relocation would create 0.5 acres of riparian fringe and wetlands with about 3.0 acres of wetlands. In addition, as identified in the description of stream relocation, wetland functions would improve. Growth of emergent and shrub vegetation would establish a wetland with the ability to provide stormflow attenuation and improve water quality by retaining sediments and providing biofiltration. In addition, wildlife habitat would be provided.

Restoration of approximately 0.5 acres of wetland and buffer areas along the Des Moines Creek Tributary with native vegetation would occur. If the golf course were to remain active, biofiltration swales could be provided to protect water quality from potential golf course runoff.

Alternative 3

Alternative 3 would require relocation of the stream and riparian fringe (Figure 4.7-4). The riparian fringe would be replaced along the relocated stream. Due to the loss of significant fringe wetlands for Alternative 3, a more extensive restoration of the Des Moines Creek Tributary would replace the functions lost by the filled riparian areas. Restoration of up to two acres alongside the Northwest ponds could occur as mitigation to replace wetland habitat lost by filling the City Hall wetland and the seep wetlands.

To mitigate for loss of fringe wetlands associated with Des Moines Creek, the width and amount of fringe wetlands associated with the tributary could be increased by approximately 0.5 acres. By retaining the stream bed and expanding the channels flood plain, the width of the wetland could be increased. Growth of planted emergent and shrub vegetation could establish a wetland area that would have the ability to reduce greater storm flows, improve water quality by retaining more sediments and pollutants, and provide a larger area available for wildlife.



N

SCALE IN FEET

0 300 600

Wetlands

Riparian Area

Culvert Sections

Wetland Buffer Area

Figure 4.7-3
Alternative 2 Mitigation

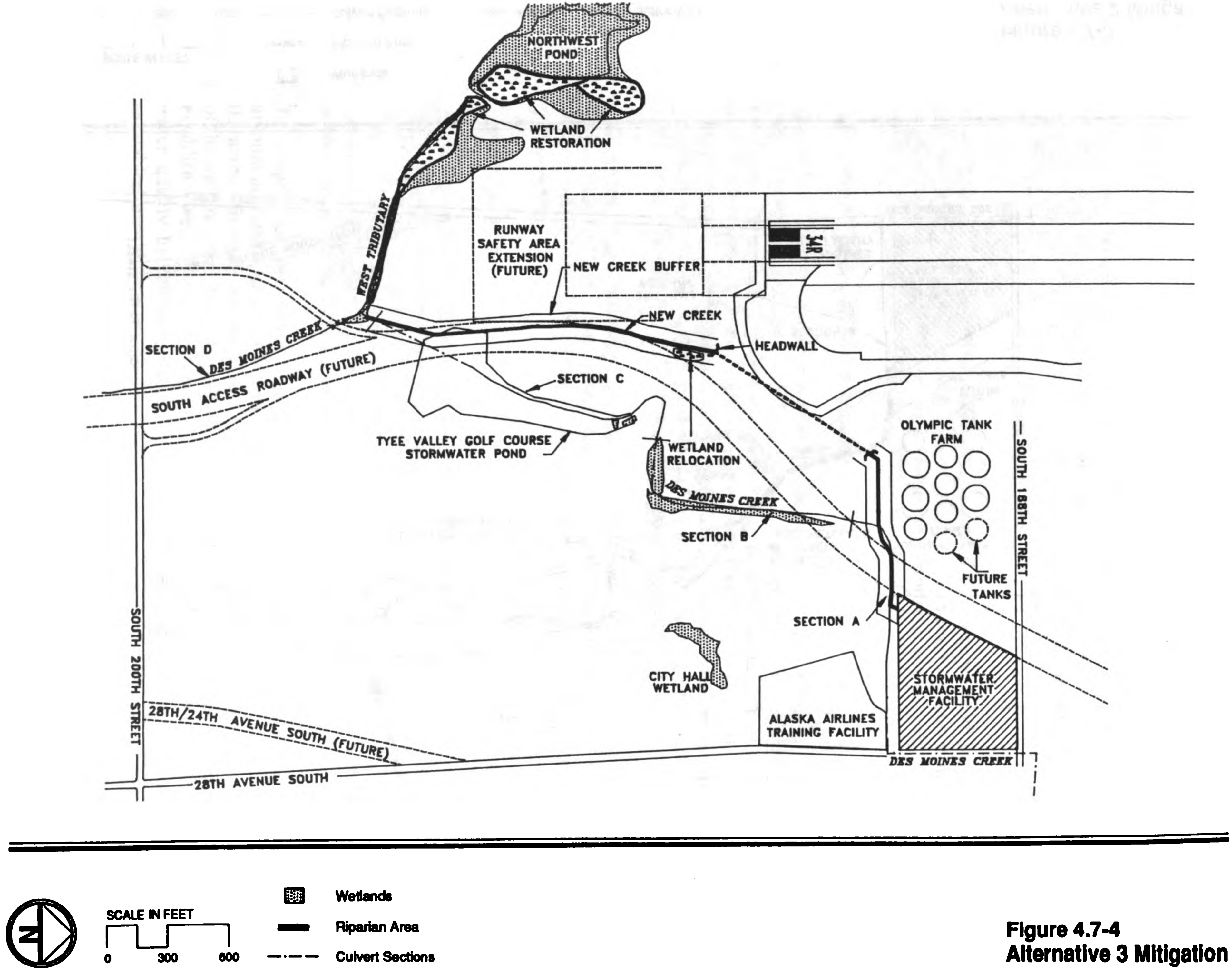


Figure 4.7-4
Alternative 3 Mitigation

To mitigate for loss of the seep wetland, in-kind replacement on the project site could occur. A system would be designed to collect the seep water and release it on a slope planted with wetland vegetation.

4.8 FLOODPLAINS

Floodplains are discussed in Water Quality (see Section 4.6).

4.9 EARTH

4.9.1 Affected Environment

4.9.1.1 Geology

Historical Geological Overview

The surficial geology of the site is, to a large extent, the result of glacial advances into the Puget Sound region, the most recent of which ended approximately 11,000 years ago (Easterbrook 1986). The segment of soils deposited during the advance of the glacial ice mass was often overridden and consolidated to form a very compact soil, usually referred to as glacial till. During interglacial periods, relatively lower density and consistency silt to boulder-size materials, and peat, were deposited in lake and stream environments. As the ice mass retreated, soil materials within the ice released by melting were deposited. Soil material from the receding ice is called recessional outwash. No bedrock is exposed on the site, and is estimated to be present at a depth of about 1,200 to 1,600 feet below current grades at the project site.

Since the glaciation period, the topography and surficial geology have been modified mostly by erosion and weathering processes. These processes have included surface water action, including streams and sheet erosion, and mass wasting of slopes. In addition, portions of the near-surface site soils have been modified during residential and civic development.

Regional Geology

The site is underlain, sequentially upward, by the following geologic units: Tertiary sedimentary bedrock, undifferentiated Pre-Vashon drift, Salmon Springs drift, and Vashon drift. Only the Vashon drift was encountered in the geotechnical borings drilled during the recent and previous investigations. Vashon drift from the Vashon stage of the Fraser glaciation is composed of sequences of clay, silt, sand and gravel that were deposited during the advance and retreat of the Vashon glacier.

Site-Specific Geology

Figure 4.9-1 shows the surficial geology of the site. The site-specific geology was characterized based on a field reconnaissance and exploration program for this study, geotechnical engineering studies conducted by Dames & Moore in 1960, 1970, 1971, and 1984, geotechnical investigations by others, a report prepared by the Washington State Department of Water Resources (Luzier 1969) and the geologic study and map of the Des Moines Quadrangle (Waldron 1962). Figure 4.9-2 shows the location of borings completed on the site in 1991. Appendix H includes information on previous borings and previous test pits used in this analysis.

Waldron (1962) divided the site into four primary geologic units; (1) Quaternary-aged glacial advance soils, (2) Quaternary-aged glacial recessional soils, (3) Recent-aged alluvium, and (4) Modern man-made fill. He mapped the project site as Vashon drift, with the higher east side of the site noted as ground moraine (mainly compact unoxidized till), and the lower west side as recessional outwash (undifferentiated stratified drift, chiefly medium sand; locally sand and gravel with pebbles and cobbles). In other sectors of the quadrangle the ground moraine is mapped as having a discontinuous cover of sand and gravel. It is not so mapped within the site limits. On the west of the project site there is an area within the valley of Des Moines Creek mapped as a more recent lacustrine deposit, chiefly silt and clay. There is a small area on South 200th Street, where it crosses Des Moines Creek, mapped as artificial fill. This is the embankment placed to allow the road to pass over the culverted creek. The south end of the airport is mapped as artificial fill.

Although Waldron mapped the higher area on the east side as Vashon till (a ground moraine of mainly compact unoxidized till), borings drilled for this investigation indicate that only the north and south ends of the higher area are correctly mapped as ground moraine. Most of the higher ground should be mapped as glacial outwash deposits. The material is more representative of the Esperance sand glacial outwash material rather than Vashon Till.

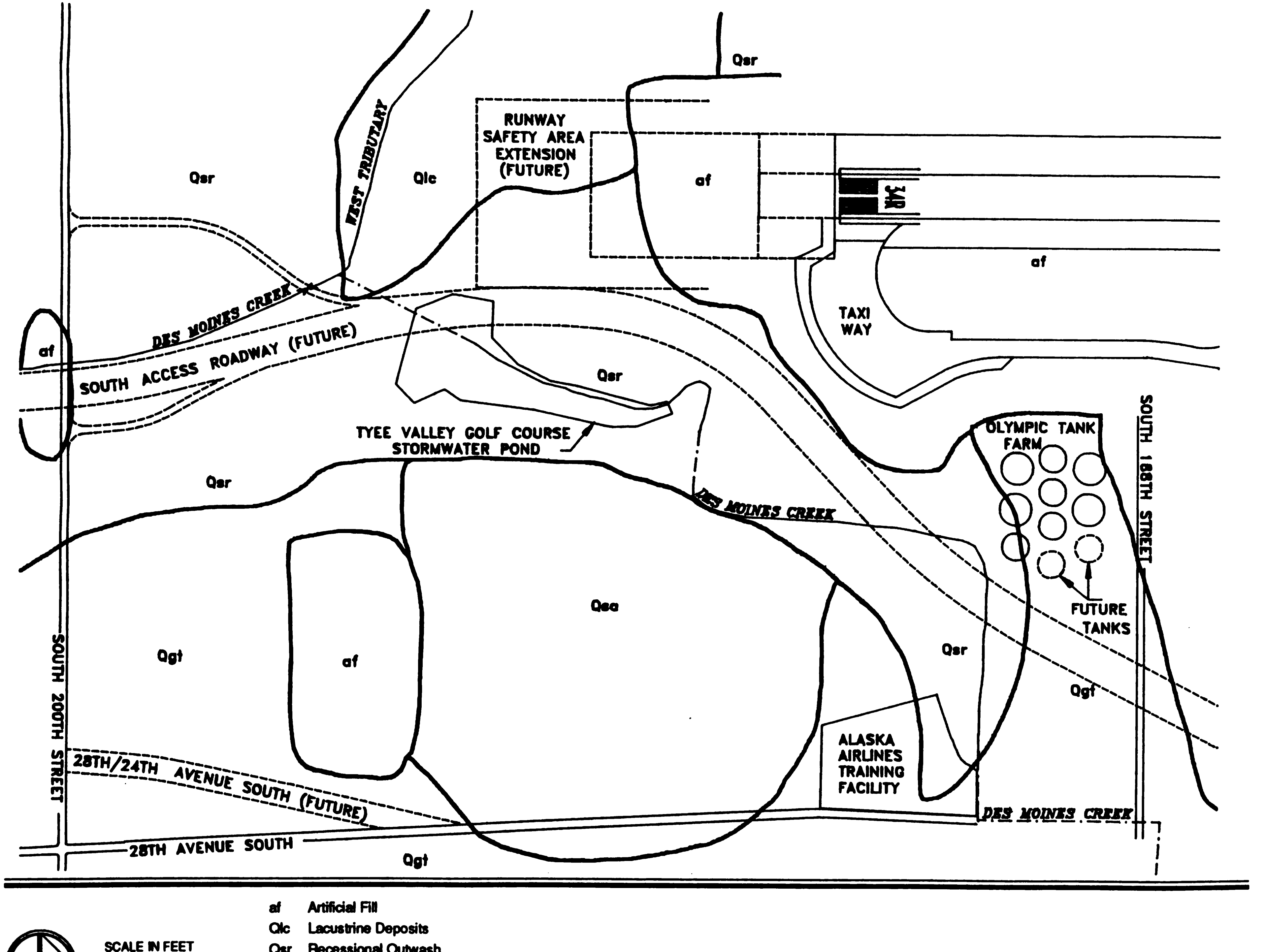
It is likely that, in geological time, the thin cap of till has been removed exposing the glacial outwash deposits of sand and gravel. This has an impact on the groundwater regime in this area as discussed below in the Groundwater section. The glacial outwash deposits on the higher area are underlain by a thick stratum of dense gravels, in which the deeper borings were terminated.

Stratigraphy

From an engineering and construction perspective, the surficial soils on the site, and near-surface stratigraphy can be described as follows.

In the lower west and central areas of the site, medium-dense to dense layers of silty sand and sand overlie deposits of a dense silty sand and gravel (glacial till), which is in turn underlain by dense sand, gravel, and cobbles. In this area the groundwater table is within about 10 to 15 feet of the ground surface.

On the higher east side of the site, over most of the area, a 30- to 40-foot-thick stratum of dense silty sand overlies a thick deposit of dense, clean gravel, and cobbles. Underlying the southeast and northeast sections of the site, dense silty sand and gravel (glacial till) overlies



Qsr
RUNWAY
SAFETY AREA
EXTENSION
(FUTURE)
Qsr
WEST TRIBUTARY
Qlc
af
34R
af
TAXI
WAY
DES MOINES CREEK
af
SOUTH ACCESS ROADWAY (FUTURE)
Qsr
TYEE VALLEY GOLF COURSE
STORMWATER POND
Qsr
DES MOINES CREEK
OLYMPIC TANK
FARM
SOUTH 188TH STREET
FUTURE
TANKS
Qea
Qsr
Qgf
Qgf
af
SOUTH 200TH STREET
28TH/24TH AVENUE SOUTH (FUTURE)
ALASKA
AIRLINES
TRAINING
FACILITY
DES MOINES CREEK
28TH AVENUE SOUTH
Qgf
af Artificial Fill
Qlc Lacustrine Deposits
SCALE IN FEET

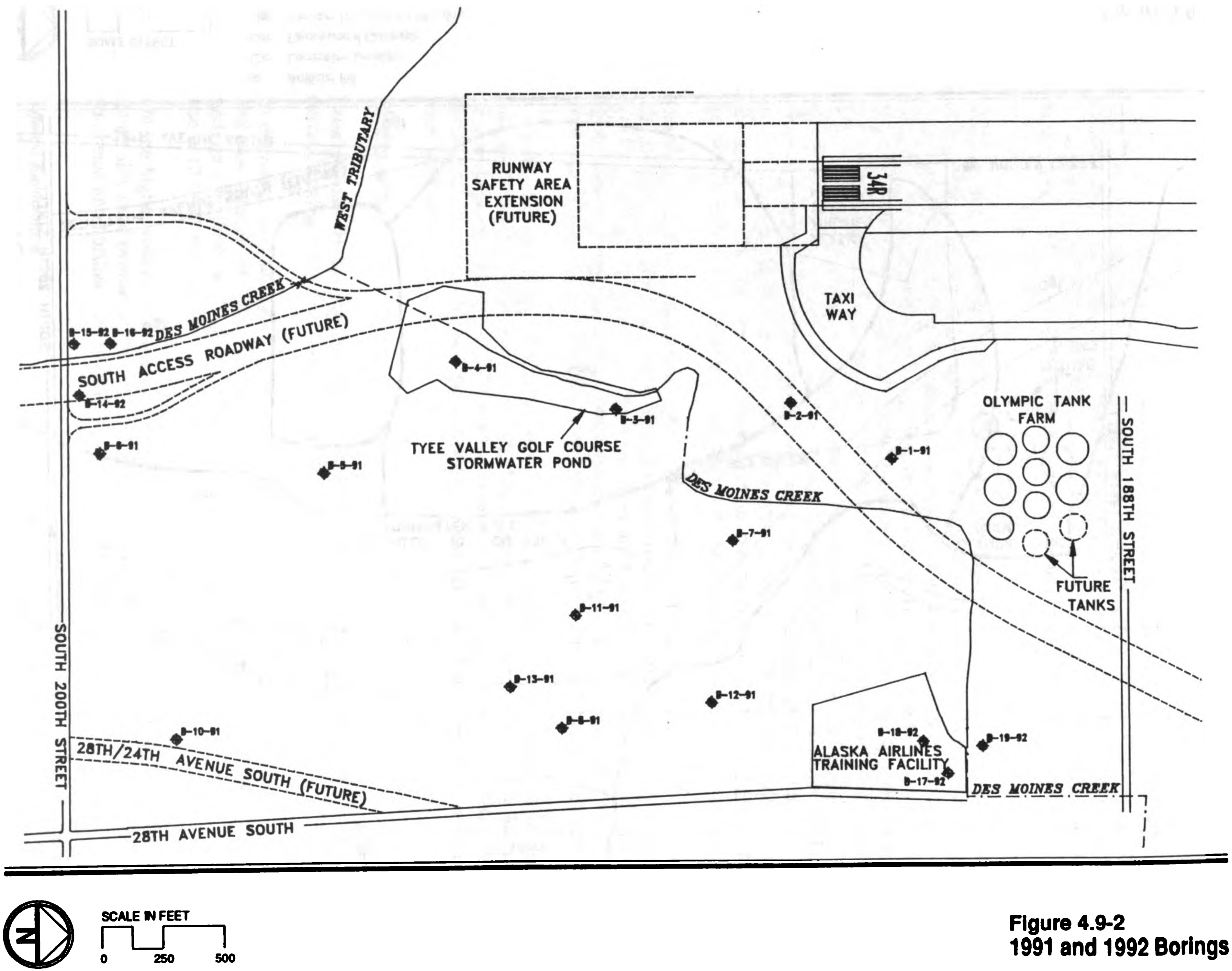


Figure 4.9-2
1991 and 1992 Borings

the thick stratum of gravel and cobbles with some sand. On this side of the site the groundwater table is usually found within the sand stratum, 5 to 15 feet above the gravel. Discontinuous zones of water were also encountered above the groundwater table.

4.9.1.2 Soils

The United States Department of Agriculture (USDA) Soil Conservation Service has determined that the characteristics of surficial soils have a direct effect on the erosion potential of a particular site, depending on the site topography and precipitation. The USDA has mapped the soils of King County (Snyder et al. 1973 - Soil Survey of King County Area) into a variety of agricultural soil types, of which seven exist on the site, as described below. Figure 4.9-3 shows the location of soil types.

The Alderwood Series comprises gravelly sandy loam on 6 to 15% slopes. Permeability of the soil is moderately rapid in the surface layer and very slow in the substratum. The available water capacity is low and the runoff rate is slow to medium. The erosion hazard is moderate.

The Arents Series occurs on 6 to 15% slopes, and consists of Alderwood soils that have been so disturbed through urbanization that they no longer can be classified with the Alderwood Series. However, the soils still have many similar features to the Alderwood Series. Runoff is medium and the erosion hazard is moderate to severe.

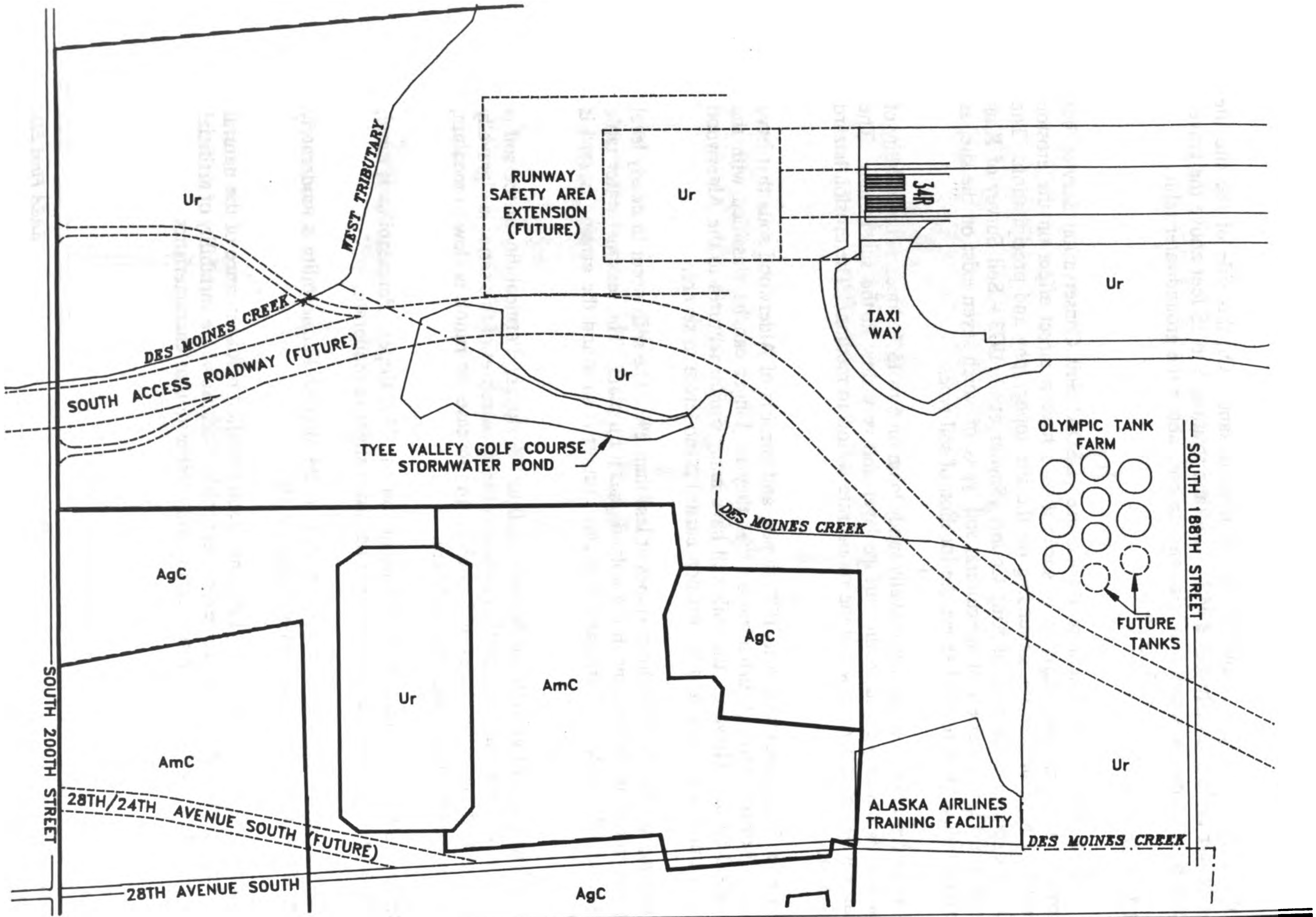
The Bellingham Series of silt loam slopes at less than 2%. The soils occur in nearly level areas and mostly in depressions in the upland glacial till plain. The seasonal water table is at or near the surface. Permeability is slow, runoff is slow and the erosion hazard is slight.

The Everett Series of gravelly sandy loam on 0 to 5% slopes. Permeability of the soil is rapid. Runoff is slow, and the erosion hazard is slight. A subset of this series is a gravelly sandy loam that occurs on slopes of 5 to 15%. In this case the runoff is slow to medium, and the erosion hazard is slight to moderate.

The Indianola Series of loamy fine sand occurs on 4 to 15% slopes. Permeability is rapid, runoff is slow to medium, and the erosion hazard is slight to moderate.

The Norma Series comprises sandy loam on 0 to 2% slopes. Permeability is moderately rapid and runoff is slow. The erosion hazard is slight.

Soil classified as Urban Land is soil that has been modified by disturbance of the natural layers with additions of fill material several feet thick. Because of the variability of artificial fill, no generalities will be made concerning soil composition or characteristics.



AgC	Alderwood Series, Alderwood Gravelly Sandy Loams, 6-15% Slopes
AmC	Arents, Alderwood Material
Bh	Bellingham Series Bellingham Silt Loam
EvB	Everett Series, Everett Gravelly Sandy Loam, 0-5% Slopes
EvC	Everett Series, Everett Gravelly Sandy Loam, 5-15% Slopes
InC	Indianola Series, Indianola Loamy Fine Sand, 4-15% Slopes
No	Norma Series, Norma Sandy Loam
Ur	Urban Land

Figure 4.9-3
Soils Map

4.9.1.3 Topography

The site topography is generally the result of geological and erosional processes and is an important factor in assessing potential impacts related to landslide, seismic, and erosional hazards. However, on this site there has been a major fill placed on part of the site to provide a level playing field for a school. In this section, reported slopes and height differentials are based on the topographical information supplied by the Port of Seattle.

The site topography can be divided into three primary areas: (1) a high area on the east side of the site that generally slopes down towards the west, but also slopes down towards the southwest and northwest, (2) a lower, generally flat-lying valley bottom on the west side of the site with slope gradients normally less than 2%, sloping down towards the south; and (3) a man-made fill in the northwest sector of the site that was placed to support the earlier runway and taxiway extension, and provides a holding area for aircraft about to take off.

The higher area on the east side of the site has a maximum elevation of 425 feet, and is relatively flat along the east boundary of the site, 28th Avenue South, but slopes down gently (2 to 3%) towards the south over the south 750 feet of 28th Avenue South, and more steeply (up to 12%) towards the north over the north 500 feet of 28th Avenue South. The south boundary of the site, South 200th Street, slopes down towards the west at a gradient varying from about 6 to 13%. South 192nd Street, which is close to the north boundary of the area of the site to be raised to a level matching the rest of the airport, is relatively level for about 400 feet from its junction with 28th Avenue South. After that it descends towards the west at about a 7% slope.

Slopes on the higher area start off at 3 to 5%, but as the area slopes down to meet the valley bottom the gradient gradually steepens, ranging from 10% to a maximum slope of about 19%. Much of the slope is in the 13 to 15% range over its entire height. At the south end there is a greater range in gradient, with the slope increasing from 10 to 19% as it descends. The toe of the slope is at an elevation of 250 to 280 over most of the site, sloping down gradually towards the south.

The slope is locally steeper in several places. The steeper sections are associated with regrading of the site for commercial purposes. An example of this is where fill has been placed west of the Seattle Christian School, on 28th Avenue South, to provide a playing field beside the school. This forms a 50-foot-high "nose" protruding west from the natural slope. The slope on the west side of this fill is at 33%, the north and south slopes are in the range of 35 to 45%. At the north end of the site, the north (upper) parking lot for the golf course was constructed by cutting into the existing hillside. Slopes at the perimeter of this parking lot and its connecting road to the clubhouse and south (lower) parking lot are at a gradient of up to 50%, and are up to about 30 feet high.

The man-made fill for the runway and taxiways is at an approximate elevation of 340 feet adjacent to the site. At the edge it slopes steeply down to about 280 to 290 feet at a 50% grade, with a level bench, 40 to 50 feet wide, at about 310 feet in elevation to accommodate the airport perimeter road. There are no drainage channels or other erosional features on this slope.

4.9.1.4 Groundwater

In the Puget Sound region, sand and gravel units within the glacial drift material form the principal aquifers. These aquifers are recharged from precipitation on or near the area. Water levels in wells generally are within 100 feet of the ground surface (Liesch et al. 1963). The water-yielding capability of the sand and gravel units ranges from a few gallons per minute to more than 5,000 gal/min (Molenaar et al. 1980). Perched water is also commonly encountered in the glacial deposits. Silt and clay within the glacial soils act as aquitards allowing water to accumulate in sand and gravel lenses.

Groundwater occurrence is described in terms of hydrogeologic units. Delineation of a hydrogeologic unit is made by determining whether the component strata of the unit functions as a single unit with respect to the occurrence and movement of ground water. A single hydrogeologic unit comprising two contiguous geologic units, sands of the Vashon drift and advance glacial outwash, is present beneath the subject site. This hydrogeological unit occurs from the ground surface to a depth of at least 100 feet beneath the higher levels of the site.

Within the higher area of the site, and because of its relative elevation, the supply of groundwater can only come from precipitation. The precipitation infiltrates the sands of the Vashon drift that occurs at or close to the surface of much of the higher area, flowing to the gravel and cobble stratum of the advance glacial outwash. Discontinuous layers of the Vashon till restrict downward flow of infiltrating precipitation, as do silt layers and siltier zones within the sands of the Vashon drift. Such areally limited bodies of shallow ground water are called perched groundwater, because they are contained by an underlying low-permeability layer in an isolated position above the deeper groundwater table.

With a silt content generally in the 10 to 20% range, the sands of the Vashon drift would have moderate to low permeability, and infiltration through this material would be slow. Estimates of permeability based on the grain size distribution and fine content of the material, are in the range 10^{-3} to 10^{-4} centimeters per second. Zones of perched groundwater would be created by dense, low-permeability till and layers of silt with permeabilities in the range 10^{-6} to 10^{-8} centimeters per second (Luzier 1969). By contrast, the underlying clean gravels and sands of the advance outwash deposits would have permeabilities in the range of 10^{-2} to 10^{-1} centimeters per second, or higher (Freeze & Cherry 1980). The advance outwash deposits therefore form a conduit for groundwater flow at this site. (Permeability is a measure of the relative ease with which a geologic material conducts water. Sands and gravels have higher permeabilities than finer-grained materials such as silts and clays.)

Eight monitoring wells/piezometers were installed in borings on the project site during 1991 and 1992 to evaluate geologic/soil/groundwater conditions beneath the site and to monitor groundwater elevations. The groundwater elevations measured in the upper geologic units follow the topography and range from less than 10 to approximately 28 feet below the ground surface. The deepest groundwater is found near the top of the hill, and the shallowest occurs towards the base of the hill, adjacent to Des Moines Creek. Based on the observed stratigraphic relationships between the perched groundwater zones and the sediments found under the project site, three hydrogeologic units have been identified. The uppermost groundwater is contained in the shallow, more permeable sediments, and is semi-perched on the deeper, less permeable compacted silty gravel. The next deeper groundwater unit is contained in the compacted silty gravel. Beneath these two shallower perched groundwater units is the regional aquifer that occurs in sediments located below the densely compacted glacial till.

In general, groundwater levels across the site decrease with depth down to the dense till. The upper and lower perched hydrogeologic units are in direct hydraulic connection to Des Moines Creek which is also perched on the compacted till and is supplemented by groundwater discharge from these units.

A groundwater production well drilled immediately north of the site to 190 feet below ground surface reported a static water level at a depth of 143 feet. This occurrence is consistent with the deepest groundwater found during the project drilling program and correlates with water levels observed in other deep groundwater production wells in the area (Water Well Reports, Washington Department of Ecology). This deep occurrence of groundwater in the borings is probably associated with the regional aquifer. Des Moines Creek, and other nearby surface water bodies, such as Angle Lake and Bow Lake, appear to be perched on the densely compacted glacial till above the deep regional groundwater. Thus the Creek forms a hydraulically interconnected flow system with the groundwater beneath the site.

The shallow groundwater elevations at the site probably vary seasonally. Seasonal water level fluctuations have been measured in nearby wells ranging from less than 5 feet to slightly more than 10 feet (Luzier 1969). The highest levels occur during the late winter and spring in response to recharge from infiltration.

Groundwater levels decrease with depth and downslope, indicating both a vertical and horizontal flow. Generally, groundwater flows at the project site radially away from the site hilltop down towards Des Moines Creek. Based on analysis, groundwater infiltrating on-site has both vertical and horizontal components in the upper sand unit. Groundwater reaching the lower silty gravel flows mainly vertically until reaching the water table perched on the dense till, where it flows laterally at a lower velocity towards Des Moines Creek.

<u>Groundwater Recharge</u>

The project site is located on a hillside situated on a drainage divide between Des Moines Creek to the west and Angle Lake to the east. The perched groundwater beneath the hill is recharged by direct precipitation on the hill surface, and discharges westward to Des

Moines Creek or eastward to Angle Lake. Groundwater discharges to the Creek, over the reach adjacent to the drainage boundary, as springs and through a french drain system installed under the Tyee Valley Golf Course that collects and routes groundwater. Figure 4.9-4 shows the approximate general area underlain by french drains. The project site is located entirely within that portion of the hill that drains towards Des Moines Creek.

The infiltration area that contributes recharge to the shallow groundwater system beneath the site and discharges to Des Moines Creek has been estimated at approximately 239 acres. The assumption has been made that groundwater drainage follows the topography. In other words, the groundwater drainage divide coincides with the surface drainage divide.

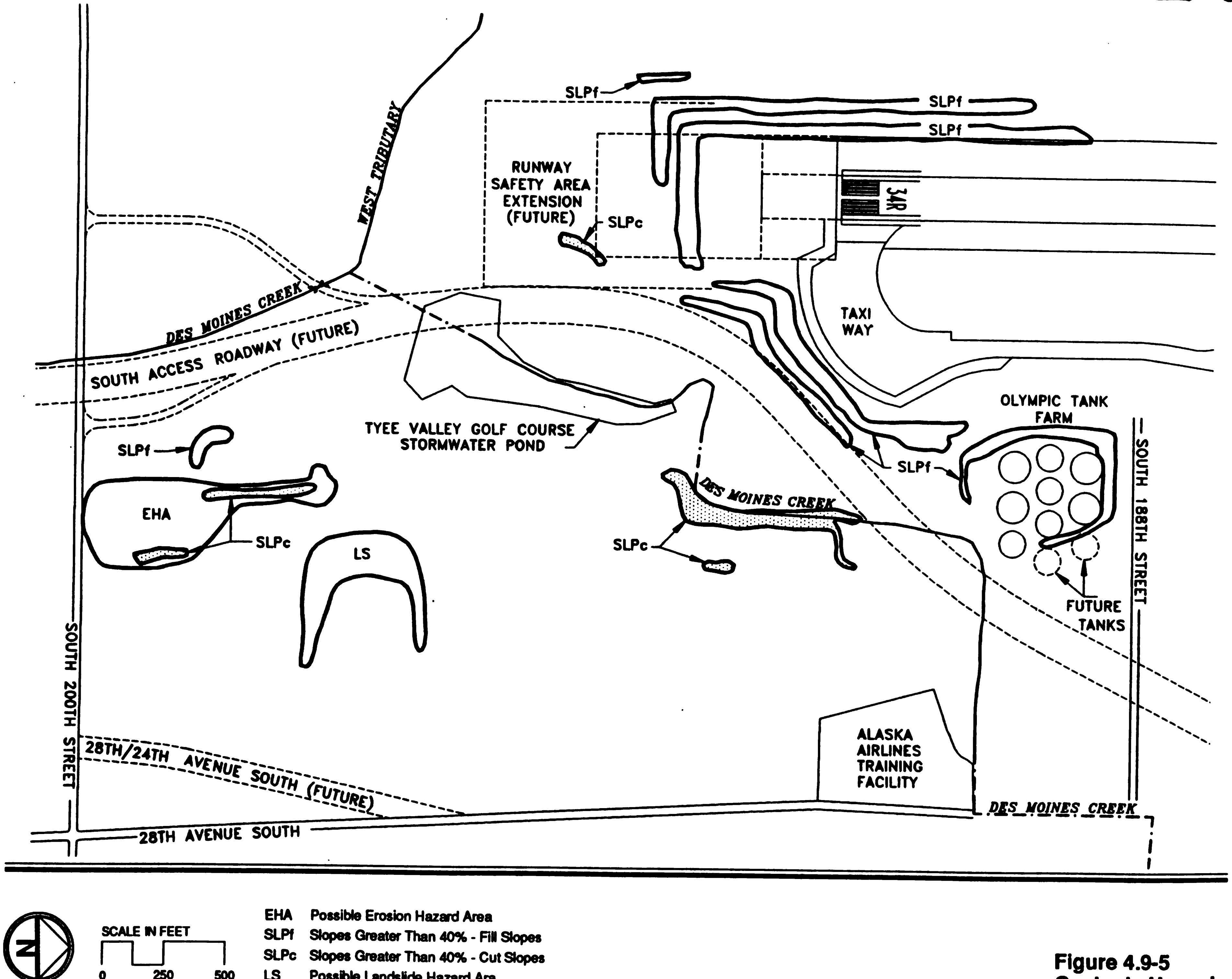
The average annual precipitation for the area is 38 inches (Climatological Data Annual Summary 1990). Evapotranspiration (uptake by plants) for western Washington has been estimated to range between 15 and 20 inches annually, and runoff (including surface runoff and groundwater discharge) to streams for the area has been estimated to average 20 inches annually (PNRBC 1970). Based on this information, infiltration and groundwater recharge from direct precipitation on the hill is estimated to range from 15 to 20 inches annually, depending on the proportion of excess precipitation that infiltrates or becomes surface runoff.

Estimates of groundwater recharge from direct precipitation have been made for Island County, Washington which has similar geologic and hydrogeologic characteristics (Island County Groundwater Management Plan 1989). Applying these estimates as a function of average annual precipitation, the estimated average annual infiltration for the site is approximately 18 inches. However, the infiltration for any given year will depend on the total amount of precipitation and the number and intensity of storms. Based on the comparison between average and maximum precipitation and estimated recharge, infiltration at the site may be as high as 1.5 times the average during a wet year.

On average, the water budget (recharge and discharge) of groundwater within the localized shallow groundwater system beneath the site would be expected to be in balance, i.e. the recharge equals the discharge. The vertical drainage through the densely compacted glacial till from the lower groundwater unit is probably negligible. This assumption is based on the observed compactness and fine grain of the glacial till. The permeability of the till is low enough to cause Des Moines Creek to be perched upon it. All shallow groundwater drainage from beneath the site is therefore assumed to discharge to Des Moines Creek. Thus, 18 inches of infiltration will eventually discharge to the Creek, yielding on average 43,000 square feet per day, of 0.5 cfs of baseflow from the 239 acre contributing area. This is a liberal estimate and does not account for evapotranspiration, which is another smaller component of groundwater discharge.

<u>Low Flow Estimates in Des Moines Creek</u>

The flow of Des Moines Creek was measured at five locations on June 5 and 8, 1992. Flow rates ranged from 0.15 to 0.49 cfs, increasing consistently downstream along the stream



EHA Possible Erosion Hazard Area
SLPf Slopes Greater Than 40% - Fill Slopes
SLPc Slopes Greater Than 40% - Cut Slopes
LS Possible Landslide Hazard Ara

Figure 4.9-5
Geologic Hazards

reach adjacent o the site boundary. During and at least three weeks prior to the discharge measurements, no rain had fallen in the Creek catchment area. Thus, the increase can be attributed to groundwater inflow. The measured 0.35 cfs groundwater contribution closely matches the average 0.5 cfs baseflow contribution estimated on a yearly basis.

Low flow information for urban creeks in the Puget Sound region (USGS 1984) indicates that the 6 month low flow which is exceeded 50% of the time (average 6 month low flow) ranges between 0.6 and 0.9 cfs per square mile. Based on these values, the 6 month average low flow for the 239 acre project area can be estimated at 0.2 to 0.3 cfs. The measured streamflows of Des Moines Creek are close to this range. Groundwater contribution to baseflow in the Creek likely increases in the winter months due to increased groundwater levels and recharge from rainfall.

Discharge to the Creek was also estimated. The results of the analysis indicate a baseflow to Des Moines Creek from beneath the site of approximately 0.65 cfs for present conditions. This value is within the order of magnitude of estimates provided by baseflow measurements, the water budget, and the low flow information for regional urban creeks.

4.9.1.5 Hazards

The types of potential hazards related to the site include: 1) landslide, 2) erosion, and 3) seismic. Figure 4.9-5 shows the location of potential hazard areas at or near the site.

<u>Landslide Hazards</u>

As discussed in the Geology section (4.9.1.1), the near-surface materials in the Puget Sound upland area comprise predominantly glacial soils. The stability of the slopes in the area is strongly influenced by the physical characteristics of the glacial formation underlying the vegetated surface. Studies have predicted relative occurrence of landslides based on topography, stratigraphy and permeability to surface water. In this region, permeable sand and gravel deposits can be found overlying less permeable glacially consolidated clayey silt and silt. The occurrence of this conjunction of soil types, and its exposure on slopes greater than 15%, together with saturated soil conditions, constitute the majority of existing landslide hazard areas in the region. Within the Puget Sound region, local governments have used the above-mentioned studies as a guideline for assessing potential landslide hazards in their jurisdictions. However, site-specific geologic and hydrogeologic conditions govern the actual slope stability on a particular site.

Landslide hazard indicators include: 1) the presence of clayey-silt/silt overlain by granular soils, 2) the presence of springs, surface water and/or groundwater within landslide susceptible soils, 3) relatively steeper slopes separated by less steep benches (indicative of possible past earth movements and/or erosion), 4) the occurrence of bent trunks in both immature and mature trees indicating surficial soil creep and/or larger-scale earth movements, and 5) the presence of features such as scarps and earth flows which point to previous landslide activity.

scharge
can be
closely

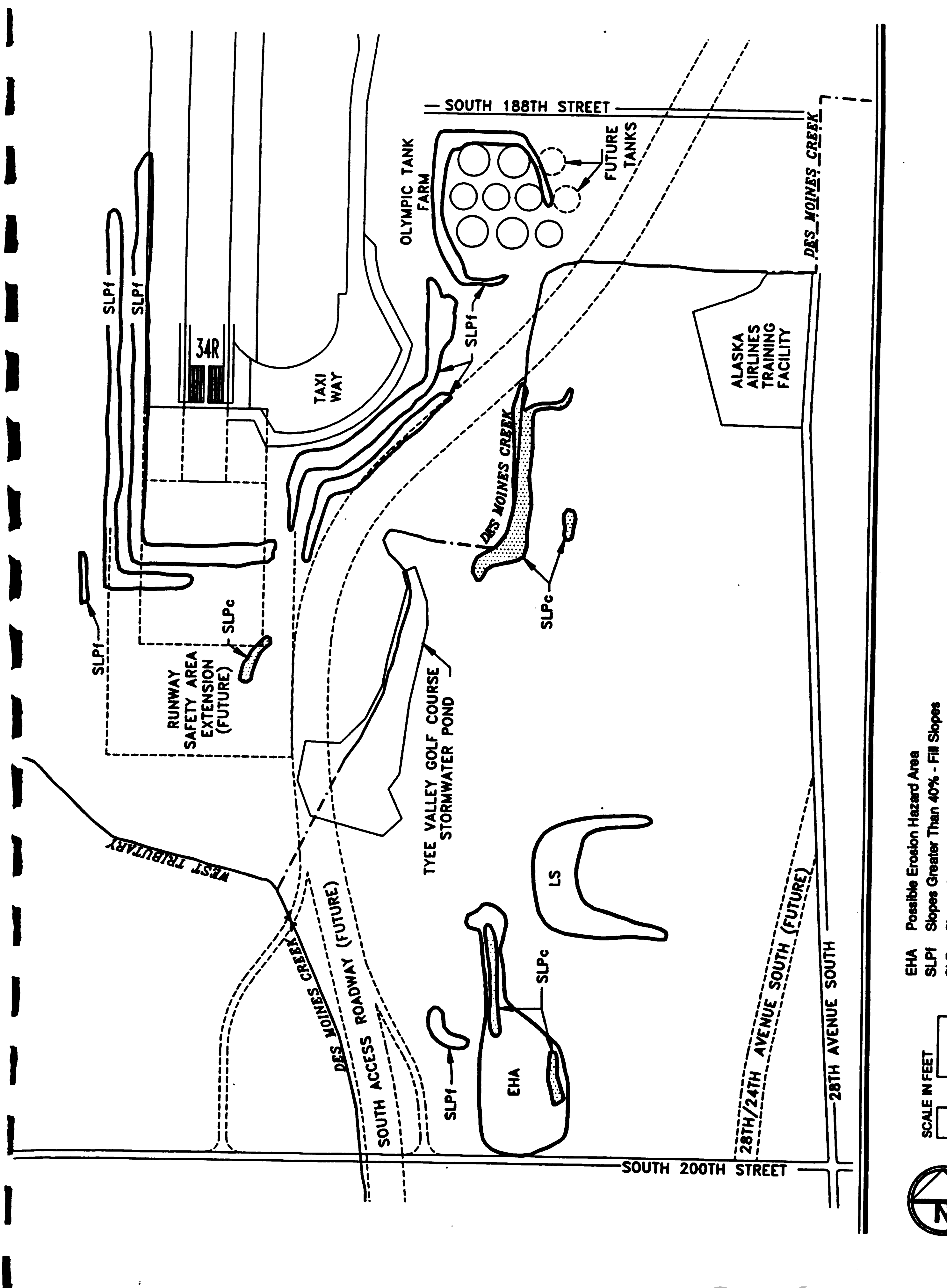
ndicates
w flow)
average
easured
ation to
ndwater

aseflow
nditions.
aseflow
creeks.

, and 3)
site.

t Sound
e area is
ying the
ased on
ble sand
ayey silt
greater
existing
rnments
andslide
nditions

granular
andslide
cative of
in both
le earth
point to



With the exception of the fill on the Seattle Christian School site, there are no areas within the SASA site that can be considered to be landslide hazards. The Seattle Christian School fill was not investigated by drilling during the recent field work. The types of material and placement method used to construct this fill, together with its configuration should be investigated during the design phase. It is possible that the fill represents a landslide hazard. However, the City of SeaTac study of sensitive areas within the city limits indicated that no landslide hazard areas are within the SASA site.

Erosion Hazard

Erosion includes the breakdown of soils by the natural processes of water and wind. Water-related erosion has the most immediate impact in the Puget Sound area. The susceptibility of a material to erosion is dependent upon 1) its chemical and physical characteristics, 2) topography in which the material is located, 3) the amount and intensity of precipitation, 4) the amount of surface water, and 5) the type and abundance of vegetative ground cover.

The site soils have been mapped by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS) as described in the Soils section. The USDA SCS considers that the Alderwood and Arents Series soils have a severe potential for erosion when they occur on slopes of 15% or greater. Potential erosion hazard areas of the site, based on this interpretation of soil conditions and topography are shown in Figure 4.9-5. Neither the geological reconnaissance nor the aerial photograph analysis indicated visual evidence of erosion in these areas. The City of SeaTac study of sensitive areas within the city limits indicated that no erosion hazard areas are within the SASA site.

Seismic Hazard

The Puget Sound Basin is located within a relatively active seismic region. Of the four seismic risk zones mapped by the United States Geologic Survey (USGS), the Puget Sound Basin has been classified as Zone 3 (Zone 4 has the highest seismic risk).

Seismic events can result in a variety of soil-related responses, including ground shaking, landslides, liquefaction and ground failure from faulting. Apart from ground shaking which happens to varying degrees during all earthquakes, landslides and liquefaction are possible on the project site. A review of geologic maps of the area indicates that no faults are present. The risk of ground failure due to faulting is therefore remote. By increasing the horizontal component of loading, a seismic event may precipitate a slippage in a landslide susceptible area even if the groundwater is below a level that would have statically induced the landslide. It may also increase the area of the landslide-susceptible zone that fails.

Liquefaction can occur within stream beds and valley bottoms in relatively low-density, fine-grained soils existing in a saturated state. Liquefaction is a condition in which during an earthquake, soil behaves more like a viscous liquid than a solid medium. The soil type most susceptible to liquefaction is saturated, low-density sand below the water table.

Two small areas of the SASA site have been mapped as seismic hazards by
SeaTac study of sensitive areas. Specifically, the areas are:

- Immediately north of South 200th Street, and bisected by Des Moines C

- Immediately west of 28th Avenue South, and area presently occupied by Alaska Airlines Training Center parking lot and a gravel parking area vehicles.

On the basis of elevation and proximity to the Creek, the areas were likely de seismic hazards because of liquefaction potential. A study conducted for the E determined that the soils are of a type and/or density that would preclude l effects even under a higher level design earthquake. The areas are therefore r hazards.

4.9.2 Construction and Operation Impacts

From a qualitative point of view the earth-related impacts of Alternatives 1, 2 an same. In each case soil would be excavated from the higher ground on the east site, and placed on the lower ground on the west side of the site. The quantit configuration of excavation and fill would vary from alternative to alternative.

4.9.2.1 No-Action Alternative

There would be no construction or operation impacts attributable to the SAS under the No-Action Alternative. Impacts due to any other type of development take place on the site would be subject to separate environmental review.

4.9.2.2 Alternative 1

Excavation

Excavation of the higher area would expose an expanse of silty sand containing 20% by weight of fines (silt and clay-sized particles). As the soil is generally gr fines are not cohesive and are not bound to the soil matrix. Below the silty sand, the excavation depth, gravel and cobbles would be exposed. The gravel and cobb is considered to be clean, with less than 5% fines.

Excavation above the groundwater table during dry weather would produce du periods of heavy rain, the finer component of the soil would be carried off with runoff, causing siltation of adjacent surface water drainages. Depending on the p of the soil at the exposed surface, ponding could develop during and immediate rain. The temporary cut slopes may fail by material sloughing, if cut at too stee Precipitation and runoff would increase the likelihood of this sloughing, and cause erosion of the exposed slope face, carrying fine and medium-sized soil particles to the base of the slope.

Groundwater was encountered at depths ranging from less than 10 feet below the existing ground surface. This level is above the proposed level of excavation and would require dewatering. The dewatering, whether permanent or temporary, would produce a substantial flow of water to be discharged into the Creek or into nearby storm water sewers. As excavation proceeds, if slopes are cut at a safe angle for drained conditions, and the dewatering does not keep the groundwater level below the base of the excavation, the cut slopes would be susceptible to failure because of reduced friction within the slope.

Flow of groundwater out from the cut slopes in the silty sand would cause erosion by removing material from the slope. This would tend to undermine the slope, thus promoting failure. Flow of water over the face of the slope would also cause erosion, carrying fine and medium-sized soil particles to the base of the slope. Within the underlying dense gravel and cobble stratum, which has little fine material, groundwater can flow from the slope without detrimental effects.

The base of the excavation could be within the silty sand layer for intermediate parking or roadway levels. In this case, if the lowered groundwater table is close to this grade, there would be disturbance of the subgrade soils due to the combination of high soil moisture and construction traffic. However, for most of the site the final grade would be within the dense gravel and cobble layer, which would not be susceptible to disturbance in this way.

The gravel and cobble stratum is very dense and likely contains sizeable boulders with the gravel and cobble-sized constituents. Excavation of this material would require heavy, powerful equipment.

Fill Placement

Placement of the substantial fills associated with raising the site grade would impose high loads on the existing soil. While the existing soil is generally dense and capable of sustaining these loads, locally there may be less dense zones. The less dense zones may settle under the imposed load and cause distress to the fill or retaining walls founded on them.

Excavated soil from the higher ground to the east would initially comprise silty sand with 10 to 20% by weight of fine-grained particles. Soil with more than about 5% of fine-grained particles is considered to be moisture-sensitive as a construction material. Compaction of this soil to an adequate density will be difficult when the soil is wet, that is, above the optimum moisture content for compaction. Soil of this type, even when excavated above the groundwater table, is somewhat above the optimum moisture content for compaction, and would require drying before compaction is attempted. Soil from above the groundwater table could also be much too wet because of capillary rise, contact with perched water, or precipitation. Such wet soil would require a longer drying period.

Silty sand excavated below the presently existing groundwater table without
would be much too wet to compact immediately after excavation. Transport of t
would also be difficult because of the high moisture content, which would ma
sand behave as a slurry when disturbed by excavation. Drying would be requ
compaction.

The excavated gravel and cobble material is free-draining, and will not hold wa
be compacted immediately after excavation. Water may have to be added to t
to facilitate compaction. Boulder-sized pieces within this material wou
compaction, and would have to be removed and disposed of, either as landsca
site. Large, heavy vibratory compactors would be required to adequately compa
the gravel and cobble material.

Groundwater

The initial volume of groundwater to be dewatered during construction is appro
million gallons. The estimated rate of withdrawal from the excavation du
dewatering is approximately 44,000 cubic feet per day or 0.5 cfs.

Once the SASA facility is constructed, the reduction in discharge to Des Moines
groundwater would be approximately 23% of the 0.5 cfs, leading to an estimate
to the Creek of 0.39 cfs. This assumes that the reduction is directly proporti
amount of increased impervious area over the site. This estimate includes bo
from groundwater discharge and inflow from the drain system. The groundwat
would be reduced in comparison to existing conditions because the dewatering a
system would maintain a lower groundwater elevation beneath the site.

Under Alternative 1, baseflow to Des Moines Creek would be reduced to 0.38
42% lower than the estimate of 0.65 cfs for existing conditions.

Sensitive Areas

Two areas of the SASA site, classified as seismic hazards by the City of SeaT
sensitive areas, have been investigated. The areas are identified in Section 4.9.1
undertaken as part of this EIS has determined that the areas are, in fact,
hazards. The impacts on these areas need not be considered in this EIS.

The fill underlying the Seattle Christian School playing field was not drilled
investigation. This possible landslide hazard requires further study if Alternative
for design and construction.

Option 1A

Under Option 1A, the area set aside for future aviation maintenance in Alternat
not be developed by the Port. Construction and operation impacts of the SAS

would be similar to, but slightly less than, Alternative 1. The impacts of any other type of development that could occur there would be the subject of separate environmental review.

4.9.2.3 Alternative 2 - The Preferred Alternative

The earth-related impacts for Alternative 2 are the same as for Alternative 1, except for the following changes to Excavation and Sensitive Areas.

Excavation

Within the existing fill at the Seattle Christian School, there are likely to be concrete rubble, deleterious material, and other items that would not be suitable for engineered fill for the SASA project. Disposal of these materials would require their segregation and removal from the site.

Groundwater

The initial volume of groundwater to be dewatered during construction is approximately 67 million gallons. The estimated rate of withdrawal from the excavation during initial dewatering is approximately 57,000 cubic feet per day or 0.7 cfs.

Once the SASA facility is constructed, the reduction in discharge to Des Moines Creek from groundwater would be approximately 36% of the 0.5 cfs, leading to an estimated discharge to the Creek of 0.32 cfs. This assumes that the reduction is directly proportional to the amount of increased impervious area over the site. This estimate includes both baseflow from groundwater discharge and inflow from the drain system. The groundwater baseflow would be reduced in comparison to existing conditions because the dewatering and the drain system would maintain a lower groundwater elevation beneath the site.

Under Alternative 2, baseflow to Des Moines Creek would be reduced to 0.34 cfs. This is 48% lower than the estimate of 0.65 cfs for existing conditions.

Sensitive Areas

The Seattle Christian School fill would be entirely removed under this alternative, and need not be considered as a possible landslide hazard area within the SASA site.

4.9.2.4 Alternative 3

The earth-related impacts for Alternative 3 are the same as for Alternative 2.

The initial volume of groundwater to be dewatered during construction is approximately 78 million gallons. The estimated rate of withdrawal from the excavation during initial dewatering is approximately 76,000 cubic feet per day or 0.9 cfs.

Once the SASA facility is constructed, the reduction in discharge to Des Moines
groundwater would be approximately 44% of the 0.5 cfs, leading to an estimate
to the Creek of 0.29 cfs. This assumes that the reduction is directly proporti
amount of increased impervious area over the site. This estimate includes bo
from groundwater discharge and inflow from the drain system. The groundwat
would be reduced in comparison to existing conditions because the dewatering a
system would maintain a lower groundwater elevation beneath the site.

Under Alternative 3, baseflow to Des Moines Creek would be reduced to 0.31
52% lower than the estimate of 0.65 cfs for existing conditions.

4.9.2.5 Cumulative Impacts

Other airport development projects that may occur in the future, such as the pot
runway, may also affect area earth elements. The site under consideration for
is separated from the area of the SASA site. Development of an additional run
west side of the airport would require fill of approximately 10 -13 million cu
material and site regrading. More detailed estimates of the quantity and footp
a fill and grading will be prepared as part of the airport Master Plan engineer

A roadway corridor EIS being prepared under the direction of the Washington I
of Transportation will provide additional analysis for earth impacts c
transportation improvements south of the airport. Areas involved, including por
Des Moines Creek basin, would depend on route alignment decisions which h
been made. Planning for other airport projects has not yet progressed to the poi
impacts on earth elements can be estimated. The potential for cumulative impa
elements will be reexamined in the airport's Master Plan Update and EIS (r
Section 3.4.13).

4.9.3 <u>Mitigation Measures</u>

From a qualitative point of view, the mitigation measures for each alternativ
similar. The degree to which these measures would be applied would vary from
to alternative. The mitigation measures recommended below have been arrang
following general groupings: soils, groundwater, and sensitive areas.

4.9.3.1 Soils-Related Mitigation

<u>Dust</u>

During initial excavation above the groundwater table, and away from the i
perched water tables, dust from the action of wind or construction traffic o
grained soil particles may be controlled by the judicious use of water applied as
from hoses or water trucks. Care should be taken not to apply too much wa

would hinder excavation at lower levels, and would increase the amount of soil material finding its way into surface drainage ditches.

Siltation

A system of temporary silt fences should be set up during earth-moving activities at locations to effectively trap the flow of fine-grained soil materials before they can enter surface drainage ditches or water courses. As earth moving proceeds, the location and extent of these fences would require adjustment to match the changes in topography. The silt fences should be maintained after completion of earth moving, until the site has been fully developed in terms of pavement construction, retaining wall construction, and landscaping. The proposed initial locations of the silt fences should be reviewed by the geotechnical engineer, and their relocation during earth-moving operations carried out under the supervision of the geotechnical engineer's representative on site.

In addition to the silt fences, temporary sedimentation ditches should be constructed along contours, in the lower portions of the site, to trap fine-grained soil materials that manage to bypass the silt fences. As a final line of defense, sedimentation ponds should be constructed at site boundaries where drainage ditches carrying runoff from the construction area leave the site. The ponds should be designed and sized in accordance with the King County Storm Water Management Guidelines. The condition of the sedimentation ditches and ponds should be monitored during construction. Sources of excessive amounts of material flowing into the ditches and ponds should be determined, and the necessary remedial measures taken.

The following mitigation measures apply to the silty sand, and other soil containing fine-grained materials, at the site. To reduce the availability of fine-grained soil material that can be washed from the site by surface runoff, the area that is opened up by excavation should be limited in extent at any one time. Permanent slopes should be hydro-seeded, covered with erosion-resistant matting, or otherwise treated as soon as is feasible after excavation. The contractor's activities should be phased so that the permanent treatment of slopes quickly follows excavation. Temporary slopes and permanent slopes that have not yet received their permanent treatment should be covered with visqueen to prevent erosion. The visqueen should be staked or weighted down with sandbags at regular intervals, such that the slope cover is not removed by wind.

Slope Slumping

Cut slopes that are excavated at too steep an angle are prone to slumping. Temporary and permanent slopes steeper than 25%, and greater in height than 5 feet, should therefore be designed by a registered geotechnical engineer. The design should take into account the type of soil material in which the slope is cut, and the groundwater level existing at the time the slope is cut. Temporary slopes can often be excavated at a steeper angle than those which must remain standing for the life of the project. The duration that a slope would be in place should also be taken into account in design.

Construction Dewatering

Lowering the site to proposed grades would involve excavation below t groundwater table. Dewatering, both temporarily during construction and pe would be required to develop the site. Dewatering is the temporary or permane of the groundwater table to allow excavation to be carried out in relatively dry above the lowered groundwater table.

The site should be dewatered before excavation in one of two ways. The ground over the entire area to be excavated can be lowered by the installation of, an from, drainage wells or sumps. Excavation can then be carried out, and the drainage system installed before removing the drainage wells or filling the su second alternative is to use more localized dewatering to install the permaner system, which then functions during construction to control the groundwater tab level of permanent drainage is completed, the process is repeated until the desig been achieved. Either method, or a combination of the two, would be appropri site. The method chosen would depend on the results of further geotec hydrogeological investigations and analysis carried out for final design.

The choice of earth-retaining structures, where grade changes cannot be effe slopes, would be impacted by the need to deal with the groundwater. If the reta are not designed for hydrostatic pressure, temporary dewatering would be require installation of a permanent drainage system behind the permanent retaining wa case of a tied-back retaining wall, the permanent drainage may take the form of a drainage layer behind the facing layer of the wall. Where a drainage layer installed behind the wall, horizontal drains drilled into the soil behind the wal required to maintain the groundwater level below the base of the wall.

Almost the entire east half of the SASA site would be constructed by cutting in the existing groundwater table. Underdrains may be required beneath the paver area to prevent uplift due to hydrostatic pressure.

Excavation

Excavation of the existing fill at the Seattle Christian School may uncover material that cannot be used as engineered fill for the SASA project. Such material should be removed from the site for disposal.

Treatment, in the form of densification or excavation and replacement, may be the lower area of the site for weaker surficial soils that are located under propo retaining walls. The condition of these foundation materials should be investi to final design and construction.

Fill Treatment and Placement

The excavated silty sand from the higher east side of the site that would be used as fill has a fines content (percentage of silt and clay-sized particles) in the range 10 to 20% and, as such, is considered to be moisture-sensitive as material for engineered fill placement. Moisture sensitivity implies that when the soil contains more than the optimum water content for compaction (from precipitation, or runoff, or by being excavated below the existing groundwater table) it will be extremely difficult or impossible to compact to the density required for engineered fill.

Earthwork should be carried out during the drier summer months. This would allow excavated wet soil to be dried before compaction is attempted. Drying can be accelerated by spreading the soil in a thin layer, and disking the layer at intervals to expose more of the soil to the drying effects of sun and wind. Another technique is to mix drier soil excavated above the groundwater table with the wet soil to reduce the required drying time.

Fill thickness of up to about 70 to 80 feet is envisioned for this development. Given the height of the fill, consideration should be given to compacting the lower layers of fill to a reduced density. Compacting to a reduced density would produce somewhat higher settlements than if higher densities were achieved. However, settlement due to fill loading should be fairly fast, with a significant portion occurring during construction. The settlement of the fill should be monitored and the timing of the construction of the facilities adjusted to accommodate settlement, if necessary.

The dense gravel and cobble material which underlies the silty sand, and which would also be excavated for use as fill, is not moisture sensitive. Placement and compaction of this material would be viable well into the fall, and the earthwork construction season may be extended when this material is being used. Powerful equipment would be required for its excavation, and heavy compactors for its densification as fill.

4.9.3.2 Groundwater-Related Mitigation

Drainage Flow

At the present time, groundwater from the higher area on the east side of the site ultimately reaches Des Moines Creek. The quantity of flow is not known, but is likely to be seasonal, with some delay as precipitation percolates to the groundwater table. During construction and operation of the SASA facility, this flow into the Creek should be maintained by directing the drainage to the appropriate part of the Creek. The elevation and slope of drainage pipes would have to set such that most of the drainage water flows to the north part of the site, rather than letting the water flow directly to the Creek at the lowest point on the site. Depending on the volume of flow, a manifold system may be required to introduce water to the Creek in a gradual fashion over a certain length of the stream bed.

French Drains

Springs that emanated from the base of the hill, on the east side intercepted by a system of french drains. Extensions to the french d Des Moines Creek. The springs are within a range of elevation bel and would continue to be fed with groundwater after SASA is in placed as part of the proposed development would cover most Levelling of the ground in preparation for the erection of reinforc walls may excavate part of the french drain system. The extent and drain system should be determined prior to construction, and the modified to maintain the groundwater flow to the Creek during an

Measures to reduce the impacts of reduced baseflow to Des Moine sending SASA roof runoff to an infiltration system that would feed t This system would be developed in addition to the french drain sys

4.9.3.3 Sensitive Areas Mitigation

The two areas that had been mapped as seismic hazards by the C sensitive areas have been investigated by drilling and sampling s conducting a liquefaction analysis. This study has determined that and/or density that would preclude liquefaction effects even unde earthquake. Mitigation would therefore not be required for these

4.10 BIOTIC COMMUNITIES

4.10.1 Affected Environment - Vegetation and Wildlife

This section describes plant and animal communities in the SASA vic likely to be affected by the proposed development. Vegetation and area were documented by field surveys (conducted between Octobe 1991), interpretation of aerial photographs, and by a search of the W of Natural Resources Natural Heritage Data System, the Wash Wildlife Nongame Program, and U.S. Fish and Wildlife Service rec

Most of the project site has been subject to a variety of disturbanc development; commercial parking lots and light industrial, Port-r school. Des Moines Creek, which has been modified previously, cr of the site and then flows south near the western boundary.

Project analysis in the upper Des Moines Creek basin is especially the special needs and flight safety issues associated with Sea-Tac Collisions between birds and aircraft represent a safety issue of seri Port of Seattle and the Federal Aviation Administration. Open wa tall trees can attract waterfowl, small flocking birds (such as starling feed on resident small mammals. Resident fish populations can also attract many birds and small mammals where shorelines and open-water fish habitat is accessible. The closer these habitat features are to airport runways, the greater the potential for aircraft interference.

4.10.1.1 Habitat types

Several habitat types are present within the project area. The least disturbed communities are two small wooded areas in the north and south ends and wetlands along a small stream channel. Other parts of the site include grassy fields, a golf course, a school, a tank farm, parking lots, and unoccupied or partially occupied residential areas.

Wooded Areas

The northern wooded area is adjacent to South 192nd Street, west of the SeaTac City Hall and east of the Tyee Valley Golf Course clubhouse and parking lot. A portion of this wooded area extends north of South 192nd Street. This area shows some evidence that it was a residential area at one time (old driveways and foundations), but these remnants are obscured as the area is now heavily overgrown. This community has numerous large trees, dominated by Douglas fir, big-leaf maple, and red alder. Some areas are relatively open under the tree canopy, but other areas have smaller trees with a dense understory of Himalayan blackberry. The dominant ground cover species are salal and sword fern. One area within this northern wooded zone is wetland, with vegetation which includes hardhack spirea, giant horsetail, and slough sedge.

The southern wooded area is located on the slope west of the residential area along 26th Avenue South; it is generally similar to the northern wooded area. The dominant trees are big-leaf maple, red alder, and black cottonwood, with some Douglas fir and Pacific madrone. This area has a relatively dense shrub understory of Himalayan blackberry, hazelnut, and Indian plum. The dominant ground cover species are salal, sword-fern, and Pacific blackberry.

Just east of the Olympic Tank Farm and south of South 188th Street, there is a small wooded area dominated by young red alders, with some willows, Douglas fir, and Pacific madrone. The understory consists of blackberries.

Grassy Fields

A few small areas around the site are now overgrown grassy fields. The largest of these fields include the northeast corner of the site, south of South 188th Street, an area south of the Seattle Christian School and west of 28th Avenue South, and around the abandoned parking lot near South 200th Street. These areas are dominated by a variety of grasses and weedy herbaceous plants including plantain, common tansy, and fireweed. They also have some shrubby areas with Scot's broom and Himalayan blackberry.

Residential Areas

The former residential area, purchased by the Port for the Noise R
of the northern wooded area, east of the golf course, and north o
School. Most of the houses have been physically removed from thi
few still remain; the streets are still usable. A large number of ornan
are found here, and the vegetation bears little resemblance to a natu
of the common native tree species include Douglas-fir, big-leaf map
open areas are rapidly being invaded by Himalayan blackberry
herbaceous species. An occupied residential area is located south o
of South 200th Street, on both 26th Avenue South and 27th Avenue
of the south residential area is similar to that described above.

Golf Course

Most of the project site below the slope is currently in use as the Ty
This area is dominated by fairways with very short grass and scatter
such as Lombardy poplar and weeping willow. Around the edge of th
red alders, Douglas fir, and Himalayan blackberry.

4.10.1.2 Wildlife

The variety of vegetation patterns provides habitat for numerous ter
the project site. Wildlife diversity is related to the structure and spec
vegetative communities. The wooded areas with well-developed
wetland areas are likely to have the greatest numbers of wildlife sp

Mammals

Coyotes, the largest predators on site, have been seen in the area by
Coyote scat containing bones of small rodents or shrews was observ
of the stream channel, near a parking lot. Other likely predators in
and opossum. Because of the relatively small size of the proje
surroundings, no large animals are expected on the site. The larges
occur on the site are eastern cottontails in the open grassy areas
mammals are likely to be present, but because they are nocturnal t
observed. The project site provides suitable habitat for several speci
the deer mouse and voles. Eastern gray squirrels were observed in
in the old residential area. Mountain beaver burrows were found i
area. Numerous mole hills were present in parts of the golf course
streams or Tyee Pond. Shrews are also likely to be present, but like r
Several species of bats may use the site for seasonal foraging.

Birds

In general, the FAA and the Port of Seattle discourage bird habitat near the airport for safety reasons. Bird strikes can pose a serious hazard to aircraft.

The diversity of vegetation on the project site provides suitable habitat for a relatively large number of bird species. Common species in the wooded and residential areas include American crow, American robin, black-capped chickadee, and dark-eyed junco. Canada geese and glaucous-winged gulls are common on the golf course. The ponds west of the golf course provide habitat for great blue heron, pied-billed grebe, belted kingfisher, and resident or migratory waterfowl. Raptors using the site include sharp-shinned hawk, red-tailed hawk, and merlin. The presence of pileated woodpeckers on the site was indicated by recently excavated snags.

Because field observations were conducted between October and December, migratory bird species, particularly warblers, vireos, and flycatchers, that may be present for breeding on the site during the spring and summer seasons were not directly observed. Table 4.10-1 lists bird species found on or near the SASA site.

Reptiles and Amphibians

The diversity of reptiles and amphibians on the project site is likely to be very low, although the riparian corridor will provide some suitable habitat. Frogs were observed along the edges of the flowing streams, and Pacific tree frogs were heard calling in the forested wetland near the clubhouse, at a detention pond just west of the school ball fields, and in both wooded areas. Common bullfrogs, tadpoles, and a crayfish were identified in the stream during the electroshock fish surveys conducted for this study. It is possible that a few species of salamanders, such as the roughskin newt, may be found in the wetland areas. The only reptile species likely to occur on the site are garter snakes and northern alligator lizards.

4.10.2 Affected Environment - Fisheries

The Des Moines Creek drainage basin consists of about 3,700 acres situated south and southeast of Sea-Tac International Airport. The primary surface water conveyance in the basin is Des Moines Creek (Bow Lake Creek) which originates from Bow Lake and extends about 3.5 miles southeast to Puget Sound, while dropping about 300 feet in elevation. There are three major unnamed tributaries which enter the Creek at about river miles (RM) 0.7, 1.9, and 2.4 (Williams et al. 1975).

Des Moines Creek flows through a natural channel, except for the section above South 200th Street, the majority of which is the SASA site. This reach includes a 3,600-foot culverted and channelized reach immediately downstream of Bow Lake. This culverted reach contains little or no salmon spawning or rearing habitat although cutthroat trout (*Oncorhynchus clarki*) and some warm-water fishes from Bow Lake may use it for some

Table 4.10-1. Birds observed on or near the SASA site.

Scientific Name	Common Name	Habitat*
Podilymbus podiceps	Pied-billed Grebe	P
Ardea herodias	Great Blue Heron	P
Branta canadensis	Canada Goose	G
Anas platyrhynchos	Mallard	G,P,S
Anas strepera	Gadwall	P,S
Anas americana	American Wigeon	P
Aythya collaris	Ring-necked Duck	P
Accipiter striatus	Sharp-shinned Hawk	G
Buteo jamaicensis	Red-tailed Hawk	G
Falco columbarius	Merlin	R
Fulica americana	American Coot	P
Chadrius vociferus	Killdeer	G
Gallinago	Common Snipe	G,S
Larus glaucescens	Glaucous-winged Gull	G
Ceryle alcyon	Belted Kingfisher	P
Colaptes auratus	Northern Flicker	G,R,W
Cyanocitta stelleri	Steller's Jay	R,W
Corvus brachyrhynchos	American Crow	F,G,R,W
Parus atricapillus	Black-capped Chickadee	G,P,R,S,W
Parus rufescens	Chestnut-backed Chickadee	W
Thryomanes bewickii	Bewick's Wren	R
Regulus satrapa	Golden-crowned Kinglet	G,W
Regulus calendula	Ruby-crowned Kinglet	W
Turdus migratorius	American Robin	F,G,R,W
Bombycilla cedrorum	Cedar Waxwing	R,W
Sturnus vulgaris	European Starling	R,G,W
Pipilo erythrophtalmus	Rufous-sided Towhee	R,W
Passerella iliaca	Fox Sparrow	S
Melospiza melodia	Song Sparrow	F,R,S,W
Junco hyemalis	Dark-eyed Junco	F,G,R,S,W
Carpodacus mexicanus	House Finch	F,R
Carduelis tristis	American Goldfinch	G
Passer domesticus	House Sparrow	F,G,R

*Habitats:

F	-	Grassy Fields	G	-	Golf Course
P	-	Ponds	R	-	Residential Areas
S	-	Stream corridors	W	-	Wooded Areas

portion of their life stages. The streambed consists of silt and sand intermixing with small gravel. Bank vegetation in the open channel areas consists of very dense brush and small trees providing a good shade canopy.

The reach between RM 2.8 and South 200th Street (RM 2.1) flows through the Tyee Valley Golf Course. This reach is characterized by an open grassy bank channel. The stream is culverted for 270-feet at the north end of the golf course and again at the outlet from the Tyee Pond at RM 2.4. The outlet structure appears to be a barrier to fish and the stream channel provides little rearing habitat for fish. The detention facility is actually a large grass-lined bowl that the Creek runs through during low flows and only impounds water during storm events. This creek section consists primarily of a straight, narrow run reach (relatively shallow, fast moving water) with virtually no pools, instream cover or under-cut banks. As a result, there is very little fish-rearing habitat in this area.

Due to the presence of the golf course, and FAA and Port safety concerns about attracting birds to areas under the flight path, the canopy in this reach is largely absent. This lack of shade probably causes water temperatures to rise during summer months which might be a problem for juvenile salmonids. The lack of trees also reduces the stability of the banks and results in excessive erosion and bank sloughing which increases the silt loading in the Creek.

The golf course reach has limited salmonid spawning habitat and marginal rearing habitat. The wetlands on the west side of the golf course are probably not used extensively by juvenile salmon due to stagnant water and warm summer temperatures. Bass *(Micropterus sp.)* have been reported to inhabit these wetlands although the size of these populations or usage of the wetlands by other fish species is not known (Alan Johnson personal communication, 1991). These wetlands are connected to Des Moines Creek by an unnamed tributary at RM 2.4. This tributary is characterized by slow-moving water; soft, marshy banks; and heavy accumulation of fine sediment. The streambed in the rest of the golf course reach is predominantly sand and silt with some small patches of gravel and small cobble. Three drop weirs (dams) are located in the golf course just north of South 200th Street. The culvert at South 200th Street is flat-bottomed and at low flows its downstream end is higher than the plunge pool. This requires fish to leap into the culvert which at low flows does not have sufficient water depth for fish to swim. The weirs, along with the box culvert under South 200th Street, might create passage problems for some fish. Although these barriers are probably not significant blockages for coho salmon (*Oncorhynchus kisutch*), they might be for trout and other smaller fish species. In addition, the outlet control structure for the Tyee Pond appears to be a barrier to most fish.

Below South 200th Street, the Creek is in a more natural condition. It runs through a forested area that provides virtually unbroken shade (Herrara 1989). This section consists of three distinct reaches: upper (RM 2.1 - 1.7), middle (RM 1.7 - 1.1), and lower (below RM 1.1). The upper reach is a relatively level stretch (0.7% gradient) with slower and deeper water than the two lower reaches (R.W. Beck 1990). The streambed consists primarily of gravel with some sands and silt (R.W. Beck 1989). This reach contains

significant salmon and trout spawning habitat although rearing habitat is limited (Jo
1989).

The relatively high gradient (3.6%) of the middle reach has cut a steep-sided ravine i
surrounding hillside. The right side of the Creek (facing downstream) is confined by
rap stabilized bank and an access road. The left side of the Creek is bounded by
banks that show signs of active erosion in places. The streambed consists of
rock/boulders with areas of clay hardpan, and localized gravel bars upstream of v
obstructions (R.W. Beck 1989). The habitat consists mostly of small cascades and
pools, thus, there are limited spawning and rearing opportunities in this section.

The lower reach of Des Moines Creek is a moderate to low gradient stretch (
consisting of medium-to-large gravel and rubble. In this section, the stream cons
mostly long, low gradient riffles. The streambanks have less slope than the middle
and are also stabilized with rip-rap in places (R.W. Beck 1989 and 1990). Althou
area contains good spawning habitat, rearing habitat is limited (Johnson 1989). A se
fish passage weirs have been constructed adjacent to the Des Moines sewage treatmen
(RM 0.85 - 0.90), however, due to their height, these weirs could act as barriers to
(*Oncorhynchus keta*) and pink salmon (*O. gorbuscha*) and partial barriers to trout (F
and Orsborn 1985). The Creek has been channelized between RM 0.0 and 0.4 crea
reach dominated by riffles and shallow pools with few bends or meanders. Thi
contains some spawning habitat, although the activity level associated with Des M
Beach Park might disturb the spawning process and thereby limit its use. In addition
is virtually no rearing habitat in this reach due to the lack of velocity breaks and cove
large woody debris, deep pools, or undercut banks.

Washington Department of Fisheries (WDF) lists coho salmon and possibly chum s
as the primary salmonid species utilizing Des Moines Creek (Williams et al. 1975). T
spawning surveys conducted in Des Moines Creek were on December 6 and 13, 1985 (
1991). No fish or spawning activities were observed during either of these surveys
survey conducted for this EIS, (November 22, 1991), two male coho salmon carcasse
observed downstream of the Des Moines Way culvert (RM 0.4). However, no fema
redds (nests) were observed in any other portion of the creek. On two subsequent s
(November 7 and December 13, 1991), no adult fish or signs of spawning activity
observed.

Washington Department of Wildlife (WDW) considers cutthroat to be the dominan
species in Des Moines Creek (Tom Cropp personal communication, 1991), alt
steelhead/rainbow trout (*Oncorhynchus mykiss*) have also been observed (Andy I
personal communication, 1991). In addition, some spiny-rayed fishes from Bow Lak
utilize the upper reaches at various times of the year (Joe Robel personal communi
1991). During an electrofishing spot-check conducted by WDW several years a
cutthroat fry (2-3 cm in length) and one cutthroat parr (15 cm) were captured below
200th Street. However, in the reach above the golf course no trout and only one b
(*Lepomis macrochirus*) were captured (Phil Schneider personal communication, 199

Ecology conducted a damage assessment survey on May 1, 1986 to determine the effects of two large jet fuel spills in November 1985 and April 1986 (Kittle 1986). This damage assessment was conducted about 60 meters upstream of the South 200th Street culvert and lists coho salmon, cutthroat trout, and steelhead/rainbow trout as the species found in the creek.

Four reaches in the upper watershed were recently electrofished to collect data for this report (Figure 4.10-1). Two passes were conducted through each reach with a backpack-type electroshocker. Block nets were used to keep fish from entering or exiting a reach during the procedure. Differences in the numbers and species of fish collected indicated distinct differences between the reaches. In Reach 1 (a 236-foot section just downstream of the South 200th Street culvert at RM 2.1), four rainbow trout (*Oncorhynchus mykiss*), and one bluegill were captured. However, in Reach 2 (a 260-foot section downstream of the golf course detention pond at RM 2.4) the catch consisted of eight bluegill, one rainbow trout, one black bullhead *(Ictalurus melas)*, and one largemouth bass *(Micropterus salmoides)*. In Reach 3, (a 200-foot section above the detention pond and below the culvert at the upper end of the golf course at RM 2.65) only one bluegill was captured. In contrast, the predominant species in Reach 4 (a 165-foot section just below the wetland ponds that feed the unnamed tributary at RM 2.4) was black bullhead (16), along with four blue gill and one bass. In addition, spot-checks (SC-1, SC-2) were conducted immediately above the South 200th Street culvert and immediately above the culvert at the north end of the golf course, but no fish were found at either site.

This fish distribution pattern indicates that the South 200th Street culvert, the three golf course weirs, and the Tyee Pond might be partial or complete barriers to fish passage. The trout captured above South 200th Street was much larger (21 cm) than the four captured downstream (mean forklength 10.4 cm). There also appears to be a distinct difference in the number and species of fish found above and below the Tyee Pond. However, the predominance of black bullhead in Reach 4 appears to be the result of the muddy, slack water habitat found there rather than a barrier problem.

A water quality investigation in 1973-74 indicated that the benthic community (flora and fauna living on the bottom of the creek) had mid-range diversity, indicating some water quality degradation. Additionally, the species present were indicative of low water quality and high pollution levels (King County and Port of Seattle 1974). Two jet fuel spills in 1985-86 eliminated virtually all aquatic life in most of the stream (R.W. Beck 1990). However, by 1989 some signs of benthic life had returned to the lower reaches of the creek, although the system continues to be threatened by pollutants in urban runoff (Herrara 1989). Despite this apparent recovery, the continued lack of cutthroat trout or coho salmon in the upper creek reaches suggests that these populations have not re-established themselves, possibly due to sub-optimal water quality conditions and/or habitat conditions.

Water quality data was also collected as part of this investigation (see Appendix D, *Des Moines Creek Water Quality Study*). These limited data do not suggest any lethal water quality problems for fish. In addition to the water quality sampling, a 96-hour rainbow trout

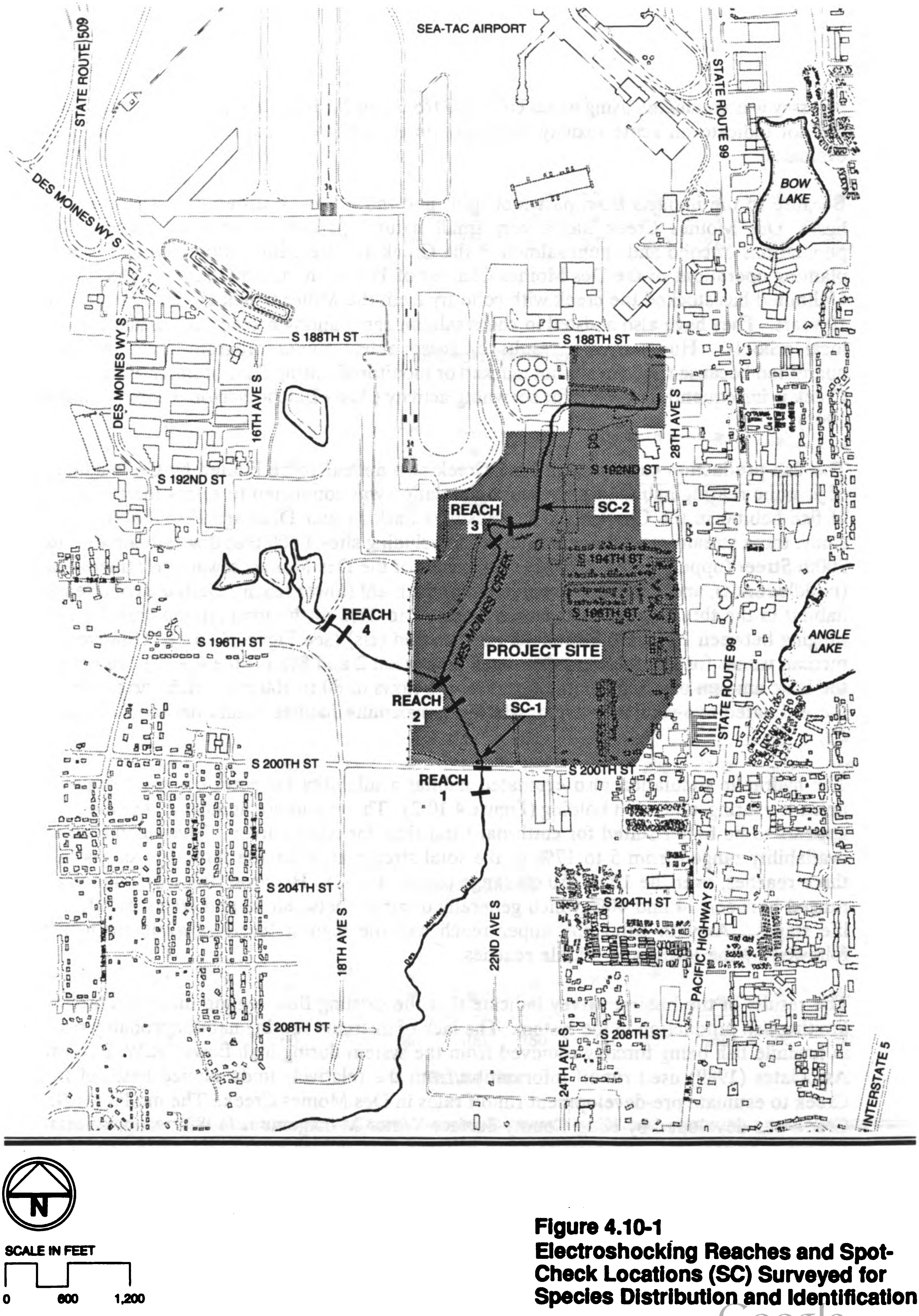


Figure 4.10-1
Electroshocking Reaches and Spot-Check Locations (SC) Surveyed for Species Distribution and Identification

bioassay was conducted using water collected from Des Moines Creek. The bioassay results did not indicate an acute toxicity problem, but the effects of chronic exposure were not evaluated.

Because of the impacts from past fuel spills and the extensive urban development in the basin, Des Moines Creek has a very small natural population of coho salmon. The populations of coho and chum salmon in the Creek are presently maintained by fry or egg planting operations of the Des Moines Chapter of Trout Unlimited (Johnson 1989). Trout Unlimited has stocked the creek with coho fry from the Miller Creek Hatchery for the last 10 years. They have also assisted in chum salmon egg planting projects in conjunction with local schools. However, the results of these enhancement programs have not been quantified because the fry were not marked or monitored during their outmigration, and the Creek is infrequently surveyed for spawning activity (Andy Batcho personal communication 1991).

The fish production capabilities in the Creek also appear to be limited by the availability of juvenile rearing habitat. A hydraulic simulation was conducted to assess the availability of fish habitat in the Creek (Sea-Tac Business Park Master Drainage Plan 1989). In this study, three stream reaches were evaluated, including sites 1,600 feet downstream of South 200th Street (upper reach); 1,900 feet upstream of the Des Moines sewage treatment plant (middle reach); and 1,200 feet downstream of the plant (lower reach). Suitable coho rearing habitat in the three study reaches varied from 1 to 23% of the total stream area for flows ranging between 10 and 350 cubic feet per second (cfs) (see Figure 4.10-1). However, the median values for the three reaches ranged between 2 and 8% (Table 4.10-1). In general, the least amount of rearing habitat occurs with flows of 80 to 100 cfs, which corresponds to the estimated two-year flow event, while the maximum habitat occurs between 10 and 50 cfs.

The hydraulic simulation also evaluated habitat availability for cutthroat trout spawning, juvenile rearing, and adult holding (Figure 4.10-2). This evaluation indicated that the Creek appears to be better suited for cutthroat trout than for coho salmon. The median habitat availability ranged from 5 to 17% of the total stream area for the three life stages in all three reaches, over the 10 to 350 cfs range (Table 4.10-2). However, the maximum values ranged between 14 and 40% which generally occurred between 10 and 60 cfs for all three life stages. As with coho, the upper reach had the highest levels of available habitat, followed by the lower and middle reaches.

The results of the habitat survey indicate that the existing flow regime may be a factor in limiting fish production in the system. The lack of instream rearing habitat probably results in juvenile fish being forcibly removed from the system during high flows. R.W. Beck and Associates (1989) used runoff information from the relatively undeveloped basin of Bear Creek to estimate pre-development runoff rates in Des Moines Creek. The model for Bear Creek was developed by King County Surface Water Management (1989) using calibrated stream gage records. The extrapolation of these data to Des Moines Creek indicated that the present flows are 2.5, 4.0, and 4.0 times greater than pre-development flows for the 2-,

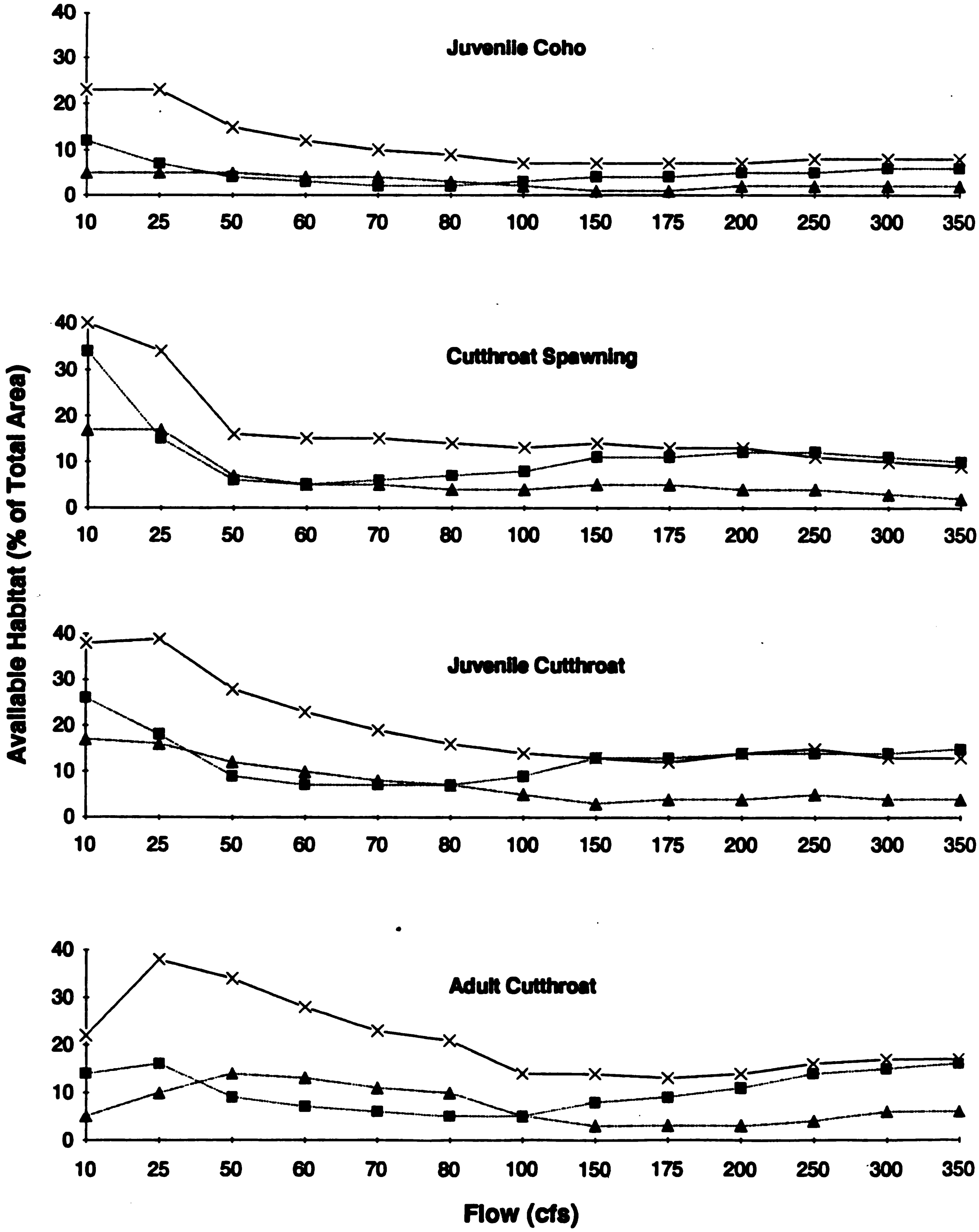


Figure 4.10-2
Available Fish Habitat Expressed as a Percentage of Total Area in Des Moines Creek for Flows of 25-350 cfs

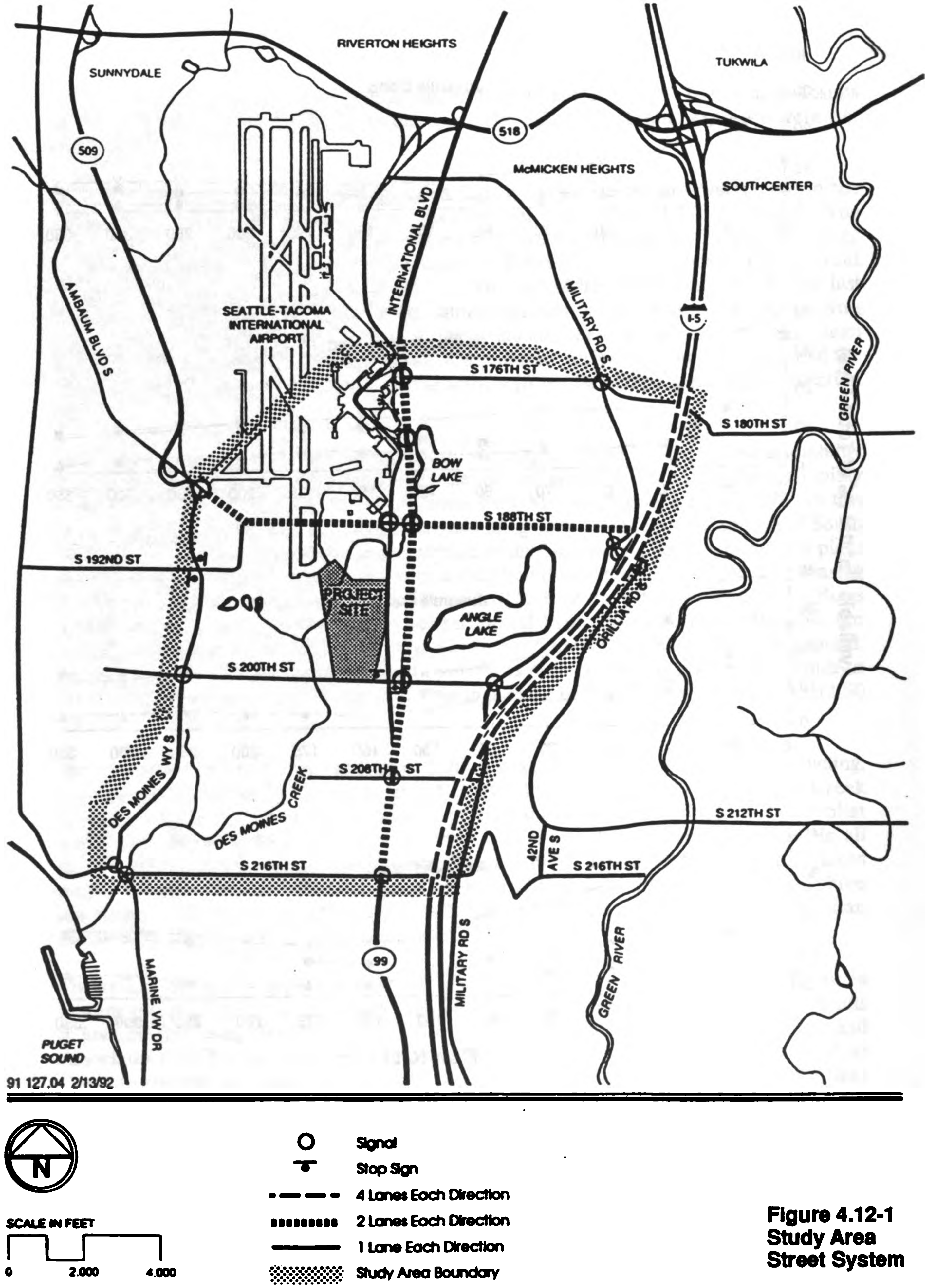


Figure 4.12-1
Study Area
Street System

4.12.1.3 Traffic Volumes and Level of Service

Existing traffic volume information was obtained from the City of SeaTac, King County, and WSDOT. In addition, PM peak-hour turning movement counts at intersections where existing volumes were not available were conducted. Figure 4.12-2 shows the existing daily and PM peak hour traffic volumes in the project vicinity.

To evaluate existing traffic operations at key intersections in the project study area, PM peak hour level of service (LOS) was calculated using the 1985 Highway Capacity Manual (Transportation Research Board) methodology. Level of service is used to evaluate and quantify operating conditions and traffic congestion at intersections. At signalized intersections, level of service is measured in terms of the average vehicle delay. At stop sign-controlled intersections, level of service is measured in terms of reserve or unused capacity available for critical turning movements. Level of service values range from LOS A, indicating free-flowing traffic, to LOS F, indicating extreme congestion and long vehicle delays. Refer to Appendix K for further information on level of service criteria at signalized and unsignalized intersections. Table 4.12-1 summarizes the existing PM peak hour level of service at study area intersections.

As shown on Table 4.12-1, an overall existing LOS E or better is obtained in the PM peak hour at all study area intersections with the exception of the International Boulevard/South 188th Street and 1st Avenue South/Des Moines Way intersections. These intersections currently operate at LOS F.

The City of SeaTac is in the process of adopting a specific policy for level of service. The proposed policy (December 1993) establishes LOS E or better as acceptable on principal or minor arterials. LOS D would be acceptable on collector arterials and lower classification streets. LOS F would be tolerated as an exception for certain intersections upon the Public Works Director's review. Similarly, the existing policy from King County's Road Adequacy Standards define LOS D or better as acceptable, LOS E as tolerable, and LOS F as unacceptable. Under the King County Road Adequacy Standards, LOS F is tolerated if the roadway or intersection is "fully built out" to its design standard; this is reviewed on a case-by-case basis.

4.12.1.4 Traffic Accidents

Traffic accident information at intersections in the project vicinity was obtained from the City of SeaTac, King County, and WSDOT. Table K-4 in Appendix K summarizes the average annual number of accidents at study area arterial intersections between 1988 and 1990. The highest accident occurrences are found along International Boulevard (SR 99). As previously noted, International Boulevard has the highest traffic volumes of the arterials within the study area; it also has the most traffic congestion in the PM peak hour.

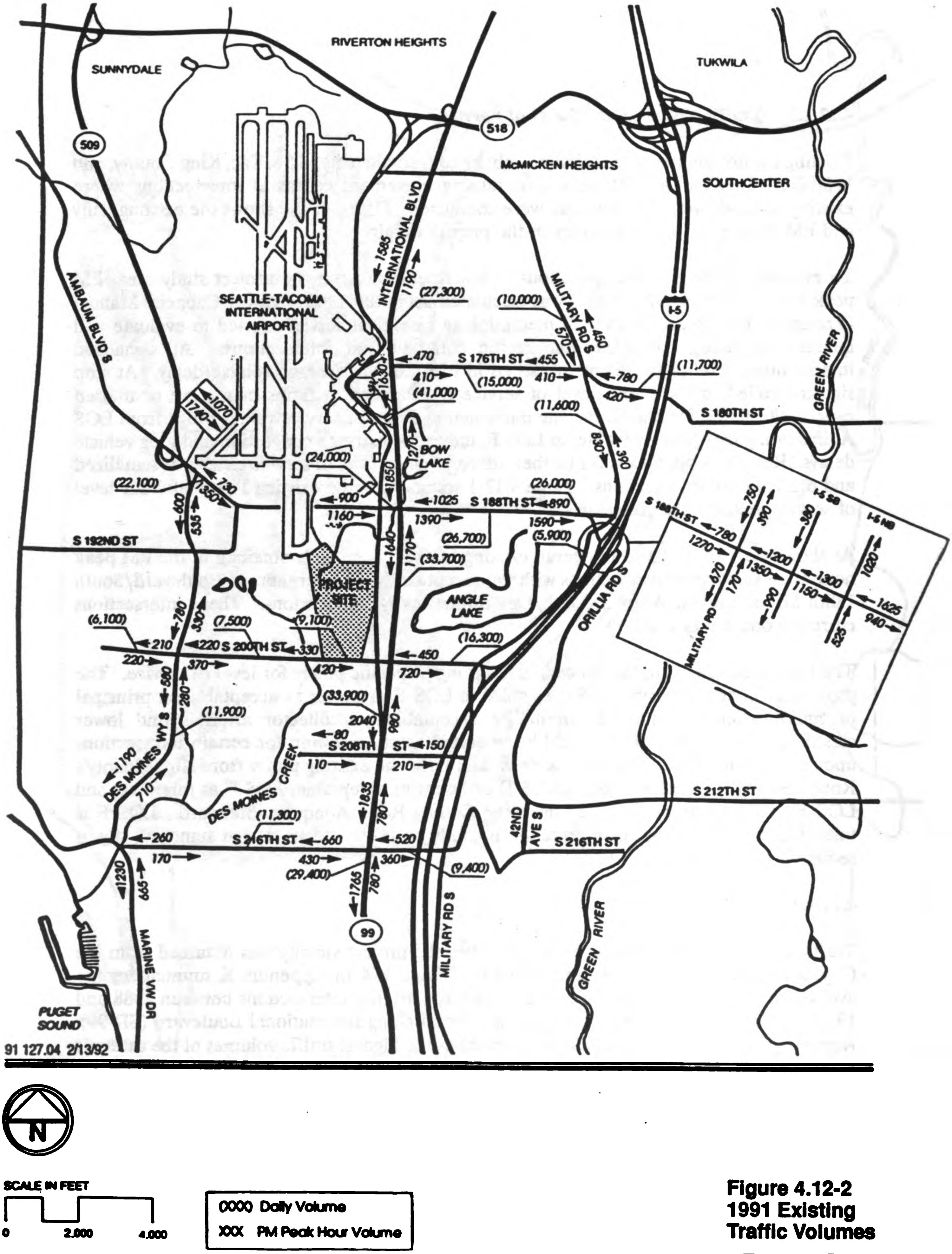


Figure 4.12-2
1991 Existing
Traffic Volumes

Table 4.12-1. 1991 and 1994 PM peak hour LOS summary — all alternatives.

Signalized Intersections		1991 Existing LOS	1991 Existing Average Delay	1994 No Action and Alternative 1 LOS	1994 No Action and Alternative 1 Average Delay	1994 Alternatives 2 & 3 LOS	1994 Alternatives 2 & 3 Average Delay
International Blvd./South 176th St.		B	11.8	B	12.4	B	12.4
International Blvd./South 188th St.		F	97.7	F	109.1	F	109.1
International Blvd./South 200th St.		D	34.9	D	36.7	D	36.7
International Blvd./South 208th St.		B	9.7	B	10.2	B	10.2
International Blvd./South 216th St.		C	21.6	E	48.2	E	48.2
International Blvd./Sea-Tac Airport Entrance		E	40.9	E	51.9	E	51.9
South 188th St./28th Avenue South		B	8.5	B	9.8	B	10.1
South 188th St./42nd Avenue South		B	7.4	B	7.6	B	7.6
South 188th St./Des Moines Way		B	14.4	B	14.9	B	14.9
South 188th St./Military Road South		D	36.3	E	52.1	E	52.1
South 188th St./I-5 Northbound Ramps		E	42.2	E	50.3	E	50.3
South 188th St./I-5 Southbound Ramps		D	32.0	D	37.6	D	37.6
South 200th St./Des Moines Way		B	9.3	B	9.6	B	9.6
South 200th St./Military Road South		E	56.8	F	>120.0	F	>120.0
Military Road South/South 176th St.		B	8.7	B	9.4	B	9.4
1st Avenue South/Des Moines Way		F	75.8	F	99.1	F	99.1
Marine View Drive/South 216th St.		B	6.9	B	7.5	B	7.5
Unsignalized Intersections	**Movement**	**LOS**	**Res.Cap.**	**LOS**	**Res.Cap.**	**LOS**	**Res.Cap.**
South 192nd St./28th Avenue South	Northbound Approach	A	773	A	732	A	677
	Southbound Approach	A	538	A	499	A	462
	Eastbound Left	A	977	A	977	A	960
	Westbound Left	A	966	A	966	A	966
South 200th St./28th Avenue South	Northbound Approach	B	340	B	301	B	301
	Southbound Approach	C	290	C	255	C	255
	Eastbound Left	A	939	A	928	A	928
	Westbound Left	A	788	A	784	A	784

NOTE: Level of service calculation sheets are included in the Appendix to this report.

Although the average number of accidents per year at some intersections is relatively high, the number of accidents per million entering vehicles (MEV) is not excessively high at most intersections. King County collects accident rate data for intersections with five or more accidents per year. In 1990, the average accident rate at all such intersections was 1.39/MEV. At all signalized intersections with at least five accidents per year the average rate was 1.04/MEV, while at unsignalized intersections the average rate was 2.08/MEV. A more detailed analysis was conducted at the intersections with above-average accident rates to determine the major causes of the accidents.

The intersection of South 188th Street/International Boulevard has the highest accident rate with an average of 36 accidents per year. Most of these accidents are directly related to the congestion at the intersection, especially left-turn and rear-end accidents.

Another intersection with a significant accident history is Military Road South/South 188th Street. This intersection has averaged over 18 accidents per year for the three-year period. The recently completed project to widen the north and south approaches and modify the traffic signal should greatly reduce accidents in the near future.

4.12.1.5 Parking

Parking facilities in the project vicinity are primarily limited to off-street parking lots that serve existing businesses in the area and remote parking lots for airport users. None of the arterial streets in the project vicinity provide on-street parking. A large surface parking lot with approximately 1,500 spaces is partially located on the SASA site. This parking lot is used by various airport employees and is served by an airport-operated shuttle service.

4.12.1.6 Transit Service

The project site is not directly served by a Metro transit route. The closest existing routes are Route 174 and Route 191 which operate on International Boulevard and Route 194 which operates on South 188th Street. See Appendix K, *Transportation Study*, for more detailed descriptions of these transit routes.

Future expansion of transit service in the vicinity is uncertain at this time. Regional plans for a High Capacity Transit (HCT) system (either light rail or separate busways) and expansion of the high occupancy vehicle lane system are being studied. All of the south corridor HCT options have included service to Sea-Tac International Airport. The City of SeaTac and Metro are also evaluating a local people-mover system to provide access between parking lots, hotels, the airport, and other local businesses. The people-mover study is currently in progress.

4.12.1.7 Truck Traffic

The project vicinity roadway system has a significant amount of truck activity. The truck traffic is largely related to the air cargo facilities, flight kitchens, and other services at

Sea-Tac International Airport. Other truck traffic generators serves local light industrial areas, primarily located south of the airport, and provide local deliveries to hotels and other businesses in the area. Refer to Appendix K for further discussion of truck traffic in the area.

4.12.1.8 Airport Traffic

Sea-Tac International Airport is the major traffic generator in the project vicinity. The airport traffic is comprised of two primary types—terminal-related and air cargo-related. The terminal traffic includes passengers, "greeters and well-wishers" (visitors not flying), airline personnel, airport employees, taxis and local and regional shuttle services, and deliveries. Air cargo traffic is primarily comprised of employees and delivery trucks. Refer to Appendix K for further discussion of airport traffic.

4.12.1.9 Pedestrian and Bicycle Facilities

Sidewalks exist along some of the study area streets; on other streets, pedestrians must use the roadway shoulders. Arterial roadways that currently have sidewalks include South 200th Street and South 188th Street (east of International Boulevard).

Major roadways without sidewalks include International Boulevard, Military Road South, 28th Avenue South, 24th Avenue South, and Des Moines Way. Pedestrians on these roadways are required to use the roadway shoulders, which range from 3 to 10 feet in width; many of the shoulder areas are paved. Many of the pedestrian access routes to schools also rely on paved roadway shoulders instead of sidewalks.

In general, bicyclists in the study area share the roadway with vehicular traffic or use the roadway shoulders. South 188th Street provides an east-west signed bicycle route between the airport and Orillia Road. East of I-5, this route provides bicycle access to the Kent Valley. South 216th Street between Marine View Drive and Military Road South is also a signed bicycle route. King County has also identified Des Moines Way and 28th Avenue South as popular bicycle routes.

4.12.1.10 Planned Transportation System Improvements

Transportation facilities in the vicinity of the SASA site are planned to be constructed by a variety of jurisdictions, including the City of SeaTac, Washington State Department of Transportation (WSDOT), King County, and the City of Des Moines. Table K-5 in Appendix K summarizes the planned transportation improvements in the project vicinity from the City of SeaTac and WSDOT. Besides facility improvements, recent state legislation requiring Transportation Demand Management could affect travel patterns in the future. Refer to Appendix K for further discussion of planned transportation system improvements in the project vicinity.

4.12.2 Construction and Operation Impacts

4.12.2.1 No-Action Alternative

Construction Traffic Impacts

For the 1994 analysis year, no SASA project development is assumed to occur; therefore, no construction traffic impacts are expected. For the 2003 analysis year with the No Action Alternative, no estimates of construction traffic were made because there are no specific development proposals on the SASA site. If some form of this alternative is implemented in the future, the specific development proposals will be required to go through additional environmental review to address construction traffic and other impacts.

Transportation Impacts in 1994

Site Development and Roadway Network Assumptions. For the 1994 analysis year, it is assumed that no new development would occur on the SASA site. Therefore, existing development levels were assumed in the traffic analysis for this alternative.

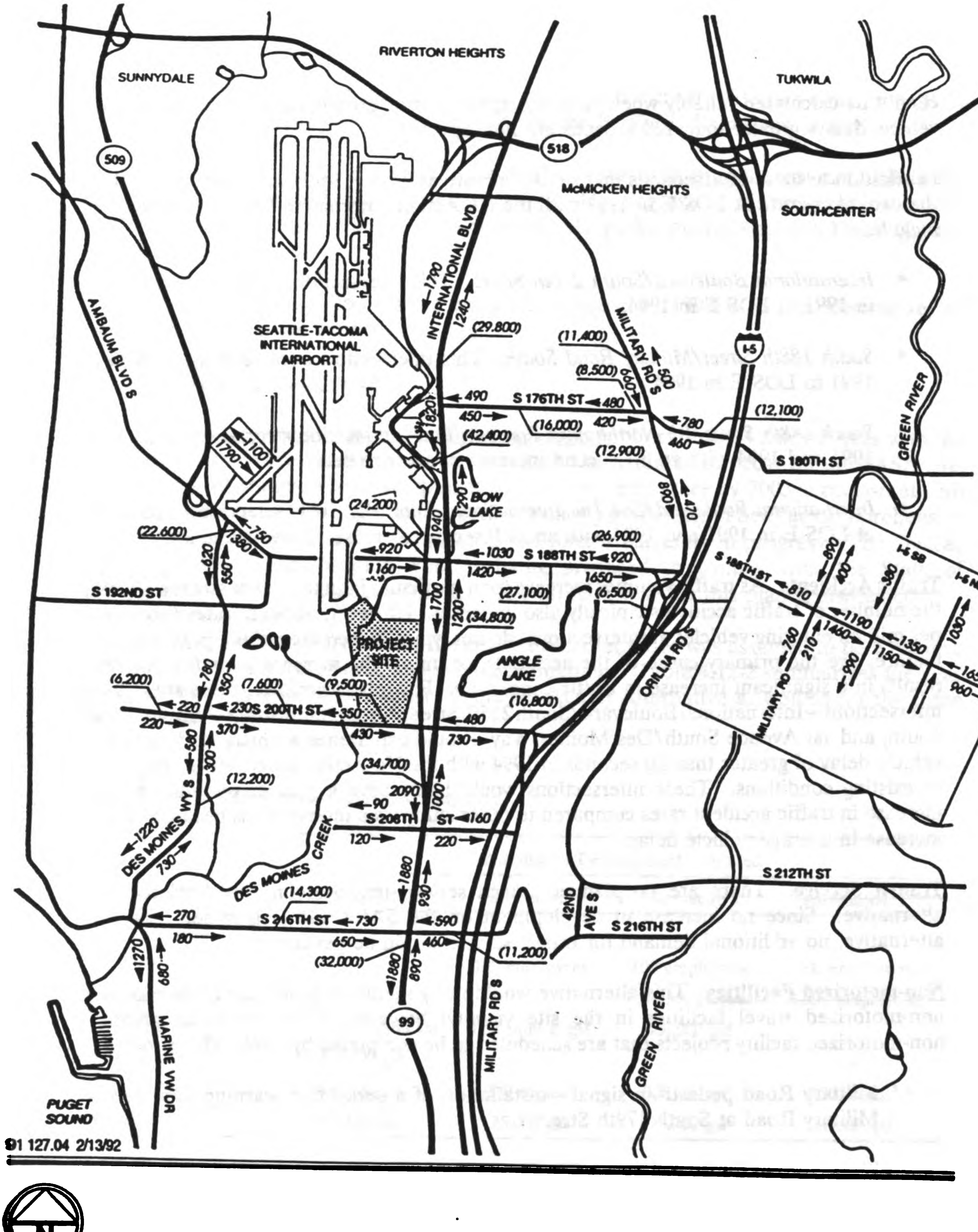
The intersection improvements contained in the City of SeaTac's Six-Year Transportation Improvement Program (TIP) 1992-1997, that are estimated to be completed in 1992 or 1993, were assumed to be in place by 1994 for this analysis. These improvements are summarized in Table K-5 of Appendix K. No other roadway network improvements were assumed to be in place by 1994.

Traffic Volume Forecasts. Traffic volume forecasts for this alternative were developed using historical traffic volume growth trend information at study area intersections. This information was obtained from King County and WSDOT traffic volume records. Table K-6 in Appendix K summarizes the historical traffic volume growth rates at study area intersections.

These growth rates were used to estimate the 1994 daily and PM peak hour traffic volumes for this alternative. Figure 4.12-3 shows the 1994 traffic volume forecasts in the study area for the No-Action Alternative.

Traffic Operations and Level of Service. Level of service for the PM peak hour was calculated at all study area intersections using the 1994 traffic volume forecasts for the No-Action Alternative. Table 4.12-1 summarizes the results of the 1994 level of service analysis for the No-Action Alternative. For comparison, 1991 existing level of service is also shown in the table.

LOS E or better is obtained at all but three intersections with the 1994 No-Action Alternative: International Boulevard/South 188th Street; South 200th Street/ Military Road South; First Avenue South/Des Moines Way. The primary contributing factors to the LOS F conditions at these intersections are discussed in Appendix K. Average vehicle delay



SCALE IN FEET

0 2,000 4,000

(XXX) Daily Volume

XXX PM Peak Hour Volume

Figure 4.12-3
1994 Forecast
Traffic Volumes
All Alternatives

cannot be calculated reliably when volume/capacity ratios exceed 1.2. Therefore, average vehicle delays greater than 120 seconds are not reported.

In addition to these intersections that would operate at LOS F, there are four intersections that would operate at LOS E in 1994 with the No-Action Alternative. These intersections include:

- *International Boulevard/South 216th Street.* This intersection worsens from LOS C in 1991 to LOS E in 1994.

- *South 188th Street/Military Road South.* This intersection worsens from LOS D in 1991 to LOS E in 1994.

- *South 188th Street/I-5 Northbound Ramps.* This intersection operates at LOS E in 1991 and 1994 with an 8.1 second increase in average delay.

- *International Boulevard/Sea-Tac International Entrance.* This intersection operates at LOS E in 1991 and 1994 with an 11.0 second increase in average delay.

Traffic Accidents. As traffic volumes increase for a particular intersection or street segment, the number of traffic accidents typically also increases. However, accident rates (accidents per million entering vehicles at intersections) do not typically increase unless specific design features are the primary cause of the accidents, or unless the increase in traffic volumes results in a significant increase in traffic congestion. For this alternative, three study area intersections—International Boulevard/South 216th Street, South 200th Street/Military Road South, and 1st Avenue South/Des Moines Way—would experience an increase in average vehicle delay of greater than 20 seconds in 1994 with the No-Action Alternative, compared to existing conditions. These intersections would likely have a greater potential for an increase in traffic accident rates compared to other study area intersections because of this increase in average vehicle delay.

Transit Service. There are no planned transit service improvements by 1994 for this alternative. Since no increase in development on the SASA site is assumed with this alternative, no additional demand for transit service would be generated.

Non-motorized Facilities. This alternative would not generate any additional demand for non-motorized travel facilities in the site vicinity; however, there are some planned non-motorized facility projects that are scheduled to be completed by 1994. These include:

- Military Road pedestrian signal - installation of a pedestrian warning light across Military Road at South 179th Street

- International Boulevard pedestrian overpass - construction of a pedestrian overpass of International Boulevard at Angle Lake Park

- International Boulevard/Sea-Tac International Entrance - sidewalk improvements in conjunction with the Port of Seattle Parking Facilities Expansion project.

In addition to these projects, the City of SeaTac's sidewalk program could result in the installation of some sidewalks in the site vicinity. The purpose of this program is to create a safe pedestrian network in the vicinity of schools, parks, public assembly buildings, and neighborhoods.

Parking. Since no development is assumed to occur by 1994 with this alternative, no impacts to parking are expected.

Transportation Impacts in 2003

Site Development and Roadway Network Assumptions. For the 2003 analysis year with the No-Action Alternative, commercial development was assumed to occur on the SASA site. The amount of commercial development assumed to be in place by 2003 is consistent with the land use assumptions made for the SASA property in the City of SeaTac Comprehensive Transportation Plan. The development of the plan is currently in progress. The SeaTac Comprehensive Transportation Plan is being prepared to comply with the State of Washington's Growth Management Act. The horizon year for this plan is also 2003.

Development on the SASA site for the No-Action Alternative was assumed to be a mixture of office, light industrial, hotel, and retail development. Table 4.12-2 summarizes the year 2003 site development assumptions for the No-Action Alternative as well as for the three build alternatives.

Table 4.12-2. 2003 site development assumptions.

	Amount of Development Assumed			
Land Use Type	No Action	Alternative 1	Alternative 2	Alternative 3
Aviation Facilities				
Line Maintenance[1]	-	100 employees	100 employees	100 employees
Base Maintenance[1]	-	-	1,500 employees	1,500 employees
Office[2]	1.00 million gsf	1.53 million gsf	606,000 gsf	-
Light Industrial[2]	200,000 gsf	-	-	-
Hotel/Motel	480 rooms	350 rooms[3]	350 rooms[3]	350 rooms[3]
Retail[2]	80,000 gsf	25,000 gsf	25,000 gsf	18,300 gsf

1 The number of employees shown for the Aviation Facilities use represents the net increase over existing employment levels.
2 Office, Light Industrial, and General Retail are expressed in terms of total gross square feet of floor area.
3 Assumes that 50 percent of the planned 700-room hotel on the Highline School District property would be developed by the year 2003.

In addition to the site development assumptions for the No-Action Alternative in 2003, there are some major transportation facility improvement projects that would affect travel patterns to and from the SASA site. Two of these improvement projects—the SR 509 extension to I-5 including a new South Access Roadway to the Airport and the realignment and widening of the 28th/24th Avenue South corridor, between South 188th Street and South 216th Street—were assumed to be completed by 2003 for all of the SASA alternatives. For this analysis, it is assumed that the SR 509/South Access project would intersect I-5 in the vicinity of South 210th Street and that alignment Alternative D would be selected for the airport South Access route. (Refer to the *South Access Roadway Final Report*, Entranco Engineers, Inc., June 27, 1990, for a description of Alignment Alternative D.)

Design studies for the 28th/24th Avenue South Arterial are planned for 1994 by the City of SeaTac. A Final EIS was published in May 1993. This new 5-lane arterial alignment is primarily intended to provide access to future development in the vicinity of the corridor. Alignment Alternative 3 from these studies is the assumed alignment for this analysis. This alignment intersects South 200th Street approximately 700 feet west of International Boulevard. (Refer to the 28th/24th Avenue South Arterial Project - Draft Transportation Technical Report, KJS Associates, November 1, 1991, for a description of alignment Alternative 3.)

These roadway improvement projects would have a substantial effect on future traffic volumes for many existing roadway facilities in the site vicinity. Without these new facilities, future traffic volumes in 2003 would be significantly higher on International Boulevard, South 188th Street, South 200th Street, and other streets.

Traffic Volume Forecasts. The travel demand forecasting model developed for the City of SeaTac Comprehensive Transportation Plan project was used to develop the year 2003 traffic volume forecasts for all SASA alternatives. The modeling software used for this analysis was TMODEL 2, developed by Professional Solutions, Inc. This software package estimates PM peak hour traffic volumes on a given roadway network using estimates of future development levels in the area.

The model used for this analysis was calibrated to match existing traffic volume levels on major roadways in the site vicinity. This calibration process was completed as part of the SeaTac Transportation Plan project. Refer to Appendix K for a description of the process used to obtain the year 2003 traffic volume forecasts.

Trip generation for the 2003 site development assumptions of the No-Action Alternative on the SASA site was estimated from the rates and equations contained in Trip Generation, Institute of Transportation Engineers (ITE), 5th Edition. Table K-9 in Appendix K summarizes the daily and PM peak hour trip generation for the No-Action Alternative by use. For comparison among the four SASA site development alternatives, Table 4.12-3 summarizes the total trip generation for the No-Action Alternative, as well as the three build alternatives.

Table 4.12-3. Trip generation comparison - 2003.

		PM Peak Hour		
Alternative	Daily	In	Out	Total
No Action	16,424	506	1,294	1,800
1	16,530	465	1,522	1,987
2	12,133	351	819	1,170
3	6,654	232	237	469

The proposed uses for the No-Action Alternative would generate a total of 16,424 daily trips and 1,800 in the PM peak hour. Approximately 60 percent of the PM peak hour trips generated by this alternative are from the 1.0 million gsf of office development. There would be no traffic generated by aviation-related uses under the No-Action Alternative.

The distribution and assignment of site-generated traffic was determined from the gravity model and trip assignment processes of the travel demand forecasting model. The PM peak hour distribution of site-generated traffic for the No-Action Alternative is summarized in Table 4.12-4.

Table 4.12-4. Trip distribution of site-generated traffic - 2003 No-Action Alternative.

Direction of Travel	Roadway Facility	Percent of Traffic
North	International Boulevard	5%
	I-5	11%
Northwest	SR 509 and Des Moines Way	15%
West	S 200th Street and other	2%
Southwest	Marine View Drive	2%
South	International Boulevard	4%
	24th/28th Ave South	3%
	I-5	27%
Southeast	Military Road South	2%
East	Orillia Road South	4%
Internal to Study Area[a]		25%
Total		100%

[a] Traffic that distributes to areas within the study area boundaries of this analysis is generally concentrated in the following areas: 10% north (including the airport), 5% south, 6% east, and 4% west of the SASA site.

Access for all of the SASA site development alternatives was assumed to occur at three locations: at the north end of the site from South 192nd Street; at one location on 28th Avenue South north of South 200th Street; and a right-turn in and out access on South 200th Street west of 28th Avenue South. Under the No-Action Alternative, the possibility exists for additional access locations to occur on 28th Avenue South. For this analysis, however, concentrating all site access at the fewest number of locations is a worst-case assumption for estimating traffic operation and level of service impacts. Additional access locations to the SASA site from 28th Avenue South should be limited to one additional location only.

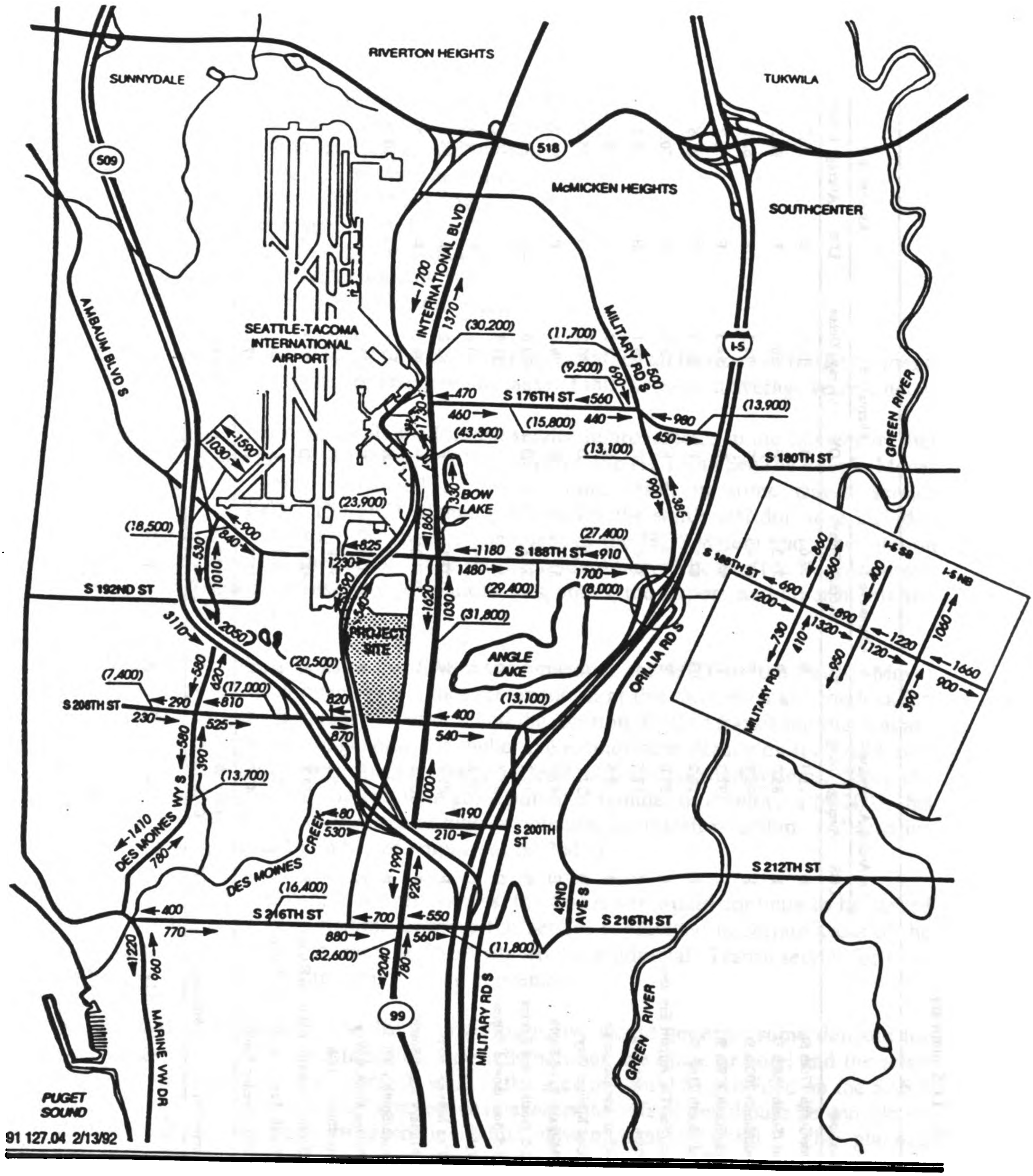
The traffic volume forecasting process described previously resulted in year 2003 traffic volume forecasts for the No-Action alternative to be used in subsequent traffic operations and level of service analysis. Figure 4.12-4 summarizes the total PM peak hour and daily traffic volumes in 2003 for the No-Action Alternative.

Traffic Operations and Level of Service. Level of service for the PM peak hour was calculated at all study area intersections using the 2003 traffic volume forecasts for the No-Action Alternative. Levels of service for the No-Action Alternative and for the other three site development alternatives are summarized in Table 4.12-5. Four intersections were added to the level of service analysis as a result of site access considerations and the planned new roadway facilities in the site vicinity: South 192nd Street/28th Avenue South, site access/28th Avenue South, South 200th Street/northbound ramps to/from the South Access roadway, and South 200th Street/southbound ramps to/from the South Access roadway. LOS F conditions would exist at eight intersections in 2003 with the No-Action Alternative.

In addition to these intersections that would operate at LOS F, there are three intersections that would operate at LOS E in 2003 with the No-Action Alternative. These intersections include:

- International Boulevard/Sea-Tac Airport Entrance
- South 188th Street/Military Road South
- South 200th Street/South Access northbound ramps.

Traffic Accidents. As traffic volumes increase for a particular intersection or street segment, the number of traffic accidents typically also increases. However, accident rates (accidents per million entering vehicles at intersection) do not typically increase unless specific design features are the primary cause of the accidents, or unless the increase in traffic volumes results in a significant increase in traffic congestion. For the No-Action Alternative in 2003, the following intersections would experience an increase in average delay of greater than 20 seconds, compared to existing conditions: (A 20-second increase in average vehicle delay is the difference between LOS E and LOS F conditions.)



N

SCALE IN FEET

0 2,000 4,000

(XXX) Daily Volume

XXX PM Peak Hour Volume

Figure 4.12-4
2003 Forecast
Traffic Volumes
No Action Alternative

Table 4.12-5. 2003 LOS summary.

Signalized Intersections	No-Action Alternative LOS	No-Action Alternative Average Delay	Alternative 1 LOS	Alternative 1 Average Delay	Alternative 2 LOS	Alternative 2 Average Delay	Alternative 3 LOS	Alternative 3 Average Delay
International Blvd./South 176th St.	B	12.4	B	12.6	B	12.5	B	12.7
International Blvd./South 188th St.	F	85.9	F	83.5	F	86.7	F	90.5
International Blvd./South 200th St.	F	76.9	F	97.9	F	74.3	F	62.8
International Blvd./South 208th St.	F	97.3	F	98.7	F	94.5	F	92.7
International Blvd./South 216th St.	F	70.2	F	87.3	F	81.9	F	81.6
International Blvd./Sea-Tac Airport Entrance	E	53.0	E	48.5	E	53.0	E	50.1
South 188th St./28th Avenue South	C	17.5	D	38.0	C	18.1	B	9.2
South 188th St./42nd Avenue South	B	8.6	B	8.8	B	8.9	B	8.7
South 188th St./Des Moines Way	D	37.1	D	34.0	D	36.2	D	35.2
South 188th St./Military Road South	E	47.3	E	51.7	E	49.1	E	45.7
South 188th St./I-5 Northbound Ramps	D	31.2	D	32.8	D	32.0	D	32.2
South 188th St./I-5 Southbound Ramps	D	32.4	D	31.4	D	31.8	D	29.2
South 192nd St./28th Avenue South[1]	C	20.6	D	27.7	C	23.6	C	21.9
South 299th St./Des Moines Way	F	105.7	F	103.1	F	92.8	F	85.6
South 200th St./Military Road South	F	105.1	F	114.2	F	84.0	F	63.2
Military Road South/South 176th St.	B	10.9	B	11.3	B	11.4	B	10.7
1st Avenue South/Des Moines Way	F	>120.0	F	>120.0	F	>120.0	F	>120.0
Marine View Drive/South 216th St.	D	35.5	D	36.8	D	35.2	D	36.3
South 200th St./South Access Northbound Ramps[1]	E	52.8	E	48.0	D	25.9	D	29.4
South 200th St./South Access Southbound Ramps[1]	C	22.6	D	28.8	C	20.7	C	19.5
South 200th St./28th Avenue South [1]	D	40.0	D	31.9	D	27.4	C	24.2

Unsignalized Intersection	Movement	No-Action LOS	No-Action Reserve Capacity	Alternative 1 LOS	Alternative 1 Reserve Capacity	Alternative 2 LOS	Alternative 2 Reserve Capacity	Alternative 3 LOS	Alternative 3 Reserve Capacity
28th Avenue South/Site Access	Eastbound Left	F	-14	F	-3	D	101	C	206
	Eastbound Right	A	637	C	274	A	512	A	766
	Northbound Left	A	602	A	554	A	686	A	946

[1] These intersections are assumed to be signalized in the year 2003.

Source: The Transpo Group

- International Boulevard/South 200th Street
- International Boulevard/South 208th Street
- International Boulevard/South 216th Street
- South 188th Street/28th Avenue South
- South 188th Street/Des Moines Way
- South 200th Street/Des Moines Way
- South 200th Street/Military Road South
- 1st Avenue South/Des Moines Way
- Marine View Drive/South 216th Street.

These intersections would likely have a greater potential for an increase in traffic accidents compared to other study area intersections because of this increase in average vehicle delay.

Transit Service. There are no planned transit service improvements in the site vicinity that would definitely be in place by the year 2003; however, the HCT and SeaTac People-Mover projects currently being conducted by Metro could result in some transit service improvements by 2003. The HCT planning efforts for the south corridor have included service to Sea-Tac Airport. The specific alignment of the HCT system and other station area locations south of the airport have not been identified. The SeaTac People-Mover System would provide access between parking lots, hotels, the airport, and other hotels and businesses in the area.

The amount of ridership from the SASA site on either the HCT or the People-Mover System is dependent on many factors that are unknown at this time, such as: the location of transit stations; the frequency of service; and the location of other transit stations that are connected to the system. In general, the higher the employment density on the SASA site, the greater the potential for transit ridership on both of these planned systems. Since the No-Action Alternative has the second highest potential number of employees by 2003, this alternative would also have the second highest potential for transit ridership. (Alternative 1 has a higher potential number of employees by 2003.)

Without the HCT and People-Mover systems, the SASA site would continue to be served by the existing bus transit system. Because this service is provided to certain areas of the region only, transit ridership from the SASA site would be minimal. Transit service for most employees at the SASA site would not be convenient.

Non-Motorized Facilities. The No-Action Alternative would generate some demand for pedestrian and bicycle travel facilities, especially between the office or hotel and the retail and restaurant facilities that currently exist in the area or would be provided on the SASA site. Pedestrian and bicycle trail connections between these facilities should be considered during the review stages of each individual development proposal. The planned non-motorized facility improvements mentioned previously under Transportation Impacts in 1994 would also exist in 2003.

Parking. The assumed development for the No-Action Alternative would generate a demand for 3,800 to 4,600 parking spaces. This estimate was based on typical parking demand rates for the various on-site uses. No parking demand would generated by aviation-related uses under the No-Action Alternative. Table K-14 in Appendix K summarizes the estimated parking demand for the No-Action Alternative in 2003 by use.

In addition, the SASA development would displace most or all of the existing 1500-space airline/airport parking spaces located north of South 192nd Street and west of 28th Avenue South. These spaces will be relocated to a site at the north end of the airport located north of SR 518 and west of 24th Avenue South. The impact of this parking lot relocation was previously identified and reviewed in the Port of Seattle's Parking and Facilities Expansion project EIS.

4.12.2.2 Alternative 1

Construction Traffic Impacts

Construction traffic impacts can be divided into impacts resulting from general construction traffic and impacts resulting from embankment/excavation traffic. The general construction traffic impacts would be caused by the arrival, departure, and parking of construction workers' vehicles; and the arrival, departure, and maneuvering of construction material and construction equipment delivery vehicles. The embankment/excavation traffic impacts would be caused by the arrival, departure, and queuing of both loaded and empty dump trucks.

General construction traffic impacts are difficult to quantify. These impacts depend to a great extent on the construction schedule. A more aggressive construction schedule means more workers and more equipment on site in a shorter time. Therefore, factors which determine construction scheduling, some as unpredictable as the weather, play an important role in determining the magnitude of general construction impacts on any given day. The worst-case impacts of general construction, however, would be less than those identified and evaluated during operation of the SASA facility.

Several factors affect the magnitude of the embankment/excavation traffic impacts. These factors include the location of the dump site or sites, the location of the source of embankment material, the duration of the earthwork activity, the capacity of the dump trucks being used, and the acceleration rate of the dump trucks. For purposes of the traffic analysis, all embankment/excavation traffic impacts were assumed to take place in 1994. Table K-18 in Appendix K summarizes the magnitude of the earthwork activity and truck traffic generation for each alternative.

Level of service was calculated at each of the nine study area intersections impacted by the embankment/excavation truck traffic on the potential haul routes described in Appendix K. Table 4.12-6 summarizes the PM peak hour level of service with and without truck traffic

Table 4.12-6. Excavation/embankment truck traffic pm peak hour level of service summary - Alternative 1.

		1991 Existing		1994 Alternative 1 without Trucks		1994 Alternative 1 with Trucks		
Signalized Intersections		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	Delay Increase
South 188th Street/28th Avenue South		B	8.5	B	9.8	F	>120.0	>110.2
International Boulevard/South 188th Street		F	97.7	F	109.1	F	>120.0	>10.9
International Boulevard/Sea-Tac Airport Entrance		E	40.9	E	51.9	E	54.4	2.5
International Boulevard/South 176th Street		B	11.8	B	12.4	B	12.4	0.0
South 188th Street/42nd Avenue South		B	7.4	B	7.6	B	8.0	0.4
South 188th Street/Military Road South		D	36.3	E	52.1	F	102.1	50.0
South 188th Street/I-5 Northbound Ramps		E	42.2	E	50.3	F	91.6	41.3
South 188th Street/I-5 Southbound Ramps		D	32.0	D	37.6	E	54.4	41.3
South 188th Street/Des Moines Way		B	14.4	B	14.9	B	14.8	-0.1
Unsignalized Intersections	Movement	LOS	Res.Cap.	LOS	Res.Cap	LOS	Res.Cap.	Res.Cap. Decrease
South 192nd Street/28th Avenue South								
	Northbound Approach	A	773	A	732	B	319	413
	Southbound Approach	A	538	A	499	E	60	439
	Eastbound Left	A	977	A	977	A	682	295
	Westbound Left	A	966	A	966	A	966	0

1 The increase in delay represents the difference between the 1994 with trucks and without trucks scenarios.

from the embankment/excavation activities for Alternative 1. Refer to Appendix K for an expanded discussion of construction traffic impacts for this alternative.

Operation Impacts—1994

Alternative 1 is identical to the No-Action Alternative for the 1994 analysis year since no SASA project development would occur in 1994.

Operation Impacts—2003

Site Development and Roadway Network Assumptions. For the 2003 analysis year with Alternative 1, existing line maintenance facilities for three airlines—in addition to commercial development—were assumed to be relocated to the SASA site. The commercial development was assumed to be a mixture of office, hotel, and retail development. The 2003 site development assumptions were previously summarized in Table 4.12-2. The roadway network assumptions for Alternative 1 are identical to those used for the No-Action Alternative.

Traffic Volume Forecasts. Traffic volume forecasts for Alternative 1 were prepared using a similar process as described previously for the No-Action Alternative. Trip generation for the 2003 site development assumptions for Alternative 1 was estimated from the rates and equations contained in trip generation; except for the aviation facility uses on the SASA site. Trip generation for these uses was derived from a trip generation survey conducted for this study at the existing Alaska Airlines maintenance facility. Table K-15 in Appendix K summarizes the results of the trip generation survey conducted at the existing Alaska Airlines maintenance facility, and Table K-16 in Appendix K summarizes the daily and PM peak hour trip generation for Alternative 1.

The proposed uses for Alternative 1 would generate a total of 16,530 daily trips with 1987 in the PM peak hour. (See Table 4.12-3 for a trip generation comparison of all alternatives.) This is slightly higher than the trip generation for the No-Action Alternative. The 1.53 million gsf of office development accounts for approximately 80% of the overall trip generation for this alternative. Aviation-related uses account for less than one percent of overall traffic generation.

The process used to distribute and assign project-generated traffic for Alternative 1 in 2003 was identical to the process used for the No-Action Alternative. This information is summarized in Table 4.12-4. Access to the SASA site was assumed to occur at the same three locations described for the No-Action Alternative. Figure 4.12-5 summarizes the total PM peak hour and daily traffic volumes in 2003 for Alternative 1.

Traffic Operations and Level of Service. Level of service for the PM peak hour was calculated at all study area intersections using the 2003 traffic volume forecasts for Alternative 1. This information is summarized in Table 4.12-5. LOS F conditions would

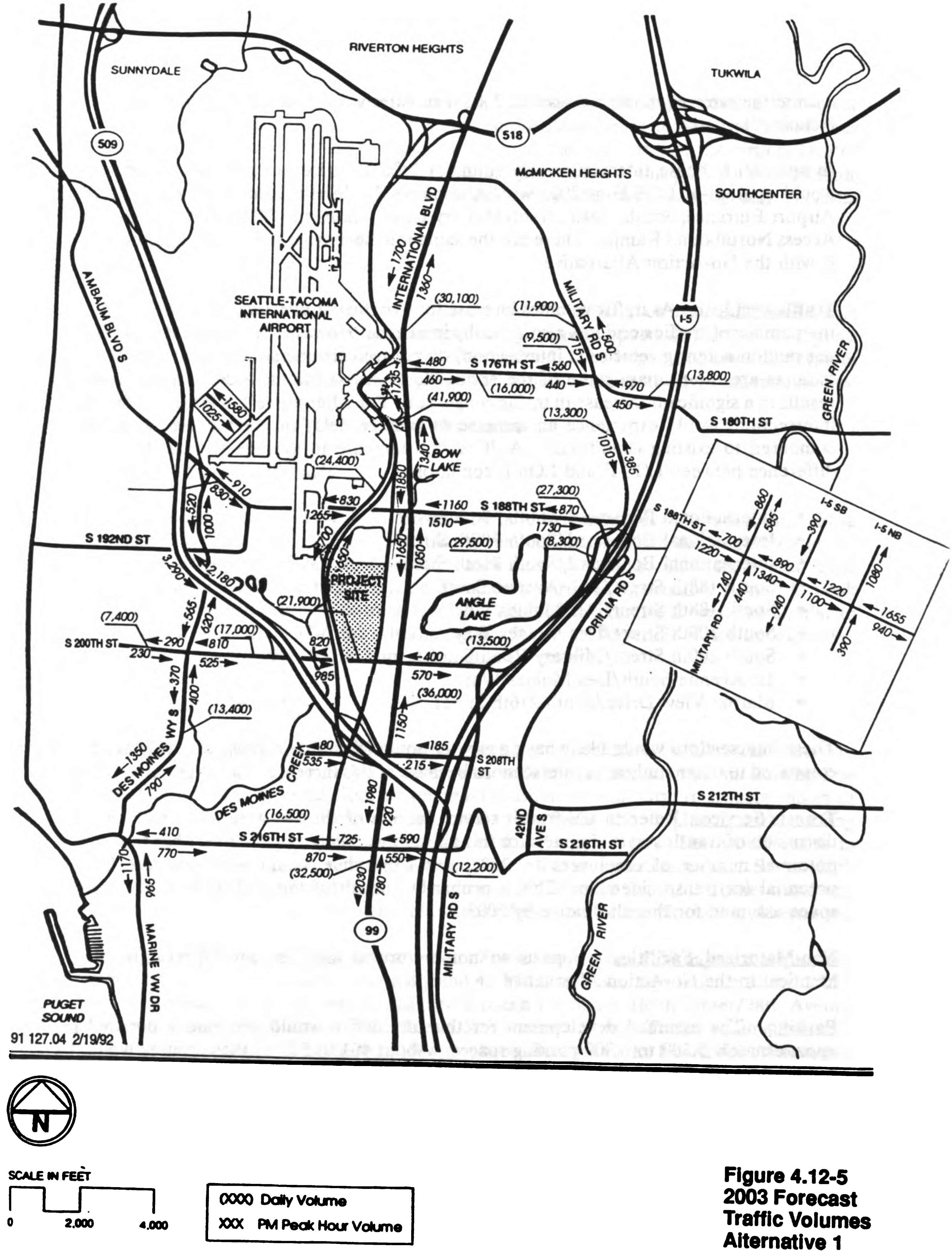


Figure 4.12-5
2003 Forecast Traffic Volumes
Alternative 1

exist at the same eight intersections in 2003 with Alternative 1 as would exist under the No-Action Alternative.

In addition to those intersections operating at LOS F, there are three intersections that would operate at LOS E in 2003 with Alternative 1: International Boulevard/ Sea-Tac Airport Entrance, South 188th Street/Military Road South, and South 200th Street/South Access Northbound Ramps. These are the same intersections which would operate at LOS E with the No-Action Alternative.

Traffic Accidents. As traffic volumes increase for a particular intersection or street segment, the number of traffic accidents also typically increases. However, accident rates (accidents per million entering vehicles at intersection) do not typically increase unless specific design features are the primary cause of the accidents, or unless the increase in traffic volumes results in a significant increase in traffic congestion. For Alternative 1 in 2003, the following intersections would experience an increase in average delay of greater than 20 seconds, compared to existing conditions: (A 20-second increase in average vehicle delay is the difference between LOS E and LOS F conditions.)

- International Boulevard/South 200th Street
- International Boulevard/South 208th Street
- International Boulevard/South 216th Street
- South 188th Street/28th Avenue South
- South 188th Street/Des Moines Way
- South 200th Street/Des Moines Way
- South 200th Street/Military Road South
- 1st Avenue South/Des Moines Way
- Marine View Drive/South 216th Street.

These intersections would likely have a greater potential for an increase in traffic accidents compared to other study area intersections because of this increase in average vehicle delay.

Transit Service. Refer to the transit service section of the No-Action Alternative for a discussion of transit service impacts for this alternative. Since Alternative 1 has the highest potential number of employees by 2003, this alternative would also have the highest potential for transit ridership. This is primarily a result of the 1.53-million gsf of office space assumed for this alternative by 2003.

Non-Motorized Facilities. Impacts to non-motorized facilities with Alternative 1 are identical to the No-Action Alternative.

Parking. The assumed development for this alternative would generate a demand for approximately 5,300 to 6,300 parking spaces. About 401 to 521 of these spaces would be required by aviation-related uses. This estimate was based on typical parking demand rates for the various on-site uses. Table K-17 in Appendix K summarizes the estimated parking demand for Alternative 1 in 2003 by use.

In addition, the SASA development would displace most or all of the existing 1500-space airline/airport parking spaces located north of South 192nd Street and west of 28th Avenue South. These spaces would be relocated to a site at the north end of the airport located north of SR 518 and west of 24th Avenue South. The impact of this parking lot relocation was previously identified and reviewed in the Port of Seattle's Parking and Facilities Expansion project EIS.

Option 1A

Under Option 1A, the area set aside for future aviation maintenance in Alternative 1 would not be developed by the Port. Construction and operation impacts of the SASA proposal would be similar to, but slightly less than, Alternative 1. The impacts of any other type of development that could occur there would be the subject of separate environmental review.

4.12.2.3 Alternative 2 - The Preferred Alternative

Construction Traffic Impacts

Construction traffic impacts with Alternative 2 would be similar to, though less than, those described for Alternative 1. Table K-18 in Appendix K summarizes the magnitude of the earthwork activity and truck traffic generation for each alternative. Since the overall truck traffic generation for Alternative 2 is only slightly lower than Alternative 1, the PM peak hour level of service values with truck traffic in 1994 for Alternative 2 would be similar to those shown in Table 4.12-6 for Alternative 1. Refer to Appendix K for an expanded discussion of construction traffic impacts for this alternative.

Operation Impacts—1994

Site Development and Roadway Network Assumptions. Alternative 2 is identical to the No-Action Alternative for the 1994 analysis year, with the exception that an existing line maintenance facility currently located on Sea-Tac International Airport property north of South 188th Street was assumed to be relocated to the SASA site, displacing 1,000 parking spaces. A total of 500 employees were assumed to be relocated. This would result in impacts that are different than the No-Action Alternative at two intersections: South 188th Street/28th Avenue South and South 192nd Street/28th Avenue South. All other transportation impacts in 1994 would be identical to those described for the No-Action Alternative.

Traffic Volume Forecasts. The relocation of 500 total employees (250 daytime employees) would result in approximately 1,023 daily and 45 PM peak hour trips moving to the SASA site. This volume of traffic was re-assigned through the South 188th Street/28th Avenue South and South 192nd Street/28th Avenue South intersections. Traffic volume forecasts at all other study area intersections in 1994 would be identical to the No-Action Alternative. (See Figure 4.12-3.) Access to the SASA site for this alternative in 1994 was assumed to occur at the north end of the site from South 192nd Street only.

Traffic Operations and Level of Service. Level of service for the PM peak hour using the 1994 traffic volume forecasts for Alternative 2 would be identical to those summarized in Table 4.12-1 for the No-Action Alternative with the following exceptions brought about by the relocation of 500 employees. The South 188th Street/28th Avenue South intersection would remain at LOS B; however, average delay per vehicle would increase from 9.8 seconds to 10.1 seconds, an increase in delay of about 3 percent. All movements at the South 192nd Street/28th Avenue South intersection would remain at LOS A; however, reserve capacity for all movements at the unsignalized intersection would decrease by about 109 vehicles.

Parking. Of the 1,500 parking spaces currently available at the SASA site, 1,000 would be displaced in 1994 with Alternative 2. These spaces would be replaced at the proposed 24th Avenue South employee parking lot. Impacts of this proposed parking lot are discussed in the *Seattle-Tacoma International Airport Parking Facilities Expansion DEIS*, September 1988.

Operation Impacts—2003

Site Development and Roadway Network Assumptions. For the 2003 analysis year with Alternative 2, development on the SASA site was assumed to be a mixture of aviation line and base maintenance facilities, office, hotel, and retail development. The aviation facilities would include five maintenance facilities for three airlines plus a base maintenance facility. Table 4.12-2 summarizes the year 2003 site development assumptions for Alternative 2 as well as for the other three alternatives analyzed.

Roadway network assumptions that would affect travel patterns to and from the SASA site in 2003 for Alternative 2 are identical to those described in Section 4.12.2.1 for the No-Action Alternative.

Traffic Volume Forecasts. Table K-20 in Appendix K summarizes the daily and PM peak hour trip generation for Alternative 2 by use.

The proposed uses for Alternative 2 would generate a total of 12,133 daily trips and 1,170 in the PM peak hour. (See Table 4.12-3 for a trip generation comparison of all alternatives.) The aviation maintenance facility uses account for approximately 27 percent of the daily and 12 percent of the PM peak hour trip generation.

In addition to the 1,600 new base and line maintenance employees, 820 existing line and base maintenance employees would relocate to the SASA site from existing maintenance facilities located north of South 188th Street. The impact of relocating these employees would be negligible at most intersections in the site vicinity, however, additional impacts would occur at the South 188th Street/28th Avenue South and South 192nd Street/28th Avenue South intersections. The travel pattern changes resulting from the 820 relocated line and base maintenance employees at these two intersections was considered in the analysis.

The process used to distribute and assign project-generated traffic for Alternative 2 in 2003 is identical to that described for the No-Action Alternative. Access to the SASA site was assumed to occur at the same three locations as described for the No-Action Alternative. Traffic volumes on study area roadways with Alternative 2 in 2003 are shown on Figure 4.12-6.

Traffic Operations and Level of Service. Level of service for the PM peak hour was calculated at all study area intersections using the 2003 traffic volume forecasts for Alternative 2. Level of service calculation results are summarized in Table 4.12-5. LOS F conditions would exist at seven of the eight intersections identified for the No-Action Alternative in 2003.

In addition to these intersections that would operate at LOS F, there are two intersections that would operate at LOS E in 2003 with Alternative 2: International Boulevard/Sea-Tac Airport Entrance and South 188th Street/Military Road South.

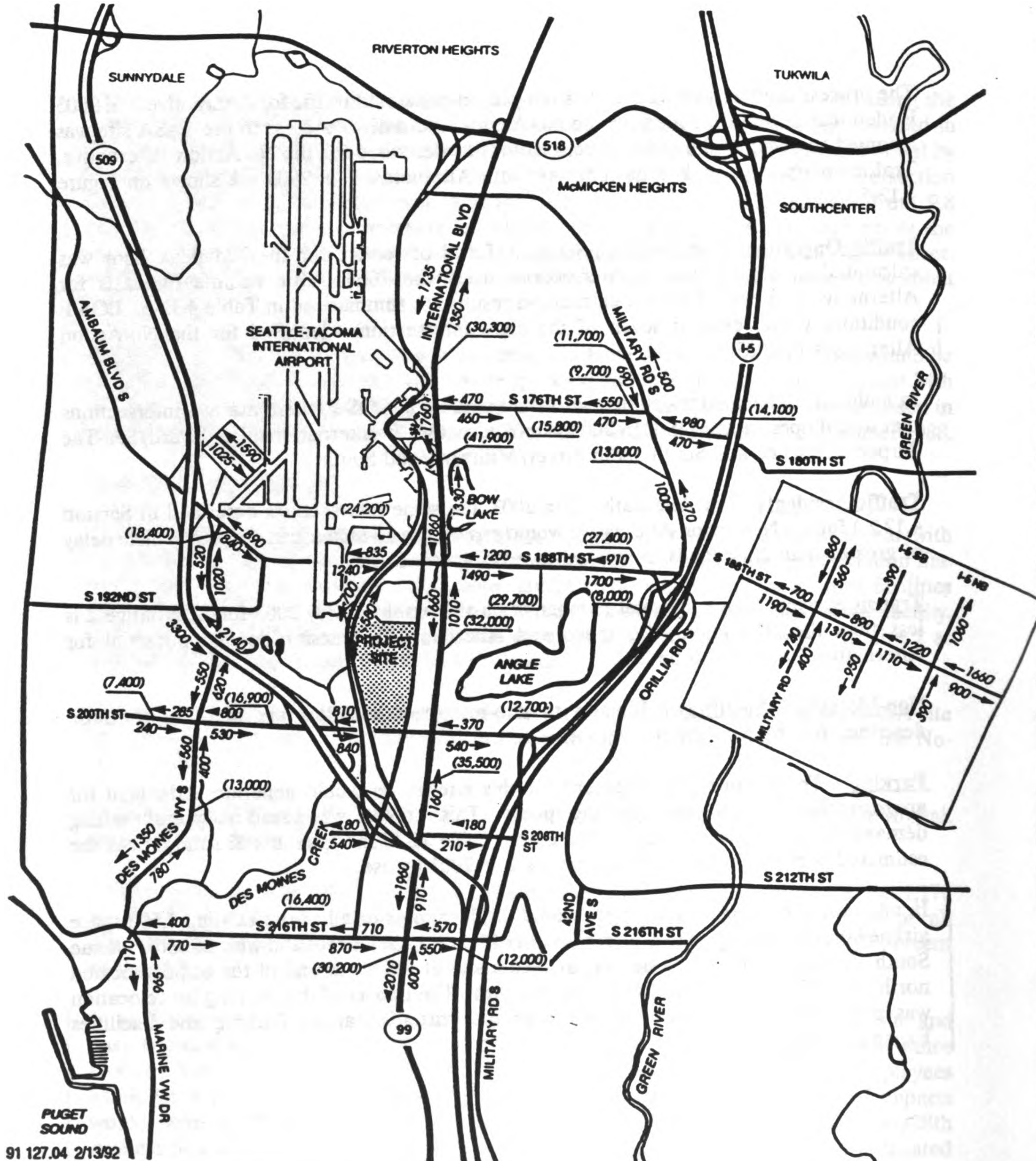
Traffic Accidents. For Alternative 2 in 2003, the same intersections described in Section 4.12.2.1 for the No-Action Alternative would experience an increase in average vehicle delay of greater than 20 seconds, compared to existing conditions.

Transit Service. Since the total number of on-site employees by 2003 for Alternative 2 is less than the No-Action Alternative and Alternative 1, transit ridership potential for Alternative 2 would also be less.

Non-Motorized Facilities. Impacts to non-motorized facilities are identical to those described for the No-Action Alternative.

Parking. The assumed development for this alternative would generate a demand for approximately 2,950 to 3,600 parking spaces. This estimate was based on typical parking demand rates for the various on-site uses. Table K-20 in Appendix K summarizes the estimated parking demand for Alternative 2 in 2003 by use.

In addition, the SASA development would displace most or all of the existing 1,500-space airline/airport parking spaces located north of South 192nd Street and west of 28th Avenue South. These spaces would be relocated to a site at the north end of the airport located north of SR 518 and west of 24th Avenue South. The impact of this parking lot relocation was previously identified and reviewed in the Port of Seattle's Parking and Facilities Expansion project EIS.



SCALE IN FEET

0 2,000 4,000

(XXX) Daily Volume

XXX PM Peak Hour Volume

Figure 4.12-6
2003 Forecast
Traffic Volumes
Alternative 2

4.12.2.4 Alternative 3

Construction Traffic Impacts

Construction traffic impacts with Alternative 3 would be much greater than those described for either Alternative 1 or 2. Table 4.12-7 summarizes the PM peak hour LOS with and without excavation/embankment truck traffic.

Table K-24 in Appendix K summarizes the PM peak hour level of service with and without truck traffic from the embankment/excavation activities for Alternative 3. Refer also to Appendix K for more detailed information on construction impacts on traffic for this alternative.

Operation Impacts—1994

Transportation impacts with Alternative 3 in 1994 are identical to those described in Section 4.12.2.3 for Alternative 2 in 1994.

Operation Impacts—2003

Site Development and Roadway Network Assumptions. For the 2003 analysis year with Alternative 3, development on the SASA site was assumed to be a mixture of aviation line and base maintenance facilities, hotel, and retail development. The aviation facilities would include line maintenance facilities for three airlines plus a base maintenance facility. Alternative 3 would also accommodate a base maintenance facility for a second airline; however, this was not assumed to be in place by 2003 and is not evaluated. Table 4.12-2 summarizes the year 2003 site development assumptions for Alternative 3 as well as for the other three alternatives analyzed.

Roadway network assumptions that would affect travel patterns to and from the site for Alternative 3 in 2003 are identical to those described in Section 4.12.2.1 for the No-Action Alternative.

Traffic Volume Forecasts. Table K-22 in Appendix K summarizes the daily and PM peak hour trip generation for Alternative 3 by use.

The proposed uses for Alternative 3 would generate a total of 6,654 daily trips and 469 in the PM peak hour. (See Table 4.12-3 for a trip generation comparison of all alternatives.) The aviation maintenance facility uses account for approximately 49% of the daily and 30% of the PM peak hour trip generation.

In addition to the 1,600 new base and line maintenance employees, 820 existing line and base maintenance employees would relocate to the SASA site from existing maintenance facilities located north of South 188th Street. The impact of relocating these employees would be negligible at most intersections in the site vicinity, however, additional impacts

Table 4.12-7. Excavation/embankment truck traffic pm peak hour level of service summary - Alternative 3.

		1991 Existing		1994 Alternative 3 without Trucks		1994 Alternative 3 with Trucks		
Signalized Intersections		LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	Delay Increase
South 188th Street/28th Avenue South		B	8.5	B	9.8	F	>120.0	>110.2
International Boulevard/South 188th Street		F	97.7	F	109.1	F	>120.0	>10.9
International Boulevard/Sea-Tac Airport Entrance		E	40.9	E	51.9	F	61.7	9.8
International Boulevard/South 176th Street		B	11.8	B	12.4	B	12.5	0.1
South 188th Street/42nd Avenue South		B	7.4	B	7.6	B	12.3	0.2
South 188th Street/Military Road South		D	36.3	E	52.1	F	>120.0	>67.9
South 188th Street/I-5 Northbound Ramps		E	42.2	E	50.3	F	>120.0	>69.7
South 188th Street/I-5 Southbound Ramps		D	32.0	D	37.6	F	>120.0	>82.4
South 188th Street/Des Moines Way		B	14.4	B	14.9	B	14.9	0.0
Unsignalized Intersections	Movement	LOS	Res.Cap.	LOS	Res.Cap	LOS	Res.Cap.	Res.Cap. Decrease
South 192nd Street/28th Avenue South								
	Northbound Approach	A	773	A	732	F	-183	915
	Southbound Approach	A	538	A	499	F	-1368	1867
	Eastbound Left	A	977	A	977	F	-163	1140
	Westbound Left	A	966	A	966	A	966	0

1 The increase in delay represents the difference between the 1994 with trucks and without trucks scenarios.

would occur at the South 188th Street/28th Avenue South and South 192nd Street/28th Avenue South intersections. The travel pattern changes resulting from the 820 relocated line and base maintenance employees at these two intersections was considered in the analysis.

Access to the SASA site was assumed to occur at the same three locations as described for the No-Action Alternative. Traffic volumes on study area roadways with Alternative 3 in 2003 are shown on Figure 4.12-7.

Traffic Operations and Level of Service. The average vehicle delay is slightly lower at most intersections with Alternative 3 compared to all other alternatives in 2003.

LOS F conditions would exist at seven of the eight intersections operating at LOS F with the No-Action Alternative in 2003. The 28th Avenue South/site access intersection would operate at LOS C in 2003 with Alternative 3. The improved level of service at the 28th Avenue South site access intersection with Alternative 3, as compared with the other alternatives, is directly related to the lower traffic volumes generated by the SASA site development. In addition to these intersections that would operate at LOS F, there are two intersections that would operate at LOS E in 2003 with Alternative 3: International Boulevard/Sea-Tac Airport entrance and South 188th Street/Military Road South.

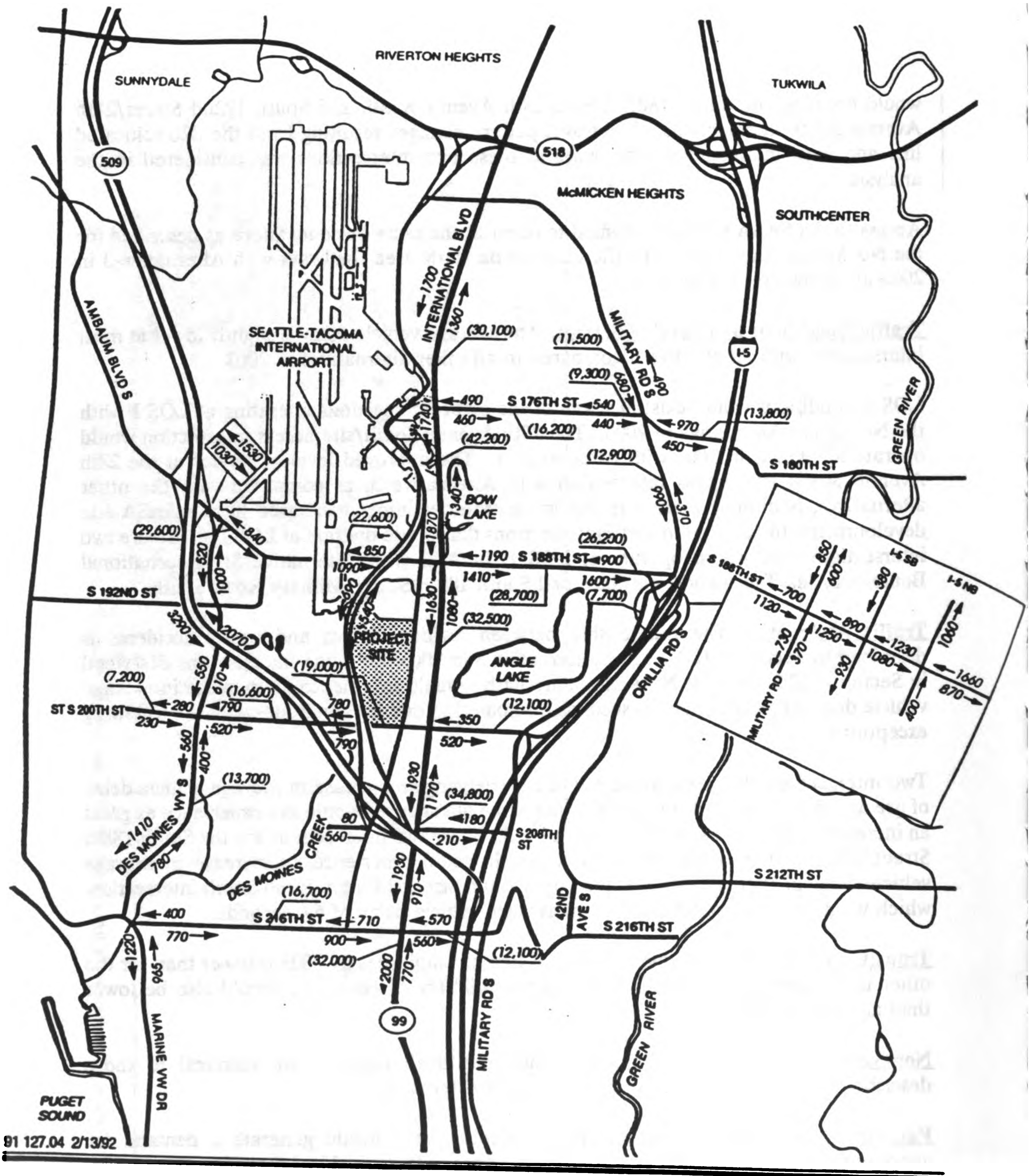
Traffic Accidents. The relationship between traffic volumes and traffic accidents is described in Section 4.12.2.1. For Alternative 3 in 2003, the same intersections described in Section 4.12.2.1 for the No-Action Alternative would experience an increase in average vehicle delay of greater than 20 seconds, compared to existing conditions with the following exceptions.

Two intersections that were identified as experiencing an increase in average vehicle delay of greater than 20 seconds under the other three alternatives would not experience as great an increase in delay in 2003 with Alternative 3. These two intersections are the South 188th Street/28th Avenue South intersection, which would experience an increase in average vehicle delay of 19.0 seconds, and the South 200th Street/Military Road South intersection, which would experience an increase in average vehicle delay of 6.4 seconds.

Transit Service. Since the total number of on-site employees by 2003 is lower than for the other three alternatives, transit ridership potential for Alternative 3 would also be lower than any other alternative.

Non-Motorized Facilities. Impacts to non-motorized facilities are identical to those described in Section 4.12.2.1 for the No-Action Alternative.

Parking. The assumed development for Alternative 3 would generate a demand for approximately 1,100 to 1,500 parking spaces. About 796 to 1,035 of these are required by aviation-related development. This estimate was based on typical parking demand rates for



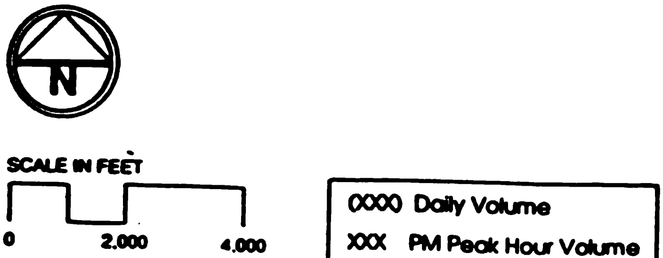


Figure 4.12-7
2003 Forecast
Traffic Volumes
Alternative 3

the various on-site uses. Table K-23 in Appendix K summarizes the estimated parking demand for Alternative 3 in 2003.

In addition, the SASA development would displace most or all of the existing 1,500-space airline/airport parking spaces located north of South 192nd Street and west of 28th Avenue South. These spaces would be relocated to a site at the north end of the airport located north of SR 518 and west of 24th Avenue South. The impact of this parking lot relocation was previously identified and reviewed in the Port of Seattle's Parking and Facilities Expansion project EIS.

4.12.2.5 Development Sequence

In the case where initial SASA development is for line maintenance followed by base maintenance, the transportation impacts projected for 2003 for the different alternatives remain the same. Regardless of development sequence, traffic generation for construction and general area growth would be essentially unchanged. The interim SASA traffic projections for 1993 would be lower because the additional employment generated by the maintenance base would not have occurred. Interim traffic would be similar to the analysis for the buildout of Alternative 1/Option 1A. Traffic generated by potential commercial development would not be changed. For example, in Table 4.12-1, the LOS and delay values listed under No Action and Alternative 1 would also apply to Alternatives 2 and 3 in the case when line maintenance is the initial development phase.

4.12.2.6 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area transportation. Traffic volumes included in this EIS are based on overall forecasts of airport activity and area/regional growth over the study period and would not be significantly affected by other identified airport projects. Development of an additional runway on the west side of the airport would include relocation or removal of some local roadways.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for impacts of regional transportation improvements south of the airport. Traffic projections for the corridor EIS will include SASA and airport-related traffic. Areas involved, would depend on route alignment decisions which have not yet been made. Other area traffic analysis has also been performed for the 28th/24th Avenue South Arterial Project EIS, under the direction of the City of SeaTac. For the purpose of this EIS, an assumption was made that these corridor projects would be developed, therefore, the transportation forecasts include impacts of that corridor development. Construction activity associated with other airport projects which might occur at the same time as SASA construction could generate additional construction vehicle trips but this would probably be routed to various separated locations. Planning for other airport projects has not yet progressed to the point that their impacts on transportation can be estimated. The potential for cumulative impacts on transportation will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.12.3 Mitigation Measures

4.12.3.1 No-Action Alternative

Construction Traffic Mitigation

No estimates of construction traffic were made for the No-Action Alternative because there are no specific development proposals for the SASA site. Therefore, specific mitigation measures would need to be developed in the environmental review process for the specific development proposals of the No-Action Alternative.

Mitigation Measures in 1994

Roadway and Intersection Improvements. As stated previously, it is assumed that no new development would occur on the SASA site by 1994. There are, however, three intersections that would operate at LOS F conditions in 1994. As discussed in section 4.12.1.3, the city of SeaTac may allow intersections at LOS F, if approved after Public Work's review. Modifications were developed at these intersections to improve operations to LOS E or better. Table K-25 in Appendix K summarizes the levels of service with and without modification at these three intersections, as well as the decrease in average vehicle delay that would occur. The following improvements are needed to improve the level of service at these three intersections.

- International Boulevard/South 188th Street
  - Add an exclusive southbound right-turn lane
  - Add second northbound and southbound left-turn lanes.
- South 200th Street/Military Road South
  - Add a second southbound left-turn lane
  - Add exclusive eastbound and westbound left-turn lanes.
- 1st Avenue South/Des Moines Way
  - Add an exclusive westbound right-turn lane.

These improvements are needed to mitigate the impact of existing plus any background growth in traffic volumes from 1991 to 1994. Since no development is assumed to occur on the SASA site by 1994, these improvements are not needed to mitigate the impacts caused by development of the SASA site.

Mitigation Measures in 2003

When an intersection's Level of Service is unacceptable, according to city criteria, contributors of an appropriate cost share for intersection improvements could be undertaken as mitigation. Because of the wide variety of traffic sources utilizing city of SeaTac roads, the Port should work with the city of SeaTac transportation planning process in identifying the proportional share that may result from airport development projects, such as SASA.

Roadway and Intersection Improvements. There are eight study area intersections that would operate at LOS F in 2003 with the No-Action Alternative. Modifications were developed at these intersections to improve operations to LOS E or better. Table 4.12-8 summarizes the levels of service with and without modification at these eight intersections for the No-Action Alternative, as well as the decrease in average vehicle delay that would occur. For comparison, the levels of service with and without mitigation for the other three alternatives are also shown in Table 4.12-8. In addition, traffic signals would be needed at the South 192nd Street/28th Avenue South and South 200th Street/28th Avenue South intersections.

The modifications at these intersections primarily include the addition of turn lanes and/or signal phases. Table 4.12-9 summarizes the modifications needed at each intersection to improve operations to LOS E or better. The proponents for developing the site should be responsible for contributing to the construction of these improvements based on the proportion of site-generated traffic volumes to total PM peak hour entering traffic volumes, or other equitable method.

In addition to these intersections, there are also a number of planned transportation improvements in the site vicinity that would be impacted by traffic generated from the site. These improvements are summarized in the Planned Transportation Improvements section of the report. The proponents for developing the SASA under the No-Action Alternative site could be responsible for contributing to some of these improvements where impacts are determined to be significant. The contribution to these improvements should be based on the proportion of site-generated traffic volumes to total PM peak hour traffic volumes or other equitable method. Since there would be no aviation-related development under the No-Action Alternative, the contribution attributable to aviation uses would be zero.

Transit Service. If any of the transit service improvements currently being considered in the SeaTac area are implemented, the proponents for developing the site could be required to contribute to the improvements, if they provide a significant benefit to the site development. Until the planned transit service improvements such as the HCT and SeaTac People Mover systems are better defined, however, the specific benefits that transit service improvements might have on the site development cannot be determined.

Non-Motorized Facilities. The proponents for developing the site under the No-Action Alternative should be required to construct all on-site pedestrian facilities that are needed to connect the different on-site uses. Off-site non-motorized facilities impacts should not

Table 4.12-8. 2003 PM peak hour level of service summary with mitigation.

	No-Action Alternative					Alternative 1				
	Without Mitigation		With Mitigation			Without Mitigation		With Mitigation		
Signalized Intersections	LOS	Average Delay	LOS	Average Delay	Decrease in Average Delay	LOS	Average Delay	LOS	Average Delay	Decrease in Average Delay
International Blvd./South 188th St.	F	85.9	E	54.3	31.6	F	83.5	E	54.5	29.0
International Blvd./South 200th St.	F	76.9	E	46.5	30.4	F	97.9	E	57.2	40.7
International Blvd./South 208th St.	F	97.3	E	54.5	42.8	F	98.7	E	57.3	41.4
International Blvd./South 216th St.	F	70.2	E	49.8	20.4	F	87.3	E	53.2	34.1
South 200th St./Des Moines Way	F	105.7	B	8.3	97.4	F	103.1	B	8.3	94.8
South 200th St./Military Road South	F	105.1	D	39.1	66.0	F	114.2	E	42.4	71.8
1st Avenue South/Des Moines Way	F	>120.0	C	17.2	>102.8	F	>120.0	C	17.2	>102.8
Unsignalized Intersections	LOS	Reserve Capacity	LOS	Average Delay		LOS	Reserve Capacity	LOS	Average Delay	
28th Avenue South/Site Access	F	-14	B[1]	6.3		F	-3	B[1]	7.2	

[1] Assumes signalization of the intersection in 2003.

Table 4.12-8. 2003 PM peak hour level of service summary with mitigation (continued).

	Alternative 2					Alternative 3				
	Without Mitigation		With Mitigation			Without Mitigation		With Mitigation		
Signalized Intersections	LOS	Average Delay	LOS	Average Delay	Decrease in Average Delay	LOS	Average Delay	LOS	Average Delay	Decrease in Average Delay
International Blvd./South 188th St.	F	86.7	E	53.1	33.6	F	90.5	E	50.0	40.5
International Blvd./South 200th St.	F	74.3	E	50.2	24.1	F	62.8	E	43.5	19.3
International Blvd./South 208th St.	F	94.5	E	55.2	39.3	F	92.7	E	53.5	39.2
International Blvd./South 216th St.	F	81.9	E	49.6	32.3	F	81.6	E	48.4	33.2
South 200th St./Des Moines Way	F	92.8	B	8.3	84.5	F	85.6	B	8.3	77.3
South 200th St./Military Road South	F	84.0	D	36.4	47.6	F	63.2	D	31.3	31.9
1st Avenue South/Des Moines Way	F	>120.0	C	17.3	>102.7	F	>120.0	C	>17.1	>102.9

Unsignalized Intersections	LOS	Reserve Capacity	LOS	Average Delay		LOS	Reserve Capacity	LOS	Average Delay	
28th Avenue South/Site Access	D	101	No mitigation needed			C	206	No mitigation needed		

[1] Assumes signalization of the intersection in 2003.

Source: The Transpo Group

Table 4.12-9. 2003 Intersection mitigation measures summary.

Signalized Intersections	No-Action Alternative	Alternative 1	Alternative 2	Alternative 3
International Blvd./ South 188th St.	• Add southbound right-turn lane • Reduce southbound, northbound, eastbound, and westbound right-turn volumes[1]	• Same as No Action	• Same as No Action	• Same as No Action
International Blvd./ South 200th St.	• Reduce southbound, northbound, and eastbound right-turn volumes[1]	• Add westbound right-turn lane • Reduce southbound, north-bound, and eastbound right-turn volumes[1]	• Same as No Action	• Same as No Action
International Blvd./ South 208th St.	• Add eastbound and westbound left-turn lanes	• Same as No Action	• Same as No Action	• Same as No Action
International Blvd./ South 216th St.	• Add second eastbound left-turn lane	• Same as No Action	• Same as No Action	• Same as No Action
South 200th St./ Des Moines Way	• Add southbound left-turn lane • Add westbound right and left-turn lanes	• Same as No Action	• Same as No Action	• Same as No Action
South 200th St./ Military Rd. South	• Add westbound left-turn lane	• Same as No Action	• Same as No Action	• Same as No Action
First Avenue South/ Des Moines Way	• Add two southbound left-turn lanes • Add southbound right-turn lane • Add westbound right-turn lane • Change eastbound left-turn lane to a combined left-thru lane	• Same as No Action	• Same as No Action	• Same as No Action
Unsignalized Intersections				
28th Avenue South/ Site Access	• Install traffic signal	• Same as No-Action	• No Mitigation Needed	• No Mitigation Needed
South 192nd St./ 28th Avenue South	• Install traffic signal	• Same as No Action	• Same as No Action	• Same as No Action
South 200th St./ 28th Avenue South	• Install traffic signal	• Same as No Action	• Same as No Action	• Same as No Action

[1] Right-turn volumes reduced to account for right turns on red.

Source: The Transpo Group

require any specific mitigation measures, except for a potential proportionate share contribution to the non-motorized facilities improvements mentioned under Construction and Operation Impacts.

Transportation Management Program. A transportation management program (TMP) should be developed for all of the employment-based uses on the site. The goal of the TMP would be to reduce the amount of travel by single-occupant vehicles (SOVs) to and from the site. Refer to Appendix K for further discussion of the Statewide TMP legislation and specific elements of the TMP.

4.12.3.2 Alternative 1

Construction Traffic Mitigation

The construction traffic impacts at intersections previously summarized would occur for approximately 9 weeks or 48 working days. Because of the temporary nature of the construction, permanent intersection improvements to mitigate the truck traffic impacts would not be required. However, there are certain other mitigation measures that could help to reduce the impacts caused by truck traffic, at least during peak hours, including:

- Prohibiting trucks from entering or leaving the site during peak hours
- Extending the schedule for all earthwork activity to be completed from 9 weeks to 15 or 18 weeks
- Storing the excavated material on the SASA site temporarily so that truck trips are spread out over a longer period of time
- Phasing construction to allow earthwork to be completed over two or more dry seasons.

Mitigation Measures in 1994

Alternative 1 is identical to the No-Action Alternative for the 1994 analysis year. Refer to Section 4.12.3.1 for a discussion of mitigation measures for Alternative 1 in 1994.

Mitigation Measures in 2003

When an intersection's Level of Service is unacceptable, according to city criteria, contributors of an appropriate cost share for intersection improvements could be undertaken as mitigation. Because of the wide variety of traffic sources utilizing city of SeaTac roads, the Port should work with the city of SeaTac transportation planning process in identifying the proportional share that may result from airport development projects, such as SASA.

Roadway and Intersection Improvements. Mitigation measures for Alternative 1 in 2003 would be required at the same eight intersections identified for the No-Action Alternative in 2003. The level of service at these intersections, with mitigation, is summarized in Table 4.12-8, and the mitigation measures are summarized in Table 4.12-9. The mitigation measures are the same as the modifications developed for the No-Action Alternative except at the International Boulevard/South 200th Street intersection where an additional westbound right-turn lane is needed to improve operations to LOS E. The proponents for developing the SASA site under Alternative 1 should be responsible for contributing to the construction of these improvements based on the proportion of site-generated traffic volumes to total PM peak hour entering traffic volumes or other equitable method. Since aviation related development accounts for less than one percent of total SASA site trip generation, the fair share contribution attributable to aviation uses would also be less than one percent of the fair share attributable to the entire SASA site.

In addition to these intersections, there are a number of planned improvements in the site vicinity that would be impacted by traffic generated from the SASA site. The proponents for developing the site could be responsible for contributing to some of these improvements where impacts are determined to be significant. If there are delays in funding some or all of these planned improvements, the Port of Seattle may need to contribute to some alternative improvements that would be needed to mitigate impacts from the various phases of development on the SASA site.

Transit Service. Mitigation of impacts to transit service under Alternative 1 is similar to that described for the No-Action Alternative.

Non-Motorized Facilities. Refer to the discussion of Non-Motorized Facility mitigation under the No-Action Alternative.

Transportation Management Program. Refer to the TMP discussion under the No-Action Alternative.

4.12.3.3 Alternative 2 - The Preferred Alternative

Construction Traffic Mitigation

Mitigation of construction traffic impacts under Alternative 2 would be similar to the measures outlined for Alternative 1. Refer to the discussion of construction traffic mitigation under Alternative 1 for this alternative.

Mitigation Measures in 1994

The relocation of 500 line maintenance employees to the SASA site in 1994 would not create the need for any additional mitigation measures beyond those described in Section 4.12.3.1.

Mitigation Measures in 2003

When an intersection's Level of Service is unacceptable, according to city criteria, contributors of an appropriate cost share for intersection improvements could be undertaken as mitigation. Because of the wide variety of traffic sources utilizing city of SeaTac roads, the Port should work with the city of SeaTac transportation planning process in identifying the proportional share that may result from airport development projects, such as SASA.

Roadway and Intersection Improvements. Mitigation measures for Alternative 2 in 2003 would be required at seven of the eight intersections identified as requiring modifications the No-Action Alternative in 2003. The 28th Avenue South/Site Access intersection would operate at LOS E with Alternative 2; therefore, no mitigation would be needed. All of the mitigation measures are the same as the No-Action Alternative, except that no mitigation is needed at the 28th Avenue South/site access intersection. The proponents for developing the SASA site under the alternative should be responsible for contributing to the construction of those improvements based on the proportion of site-generated traffic volumes to total PM peak hour entering traffic volumes, or other equitable method. Since aviation-related development accounts for about 27 percent of daily and 12 percent of pm peak hour tips generated by total SASA site development, the share contributed attributable to aviation uses would similarly be some percentage of the fair share attributable to the entire SASA site.

In addition to these intersections, there are a number of planned improvements in the site vicinity that would be impacted by traffic generated from the SASA site. The proponents for developing the site could be responsible for contributing to some of these improvements where impacts are determined to be significant. If there are delays in funding some or all of these planned improvements, the Port of Seattle may need to contribute to some alternative improvements, that would be needed to mitigate impacts from the various phases of development on the SASA site.

Transit Service. Since Alternative 2 would have fewer employees than the No-Action Alternative or Alternative 1 in 2003, the benefits to the SASA site development from transit service improvements would be less than these two alternatives.

Non-Motorized Facilities. The impacts and proportionate share contributions to off-site non-motorized facilities improvements would be less than the No-Action Alternative or Alternative 1 in 2003.

Transportation Management Program. Since Alternative 2 would have fewer employees than the No-Action Alternative or Alternative 1 in 2003, the potential effectiveness of TMP programs would be less.

4.12.3.4 Alternative 3

Construction Traffic Mitigation

Mitigation of construction traffic impacts under Alternative 3 would be similar to the measures outlined for Alternative 1. Refer to the discussion of construction traffic mitigation under Alternative 1. The unsignalized South 192nd Street/28th Avenue south intersection may require temporary signalization and/or manual traffic control in addition to the earthwork timing measures outlined under Alternative 1.

Because of the substantial impacts that this alternative would have on the transportation system in the area, an additional mitigation option would be to redesign the site grading in a way that would require less fill material. This could be accomplished by changing the assumed 0.5% uphill slope from the northwest to southeast corners of the site to a 0.5% downhill slope. This site grading modification could reduce the quantity of fill material and truck traffic generation and impacts by about 50% and possibly more.

Mitigation Measures in 1994

Mitigation measures for this alternative would be similar to those for Alternative 2.

Mitigation Measures in 2003

When an intersection's Level of Service is unacceptable, according to city criteria, contributors of an appropriate cost share for intersection improvements could be undertaken as mitigation. Because of the wide variety of traffic sources utilizing city of SeaTac roads, the Port should work with the city of SeaTac transportation planning process in identifying the proportional share that may result from airport development projects, such as SASA.

Roadway and Intersection Improvements. Mitigation measures for Alternative 3 in 2003 would be required at seven of the eight intersections identified as requiring modifications under the No-Action Alternative in 2003. The 28th Avenue South/Site Access intersection would operate at LOS E or better with Alternative 3; therefore, no mitigation would be needed. All of the mitigation measures are the same as the No-Action Alternative, except no mitigation is needed at the 28th Avenue South/Site Access intersection. Since aviation-related development accounts for about 49 percent of daily and 30 percent of pm peak hour tips generated by total SASA site development, the fair share contribution attributable to aviation uses would similarly be some percentage of the fair share attributable to the entire SASA site.

In addition to these intersections, there are a number of planned improvements in the site vicinity that would be impacted by traffic generated from the SASA site. The proponents for developing the site could be responsible for contributing to some of these improvements where impacts are determined to be significant. If there are delays in funding some or all of these planned improvements, the Port of Seattle may need to contribute to some alternative improvements, that would be needed to mitigate impacts from the various phases of development on the SASA site.

Transit Service. Since Alternative 3 would have fewer employees than the other alternatives in 2003, the benefits to the SASA site from transit service improvements would be the least with Alternative 3.

Non-Motorized Facilities. The impacts and proportionate contributions to off-site, non-motorized facilities improvements would be less than all other alternatives in 2003.

Transportation Management Program. Since Alternative 3 would have fewer employees than all other alternatives in 2003, the potential effectiveness of TMP programs would be the least with Alternative 3.

4.13 AESTHETICS AND URBAN DESIGN

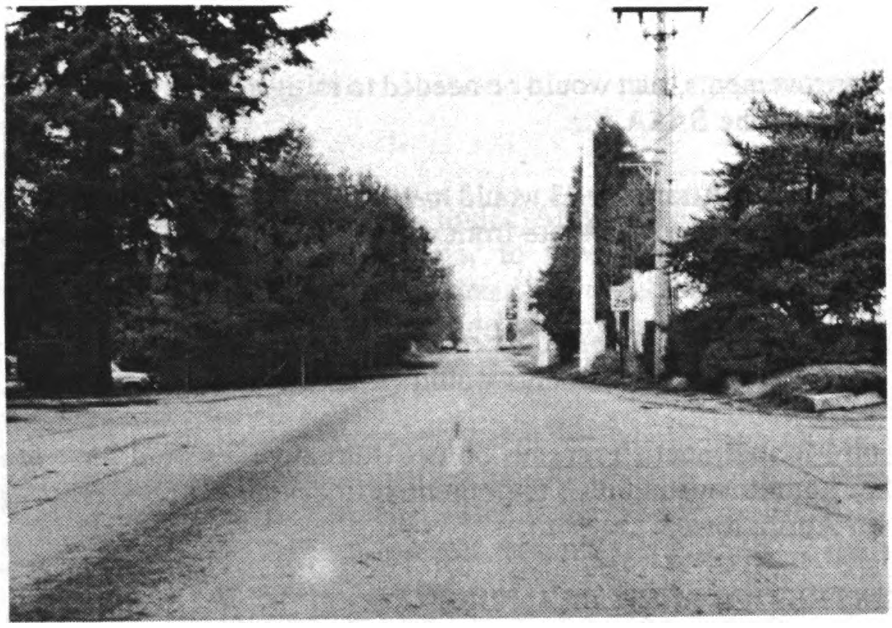
The following section includes a general description of the aesthetic character of the site, and an analysis of the views and view impacts from specific locations in public right-of-ways around the perimeter of the proposed development.

4.13.1 Affected Environment

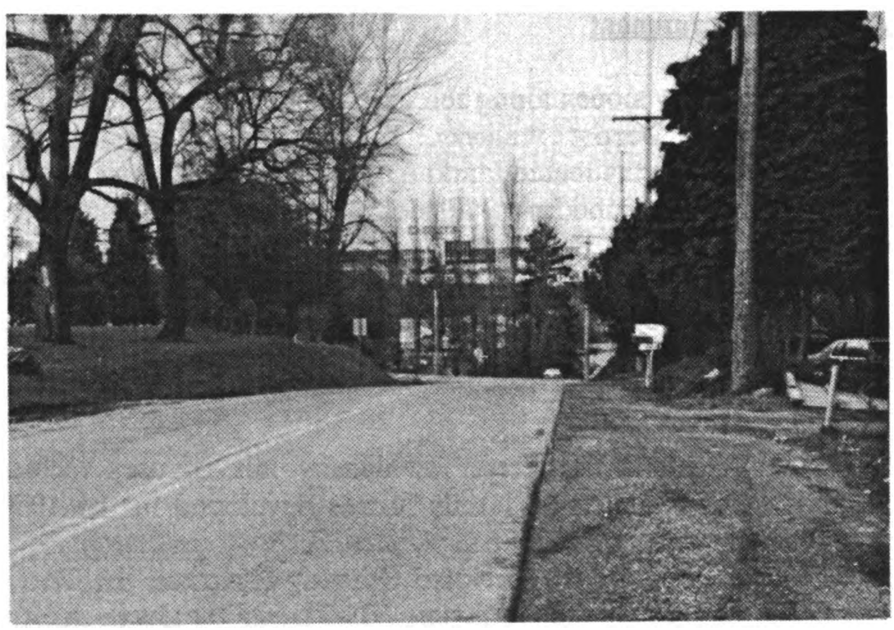
The site is characterized by slopes along the eastern, northern and western edges, and the 34R Sea-Tac International Airport Runway. These landforms define a small valley where the Tyee Valley Golf Course is located, and a sloping terrace above the golf course to the east. The western edge is defined by a hillside, ponds, and the golf course. The eastern edge of the site as defined by 28th Avenue South, is the highest edge of the site (Figure 4.13-1, View A and View B). The northern edge is made up of the slopes wrapping around the runway from the golf course to South 182nd Street. The southern edge of the site is defined by South 200th Street, which drops down into the lowest part of the site in the valley.

Above the eastern slope is a scattered, low-density mix of uses including a vacated neighborhood and a few small single family homes developed in the 1950's and 1960's, vacant or undeveloped tracts of land, and two small school buildings (Figures 4.13-1 and 4.13-2, Views A - D). As part of the Noise Remedy Program, the Port of Seattle has acquired most of the residences within the site. The homes that have been acquired in the area between South 194th Street and South 196th Street are vacant, boarded, or have been moved from their foundations. Litter and abandoned cars are scattered around the now vacant neighborhood. At the southern edge of the terrace some homes are still occupied (Figure 4.13-3, View E).

Over time, the commercial development along SR 99/International Boulevard and the airport have become the dominant influences on the eastern edge of the site. The result has been a change in the scale, texture, and pattern of land use and development (Figure

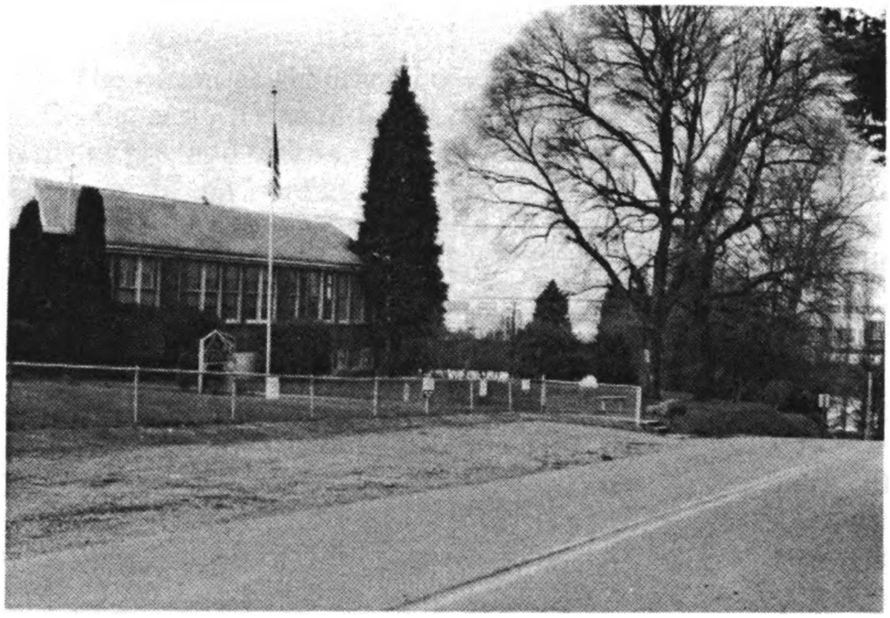


A. View North of 28th Avenue South from South 200th Street

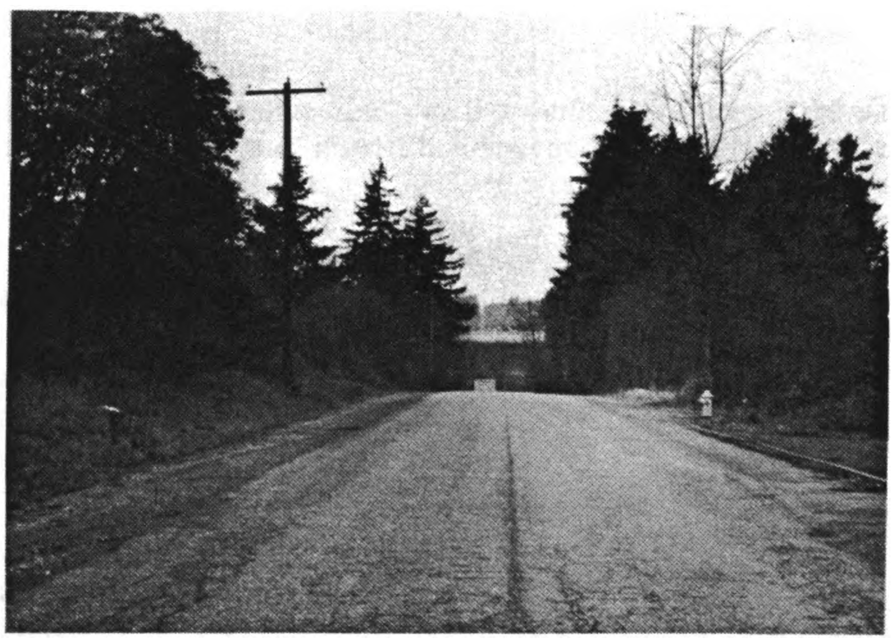


B. View North of 28th Avenue South South of South 192nd Street

Figure 4.13-1
Views A and B



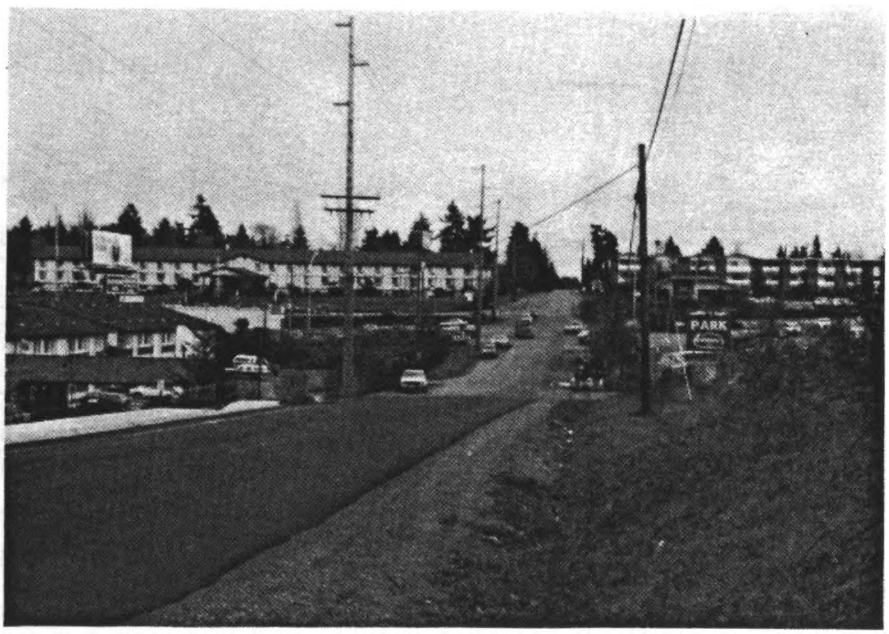
C. View of Angle Lake School from 28th Avenue South



D. View West from South 192nd Street

Figure 4.13-2
Views C and D

E. Existing Residential Area North of South 200th Street



F. Surrounding Landuses: View East from South 192nd Street and 28th Avenue South

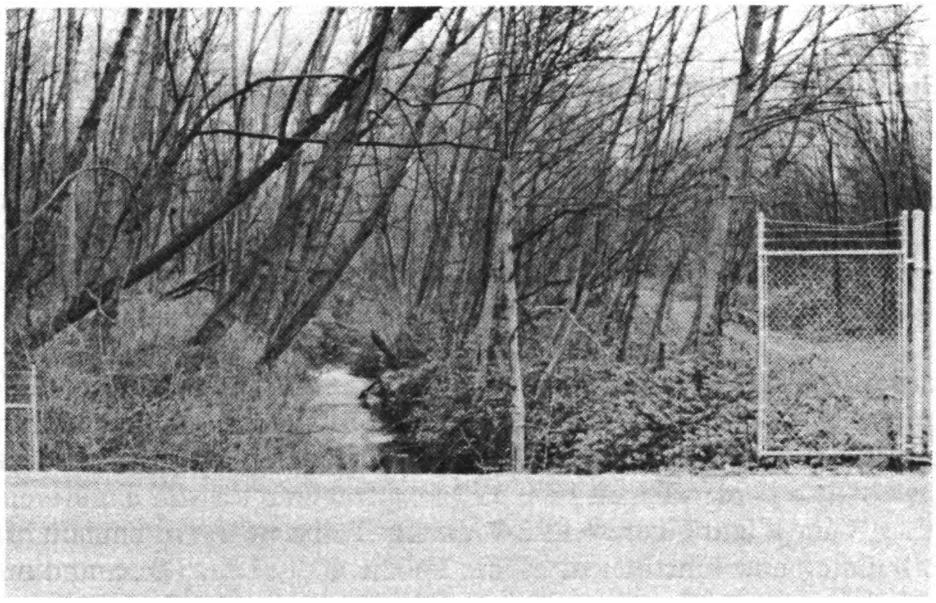
Figure 4.13-3
Views E and F

4.13-3 View F). The vacant neighborhood described above is on the western side of South 28th Avenue. On the eastern side of South 28th Avenue, development is entirely different in scale, intensity of use, and texture. The eastern site of the street serves as the backside for commercial development locating along SR 99/International Boulevard (Figure 4.13-3, View F) consisting of parking lots, service areas and minimal landscaping. The lighting levels and style are consistent with highway commercial developments, i.e., bright, high, and covering large areas.

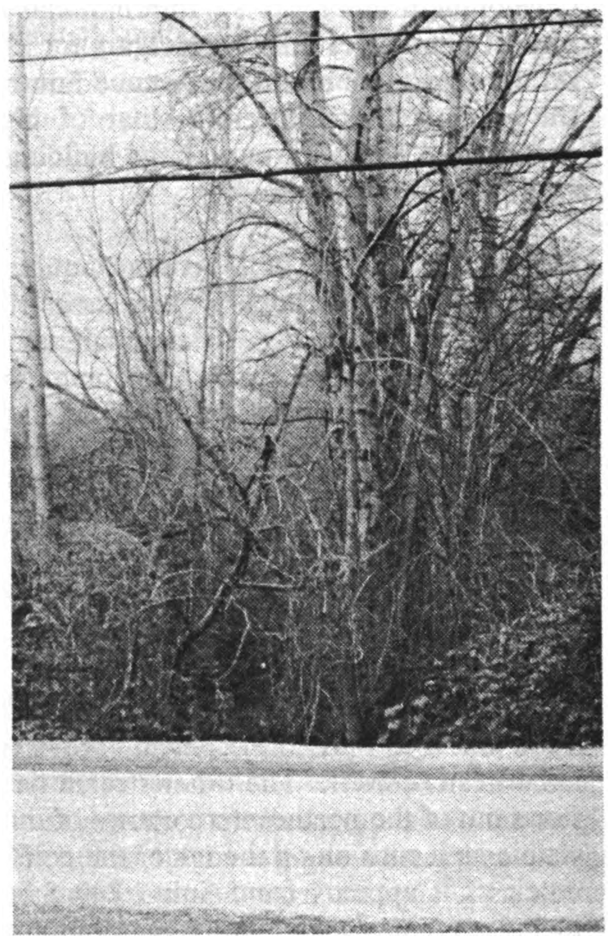
At the northern corner of the site, near the intersection of South 192nd Street and South 28th Avenue one can gather a sense of how the neighborhood may have appeared in the past. On the western side is the old Angle Lake Elementary School, on the eastern side are a few remaining single family homes. The road is a narrow two-lane road with undeveloped shoulders (Figure 4.13-1, View B and Figure 4.13-2 View C). The view is a remnant of past land uses; the school building now functions as offices for the City of SeaTac, and others. On the other side of the residential areas are large parking lots for the commercial development along SR 99/International Boulevard. In the distance, the parking lots for airport employees and the hangars for Delta Airlines are visible (Figure 4.13-1 View B). At the intersection of 28th Avenue South and South 192nd Street, Figure 4.13-1, View B, the view is quite different—that of highway commercial development—busy, intense, commercial activity around large buildings spreading over large lots, served by wide roads with high traffic volumes.

Development along 28th Avenue South in the southern corner of the site includes the Seattle Christian School, a water district building, and an electrical substation owned and operated by Puget Power. A few single family homes are interspersed between the utilities and the school. The scale of development is similar to the northwestern corner of the site; a low density scattered mix of buildings on the site across the street from highway commercial development. A partial view of the Seattle Christian School is shown in View 3. The school is a one-story building with a parking lot between the building and 28th Avenue South. Playgrounds for the school are behind the structures, hidden from views from the road.

In contrast to the commercial development in the northeastern corner of the site is the valley in the southwestern corner of the site. It includes an 18-hole golf course which is surrounded by wooded areas to the south of South 200th Street and a wooded hillside to the west, and the runway to the north. Two stream beds cut through the course, one from the northwestern corner. The other stream bed is the upper reach of Des Moines Creek that flows out of the northeastern corner of the golf course. The course of the Creek is partially visible as it runs along the edge of the golf course. Figure 4.13-4 Views G and H show the creek as it appears from South 200th Street. Other major elements in the golf course include a mix of deciduous trees in thin groupings between the fairways and the approach light towers for the runway located down the middle of the course.



G. View South of Des Moines Creek
from South 200th Street



H. View North of Des Moines Creek
from South 200th Street

Figure 4.13-4
Views G and H

No publicly identified view points or vistas exist either in the site or anywhere around the perimeter of the site. The roads around the site, especially to the south of the runway, are used by some individuals to watch airplanes taking off or landing.

4.13.2 Construction and Operation Impacts

A project of this magnitude would change the character of the site and affect views of the area. View I and J in Figure 4.13-5 show typical hangars that exist in the area. These images would be similar to the proposed hangars and shops in Alternative 1, Option 1A, and Alternatives 2 and 3. The scale of the hangars would be different than the scale of adjacent commercial land uses to the east. The hangars and shops would have more unbroken facades. Due to the finished elevation of the alternatives, most of the developed portions of the site would be hidden from view from the eastern side of the site, along 28th Avenue South. Alternative 1, Option 1A, and Alternative 2 would also be setback from the eastern edge, providing opportunities for other land uses to locate along 28th Avenue South, or for existing vegetation to remain, further screening views of the site.

The most significant view impacts would be from the northeastern and southwestern corner of the site, from 28th Avenue South and South 188th Street and from the golf course, respectively. Views from these positions from public rights-of-ways have been included in the following analysis.

The following section includes an analysis of four views of Alternatives 1, 2, and 3 from public right-of-ways around the perimeter of the site. Option 1A is similar to Alternative 1 with some exceptions as noted in the text. The technique used to generate the images of the alternatives was a three-dimensional computer modeling program that allowed the generation of perspectives from the various photographed viewpoints. Wire frame diagrams for each alternative were superimposed on photographs to show the relationship to existing conditions. The technique is an approximation of what the human eye would actually perceive. There is some variability between the computer image and photographs due to the lens curvature of the camera and the calculated curvature of the view from the computer. These images are meant only to show the building outline and positions of retaining walls in order to show view blockage. The images do not include final design details.

Figure 4.13-6 shows the positions from which the photographs for Views 1-4 were taken. The arrows indicate the direction of each view.

4.13.2.1 View 1

The photographs for Alternatives 1, 2, and 3 for View 1 (Figures 4.13-7 and 4.13-8) show a partial panorama from a position near South 200th Street in line with the centerline of the runway under the approach light system towers. The wire diagram includes two other projects proposed in the area: the South Access Roadway and the Runway Safety Area Extension. The South Access Roadway would be visible along the length of the wall supporting the site, and the Runway Safety Area Extension would extend into the existing

I. Existing Delta Hangar and Shop

J. Existing Alaska Hangar and Shop

Figure 4.13-5
Views I and J

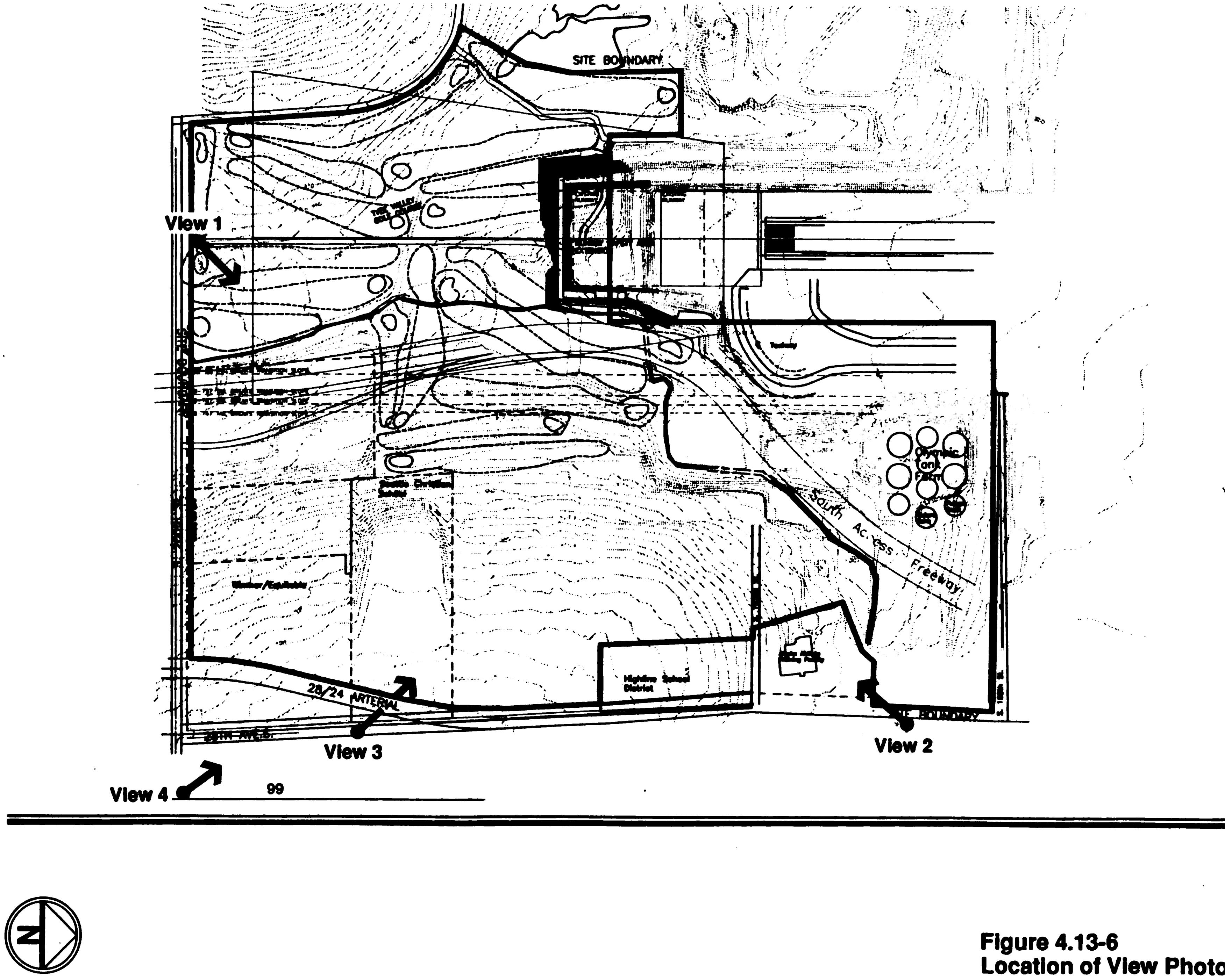


Figure 4.13-6
Location of View Photographs

golf course. The South Access Roadway would bridge over South 200th Street. The potential position of the freeway over the road is included in the image for View 1.

The alternatives would be most visible from the position shown in View 1. Most notable of the features in all of the alternatives would be the retaining wall above the South Access Roadway. Common to all of the alternatives would be views of the taxiway bridge over the South Access Roadway connecting the runway with the site. In the foreground of the view would be the Runoff Treatment Facility ponds covering the golf course east of the roadway shown in the photograph. The ponds would have berms 3-7 feet high and would be covered.

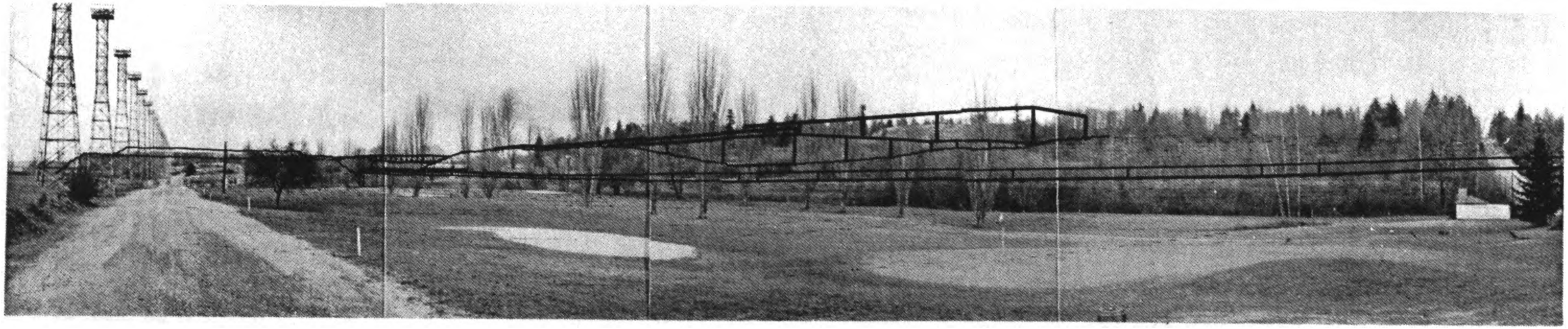
Near South 200th Street the end of the wall would be most dramatic in Alternatives 2 and 3 rising nearly 90 feet above the ground. This area would also be the potential location of access ramps from South 200th Street and the proposed South Access Roadway. The western wall in Alternative 1 would not extend as far south as the other two alternatives. As can be seen in View 1 of Alternative 1, the grading around the western edge of the building would allow for a more gradual edge, cutting down on the overall impact on the western side of the site. Option 1A would have relatively less wall length and consequently more grading would be possible to soften the southwestern edge of the site.

The top portions of the hangars would be visible in Alternatives 1, 2, and 3. Since the hangars are set back from the western wall, most of the buildings would be hidden from view. Option 1A would not include the southern two hangars as shown in Alternative 1. Therefore, less building faces would be visible in Option 1A.

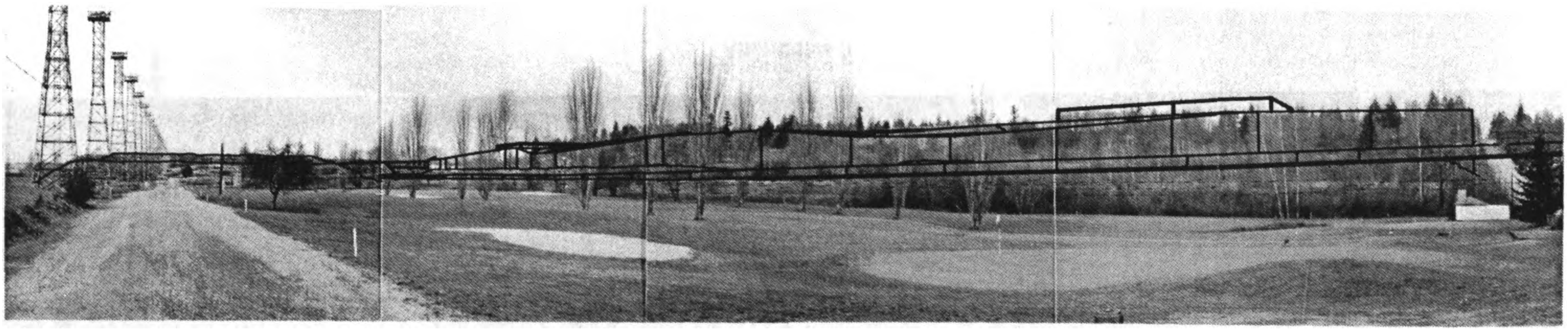
4.13.2.2 View 2 - Looking south from 28th Avenue South, between South 188th Street and South 192nd Street

Figures 4.13-9 and 4.13-10 show the view of the northern end of the site. The view would include the proposed taxiway connecting the existing taxiway to the site, and would include the proposed South Access Roadway. The bridge over the South Access Roadway would have different configurations for each alternative. Alternative 2 would be the most open to allow space for the existing stream bed for Des Moines Creek. Alternative 3 would fill in this area for the largest possible buildable area. The resulting view from the location shown in View 2 would be the mouth of a tunnel for the proposed South Access Roadway. Alternative 1 and Option 1A would be similar to Alternative 2 though slightly narrower.

Alternative 3 would have the most building bulk blocking views from this location due to the expansion of built area to the north of South 192nd Street. The building outlines shown for Alternative 1 and 2 would be behind the existing wooded area visible to the north of the existing building. As a result the existing trees would screen most of the built area in these two alternatives. Option 1A would have the same view impacts from this view location as Alternative 1.

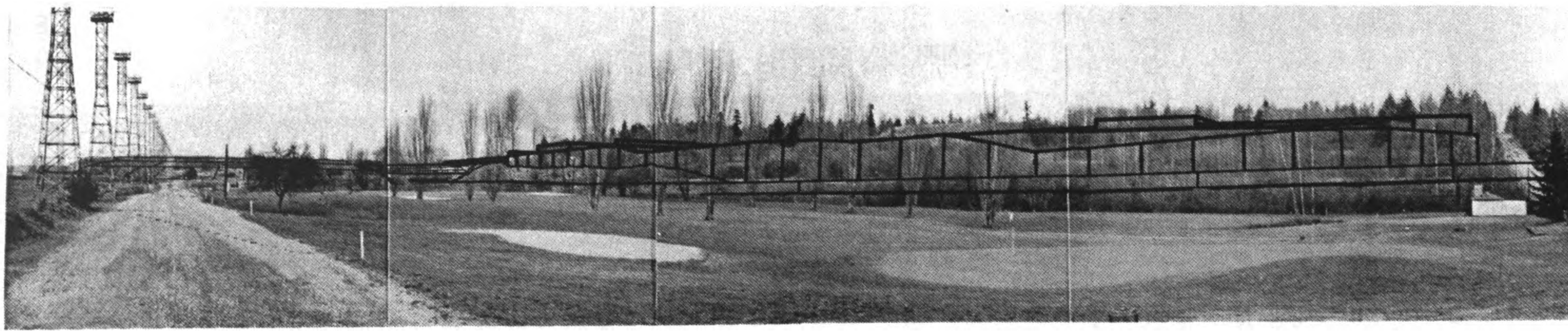


Alternative 1



Alternative 2 - Preferred Alternative

Figure 4.13-7
View 1 for Alternatives 1 and 2 - Preferred Alternative



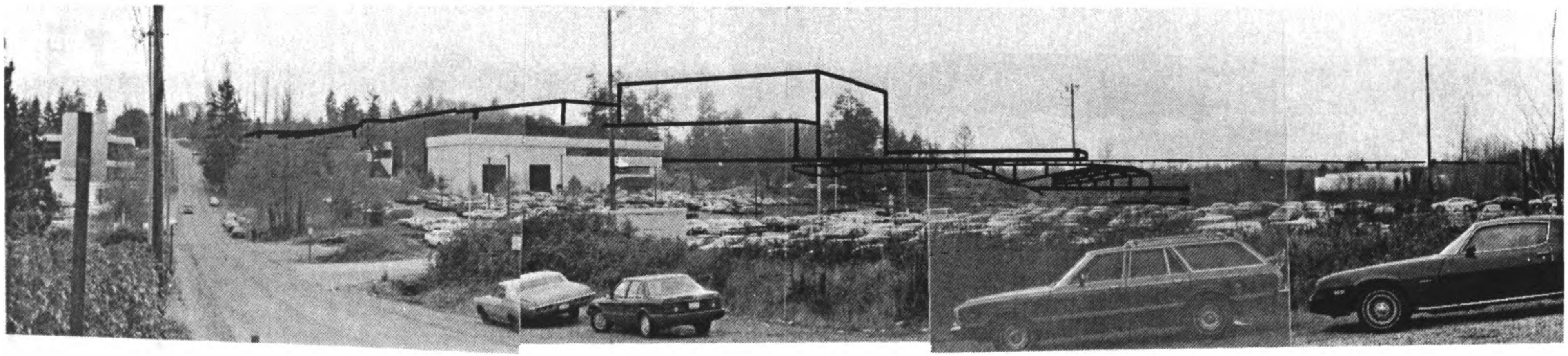
Alternative 3

Figure 4.13-8
View 1 for
Alternative 3

Alternative 1

Alternative 2 - Preferred Alternative

Figure 4.13-9
View 2 for Alternatives 1 and 2 - Preferred Alternative



Alternative 3

Figure 4.13-10
View 2 for
Alternative 3

4.13.2.3 View 3 - Looking north from 28th Avenue South, near Seattle Christian School

The existing view from the position shown in Figure 4.13-11, View 3 is from the high point of the site. The proposed realignment of the 28th/24th Avenue South Arterial would be in the foreground in this view. The buildings that are visible are 80 to 100 feet in height; most of the buildings are screened from view because the elevation of the deck would be 60 feet below the view position.

Alternative 3 would have the most impact on this view due to the extension of the parking lot to the edge of the 28th/24th Avenue South Arterial. Alternatives 1 and 2, Option 1A would be set back 360 feet from the edge of the proposed arterial at this point. Existing vegetation and or other developments that may occur in the 360 foot strip along 28th Avenue South could screen views of the site from this vantage point. The higher buildings shown in View 3 for Alternative 1, Figure 4.13-11 would be the Northwest and Delta hangars, which would require a 100-foot high structure for larger planes. These hangars would not be present in Option 1A and consequently would not block views from this position. The finished elevation of the deck for Alternatives 1,2, and 3 is approximately 60 feet below the location of the view—thus the existing ground from this viewpoint would block the lower portions of the hangars and hide views of the eastern retaining wall.

4.13.2.4 View 4 - Looking northwest from the intersection of SR 99 and South 200th Street

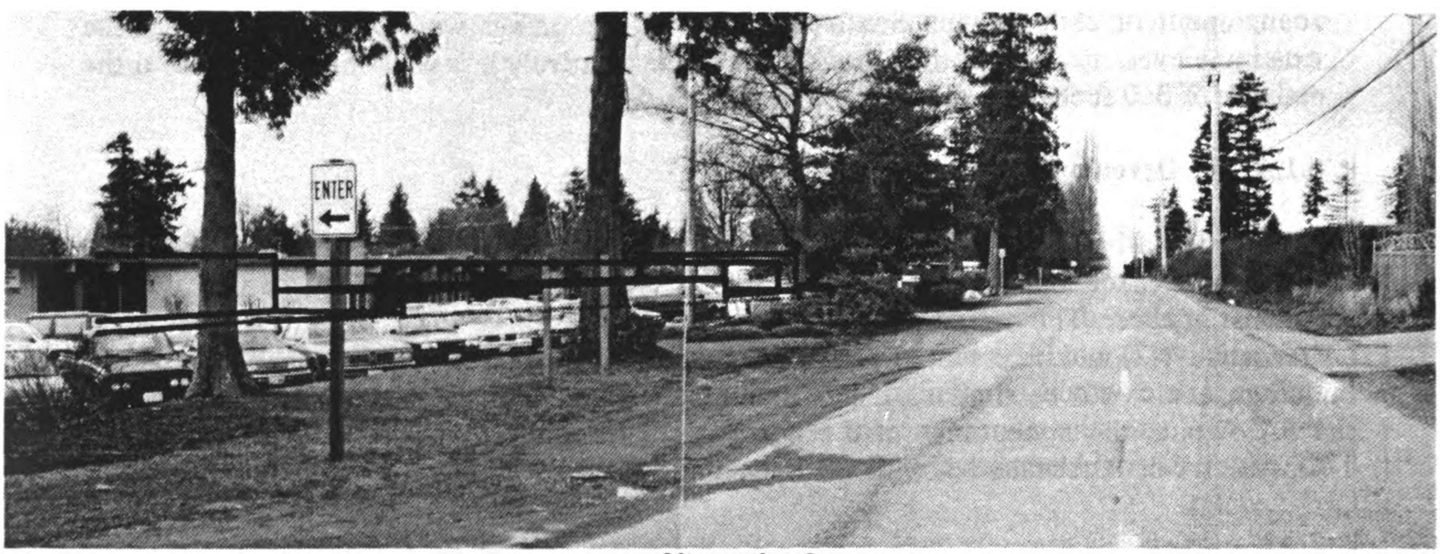
The views shown in Figure 4.13-12, View 4 show the extent of the building outlines in Alternatives 1, 2, and 3. Option 1A would not be visible in this view due to the absence of the two southern hangars. Only glimpses of the hangars in the alternatives would be possible from the location shown in View 4. Views of the proposed buildings would be screened by existing development along SR 99/International Boulevard, by the proposed realignment of 28th Avenue South and because the buildings would be lower than the existing elevation. Alternatives 1 and 2 would have relatively less view impacts due to the setback of 360 feet from the proposed arterial.

4.13.2.5 Development Sequence

In the case where initial SASA development is for line maintenance followed by base maintenance, the visual impacts projected for 2003 for the different alternatives may be somewhat altered. The basic footprint and taxiway alignment of the Preferred Alternative (Alternative 2) would be essentially the same and the overall scale of aircraft hangars, shop buildings, etc. would be similar. If line maintenance is developed at the northern part of the SASA site, the appearance at the north could resemble that shown for Alternative 1/Option 1A or Alternative 3, with the base maintenance facilities located to the south.

Alternative 1

Alternative 2 - Preferred Alternative



Alternative 3

Figure 4.13-11
View 3 for
Alternatives 1, 2 and 3

Alternative 1

Alternative 2 - Preferred Alternative

Alternative 3

Figure 4.13-12
View 4 for
Alternatives 1, 2 and 3

4.13.2.6 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area aesthetics and design. The site under consideration for the runway is separated from the area of the SASA site by a sufficient distance that cumulative impacts are not anticipated. Development of an additional runway on the west side of the airport would alter existing territorial views from locations west of the airport. Visual elements will be considered in the evaluation of the potential runway project. However, preliminary planning and engineering have not yet reached a stage at which such elements can be evaluated. A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis of view impacts of regional transportation improvements south of the airport. Areas involved would depend on route alignment decisions which have not yet been made. Planning for other airport projects has not yet progressed to the point that their impacts on aesthetics and design can be estimated. The potential for cumulative impacts on aesthetics and design will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.13.3 Mitigation Measures

The design of the western wall has incorporated sloped walls where possible to mitigate the height and bulk of the wall in Alternatives 2 and 3. Impacts from the western walls could be further mitigated by plantings along the base of the wall and/or with surface treatment of the wall face that would break up the expanse. The plantings that would be included as part of stream relocation and mitigation for Des Moines Creek would also add screening of the wall from the viewpoint shown in View 1 and View 2.

The setback of buildings from 28th Avenue South, as proposed in Alternative 1 and 2, would provide opportunities to buffer the eastern edge of the proposal to adjacent land uses to the east.

4.14 LIGHT EMISSIONS

4.14.1 Affected Environment

Existing lighting is concentrated on the east side of the site, along 28th Avenue South. Lighting includes normal street lighting and lighting associated with buildings and parking lots. The highest impact from lighting presently occurs from lights spilling over from the commercial development and parking lots located along SR 99/International Boulevard. The remainder of the site, including the vacant areas and golf course, have no lighting except for the approach lights system through the golf course. The approach lights are intended to be visible specifically for approaching aircraft, and have minimal impact on lighting levels for the site at ground level.

4.14.2 Construction and Operation Impacts

4.14.2.1 No-Action Alternative

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place on the site would be subject to separate environmental review.

4.14.2.2 Build Alternatives

The SASA project would involve light emissions from the following sources:

- Taxiway lighting
- Apron and hardstand lighting
- Ramp area flood lighting
- Hangar and parking area security lighting
- Interior hangar lighting
- Aircraft landing lights
- Aircraft navigation lights
- Traffic control and signage lighting.

The lighting systems and the levels of emissions associated with each would be the same for all site development alternatives. Therefore, the environmental impacts associated with light emissions from the SASA project are grouped and discussed below.

Taxiway Lighting

The FAA requires all taxiways to be lighted according to the standards outlined in Advisory Circulars 150/5340-19 (Taxiway Centerline Lighting System) and 150/5340-24 (Runway and Taxiway Edge Lighting System). Taxiway centerline lighting systems are designed to facilitate ground traffic under low-visibility conditions. The taxiway centerline lights are primarily a ground traffic aid which provide positive visual guidance and supplement taxiway marking and other taxi guidance elements.

The taxiway centerline lighting system consists of single semiflush inset light installed along the taxiway centerline in a straight line on straight portions, on the centerline of curved portions, and along designated taxiing paths in portions of runway, ramp, and apron areas. All taxiway centerline lighting fixtures emit steady-burning green light. The spacing of the light fixtures depends on the actual design of the taxiway; however, the general guideline for spacing on long, straight sections is 100 feet maximum. On all straight portions of taxiway centerlines, the axis of the light beam is parallel with the centerline of the taxiing path.

Edge lights are used to outline usable operational areas of airports during periods of darkness and low-visibility weather conditions. Since the runways use High-Intensity

Runway Lights (HIRLs), taxiways at Sea-Tac utilize Medium-Intensity Taxiway Lights (MIRLs). The standard height of the top of the elevated light fixture is 14 inches above finished grade; the fixture is mounted on a frangible stake. All taxiway edge lighting fixtures emit steady-burning blue light. The light fixtures are located not more than 10 feet from the edge of the full-strength pavement on each side of the taxiway and are spaced longitudinally not more than 200 feet apart to define the lateral limits of the taxiing paths.

Alternatives 1, 2, and 3 and Option 1A would have taxiway lighting on the structure that would connect the existing taxiway to the site.

Taxiway lights are relatively low-intensity, non-glaring incandescent lights; they are discernible primarily from the airfield. Consequently, there would be no significant impact associated with taxiway lighting for the SASA project.

Apron and Hardstand Lighting

The SASA project would include the use of an in-pavement lighting system to demark the apron and hardstand areas during either low visibility or evening hours of operation. These lights are similar to the taxiway lights discussed above. They are low-intensity, non-glaring, incandescent lights and are discernible primarily from the airfield. Lights required to perform maintenance on aircraft while parked at the hardstand areas would depend on tenant requirements. The height of such light standards would be limited by the airport's transitional surfaces, most notably, on the western edge of the SASA site. In any event, such lighting systems would be directed at aircraft parked on the hardstands with minimal spillage to other areas of the site. Therefore, there would be no significant impact associated with apron and hardstand lighting for the SASA project.

Ramp Flood Lighting

Flood lighting would be used to light aircraft parked on ramp areas outside hangar buildings. These lights would be of high-intensity (either high pressure sodium or metal halide) and would be mounted on the west side of the maintenance hangars. They would be approximately 50 to 80 feet above the ground, spaced approximately 50 to 100 feet on center, and shielded in such a way as to flood ramp areas only (i.e. with minimal glare and spillage). These lights would only be visible from the west, north, and south of the SASA project. No residences are located in the immediate vicinity of the site to the north or south.

Hangar and Parking Area Security Lighting

High-mast flood lighting would be used to light areas in the immediate vicinity of all hangar buildings and parking areas. These lights would be for the security and convenience of SASA employees and visitors. These lights would be of high-intensity (either high pressure sodium or metal halide) and would either be mounted on the hangars, or on high-mast pylons. They would be approximately 50 to 80 feet above the ground, spaced approximately

50 to 100 feet on center, and shielded in such a way as to flood building perimeters and parking lots only (i.e. with minimal glare and spillage). These lights would be visible from the east, north, and south of the SASA project. Since there are no residential areas in the immediate vicinity in these directions, there would be no significant impact associated with hangar and parking area security lighting for the SASA project. Since there are no residences to the north or south in the immediate vicinity there would be no significant impacts along these edges of the site. Night lighting could be annoying to occupants of hotels and motels east of the site.

Interior Hangar Lighting

The interiors of all hangar buildings would be lighted with high-intensity fluorescent lights. When the hangar doors are closed, these interior lights would not be visible outdoors. However, when the hangar doors are open, these interior lights may be visible from the airfield for a short distance to the west. While these lights are of high intensity, they create little glare or spillage outside the building even with the hangar doors open. Since there are no residential areas in the immediate vicinity to the west of the site, there would be no significant impacts associated with interior hangar lighting for the SASA project.

Aircraft Landing Lights

Aircraft landing lights are used on the ground only while taxiing around operational areas of the airfield. If the aircraft is under tow, the landing lights are generally not in use. Landing lights are of very high-intensity, but are angled down towards the pavement and aimed only in the direction of the taxiing path. Landing lights would be visible while aircraft are approaching or departing the SASA site to the north or south. However, since there are no residential areas in the immediate vicinity of these directions, there would be no significant impact associated with aircraft landing lights for the SASA project.

Aircraft Navigational Lights

As required by the FAA, all aircraft have navigational lights on their tails, wings, and fuselages. These navigation lights consist of high-intensity, steady burn or strobe, green, red, and white lights. For safety reasons, these lights are visible from great distances. However, they produce minimal glare, and are a prime necessity on all aircraft. They are only on while an aircraft is in motion and they are not considered a nuisance. Consequently, there would be no significant impacts associated with aircraft navigation lights for the SASA project.

Vehicle Traffic Control and Signage Lighting

The SASA project would involve standard traffic control and signage lighting. This is not considered a nuisance in terms of light emissions, and, therefore, there would be no significant impacts associated with traffic control and signage lighting for the SASA project.

Conclusion

Alternatives 1, 2, and 3 and Option 1A would increase lighting levels in the area. Lighting that would affect residents or building occupants in surrounding areas would be located on the east side of the site, and consist of Hangar and Parking Area security lighting. However, since parking areas are below 28th Avenue South much of the light on parking areas would be shielded from view. Alternatives 1 and 2 would have relatively less light impacts than Alternative 3 due to the set back from 28th Avenue South, and the lesser levels of development. Lighting for hangars, aprons and hardstands, and ramps would be noticeable from South 200th Street although the wall along the west side of the site would shield much of the light.

4.14.2.3 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area light emissions. The site under consideration for the runway is separated from the area of the SASA site by a sufficient distance that cumulative impacts are not anticipated. Development of an additional runway on the west side of the airport would include navigational lighting similar to that installed on existing runways, including approach light support towers. A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for light emissions from regional transportation improvements south of the airport. Roadway lighting, particularly in the vicinity of interchanges would likely be installed. Areas involved would depend on route alignment decisions which have not yet been made. Planning for other airport projects has not yet progressed to the point that their impacts on light emissions can be estimated. The potential for cumulative impacts on light emissions will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.14.3 Mitigation Measures

The impacts of nighttime illumination could be mitigated by using directional shields on exterior light fixtures, and using low-intensity lighting fixtures where appropriate.

4.15 RECREATION

This section analyzes potential impacts to recreational areas associated with the development of an aircraft maintenance facility on the SASA site.

4.15.1 Affected Environment

There are five recreational areas located in the immediate vicinity of the SASA site. These five areas are:

- The Tyee Valley Golf Course
- Angle Lake Park

- Des Moines Creek Park
- King County Bicycle Route System
- Local Community Centers.

4.15.1.1 Tyee Valley Golf Course

The Tyee Valley Golf Course is located on Port-owned property directly south of Runways 34R and 34L to Sea-Tac International Airport. Site boundaries for the golf course are: South 200th Street to the south, the existing Runway Safety Areas to the north, Seattle Christian School/vacant residential properties to the east, and 18th Avenue South/existing water bodies to the west. Currently configured in 18 holes, the golf course occupies approximately 100 acres of land leased from the Port of Seattle. The course property is owned by the Port of Seattle and is privately operated and open to the public. The approach light pylons for Runway 34R divide the golf course into 10 holes to the east and 8 holes to the west of Runway 34R's centerline. The golf course clubhouse is located 1,200 feet due east of the southern boundary of Runway 34R's runway safety area at approximately the same elevation as the runway. Des Moines Creek enters at the northeastern corner of the golf course from a culvert near the southern edge of the airport's remote south parking lot, and runs in a north-south direction for approximately 1,400 feet, where it joins the drainage course from the water body to the west (near Holes 12 and 13). Des Moines Creek then flows south to South 200th Street and continues to Puget Sound. A detention basin is located between Holes 10 and 18. The long-term lease for the golf course expired in April 1992; the Port is renewing the lease on a month-to-month basis.

4.15.1.2 Angle Lake Park

Angle Lake Park is located directly east of the SASA site, across SR 99/International Boulevard. Owned by the King County Park and Recreation Department, the park consists of 10.5 acres of developed land with the following facilities:

- Swimming beach
- Concession stand
- Fishing dock
- 24 picnic tables
- Play area
- Restroom
- Boat launch.

4.15.1.3 Des Moines Creek Park

Des Moines Creek Park is located southwest of the SASA site, across South 200th Street. Established by the King County Park and Recreation Department, and being transferred from the county to the cities of Des Moines and SeaTac, the park consists of 106.1 undeveloped acres along the Des Moines Creek channel. Des Moines Creek Park is intended to support the natural setting of Des Moines Creek from South 200th Street to Puget Sound.

4.15.1.4 King County Bicycle System

There are currently 5 designated bicycle routes in the King County system located near the SASA site. These routes consist of the following:

- City of SeaTac Access Route
- South 188th Street from S.R. 99 to the Valley Ridge Library
  (Class III - Highline Community Plan)
- South 188th Street from Des Moines Way South to the Valley Ridge Library
  (Class II - Highline Community Plan)
- Des Moines Way South from 12th Place South to S.R. 509
- South 216th Street from Des Moines Way South to S.R. 99
  (Class II - Highline Community Plan).

There are no King County, City of Seattle, or City of SeaTac designated bicycle routes that can be physically accessed from the SASA site at this time.

4.15.1.5 Local Community Centers

There are 3 local community centers located within the SeaTac area. These 3 community centers are:

- Highline Community Center (425 S.W. 144th Street, Burien)
- Moshier Art Center (430 S. 156th Street, Burien)
- Des Moines Recreation Center (10th Street South and South 220th Street, Des Moines).

The closest community center to the SASA site is the Des Moines Recreation Center, located approximately 2¼ miles southeast of the SASA site.

4.15.2 <u>Construction and Operation Impacts</u>

4.15.2.1 Impacts of Other Projects

Significant impacts associated with the construction and operation of an aircraft maintenance facility at the SASA site revolve around the Tyee Valley Golf Course. Given the relative distance from the SASA project, the other major recreational areas are not expected to experience any significant adverse impacts.

While each of the SASA site development alternatives are primarily contained on land east of the golf course, a number of other improvement projects currently being considered by

the Port, the City of SeaTac, and WSDOT (Division
golf course. These projects include:

- Extension of SR 509 (WSDOT)
- Widening of South 200th Street (City of SeaT
- Extension of the Runway Safety Area for Run
- South Access Roadway (Port of Seattle).

Provisions for incorporating each of these projects ha
planning for each of the SASA site development alter
with the SASA project are limited to those areas of th
34R's centerline, the impacts associated with oth
eventually affect the golf course, and are therefore d
the golf course with the green/tees identified by num

Extension of SR 509

The current right-of-way being considered for the exte
3.4-1. If constructed, this extension project would elin
Holes 6, 7, and 11 of the golf course.

Widening of South 200th Street

Current plans by the City of SeaTac call for the wideni
to 7 lanes. If constructed, this widening project would
for Holes 3, 5, and 6 of the golf course.

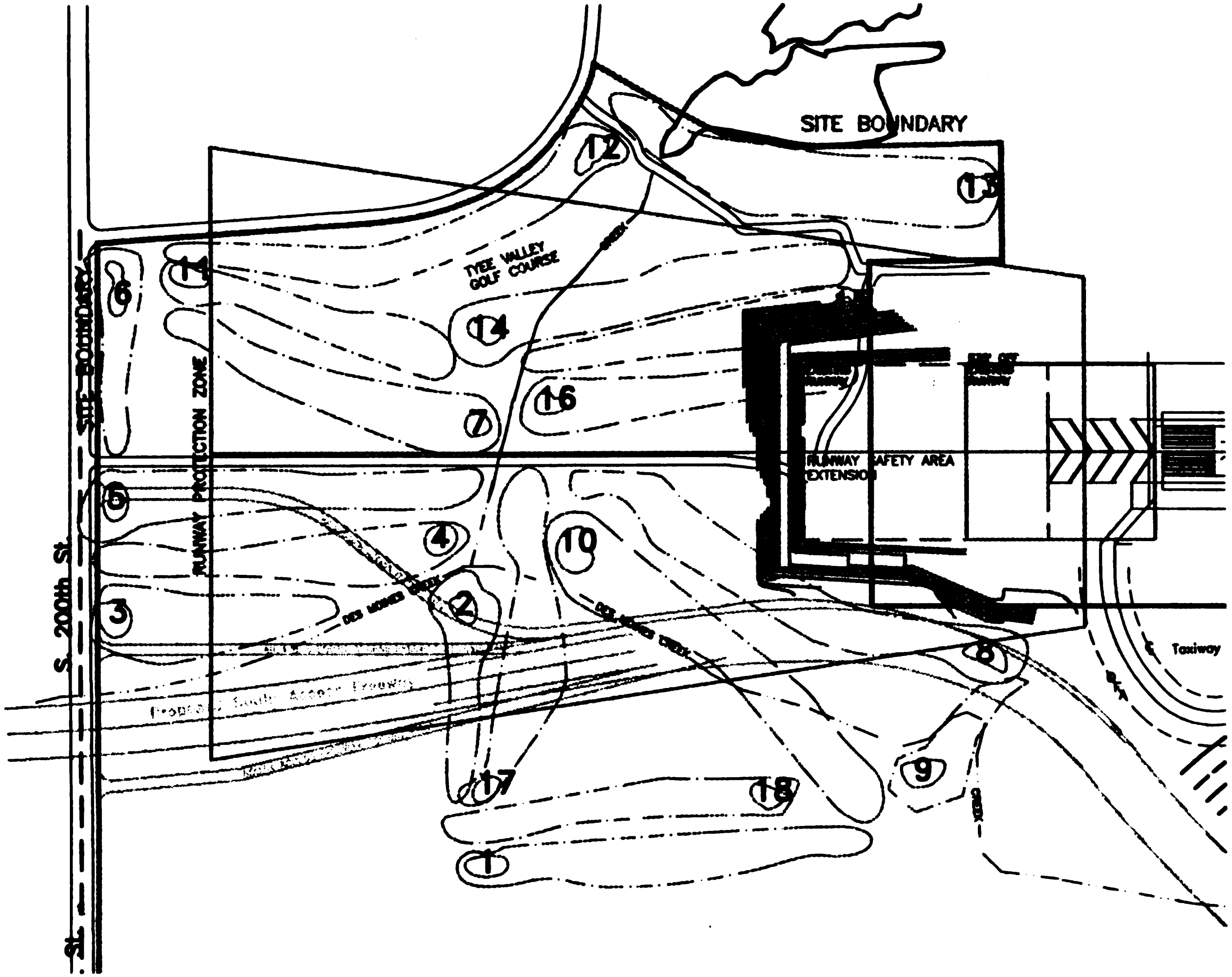
Extension of the Runway Safety Area for Runway 34I

If constructed, the extension of the runway safety a
greens/tees for Holes 8, 15, and 16 of the golf course

South Access Roadway

As part of its long-term master plan for the airport, t
construction of a 4-lane access road to connect SR 5
International Airport terminal. Several alternative alig
final design has yet to be determined. A prelimin
Roadway was included as part of the SASA project
Roadway would eliminate portions of the greens/tee
golf course.

If these improvement projects being considered by oth
the golf course may cease to exist as a viable recreat
portions of the golf course left intact after the SASA



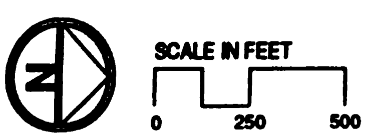


Figure 4.15-1
Tyee Valley Golf Course
Greens/Tees

continue to keep those portions of Port-owned property in golf course use. At such tim as other improvement projects eliminate further areas of the golf course, the Port woul consider the possibility of utilizing other undeveloped Port-owned properties t accommodate displaced greens, tees or holes (namely west and/or south of the existing gol course). These options are further discussed under Section 4.15.3, Mitigation Measures below.

4.15.2.2 No-Action Alternative

There would be no construction or operation impacts attributable to the SASA proposa under the No-Action Alternative. Impacts due to any other type of development that coul take place on the site would be subject to separate environmental review.

4.15.2.3 Alternative 1

Under Alternative 1, all 10 greens and tees for the golf course holes east of Runway 34R' centerline (namely 1, 2, 3, 4, 5, 8, 9, 10, 17, and 18) would be eliminated. The hangars aprons, and hardstands for the SASA facility would affect holes 1, 2, 9, 10, 17, and 18. Th IWS affects holes 3, 4, 5, 8, 10, and 17. The 8 holes west of Runway 34R's centerline coul continue to operate as they do now during and after construction of the SASA project.

At present, Alternative 1 is configured in such a way that the right-of-way for the Sout Access Roadway does not have to be graded in order to complete the SASA project. Th western edge of the SASA facility would be graded at a 4 to 1 slope, down to existing grade thereby allowing an area in which affected greens and tees (from SASA hardstands, aprons and hangars) could possibly be reconfigured to accommodate displaced holes.

<u>Option 1A</u>

Under Option 1A, the area set aside for future aviation maintenance in Alternative 1 woul not be developed by the Port. Construction and operation impacts of the SASA proposa would be similar to, but slightly less than, Alternative 1. The impacts of any other type o development that could occur there would be the subject of separate environmental review

4.15.2.4 Alternative 2 - The Preferred Alternative

Under Alternative 2, all 10 greens and tees for the golf course holes east of Runway 34R' centerline (namely 1, 2, 3, 4, 5, 8, 9, 10, 17, and 18) would be eliminated at ultimat buildout. The hangars, aprons, and hardstands for the SASA facility affect holes 1, 2, 9, 10 17, and 18. The Runoff Treatment Facility affects holes 3, 4, 5, 8, 10, and 17. Under thi alternative, Des Moines Creek wetlands would be relocated and this affects holes 2, 8, 9 10, 17, and 18. With the exception of new stream buffers, the 8 holes west of Runwa 34R's centerline could continue to operate as they do now during and after construction o the SASA project.

Alternative 2, including stream and wetland mitigation, is configured to allow the right-of-way for the South Access Roadway on the western edge of the SASA facility. This right-of-way encroaches on holes 2, 8, 10, and 17.

4.15.2.5 Alternative 3

Under Alternative 3, all 10 greens and tees for the golf course holes east of Runway 34R's centerline (namely 1, 2, 3, 4, 5, 8, 9, 10, 17, and 18) would be eliminated at ultimate buildout. The hangars, aprons, and hardstands for the SASA facility would affect holes 1, 2, 9, 10, 17, and 18. The SASA Runoff Treatment Facility would affect holes 3, 4, 5, 8, 10, and 17. Under this alternative, Des Moines Creek would be relocated in several areas and this would affect holes 2, 8, 10, and 17. The 8 holes west of Runway 34R's centerline could continue to operate as they do now during and after construction of the SASA project.

At present, Alternative 3 is configured in such a way that the right-of-way for the South Access Roadway is benched into the western edge of the SASA facility with a combination of retaining walls and reinforced earth slopes. This benching encroaches on holes 2, 8, 10, and 17.

4.15.2.6 Development Sequence

In the case where initial SASA development is for line maintenance followed by base maintenance, displacement of the golf course would still occur but would be delayed by one to two years. The Runway Safety Area project could displace the golf course as early as 1994. The overall SASA site footprint would remain the same so the potential for future golf course development would be unchanged.

4.15.2.7 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area recreation. The site under consideration for the runway is separated from the area of the SASA site, and does not have shared recreational facilities. Development of an additional runway on the west side of the airport would not alter existing recreational facilities. The City of SeaTac is considering potential future park development in the area west of the area but planning has not progressed to the stage at which impacts can be evaluated. The City of SeaTac, with cooperation from King County and the Port of Seattle, is also developing a major park on airport-owned land north of the airport. North SeaTac Park is being designed with layout and uses compatible with its high noise location and aircraft overflights.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for impacts of regional transportation improvements on recreational facilities. Areas involved would depend on route alignment decisions which have not yet been made. Potential roadway alignments would pass through portions of land designated for the future development of Des Moines Creek Park, which is to be developed by the cities of Des Moines and SeaTac. Potential roadway alignments would also pass through the existing golf course and were considered in this EIS (refer to Section 4.15.2.1). Airport area parks have been identified in the airport's FAR Part 150 Study. Potential future noise and air quality impacts on these facilities will be readdressed in the Master Plan Update and EIS. Planning for other airport projects has not yet progressed to the point that their impacts on recreation can be estimated. The potential for cumulative impacts on recreation will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.15.3 Mitigation Measures

As previously mentioned, all 10 greens and tees for the golf course holes east of Runway 34R's centerline would be eliminated by the SASA project and other non-SASA-related improvements.

The Port has extended the lease with the golf course operator on a month-to-month basis since it expired in April 1992; it can be terminated upon 30 day's notice. If the proposal is constructed, it is possible that some arrangement may be made in the future to lease the remaining property for golf course use.

It is currently anticipated that the golf course would be disrupted or shutdown during construction. Over the long-term, the Port would consider proposals for construction and operation of the golf course in the south end as space and conditions warrant. Future use of the site as a golf course (or any other land use) would have to maintain water quality protections, including 25-foot buffers, on Des Moines Creek and its contiguous wetlands.

The illustrative diagrams for the alternatives, shown in Figures 3.3-1 through 3.3-4, show a possible layout for a nine hole, par 4 golf course which uses adjacent Port-owned property. The area to be used for the South Access Roadway could also be used for additional fairways or driving ranges until that time that the road would be built. Final development of the course would be the responsibility of a private operator of the golf course per a future agreement.

4.16 HAZARDOUS MATERIALS AND WASTE

A Phase I Environmental Assessment was conducted on the proposed SASA site. Phase I Assessments consist of: (1) reviewing historical records of land use, (2) consulting agency records for evidence of past (or present) hazardous waste storage and/or use, and (3) visiting the site to look for visual indicators of potential sources of contamination. The complete Phase I Environmental Assessment is included as Appendix L.

4.16.1 Affected Environment

The site was broken down into three smaller sites, A, B, and C (Figure 4.16-1). The following section discusses the findings of the Phase I Assessment for each of the smaller sites.

4.16.1.1 Section A

Section A encompasses land located at the south end of the Sea-Tac International Airport, south of South 192nd Street, north of South 200th Street, and west of 28th Avenue South. Section A contains the Tyee Valley Golf Club, a vacated residential neighborhood, some additional residential dwellings, the Seattle Christian School, undeveloped parcels, a wetland, and Des Moines Creek.

Underground Storage Tanks

There were approximately 32 sites within a 1-mile radius of the project site, and one site included in the project area, listed as having registered underground storage tanks (USTs) (Ecology 1991d). The Tyee Valley Golf Club was listed as having maintained USTs.

Port of Seattle officials indicated that these tanks were located next to the golf course pro shop. Port officials also reported that the USTs were removed by the golf course operator before the effective date of the Federal UST Regulations (December 22, 1988), and no evidence of leakage or contamination was observed at the time of the removal. Ecology's UST database system still showed these tanks as active. Apparently these USTs were removed without notifying Ecology or testing, or prior to regulations pertaining to UST removals.

According to Ecology files, parties that operated at Sea-Tac International Airport had experienced releases of petroleum products (predominantly jet fuel) from both leaking underground storage tanks and spills. These releases have impacted soil conditions onsite, and potentially the groundwater. Des Moines Creek has also been impacted by fuel spills which occurred in 1974, 1982, 1985, and 1986. Impacts to the living organisms in the creek have been documented in the Ecology files relating to these releases (Ecology 1973, 1985, and 1986).

In addition, an investigation by Hart-Crowser of potential leaking USTs at the airport indicated that the general flow direction of the regional aquifer in this area was to the west (Hart-Crowser 1989). Based on a review of this report, groundwater was encountered in monitoring wells at 12 to 16 feet below grade in the area.

Transformers

Puget Power was contacted regarding three pole-mounted transformers observed on, or adjacent to, Section A. Two of these transformers were observed along South 200th Street,

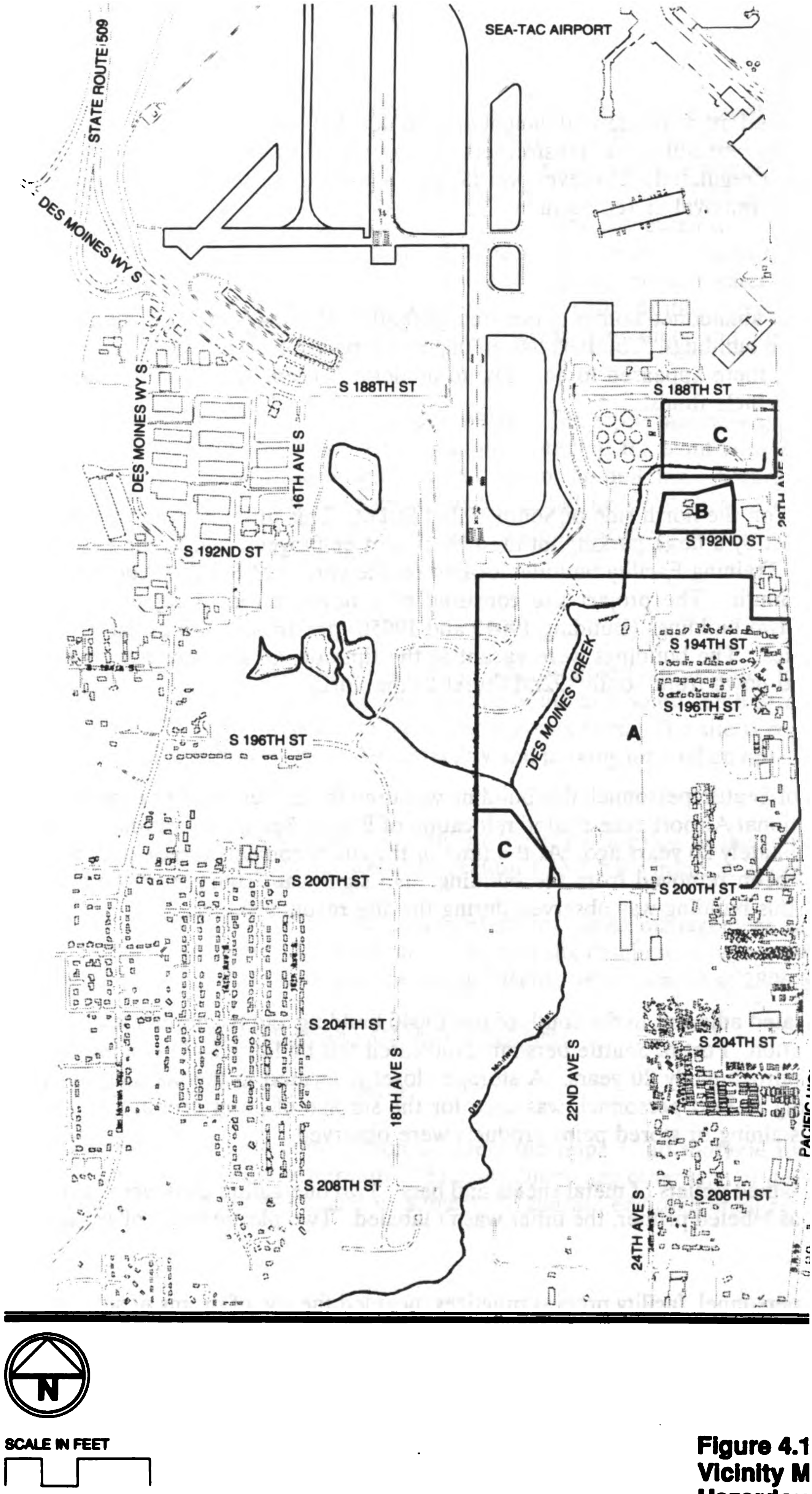


Figure 4.1
Vicinity M
Hazardou

and one was observed in a residential neighborhood located on 26th Avenue South. According to company personnel, the transformers are considered to be in residential areas and are not federally regulated. However, verification sampling would be conducted by Puget Power prior to removal or replacement.

Residential Uses

Because of the age of abandoned homes in the area, potential asbestos-containing materials may be present in the buildings. The Port has an ongoing program to abate, then demolish houses. In addition, there appeared to be a low to moderate potential for contamination of soils because of vehicle fluids.

4.16.1.2 Section B

Section B is located on the north side of South 192nd Street. This property was bordered to the north and west by a large parking lot used by airport employees, and to the east by the Alaska Airlines Training Facility building located on the corner of South 192nd Street and 28th Avenue South. The project site consisted of a paved access road, open and wooded areas, and two buildings (Building 19040 and 19050) previously used as carpentry and painting facilities. The buildings were vacant at the time of the site reconnaissance. The property sloped down from South 192nd Street to the north.

Building 19040

According to Port of Seattle personnel, this building was used for carpentry after expansion of Sea-Tac International Airport necessitated relocation of Port of Seattle operations to the project site approximately 20 years ago. At the time of the site reconnaissance, equipment and materials had been removed from the building. No significant staining of the soils within the area of this building was observed during the site reconnaissance.

Building 19040

This building is located adjacent to the south of the 19040 building and is approximately 10 feet higher in elevation. Port of Seattle personnel indicated this building had been used as a paint shop for approximately 20 years. A storage closet is located in the southernmost room and, according to Port personnel, was used for the storage of paint products in the past. No signs of staining or stored paint products were observed.

The shop area contained pallets of metal sheets and bars. Two one-gallon cans were found in this area, one was labeled primer, the other wasn't labeled. Two plastic tubes of sealant were also noted.

According to Port personnel, facility process practices included the use of drums of solvents to clean painting equipment. Port personnel also indicated the former location of a large sink used to clean paint brushes. One type of previous waste handling practice included the disposal of empty paint containers in the trash. Other waste handling practices, such as the disposal of paint and solvent wastes could not be determined. Cracks, floor drains, and stains were not noted in this shop during the site reconnaissance. Three empty shipping containers were located behind the building. A concrete pad adjacent to the roll-up door at the back was observed to be stained with what appeared to be white and yellow paint. Rust stains on the concrete pad indicated the presence of drums previously stored onsite. An empty plastic barrel filled with garbage, rags, debris and water was located behind the building. A corrosive sticker and the label Avion 50 (derubbering compound) was observed on the drum. The drum appeared to be used as a container and possibly came from offsite already empty.

The building was serviced by a septic system. The septic tank was apparently located on the west side of the building. There was the potential for paint wastes and solvents to have been disposed of in the sink that had been in the building. According to Port personnel, the septic system was reported to have backed up on several occasions. Past cleaning practices of paint brushes may have caused any hazardous materials disposed in this manner to collect in the septic system.

4.16.1.3 Section C

The project area consists of two sites. The proposed storm water management facility is located at the intersection of 28th Avenue South and South 188th Street and is bordered to the west by the Olympic Pipeline Company tank farm. The site is comprised of an airport parking lot, a Budget Rent-A-Car facility and parking lot, and an open area of tall grass and trees.

The proposed SASA Runoff Treatment Facility is located at the southwest corner of the main SASA project area. Refer to Section 4.16.1.1 for information pertaining to this site.

One facility included in the proposed storm water management facility was listed by Ecology's Registered Underground Storage Tank database (Ecology 1991d) as maintaining four USTs. This facility was the Budget Rent-A-Car located at 2806 South 188th Street.

4.16.2 <u>Construction and Operation Impacts</u>

4.16.2.1 No-Action Alternative

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place on the site would be subject to separate environmental review.

4.16.2.2 Alternative 1

Construction

Section A. Construction of the proposed SASA facility buildings in the main SASA project area south of South 192nd Street would require the demolition or removal of residential housing, a school, and the Tyee Valley Golf Club. Based on the age of these buildings (at least 20 years), potential asbestos-containing material (ACM) may be contained within them (ceiling applications, wall materials, vinyl tile, roofing material, and insulation).

Construction could involve the removal of three pole-mounted transformers located in the area. Two of these transformers were observed along South 200th Street, and one was observed in a residential neighborhood located on 26th Avenue South. According to Puget Sound Power and Light Company personnel, the transformers were considered to be in residential areas and are not federally regulated.

The SASA facility would be located to the south of Sea-Tac International Airport. According to agency files, the airport facility has a history of hazardous material releases from underground storage tanks and spills; a majority of the material appeared to be petroleum products such as jet fuel. At least three of these spills have affected surface waters including Des Moines Creek. Topography in the area of the airport slopes predominantly to the south towards the proposed location of the SASA facility.

Under Alternative 1, Des Moines Creek, which traverses Section A, would be relocated. According to agency files, the creek has been affected by releases of aviation fuel from the airport on at least three occasions (Ecology 1973, 1985, and 1986). In addition, the overflow for the IWS for Sea-Tac International Airport was directed to Des Moines Creek; however, this system has apparently never been at capacity. Should capacity of the IWS be exceeded, chemical constituents such as petroleum products, from airport operations, have the potential to be released to the stream.

Section B. Under Alternative 1, a parking lot would be constructed on this site. This construction would necessitate the removal of two vacated buildings once used by the Port of Seattle for carpentry and painting operations. Because of the age of the existing buildings, potential ACM (ceiling applications, wall materials, vinyl tile, and insulation) may be contained within these structures. Fluorescent light fixtures were also observed throughout both buildings. Because of their age (pre-1978), these fixtures may house PCB-containing electrical ballasts.

Several piles of miscellaneous debris including sandblasting grit, wood waste, pea gravel, metal, and building materials were also observed at this site. According to the Port's Environmental Management personnel, the grit has been sampled and was not designated dangerous waste. Although the environmental impacts of this debris appear to be minimal, it may be prudent to remove the material before construction activities begin.

The septic system has backed up on several occasions according to Port personnel. A limited subsurface soil and chemical analysis program should be conducted in the area of the septic drainfield to assess the soil quality onsite.

Section C. Construction on these sites would require development of a vacant parcel and the southwest portion of the Tyee Valley Golf Club within the main SASA project area. The removal of a large parking lot currently used by airport employees and a Budget Rent-A-Car facility would also be necessary.

Four USTs were registered for the Budget Rent-A-Car facility located at the northeast corner of the proposed storm water detention site. Ecology's LUST list did not include this facility. Development of this property for storm water detention could require the removal of these tanks. The demolition of the Budget Rent-A-Car office may also be necessary for the construction of this detention facility. Because of the age of this building, potential ACM may be contained within it.

Operations

It should be noted that the Port of Seattle would prepare the SASA site and lease the land for hangars, hardstands, etc. to interested airlines. The airlines would be responsible for the proper use and storage of hazardous materials and waste.

Operations which may take place at the facility would include general maintenance, plane washing, de-icing, paint stripping and repainting, and metal plating. Most process wastewaters would be discharged to the Runoff Treatment Facility, however, hazardous wastes would not be discharged to the Runoff Treatment Facility. Wastewaters from plane wash operations, which could potentially contain residues from petroleum products, cleaners, and ethylene glycol or propylene glycol used for de-icing, would be recycled or routed to the Runoff Treatment Facility.

General airplane maintenance could use oils and solvents such as Stoddard solvent, petroleum based solvents, tetrachloroethylene (Perc) (PCE), trichloroethene (TCE), and 1,1,1 trichloroethane (TCA). Wastes produced could include spent solvents, hydraulic oils, jet fuel, and ethylene glycol. Wastewaters could contain soap and surfactant residues from cleaning activities.

Ethylene and propylene glycol would be the primary chemicals used for plane de-icing. Wastes which contain a concentration of ethylene glycol greater than 10% would be considered hazardous under Washington State Dangerous Waste Regulations (WAC 173-303) and would not be discharged to the Runoff Treatment Facility.

Painting processes can involve stripping of the old paint, surface preparation, and repainting. Paint stripping would most likely utilize a "dry" process which uses formic acid (also known as methanoic acid) to cause the paint to "bubble," allowing it to be squeegeed off. Methanoic acid is listed as a dangerous waste (corrosive, Category D Toxic) under the

Dangerous Waste Regulations (WAC 173-303). Workers using methanoic acid during paint stripping operations would need personal protective equipment (PPE) such as gloves and protective suits.

After paint removal, surfaces to be painted are often washed down with water, or tacky paper is used, to remove remaining particles. Surface preparation could involve the use of corrosion inhibitors such as sodium chromate and phosphoric acid for strip etching or brightening which prepares the surface to readily receive paint. Primers, paint carriers, and paints used for repainting operations could contain lead and high levels of volatile organic compounds (VOCs). Wastes produced during painting operations could contain lead and other heavy metals and spent solvents.

Metal plating operations can utilize and produce a variety of hazardous substances, depending on the type of process and plating material used, such as nickel, chrome, or aluminum. Hazardous materials used in the plating process could include corrosives and acids for plating baths, detergents and solvents such as TCE and TCA for cleaning oil, grease, and scales from parts to be plated, and cyanide baths. The metal plating process may generate hazardous wastes including spent solvents, acids, bases, petroleum products, and cyanides. Sludges and wastewaters produced from metal plating operations can contain residues of these chemicals as well as heavy metals.

Wastewater produced from operations taking place at the SASA facility could contain residues of process materials such as metals, solvents, oils, and grease.

Operations which could take place at the SASA facility have the potential to produce hazardous wastes. These wastes would be stored onsite until arrangements for transportation and off-site disposal at a licensed RCRA facility could be made.

The storm water management facility would consist of a system using natural settling and filtration principles to remove particles and chemical constituents which may be contained in run-off originating from the rooftops of the SASA facility. A wet pond would be used to gather run-off and allow the settling of suspended particles. A biofiltration system consisting of grasses and wetland plants would also be used at this site to remove chemical impurities and allow slow percolation of run-off. The water would then be discharged to Des Moines Creek. As the water routed to this facility would be relatively clean roof run-off, the sludge formed would most likely not classify as a hazardous waste.

The proposed Runoff Treatment Facility would receive process waste waters from SASA facility operations and run-off from areas contained within the project area. Sludge produced from the operation of the treatment system could be designated as hazardous waste because of potentially hazardous process wastes which could settle out into the sludge during treatment operations.

Storm water run-off and process waste waters directed to the treatment facility would have the greatest potential for containing hazardous wastes. These waste waters would need more intensive treatment than those directed to the storm water detention site. Treatment of waste waters at the facility could potentially utilize hazardous chemicals such as chlorine, polymers, acids, and bases—chemicals which can be associated with treatment facilities.

There exists the potential for the storm water detention and treatment facilities to overflow, and untreated or partially treated run-off and waste waters to discharge to Des Moines Creek. Chemical constituents which may be found in these waters have the potential for adversely impacting Des Moines Creek in the event of overflow.

<u>Option 1A</u>

Under Option 1A, the area set aside for future aviation maintenance in Alternative 1 would not be developed by the Port. Construction and operation impacts of the SASA proposal would be similar to, but slightly less than, Alternative 1. The impacts of any other type of development that could occur there would be the subject of separate environmental review.

4.16.2.3 Alternative 2 - The Preferred Alternative

<u>Construction</u>

The construction impacts of Alternative 2 would be similar to those described for Alternative 1.

<u>Operation</u>

Operations contained within this area under Alternative 2 would be similar to those under Alternative 1.

Hush facility operations would include the testing of airplane engines. It is unlikely that hazardous materials would be used at this site.

4.16.2.4 Alternative 3

<u>Construction</u>

The impacts of constructing Alternative 3 would be similar to those described for Alternatives 1 and 2 which are discussed in Section 4.16.2.2.

<u>Operation</u>

The impacts of Alternative 3 would be similar to those described for Alternatives 1 and 2.

4.16.2.5 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect hazardous materials use. Development of an additional runway on the west side of the airport could require the construction of additional storm water treatment and/or control systems. Removal of residential structures could require abatement of asbestos, septic tanks, and/or home heating oil tanks. Should such a project occur, all removals and disposals would be carried out in compliance with appropriate applicable regulatory provisions and safeguards.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis of hazardous materials risk of regional transportation improvements south of the airport. Planning for other airport projects has not yet progressed to the point that their impacts on hazardous materials use can be estimated. The potential for cumulative impacts on hazardous materials use will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.16.3 Mitigation Measures

There are several regulatory programs, at the federal and state levels, which may impact development operations should they occur. These are as follows:

- Asbestos is regulated at the federal level under three pieces of legislation, one of which could impact construction activities for the SASA facility. The National Emissions Standards for Hazardous Air Pollutants (NESHAP), under the Clean Air Act, governs renovation and demolition of buildings containing ACM. Under NESHAP, building owners, or operators must provide written notice to EPA of the intention to renovate or demolish buildings and to follow certain procedures in the handling, transportation, and disposal of ACM (40 CFR 61 Part M).

- The State of Washington regulates asbestos through its Dangerous Waste Regulations (WAC 173-303-103), the State Department of Labor and Industries (WAC 296-62 and 65) and the Puget Sound Air Pollution Control Agency (PSAPCA). PSAPCA has the authority to enforce the hazardous air pollutant standards including the asbestos emission standard, in the Seattle/Tacoma area (Regulation III, Article 4, Asbestos Control Standard).

The adopted state regulations, WAC 296-62-07707, state that before authorizing or allowing any construction, renovation, remodeling, maintenance, repair, or demolition project, the owner, or owner's representative, will perform a good faith inspection to determine whether materials worked on or removed contain asbestos, and maintain the findings in a written report.

Wastewater produced from operations performed at the main SASA facility area would be directed to the Runoff Treatment Facility. Discharge parameters should be established to insure that hazardous wastes are not discharged to this system. Sampling should be scheduled at regular intervals to monitor the established discharge limits.

Wastewater produced from plane wash operations could be recycled or sent to the Runoff Treatment Facility. Good housekeeping practices, such as waste segregation, should be in place to help reduce potential contamination which could reduce the recyclability of the plane wash wastewater.

Because of restrictions placed on the discharge of wastes containing concentrations greater than 10% of ethylene glycol, the ethylene glycol concentration of the de-icing material should be checked. De-icing operations should not take place near drains and overspray should be controlled. Propylene glycol could be substituted.

Sampling protocols should be established for painting and stripping operations as well as metal-plating operations to insure that wastewaters are not designated as hazardous waste before discharge to the Runoff Treatment Facility. Sludges produced from any of these operations should be tested before disposal for heavy metals and other potential materials, such as solvents.

Protective equipment exposed to hazardous materials should be decontaminated following established procedures or collected and disposed of properly as hazardous waste.

Hazardous wastes accumulated onsite should be handled, stored, transported, and disposed of in accordance with the Dangerous Waste Regulations.

Vehicles, debris, and stained soils throughout the residential neighborhood within the main SASA facility area should be removed when development is initiated. All materials removed from this area should be disposed of properly.

Construction in this area could also necessitate the removal of pole-mounted transformers observed in the area. Puget Power should be contacted for proper handling and disposal of the transformers.

The entire SASA facility would be in close proximity to Sea-Tac International Airport. According to Ecology files, the airport has experienced releases of hazardous materials to the environment. Preliminary reports contained within these files indicated that materials released had not migrated offsite. A more detailed review of the files and analysis of data beyond the scope of this project should be conducted to further evaluate the specific locations of spills and their possible impact on SASA facility development.

Hazardous material releases occurred at adjacent properties and may have impacted Des Moines Creek. If stream sediments are to be disturbed during construction activities, verification samples should be taken to confirm the presence or absence of potential contamination.

As discussed above, the two buildings currently located at this site have the potential to contain ACM. In addition, fluorescent light fixtures were located throughout both buildings. The electrical ballasts should be inventoried, and the PCB content of the ballasts identified by label, historical record, or sampling. Debris observed at this site should be removed and disposed of properly when construction activities are initiated. Stained soils should also be removed and disposed of properly if found during debris removal.

If development of this site is initiated and the septic system removed, the surrounding soils should be checked for visible signs of potential contamination. Verification soil samples should also be collected and analyzed for chemical constituents which may have been discharged into the septic system and surrounding drainfield.

Potentially hazardous wastes may be produced at this site if a line maintenance facility is located on this parcel under Alternative 3. Waste oils, petroleum products, and solvents should be handled and stored properly. Arrangements should be made with a licensed recycler or transporter for proper disposal.

Development of the storm water detention site could necessitate the removal of the Budget Rent-A-Car facility located at the corner of South 188th Street and 28th Avenue South. Four USTs were registered at this facility and should be removed prior to site development. If the USTs are removed, the soils immediately surrounding the USTs and, presumably, down gradient should be sampled and analyzed to assess soil quality. Any other visibly stained areas should also be included in the sampling and analysis effort.

Various piles of debris were observed on the undeveloped parcel north of the Alaska Airlines employee parking lot. The debris should be removed and disposed of properly. Stained soils should be sampled and analyzed for removal and proper disposal, if found during debris removal.

A pile of unidentified black, fine sandy material was also observed on this vacant parcel. This pile of material should be identified and removed from the project site. Verification samples of underlying soils may be necessary if identification indicates the possibility for hazardous constituents leaching to underlying soils.

Oil and grease were observed in storm drains located at the airport employee parking lot which may be impacted by construction of a storm water detention facility. Information provided by the Port of Seattle indicated that these drains discharged to the IWS currently serving Sea-Tac International Airport. Sludge within these drains should be sampled and analyzed for hazardous materials and compared to the Washington State Model Toxics Control Act (MTCA) cleanup levels. If hazardous wastes are above MTCA cleanup standards, the sludge should be removed by a licensed hazardous waste contractor and disposed of properly.

Sludge may develop in the storm water detention and treatment systems. *Specific sampling* requirements for this material may be outlined in permits *issued for these systems.* Requirements for sampling, analysis, and disposal of accumulated *sludge should be followed.*

Proper storage procedures and safety precautions incorporated into the storm water treatment facility design would minimize risks associated with hazardous chemical use and storage.

4.17 PUBLIC SERVICES AND UTILITIES

This section addresses impacts on fire, police, and emergency medical services, and on water, sewer, electricity, natural gas, and solid waste. Storm water (including industrial waste water) issues, impacts and mitigation are discussed in Section 4.6, Water Quality. The analysis of public services included a review of published literature, maps and aerial photos consultation with appropriate agencies, and site visits.

4.17.1 Affected Environment

4.17.1.1 Public Services

Fire

The Port of Seattle Fire Department (under the Port's Aviation Division) and the Cit SeaTac currently provide fire protection services at the proposed site. Generally, the is responsible for providing fire protection services on Port-owned properties while the of SeaTac provides services for other properties in and around the site. However, the of Seattle Fire Department would assume responsibility for fire protection services at out because the project would come under its jurisdiction.

The Port of Seattle Fire Department maintains one full-time fire station at the airpor station is located approximately 1.75 miles north of the site (north of the North Sa Building). The estimated response time to the site (worst case scenario) is 4- to -5 m (Robinson 1991 personal communication). Long-term planning for the airport pr development of a second fire station towards the south end of the airport. Informati the exact location and the time of development was not available. Table 4.17-1 illus existing fire fighting and emergency response vehicles operated by the Aviation Divi

The Port of Seattle has entered into mutual aid agreements and has back-up arrange with local fire districts as well. Fire District 24 (formerly the Angle Lake district) main a full-time fire station near the site at South 200th Street and 30th Avenue South.

Table 4.17-1. Port of Seattle Fire Department response vehicle information.

Call Sign	Type of Vehicle	Capacities	Discharge Rate
Command 700	Ford Van	Mobile Com. Post	N/A
Aid 731	Aid Unit	N/A	N/A
Eng 711	Structural Pumper	500 gal. water	2000 gpm
Trk 762	CFR (Crash Fire Rescue)	1500 gal. water 200 gal. AFFF 700 lbs. Dry Chem	1500 gpm @ 250 psi
Trk 764	CFR	3000 gal. water 400 gal. AFFF	1800 gpm @ 220 psi
Trk 765	CFR	3000 gal. water 400 gal. AFFF	1800 gpm @ 220 psi
Air 732	Aid Unit (Reserve)	N/A	N/A
Eng 712	Struct. Pumper (Reserve)	270 gal. water	1500 gpm
Trk 763	CFR (Reserve)	3000 gal. water 400 gal. AFFF	1800 gpm @ 220 psi

Minimum standard structural response is 1 engine and 1 aid car with 2 lieutenants and 4 firefighters.

Minimum CFR response is 1 command van; 1 aid unit; 1 engineer, and 3 CFR trucks.
Total minimum manning is 3 officers, and 10 firefighters.

Initial discharge capacity of the CFR response is 7,500 gallons of water; 1,000 gallons of AFFF (Aqueous Film Forming Foam), and 700 lbs. of dry chemical agent.

Emergency Medical Services

The Port of Seattle Fire Department, King County Paramedics, and private carriers provide emergency medical services in the project area. In general, the fire department's medical aid unit is the first unit dispatched in a medical emergency. Fire department aid units are staffed with at least one certified Emergency Medical Technician capable of giving life support assistance. The emergency dispatcher (or the fire department aid unit in contact with the dispatcher) may request a paramedic unit depending on the degree of the emergency. This determination can be made either before or after the fire department aid unit arrives at the scene.

Several paramedic units serve the area. These include: Medic Unit No. 4 located at approximately South 154th Street and Highway 99 (which generally serves the SeaTac area); Medic Unit No. 5, located at Valley General Hospital in Renton; and Medic Unit No. 6 and No. 8 located in south King County.

Transportation to area hospitals is typically done by medic units although this de the seriousness of the accident. If the accident does not warrant medical unit transp then a private carrier is contacted (this enables medical unit vehicles to respond calls).

Police

The Port of Seattle Police Department and King County Police (the City of S contracts with King County for police services) currently provide police protection s at the site. The Port of Seattle Police Department would assume police protection s at build-out because the project would come under the Port's jurisdiction.

The Port of Seattle Police Department is located at the Sea-Tac International A Center Main Terminal Building. Radio Dispatch is also located there and handles calls coming in from Port areas. The department supports a staff of 87 officers, 52 of are patrol officers. A minimum of 3 officers are assigned to the project area during hour period. Typically, one officer in a patrol car patrols the area several times du 10-hour shift. There are five shifts per day allowing some overlapping and sharing of The average response time to the area is two minutes or less.

The main service calls to the project area between January 1st and September 30th included 25 reports of suspicious circumstance (reported by patrol units) and 8 cou vehicle prowl (Alexander 1991 personal communication). There were no reports of v crimes.

The Port has a "letter of agreement" with King County Police for mutual aid assist King County Police in the City of SeaTac operate out of the Burien Precinct locat 14905 6th SW, Seattle.

4.17.1.2 **Utilities**

Water

Water service in the project area is provided and maintained by the Highline Water Dist The district supplies water to approximately 16,000 customers southwest and southeas the airport. The district purchases its water from the City of Seattle.

Water service to the site is available primarily through 6, 10, 12, and 16-inch mains. 6- to 12-inch line extends east along South 192nd Street from 24th Avenue South International Boulevard (SR 99). The Highline Water District Comprehensive P proposes that all 6-inch lines along South 192nd Street be up-graded to 12-inch lines. A inch line extends along South 188th Street from SR 99 to Des Moines Way. An abando 6-inch line and an active 12-inch line extend along South 192nd Street to South 188th St (near 24th Avenue South). The 12-inch line ties into a 16-inch main that runs along So 188th Street (bisecting 24th Avenue South).

One 10-inch main extends along an access road (parallel to the airport approach lighting system) through the Tyee Valley Golf Course. The line continues in a northwesterly direction to the north side of South 188th Street (west of the Alaska Airlines hanger). At that point, the line ties into the Port of Seattle water distribution system serving Sea-Tac International Airport.

Based on communications with the Highline Water District, there is currently inadequate capacity in the water lines serving the site. Water service would have to be provided through the Port's system. According to the Port of Seattle's Comprehensive Water System Plan, "if the Airport water system is to supply the proposed SASA development project, the 10-inch line (mentioned above) must be upsized to 16 inches to provide the anticipated fire flow requirements. In addition, a 16-inch loop through or around the SASA development will be required." According to the plan, total length of the pipe required to serve the proposed development is approximately 12,000 feet.

Sanitary Sewer

Sanitary service at the site is maintained by the Midway Sewer District. One 21-inch trunk line extends from 28th Avenue South across the site and the Tyee Valley Golf Course to South 200th Street. This line continues south to the Des Moines sewage treatment plant located at South 200th Street and 14th Avenue South. One 18-inch ductile iron pipe runs easterly north of the golf course pond then jogs around the south end of Runway 34 to tie in with the 21-inch main described above. An abandoned 21- to 24-inch main is also located on the golf course parallel to and a few hundred feet east of 18th Avenue South (this line ties in with the active main described above). Other 21-inch mains and smaller mains are located in the area bounded by South 188th Street, South 192nd Street, 28th Avenue South and SR 99. In addition, a few small feeder lines are connected to the Seattle Christian School. Based on communications with the Midway Sewer District, adequate sewage capacity exists at the site.

Communications

Telephone service in the project area is provided by U.S. West Communications. Telephone cables at the site are aerial and can be found adjacent to and on the site. Specifically, aerial cables are located along South 194th, 195th, 196th, and 200th Streets, and partially along South 192nd Street (to approximately 24th Avenue South). Other aerial cables extend along 28th Avenue South and 26th Avenue South.

Natural Gas

Natural gas service to the project area is provided by Washington Natural Gas Company. Service is available to the site through 2-inch mains extending along 28th Avenue South, South 200th Street, and South 192nd Street. A 1¼-inch line branches off the 2-inch main along South 192nd Street at approximately 24th Avenue South to serve the Tyee Valley Golf Course. This is the only active line on the site proper. A 6-inch high pressure main is located along the east side of International Boulevard and is the major distribution line for the area. Adequate natural gas capacities to serve the project exist in the area (Fry 1991 personal communication).

Electricity

Electrical service to the project area is provided by Puget Power. Several major distribution lines are located near the site. One 15 kilovolt (kv) feeder line extends along South 188th Street from 16th Avenue South to 28th Avenue South. Overhead 15 kv lines extend along Des Moines Way, South 200th Street, SR 99/International Boulevard South, and 28th Avenue South. One 115 kv overhead line extends along SR 99/International Boulevard South, South 192nd Street (from SR 99 to 28th Avenue South) and 28th Avenue South. The line enters a substation at the intersection of 28th Avenue South and South 200th Street. Smaller 7.2 kv overhead lines are located along South 194th, 195th, and 196th Streets and along 24th Avenue South. These lines have been deactivated with the exception of the lines along South 194th Street and 24th Avenue South which serve the golf course. Adequate electrical capacity exists in the area to serve the project initially. Future power requirements for the entire airport are currently in the planning stages and will address the entire buildout of the project area.

Solid Waste

Solid waste collection service for the site falls under the jurisdiction of SeaTac Disposal, a division of Rabanco Ltd., and Raffo Recycling Company, a division of Bayside. Raffo Recycling Company is permitted to collect dry refuse (which includes most wastes except organics and hazardous waste) while SeaTac Disposal is permitted to collect wet refuse (food waste and other organics). Raffo Recycling currently serves Sea-Tac International Airport (SeaTac Disposal mainly collects south of South 192nd Avenue). Waste collected from the site is trucked to the King County transfer station located at South 188th Street and Interstate 5. Both companies have adequate waste collection and hauling capacity.

4.17.2 Construction and Operation Impacts

4.17.2.1 No-Action Alternative

Assuming some commercial development, local demand for public services and utilities would increase under this alternative. The actual net demand for public services and utilities will depend upon specific types of land uses, locations and densities. Because of the GMA concurrency requirement, adequate services must be provided (either developed or substantially planned for) before a new facility is developed. Each project proposal would be subject to separate environmental review.

4.17.2.2 Alternative 1

Public Services

Fire. Sea-Tac International Airport has adequate fire fighting capacity to serve the proposed project. In addition, several fire districts are located in the airport vicinity and can provide mutual aid assistance. All buildings on the site would be connected to the airport fire alarm system via underground cable.

Emergency Medical Response. Incidents involving emergency medical response teams would increase under this alternative. However, this increase is not anticipated to pose a significant impact. Adequate emergency response personnel and facilities exist in the area and could easily serve the proposed project.

Police. Some construction and operation-related impacts to Port police services are anticipated. Additional patrol responsibilities (particularly the parking areas) would be necessary and another patrol car may be required (Anderson 1992 personal communication). The fenceline containing SASA would also require a greater security officer presence. Increased congestion at site-access intersections, particularly at shift change, may result in more vehicle accidents requiring police assistance.

Utilities

Some impacts to utilities would occur. The Highline Water District would lose part of its service area (as the site is vacated of homes and existing pipelines are abandoned).

Approximately 700 feet of sewer main (on the site) would be relocated under the proposed South Access Roadway to avoid potential construction and operation impacts (the existing section is located under the project's hard surface area and proposed facility structures). Other utilities may be affected on a minor and intermittent basis to allow relocations or extensions. A full array of utilities would be provided at the hangars including power, water, sanitary sewer, telephone, and compressed air. Power and water would be available at the hardstands. Electrical substations serving the site would be upgraded to provide necessary capacity.

In addition to upsizing the water system that serves the site, the airport's water system plan also calls for an intertie with the Highline Water District in order to insure an uninterrupted supply of water in the event that the Port's system fails or the City of Seattle should lose or have a break in service.

Option 1A

Under Option 1A, the area set aside for future aviation maintenance in Alternative 1 would not be developed by the Port. Construction and operation impacts of the SASA proposal would be similar to, but slightly less than, Alternative 1. The impacts of any other type of development that could occur there would be the subject of separate environmental review.

4.17.2.3 Alternative 2 - The Preferred Alternative

Impacts under this alternative would be similar to those described under Alternative 1.

4.17.2.4 Alternative 3

Impacts under this alternative would be similar to those described under Alternative 1.

4.17.2.5 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect public services and utilities. Development of an additional runway on the west side of the airport could require alteration of existing utility lines. Property acquisition and removal of residential uses could reduce service requirements from local utilities and government and could also affect utility taxes and revenues. Additional utility service capacity could be required in the future at the airport depending on its rate of growth. Emergency services (e.g. fire and police protection) for the airport are provided primarily by the Port of Seattle.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for utility and service impacts of regional transportation improvements south of the airport. Areas involved would depend on route alignment decisions which have not yet been made. Planning for other airport projects has not yet progressed to the point that their impacts on public services and utilities can be estimated. The potential for cumulative impacts on public services and utilities will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.17.3 Mitigation Measures

4.17.3.1 Public Services

Emergency Medical

A detailed construction schedule including provisions for emergency access to all roadways could be planned prior to construction in conjunction with the Port of Seattle, King County, and the City of SeaTac police and fire departments.

Police

The following measures could be implemented to prevent potential impacts on police and security:

- Expand or change existing police staffing to meet anticipated demand

- Maintain some officer presence at all times during construction (either on an on-duty or off-duty basis) to prevent security breaches in the construction fenceline

- Utilize traffic control devices at on-site intersections

- Design buildings, parking facilities, and the circulation system so that structures and lighting serve to discourage crime and aid patrols

- Use only approved doors and locking devices as well as mechanical or electronic security systems

- Promote employee security training and awareness programs.

4.17.3.2 Utilities

Water

Water service would be maintained during construction and/or during the removal of existing mains. By replacing the 10-inch main (that connects the southern portion of Port's system with the Highline Water District's system) with a 16-inch main, potential fire flow impacts would be mitigated. Future discussions between the Port and the Highline Water District would occur to resolve "loss of service area" impact costs and to address the possible water line intertie between the District and the project.

Electricity

Facilities and equipment would be designed in accordance with applicable sections of the energy code and in consultation with energy conservation staff from Puget Power.

Sanitary Sewer

Sewer service to surrounding areas would be maintained during relocation of sewer mains crossing the site.

Natural Gas

Existing natural gas lines would either be utilized or "capped off" and removed. Gas service to surrounding areas would not be disrupted.

4.18 SOLID WASTE IMPACTS

Solid waste impacts are discussed in Section 4.17, Public Services.

4.19 ENERGY SUPPLY AND NATURAL RESOURCES

4.19.1 Affected Environment

At the present time, there is little consumption of energy or natural resources associated with the proposed SASA site.

4.19.2 Construction and Operation Impacts

4.19.2.1 No-Action Alternative

There would be no construction or operation impacts attributable to the SASA proposal under the No-Action Alternative. Impacts due to any other type of development that could take place on the site would be subject to separate environmental review.

4.19.2.2 Alternative 1

Construction of Alternative 1 is expected to cost approximately $61,358,600 (This figure is the net sum cost of construction and does not include contingency fees or sales tax). A rough analysis of construction cost data indicates that fuel costs are approximately 2 to 3% of the total cost. Fuel costs are, therefore, expected to be between $1,227,172 and $1,840,758 for the project. The majority of the demand for energy during construction would be for diesel fuel for earth moving and hauling. If the estimated price of diesel fuel is $1.35 per gallon (Diesel fuel is priced at $1.31 per gallon in the *Means Heavy Construction Cost Data 1991*, by the R.S. Means Company, Inc. 1990), total consumption of diesel fuel for Alternative 1 would be between 909,016 and 1,363,524 gallons. Expressed in terms of British Thermal Units (BTUs) (one gallon of diesel fuel equals 138,800 BTUs), expected consumption of diesel fuel for Alternative 1 would be between 1.26E+11 and 1.89E+11. When considering the large quantity of fuel required for construction of this alternative, one should bear in mind that construction of this alternative includes excavation of 2.2 million cubic yards of material and hauling 810,600 cubic yards of material offsite for disposal. Although construction of Alternative 1 would require a large amount of diesel fuel, it is not expected to cause an increase in price or reduce the availability of supply.

Electricity is used for lighting and operational needs, and a natural gas fired boiler provides heat. Operation of Alternative 1 would not necessarily result in additional consumption of energy compared with existing conditions. The three line maintenance facilities that would be located on the site are currently operating, and would be relocated if Alternative 1 is selected.

Estimating energy consumption for proposed Alternative 1 can be accomplished by extrapolating existing energy consumption at the existing hangars on a per square foot basis. Using this method indicates that Alternative 1 might consume 840,000 kWh (2,866,920,000 BTUs) of electricity per month. Maximum consumption might be in the range of 1,053,333 kWh (3,595,026,666 BTUs). These estimates do not include any potential energy conservation measures, such as minimization of heat loss from the hangars, that would reduce per foot consumption of energy.

Development of the site under Alternative 1 would not have a significant effect on the natural resources of the immediate area or the Puget Sound region.

Option 1A

Under Option 1A, the area set aside for future aviation maintenance in Alternative 1 would not be developed by the Port. Construction and operation impacts of the SASA proposal would be similar to, but slightly less than, Alternative 1. The impacts of any other type of development that could occur there would be the subject of separate environmental review.

4.19.2.3 Alternative 2 - The Preferred Alternative

Construction of Alternative 2 is expected to cost approximately $93,822,500 (this figure is the net sum cost of construction and does not include contingency fees or sales tax). Fuel costs are expected to be between $1,876,450 and $2,814,675 for the project. If diesel fuel is priced in the range of $1.35 per gallon, total consumption of diesel fuel for Alternative 2 would be between 1,389,963 and 2,084,944 gallons. Expressed in terms of British Thermal Units (BTUs), expected consumption of diesel fuel for Alternative 2 would be between 1.93E+11 and 2.89E+11.

Operation of Alternative 2 would increase consumption of energy compared to the No-Action Alternative as a result of the placement of the new base maintenance facility on the site. The three line maintenance facilities that would be located on the site are currently operating and would be relocated to the SASA site under all the build alternatives.

Using the method described above for Alternative 1, average monthly energy consumption for Alternative 2 might be 1,960,000 kWh (6,689,480,000 BTUs), and a maximum of 2,457,778 kWh (8,388,395,556 BTUs). These estimates do not include any potential conservation measures, such as minimization of heat loss from the hangars, that would reduce per foot consumption of energy.

Development of the site would not have a significant effect on the natural resources of the immediate area or the Puget Sound region.

4.19.2.4 Alternative 3

Construction of Alternative 3 is expected to cost approximately $93,112,000. Fuel costs are expected to be between $1,862,240 and $2,793,360 for the project. If diesel fuel is priced in the range of $1.35 per gallon, total consumption of diesel fuel for Alternative 3 would be between 1,379,437 and 2,069,156 gallons. Expressed in terms of BTUs, expected consumption of diesel fuel for Alternative 3 would be between 1.91E+11 and 2.87E+11.

Operation of Alternative 3 would increase consumption of energy compared to the No-Action Alternative as a result of the relocation of the line maintenance facilities and the placement of the new base maintenance facility on the site.

Using the method described above for Alternative 1, average monthly energy consumption for Alternative 3 might be 1,960,000 kWh (6,689,480,000 BTUs), and a maximum of 2,457,778 kWh (8,388,395,556 BTUs). These estimates do not include any potential conservation measures, such as minimization of heat loss from the hangars, that would reduce per foot consumption of energy.

Development of the site would not have a significant effect on the natural resources of the immediate area or the Puget Sound region.

4.19.2.5 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect energy and natural resources. Development of an additional runway on the west side of the airport could alter demand for energy and natural resources. Energy consumed by existing residential uses would be relocated and dispersed. Energy would be used in construction and for operational lighting. Fill material (10-13 million cubic yards) would be needed to develop a runway site. Additional utility service capacity could be required in the future at the airport depending on its rate of growth. Because planning is not yet sufficiently advanced, these requirements cannot be calculated.

A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for energy and natural resources impacts of regional transportation improvements south of the airport. Areas involved would depend on route alignment decisions which have not yet been made. Planning for other airport projects has not yet progressed to the point that their impacts on energy and natural resources can be estimated. The potential for cumulative impacts on energy and natural resources will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13).

4.19.3 Mitigation Measures

Energy consumption for construction activities could be minimized by proper sizing of construction vehicles and adherence to a prescribed maintenance program. These measures should be undertaken during construction of any of the action alternatives. During operations, potential energy conservation measures, such as minimization of heat loss, should be analyzed during engineering design. Given the size of the project, adopting energy conservation measures could mean significant energy savings.

No other mitigation measures would be required.

4.20 HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

4.20.1 Affected Environment

The King County Cultural Resources Division and the Washington State Historic Preservation Office (SHPO) were contacted in regards to their records of inventoried historic properties. Letters written to and received from SHPO and King County are included as Appendix J. According to King County (1991) and SHPO (1991), no inventoried historic properties have been identified on the site of the proposed aviation support area. An inventoried property, the Hillgrove Cemetery, is located a quarter of a mile west of the project site (King County 1991).

4.20.2 Construction and Operation Impacts

As there are no identified properties of historical or cultural significance on the site, construction or operation of the alternatives would have no impact.

4.20.3 Cumulative Impacts

Other airport development projects that may occur in the future, such as the potential third runway, may also affect area historic, architectural, archaeological, and cultural resources. Such resources have not yet been identified for the potential runway site on the west side of the airport. A roadway corridor EIS being prepared under the direction of the Washington Department of Transportation will provide additional analysis for potential impacts of regional transportation improvements south of the airport on historic. archaeological, and other resources. Areas involved, including portions of the Des Moines Creek basin, would depend on route alignment decisions which have not yet been made.

Planning for other airport projects has not yet progressed to the point that their impacts on historic, architectural, archaeological, and cultural resources can be estimated. Such resources have not been identified on the airport areas where other airport projects would most likely occur. The potential for cumulative impacts on historic, architectural, archaeological, and cultural resources will be reexamined in the airport's Master Plan Update and EIS (refer also to Section 3.4.13). Projects are reviewed with the Washington State Office of Archaeology & Historic Preservation, and other agencies as appropriate, as part of environmental reviews and assessments. This provides review and assurance that potential impacts are considered.

4.20.4 Mitigation Measures

If archaeological remains of any kind are encountered during construction, all work would stop, a professional archaeologist would be contacted immediately, and the Historic Preservation Office would be notified.

4.21 DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f)

Section 4(f) of the Department of Transportation (DOT) Act requires a finding by the Secretary of Transportation that no prudent and feasible alternative exists to any Federal action that has negative impacts on properties covered by the Act, and that all possible planning has been done to minimize harm. Subject properties include significant publicly-owned parklands, recreation areas, open spaces, wildlife and waterfowl refuges, and historic sites.

The Tyee Valley Golf Course, which would be impacted by implementation of Alternatives 1, 1A, 2, and 3, is not a significant recreation area as defined under section 4(f).

Tyee Valley Golf Course exists on lands wholly owned by the Port of Seattle. A portion is located within the Sea-Tac International Airport south runway clear zone. This land is leased between the Port (as lessor) and a private operator of Tyee Valley Golf Course. The Port does not now, nor has it ever, operated the golf course. The lease has at all times contained a special termination provision which provides the Port of Seattle with the option to reclaim all, or a portion of, the land for the purpose of expanding the Airport operations or facilities into the leased area. Also, the lease expired in April 1992 and has been renewed on a month-to-month basis subject to closure after 30-days notice.

The FAA Order 5050.4A discusses the application of the statute to similar facilities at Chapter 5, Paragraph 47, pages 36-37, and contains the following conclusion which describes the circumstances of Tyee Valley Golf Course:

> Where property is owned by and currently designated for use by a transportation agency and a park or recreation use of the land is being made only on an interim basis, a section 4(f) determination would not ordinarily be required. The sponsor should indicate in any lease or agreement involving such use that this use is temporary.

4.22 COASTAL ZONE MANAGEMENT PROGRAM AND COASTAL BARRIERS

The Washington State Coastal Zone Management Program has been reviewed by the applicant and none of the alternatives fall within the scope of that program. This determination will be reviewed by Ecology as part of the Section 404/Section 10 permitting process. See Section 2.5.1, Department of Ecology Actions.

4.23 WILD AND SCENIC RIVERS

No wild and scenic rivers would be affected under any of the alternatives.

4.24 FARMLAND

None of the alternatives would impact farmlands.

Adverse Impacts Which Cannot be Avoided, Short-Term Use and Long-Term Productivity, and Irreversible Commitments of Resources

5. ADVERSE IMPACTS WHICH CANNOT BE AVOIDED, SHORT-TERM USES AND LONG-TERM PRODUCTIVITY, AND IRREVERSIBLE COMMITMENTS OF RESOURCES

5.1 ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

There would be unavoidable adverse impacts associated with the implementation of each of the proposed SASA alternatives. Site grading and preparation would significantly alter the existing topography. Wetlands would be filled under each build alternative. Des Moines Creek would be moved from its existing, man-made channel and placed in a new channel. Views of the site would be significantly different. Mitigation has been proposed to reduce and compensate for impacts but some cannot be avoided.

5.2 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Implementation of any of the build alternatives would require a short-term commitnent of financial and natural resources. The long-term benefits that would be realized, including the relief of congestion at Sea-Tac International Airport and the introduction of a major economic asset into the community, would compensate for the short-term losses associated with construction.

5.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

No unusual materials are anticipated to be used during construction. The SASA site contains no prime or unique farmlands. No depletion of materials in short supply or significant irreversible changes in natural and cultural resources is anticipated.

Comments and Responses

6. COMMENTS AND RESPONSES

Comments were taken on the Draft EIS from March 13, 1992 to April 27, 1992. In addition, a public hearing was held on April 9, 1992 in SeaTac, Washington to elicit further comments. In this section of the Final EIS, the comment letters and hearing transcripts are reproduced with the responses to the comments next to them.

Each comment letter has been assigned a number. Within the letters and transcripts, each comment has been assigned a number that has been marked in the margin. This facilitates cross-referencing of responses. For example, "See the response to Letter 9, Comment 3" refers the reader to the response to the third comment in the letter from the Southwest King County Chamber of Commerce.

Numerous letters had similar comments or questions. In order to reduce repetition, these questions were answered once at the beginning of this section and are cross-referenced when appropriate.

COMMENT LETTERS

Number	Commentor
1	Joan Bell
2	Donna Smith
3	Highline Public Schools
4	United States Department of Interior, Fish and Wildlife Service
5	Highline Water District
6	CASE (Citizen Alternative to SeaTac Expansion)
7	Muckleshoot Indian Tribe, Fisheries Department
8	Washington State Department of Transportation
9	Southwest King County Chamber of Commerce
10	State of Washington, Department of Ecology
11	City of Federal Way
12	Municipality of Metropolitan Seattle
13	Puget Sound Air Pollution Control Agency
14	City of Normandy Park
15	Charles E. Higbee, M.D.
16	J. Richard Aramburu
17	Peter H. Townsend
18	Seattle Community Council Federation
19	City of Des Moines
20	Portwatch
21	United States Environmental Protection Agency
22	Thomas C. Reno
23	City of SeaTac

PUBLIC HEARING TRANSCRIPT

Comment Number	Commentor
1-7	Mary Cline
8	Joan Bell
9-12	Jean Mohler
13	Dennis Lensegrav
14	Russ Richter
15	Thomas Crawley
16	Jerry Harkness
17	Raymond Graves

General Response A: Siting of SASA at the Airport

A number of commentors ask about the choice of the proposed location for the SASA project at the airport. Several criteria were used in assessing the suitability of various airport locations. They included:

1. Capability for direct aircraft access to the taxiway/runway/terminal system
2. Efficiency with respect to airport operations
3. Minimization/mitigation of adverse environmental impacts
4. Sufficient area to accommodate anticipated facilities
5. Compatibility with FAA regulations and guidelines
6. Compatibility with other airport area planning and land use
7. Feasible construction cost.

The following is a review of the airport siting options that were considered.

Northeast: The area north of the terminal between the airfield and the north access freeway has long been designated for the development of air cargo, aviation maintenance, and other support facilities. It has excellent airfield access; is compatible with adjoining uses, airport facilities, and operations; and would be relatively low cost to develop. Since the airport was established, this area has been intensively developed, particularly for air cargo development but has also included United Airlines' maintenance facilities. There is no longer sufficient space in the northeast area to accommodate any of the aircraft maintenance facilities proposed for location in the SASA area. The existing facilities in the NE area also require direct airfield and terminal access for aircraft loading and cargo equipment handling, so their relocation would not free additional space. The limited space remaining in this area is expected to be used for additional air cargo facilities, as planned, to maintain the efficiencies that result from co-location of cargo facilities.

North: This area is infeasible for the SASA project because SR 518, a wide, limited-access freeway, passes along the north boundary of the airfield. Developable area would have to be located north or east outside the runway safety zones. Aircraft access is not feasible because any aircraft maintenance development would require a long and very expensive bridge, in order to connect with the airfield. Aircraft taxiing distances would typically be nearly twice as far as for the proposed SASA location. Additionally, much of the land use in the vicinity is residential and recreational. Building hangars in this area would lead to more noise impacts than at the proposed site. Existing topography would also require greater volumes of grading and filling, together with higher costs.

West: Earlier planning studies considered some development of the west side of the airfield for potential aircraft maintenance and air cargo facilities. Previous work was relatively broad in scope, examining area requirements but not addressing operational limits in specific detail. Current analysis of facility needs and increased operating activity projections indicate that this area is not a feasible site for the SASA project for several reasons.

Area on the west side of the airport is limited by safety clearances from the runways and taxiways to the east and SR 509 and topography to the west. Previous planning documents (e.g. the 1985 Master Plan Update), identified approximately 60 acres for potential development of maintenance, air cargo, and general/corporate aviation. This was a planning study that looked primarily at the passenger terminal needs and addressed general areas and locations for other airport activities but did not examine detailed layout or operating requirements for most facilities. Continued use of the West Ramp taxiways, fire training pit, and runoff treatment system together with height limits imposed by radar equipment (discussed below) restrict the available area even further. To create additional area on the west side, costly and extensive fill would be required, with all material imported to the site and consequent traffic impacts. Adjacent land use would be residential and less compatible with SASA activities than the land uses surrounding the proposed site. The west side of the airport cannot feasibly accommodate the 80-100 acres that the SASA program needs for line and base maintenance facilities.

Operationally, transfer movements of aircraft between a west side maintenance area and the passenger terminal could not be accomplished without unacceptable delays in operations. Such movements involve the crossing of two active runways and, depending on wind direction, taxiway movements across runway departure ends and counterflow on taxiways. Because aircraft takeoffs and departures have a higher priority, transfer movements must be delayed until there are gaps available in the flight stream to ensure adequate safety margins and avoid unacceptable flight delays. With increased activity at the airport, adequate intervals are infrequent to non-existent, particularly during peak periods for operations. This problem is most acute for movements, from line maintenance facilities to terminal areas, during the early morning and other peak hours when several aircraft must be moved within a short time span in order to meet operating schedules. This condition will become more severe in the future. Previous planning studies have identified the difficulties involved in moving between the west side and the terminal area across the runways. Movement of aircraft by towing (rather than under power) is preferred and encouraged for noise abatement and air emissions reduction, although it is slower than taxiing under power. The time required for towing compounds the delay problems.

Discussions with airlines reinforce the severity of the problem for a west side location. In order to quantify this delay, airport operations with a west side SASA site were simulated using the Airport Machine computer model (FAA validated). Assumptions for this modeling included typical annual mix of Sea-Tac weather conditions relating to visibility and wind direction. Along with a west side maintenance area, a new taxiway was assumed to be built between the passenger terminal area and the west side. It would be dedicated solely to maintenance area aircraft to reduce the interference with taxiing flight operations. Assumptions related to number of operations were the same as used in the SASA noise study, a total of about 50 daily inbound and outbound SASA-area movements and 420,000 total annual airport operations (year 2003).

Results show that the construction of a west side maintenance facility would increase total airfield delays by 5.2%, or an increase of 6,200 hours annually. Based on an average operating cost derived for the Sea-Tac fleet, this would cost airlines about $8.8 million annually. The average operating cost estimate of $1,440/hour was derived in 1990 for the Sea-Tac fleet mix. The estimate includes cost of fuel, aircraft operating costs and flight crew salaries. it does not include aircraft depreciation or maintenance costs. Most of the delays would occur in good weather conditions where separation between arriving aircraft is minimized. North-flow operations showed more delays due to proximity of the facility to runway departure areas.

Use of the area on the west side is further restricted because of structure height limits imposed by the radar equipment sited there. The Aircraft Surveillance Radar (ASR) is the primary air traffic control radar for both Sea-Tac Airport and Boeing Field. It is critical to all aircraft operations and is located on the west side opposite the north end of the terminal. The Airport Surface Detection Equipment radar (ASDE) is used to monitor movement of aircraft and other equipment on the runways, taxiways, and in the vicinity of the terminal. It is particularly important during periods of low visibility (fog or precipitation) and at night. The ASDE is located across from the passenger terminal on the west side in order to provide the best view of movement areas around the terminal buildings. Depending on structure height, building locations on the west side would be restricted to avoid shielding aircraft movement areas from the ASDE. Reflections of both ASDE and ASR signals by west side structures would also be of concern if they interfered with radar tracking of aircraft. This factor could also limit building location.

An additional consideration for the west side of the airport is its potential use for construction of a dependent runway as an addition to regional aviation capacity. The current recommendation of the multi-party Flight Plan project and the Puget Sound Regional Council's recent update of the Regional Airport System Plan is that such a runway should be a major element of the regional aviation program. Final decisions on such development will not be made until additional project-specific design studies and Environmental Impact Statement are prepared. However, use of the site for other development in advance of the ongoing regional decision process would inappropriately interfere with the consideration of regional alternatives. Refer to Section 3.4.13 for discussion of this planning process.

Southwest: Aircraft maintenance development in this location would have to be located west of the safety zones for the existing runways. This area is not feasible as a location for SASA for several reasons. There are major ponds and wetlands in the area which would result in more severe impacts with the extensive bridging and filling that would be required. Bridging to cross South 188th Street and site regrading would be more extensive and costly than for the proposed location. Acquisition of land and displacement of existing businesses would be very costly. Adjoining land use would be primarily residential and subject to increased noise impacts. As previously noted, there would be operational difficulties for aircraft movements to the west side of the airfield.

Southeast: This is the area proposed for development of the proposed SASA project. While costly to develop because of site grading and construction of the taxiway bridge, it would be less costly than other alternatives where sufficient space could be created. The site has sufficient area and the location is operationally satisfactory (relatively close to terminal, short bridge, no runway crossings). The adjacent land has commercial zoning (actual or potential) and would be more compatible with SASA development and less impacted than residential areas would be. Most of the property is already in Port ownership (primarily through noise remedy buyout) so additional acquisition costs would be relatively low. Grading and filling can be balanced to minimize site import/export of fill. The southeast area is the only feasible location for the proposed type and scale of development at the airport.

Other Airports: Location of the proposed facilities at some other airport was not considered because the purpose of the project is to provide for the maintenance needs of aircraft operating at Sea-Tac Airport. There is a sufficient volume of aircraft operations that the capability for on-site line maintenance is a necessity. In the case of a maintenance base for any airline, the siting decision will be based on market conditions, operating needs, and financial considerations. Such siting is a user decision made by the airline. Neither the FAA nor the Port can direct that a base go to any other specific airport. The Port supports the Sea-Tac Airport location for maintenance base construction because of the high economic development benefits that would be derived from such a project. See Section 4.3, Induced Socioeconomic Benefits, for further discussion of these impacts. This is consistent with the major Port purpose of fostering regional economic growth.

General Response B: Effect of SASA on Airport Operations

If the SASA project proceeds, it would not generate a significant number of additional aircraft flights to or from the airport. Use of the SASA facilities would be proportional to the level of normal airport commercial operations. SASA is intended to support the maintenance needs of operations at the existing airport, not to add facilities to attract more operations. Projected increases in flight operations at the airport will result from regional demand for service, not from the SASA facilities.

Regular *line maintenance* services are provided for aircraft that pass through the airport as part of normal flight operations. The number of aircraft handled will depend on the volume of airport operations and will drive the demand for and sizing of such facilities.

Due to airlines' ability to schedule aircraft on routes through their base airport, the *base maintenance* facility would attract few new flights to Sea-Tac Airport. Airlines schedule base maintenance services for their aircraft well in advance so that aircraft arriving for (or departing after) base servicing are routed as scheduled flights. Base maintenance facilities would most likely be developed by an airline with a strong route structure at the airport. Using Alaska Airlines as an example of a possible base operator, maintenance scheduling could be accomplished without difficulty and without adding additional operations because of Sea-Tac's central position within Alaska Airlines' route structure. Furthermore, the aircrafts' length of stay for base maintenance further limits the frequency of flights to and from the base. On the average, a typical "C check" service requires 8-12 days in the hangar, while a typical "D check" service requires 45 days. On the average, a typical base maintenance stay will require over two weeks.

Transfer flights of empty aircraft is unusual. Based on interviews with Alaska Airlines staff, they do not need to perform transfer flights. FAA statistics for 1990 show that for the airlines with maintenance facilities at Sea-Tac Airport, non-scheduled flight departures represent 0.4% of their total flights. This number includes unscheduled charter flights, fleet additions, and maintenance transfer flights. Aside from unscheduled charter flights and fleet additions, the remaining transfer flights would represent less than one arrival and departure per day. (Alaska in particular operates a large number of charter flights; excluding them would reduce the estimate even further.) Any maintenance facilities proposed for location at Sea-Tac by another airline would be expected to operate on a basis similar to Alaska's situation, where no significant number of new flights are generated.

<u>Describing Capacity.</u> There is often confusion about the term "capacity" as it relates to aircraft operations at a specific airport. There is no absolute single number that reflects the number of operations that an airport can handle. Rather, for a particular runway/airspace system, we can speak of some number of operations that can occur together with a given level of average delay per operation. As market demand develops and airlines respond by adding flights at a particular airport, operations increase as does the corresponding delay. Some types of delay include runway crossing delays, holding in taxiway queues, departure

delays to allow spacing of aircraft along flight corridors, reduced landing rates at destinations adversely affected by weather, and others. The rate of increase in delay is not linear; it becomes greater as more and more flights are added.

The primary forces which shape the number of operations at an airport are the demand for air service through the airport and the ability of the airspace and airfield (i.e. flight corridors and runways) to handle sufficient flights to meet the demand. The sizing and arrangement of supporting facilities such as passenger terminals, vehicle parking, etc. affect the convenience and comfort afforded the traveler but do not set major constraints on the number of aircraft operations.

The determination of what constitutes an acceptable level of delay is subjective. The FAA maintains records of delays greater than 15 minutes. In 1990, at the most severely congested U.S. airports (e.g. San Francisco, Chicago, and the 3 New York area airports) between 5 and 10% of all operations were delayed more than 15 minutes. At Sea-Tac Airport, the number was less than 0.5%. There are a number of airports which operate with much more severe delays than does Sea-Tac.

In the case of the Flight Plan, SASA, and Terminal Development Plan studies, various numbers have been cited for projected annual operations in different years. These numbers are consistent with one another and with the forecasts developed for the Flight Plan project. The corresponding delay values have not always been cited, however, resulting in misunderstanding of what is usually referred to as airport capacity. To summarize the current forecast for future operations at Sea-Tac Airport, the following table shows actual numbers of operations and passengers in 1990 and 1991, together with projections for the years 2000, 2010, and 2020 and the corresponding delay values. These projections are based on the existing runway/airspace system and assume that Sea-Tac airport is the only commercial airport serving the region. The airfield can physically accommodate these operations but the project 2020 delays are clearly unacceptable both operationally and to the travelling public.

Table 6.1. Operation delays.

Year	Passengers (millions/year)	Operations (thousands/year)	Average Delay (Minutes/operation)
1990	16.2	355	7
1991	16.3	339	7
2000	25.4	411	15
2010	34	447	22
2020	45	524	47

An operations level of 380,000 per year for Sea-Tac Airport has been cited in a number of studies. This number is a capacity estimate based on a standardized FAA formula rather than the more detailed methodology used to develop the preceding table. Use of this formula and a standardized delay value allows for comparisons among airport systems. This value assumes an average delay of 4 minutes per operation and average peaking characteristics and yields a lower number of operations than can actually take place with a greater amount of delay.

General Response C: Separation of SASA from Other Airport Programs

Separation of Environmental Reviews

The lead agencies have considered whether to address the potential environmental impacts of the SASA proposal in a single comprehensive EIS with other projects now in the early stages of master plan review at the airport. Such projects could include a possible additional runway and possible passenger terminal expansion. Combining the environmental analysis of such projects with SASA in one EIS would not be the best way to assess the cumulative environmental impacts of the various projects for the following reasons.

First, the timing of the environmental analyses for such projects does not lend itself to a combined EIS. The EIS process for master plan improvements is only now beginning and is not expected to be complete until 1996. Some possible improvements such as terminal expansion have not yet even reached a proposal stage and no schedule for environmental review yet has been determined. Delay of publication of the SASA EIS until the completion of environmental review on these potential projects would be unreasonable and could lead to unnecessary delay of the SASA project. Further, by the time the environmental review on the other projects is complete (if ever, in the case of the terminal expansion for example), some of the information developed currently for the SASA project could become obsolete, requiring yet additional analysis, time and delay for decision-making on all projects.

Second, the potential cumulative impacts of the other projects can be adequately considered in separate EISs. Decision-makers are informed of the potential additional airport projects. In this general response C and in the various sections, this EIS identifies and addresses the potential impacts of the other projects, to the extent such impacts are reasonably foreseeable at this time. For example, consideration is given in various sections of this EIS to known possible impacts of a potential new runway, particularly as documented in the Flight Plan EIS which is incorporated by reference. Later EISs for additional projects, if they are carried forward, will address cumulative impacts in more detail as more information is developed.

Finally, preparation of a single EIS combining the discussion of environmental impacts for SASA with that for other complex projects would result in an extremely lengthy and cumbersome document. This could prove more confusing for both the public and decision-makers than would separate EISs specific to each project, each containing discussions of known cumulative impacts. For example, the two projects mentioned above are not functionally or geographically interrelated to the SASA project. If they were considered together with the SASA project in a single EIS, because of their independent nature, wholly separate and extensive discussions for each project would be required for every topic analyzed, including noise, air quality, earth resources, water quality, transportation including traffic impacts, land use, wetlands, plans and animals and others. The resulting document would be unwieldy.

Separation from Other Airport Projects

Numerous commentors expressed the opinion that the SASA project is integrally linked with other projects and programs at the airport to the extent that all must be addressed together in a single comprehensive EIS. Among the other projects cited were:

1. Flight Plan and EIS (the regional aviation planning project and potential dependent runway)
2. 4-Post Plan (the FAA's airspace operating procedures)
3. MLS Demonstration Project (FAA installation of microwave landing system equipment)
4. Runway Safety Area Extension (lengthening of unpaved safety overrun area)
5. Terminal facilities expansion (facilities to accommodate anticipated passenger volume)
6. Part 150 Noise Compatibility (update of airport noise maps and Noise Remedy Program)
7. Roadway projects (e.g. 28th/24th Avenue South Arterial, South Access Roadway, SR-509 extension)

With respect to other facility development at the airport, whether currently programmed or in an early planning stage, SASA stands as an independent project which neither requires nor triggers the implementation of any other of the referenced projects. Proceeding with SASA does not limit the range of reasonable alternatives for any of the other projects.

Flight Plan. The Flight Plan project and its EIS evaluated options for the future development of additional aircraft flight capacity for the regional aviation system. Expansion of existing airports and/or the creation of new airfields are considered. One element of the Flight Plan recommendation would be the addition of an additional runway for dependent operations at Sea-Tac Airport. The airport's need to develop the SASA area is based on existing demands and does not depend on future decisions regarding the Flight Plan recommendation. Refer also to Section 3.4.13 for discussion of current airport planning. Maintenance facilities are needed to serve existing operations and projected growth that will occur in the coming years—regardless of aircraft operation capacity decisions at the airport. Development of the SASA facilities will not affect any of the flight operations or procedures at the airport.

As discussed in General Response B: Effect of SASA on Airport Operations, Development of the SASA facilities would not cause any significant increase in aircraft flights. Line maintenance facilities are scaled to meet the needs of aircraft operating through the airport in regular service and are not a focus for additional operations. Maintenance base facilities would be developed by an airline with a high level of service through the airport, with aircraft brought to the base a part of scheduled revenue operations. The level of aircraft operations would reflect regional service demand and market conditions, not the scale of maintenance facilities. Neither line nor base maintenance activities cause or require an increase in other airport facilities or operations.

The Sea-Tac Master Plan Update (MPU) and accompanying EIS result directly from the Flight Plan project. The MPU and EIS program will lead to a decision by the Port Commission regarding the airport's long-range development plans and whether to construct a third runway. Because the multi-year MPU and its EIS have only just commenced, it is not possible at this point either to describe the complete range of airport improvements that may be considered or to assess their potential environmental impacts in complete detail. The analysis contained in this EIS reflects the best information available at this time for the level of detail available. Concerns have been expressed that other airport development projects, particularly the potential third runway, would have a strong interaction with the SASA project and could lead to significant cumulative impacts. These concerns have been addressed in this EIS in Chapters 3 and 4.

The potential for cumulative impacts will be evaluated again the MPU EIS over the full range of elements of the environment. This second review will ensure that all of the projects proposed for the airport, both those already planned such as SASA and those additional ones which are further examined through the MPU process, are considered as a cumulative whole.

Appropriate mitigation for any significant cumulative impacts would then be identified. Additionally, in reviewing the cumulative impact potential, the separation between the SASA project and other airport programs has been recognized. The SASA site is a distinct area separate both from the airport terminal complex and particularly from the potential third runway site. The latter is located in a separate drainage basin and is more than three-quarters of a mile from the SASA site. Operationally, neither project requires or triggers the other. Neither do the respective development areas interfere with one another.

4-Post Plan. The 4-Post Plan is the FAA's set of flight tracks and procedures used for managing the flow of aircraft in flight into and out of the Seattle Terminal Control Area. The Plan was developed to provide safe and efficient control of aircraft flights serving Sea-Tac Airport. Procedures for directing aircraft in flight are the responsibility of the FAA. In developing the 4-Post Plan, the FAA followed its procedures for environmental assessment and for public review and that process has passed a court challenge. The 4-Post Plan procedures and flight tracks have no interaction with the SASA project and there is no justification for their inclusion in this EIS.

MLS Project. The Microwave Landing System (MLS) Demonstration Project is an FAA project for the initial installation of a new technology aircraft guidance system at Sea-Tac Airport. As planned, the MLS project would allow certain types of aircraft to follow an additional approach flight track to the airport under a limited range of weather conditions. Use of the MLS approach procedure would reduce aircraft delays. The aircraft using this track would be commuter turboprops, not the air carrier jets planned to utilize the SASA facilities. The FAA is responsible for preparation of the environmental assessment for the MLS project. Neither installation nor operation of the proposed MLS system would have an effect on the need, siting, or operation of the SASA project; therefore, it is not evaluated in this EIS.

Runway Safety Area Extension. The airport's Safety Area Extension project is designed to improve the runway safety areas at the ends of the existing runways. While the existing runways/safety areas have been considered acceptable, the FAA has requested that the Port improve and increase the safety area at the southern end of the east runway (16L/34R) to meet current FAA standards. The Port is evaluating the best way to respond to that request. Alternatives under discussion include combinations of physical extensions to the runway safety area and/or reduction in runway length. Such safety areas are not paved like the runway and cannot be used for normal aircraft operations. They serve solely as a safety margin for arriving and departing aircraft. The potential extension would be located within the safety clear zone at the end of the runway and would be separated from the SASA development nearby. Its construction would not affect the siting or scale of the SASA development. The Safety Area Extension project will be addressed in a separate environmental assessment. The only connection with the SASA project is that fill material from the SASA site may be used to construct the runway safety area.

Terminal Expansion. As described in the EIS, the development of the SASA project would provide for the relocation of existing line maintenance facilities now in operation at the south end of the terminal area. This would free space in the terminal area so that additional aircraft gates and related terminal facilities could be constructed. The need to consider such passenger terminal expansion results from forecasts of increased annual numbers of passengers traveling through the airport. In particular, an increase of approximately 50% in passenger volume (to 25 million annually) is anticipated within the next 8-10 years. An additional increase to 35 million annually over the following ten years can occur with the existing runway/taxiway system at the airport. The addition of a dependent runway as now being considered in the Flight Plan project, is not required. However, very significant operating delays would result if airfield improvements are not made. Regardless, there will be continued increases in passenger volume through and beyond the year 2000. The addition of new gates and terminal facilities at the airport has been recognized in numerous planning studies as an appropriate need as passenger volumes increase. Such improvements to terminal facilities are a response to aviation demand and increased numbers of passengers, not their cause. Additional discussion of potential terminal development and its impacts, to the degree that they can be foreseen at this time, has been included in this EIS in Part 3.4, Coordination with Other Proposals. Additional environmental assessment(s) will be prepared for terminal facility development or other airfield projects when such projects reach the appropriate stage for such review.

Part 150 Program. The airport's Part 150 program is carried out in compliance with the FAA's FAR Part 150 regulations to improve the compatibility of airport area land uses with the airport noise environment. Forecasts of the airport noise environmental are prepared, incompatible land uses within the Ldn 65 noise contour are identified, and remedial programs are implemented to address the noise impacts. With an FAA-approved Part 150 program, certain remedial actions are eligible for federal funding. The Port's noise remedy program efforts started in the mid-1970s. Once the Part 150 regulations were established, the Port brought the noise remedy program into that process in 1985. Major elements of the Port's ongoing program include the acquisition of noise-impacted residences and the sound insulation of others. Environmental assessments have been prepared at appropriate points in the program. The Port has periodically evaluated both the noise forecasts on which the program is based and the elements and implementation of the program itself.

An update of the Part 150 program has recently been completed, including preparation of new noise exposure maps and modifications of the remedy program. The noise analysis included in this EIS is based on the same aircraft operational forecasts and other data used in the current Part 150 program update. A discussion of the results from the SASA analyses of runups and aircraft taxiing have been incorporated in the Part 150 update. As described in the noise section of this EIS, the SASA development would not affect the boundaries of the noise remedy program nor would it increase the number of residents subject to noise levels above Ldn 65. Additional information regarding the Port's Part 150 study and the Noise Remedy Program can be obtained from the Port's Noise Abatement and Noise Remedy offices.

Roadway Projects. Several potential roadway projects which would, in part, serve the airport and vicinity are currently being planned and evaluated. These include the 28th/24th Avenue South Arterial and the SR-509 Extension/South Access Roadway projects. They are discussed in Section 3.4 of this EIS. An EIS for the former has been completed (Lead Agency = city of SeaTac) and an EIS for the latter is being prepared (Lead Agency = Washington State Department of Transportation). The transportation analysis in this EIS assumes that needed area and regional transportation improvements will be constructed to meet the demands of area growth and development in accordance with Growth Management Act policies. With local governments proceeding to evaluate these roadway projects, preparing design studies and EISs, it is reasonable to include them in the SASA traffic analysis. The SASA development, however, would not require either of these roadway projects in order to accommodate and mitigate its projected traffic generation. The SASA alternatives have been designed to accommodate both roadway projects so that future decisions on those projects are not impeded.

The environmental evaluation of the SASA project has also considered potential interactions with other potential projects in the SeaTac area to the degree that they are defined and can be reasonably estimated at this time. Potential commercial development by others in the vicinity of the SASA site has been incorporated in the transportation and economic analyses. The project alternatives take into account area roadway projects and storm drainage needs and provide for potential co-location of commercial development. All of these other potential projects are separate from and not contingent on the SASA project. The SASA EIS provides information on the impacts of SASA that can be utilized as and when such other projects reach the appropriate environmental assessment stage.

General Response D: Commercial Development Assumptions

The primary goal of this EIS is to analyze the impacts of the *aviation support development* on the environment. In some cases, elements of the environment represent shared resources: the impacts of any one project interact with other possible projects. Here, it is important to analyze impacts in the context of cumulative development in the area. The cumulative impact analysis is incorporated in the EIS sections on socioeconomic impacts, noise, air quality, transportation, recreation, and water quality.

The EIS follows the development forecast supplied by the Puget Sound Regional Council (PSRC, previously Council of Governments). These forecasts are routinely used by planning agencies, and are included in the transportation plans of both the cities of SeaTac and Des Moines.

To better assess the cumulative impacts of SASA and other future development on shared resources, the EIS makes assumptions about the background development in the area based on the PSRC forecasts, City of SeaTac zoning and planning, and an analysis of the development market in the area. It further assumes that all roadways, utilities and other improvements necessary to support such development are provided and would be coordinated with relevant elements of growth management planning.

While details of potential development are speculative at this time, in order to provide a basis for evaluation of cumulative impacts, the EIS makes specific, yet conservative, assumptions about development that might occur on given parcels (Table 3.1-3). These assumptions reflect current land use planning by local agencies. This development is not part of the proposed action and would require its own environmental assessment(s) as and when actual commercial development proposals are put forth. The SASA EIS does not, and is not required to, include project-specific analysis of potential commercial development. Again, these assumptions are a conservative forecast within the guidelines referred to above.

Similarly, for the No-Action Alternative, if the proposed action (SASA) does not occur, the EIS assumes that development consistent with the PSRC forecast would occur on the SASA site. However, if the Port of Seattle were to maintain the major parcels A and F in reserve to meet future aviation demand, then the market demand could be accommodated by more intensive use in the remaining area, in keeping within the Floor/Area Ratios (FARs) of the current zoning code (Table 4.3-1).

General Response E: Airport Planning Context for SASA

Several commentors raised the issue of previous airport planning documents, particularly the Master Plan Update (1985), and their role in guiding the SASA program. Neither state nor federal regulations require that the airport prepare or conform to a comprehensive plan in the same sense that general purpose local governments typically are required. From time to time, the Port has prepared studies and documents as part of planning and evaluation of airport projects, both in the context of specific proposals and as wider examinations of all or part of the airport's facility and operational needs. As referenced in the EIS, these studies form a body of information that is modified and added to as warranted by changes in demand for aviation services, airline industry needs, regional population growth and economic conditions, regulatory requirements, etc.

Since the preparation of the SeaTac Communities Plan (adopted in 1976), major changes have occurred in the region and in the airline industry. Continued population growth and business development in the Puget Sound region have led to an increasing demand for airline services. Federal deregulation of the airlines has produced major changes in operating patterns with increases in hubbing and a rising importance of commuter airlines. Economic conditions have led to intense competition, producing mergers and failures of some airlines as well as the creation of new airlines. Among the results are changes in the number of airlines serving the region, the mix of aircraft, passenger load per flight, operating frequency and time of day, etc.

As these changes have occurred, the Port has updated forecasts of passenger flow and aircraft operations. Planning studies, including those referenced in the EIS, are then carried out to address airport facility requirements to meet these evolving regional needs and industry patterns. The SASA program considers the airport's aviation maintenance needs, including current information on area and facility requirements based on the most recent forecasts for operation of the airport. Airport planning is carried out with the involvement of the FAA and, as appropriate, incorporated into the Airport Layout Plan for FAA review and approval. Other agencies, groups, and the public are involved at the appropriate stages of the planning and environmental processes. Refer also to Section 3.4.13 for additional discussion of current airport planning programs.

Under the FAA's Part 150 regulations, which guide airport noise compatibility planning, airports are encouraged to ensure that local area land use plans are coordinated with airport activities. Sea-Tac is working with nearby agencies in this regard as part of the current Part 150 program.

For SASA specifically, the City of SeaTac zoning of adjacent land is compatible with this use. Previous residential zoning has been redesignated to commercial (Aviation Business Center) and much of the adjacent property is now zoned ABC or potential ABC. The Port of Seattle would work with the City of SeaTac if they choose to amend their Comprehensive Plan Land Use Element and zoning code to assure consistency with City of SeaTac policy and the SASA development as addressed in their comment letter.

LETTER 1.

April 9, 1992

Public Hearing on the South Aviation Support Area
Comments by Joan Bell, CASE, RCAA

Our community is being attacked again, folks!

Our small airport is on the move. 2,400 acres are too confining to accommodate grandiose plans to be the international gateway to both Asia and Europe.

1. Is There a Capacity Crunch?

Port officials say they have to move existing maintenance facilities so they can more easily accommodate the traveling public, especially the INTERNATIONAL visitors being courted. The European Study Mission being organized by the Greater Seattle Chamber of Commerce leaves April 21 TO PROMOTE EUROPEAN TRADE THROUGH SEATTLE! Zeger van Asch van Wijck, Patricia Davis, Paul Schell and Andrea Riniker plan to go as Port representatives. If they really believed the airport to be short of space in the terminal passenger areas they wouldn't be soliciting more customers. They know that there are some hours of the day when it is really deserted at the airport. Planes that avoid the peak hours can land easily.

. Before moving the line maintenance facilities from their present location,
. and before building another runway, the question of airport capacity has
. to be faced honestly and not based on inaccurate data fed into a
. computer. Capacity has been defined as the amount of delay people will
. tolerate. Stagger arrival hours and use the dead times of day. Don't
! let the airlines dominate your policies.

2. The Hush Facility

1 If you like to read horror stories, get a copy of the Technical Appendices on the SASA project. How will the airport deal with the noise of the proposed maintenance base? Don't worry! They plan to build a "hush facility" designed for narrow-body planes. If these narrow bodies are not too different in design one from the other, the hush facility should be able to achieve noise reduction of about 10 dB. The port would like us to believe that this puny amount of noise reduction will actually make an appreciable difference to the ear-splitting noise of airplane engines doing run-ups at 80%-90% of engine power for 10 minutes at a time!! The charts suggest that 2% of run-ups could be night operations.

. It is obvious that a hush facility is not going to conceal the noise of
. narrow-body run-ups above idle power. 10 dB is minuscule in relation to
. the total din. Planes that cannot use the hush facility would be doing
. run-ups above idle back at the existing airport locations. All the rest
. of the planes doing idle power runs would be outside the SASA hangars.
. Is this cacophony part of the airport's good neighbor policy?

3. Excavation Traffic Impacts

You read about the process of constructing this monstrous maintenance base. All the major intersections of our community are discussed dispassionately, describing the destruction, gridlock, mud and chugging trucks controlling our lives for months. The estimate is about 9 weeks for the job but everyone knows this is deliberately optimistic to encourage approval of the project.

Letter 1 - Joan Bell

1. Your comments are noted.

1

Consider the excavation traffic impacts due to the magnitude of earthwork required to create a level site. Some existing material will need to be excavated and removed from the site and some new material will need to be brought to the site. So far, only one such site has been identified on the current port property - the runway safety area extension site located at the south end of the current runways.

But other potential sites for excavated material are located up to 10 miles from the SASA site. Four dump truck routes have been analysed:
10% would use S 188th and International Blvd to access sites N of airport.
25% would use S 188th and SR 509 to access other N sites.
65% would use S 188th to access I-5, 20% northbound and 45% southbound.
The same truck distribution would bring fill material to the site.

The acceleration of trucks is estimated at 1/4 the acceleration of passenger vehicles. Acceleration is an important factor in determining congestion at intersections. The project would tie up our major access routes for months! Alternative 3 generates 4,142 daily trips.

We would find the construction phase noisy, dirty and frustrating but the REAL impact would be the monstrous maintenance base created. The loud, reverberating noise would invade our homes both through the air and under the ground as infrasound that cracks cement foundations.

I recommend the NO ACTION ALTERNATIVE. The airport should not be allowed to intrude into the neighborhoods any more violently than it does at this time.

LETTER 2.

April 8, 1992

Dear Sarah Dalton,

(1) I am very much concerned about the possibility of Alaska Airlines putting in a "Supplylane" maintenance system just south of Sea-Tac airport. Loud noise, air pollution, & traffic problems are already over-burdening and unbearable in our area. Please, please don't subject us to any more of the same.

It seems to me Spokane or Moses Lake could & should get this type of business. They have the space, and need the employment opportunities far more than we do.

Thanks for your time.

APR 1992
RECEIVED

Sincerely

Donna Smith
23907 7th Ave. So.
Des Moines Wa. 98198
(206) 878-9605

Letter 2 - Donna Smith

1. Your comments are noted.

LETTER 3.

HIGHLINE PUBLIC SCHOOLS

FACILITIES AND MAINTENANCE DEPARTMENT
18010 8th Avenue South TELEPHONE (206) 433-2501
Seattle, Washington 98148 FAX. NO. 433-2147

APR 1992
RECEIVED

April 13, 1992

Sarah Dalton
Federal Aviation Administration
South Airport's District Office, Suite 250
1601 Lind Ave. S.W.
Renton, WA. 98055-4056

RE: COMMENTS ON DRAFT EIS-SOUTH AVIATION SUPPORT AREA

Dear Ms. Dalton:

We have enclosed the full text of the Highline School District's comments on the draft EIS for the SASA. The president of the district's Board of Directors, Mary Cline, delivered a condensed version of these comments in her testimony during the April 9 public hearing. We request that the full text also be entered in the record.

Yours truly,

Paul F. Bray

Paul F. Bray, Jr.
Facilities Supervisor

PFB:mh
encl.

cc: Mary Cline, President - Highline School District Board of Directors
Kent D. Matheson, Superintendent - Highline Public Schools
Geri Fain
Jerry C. Heigh

HIGHLINE PUBLIC SCHOOLS

EDUCATIONAL RESOURCES and ADMINISTRATIVE CENTER
[illegible] Boulevard SW • Telephone 206-[illegible]
Seattle, Washington [illegible]

April 13, 1992

Sarah Dalton
Federal Aviation Administration
South Airport's District Office, Suite 250
1601 Lind Ave. S.W.
Renton, WA. 98055-4056

RE: STATEMENT REGARDING THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR SOUTH AVIATION SUPPORT AREA (SASA)

Dear Ms. Dalton:

The Highline School District has several concerns regarding the impacts of the proposed South Aviation Support facility on our operating schools. The concerns are related to the noise, air pollution and traffic impacts on schools in the vicinity of the proposed project.

1 With respect to the noise impacts, our most immediate concern is for the Madrona Elementary School which is located just 4 blocks to the southeast of the SASA site. We note the EIS addresses some limitations that will be imposed on noise generated at night. The limitations do not apply during the normal school day. 2 We also note that the "hush facility" is open to the east and will provide little noise abatement in the easterly direction. There appears to be an assumption that the topography and SASA buildings will shield the east side. 3 We believe that our Madrona Elementary School site will be a recipient of increased noise from the SASA facilities. Therefore, the district will be forced to install noise reduction measures in the existing school or, if the district's long range facilities plan is implemented, add such measures to a new school. In either case the district will incur the costs because schools are not currently eligible for assistance from the Noise Remedy Program.

4 The school district is also very concerned about the potential for increased air pollution at the Madrona Elementary School site. Madrona Elementary will be down wind from the SASA during periods of northwesterly winds, our "fair weather" winds. The EIS indicates that the emissions from the SASA will add from 0.2% to 10% of the current level of aircraft emissions depending upon the particular pollutant and the alternative. Unlike noise, which the district can reduce inside its buildings, it is not feasible for the district to protect its students and staff from air pollution. We must therefore request that the most stringent mitigation measures be imposed to protect the health and well being of our staff and students.

Letter 3 - Highline Public Schools

1. Your comment is noted.

2. The hush facility would open to the east to allow aircraft to enter and exit. There would be doors, however, that would be closed when an aircraft is conducting a runup inside the facility. Therefore, the noise reduction in the easterly direction due to the hush facility would be equal to the reduction to the west, north, and south. Shielding to the east provided by the topography and SASA buildings is included in the sound-level calculations included in Appendix M of the Final EIS.

3. The EIS noise analysis projects no significant increase in the average noise impact at the Madrona School site. Maximum noise levels for runups in the hush facility would remain below 65 Db. The Port of Seattle is currently in the process of reevaluating the status of public schools in the Noise Remedy Program. The Highline School District has been participating in this effort.

4. It is true that northerly winds are predominant in fair weather periods, especially during the summer, and that these winds would carry emissions from the airport and the SASA site toward Madrona Elementary School. The Draft EIS indicates emissions from jet engines at SASA would incrementally increase emissions compared with the No-Action condition. The Draft EIS indicates SASA emissions would be approximately 0.2% to 10% of the existing emissions at the airport based on a preliminary study by Ecology. The analysis does not conclude that the emissions would be 0.2% to 10% higher than the No-Action Alternative.

   It is important to note, however, that SASA emission estimates are based on the scheduled phase-out of older technology aircraft engines. The replacement of older jets and older engines will also reduce emissions from Sea-Tac International Airport, independent of any decisions regarding SASA. It is quite possible that future jet engine emissions from Sea-Tac International Airport and SASA will be less than that which is emitted today.

5 And finally the district has serious concerns about the levels of traffic that will be generated by the SASA. We have a middle school and a high school located on South 188th Street between 42nd and 46th Avenue South. Many students attending Chinook Middle School and Tyee High School must walk along South 188th Street. The recent curb and sidewalk improvements by the City of SeaTac have improved safety for pedestrians but there is still cause for concern. The intersections at South 188th/42nd Avenue and South 188th/46th Avenue are critical because many students must cross at these points. We also have Madrona Elementary School which is located on 30th Avenue South and South 203rd Streets. The intersection at 30th Avenue and South 200th Street is critical because students must cross there. The intersection was only recently signalized following the tragic death of two students who were struck by a car in the intersection. Also, 30th Avenue and South 204th Street are rapidly becoming an alternate route, between South 200th and International Boulevard, for drivers trying to avoid the South 200th/International Blvd. Intersection. This circumstance has increased the traffic past the school. Both 30th Avenue South and South 204th Street lack curbs and sidewalks and the increase in traffic is already raising concerns for the safety of pedestrians. Any increase in traffic from the SASA will exacerbate these problems.

6 The EIS also assumes a future connection between 28th Avenue South and 24th Avenue South. The SASA project is designed to facilitate the connection. We are aware that this street revision is covered by the 28th/24th Avenue South Aterial Project Draft Report. However, the connection of these two streets will create a through route between South 188th Street and Kent/Des Moines Road (approximately South 230th Street). The existing 24th Avenue South, between South 207th and 216th Streets, is within the SASA transportation study area boundaries and yet the only data provided for 24th/28th Avenue South is for year 2003 under the No Action Alternative. It indicates 3% of SASA traffic using the route. We believe that the streets will become an alternative north/south route. That is a concern for the school district because we have a multi-school complex on 24th Avenue South between South 244th and 228th Streets. The complex includes Midway Intermediate Schools and Pacific Middle School with frontage on 24th Avenue. Mt. Rainier High School also shares the same site. There are high levels of school bus, auto and pedestrian traffic around these schools and nearly all of 24th Avenue is without curbs and sidewalks. We believe that EIS for the SASA should have given more consideration to traffic on the interconnected streets rather than refer to a separate study.

PB:mh

5. Overall traffic volume increases between the years 1991 and 2003 on South 188th Street in the vicinity of Chinook Middle School and Tyee High School from the SASA project and other planned development in the area are shown in the following table.

Table 6-2. Traffic volume increases

Alternative	1991 Volume	2003 Volume	Percent Increase
No-Action	26,000	27,400	5.4%
1	26,000	27,300	5.0%
2	26,000	27,400	5.4%
3	26,000	26,200	0.8%

The traffic volume increases between the years 1991 and 2003 are relatively small because the planned SR 509 extension and South Access Roadway projects would effectively reduce the existing traffic volumes on South 188th Street. This small increase in through-traffic volumes on South 188th Street would not be expected to worsen the pedestrian safety concerns that currently exist in the corridor.

The SASA project would not increase traffic volumes on 30th Avenue South and South 204th Street near the Madrona Elementary School. The alternate route used by some motorists to avoid the traffic signal at the South 200th Street/International Boulevard would not be used by traffic generated from the SASA site because this alternate route would not reduce travel times for motorists traveling to or from the SASA site.

6. The 28th/24th Avenue South arterial project was assumed to be in place for purposes of the SASA EIS analysis because this project is a high priority on the City of SeaTac's Six-Year Transportation Improvement Program. The SASA project does not trigger the arterial development. Detailed analysis of the 28th/24th Avenue South is provided in the 28th/24th Avenue South EIS (contact City of SeaTac).

The SASA project is expected to have 3% of its traffic using this 28th/24th Avenue South corridor for all alternatives, not just the No-Action Alternative. The majority of this traffic, however, would be destined for the new SR 509 interchange on 24th Avenue South and would not be expected to impact the section of 24th Avenue South near the school complex.

The City of Des Moines is also currently considering alternatives that would redirect traffic from 24th Avenue South in the vicinity of the school complex to SR 99/International Boulevard. These alternative improvements would limit the potential traffic volume increases on 24th Avenue South, south of South 216th Street.

LETTER 4.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Fish and Wildlife Enhancement
3704 Griffin Lane SE, Suite 102
Olympia, Washington 98501-2192
(206) 753-9440 FAX: (206) 753-9008

April 27, 1992

APR 1992
RECEIVED

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, Washington 98055-4056

Re: PORT OF SEATTLE SOUTH AVIATION SUPPORT AREA DRAFT ENVIRONMENTAL IMPACT STATEMENT EIS-920105

Dear Ms. Dalton:

The U.S. Fish and Wildlife Service (Service) has reviewed the Draft Environmental Impact Statement (DEIS) for the above referenced project. In general, our opinion is that the document provides a fair review of the resources and issues. However, the level of detail provided for some issues should be strengthened, and the project's impact to migratory birds should be included. Therefore, the Service requests that the following information and documentation be included in the Final Environmental Impact Statement (FEIS).

GENERAL COMMENTS

Service biologists from the Olympia Field Station participated in an interagency meeting and site visit, with the project consultants, on December 12, 1992. The Service conducted a preliminary survey of the proposed project site and recommended possible mitigation for project impacts. Most of the Services recommendations made on that day have been incorporated into the DEIS.

1 However, neither the performance standards nor the monitoring program contain specific parameters from which the success of the proposed mitigation could be ascertained. These parameters are necessary to assess the probability of successful mitigation. Therefore, quantitative, specie specific performance standards for the mitigation area(s) should be incorporated into the FEIS.

No specific information regarding the mitigation contingency plans has been provided. This information is necessary to ascertain what the Port would do

Letter 4 - United States Department of Interior Fish and Wildlife Service

1. Appendix G of the Draft EIS outlines basic elements of the natural resources mitigation plan for the relocation of Des Moines Creek and impacted wetlands. The conceptual mitigation plan was developed as a guideline for future detailed mitigation planning to be developed as part of permit applications. It is not the intent of the conceptual plan in Appendix G to fully address all permit issues. A mitigation monitoring program, including specific performance standards, mitigation contingency plans, and an implementation schedule will be developed as part of the permit application package. The monitoring program will be designed to assess the character and biologic functioning of Des Moines Creek.

The Port has conducted on-going consultations with the appropriate resource agencies, including U.S. Fish and Wildlife, and has included their comments and concerns into the design of the relocated portion of Des Moines Creek. Appendix O of the Final EIS includes the design.

While a degree of risk is associated with the mitigation design itself, there will be no risk associated with project monitoring. That is, a well-designed monitoring program based on clearly specified project goals can be undertaken to assess the success of the mitigation project. Baseline monitoring of existing resources on the project site will commence during 1992. The details of the baseline monitoring program will be developed in conjunction with permitting and review agencies. An implementation schedule will be developed as part of the permit process and in coordination with the development program. Refer to Appendix O for a record of agency consultations to date. Refer to Appendix O for a record of agency consultations to date. The FAA's Record of Decision for this project will be either based or contingent on permit approval and conditions.

1 should the proposed mitigation not meet the performance standards. Therefore, contingencies should be developed for all build alternatives, and incorporated into the FEIS.

Considering the project's complexity, a detailed implementation schedule for the project and associated mitigation should be developed. A page summarizing the acreage and type of habitat to be impacted for each build alternative would also be useful in evaluating the proposed project.

SPECIFIC COMMENTS

2 Page 4-75, Section 4.6.1.3 - The water quality of Des Moines Creek appears to be degraded, possibly due to contaminants from the existing golf course. If the golf course is relocated as a part of this project, the FEIS should discuss this contaminant source in greater detail. Methods for preventing contaminants from entering the creek and adjacent wetlands should also be developed.

3 Page 4-87, Section 4.6.3.2 - The Service recommends that contaminated waste not be transported over or adjacent to Des Moines Creek. Leaks from this pipe could cause serious adverse impacts to the creek's resources. Alternative transport methods and/or sighting should be discussed.

4 Page 4-106, Section 4.7.2.2; Page 4-107, Section 4.7.2.3; Page 4-108, Section 4.7.2.4 - The DEIS states that shading from the 250-foot wide taxiway bridge would result in the loss of riparian vegetation for all three build alternatives. The DEIS proposes to allow shade tolerant species to naturally colonize this area. This process could take a fairly long period, resulting in decreased water quality in increased sedimentation in Des Moines Creek. Therefore, we recommend that native shade tolerant species be planted and monitored in this area. The possibility of temporary bank stabilization, to prevent erosion while plants are becoming established, should also be discussed.

5 Pages 4-106, Section 4.7.2.2; Page 4-107, Section 4.7.2.3; Page 4-108, Section 4.7.2.4 - The DEIS states that operation impacts for all the alternatives would result in a change in water sources to Des Moines Creek. The DEIS further states that these changes are not expected to alter wetland vegetation or wetland functions. These statements do not address the water source changes to Des Moines Creek. The FEIS should discuss how these water sources would be altered and the resulting impacts to the creek.

6 Page 4-109, Section 4.7.3.1 - We are unaware of successful creek relocation as proposed. The FEIS should provide specific details of the design and any available information regarding the prior success of this type of creek relocation. The FEIS should also discuss the ability of the relocated creek to provide an adequate food supply, e.g. aquatic invertebrates, to support an increase in anadromous fish usage.

2. The golf course relocation is not a part of the project considered under this EIS. The 18-hole Tyee Valley Golf Course is privately operated and under lease on Port-owned land. If SASA is developed, enough land could remain for a nine-hole course. The Port would again consider the possibility of a private operator developing a golf course on the site. If that happened, the operator would be responsible for preventing contaminants from the golf course from entering Des Moines Creek. Appropriate controls to protect water quality would be considered at that time.

3. While runoff from the SASA facilities would not always necessarily be significantly contaminated, it is appropriate to design the transfer and treatment system to minimize risk. Because the project would be located next to the Creek, collection of runoff would have to take place near the Creek. However, several options for locating the Storm Water Treatment Facility ponds and crossing Des Moines Creek were explored prior to selecting the locations detailed in the Draft EIS.

Other Storm Water Treatment Facility pond sites were considered at locations further away from the SASA site and the Creek. A more distant location would necessarily require a longer Storm Water Treatment Facility pipe for transport. A longer pipe increases the chances for pipe leakage and for accidents. The Storm Water Treatment Facility pond site selected requires the minimum pipe length for transport of contaminated runoff.

Once the closest Storm Water Treatment Facility site was selected as the best alternative for limiting opportunities for pipe leakage and accidents, some method of traversing the Creek needed to be selected. There are three possible routes: under the Creek, around the Creek via several routes, or over the Creek. These alternative methods for crossing the Creek were evaluated.

The "under-the-Creek" option has a greater potential for contamination of shallow ground water if a leak occurs. Any leaks which do occur would be difficult to detect underground until the problem was severe. If the pipe requires repair, an entire section of the Creek (and associated wetlands mitigation) would have to be excavated to access the pipe. Further, because a pipe under the Creek would be below the surrounding topography, a pumping system would have to be constructed. Any pumping system, no matter how well designed would be a further opportunity for failure or leaks.

The "around-the-Creek" option would also be underground and would also require some type of pumping system. This option has many of the same problems as the "under the Creek" option with the additional requirement of a much longer pipe. A longer pipe defeats the entire purpose of placing the Storm Water Treatment Facility near the contaminant source and would create greater opportunities for pipe leakage or accidents.

The "over-the-Creek" option has several advantages over the other options. It requires the shortest length of pipe, which minimizes the opportunities for leaks and accidents. It would operate on a gravity system so a pumping system would not be required. No excavation of the Creek or wetlands would be necessary to make repairs. If leaks do occur, they will be easily detectable and there would be less chance of severe groundwater contamination.

Based on these advantages, the "over-the-Creek" option was selected as the best option with the Storm Water Treatment Facility ponds located close to the pollutant source.

4. Subsequent to issuance of the Draft EIS, there has been additional design work on the relocation of Des Moines Creek and the layout of the preferred SASA alternative. The preferred alternative and stream design would require culverting a 260-foot section of Des Moines Creek under the aircraft access ramp for SASA. The culvert would be a wide section box or arch with a stream bed of natural materials (rock, gravel, etc.); not a small-diameter, round pipe. This design would not allow for any streamside plantings as previously outlined. In addition, the stream course through the culverted section would not be affected by direct precipitation. The culverted channel would also be stabilized with rock to prevent erosion during high flows. Therefore, no significant erosion from the culverted stream section is anticipated.

5. Construction of the SASA project would result in changes to the local hydrology of the SASA site and patterns of runoff to Des Moines Creek. Development of the site would result in less groundwater recharge and greater runoff rates from the project site. Therefore, a greater proportion of streamflow in Des Moines Creek would be storm flow, and groundwater discharge flow to the stream channel would be reduced. The maximum reduction of groundwater recharge would be about 6% (0.16 cfs) of average stream flow.

   This estimate of maximum reduction is not likely to be large enough to alter the vegetation or occurrence of riparian wetland fringes along Des Moines Creek. The reduction in base flow would have some impact on fisheries habitat during low flow. These impacts could include slight increases in summer temperatures and slight loss of rearing habitat. While quantification of these has not been completed, effective mitigation—including increased shading of a relocated Des Moines Creek channel—design of stream features to enhance fisheries and excess storm water detention capabilities is likely to more than offset the project impacts to stream hydrology.

6. Several successful creek relocations in the local area are known, these include the off-site restoration project for SR 901, the West Lake Sammamish Parkway in Redmond, and Forbes Creek in Kirkland.

   The Creek would have increased ability to support aquatic invertebrates as a food source to resident and anadromous fish because of increased channel length and greater diversity of in-stream substrate types, which would promote invertebrate colonization. More stable flows (resulting from greater upstream detention) would reduce scouring and wash out of invertebrates and greater vegetation cover along the stream channel will increase organic matter inputs to the stream which would help support invertebrate production.

   Groundwater is frequently collected from dewatering systems similar to those proposed for SASA. After collection, this groundwater is typically distributed to storm water or another conveyance system. The SASA project simply proposes to utilize this water as a hydrologic source for a constructed wetland.

6 **Page 4-111, Section 4.7.3.2 - We are unaware of successful ground seep relocation as proposed. The FEIS should provide specific details of the design and any available information regarding the prior success of this type seep relocation.**

7 Page 4-151, Section 4.10.5 - The DEIS states that "The golf course is also an unnatural situation, and no mitigation is needed to replace the lost wildlife values of the golf course." Migratory waterfowl are known to use the golf course and its associated wetlands. Migratory waterfowl are protected under the Migratory Bird Treaty Act of 1916 (MBTA) despite the origin of the habitat. The U.S. Supreme Court recently affirmed its evaluation of the MBTA when it observed that the Conventions "obligate the United States to preserve and protect migratory birds through ... the protection of bird habitats" and that "the protection of migratory birds has long been recognized as 'a national interest of very nearly the first magnitude.'" North Dakota v. United States, 460 U.S. 300, 310, 103 S. Ct. 1095, 1101 (1983 quoting from Missouri v. Holland, 252 U.S. 416,435, 40 S. Ct. 382, 384 (1920). Therefore, the Service requests that project impacts to migratory waterfowl using the golf course be addressed in the FEIS. Mitigation should also be developed for any unavoidable impacts to migratory waterfowl.

8 Page 4-152, Section 4.10.6; Appendix G, Pages 24 and 32 - The proposed mitigation for this project involves improving the stream habitat for anadromous fishes. However, this project does not allow for unimpeded fish passage into this improved fisheries habitat because downstream fish passage barriers will not be removed. Therefore, the proposed mitigation does not serve its stated purpose. Proposing to remove the fish passage barriers as part of future projects does not satisfy the mitigation requirements for this project. The FEIS should discuss removal of fish passage barriers as a part of this project or discuss additional mitigation.

Appendix G, Page 2 - The Port contends that riparian vegetation planted along the relocated creek must become established prior to allowing fish into the area. This established vegetation would prevent raptors and heron, which could present airplane flight safety problems, from foraging on the fish in the relocated creek. However, it is not clear if raptors and heron are currently foraging in Des Moines Creek. The FEIS should clearly state all raptors, heron, and other bird species using Des Moines Creek. If these birds are currently present, but will be excluded from the mitigation site, additional mitigation for migratory bird impacts should be discussed.

9 **Appendix G, Pages 24 and 26 - One goal of the riparian plantings is to provide shade to maintain suitable water temperatures for fisheries. Water temperature studies should be conducted in Des Moines Creek. This data and a discussion of its use in the analysis should be presented in the FEIS.**
We also feel that longer monitoring periods, a minimum of 5 years after the riparian vegetation has become established, is needed to ensure that proper temperatures are maintained.

7. **Migratory waterfowl usage of the golf course is low. Areas of the golf course which would be directly developed for the SASA project are not used by geese. Geese commonly use the wetlands and wet golf course areas west of the SASA site. Due to safety concerns for operating aircraft, such usage has been and will continue to be discouraged. Due to minimal use, no significant adverse impact is project. Wetland/stream habitat affected by the project will be mitigated at a greater than 2 to 1 ratio, as described elsewhere. Continued minor use by waterfowl is anticipated. As discussed in the EIS, mitigation options included enhancement through planting wetland and buffer shrub vegetation. While this enhancement would benefit passerine birds and small mammals, it would discourage geese from the area.**

8. **The Port is committed to providing mitigation for the impacts to wildlife caused by** the SASA proposal. To that end, an extensive mitigation program for wetlands and Des Moines Creek has been proposed. However, the FAA and the Port are strongly committed to the continued safe operation of Seattle-Tacoma International Airport. Therefore, the mitigation plan has been modified to reflect the special safety concerns of the airport. Allowing vegetation to become established before allowing unobstructed fish passage to the northern reach of Des Moines Creek is one of the modifications. This provides for assurance that water quality, food sources, and other **habitat conditions are well established and reduces risk of attracting birds to open water areas.**

A table listing birds observed on or near the SASA site has been added to Section 4.10 of the Final EIS. Continued minor use of the site by these species is expected.

9. Water temperature studies in the Creek were conducted as part of the SeaTac Communities Plan and the Des Moines Creek Restoration Plan projects. Stream temperatures were identified as a problem area. Given no significant changes in the exposure of the Airport portion of the Creek, it is assumed that elevated temperature is comparable to previous observations and still a seasonal problem. As noted in the response to Comment 1 of this letter, a detailed baseline and project monitoring program will be developed in cooperation with permitting and review agencies as part of the permit application process, including monitoring parameters and monitoring duration.

10 Appendix G, Page 32 - No monitoring period was discussed for the fisheries habitat features. It should be noted that success of these features depends on whether they are meeting design expectations, not necessarily on the percent of a specific feature that is destroyed or damaged. It is also important to know that the fish are utilizing these features. Therefore, we suggest that a monitoring plan be developed to ensure that the features are creating their designed habitat, and that fish are utilizing these features, after downstream fish barriers are removed. We also recommend that monitoring for fisheries be conducted for a minimum of 10 years with reports submitted in years 1,2,4,6,8,10.

Appendix G, Pages 32 and 36 - The Port of Seattle has proposed riparian plant monitoring for 3 years. However, removal of the fish passage barrier at South 200th Street is not recommended until sufficient vegetation has developed, at least 5 years. Therefore, we feel that the plant monitoring period should be extended to a minimum of 5 years.

SUMMARY COMMENTS

11 No alternatives are proposed, other than the no action alternative, which would not negatively impact wetland, fish, and wildlife resources. However, alternatives one and two have the least impact to trust resources. Alternatives one and two also proposed the most substantial stream reconstruction and mitigation. Therefore the Service would recommend alternatives one or two if;

1) the previous information and documentation on contaminants, wetlands, creek and ground seep relocation is included in the FEIS,

2) quantitative, specie specific, success criteria is developed,

3) mitigation areas are monitored for the recommended duration,

4) migratory bird mitigation is developed, and

5) contingencies are developed in the event that the mitigation does not meet the success criteria.

The Service will be commenting on the U.S. Army Corps of Engineers public notice to allow filling of wetlands for the proposed project, pursuant to the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. et seq.), the Endangered Species Act of 1973, as amended, and other authorities mandating Department of the Interior concern for environmental values.

10. Please see the response to Comments 1 and 9 of this letter.

Mitigation monitoring will track both establishment and maintenance of the mitigation elements as well as water quality and utilization. Your comments on monitoring periods will be taken into consideration in developing the monitoring plan. Appropriate monitoring for fish will be developed and coordinated with future removal of fish barriers.

11. Your comment is noted.

Thank you for the opportunity to comment on the DEIS. We look forward to continued coordination with you in developing this project. Please contact Richard Carlson or Joanne Stellini of my staff at the letterhead phone/address, if you have any questions concerning these comments.

Sincerely,

David C. Frederick
Field Supervisor

rc/kr

c: EPA, Seattle
NMFS, Portland
WDE, Olympia
WDW, Olympia
WDF, Olympia

LETTER 5.

HIGHLINE WATER DISTRICT

Serving the Southwest Metropolitan Area since 1946

April 27, 1992

Confirmation of FAX Transmission

APR 1992 RECEIVED

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airport - District Office
1601 Lind Avenue SW
Renton, WA 98055-4056

Re: Draft Environmental Impact Statement
Seattle-Tacoma Int'l Airport
South Aviation Support Area
Sea Tac, King County, Washington

Dear Ms. Dalton:

On behalf of Highline Water District, I would like to take the opportunity to respond to your March 1992 Environmental Impact Statement for the Port of Seattle South Aviation Support Area. Some of the information stated in the Draft EIS appears to be in error, and should be corrected as follows:

1 1. Pages 4-13, Table 4.3-1: Highline Water District, formerly known as King County Water District No. 75 has 32 employees, not 15.

2 2. Pages 4-230, Section 4.17.1.1 - Utilities: water:

First paragraph: 1) As of March 1992 Highline Water District provides water service to 15,983 customers, not 13,700; 2) Highline Water District purchases the majority of water from Seattle Water Department and supplements this source with two wells, which furnish approximately 20% of the total volume.

Second paragraph: 1) In addition to the pipe sizes listed in this paragraph, Highline Water District maintains a 16" main along S. 188th St. (not a 6" as stated). 2) The Highline Water District Comprehensive Plan identifies the 6" watermain along S. 192nd to be upgraded to 12". Coordination of this pipeline replacement is anticipated with the South Access Project. 3) The abandoned 6" line located along approximately 24th Ave. S. does not tie into any active lines, such as the 16" main on S. 188th St.

23828 - 30th Ave. S. • P.O. Box 3867 • Kent, WA 98032 • 824-0375 / FAX: 824-0806

Letter 5 - Highline Water District

1. Your comment is acknowledged. Table 4.3-1 has been revised in the Final EIS.

2. Your comment is acknowledged. These sections have been revised in the Final EIS.

2

Third paragraph: 1) The 10" watermain extending along the access road through Tyee Valley Golf Course was installed by the Port of Seattle a few years ago. It ties into the Highline Water District 16" watermain on the south side of 188th St., and water is provided through an unmetered connection. 2) The Port of Seattle intertie valve on the north side of S. 188th St. is normally closed and provides water to the Port of Seattle when opened.

Fourth paragraph: 1) We are not sure exactly what communications you are referring to in this paragraph, but Highline Water District has not given any formal response to the system capacities as it relates to the proposed SASA project. 2) For your information, storage facilities at Bow Lake and Mansion Hill are networked together with 12", 16" and 18" piping which should be sufficient supply to the area, although system capacities should be confirmed by analysis of the hydraulic model.

3

3. **Pages 4 - 233 - Utilities:**

First paragraph: This section states that there are no significant impacts to utilities with the exception of flow capacities of Highline Water District mains. It's interesting to note the following conditions:

a) **The proposed SASA project lies within Highline Water District service area as defined by the Coordinated Water System Plan.**

b) The undersized piping referred to in this paragraph are located in residential neighborhoods where the Port of Seattle is currently removing the houses. Once the area is completely vacated of homes, the existing pipelines will be scheduled for abandonment. Highline Water District will incur some cost to maintain water quality caused by the loss of circulation.

c) **New system improvements can be built by the method of developers' extensions in accordance with comprehensive planning.**

3. The project site is currently located within the Highline Water District service area. However, it is our understanding that since the project would be located on Port property and because the Port's water system would be used, there would be no significant "service-related" impacts (i.e., additional services required due to development of the project) to the Highline Water District.

There would be some associated costs with the "capping" and removal of water lines after the area is vacated of homes. The Port would work with the District to resolve cost impacts. The Highline Water District would incur some loss of revenue (as yet undetermined) caused by the loss of part of its service area. A revision in the Final EIS has been made to reflect this impact. This potential loss of service area could be offset by future commercial development in the area zoned ABC.

Your comment regarding new system improvements is acknowledged.

A possible intertie with the Highline Water District (as part of the project) was mentioned in the Port's Comprehensive Water Plan. An agreement would be reached between the District and the Port before any intertie occurred.

The existing Port water system would be modified as required to meet the fire flow needs of the project. A 16-inch water line around the site ("loop") to meet fire flow requirements is proposed. It is our understanding that the Highline Water District does not have adequate capacity or pressure to meet the project's fire flow requirements. Therefore, a separate 16-inch loop is required.

Future discussions between the Port and the Highline Water District regarding the SASA project will take place.

Second paragraph: This section mentions an intertie with Highline Water District as backup to ensure uninterrupted supply. This statement seems quite odd, as Highline Water District is already providing water service to this area. In addition, Page 6-12 of the Port of Seattle Comp Plan entitled "Distribution System" seriously questions the integrity of the major pipelines within the Port's water system. How does this affect your proposal for water service?

3 My question of common sense, what would be the purpose in two agencies maintaining parallel lines on S. 188th St., S. 200th St., 28th Ave. S. and some local areas inside the proposed 16" loop? Before the Port commits to providing water service as proposed, we would like to suggest that a more comprehensive study be conducted on system capacities, water quality regulations and system planning of both agencies. For example, extending the 16" main from S. 188th to S. 200th St. would enhance Highline Water District's water quality and system capacities in this area by connecting two dead end lines.

In conclusion, we should be working together for a more cost-effective and well-planned solution to serving this development. As you are already aware, previous system improvements have resulted in pipeline entanglements which are undesirable installations for both of us. Let's solve this problem ahead of time.

Very truly yours,

HIGHLINE WATER DISTRICT

Jay E. Gibson

Jay E. Gibson
Manager, Technical Services

JBG:w

E. *DISTRIBUTION SYSTEM*

1. *Pipe Materials*

As was mentioned in Chapter 5, it appears that approximately 8000 feet of 45-year-old steel pipe is still in operation within the water distribution system. If a major break were to occur in the steel main, it would restrict the ability of the distribution system to deliver required fire flows. It is recommended that testing be undertaken to determine first, if the steel pipe is still in service and second, if it is in service, the current condition of the steel main. If the pipe is in service, the testing could entail excavating the pipe in several representative locations, cutting out a short section of pipe and repairing with a coupling. The pieces of pipe can then be examined for wall thickness and localized pitting and corrosion. If the pipe is found to be deteriorated beyond a reasonable point, a pipe replacement schedule should be included in the Airport's regular maintenance program. This will avoid increasing maintenance costs associated with the steel main and assure the future reliability of the system.

The 10-inch pipe that connects the southern portion of the distribution loop with the Highline Water District intertie is estimated at 30 years old. This in itself is not a major problem as the pipe is cast iron and would normally be expected to last that long. However, several breaks at the south end of the main have been experienced in the recent past. This pipe, and other smaller mains in the Airport's system of the same age or older, should be monitored closely for further deterioration. If more problems are encountered, the Airport should consider replacing the main entirely. If the Airport water system is to supply the proposed SASA development project, this 10-inch line must be upsized to 16 inches to provide the anticipated fire flow requirements. In addition a 16 inch loop through or around the SASA development will be required. As indicated in Table 6-2 the total length of pipe required to serve this proposed development is approximately 12,000 feet.

2. *System Looping*

The Delta Airlines Hangar is served by a 12-inch, dead-end main, leaving it vulnerable to a loss of service should the 12-inch main break. This line should be looped to provide an alternate source of water to the building. This would be fairly easy to accomplish by installing new 8-inch pipe between the end of the existing pipe at the southeast corner of

LETTER 6.

1

CITIZEN ALTERNATIVE TO SEATAC EXPANSION
CASE
P.O. Box 40171
Seattle, Washington 98166-0171

APR 1992
RECEIVED

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, Washington 98055-4056

Re: Comment on Draft EIS South Aviation Support Area (referred to as EIS)

Dear Ms. Dalton:

This letter is written on behalf of individuals in the community and Citizen Alternative to SEATAC Expansion, CASE, a community based organization concerned with SEATAC airport expansion.

We find that the Draft EIS, March 1992 concerning the South Aviation Support Area (SASA) is inadequate, insufficient, and deficient. Vital information is missing that render the draft EIS inadequata in studying, exposing, weighing and articulating the possible environmental consequences caused by the location of the SASA in the area studied.

The studies and data contained in the report fail to include vital information essential for an informed agency decision. The EIS fails to study nor does it take into account the probable significant adverse environmental impacts due to pollution to the air and water and the absolute destruction of the wetlands habitat and the fishery culture.

1 The EIS is woefully deficient in that it fails to analyze nor consider such mitigating factors as not building the facility or building a facility at a site other than contiguous to SEATAC airport.

2 The EIS fails to adequately study nor does it adequately address the potential fuel construction spills and chemical releases during the grading and construction that will according to estimates cause adverse water and air quality.

3 The proposed alternatives and the mitigation measures that are addressed such as filling present wetlands during

Letter 6 - CASE (Citizens Against SeaTac Expansion)

1. The EIS does consider the No-Action Alternative (see Section 3.3.1). As stated in Section 3.2, an aviation support area must be located within or next to the airport it serves. Please also see General Response A: Siting of SASA at the Airport.

2. Accidental spills during construction are discussed in Section 4.6.3.2. Contractors would be required to use Best Management Practices including but not limited to: retaining sediments containing oil on the construction site; and storing oil and oily wastes in the proper receptacles.

3. The EIS proposes an extensive mitigation program to address impacts to the natural environment.

(3) construction, will alter groundwater discharge and eliminate forested wetland habitat. These render the three alternatives that are contemplated in the EIS unacceptable.

(4) The EIS does not explore and analyze expansion of existing maintenance sites. Nor does the EIS explore the possibility of not building the SASA. The lack of consideration to these aspects renders the three alternatives that are studied inadequate.

(5) Under all three alternatives that are proposed, existing wildlife habitat would be destroyed. Merely noting, without proposing other mitigation renders this aspect of the report inadequate. Instead, the EIS merely speculates, without data or study, that new habitat will be formed.

(6) The EIS fails to address nor concern itself with a plan for disposal of asbestos, metals, solvents, and oils that will be uncovered during the construction phase. The construction of the SASA will result in extensive excavation and disposal of soil. Yet the EIS fails to address the potential of discovering soil contaminants, disposal of contaminated soil, and has failed to explore these possibilities by failing to take borings and sampling from the area being studied.

(7) The proposal fails to adequately consider, study nor address the impact on fish and their habitat. Failure to sufficiently address the requirements of the Washington Department of Fisheries and the Fisheries potential requirements for mitigation measures and protections make this EIS fatally flawed.

(8) The EIS is deficient for failure to explore nor study the high likelihood that noxious contaminates will be released in the SASA area. Stripping, repainting, cleaning, lubricating, deicing, metal plating among other activities are major components of the work that will be performed at the SASA. These activities release noxious and highly toxic chemicals into the atmosphere. The Airport Authority admits that the SASA activities will be a major factor in causing increased air emissions and water pollution. Yet nowhere is there consideration, study, nor data concerning the effect that these and other activities will have on the air quality and health of the surrounding communities. Mitigating measures are ignored and alternatives are not explored.

(9) The EIS recognizes that there have been three major jet fuel spills near Des Moines Creek, wiping out the salmon runs in the creek. Yet there is a failure to suggest alternative sites away from the Des Moines Creek area that has already suffered from and been adversely impacted by airport contaminants and pollution. Instead, no other sites

4. Please refer to the response to Comment 1 of this letter.

5. Please refer to the response to Comment 3 of this letter.

6. Further site investigations will be conducted at the proposed SASA site based on preliminary site investigation findings. As described in Section 4.16.3, Mitigation Measures, sampling would be conducted from structures suspected of having asbestos-containing material (ACM). Additionally, it is recognized that soil excavation will be required for development of the SASA site. Therefore, analysis of site soils and sediments may be necessary to accurately characterize potential site contamination. Subsequent to these analyses, appropriate waste management plans would be developed.

7. Section 4.10, Biotic Communities, includes a detailed discussion of the impacts to the fishery habitat of Des Moines Creek.

8. The Draft EIS acknowledges that maintenance activities would release air contaminants into the atmosphere. The magnitude of the emissions is impossible to confirm at this time because a specific tenant has not been selected and the tenant has not negotiated permit conditions with the Puget Sound Air Pollution Control Agency (PSAPCA). PSAPCA's comment letter on the Draft EIS (Letter 13) confirms that a Notice of Construction permit is required "prior to the installation of any air pollution control equipment or air pollution generating equipment." The application for the Notice of Construction permit will address emission sources, emission strengths, hours of operation, and emission controls. PSAPCA will require operational procedures or emission controls to ensure that public health is protected. Washington has also adopted air toxics regulations that require a demonstration that emissions of specific toxic chemicals will not generate concentrations that exceed "acceptable source impact levels." These so-called "ASILs" were based on health risk criteria but include a substantial margin of safety. Based on this regulatory structure, it is very unlikely emissions related to SASA maintenance activities will generate significant air quality impacts. An extensive storm water treatment system serving the SASA site is an important component of the project and will provide protection against water pollution.

9. Please see General Response A: Siting of SASA at the Airport, regarding the reasons for the proposed location of SASA. Again, the EIS proposes an extensive mitigation program to address impacts to the natural environment. Details of mitigation design will be determined in consultation with appropriate resource agencies as part of project permitting. Measures have previously been taken to correct identified problems and reduce the risk of fuel entering the Creek. Such protection is included in the design of the SASA project.

9 are even proposed. The fact that *all* wildlife habitat -- vegetation, insects, small animals, birds, and fish will be destroyed is deemed acceptable by the EIS. No measures are explored as to the impact that this will have on the surrounding community, the ecological chain, and so forth. Mitigation and alternatives are all but ignored.

10 Though the EIS mentions the requirement of the project to obtain a construction permit from PSAPCA (the regional air pollution control agency) the EIS fails to address nor does it study the potential that is raised for serious and debilitating contamination of the air. Failure to study how these chemical contaminants will impact on the air quality, whether they can be prevented or controlled is a serious and significant omission of a substantial adverse impact.

The EIS fails to consider other factors such as seasonal winds, engine exhaust pollutants, temperature inversions, and their effect on the air and ozone layers when coupled with the increased activity from the SASA. Of particular oversight is the failure to study the effect that benzene, a highly toxic air contaminant associated with gasoline and jet fuels will have on air pollution.

11 The EIS statement that a maintenance facility at SEATAC airport "will not increase the number of flights" (3-1, 4-30) is fallacious, simply unsupported by the data, and is a conclusion based on mere speculation. The EIS fails to consider data available from other airport experiences that have constructed similar facilities. Such an omission makes this EIS incomplete and inadequate.

The Authority readily admits there will be increased noise that will be generated by the SASA. Obnoxious noise will occur during construction and will continue to be a significant fact in the use of the SASA. That engine testing and maintenance are exempt from general noise abatement requirements renders the study and consideration of such long term noise disturbance crucial in the EIS. Yet the EIS fails to take account of the federal and state noise specifications.

Instead reliance is placed upon a so-called community Noise Mediation Agreement (1990) in order to show that although there will be an increase in noise beyond the government tolerances, the community has agreed to an increase in tolerance level in exchange for a sundry list of airport actions. Reliance upon such an agreement is so fallacious as to be foolhardy since any agreement is binding only on those members who are signatories to the agreement or were afforded their due process rights. The entire populace was not a party to the agreement, nor was notice and hearing afforded to the populace. It cannot be held that such a collective waiver of federal and state statutory

10. Please refer to the response to Letter 6, Comment 8 regarding maintenance issues.

Additional material discussing air quality impacts has been added to Section 4.5 of this EIS.

In terms of engine emissions, the Draft EIS notes that the emissions associated with SASA will be quite small compared with Ecology's preliminary estimates of existing airport emissions. It is important to note, however, that SASA emission estimates are based on the scheduled phase-out of older technology aircraft engines. The replacement of older jets and older engines will also reduce emissions from Sea-Tac International Airport, independent of any decisions regarding SASA.

The Port has initiated further study (including field measurements) of air quality issues associated with the airport in coordinating with appropriate resource agencies. Benzene is one of the compounds to be addressed in the studies.

11. See General Response B: Effect of SASA on Airport Operations.

Your comment is noted. No Federal or other statutory requirements were waived as part of the Noise Mediation Agreement. The noise analysis in the EIS includes consideration of all applicable regulations.

protections is permissible.

In addition to reliance on a mediated agreement, the EIS only summarily and speculatively takes into consideration how the increased airplane noise will be dealt with, and that is by reliance upon a hypothetical belief that a "hush facility" might be constructed by the airlines. This measure does not take into consideration the alternative that such a facility isn't mandated and might not be constructed. Reliance on speculative ventures means that there were not alternatives explored for dealing with the noise issue. The EIS readily admits that occasional temperature inversions could cause increased sound levels, but they "are not accounted for in this analysis".

12 But assuming for argument sake that a "hush facility" were to be built, that planes would be of low noise type, that certain maintenance at high runups wouldn't occur, noxious noise would still not be abated. It is not even debatable, even for airport authorities to argue that noise causes health problems. Yet even with this recognition, the EIS fails to take account of nor does it consider the scientific studies concerning the short and long-term effects of noise on stress, educational facilities, and sleep disturbance. Failure to study the effects, especially the long-term effects of noise on the surrounding community and failure to explore mitigating measures and alternatives is a significant deficiency in the EIS. Instead, the EIS projects, "no additional aircraft noise mitigation measures."

13 **The EIS fails to address the issue of fuel exhaust and fuel spillage caused by tha increased taxiing of airplanes to the SASA facility. This serious omission in the EIS and failure to analyze mitigating measures and alternatives is a significant error.**

14 Lastly, the proposed South Aviation Support Area is an illegal use of taxpayer money for wholly private use. It is a public monetary subsidy that neither is authorized nor permissible under Federal or state law. Planning for and preparing sites for hypothetical private airlines to submit bids in the future is a gross misuse of taxpayer monies. There can be only two potential reasons for embarking on this project, neither one being legal. The first scenario is that the Port of Seattle is engaging in a gross speculative enterprise since there is no bid by any airline to locate their maintenance facility in Seattle at the SEATAC airport, nor one contemplated in the future, making planning and designing for such hypothetical facilities a gross mismanagement of funds.

The second scenario is that the Airport Authority has secretly conspired to build the SASA as part of their grand

12. The Port of Seattle is committed to construction of an aircraft runup hush facility if a major maintenance base is established at Sea-Tac Airport (as in Alternatives 2 or 3). Alternative 1, Option 1A, and the No-Action Alternative do not feature a hush facility because these alternatives also do not have a maintenance base.

    The EIS noise analysis appropriately addresses the impacts of the SASA project on the surrounding area. Mitigation appropriate to anticipated impacts is included.

13. The impact of increased emissions is discussed in Section 4.5, Air Quality. The impact of fuel spills is discussed in Section 4.6, Water Quality.

14. Pursuant to Title 53 and Title 14 of the Revised Code of Washington, the Port of Seattle has authority to make proposals of this type. It is fully consistent with Port of Seattle authority and state and federal law. If constructed, SASA would operate in a manner similar to the existing airport.

and confidential scheme to enlarge the SEATAC airport. A plan that is secretly tied to the construction of a third runway. Such a plan is conspiratorially a denial of procedural due process.

The omissions from the EIS are significant errors that are substantial and significant, causally related to the action proposed. The EIS is fatally defective.

Sincerely,

Douglas C. Graves

Doug Graves
Chair, CASE

Luella Gestner

Luella Gestner
Vice Chair CASE

Joan Bell

Joan Bell
Secretary CASE

Loretta Bower

Loretta Bower
Treasurer CASE

Marilyn J. Berger

Marilyn J. Berger
Professor of Law

K. Schvanoff Parker
Co-Chair SAAC

Len Osborn - SAAC

Jeanne Mackie SAAC - Ex. BOARD

Minnie O. Brasher SWKB.

Bell C.A.S.E

Thomas C Rena

Robert

Frank Osborn

4/27/1992

LETTER 7.

MUCKLESHOOT INDIAN TRIBE
FISHERIES DEPARTMENT

39015 AUBURN-ENUMCLAW ROAD - AUBURN, WASHINGTON 98002
(206) 825-7030 - FAX # (206) 825-8027

24 April, 1992

Ms Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, WA
98055-4056

VIA FAX (206) 227-2650

RE: SOUTH AVIATION SUPPORT AREA DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Ms Dalton:

The Fisheries Department of the Muckleshoot Indian Tribe has reviewed the South Aviation Support Area DEIS. The inclusion of a thorough, distinct fisheries resource section with this comprehensive DEIS was most appreciated by the Tribal Fisheries Department. We concur with the laudable goal of the Port to increase the functional benefits of the riparian wetlands, and the fisheries habitat. To ensure that the resources devoted to stream relocation and enhancement maximize benefits, several impacts upon the environment and proposed mitigations require elaboration in the FEIS.

HYDRODYNAMICS

Considerable effort has been expended documenting and detailing the project impacts upon surface water quality and high flows. The reduction in high water flow rates and volumes enabled by the project's mitigation measures will improve fisheries habitat. However, low summer stream flows, with associated high temperatures and low dissolved oxygen content, may limit salmonid populations in Des Moines Creek.

1 Between 77% to 86% of the SASA site runoff will be diverted away from Des Moines Creek and into the Industrial Waste System. Stream relocation and rehabilitation represents an expensive allocation of resources that may be wasted if low summer flows limit stream salmonid productivity either in the relocated sections, or downstream, to levels below that sustainable by the restored physical infrastructure. Therefore, the FEIS should include an expanded analysis of the impacts of diversion upon summer low flow conditions as affecting temperature, flow connectivity between pools, etc. If such analysis indicates adverse impacts will not be limited to the relocated stream section, the stream reaches south of 200th Street should be similarly analyzed. Mitigations measures must be proposed for any predicted adverse impacts.

2 The stormwater analysis, presented in the DEIS, is based upon 24 hour events,

Letter 7 - Muckleshoot Indian Tribe
Fisheries Department

1. Diversion of storm water runoff to the Storm Water Treatment Facility would decrease annual runoff volumes from the SASA site. However, this area would be between 43 and 87 acres, compared to the watershed upstream of the SASA site totaling approximately 2,300 acres. Also, this area would contribute storm water runoff to the Creek only in immediate response to storm events. Bow Lake provides the majority of the surface water contribution to summer low flows through the slow release of water from the 36-inch outlet pipe.

(2) however it rarely rains for only 24 hours at the airport. Thus some of the model assumptions used to calculate the required stormwater detention basin size are invalid. The ability of the stormwater control facilities to attenuate runoff rate and volume should be based upon a 7 day event for the 2, 10 and 25 year storm events. Required basin size and calculated performance should be discussed in the FEIS, and compared with the 24 hour design events for ability to improve salmonid habitat. If a substantial improvement in calculated fish habitat is observed, then basins sized to a 7 day event should be used.

WATER QUALITY

(3) Chemical monitoring of stormwater often gives erroneous estimates of runoff toxicity to aquatic organisms. To ensure that inadequate performance of water quality structures does not limit aquatic community structure, annual three species sensitive life-cycle stage bioassay of runoff shall be conducted. Samples for such testing should be collected 100 feet downstream of all applicable SASA discharge outlets to Des Moines Creek.

Biomonitoring will ensure water quality is not compromised by chemicals occurring below detection limits, unknown additive or synergistic effects, chemical species of unknown toxicity, and initiate data collection on the effects of treatment upon stormwater and runoff toxicity.

STREAM RELOCATION

(4) If the development and mitigation are implemented as presented in the DEIS, the suitability of Des Moines Creek to support salmonids should increase. Alternatives 1 or 2 offer the greatest opportunity to both mitigate project impacts and *restore* lost salmonid productivity. Alternative 3 offers the least opportunities for stream mitigation and restoration. Thus, this development option is not recommended for implementation by the Tribal Fisheries Department.

The DEIS indicates that large boulder or gravel riprap may be used to stabilize portions of the relocated stream likely to experience erosion. Riprap has known adverse impacts upon salmonid habitat. Mitigation measures should be proposed to reduce the adverse impacts of riprap. Additionally, the FEIS should propose and compare the viability of alternative bank stabilization technologies, such as bioengineering, to the proposed riprap.

(5) Diversion of Des Moines Creek from its present course into the reconstructed and relocated stream bed may strand fish utilizing the stream reaches to be diverted. Prior to diversion, fish in the diverted sections should be captured, held, then transferred to the relocated stream sections. The small numbers of fish involved should not appreciably increase bird numbers at the relocated size with associated hazards to aircraft.

MONITORING PROGRAM

(6) **To improve data acquisition, we recommend that the monitoring program last a minimum of eight years. Additionally, as the culvert at 200th Street is not a complete barrier to salmonid migration, we would recommend that salmonid use of the site be monitored. This would provide further evidence of efficacy of the restoration work.**

As this stream restoration project is extensive and will provide a vast quantity of

2. While it is true that rainfall events at Sea-Tac are rarely only 24 hours in duration, using a 24-hour storm distribution is an appropriate method for the design of the Storm Water Management Facility. The following is a brief explanation of how rainfall records and event modeling were used for design.

Twenty-four-hour rainfall totals for the period of precipitation record are ranked by amount from largest to smallest. Similurly, 7-day rainfall totals are compared with other 7-day events. The largest storm event of a chosen duration has a return frequency equal to the period of record. For example, if the largest 24-hour storm event for a 50-year period is 5.00 inches, the average interval (return frequency) between storms equal to or greater than 5.00 inches is 50 years. The intensity of rain during the 24-hour period of the return frequency storm event is called the distribution. In the Northwest, Soil Conservation Service Type 1a distribution is used. Generally speaking, Type 1a distribution rainfall begins gradually, has a large spike of high intensity rain which occurs in the middle of the storm, and then the rainfall rate gradually decreases to the end of the 24-hour period. The pattern for tbe 7-day storm distribution is similar, with the peak occurring on the third day of the storm.

When considering whether the 24-hour storm or the 7-day storm is appropriate for design of the Storm Water Management Facility, three important points must be kept in mind: 1) no 24-hour period within the 7-day distribution has a greater intensity or total rainfall than the same frequency 24-hour storm, 2) the time of concentration of the drainage basin is relatively short, and 3) recovery time of storm water management facility storage volume is moderate. If a drainage basin has a relatively short time of concentration, the peak rainfall of a storm event will be followed closely by peak runoff inflow rates at the storm water pond. In other words, the most intense part of the storm would quickly runoff, collect in the storm water pond, and release into the stream before the next large rain could impact the pond or stream. Longer storm events do not have higher intensity rains, just more rain spread over a longer period.

Initial design of the new pond only considered limiting peak flow rates to existing peak flows for the 2-, 10-, 25- and 100-year, 24-hour storm events. A control structure was designed that meets these criteria. Because the proposed pond has excess capacity available, reduction of existing peak flow rates was considered. The control structure size was reduced to limit flows for the 2-year, 24-hour storm while still providing adequate detention for larger storms. This resulted in higher peak stages in the pond during all storm events. Reduction of the outlet structure size is limited by storage volume available in the pond during larger storm events that could overtop the pond. If the structure were designed to accommodate the 7-day storm event, a larger control structure may be required for smaller frequency storms to release more water from the ponds to accommodate longer storms.

The 100-year, 7-day storm was modeled through the proposed pond for comparison with the 100-year, 24-hour result. Inflow to the pond for the 24-hour storm is 267 cfs, relevant information, we request that the Muckleshoot Tribe receive a copy of the proposed annual mitigation monitoring report.

CONCLUSIONS

Alternatives 1 and 2 offer the best compromise between site development and restoration of Des Moines Creek. If the mitigation measures discussed in the DEIS are adopted, Des Moines Creek should experience an increase in wetland functions and improved fisheries habitat. Implementation of the comments in this letter will ensure mitigation is more effective, restoration is not compromised by adverse water quantity or quality, and assure the protection of the salmonid resource.

Thank you for your attention to these comments. Please direct any questions to me at 825-7030.

Sincerely,

Rod Malcom

Roderick Malcom
Habitat Specialist

cc: Port of Seattle/ Barbara Hinkle
WDF/ Joe Robel

compared to 212 cfs for the 7-day storm. This is because of the lower rainfall intensity during the 7-day storm and the relatively small drainage basin. However, the peak discharge and stage in the pond for the 7-day storm is higher than the 24-hour storm at 212 cfs vs. 156 cfs and 7.7 feet vs. 7.3 feet, respectively. A greater volume of storm water runs off and is stored in the pond during the 7-day storm. However, the peak flow rates are reduced from 267 cfs to 212 cfs, therefore the pond does reduce flows for the 100-year, 7-day storm. We anticipate that flow rates for the 2-year, 7-day storm would be reduced as well.

We recognize that regional development of a watershed increases peak flow rates in rivers and streams, even with on-site detention, due to the cumulative impacts of increased runoff volumes. However, the SASA project site does not increase the volume or rate of storm water runoff to Des Moines Creek since 77% to 86% of the SASA site runoff would go to the Runoff Treatment Facility and piped directly to an outfall in Puget Sound. The Storm Water Management Facility has been designed to replace the flood control functions of the Tyee Pond and provide additional decreases in peak runoff rates.

3. The only SASA-related runoff entering Des Moines Creek would be runoff from roof tops which could enter the proposed detention pond or wetland system. All other SASA runoff would enter the Runoff Treatment Facility system. Considering the very low probability of significant contamination occurring in roof runoff, bioassay monitoring is not necessary.

4. Your comment regarding the use of riprap for the purpose of stream stabilization is noted. The most appropriate bank stabilization technique for Des Moines Creek will be determined as part of the permitting process.

5. Your comment is noted. The Port agrees that an effort to relocate resident fish is an appropriate step. A detailed stream relocation plan, including implementation guidelines, monitoring and contingency plans, will be developed in cooperation with permitting and review entities as part of the permit application process. Please refer to Appendix O for the stream design plans.

6. Monitoring recommendations are noted. Details of the monitoring program will be determined in consultation with appropriate resource agencies. Monitoring reports will be provided to the Muckleshoot Tribe.

LETTER 8.

Washington State Department of Transportation
Duane Berentson
Secretary of Transportation

District 1
15325 Southeast 30th Place
Bellevue, WA 98007-6538

(206) 562-4000

April 24, 1992

4 APR 1992 RECEIVED

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, WA 98055-4056

Seattle-Tacoma International Airport
South Aviation Support Area
DEIS Review Comments

Dear Ms. Dalton:

This letter is in response to the Draft Environmental Impact Statement (DEIS) issued by the Port of Seattle and the Federal Aviation Administration for the proposed South Aviation Support Area (SASA) at Sea-Tac International Airport. Due to growth at the airport and the need for aircraft support facilities, the Port of Seattle has proposed to grade, pave and extend utilities to an area intended for maintenance hangars and related activities. The airlines that lease space in the SASA area would typically be responsible for construction of the actual maintenance structures. Three build alternatives and a no-action alternative are examined in this DEIS.

Our comments regarding the DEIS for the proposed South Aviation Support Area are as follows:

1 1. The Land Use section of the DEIS discusses the relationship of the proposal to local comprehensive plans, Port of Seattle planning documents, and the state's growth management legislation. Not mentioned in the DEIS is the relationship of the proposal to Vision 2020, the adopted regional transportation plan and development strategy.

2 2. The Transportation section of the DEIS keeps referring to the Transportation Study in the Technical Appendices as Appendix L, but is labeled as Appendix K in the List of Appendices. To avoid confusion, this discrepancy should be resolved.

Letter 8 - Washington State Department of Transportation (District 1)

1. Vision 2020 was developed by the Puget Sound Council of Governments (now known as the Puget Sound Regional Council) as a regional growth and transportation strategy for King, Kitsap, Pierce, and Snohomish counties. The plan satisfies federal requirements for transportation planning and meets state requirements under the Growth Management Act. The Puget Sound Regional Council is authorized by Federal Highway and Urban Mass Transit statutes (23 USC 134 and 49 USC 1607) and implementing regulation as the Metropolitan Planning Organization (MPO). As the MPO the Puget Sound Regional Council is required to develop a Regional Transportation Plan (RTP). Vision 2020 has replaced the 1982 RTP (Res. A-90-01). To receive federal funding, projects must be found to be consistent with the RTP.

   The goals of the Vision 2020 plan include the concentration of growth within an identified Urban Growth Area, focuses urban growth in identified growth centers, and encourages all growth to support and connect to multi-modal transportation systems.

   The SASA site is located within the Urban Growth Area identified by the Vision 2020 plan. Adjacent to the site is the City of SeaTac which has been identified in the plan as a candidate Subregional Growth Center and Pedestrian Pocket.

   The build alternatives for the SASA site satisfy the Vision 2020 goal to locate new employment within the Urban Growth Area, and specifically to locate new jobs within a Subregional Center. The SASA proposal would be a significant single land use in the area, but it does not preclude the future development of a diversity of other uses or a smaller scale of development as encouraged within the Subregional Growth areas and the Pedestrian Pockets. All three build alternatives leave areas within the site that could potentially be developed by other uses. Alternative 1, Option 1A, and Alternative 2 would leave areas of the site undeveloped along the eastern edge of the site, allowing future developers land area to further develop the diversity of uses and scale encouraged in the two types of Centers for the City of SeaTac. Land would not be left over in Alternative 3, but the potential for development in the air rights over portions of the site would exist. Development of air rights would also be a potential future use in Alternative 1, Option 1A, and Alternative 2.

2. Your comment is acknowledged. The reference in the Draft EIS was incorrect and has been corrected in the Final EIS.

3
3. To mitigate the traffic impacts of the SASA proposal, background growth and other proposed developments, the DEIS relies upon (1) the completion of projects listed in the city of SeaTac's Six-Year Transportation Improvement Program (1992-1997), (2) construction of the SR 509 Extension, South Access Road and 24th/28th Avenue South corridor, and (3) the year 2003 intersection mitigation measures summarized in Table 4.12-10 of the DEIS. With all these measures in place, a level of service (LOS) "E" or better could be achieved at all intersections in the study area. Should these roadway improvement projects not be constructed, many intersections in the study area would operate at an unacceptable LOS "F". The resulting traffic congestion would violate the concurrency provision of the Growth Management Act and development activity would, therefore, have to be curtailed until the transportation system could be improved. This could affect the build-out of facilities at the SASA as well as other proposed expansion projects at SeaTac International Airport. The Port of Seattle should contribute a proportionate share of the costs to construct the needed roadway improvements identified in this DEIS.

Thank you for the opportunity to comment on the DEIS for the proposed South Aviation Support Area.

If you have any questions concerning these remarks, please contact Mr. David Oberg of my staff at 562-4106.

Sincerely,

DONALD K. NELSON, P.E.
Manager of Planning and
Local Coordination

DAO:em
59/daosaga

3. We understand the provisions of GMA as they apply to concurrency of transportation facilities and development. The projects listed are under study including determination of timing and need. As mentioned in the Mitigation Measures section of the Draft EIS for each alternative, the Port of Seattle would contribute a proportionate share of the costs of future improvements based on the proportion of site-generated traffic volumes to total traffic volumes, or other equitable method.

The comment goes on to state that if these roadway improvements are not constructed in the future, development activity would have to be curtailed until the transportation system could be improved. In this regard, aviation-related uses that are under Port of Seattle control represent only a portion of the total potential traffic generation from the SASA site. The majority of traffic would be generated from commercial development that would not be controlled by the Port of Seattle. The proportion of aviation-related to total PM peak hour traffic generation is less than 1% for Alternative 1, 12% for Alternative 2, and 30% for Alternative 3. Therefore, if the timing of the planned transportation improvements becomes an issue in the future, the traffic impact differences between the aviation-related uses and other commercial development on the SASA site will need to be examined prior to curtailing development activity on the site.

LETTER 9.

SERVING BURIEN SEATAC TUKWILA

Southwest King County Chamber of Commerce

April 23, 1992

APR 1992 RECEIVED

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airport District Office
1601 Lind Avenue SW, Suite 250
Renton, WA 98055-4056

The Southwest King County Chamber of Commerce has taken a position in support of the selection of alternative #2 in the South Aviation Support Area DEIS as the preferred alternative based on the need to support economic development and to equitably accommodate both aviation and commercial space needs over the next 20 year planning horizon.

Based on our findings, however we recommend that the following major areas of concern be addressed by the Federal Aviation Administration prior to passage of the South Aviation Support Area DEIS document.

1 1. Transportation - This DEIS does not list South Access as a planned transportation improvement although it is reflected as a planning criteria. We believe South Access needs to be formally recognized as a committed project and should proceed on a timely basis.

2 2. Property Taxes - This DEIS does not include in the tax base the personal property assessed value associated with the aircraft located in the heavy maintenance hangars (approximately $150 million for five narrow body aircraft)

3 3. Des Moines Creek - This DEIS provides for creek bed enhancement north of south 200th street. We believe such enhancements should be limited to flow and water quality issues. All stream bed enhancements to promote fish propagation should occur south of south 200th street before going north.

4 4. Golf Course - This DEIS reflects discontinuance of the existing golf course but suggests a future 9 hole golf course could be developed. We believe serious effort should be made to ensure that total discontinuance does not occur as such may endanger the viability of even a future golf course.

In conclusion, the Southwest King County Chamber of Commerce recognizes the importance of the South Aviation Support Area and we strongly urge you to carefully consider our comments.

FOR BOARD OF DIRECTORS:

Bill Arthur

Bill Arthur
President

Burien: 15030 8th Avenue SW, Burien, WA 98166
Mailing: P.O. Box 58591, Seattle, WA 98138, (206) 244-3160, (206) 244-5332 (Fax)
Tukwila: 225 Tukwila Pkwy., Seafirst Bank @ Southcenter, Tukwila, WA 98188

Printed on recycled paper.

Letter 9 - Southwest King County Chamber of Commerce

1. The new South Access Roadway to Sea-Tac Airport is not listed as a planned improvement in Table K-5 of the Draft EIS Appendix K; however, this improvement is mentioned in Section 3.4, Coordination with Other Area Proposals, as a major project. Environmental studies for this project have started as part of WSDOT's SR 509 freeway extension and Airport South Access Roadway alternatives study and EIS process. Since this project does not currently appear on the City of SeaTac's Six-Year Transportation Improvement Program or in the WSDOT's Sunshine Report, the project is not formally recognized as a committed project. The project, however, is considered to have a high priority by the Port of Seattle. In this regard, the Port of Seattle will cooperate with WSDOT and the City of SeaTac to ensure that the project planning proceeds in a timely manner.

2. Aircraft temporarily located in the maintenance facility for servicing would not *de facto* be included in the personal property tax base. Rather, the value of these aircraft is included in the appropriate airline's state public service (SPS) property tax assessment determined annually by the State Department of Revenue under RCW 84.12.

3. Your comment is noted.

4. Your comment is noted. It is the Port's intention to maintain operation of all or part of the golf course as long as feasible, given the development schedule.

LETTER 10.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

April 23, 1992

APR 1992
RECEIVED

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton WA 98055-4056

Dear Ms. Dalton:

Thank you for the opportunity to comment on the draft environmental impact statement (DEIS) for the South Aviation Support Area. We reviewed the DEIS and have the following comments.

1 1. Permit-By-Rule -- The DEIS describes the Industrial Waste System (IWS) which is currently operating and indicates that a second IWS may be added. It states that process wastewaters would be discharged to the IWS and that hazardous wastes would not (Page 4-222). It further explains monitoring of wastewaters will occur to ensure hazardous wastes are not discharged (Page 4-225).

Further details regarding this monitoring program would be useful as it is likely that the facility will generate some process wastewaters which designate. Please be aware that facilities which allow designated wastewaters to be treated in a wastewater treatment unit (WWTU) must comply with the "permit-by-rule" provisions (WAC 173-303-802(5)). If a facility which treats designated wastewaters in a WWTU cannot meet the permit-by-rule provision, the facility must submit an application for a dangerous waste permit (WAC 173-303-802(1)).

2 2. Contaminated Soils -- The DEIS indicates that contaminated soils may exist in the proposed SASA. If excavated soils designate as dangerous wastes, they must be managed in accordance with the state dangerous waste regulations.

3 3. Antifreeze Used for De-Icing -- The DEIS notes that wastes which contain a concentration of ethylene glycol greater than 10% are dangerous wastes and would not be discharged to the IWS. Please explain how this de-icing waste would be collected and managed.

4 4. Liquids Managed by the Stormwater Management Facility versus the IWS -- The distinctions between liquids handled by the IWS and the "Stormwater Management Facility" (SMF) were not clear. Section 3 describes the IWS as being a three-celled lagoon system that detains runoff and routes it to a treatment facility. The SMF is described as a system of three ponds which discharges runoff to Des Moines Creek (Page 3-9 and Page 4-223). Page 4-223 also states that the "IWS would receive process waste waters from SASA facility operations and runoff from areas contained within the project area."

Letter 10 - State of Washington Department of Ecology

1. The IWS which serves existing airport hangars and work areas, is designed to accept storm water and incidental low-level concentrations of petroleum products. A new Runoff Treatment Facility, developed for the SASA site, would connect to the existing IWS to convey treated storm water through the existing outfall to Puget Sound.

   The IWS/RTF is not intended to treat dangerous waste. The potential for dangerous waste entering the IWS/RTF is affected by the activities of Port tenants. It is the Port's policy that all Port tenants at Sea-Tac International Airport manage their dangerous waste according to Washington State Dangerous Waste Regulations. Therefore, dangerous wastes are not to enter the IWS/RTF. A memorandum reiterating this policy was sent to all Port tenants on November 7, 1991.

   It is anticipated that facilities developed by SASA users will include controls and protections for the use and recovery of any hazardous or potentially contaminating materials, which they utilize.

   In coordination with the Washington State Department of Ecology, the Port has been re-evaluating the current IWS as part of the NPDES permit procedures.

2. Your comment is noted.

3. Handling of deicing liquids is a topic under active investigation by a variety of agencies and the airline industry at the national, as well as local, level. The use of alternatives to ethylene glycol is a primary consideration. The Port has replaced ethylene glycol with propylene glycol for its airfield deicing. The airlines typically use ethylene glycol for aircraft deicing. Aircraft deicing is most effective when done immediately before departure. For that reason, it is done primarily at the terminal gates, not at maintenance facilities.

4. The Runoff Treatment Facility would be designed to handle all storm water runoff from all paved surfaces that would be used by automobiles or aircraft, including hardstands, taxiways, and parking areas. The runoff would be collected in storm sewers on the site and piped to a two-celled covered pond for detention before it would be routed to the new Storm Water Treatment Facility.

5
5. It appears site runoff is processed through both systems. How is it determined which runoff warrants treatment in a WWTU versus a biofiltration system? (For example, parking lot runoff is described as being run through both systems.)

6
6. We have one additional suggestion regarding wastes handled by both systems. We would again provide greater detail regarding the monitoring program of wastes allowed to enter either the lagoons or ponds of the IWS and SWF systems. A description of the monitoring program will demonstrate that runoff or wastewaters that designate are not allowed to accumulate in unlined surface impoundments.

7. The subject DEIS does not adequately address the collection and treatment of de-icing agents at SeaTac currently in its discussion of Existing Water Quality Treatment (4.6.1.5), nor does it discuss these issues under the Industrial Wastewater Treatment System (4.6.5.1) for the proposed options for the South Aviation Support Area.

7
8. The use of de-icing agents at airports is a recognized source of industrial wastewater at these facilities. The use of ethylene glycol in these de-icing agents presents a serious environmental threat because of the immediate aquatic toxicity presented by this compound prior to its degradation. In addition, our Solid and Hazardous Waste Program has classified waste ethylene glycol as a dangerous waste, which presents a serious regulatory obstacle to its continued use as a de-icing agent.

9. The DEIS for the South Aviation Support Area should, at a minimum, address the concerns of collection and treatment of de-icing agents and explore the options of product substitution (propylene glycol versus ethylene glycol) and also address the need for an upgraded industrial wastewater system that includes secondary biological treatment. Glycols are extremely amenable to secondary treatment systems and upgrading the existing Industrial Wastewater facility at SeaTac to secondary, coupled with the substitution of propylene glycol for ethylene glycol, would be an essential environmental enhancement and necessity.

The remaining SASA impervious areas, principally the rooftops, would be collected and piped to the Storm Water Management Facility (Storm Water Management Facility). Rooftop runoff is generally considered "clean water" and is exempted under King County Surface Water Design Manual (SWDM) requirements, which have been adopted by the City of SeaTac. Routine storm water treatment techniques are not proposed for SASA roof runoff. However, the rooftop runoff would be directed to the water quality cell of the proposed Storm Water Management Facility.

Runoff from the remaining SASA site footprint, consisting of vegetated slopes and retaining walls, would not be collected or treated in either system.

5. Please see the response to Comment 4 of this letter.

6. The new Storm Water Treatment Facility ponds would be lined in accordance with sound engineering principals and permit requirements to minimize leakage. The water quality ponds would be lined if soil conditions indicate that infiltration could lead to groundwater contamination.

7. Your comment is noted. The Port of Seattle and the airlines are aware of these concerns. The Port of Seattle has switched to propylene glycol for all runway, taxiway, and ramp area deicing. The Port is currently evaluating the overall operation of the existing IWS. Handling of de-icing chemicals is a component of that evaluation and will also be considered in the design of the SASA Storm Water Treatment Facility.

If you have any questions on Comments 1-6, please call Ms. Jeannie Summerhays with the Solid and Hazardous Waste Program at (206) 649-7055. For questions on Comments 7-9, please call Mr. Kevin Fitzpatrick with the Water Quality Program at (206) 649-7037.

Sincerely,

M. Vernice Santee

M. Vernice Santee
Environmental Review Section

MVS:
92-1404

cc: Jeannie Summerhays, NWRO
Kevin Fitzpatrick, NWRO
Janet Thompson-Lee, NWRO

LETTER 11.

CITY OF FEDERAL WAY 33530 1ST WAY SOUTH • FEDERAL WAY, WASHINGTON 98003

April 24, 1992

Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, WA 98055-4056

RE: *PORT OF SEATTLE - SOUTH AVIATION SUPPORT AREA; DRAFT ENVIRONMENTAL IMPACT STATEMENT*

Dear Ms. Dalton:

Thank you for the opportunity to review and comment on the South Aviation Support Area (SASA) draft environmental impact statement (DEIS). Overall, the City supports efforts to improve efficiency and safety of existing aircraft operations; however, the City does not support any system enhancements or improvements that increase the current operating capacity of Seattle-Tacoma International Airport (SeaTac).

The following comments comprise the City's response on the technical analysis provided in the DEIS. For organization purposes, I have outlined our comments on the DEIS into three categories including: 1) Introduction; 2) Procedural Issues; and, 3) Conclusions.

I. INTRODUCTION

As we previously commented on the Puget Sound Regional Council's Flight Plan Project DEIS, expansion of SeaTac will have serious negative impact on the City of Federal Way and surrounding communities. Expansion of the airport and increased aircraft operations will reduce our property values, increase community uncertainty, disrupt community planning, reduce private investment, and seriously degrade our quality of life.

When considered by itself, the SASA project will not have a direct adverse impact on the City of Federal Way; however this project is currently only one of several projects related to expansion of SeaTac. Collectively, these projects will affect regional commercial air service for the next 3o or more years, as they are expected to increase the capacity of SeaTac from 380,000 operations per year to as many as 480,000 operations per year. Together these projects will have a direct and significant impact on Federal Way, and this end result is unacceptable to the City. To address this concern, our comments are primarily focused on procedural issues related to the overall master planned expansion of the airport and related service facilities.

II. PROCEDURAL ISSUES

There is currently no less than eight known actions related to expansion of SeaTac. These actions will be or have been recently made available for public review and comment. Actions of which we are presently aware include:

1. Puget Sound Air Transportation Committee (PSATC) Flight Plan Project Report
2. Puget Sound Regional Council (PSRC) Flight Plan Project DEIS
3. Federal Aviation Administration (FAA) Microwave Landing System Demonstration Program (MLS) Draft Environmental Assessment (DEA)
4. FAA Four Post Plan
5. Port of Seattle (POS) Noise Exposure Map Update: 1991
6. POS South Aviation Support Area (SASA) DEIS
7. POS Terminal Development Plan Study (pg. 2-3, SASA DEIS)
8. POS Proposed Safety Area Extension of Runway 34R (pg. 3-8, SASA DEIS)

1

Each of three projects is an "interdependent part of a larger proposal" related to expansion of SeaTac. However there has been no single point of environmental analysis or process for review and comment. This fragmentation of the environmental review process is a violation of both state and federal environmental law and makes review of the overall SeaTac expansion project and cumulative impacts resulting from three projects impossible.

Fragmentation of there projects is also misleading. Taken individually, environmental analysis of various projects leads the public to believe that there will be no increase in the number of aircraft operations at SeaTac. The following are two examples of this misleading fragmented analysis.

As indicated in the MLS DEA, the purpose of the MLS is to "increase the efficiency of airport operations" (pg. 2.1, MLS DEA). The DEA also indicates that "the number of aircraft operations will not increase due to this project" (pg. 5.19, MLS DEA), and further that "this project will not increase or decrease the air traffic at SEA" (pg. 5.5, MLS DEA).

These conclusions conflict with operational activity analysis provided in the MLS DEA. Page 5.5 of the DEA forecasts that there will be 382,600 operations in 1993 and 407,000 operations in 1998. As indicated in the PSRC's Flight Plan Project DEIS, SeaTac has a current capacity of 380,000 aircraft operations. Therefore, without significant system improvements, SeaTac does not have sufficient capacity to handle aircraft operations which the DEA forecasts based

Letter 11 - City of Federal Way

1. See General Response B: Effect of SASA on Airport Operations, and General Response C: Separation of SASA from Other Airport Programs. The operational forecasts used in the SASA analysis are consistent with the Flight Plan project forecasts. Airport capacity values are based on corresponding delay factors. Airport capacity is determined according to what is considered a reasonably acceptable level of delay. However, airports can typically accommodate an increased number of flights with a resulting increase in operational delays. The numbers used for future operations in the SASA analysis can be accommodated at the airport with the existing runways, albeit with increased delays. The SASA project is not dependent on the other area projects cited and is appropriately addressed in the EIS.

Secondly, the SASA DEIS indicates that the SASA project will move existing maintenance facilities to make room for "increasing the number of international gates at the south end of the main terminal" (pg. 3-1, SASA DEIS). The DEIS indicates that the project is proposed as a "response to current and forecasted operations of the airport" (pg. 3-1, SASA DEIS).

The DEIS concludes that "it is important to note that the establishment of a maintenance facility at SeaTac International Airport will not increase the number of flights" (pg. 3-1, SASA DEIS). This conclusion is based on a projection of 410,000 aircraft operations by the year 2000 (pg. 2-1, SASA DEIS).

Again, this conclusion conflicts with operational activity analysis provided in the PSRC's Flight Plan Project DEIS, which indicates that SeaTac has a current capacity of 380,000 aircraft operations. Without significant system improvements, SeaTac does not have sufficient capacity to handle aircraft operations which the DEIS forecasts based on the proposed SASA project. There is no mention of the cumulative compounding impact of increased aircraft operations resulting from implementation of both the MLS and SASA projects.

1

Both the MLS and SASA projects do, in fact, appear to result in a net increase in aircraft operations. This could only occur if the proposed projects result in more efficient airport operations. considering that the projected number of operations exceeds current capacity. To conclude that neither of three projects will increase the number of aircraft operations is misleading and incorrect.

The purpose of these examples is to demonstrate the inconsistent information being provided to the public regarding these fragmented projects. Also, it is evident that this fragmented analysis does not allow for a full disclosure and consideration of the cumulative impacts resulting from these projects. Collectively the purpose of three fragmented projects is to provide space, improved aircraft operation safety and efficiency, and opportunity for expansion of existing aircraft operations. This end result is not acceptable to the City of Federal Way.

As defined by the State Environmental Policy Act (SEPA) Rules, these activities are clearly "interdependent parts of a larger proposal and depend on the larger proposal as their justification or for their implementation" (WAC 197-11-060(3)(b)(ii)). The total SeaTac proposal must be considered and, at a minimum, must include each of the projects listed above.

The SEPA Rules, which will apply to the POS prior to implementing the SASA project, do not allow fragmentation of proposals that must be considered as a single action (WAC 197-110960(5)(d)). Included in this prohibition are actions that "would merely divide a larger system into exempted fragments or avoid discussion of cumulative impacts" (WAC 197-11-060(5)(d)(ii).

III. CONCLUSIONS

The DEIS provides inadequate analysis of the relationship between the SASA project and other projects related to expansion of SeaTac. The FAA, POS and PSRC have arbitrarily and improperly divided a larger planned airport expansion proposal into fragmented environmental review. The entire proposal for expansion of SeaTac must be considered at one time in one environmental review.

Analysis and conclusions of the SASA DEIS are contradictory and conflict with operational and capacity analysis provided in the PSRC's Flight Plan Project DEIS and the FAA's MLS DEA. Based on our assessment of each of these environmental analysis, it is apparent that implementation of three projects will increase aircraft operations at SeaTac.

1

Implementation of the overall SeaTac expansion project will result in increased adverse environmental impact to the Federal Way community. Therefore, an analysis of the relationship between the SASA project, other airport expansion projects, increased aircraft operations, and potential adverse environmental impacts on the city of Federal Way must be disclosed and evaluated in the DEIS.

Last, each of these air transportation issues are of state-wide significance end concern. In recognition of these concerns, the Washington State Legislature established an air transportation committee to address air transportation issues. The SASA project, in conjunction with other SeaTac airport expansion projects, is a project which should be considered by the committee.

If you have any questions regarding three comments, please contact Greg Fewins, Senior Environmental Planner, at 661-4108.

Sincerely,

J. Brent McFall
City Manager

c: Federal Way City Council
Kenneth E. Nyberg, Assistant City Manager/Director of Community Development
Carolyn Lake, Acting City Attorney
Greg Fewins, Senior Environmental Planner

jbm[illegible]
[illegible].wp

LETTER 12.

METRO
Municipality of Metropolitan Seattle
Exchange Building • 821 Second Ave. • Seattle, WA 98104-1598 • (206) 684-2100

April 23, 1992

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue S.W.
Renton, Washington 98055-4056

RECEIVED APR 1992

Draft Environmental Impact Statement:
Port of Seattle - South Aviation Support Area

Dear Ms. Dalton:

Metro staff has reviewed this proposal and anticipates no significant impacts to water quality or to Metro's wastewater facilities. However, we have the following comments regarding public transportation services.

Metro staff recommends that the proposed project include a Transportation Management Plan that includes the following actions:

1

- Appoint a Transportation Coordinator to promote and coordinate the use of public transportation and high occupancy vehicles.
- Design and implement a guaranteed ride home program.
- Provide a financial subsidy for employees who use HOV.
- Display site-appropriate transit and ridesharing information in prominent public locations.
- Develop a site plan that shows how access to transit and ridesharing have been considered.
- Provide lighted hard-surfaced sidewalks or pedestrian pathways to facilitate safe and convenient access to transit or rideshare service locations.
- Provide secure bicycle parking.
- Conduct transportation surveys/monitoring.
- Design and implement a parking management program.
- Provide preferential parking for high occupancy vehicles.

Letter 12 - Municipality of Metropolitan Seattle

1. As discussed in Section 4.12, Transportation, a transportation management program (TMP) will be developed for all of the employment-based uses on the SASA site. The TMP will be developed to comply with the statewide TDM legislation that passed in 1991. This legislation establishes goals for employers with over 100 employees to reduce commuting by single occupant vehicle (SOV). SOV trips must be reduced by 15% in 1995, 25% in 1997, and 35 % in 1999.

   The TDM legislation does not, however, specify the programs that would need to be implemented in order to achieve the SOV trip-reduction goals. This was done to maintain flexibility for each employer to develop a TMP tailored to its specific site and employee characteristics. Therefore, while most of the individual TMP elements listed in this comment will likely be part of the TMP, some of the individual elements may not be included in the TMP initially. The Port of Seattle would work with the City of SeaTac and Metro to establish the initial list of TMP elements to be implemented.

Sarah Dalton
April 23, 1992
Page Two

1
- Implement parking charges for single occupancy vehicles with the revenues generated being utilize to support measures utilized to encourage employee use of high-occupancy vehicles.

- Establish a performance goal for high occupancy vehicle use.

For assistance in developing and writing the transportation management plan, contact Bob Flor at the Metro Market Development office at 684-1161

2 The discussion of parking requirements presented in the DEIS is confusing. The numbers of required parking spaces cited for Alternatives 1 through 3 on pages 3-10, 3-15, and 3-19 differs significantly from the estimates of parking demand for the alternatives in chapter 4, and the relationship of the two sets of figures is not clear. For reasons that are not apparent, the two sets of figures seem to be inversely related.

3 We recommend that all of tha alternatives under consideration incorporate improved pedestrian access between the site and Pacific Highway South.

4 Discussion of the Regional Transit Project should be updated to reflect the fact that a vote is now expected in fall 1993 instead of November 1992. Also the vote is expected to focus on a tax increase rather than a bond measure.

Thank you for the opportunity to review and comment.

Sincerely,

Paul D. Leland

Paul D. Leland, Environmental Planner
Environmental Compliance and
Right-of-Way and Property Division

PL:ymg1332

2. The parking numbers shown in Section 4.12, Transportation, include the total parking demand that could be expected by development on the entire site, including office development, retail, and hotel use. The numbers do not include parking that would be necessary for the future aviation development proposed in Alternatives 2 and 3. the amount of development is based on assumptions discussed for the No-Action alternative. The number of parking stalls cited in Section 3.3, Alternatives Selected for Further Study, includes only those stalls necessary for aviation-related parking, specific to the SASA proposal. Table 6-3 lists, for each alternative, the gross square footages of the areas that would require parking.

Table 6-3. Total gross square feet and required parking.

		Alternatives			
Buildings	Program[1]	Alt. 1	Option 1a	Alt. 2	Alt. 3
Line Maintenance					
NW Hangar	75,525	75,525	75,525	75,525	75,525
Shop	57,000	57,000	57,000	57,000	57,000
Delta Hangar	75,525	75,525	75,525	75,525	75,525
Shop	34,200	34,200	34,200	34,200	34,200
Alaska Hangar	122,000	122,000	122,000	122,000	122,000
Shop	36,400	36,400	36,400	36,400	36,400
Base Maintenance					
Alaska Base	164,500			164,500	164,500
Shop	231,000			231,000	231,000
Future Base Maintenance					
Hangar				151,050	136,320
Shop				91,200	133,400
Future Hangar		151,050			136,300
Shop		91,200			92,800
Total GSF		642,900	400,650	1,038,400	1,294,970
Parking Required[2]					
lower range[3]		643	401	1,038	1,295
upper range[4]		836	521	1,350	1,683
Shown in Figures 3.3-1 through 3.3-4		801	631	1,301	1,554

[1] Program requirements are from TRA, Ltd., 11/4/91.
[2] Calculations for parking amounts are from Appendix K, SASA Draft EIS, Transpo, 3/92, and King County Code requirements.
[3] 1 stall per 1,000 gross square feet.
[4] 1.3 stalls per 1,000 gross square feet.

3. Pedestrian access between the site and SR 99/International Boulevard would be provided at South 200th Street and South 192nd Street at the minimum. An additional pedestrian access connection may be desirable between South 200th Street and South 192nd Street as commercial development proceeds in the area. The City of SeaTac is currently considering a pedestrian connection between 28th Avenue South and International Boulevard in the vicinity of South 196th Street. This pedestrian corridor would connect to the planned pedestrian overpass of International Boulevard at Angle Lake Park that is listed as a planned project in the City of SeaTac's Six-Year Transportation Improvement Program.

4. Your comment is noted.

LETTER 13.

PUGET SOUND AIR POLLUTION CONTROL AGENCY
KING COUNTY ▲ KITSAP COUNTY ▲ PIERCE COUNTY ▲ SNOHOMISH COUNTY

April 24, 1992

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue Southwest
Renton, Washington 98055-4056

APR 1992 RECEIVED

Dear Ms. Dalton:

South Aviation Support Area DEIS

In response to your request for comments on the Port of Seattle South Aviation Support Area Draft Environmental Impact Statement, we are submitting the following air quality considerations.

Aircraft Emissions -

1 It is stated on page 4-60 that "the exact composition of the aircraft hydrocarbon emissions and possible toxicity has not been studied." We suggest that the Port of Seattle contact aircraft and jet engine manufacturers, the U.S. Environmental Protection Agency, and Federal Aviation Administration to verify this conclusion.

Further, we recommend that all emissions associated with aircraft taxiing and engine run-ups be included in the modeling being performed for the Flight Plan Project EIS.

Maintenance Facility Emissions -

2 It is stated on page 4-63 that "it is impossible to quantify the emissions at this time" and on page 4-66 that "the emission rate is expected to be very small, and would be offset by reduced line maintenance at SeaTac International Airport."

Regardless of the actual amount emitted, a Notice of Construction permit is required by this Agency *prior* to the installation of any air pollution control equipment or air pollution generating equipment.

Automobile Traffic Emissions -

3 We recommend that such dispersion modeling be performed in accordance with the U.S. Environmental Protection Agency's "Guideline for Modeling Carbon Monoxide From Roadway Intersections (Oct. 89)." This document specifies that receptors (i.e. places where concentrations are calculated) be located "no closer than 10 meters to the cross street" and an urban background carbon monoxide concentration of 5 parts per million.

Letter 13 - Puget Sound Air Pollution Control Agency

1. In response to PSAPCA's comment, TRC discussed the issue with PSAPCA staff and obtained a 1983 study of hydrocarbon emissions from two jet aircraft engine types. This in-depth study provides better review of hydrocarbon speciation than is available in the EPA literature. But while it is a substantial improvement, it does not help forecast emissions expected from jet engines in 2003.

   The Port has initiated further study of air quality issues associated with the airport in coordination with appropriate resource agencies, including PSAPCA.

   Hydrocarbon types, emissions, and ambient concentrations are being investigated.

   The recommendation that emissions associated with aircraft taxiing and engine run-ups be evaluated in the Flight Plan Project EISs is noted.

2. Your comment is noted. Appropriate permits will be applied for.

3. In response to this comment, the air quality analysis of traffic conditions in the project area was revised. Receptors were moved to a position 10 meters from the cross street and the background concentration was revised to 5 ppm. Please see Table 4.5-2 in the Final EIS for the revised results. Additional discussion of modeling assumptions has been included in Section 4.5.

3 Given that the analysis in this DEIS included a background of only 2 parts per million, it is conceivable that potential problems might have been identified at the intersections of South 216th Street/Marine View Drive and South 188th Street/International Boulevard.

Conformity -

4 A determination on whether project each as this must conform with the State Implementation Plan is expected this summer through a joint rule making process by the Washington State Departments of Transportation and Ecology.

Thank you for the opportunity to comment.

Sincerely,

Gerald S. Pade

Gerald S. Pade
Air Pollution Engineer

4. Your comment is noted.

LETTER 14.

CITY OF NORMANDY PARK
801 SW 174TH STREET NORMANDY PARK, WA 98166 TELEPHONE (206) 248-7603

APR 1992
RECEIVED

April 22, 1992

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, Washington 98055-4056

Dear Ms. Dalton:

Thank you for allowing the City of Normandy Park to comment on the Draft Environmental Impact Statement (DEIS) for the South Aviation Support Area (SASA), to be located at Seattle-Tacoma International Airport.

In general, the City of Normandy Park is opposed to any project that will allow for increased air traffic capacity at Sea-Tac Airport. We have found numerous deficiencies in the DEIS and it's relationship to other projects proposed by the Port of Seattle.

1

In 1985 the Port of Seattle developed a Sea-Tac Master Plan Update. That master plan specifically proposed development of new maintenance facilities in the southwestern portion of the airport. The SASA proposal, with a location in the southeastern portion of the airport, is inconsistent with the 1985 master plan.

Allowing the availability of larger and relocated maintenance facilities, it can be interpreted that SASA is a precursor to the expansion of current passenger terminals. With the relocation of existing maintenance facilities, it is a logical assumption that the terminals could be expanded to handle an increase in airport capacity. No comment was made on the future usage of the current maintenance facilities or their relationship to terminal expansion.

In proposing a relocation of the current aircraft maintenance areas, the City of Normandy Park has concluded that SASA is a direct element of air transportation capacity issues facing Sea-Tac Airport. By reviewing the SASA project in conjunction with other recent Port of Seattle proposals, it can be seen that SASA is being considered with an overall master plan of the airport in mind. Why has no updated master plan been developed and if it has, why was it not made public?

The SASA project and other recent proposals made by the Port of Seattle are significantly inconsistent with the 1985 Master Plan. It is now essential for the Port to develop a revised master plan

Letter 14 - City of Normandy Park

1. Please see General Response A: Siting of SASA at the Airport, General Response E: Airport Planning Context for SASA, and additional text in Section 3.4.13 of this EIS.

of airport expansion. An updated master plan will allow the public to view how all Port proposals will impact surrounding communities in a comprehensive manner, instead of the current piecemeal approach.

1 The City of Normandy Park strongly believes because there is such an identifiable relationship between SASA and several other Port of Seattle actions, it is imperative that SASA be consistent with and developed as an element of a comprehensive airport expansion proposal.

Thank you again for the opportunity to comment on this proposal. The City of Normandy Park is very concerned with the potential expansion of Sea-Tac Airport because of the impact on quality of life issues important to our City. We look forward to the response to our comments and concerns.

Respectfully Submitted,

Dale J. Gredler
Director of Planning

cc: City Manager
file

LETTER 15.

Charles E. Higbee, M.D.
10733 Glen Acres Drive South
Glen Acres
Seattle, WA 98168

24 April 1992

APR 1992 RECEIVED

Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
Suite 250,1601 Lind Ave. S.W.
Renton, WA 98055-4056

Sarah Dalton:

The noise and air polution have been getting steadily worse over the last nine months as the number of flights increases. There is no "quiet" jet, as anyone living in the Sea-Tac corridor will testify. It is unconscionable for the Port of Seattle to put the financial interests of businesses associated with Sea-Tac before the welfare of the thousands of residents living in the area. The measures being pushed by the Port are at best "stop-gap" ones that will only add to the already air and surface congestion which exhists. A cogent long range plan would be to combine the use of McCord Airforce Base with a rapid transit system. The 65 LDN measurement is a farce as those of us who are impacted by the noise appreciate; I understand that the ground noise and the international flights are omitted from the computation-a gross omission.

1

2

I live in a townhouse which has only two exposed sides, but even this does not keep the noise vibrations from jarring and rattling of the structure and our nerves.

Respectfully submitted

Charles E. Higbee, MD

Charles E. Higbee, M.D. (member C.A.S.E.)

Letter 15 - Charles E. Higbee, M.D.

1. Your comment is noted. The Flight Plan project studied long-range planning for regional needs, including consideration of McChord Air Force Base.

2. The United States Environmental Protection Agency recognizes the Ldn metric as appropriate for assessing impacts where the noise environment is characterized by relatively repetitive day-to-day behavior. To account for day-to-day and some seasonal variations it has been found useful to measure environmental noise in terms of the long-term yearly average of the daily levels. Ldn 65 is the level set under FAA procedures for determining environmental impacts and residential land use compatibility.

   Aircraft taxiing and run-ups, as well as international flights, are considered in the noise analysis.

LETTER 16.

J. RICHARD ARAMBURU
ATTORNEY AT LAW
SUITE 209, COLLEGE CLUB BUILDING
505 MADISON STREET
SEATTLE, WASHINGTON 98104
(206) 625-9515

J. RICHARD ARAMBURU
JEFFREY M. EUSTIS

RECEIVED APR 1992

April 27, 1992

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue S.W.
Renton, WA 98055-4056

Ms. Barbara Hinkle
Port of Seattle
P.O. Box 1209
Seattle, WA 98111

Re: Draft Environmental Impact Statement, South Aviation Support Area, Sea-Tac Airport

Dear Ms. Dalton and Ms. Hinkle:

This office represents the cities of Des Moines and Normandy Park, which are located adjacent to and are affected by the foregoing proposed action. The cities offer the following comments on the subject document, to be referred to herein as the "DEIS." We will refer to the subject project as the "SASA project.

We find numerous deficiencies in the DEIS especially relating to the scope and nature of the action proposed and consideration of cumulative impacts and alternatives. Our comments are found below.

1 At the outset, we note that the DEIS is identified as "submitted for review pursuant to" the terms of the National Environmental Policy Act in consideration of impacts associated with federal actions. However, it is obvious that there are significant state and local actions involved with the proposal as identified on pages 2-4 through 2-6 of the document. In fact, this is an action that is initiated by the Port of Seattle, a Washington state agency. Because of this, the Port is required to comply with the terms of the State Environmental Policy Act, RCW ch. 43.21C. As the SASA proposal is plainly an action and a proposal under the terms of the SEPA rules, compliance with SEPA procedures is required for this action. See WAC 197-11-055 and -060. The Port is accordingly required to comply with the terms of SEPA in preparation of the draft

Letter 16 - J. Richard Aramburu

1. Because both federal and local/state level decisions are required by this project, the FAA and the Port of Seattle have acted as joint lead agencies in the preparation of this document. As discussed in Section 2.3.1, the Federal Aviation Administration will be making decisions regarding the proposal. These decisions include whether to fund part of the proposal through Federal grant-in-aid funds and final approval of a revised airport layout plan.

These federal actions required that this EIS be prepared under the guidelines of the National Environmental Policy Act. However, it is recognized that the State Environmental Policy Act will also have to be satisfied in order for the Port of Seattle to take action on the proposal. The Draft EIS followed several procedures not required under NEPA including the following: publication of pertinent dates in the SEPA Register, a public scoping meeting, and a public hearing to gather comments on the Draft EIS.

After the completion of the Final EIS, the Port of Seattle will adopt the NEPA EIS under the provisions of WAC 197-11-600 and -610.

environmental impact for the subject proposal. See WAC 197-11-400 to -460.

Of the issues raised by the current DEIS, the most serious is whether the current document inappropriately piecemeals an overall project. The subject DEIS deals only with the proposal of the Port "to prepare an area for maintenance hangers and related activities." DEIS, p.3-1. However, the need and justification for the project is made clear on page 2-1, where it is indicated that:

> This increase in air passengers is putting pressure on the passenger terminal. While concourse and garage construction projects are already underway, more improvements are necessary, especially for international visitors. The proposed solution includes increasing the number of international gates at the south end of the main terminal. . . . .This construction would require the relocation of some or all of the existing line maintenance facilities used by Northwest, Delta and Alaska airlines. These type of facilities need direct access to the airfield operating area.

2 Despite the fact that the proposal here is directly a product of the need for more terminal space, no analysis of that action is considered in the SASA DEIS. Instead the statement says:

> Once designed, the terminal development will be the subject of later environmental review.

DEIS, page 2-3.

We consider the failure to include the impacts of the terminal facility with the SASA proposal as inappropriately piecemealing what should be a single environmental review. Under the terms of the SEPA rules:

> Proposals for parts of proposals that are related to each other closely enough to be, in effect, a single course of action shall be evaluated in the same environmental document. Proposals or parts of proposals which are closely related, and they shall be discussed in the same environmental document if they:
> (i) Cannot or will not proceed unless the other proposals (or parts of proposals) are implemented simultaneously with them; or
> (ii) Are interdependent parts of a larger proposal and

2. Please see General Response A: Siting of SASA at the Airport, General Response C: Separation of SASA from other Airport Programs, and General Response E: Airport Planning Context for SASA. Additional discussion of potential terminal improvements has been added to Sections 3.4 and 4.3.2.6.

> depend on the larger proposal as their justification or for their implementation.

WAC 197-11-060(3)(b).

While "phased review" may be used under certain circumstances, the current proposal does not qualify for that procedure. Under WAC 197-11-060(5) phased review is not appropriate when:

> (ii) It would merely divide a larger system into exempted fragments or avoid discussion of cumulative impacts; or
> (iii) It would segment and avoid present consideration of proposals and their impacts that are required to be evaluated in a single environmental document under 197-11-060(3)(b) or 197-111-305(1); however, the level of detail and the type of environmental review may vary with the nature and timing of proposals and their component parts.

2 **Here it is evident that the justification for the present proposal is as a precursor to additional terminal space.**

Nor is this the case where the future activity is so vague that it cannot now be analyzed presently. The terminal expansion proposal is a part of a 1985 Master Plan Update that has not been the subject of environmental review, but is identified in this document. A look at the 1985 Master plan shows the extent of new terminal development , including detail as to the number of new gates, the square footage of the additional terminal area and other details. Since this is the first stage in the development and implementation of that proposal, compliance with both SEPA and NEPA must occur at this time.

In fact there are other activities that are presently ongoing that also add facilities and improvements that will modify airport facilities. First, there is a proposal, also sponsored in part by the Port, to expand the airport capacity by adding a new third runway at the western edge of the airport over the current location of 12th Avenue South. That proposal is also significantly related to the SASA proposal and expansion of terminal facilities to the south. That proposal will not only allow a significant increase in airplane traffic and bring with it an increase in passenger traffic. That proposal will plainly hasten the need to expand terminal facilities.

Secondly, the location of the third runway will also utilize an area in the south western portion of the airport which is currently unused, except for West Ramps 5 and 6 and the Weyerhaeuser corporate hanger. Under the 1985 Master Plan discussed in the DEIS as the planning justification for the SASA project, the area in the southwestern part of the airport was designated as areas for "air cargo, maintenance, and airfield support." See 1985 Master Plan, on map following page 6. In fact while the 1985 Master Plan discussed the need to possibly relocate "aircraft maintenance and hangar facilities," the location for such facilities was specified as follows:

> The land area requirement for airline maintenance and hangar facilities may be met on vacant sites in the northeast cargo area and on the west side of the airfield between the Weyerhaeuser hanger and West Ramp 6.

1985 Master Plan, page 5-9. This is the area shown on the Master Plan Map. Since the third runway will conflict with the Master Plan and remove alternative areas for maintenance facilities, it is incumbent on the Port to consider each of these projects together. It is also essential that the port consider the relocation of maintenance facilities to the areas specified in the 1985 Master Plan as an alternative to the proposed location in the SASA DEIS.

2

In addition, the Port and FAA have under consideration a proposal to install a microwave landing system at the airport. This proposal has been the subject of a recent environmental assessment by the FAA. Comment on that proposal was provided by the Regional Commission on Airport Affairs (RCAA) of which both Normandy Park and Des Moines are members. Since the purpose of that facility is to increase the number of operations at the airport to accommodate more passengers, we believe that facility must also be considered in the same environmental review as the current proposal.

In considering these proposals, we note that the proposals are closely related in time as well. The Comments for the flight Plan DEIS were due March 23, 1992, the comments of the MLS environmental assessment March 6, 1992 and the current comments, April 27, 1992. This certainly supports the consolidation of all of these impacts in one overall environmental review even if such consolidation was not otherwise required.

The draft environmental impact statement must be revised to

(2) include all aspects of airport expansion and enhancement , including the new terminal facilities, the third runway and the MLS proposal. Only in this manner can the total impacts and available alternatives be considered in a comprehensive manner as required by both NEPA and SEPA.

In addition to the general comments found above, we have the following comment on specific issues in the DEIS.

(3) 1. At page 3-3, the DEIS dismisses the west side of the airport as a location for the aircraft maintenance area:

> because, operationally, locating such facilities on the Airport"s west side would increase aircraft congestion and delays. Aircraft would have to move across both runways, which could occur only during gaps in flight operations, or would result in flight arrival or departure delays.

This is a curious revelation given that the 1985 Master Plan (as discussed above) placed these facilities in that location. It is further curious given the fact that the west side of the airport is now proposed for a third runway, which will create many times the traffic crossing the two current runways for any maintenance facilities. The west side of the airport must remain as an alternative to be thoroughly reviewed in this DEIS.

(4) 2. Also at page 3-3 there is discussed that:

> The limited remaining space in the northeastern portion is planned for the consolidation of air cargo-related uses to facilitate cargo interchange.

What is the nature of such plans? Have they been the subject of environmental review?

(5) 3. At pages 3-8 and 3-23, there is discussion of a proposed safety area extension of Runway 34R. What is the need for such safety area extension? Does the current runway violate FAA standards for such safety areas? Again, all proposed projects in the area of the airfield should be combined for environmental review.

(6) 4. The section of the DEIS dealing with "coordination with other area proposals" (Section 3.4) fails to list any of the projects which are currently ongoing at the airport. These other projects should include all the ones mentioned above including the third runway, the MLS proposal and terminal

3. Please see General Response A: Siting of SASA at the Airport

4. See General Response A: Siting of SASA at the Airport. No specific air cargo facility proposals are currently under review.

5. The existing runway/safety area is acceptable. The FAA has requested that the Port improve and increase the safety area and the Port is evaluating the best way to respond to that request. Alternatives under discussion include combinations of physical extensions to either or both ends of existing safety areas north and south of the east runway and reductions in declared runway length.

6. See General Response C: Separation of SASA from other Airport Programs.

facilities expansion.

7 5. At page 3-25, the DEIS rejects any consideration of extensive commercial development of the SASA area. We note that the Flight Plan DEIS has indicated that there is significant demand for new commercial and hotel activity in the vicinity of the airport. See Working Paper 8, page 3, where from 1.4 to 2.3 million square feet of new office space and as much as almost 11,000 new hotel rooms are expected to be generated by airport expansion. Given these demands, the DEIS must consider the potential of commercial development on the site and the consistency with other goals and plans.

8 Another alternative that must be considered in the deletion of the maintenance base entirely and the possible reconfiguration of the line maintenance facilities within existing areas on the south part of the existing airfield. The alternative of some consolidation of maintenance facilities and some new terminal facilities should be considered. The DEIS should identify the number of new gates required and the amount of new terminal space that is necessary for various growth scenarios.

9 6. The representation that "there would be no significant impact to the surrounding land uses if the SASA site were put into use as proposed" at page 4-10, seems obviously incorrect. First, the dedication of this area to aircraft maintenance means that other uses are now precluded. Given the demand for commercial, hotel and other uses that has been identified, the implementation of the SASA proposal will obviously push such other uses to different locations causing new impacts. The type, scope and extent of such impacts must be considered in this environmental process.

Secondly, the SASA proposal involves the establishment of a heavy industrial use in an area that presently is limited to much less intensive uses. It will also place such uses adjacent to commercial and hotel uses to the east. The noise and other impacts of the SASA proposal on adjacent property must be considered.

10 7. At page 4-15 it is indicated that there has been a significant drop in the assessed value of state public service properties in the City of Sea-Tac. What has been the cause of such drop in value? What property has been the subject of the sharp (17%) drop in assessed value?

8. At page 4-19, there is discussion of the methodology for

7. The EIS does not reject commercial development. While the exact nature of commercial development is speculative, interaction of such potential development with SASA is considered in the appropriate sections of the EIS (e.g. economics, transportation, etc.) for all of the alternatives. See the description of alternatives in the EIS and General Response D: Commercial Development Assumptions.

8. Previous and current planning studies referenced in the EIS identify the future need for aircraft gates and other terminal facilities as requiring relocation of all of the existing line maintenance facilities now at the south end of the airport. This relocation will he necessary with the future passenger flows projected for the current runway system, regardless of decisions on additional airfield facilities. See also General Response A: Siting of SASA at the Airport.

9. Please see General Response D: Commercial Development Assumptions. Indirect impacts from SASA employment could stimulate demand for services (food, recreation, etc.) in the area. This demand would be directed to existing businesses in the vicinity. Excess demand, beyond what can be met on site or by existing businesses, would have an indirect impact on surrounding properties, particularly under-utilized property that is susceptible to redevelopment. Development for public services that would be generated by the increased employment is described in Section 4.17, Public Services and Utilities. Please also see the response to Letter 19, Comment 7.

Noise and other impacts are discussed in the relevant sections of the EIS. The construction of the large wall along the eastern edge of the site would also provide a visual and functional buffer between the SASA facility and any future land uses. Note that currently some hangars and maintenance facilities at Sea-Tac International Airport are located across the street from commercial uses.

10. The drop in assessed values referred to is due to the decrease in the market value of several airlines operating out of Sea-Tac Airport. Under RCW 84.12 the Department of Revenue annually assesses the total market value of all airlines doing business in Washington, and prorates the State's share based on the ratio of flights and other operations in-state versus out-of-state. As stated in the document, the 17% drop in SeaTac's assessed value reflects operating changes which have occurred with various airlines, including the bankruptcies of at least two airlines. The bulk of the decrease in value is in personal property (i.e. equipment) versus real property (land).

revenue estimates due to the SASA proposal. The methodology includes uses properties outside the SASA area for analysis. We question the use of such areas for impact analysis unless it is shown that these areas will be directly affected by the SASA proposal.

11 At page 4-23, there is an assumption that property owned by the Highline School District would be leased for hotel development and would generate leasehold revenues to the District. However, the DEIS refuses to consider the amount of such leasehold value. Given the need for full disclosure, the failure to ascribe value to this element seems obviously in error.

12 9. Page 4-24 indicates that the City of Sea-Tac has "indicated their (sic) intention to take step to encourage high quality, non-speculative, aviation-related development on the site. Such intervention could have a significant effect on market demand and absorption levels.

While we do not question the City's intentions, precisely how such intentions will be implemented is unclear. Details as to how the city will accomplish this objective must be provided.

13 10. We find significant problems with Table 4.3-10. First we have difficulty understanding how there will be more commercial development on the sits if Alternative 1 is implemented than if the no action alternative is followed (1,750,000 square feet of commercial development for "No Action" and 1,852,000 for alternative 1[plus 908,975 for SASA development]). In that same vain, why would the SASA alternative generate commercial development "in Project Impact Area" but the No Action alternative generates none. In fact, the existence of an industrial uses adjacent to commercial uses would appear to limit development there.

Under sales tax revenues, it is indicated that the "SASA Site and Project Area Commercial" properties will generate some $27,485,170 in sales taxes, for some 1,852,000 square feet of commercial development. However, the table indicates that the 1,750,000 square feet of commercial development in the No Action alternative will generate only $12,937,140 in sales taxes. These figures are obviously in error as we find no basis to indicate that sales tax revenues will be twice as much for SASA commercial development as for "no action" commercial development.

The table also shows significant employment related to the

11. We do not have enough information about the proposed development to make reasonable assumptions about leasehold revenues.

12. The steps the City chooses to take to encourage high-quality development within its city limits are not related to the Port's proposal for an aviation maintenance support facility. The site is located on a site that is nearly completely Port-owned.

The City's intention regarding the type of development was used to forecast the possible future development of the property if SASA were not to go there.

13. The analysis assumes that there would be a different mix of uses on the property, depending upon whether or not the aviation facility is constructed. Under the build alternatives, it is assumed that there would be increased density, as the market adjusts to meet the demand for various uses in the area.

The "project impact area" refers to the SASA project. There is no commercial development assumed in the project impact area under the No-Action Alternative, commercial development would be spread throughout the site.

Sales tax revenues are based on the estimated value of construction. Under the No-Action Alternative, all commercial development is categorized as "project area commercial" and is shown under this category.

The table does show significant employment estimates for both construction and operational jobs under the No-Action Alternative.

construction of facilities but none for no action employment. No explanation is provided for such inconsistency.

14 In summary, we question the entire analysis of jobs and revenue impacts. Given the current and future demand for commercial and other uses around the airport, it appears that the no action alternative will generate employment and revenues that will be greater than these connected with the SASA proposal.

From the foregoing it is clear that the analysis of environmental impacts found in the SASA DEIS is insufficient and incomplete. the Requirements of SEPA and NEPA require an overall comprehensive review of environmental impacts. The current DEIS fails to meet this mandate as specified above and the entire DEIS should be redone to include an overall review of environmental impacts of all current airport proposals.

Thank you in advance for your attention to our views.

Sincerely yours,

J. Richard Aramburu

J. Richard Aramburu

JRA/km

14. The methodology used to estimate commercial employment—which applies to both the no-action and action alternatives—is described in Section 4.3, Induced Socioeconomic Impacts.

LETTER 17.

29508 - 12th Avenue S.W.
Federal Way, WA 98023

Ms. Sarah Dalton
FAA
Seattle Airport District Office
1601 Lind Avenue S.W., Suite 250
Renton, WA 98055-4056

RECEIVED APR 1992

April [illegible], 1992

South Aviation Support Area DEIS

Dear Ms. Dalton,

I wish to express my strong opposition to the South Aviation Support Area (SASA) DEIS. The citizens of King County are severely affected by excessive aircraft operations now and the combined effect of the projects, (including SASA included in para 1 below) will aggravate the present deterioration of quality of life owing to extra SASA noise, pollution and traffic. No amount of "increased employment" is worth this further untenable degradation to existing citizens.

1 1) Why has not one combined DEIS been prepared for 3rd runway, SASA, extension of SR 509, MLS, etc.? These projects need to be looked at as a whole. Why does the Port of Seattle treat each part of the whole picture as distinct? These combined projects, including SASA, will only add to the environmental misery of King County citizens.

2 2) Why has no trade-off analysis been made in the DEIS between loss of quality of life through SASA being shoe-horned into Sea-Tac and the questionable increased job/traffic reduction?

Letter 17 - Peter Townsend

1. Please see General Response B: Effect of SASA on Airport Operations and General Response C: Separation of SASA from Other Airport Programs.

2. "Quality of life" means different things to different people and is therefore a difficult concept to measure. The EIS does look at elements that make up what most think of as contributing to the quality of life including air quality, noise, employment, revenues, natural resources, traffic, etc.

3 3) Why has there been no analysis on the loss in value of property in King County due to increased noise, traffic and pollution from SASA?

4 4) Why does the EIS not say that this SASA project (moving operations south of S. 188th St.) is only being proposed now to make more room north of S. 188th St. for increased air craft operations and 3rd runway? Why not call "a spade a spade"?

5 5) Why has not the proposal to move part or all of Sea Tac operations to a new facility been considered? A maintenance base could then be built at the new facility? "Hush" facilities may not then be needed & costs could be reduced.

6 6) Communities all around Sea Tac get too much noise and pollution from present engine run ups - why does the Port and FAA insist in increasing this?

7 7) Other businesses would be far more acceptable to King County citizens than increased heavy industrial aircraft operations - employees of these new businesses could be transported by bus/rail instead of cars to reduce the traffic congestion. Why has this alternative not been investigated?

This project appears to be one more assault of a calculated series of assaults on King County quality of life and is in direct contrast to the Port of Seattle mission statement "to foster regional .... quality of life for King County citizens" (page 2 of 1991 Facilities Handbook - Port of Seattle).

Very truly yours,

Peter H. Townsend

Peter H. Townsend

3. Elements that make up the quality of life also affect property values. Based on the level of environmental impacts identified in the EIS and the mitigation proposed, no significant reduction in property values is anticipated.

4. Please see General Response B: Effect of SASA on Airport Operations and General Response C: Separation of SASA from Other Airport Programs.

5. Please see General Response A: Siting of SASA at the Airport.

6. One of the features of the proposed SASA facility under Alternatives 2 and 3 is a hush facility designed to reduce the noise from engine run-ups. Please see the response to Letter 6, Comment 12.

7. The objective of the SASA proposal is to provide an aviation maintenance support area at Seattle-Tacoma International Airport. The EIS for this proposal is not required to examine alternative methods for increasing employment in King County.

In Section 4.12, the EIS discusses transportation methods other than the single-occupant vehicle for SASA employees. If SASA is constructed, the Port of Seattle and the tenant airlines will be required to develop a Transportation Management Program (TMP). The purpose of a TMP is to reduce the number of single-occupancy vehicles a site generates and instead encourage people to use alternate methods of transportation, including mass transit.

LETTER 18.

SEATTLE COMMUNITY COUNCIL FEDERATION

April 18,1992

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue S.W.
Renton, WA 98055-4056

RECEIVED APR 1992

Re: South Aviation Support Area
Draft Environmental Impact Statement

Dear Ms. Dalton:

A special committee of our federation of community associations reviewed your draft environmental impact statement on the expansion of Seattle-Tacoma International Airport ("Sea-Tac") by constructing a South Aviation Support Area at the downtown Seattle Public Library and recommended that we comment on two important issues: overflight noise and inadequate provisions for public transit.

(1) Overflight Noise

The DEIS states repeatedly that the construction of a new aircraft maintenance center and support facilities on site would not generate any increased flights to or from Sea-Tac and therefore there would be no additional noise from flight operations. This assumption needs re-examination for several reasons.

1 The DEIS in its mitigation measures contains no restrictions that would restrict the airlines in the use of their facilities on site. Such an assumption needs to be buttressed by a stipulation, enforceable by the surrounding communities, forbidding any airline using the site from bringing any aircraft in for emergency repairs or scheduling added flights for the purpose of securing maintenance.

During its deliberations from 1985-1987, the Port's Joint Committee on Aircraft Overflights considered a proposal for prohibiting the "ferrying" of aircraft (flying empty jets) at night for maintenance purposes. The airline spokespeople opposed the restriction. They argued that airlines can schedule routine maintenance and regular maintenance can prevent most defects from developing. However, failures in aircraft systems or airframes do not make advance appointments. Once a serious defect is discovered, safety precludes loading it with passengers or cargo. The Port of Seattle and the F.A.A. representatives corroborated the airlines.

Letter 18 - Seattle Community Council Federation

1. See General Response B: Effect of SASA on Airport Operations. The Port cannot legally bar aircraft from landing at the airport. Federal regulations require that the airport be available to all aircraft on a non-discriminatory basis. Maintenance base sitings are often at locations where service levels are high because that minimizes the need for any maintenance-only flights. Market demand rather than maintenance location, however, is the primary basis for the arrangement of an airlines route structure and number of flights. The Thai Air relocation was of an operating base, not a maintenance base.

1

An industry study would show a strong correlation between an airline's operations from an airport and the location of its maintenance center. Airlines commonly arrange their flights around a "hub" and site their "hub" at the airport with their maintenance facilities. For example, the Seattle P.I. on March 20,1992, p. C-5, reported that Thai Air had moved its base to Los Angeles and was cutting back services at Sea-Tac from 7 flights per week to three. Its flights from Los Angeles would increase.

(2) Transit

2

The draft environmental impact statement needs to <u>require</u> that the Port of Seattle and any tenants or occupants of the site actively commit toward the use of public transit and vanpooling programs. The DEIS estimates that development of the site will generate up to 1,500 employee trips daily. Appendix K at pages 35-56 forecasts a demand for parking spaces varying from 1,100 to 1,500 parking spaces for Alternative 3 to 5,300 to 6,300 for Alternative 1. Page 35 of Appendix K states:

> " Because this service is provided to certain areas of the region only, transit ridership from the SASA site would be minimal. Transit service for most employees at the SASA site would not be convenient."

Its mitigation measures at page 4-186 barely mention transit service:

> " If any of the transit service improvements currently being considered in the SeaTac area are implemented, the proponents for developing the site <u>could</u> be required to contribute to the improvements, <u>if they provide a significant benefit to the site development.</u> Until the planned transit service improvements such as the HCT and SeaTac People Mover systems are better defined, however, the specific benefits that transit service improvements might have on the site development cannot be determined."

As for vanpooling programs, the DEIS merely refers to the statutory minimum.

The Final EIS needs to strike "could be" (underlined above) and substitute "must be" and the phrase, "if they provide a significant benefit to the site development" (also underlined) should be focused on environmental amelioration rather than private gain. The correct condition is: " if transit would assist in offsetting air pollution generated by vehicular traffic to the site or on-site operations." Sea-Tac is a non-attainment area for certain identified pollutants. The Clean Air Act, as amended, forbids degradation of air quality by new plants or facilities.

The DEIS' approach toward transit and vanpooling appears apathetic when compared to the cost of constructing the anticipated parking spaces. The cost comes not only in the grading and paving, but also in the valuable land used. Transit assists lower income Americans and the handicapped whose ability to drive is restricted to take advantage of job opportunities at the site. Withholding transit has a disproportionate negative impact on the very groups that the government has the greatest obligation to accomodate.

The Final EIS needs to make a strong commitment to provide public transit, to emphasise it as a mitigation measure, and to condition federal assistance on the making of transit as the primary method for commuting to the site.

Yours very truly

[signature]

2. As mentioned under Section L.3.1.2.4. Transportation Management Program the project would be required to develop a TMP that provides incentives for employees to use alternative travel modes, such as transit, carpools, and vanpools. Because the project would be required to meet the single occupant vehicle (SOV) trip reduction goals prescribed in the Washington State TDM Act of 1991, a commitment to encouraging alternative modes of travel is a key component of minimizing the traffic impacts of the project. In addition, since the TDM Act of 1991 is an outgrowth of the Clean Air Act, the requirements of the TDM legislation would also be consistent with the goal of minimizing any further degradation in air quality conditions.

In the Mitigation Measures subsection of Section 4.12, Transportation, the language was specifically chosen to read that "the proponents for developing the site could be required to contribute to the improvements if they provide a significant benefit to the site development." This language was chosen because there are no planned transit improvement projects in the area that would specifically benefit the SASA site. The proposed High Capacity Transit (HCT) system and Sea-Tac People Mover project could provide some benefit to the SASA site; however, until either of these projects is better defined, the benefits provided to the SASA site cannot be determined. The Port of Seattle will work with Metro and the City of SeaTac on establishing new transit routes or rerouting of existing transit routes to provide transit service on 28th Avenue South adjacent to the SASA site.

Postscript

For accuracy's sake, the FEIS should amend the reference to "the airport's mediated noise agreement", now appearing in the first line of p. 4-38 of the DEIS. As is well known, there is no mediated agreement. The Port's present noise regulations were issued by it in Fall 1990, half a year after the mediation process was unilaterelly terminated by the Port, while a draft agreement was still under review by the parties to the mediation.

Chas. H.W. Talbot

PS-118

LETTER 19.

City of Des Moines

THE "Waterland" CITY

DES MOINES, WASHINGTON [illegible]

April 27, 1992

Ms. Sarah Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, WA 98055-4056

Re: SOUTH AVIATION SUPPORT AREA DEIS

Dear Ms. Dalton:

The City of Des Moines has reviewed the Draft Environmental Impact Statement (DEIS) for the South Aviation Support Area (SASA). City of Des Moines comments/concerns include:

1 1) The DEIS provides inadequate disclosure/analysis of how the SASA facility may allow for an increase in the intensity of use of Sea-Tac Airport. Although the DEIS suggests that no increase in take-off/landings would occur, construction of SASA would allow for new uses within existing vacated structures. Construction of SASA would increase the capacity of the terminal as maintenance operations are relocated to SASA. The availability of vacant building area could allow for increased airport activities, especially when considered with other facility improvements (new parking garage, possible third runway, etc.). Chapter 2.1 states that SASA is partially intended to increase the capacity of the terminal, where certain maintenance operations currently occur. "The current Terminal Development Plan Study supports the need for additional gates and expanded international facilities." Accordingly, disclosure and assessment of the environmental impacts associated with SASA cannot be considered separately, but instead must be considered with all proposed/planned airport improvements.

2 2) The DEIS should examine the <u>cumulative</u> impacts upon housing, traffic, noise, etc. that would occur with SASA <u>and</u> the other projects identified in Chapter 3.4 (including the third runway). For example, within the analysis of transportation impacts (Chapter 4.12), only those known projects that would <u>improve</u> traffic conditions (extension of SR 509, and the South-access roadway) are included within the cumulative analysis. The transportation analysis must also include known or proposed developments that would increase traffic volumes. Furthermore, The disclosure of potential environmental impacts associated with each

Letter 19 - City of Des Moines

1. Please see General Response B: Effect of SASA on Airport Operations, General Response C: Separation of SASA from Other Airport Programs, and Section 3.4.13 of this EIS.

2. The cumulative impacts of other planned projects in the SASA site vicinity have been included in the transportation impact analysis of the Draft EIS. The background land use assumptions that are used for the 2003 traffic impact analysis for all alternatives are consistent with the land use assumptions that are being used for the City of SeaTac's Comprehensive Transportation Plan. These land use assumptions assume a growth in annual passengers at Sea-Tac Airport from approximately 16 million today to approximately 27 million in the year 2003. Since this passenger volume growth could be accommodated without the addition of a third runway, this passenger growth assumption does not require that the third runway would be in place by the year 2003. In addition, all of the alternatives have been analyzed to include cumulative impacts associated with future land uses that would likely be established on the undeveloped portions of the SASA site. Additional text regarding cumulative impacts has been added at several locations in this EIS. Please see Section 3.4.13, for example.

2 alternative should include cumulative impacts associated with future land uses that would likely be established on the undeveloped portions of the site.

3 3) Page 3-8 states in part, "The areas of the SASA site that would require IWS treatment include all the proposed paved surfaces that would be used by automobile or aircraft." However, page 4-223 states in part, "Surface water run-off from parking areas and structures contained within the main SASA area would also be directed to the stormwater treatment system. These sentences regarding treatment of run-off from parking areas are contradictory. Run-off from vehicular parking areas will contain residues from petroleum products, such as oils, grease, and fuel. The stormwater treatment system would not include oil/water separators. Natural settling and biofiltration measures do not adequately remove these petroleum-based materials.

4 4) Chapter 3.4 does not include the proposed third runway as a proposed major project in the area. For full disclosure and accurate assessment of impacts, SASA must be evaluated in relation to a third runway at Sea-Tac Airport.

5 5) Chapter 4.1 provides insufficient analysis of potential land use impacts. The DEIS should provide additional information regarding the types of land uses permitted/envisioned by existing regulations/plans, and the intensity of land use that could be expected given existing regulations and environmental constraints. Such "probable" land use (without construction of SASA) can then provide more realistic comparison of SASA build/no-build alternatives. Table 4.3-10 indicates that 1,750,000 square feet of commercial area would be developed with the No Action Alternative. Please explain in detail how this number was determined. What types of uses are envisioned? The DEIS should also discuss the compatibility of the SASA alternatives to planned uses in the vicinity and the impact of the alternatives on the planned land use pattern. The introduction of essentially industrial uses into an area planned for office, retail, and related uses would hold the potential for significant impacts.

6) Similar to comment No. 5 above, the DEIS provides insufficient disclosure of the types and intensity of land uses that would likely be developed on vacant portions of the SASA facility. Table 4.3-10 suggests 1,533,000 and 606,000 square feet of commercial area would be developed with Alternatives 1 and 2, respectively. Please explain in detail how these numbers were determined. What types of uses are envisioned?

3. Please see the response to Letter 10, Comment 4

4. Please see General Response B: Effect of SASA on Airport Operations and General Response C: Separation of SASA from Other Airport Programs.

5. The No-Action Alternative of 1,750,000 square feet of commercial development used in the Draft EIS was based upon numbers supplied by the City of SeaTac in connection with preparation of the city-wide transportation plan. For purposes of the plan, the City assumed that 1,750,000 square feet of commercial development would be built by 2003. Of this total, the City assumed that there would be approximately 1,067,000 square feet of office, 400,000 square feet of hotel, 200,000 square feet of light industrial, and 80,000 square feet of retail.

Levels of commercial development assumed under Alternatives 1 and 2 were based on the square footages of land remaining for non-aviation uses under each alternative, adjusted for right-of-way takings associated with construction of the 28th/24th Avenue South arterial. In keeping with the City of SeaTac's vision for the area, all of the development on the remaining property was assumed to be office, at a density of 1.0—i.e. a building-to-land ratio of 1.0. Thus, for example, because the land available for non-aviation uses in Alternative 1 was 1,533,000 square feet, using the 1.0 density factor results in an assumed 1,533,000 square feet of commercial development. The 1.0 density factor represents a medium density level for the area.

Sarah Dalton
April 27, 1992
Page 3

6 7) The DEIS suggests that SASA would merely <u>replace</u> commercial development that would otherwise locate on the project site. However, it is more likely that SASA would instead <u>displace</u> commercial development to another nearby location. This assumption requires that the DEIS disclose and analyze <u>cumulative</u> impacts associated with SASA and <u>displaced</u> commercial development.

7 8) Section 4.1.2 merely describes existing planning documents. The DEIS should instead analyze the project in relation to the findings/policies of these various planning efforts. In other words, does SASA compliment and implement adopted policies?

8 9) The DEIS provides insufficient analysis of potential construction impacts. The impacts related to construction of a facility of this magnitude, especially with the grading required, will certainly be significant and adverse. The DEIS does not sufficiently disclose traffic impacts associated with construction vehicles.

9 10) Within Section 4.3.2.1 (Employment), the DEIS should examine existing aviation maintenance facilities at other airports to more accurately assess job multiplier impacts.

11) Section 4.4.2 should include noise contour maps for each of the construction and use activities described. Such maps should indicate existing land uses, especially noise-sensitive land uses.

10 12) The DEIS should disclose and analyze noise impacts regardless of whether the particular noise is exempt from regulation in the King County Noise Ordinance. Furthermore, Chapter 4.4 should include noise contour maps for run-ups as measured in <u>dBA</u>. Such maps should include run-ups both inside and outside the hush facility, and identify all affected land uses in the vicinity.

13) To minimize construction noise impacts, construction should be limited to non-holiday weekdays between 7:00 a.m. and 6:00 p.m. (see Section 4.4.3.1.)

11 14) Additional effort should be made to disclose the air quality impacts associated with SASA (Section 4.5.2.1). The DEIS should consider existing maintenance facilities at other airports to determine direct and indirect air quality impacts.

6. No evidence was found that neighboring businesses would relocate as a result of SASA. The recent market demand study conducted by Mundy and Associates shows that there is demand for new office, hotel and industrial development in the SASA area. Because SASA would reduce the amount of developable land available in the area, it can be expected that the remaining land would become more valuable, and would be more likely to attract highest and best uses.

7. The relationship of the SASA proposal to the SeaTac Area Update (STAU) is reviewed below, since the STAU consolidates the previous planning efforts for the area. The Draft EIS includes a discussion of the relationship of the proposal to the City of SeaTac's ABC zoning.

The STAU specifies the area within which the SASA proposal is located as potentially to be zoned and developed as a Business Park. The policies to direct such development include:

- Development of a quality commercial area through adequate off-street parking, landscaping, pedestrian linkages, and site plan review
- Location of manufacturing, commercial, and office uses to be concentrated in areas to improve provision of services and protect existing residential areas
- Concurrent development of building projects, road, and drainage improvements to lessen impacts to community
- Landscaping and screening to lessen visual impacts to surrounding communities
- Major development should incorporate open space into their site plans.

The following policies would guide development of the Business Park:

- The Business Park should generate a diverse and concentrated employment center with open space, pedestrian amenities and a diversity of uses
- Business Park developments should be identifiable through the use of entry, landscaping, lighting, etc.

- Adjacent developments should be linked through open space and be accessible to the public

- The Business Park should be encouraged to develop as a cultural center and as a regional resource.

The proposal would locate a single use on a large area in the vicinity of the proposed Business Park zone. The transition from a single-family neighborhood has already occurred due to the Port's Noise Remedy Program's acquisition of most of the residences on the site. The remaining use is the Seattle Christian School, which will be vacated and relocated at a future date. Existing zoning allows commercial and industrial development on the site.

As stated in Section 4.1, Land Use, the use of Port-owned property for aviation uses is given precedence. However, the Port of Seattle has developed alternatives that could accommodate the desired future development as stated in the policies of the STAU and the ABC zoning of the City of SeaTac.

Both the STAU and the City's ABC zone specify development of a diverse business park in the area. Development of the SASA proposal does not preclude such development in the area. The SASA project itself does not propose the scale and mix of uses intended for the zone. However, in every alternative except Alternative 3, portions of the site have been left for future non-aviation development. The total area left for future development ranges from 1,519,000 square feet to 606,300 square feet.

Where feasible, joint coordinated development within air rights of all the alternatives would also be possible. This would most likely occur along the eastern edge of the site, above the vehicular parking areas. Such development could support the type of future uses that are encouraged in the City of SeaTac's ABC zone and the region's Vision 2020 plan. The area left vacant by the build alternatives combined with development within the air rights could potentially lead to a large contiguous area for future commercial development.

Further review of the relationship of the proposal to the ABC zone is presented in Section 4.1, Land Use. Review of regional policies has been expanded to include the Vision 2020 plan (also see the response to Letter 8, Comment 1).

8. A detailed analysis of construction traffic impacts was included in Section 4.12, Transportation, for each alternative. This analysis included documentation of the daily and peak hour trip generation, the distribution of truck traffic on the surrounding street system, and level of service analysis at ten intersections with the truck traffic generated from construction activities on the SASA site. This level of service analysis was conducted for 1994 with and without the construction truck traffic to show the relative increase in impacts that is created by the SASA-generated

truck traffic. The construction traffic impacts are the greatest at intersections in the South 188th Street corridor between 28th Avenue South and I-5 because the majority of truck traffic would be destined to and from I-5. In addition to identifying truck traffic impacts, measures to mitigate these impacts were also developed for each alternative. These mitigation measures are limited to items that would reduce the impacts caused by construction truck traffic; permanent intersection improvements to mitigate these impacts were not examined because the earthwork activity on the site is expected to last for only nine weeks.

9. Employment multipliers used in the analysis were taken from the Washington State Input-Output Model (1982) developed by Professor Phillip Bourke of the University of Washington. The model is routinely used for evaluating employment and earnings impacts for projects in the state. To be particularly conservative, the multipliers from the model were reduced by 15% for the SASA analysis.

10. The Draft EIS disclosed and analyzed runup noise impacts. Appendix M of the Final EIS contains L_{max} noise levels in dBA units for a variety of locations and for different alternatives. Construction would comply with the appropriate noise ordinance provisions for construction, including time limitations.

11. Please see the response to Letter 6, Comment 8. Please note that comparisons with existing maintenance facilities at other airports would provide a relatively poor estimate of emissions from a new facility at SASA. In addition to possible differences in maintenance activities, materials and solvents used, hours of operation, and the size of the facilities, regulatory requirements are continually becoming more stringent. Emission rates that were authorized for an existing facility might be considerably more lenient than what would be allowed today.

(12) 15) In keeping with King County and City of Des Moines Environmentally Sensitive Areas Regulations, replacement sensitive areas should be established as follows:

Significant wetlands	2:1 replacement ratio
Important wetlands	1:1 replacement ratio
Stream habitat areas	2:1 replacement ratio

(13) 16) Section 4.6.5 should include discussion of proposed Best Management Practices that could minimize adverse water quality impacts during construction and operation of SASA. Any approval of SASA should include specific Best Management Practices as conditions of approval.

(14) 17) Further analysis and disclosuro is warranted regarding potential impacts resulting from bridging/culverting Des Moines Creek. The proposed 250-wide bridge over Des Moines Creek will certainly create more impacts than "...plant species intolerant of shade would die, and through natural colonization, be replaced by more shade-tolerant plants".

(15) 18) The DEIS describes various stream channel improvements that would be provided, but also indicates that the South 200th Street culvert prevents fish from fully utilizing the enhanced habitat area. Because the project site extends to South 200th Street, and because the proposed mitigation for fish habitat would not be effective without alteration of that culvert, any approval of SASA should include required modification of the South 200th Street culvert. The timing of the culvert replacement could be stipulated to achieve the desired goals regarding birds/waterfowl.

(16) 19) In no case should buffer areas along streams and wetlands be less than 35 feet in width. Buffers between 35 and 100 feet in width are necessary to minimize adverse impacts upon streams and wetlands. Berms within the buffer area could provide additional protection against spilled contaminants entering wetland and riparian areas.

(17) 20) Chapter 4.12 provides insufficient analysis of parking impacts. How many existing parking spaces would be displaced? How would proposed parking implement transportation demand management strategies?

Enclosed with this letter are written comments regarding water quality (from Richard E. Warren, P.E.) and transportation (David Markley). It is important that the FEIS address the inconsistencies and

12. Your comment is noted. Please see the response to Comment 23 of this letter.

13. The following specific Best Management Practices (BMPs) are described in Section 4.6.5:

- Runoff Treatment Facility treatment of all runoff from the site except roofs
- Water quality pond treatment for roof runoff
- Wetlands biofilter for roof runoff
- Establishment of a spill control and response plan which will have containment, limitation, and clean-up procedures
- Specific sediment and erosion control BMPs for construction.

Further details for BMPs like sediment and erosion controls or spill controls are difficult to fully describe at this stage of the project. For example, sediment and erosion controls are highly dependent on the grading, construction, and phasing plans. Proper sediment and erosion controls must be altered for each phase of construction.

As grades and structures are changed and built, runoff patterns, amounts, and rates change as well. Further design of the sediment and erosion control plans will have to be delayed until the grading, construction, and phasing plans are near completion. For a better idea of what the sediment and erosion controls will include, King County's Surface Water Design Manual, Chapter 5, describes detailed guidance for the types of sediment and erosion controls that would be followed during the design and implementation of sediment and erosion controls.

14. Subsequent to issuance of the Draft EIS, there has been additional design work on relocation of Des Moines Creek and the layout of the preferred SASA alternative. The preferred alternative and stream design would require culverting a 260-ft section of Des Moines Creek under the aircraft access ramp for SASA. This design would not allow for any streamside plantings. In addition, the stream course through the culverted section would not be affected by direct precipitation. Refer to Appendix O for the stream design plans.

15. The culvert located at South 200th Street is a partial barrier to fish. It is anticipated that South 200th Street will be reconstructed, and at that time a new, passable culvert could be installed.

16. At present there is little or no buffering of the creek from adjacent activities. The conceptual mitigation plan would provide significantly improved buffering between the relocated Des Moines Creek and the proposed SASA facility or the proposed South Access Roadway. Since the SASA project would divert all contaminated runoff to a Storm Water Treatment Facility system, additional berms are not required as a spill control measure.

17. The SASA development would displace most or all of the existing 1,500-space airline/airport parking spaces located north of South 192nd Street and west of 28th Avenue South. These spaces could be relocated to a site at the north end of the airport located north of SR 518 and west of 24th Avenue South. The impact of this parking lot relocation was previously identified and reviewed in the Port of Seattle's Parking and Facilities Expansion Project EIS. (See Section 3.4.8 of the SASA Draft EIS.) Therefore, the impact of this parking lot relocation was not specifically analyzed in this EIS.

As mentioned in Section K.2.1.2.7, under Parking and Section K.3.1.2.4. under Transportation Management Program, the on-site parking supply provided should be slightly less than or equal to the most accurate estimate of parking demand. Providing an over supply of parking could undermine the effects of other demand management strategies. Therefore, the on-site parking supply would need to be slightly less or equal to actual parking demand in order to be an effective demand management strategy.

inadequacies described above, and within the two enclosures. Thank you for the opportunity to review and comment on SASA DEIS. Please call me at 878-8626 if you have any questions.

Sincerely,

Eric Shields
Planning Director

Enclosures: Richard E. Warren letter
David Markley letter

cc: Greg Prothman, City Manager

et13\SASADEIS

RECEIVED
APR 27 1992

To: Eric Shields
City Planning Director
City of Des Moines, WA

From: Richard E. Warren, P.E.
Kato & Warren, Inc.

Re: Review of Draft EIS
SeaTac-South Aviation Support Area (SASA)

Date: April 23, 1992

As requested, we have reviewed the above DEIS and Technical Appendices D,E,F,G,H, and I for the above project as prepared by the Port of Seattle and their consultants.

General Comments

As you are aware, the SASA project is only one of several proposals related to the expansion of SEATAC airport. Proposals are in various stages for:

- Extension of the existing runways (safe zones)
- Addition of a third runway
- Construction of a south access freeway
- Extension of SR-509
- Additional private commercial development

We are of the opinion that the proposed impacts and mitigations related to Des Moines Creek as a result of the SASA project are so extensive as to require a full analysis of the conditions that would occur if all of these other projects were to be completed. It is easy to envision future DEIS's suggesting further loss of streamways, wetlands, habitat and other serious impacts on Des Moines Creek.

16 It is our feeling that the Port of Seattle, as the proponent of, participant in, or causative source of the projects listed above should, at this time, commit to a complete master plan for the protection of Des Moines Creek from its source, adjacent to the airport, to its mouth.

Such a commitment is absent from the documents we reviewed. These allude to possible impacts and possible additional mitigating features, but make no commitment that they are part of the SASA proposal or of the Port's long term plans.

18. The Port of Seattle has developed a comprehensive plan to mitigate impacts of SASA. It was developed with consideration of future potential projects where sufficient information exists. The mitigation plan is consistent with other planning for the Creek as identified in the Des Moines Creek Restoration Plan and storm water management planning. Factors such as routing of water flows and maintenance of stream flows have been incorporated in the design of SASA facilities and mitigation. Final mitigation design and monitoring details are being developed in consultation with appropriate resource agencies. Refer to Appendix O for a record of agency consultations to date. See General Response C: Separation of SASA from Other Airport Programs.

A master plan to protect Des Moines Creek would certainly entail considerably more detention storage and wetlands restoration than is suggested in the DEIS for SASA. Also, the Industrial Wastewater System (IWS) would be larger to accommodate the entire airport complex and the adjacent roadways. A by-pass pipeline from the airport to salt water could be required to handle peak runoff and IWS flows. Also, considerably more work is needed to protect the low flows in Des Moines Creek. None of these issues are adequately addressed in the DEIS since the basic assumption is that the SASA is an isolated and limited proposal. In our opinion, it must be considered as part of the total future development of the SEATAC area.

(19) I feel that the City of Des Moines can demand, and expect to receive, far more mitigation as part of the Port of Seattle's plans. The City should also obtain an agreement from the Port regarding operation and maintenance of the mitigation facilities and the Des Moines Creek streamway for its full length. The City should receive annual payment from the Port to offset the cost of monitoring the condition of the creek and performing regular maintenance and repair of the streamway.

Specific Comments

In the following paragraphs I will comment on specific elements of the DEIS using the format of Appendix G, Natural Resources Mitigation Plan. This appendix contains the basic elements of the Port's proposals to address the impacts on the Des Moines Creek system.

Stormwater Management Facilities

The proposed facilities are stated to be sized to control future runoff from the airport area and the SASA project to "existing flows". Actually, the modeling effort reports a potential reduction in peak flows below existing conditions, but it is not clear that this level of control will actually be installed. Also, it is questionable if the consultants considered other proposed projects in their modeling.

(20) No commitment is made to improvements in the Des Moines Creek streamway. The DEIS simply assumes that the stream can be moved and restored without impact and that the massive fill required for the SASA project will not affect dry weather base flows to the stream. We seriously question these assumptions.

The question of construction impacts is given little weight. When one considers a 13,000,000 cubic yard earth moving project, it would seem reasonable to plan for extensive erosion and sediment control facilities.

The stormwater control pond and water quality control pond appear inadequate to deal with the impact of the SASA project and other potential development upstream of South 200th St. More storage will be needed at the south end of the project area.

19. Your comment is noted. The proposed mitigation addresses the impacts of the SASA project. No significant impact is identified to the streamway within the City of Des Moines.

20. The proposed Storm Water Management Facility would be designed to prevent increased peak stream flows at the confluence of Des Moines Creek with the west branch due to the SASA project. In addition to no increase in peak discharge for the 10-, 25- and 100-year, 24-hour storms, the 2-year flows will be reduced to improve the suitability of Des Moines Creek to support fish.

The runoff factors used in the model were taken from the Hydrological and Hydraulic Simulation Study for Drainage Control in Des Moines Creek (HSS) which assumed watershed conditions based on "future zoning." Therefore, basin build-out was considered in the modeling effort and design of the Storm Water Management Facility. Other airport projects would be assessed separately and would be required to mitigate impacts.

A project of this magnitude would require extensive erosion and sedimentation control. The plan would be very detailed and specifics would rely on the construction plan and phasing. The detailed construction phasing and planning has not been completed at this time, but will be reviewed with appropriate jurisdictions.

The proposed storm water management facility allows for no increase in peak runoff rates due to the SASA site for the 10-, 25-, and 100-year, 24-hour storm events at the confluence of Des Moines Creek with the west branch. The modeling was prepared using future development conditions in the watershed. Also, future development upstream of SASA will be required to mitigate storm water impacts. Runoff into Des Moines Creek from SASA downstream of the Storm Water Management Facility and the confluence with the west branch is limited to fill slopes, which have similar runoff characteristics to existing conditions. In addition, peak flows for the 2-year, 24-hour storm would be reduced by the Storm Water Management Facility, which would, in fact, accommodate future development in the watershed at existing peak flow rates.

__Spill Control__

21 The DEIS proposes diverting stormwater from the travel surfaces and tarmac to the IWS. This is a correct solution. However, the DEIS only alludes to the potential for treating runoff from other parts of the airport and other projects at the IWS. This must be a firm commitment by the Port and the needed IWS should be sized and built to its ultimate size prior to completion of the SASA project or any other major airport construction. If a larger outfall line to salt water is required, this must also be built at the same time.

Proposals for preventing future operational fuel spills from other airport activities are vague. If all operational surfaces are connected to the IWS and the IWS is properly sized, this issue could probably be resolved. A commitment to such an approach is not firm in the DEIS.

__Stream Relocation/Enhancement__

The SASA project alone is a massive earth moving project that requires a major relocation of the headwaters for Des Moines Creek. The DEIS does not, in my opinion, adequately evaluate or provide contingency plans for, the protection of the groundwater that recharges this important section of the creek. Some indication of artificial seep areas is provided, but no commitment is made as to their adequacy or long term reliability. No mention is made of future operation and maintenance.

22 Alternative 3, which includes a long tunnel section for the stream should not be considered acceptable due to the impact this would have on the basic hydrology and biota of the stream.

The proposed relocated stream cross sections are too narrow and result in a loss of streamside wetlands and flood fringe. In several areas rip-rap is indicated due to the steepness of the proposed stream corridor. At least a 50% greater area should be set aside for the streamway.

Although a number of possible enhancements to the streamway below the SASA project are referenced, no commitment is made as to how these will be accomplished. The Port of Seattle should assume this responsibility as a condition of any project approval.

__Wetland Creation/Restoration__

23 The SASA project impacts a considerable wetland area and groundwater recharge area. The proposed mitigation in the DEIS is very inadequate and should be increased in both area and recharge capability. I believe that up to 20-40 acres of restored wetlands would be needed to compensate for the disruption to the natural water balance caused by the SASA project.

21. The existing IWS system is designed to accommodate storm water contaminated by aviation fuel or other petroleum products from accidental spills. Dangerous wastes are not easily treated by the IWS system and can be harmful even in small quantities. Consequently, dangerous wastes are not allowed to enter the IWS conveyance or treatment facilities.

The SASA Storm Water Treatment Facility would be a new, separate facility which would be designed to treat runoff from taxiways, hardstands, hangars, and vehicular parking. Every surface at SASA which is not a generator of dangerous waste would be connected to the new Storm Water Treatment Facility except the roofs of buildings.

Specific spill control and response plans would be designed with the participation of the airlines leasing space at the SASA facility. Airlines which use SASA would be ultimately responsible for any dangerous wastes which they generate and would have a major role in determining the content, procedures, and facilities in the plan. Necessarily, spill control and response plans must include detailed descriptions of procedures and facilities which must be used in a variety of situations. The procedures and facilities used are dependent on the type of material, volume, location on the site, whether the spill is indoors or outdoors, etc. Many of the activity locations, storage of used and raw materials, and amounts of materials commonly on site have not been defined at this time.

22. Permits required for the development of the SASA project would require the development of specific, detailed mitigation plans, implementation schedules, monitoring plans, performance standards, and contingency options.

The creek relocation will provide significantly wider stream way than is now present. Please refer to Appendix O for the stream design plans. Also see the response to Letter 4, Comment 6.

23. The final amount of mitigation will be determined as part of the permitting process. According to Ecology's wetland replacement mitigation guidelines, the project would require about 4.5 acres of wetland mitigation. Current mitigation planning includes wetland replacement and flow control along the same reach of the Creek. Detailed studies of flow are included in Appendix E.

(23) The DEIS assumes that natural wetlands can simply be filled and replaced on another tributary to the creek. Our feeling is that the main stream of Des Moines creek must have more protection for water quality and low flow than is provided by the proposed mitigation plan.

Conclusion

Again, we suggest that the City obtain a firm agreement from the Port for the full restoration and long term protection of the Des Moines Creek system. Negotiations based on the DEIS could lead to such an agreement. Obviously other City concerns would also be included in such an agreement.

If we can provide further information for your use in responding to this project, please call us at any time.

End of Memo

cc: Dale Schroeder
City Engineer

TSI
Transportation Solutions, Inc.
16310 NE 80th Street, Suite 100
Redmond, WA 98052-3861
(206) 883-4134 (800) 285-4134
FAX: (206) 867-0898

April 27, 1992

To: Eric Shields 8?0-

From: David Markley

Subject: South Aviation Support Area EIS

The following outline our comments on the Traffic analysis found in the SASA EIS Techinical Appendix. In general we find that the analysis to be well organized and prepared using generally accepted procedures. There are, however several comments that we believe deserve some analysis or response.

24 **Land Use** - There is an assumption that the uses described in the No Action Alternative will simply be replaced by one or another of the Alternative land use configurations. Presuming there is a market demand for the No Action Alternative (these uses are needed in this area), where are they located and what effect does this relocation have on the traffic forecasts? Provided this market demand exists, it seems that the Alternatives described would be generating substantially more demand even though the uses and the associated demand would be located on another site in the vicinity. What is the effect of this displaced demand on the traffic forecasts?

25 **Existing Parking** - A similar concern is the issue of the relocation of the 1500 satellite parking stalls that exist on the site to serve airport employees. While this parking, in and of itself is not a generator, its relocation will become a source of trip generation. Is this going to remain on the site or is it going to be relocated to another site in the area and what are the traffic volume implications of this relocation?

26 **Planned Street Improvements** - The No Action and other Alternatives assume the SR 509 completion, and other major road improvements. In the event there are delays in funding these improvements, what will the impacts be or will development of the site be conditioned upon completion of these improvements? What will those conditions involve?

24. **The land use assumptions used for the No-Action Alternative were based on the City of SeaTac's vision for this area, not necessarily an analysis of market demand. Therefore, since it is not known if there is a demand for these uses, an analysis to determine the impact of this displaced demand on the traffic forecasts would be purely speculative. This type of speculative analysis is not appropriate for a project-specific EIS such as this. Please also see the response to Comment 7 of this letter.**

25. **Please see the response to Comment 17 of this letter.**

26. The completion of major road improvements in the area will likely require contributions from the Port of Seattle in proportion to the airport's share of traffic in the vicinity of Sea-Tac Airport. These contributions will occur when funding sources are established for each individual project. If there are delays in funding these projects, the Port of Seattle may need to contribute to some alternative interim improvements that would be needed to mitigate impacts from the various phases of development on the SASA site.

13

27 **Traffic Forecasts** - The traffic forecasts appear to assume that the level of transit use or non auto mode split is the same for each alternative. Considering the differences in the character of the land uses in the No Action and the Alternatives, the use of transit and opportunity for carpooling could be noticeably different. What is the effect on the traffic forecasts for each alternative?

28 **Mitigation** - There seems to be a willingness to participate in the improvement of intersections that are operating below LOS F but not a similar commitment (due to their lack of definition) to transit improvements which could have a more significant impact on the LOS at area intersections considering the proximity of this site to the transit systems being considered. Therefore, the project sponsor should agree not to waive their right to protest the formation of an assessment district or funding program to fund the construction of such a transit system.

27. The mode split assumptions used for the aviation-related uses on the SASA site are the same as the mode split at the existing Alaska Airlines maintenance facility located north of South 188th Street. Mode split assumptions for the retail, office, hotel, and light industrial uses are inherent in the trip generation rates used for each of these uses. The mode split assumptions that are inherent in the ITE trip generation rates typically reflect mode split characteristics of suburban areas. Therefore, the mode split assumptions used for the office and light industrial uses are conservative since they assume only a small percentage of transit and carpooling uses. Carpooling and transit usage is typically greater for employment-based land uses such as office and light industrial uses compared to retail or hotel uses. Given these facts, transit and carpooling use could be somewhat different among the alternatives; however, since all of the alternatives were analyzed using the same conservative mode split assumptions, the resulting traffic forecasts should be conservatively high for each alternative. If transit or carpool usage were higher than assumed in the analysis, the impacts identified for each alternative would be somewhat less.

28. The Port of Seattle is committed to contributing to future transit improvements in the project vicinity if they provide a benefit to the site development. The potential benefit to the SASA site, however, cannot be determined until the planned transit system improvements are better defined. Your comment regarding an assessment district is noted.

PORTWATCH LETTER 20. April 28, 1992

RECEIVED APR 1992

Ms. Sarah Dalton

F.A.A.

Dear Ms. Dalton

Washington law provides that maintenance bases for airplanes not be located in urban areas, unless no other location can be found. There are many other locations within Washington that are available. Two cities in particular are begging for it: Moses Lake and Spokane. Neither of these areas have the high density population of the Sea-Tac area. The lack of population is necessary to obtain relief from the overwhelming noise of revving engines. Denver has a building referred to as a "hush" house. It works partially because the open end is directed to the uninhabited mountains. Even so, the building is not quiet but it is removed from an urban area.

1 In addition the Port of Seattle with respect to the maintenance base hasn't addressed the problem of what to do with the waste water. A reference is made to rerouting Des Moines and Miller creeks but that is not a SOLUTION. It is only a statement of the problem.

2 We are expected to answer DEIS statements on four projects. These should not have been addressed individually but collectively as the problems of noise, airway pollution and automobile traffic interact and compound the problems of each other. We presently must consider the problems with having a jail built adjacent to a city park, the Maintenance base (SASA) located in a densely populated urban area, the 3rd runway a nightmare in the surrounding areas of Puget Sound and the noise exposure map update of 1991. Surely, you realise that the Mediation Agreement was worthless. There were no signatories and that all agreements reached were VOLUNTARY.

If we are to curb the depression and move from a war economy to a peacetime economy with least displacement of our local population, two military bases within the Puget Sound area offer a long term solution to the overcrowing of SeaTac airport. McChord is a "state of the art cargo base" and Whidby solves the noise problem with all flights taking off and landing over water and fairly sparsely populated areas.

Both these bases are adjacent to I-5 and suitable for transportation by monorail. Both can be shared by military and civilians. We mean this statement to direct you to constructive solutions. George has had extensive flying experience with these and similar bases and would be willing to illustrate for you the pacetime advantages of both McChord and Whidby. Please call either of us at the telehpone numbers below.

GEORGE MAILLOT
George Maillot
3312 - 78th Pl. N.E.
Bellevue, Washington 455-2461
Elizabeth Springer
ELIZABETH SPRINGER
13325 Macadam Road South
Tukwila, Washington 242-2835

Co-Chairs PORTWATCH

Letter 20 - Portwatch

1. The Port is addressing the storm water issue by proposing two different systems that together will treat runoff from the site. Des Moines Creek must be relocated because it currently runs through the area where SASA would be located. Sanitary sewer service to the SASA site would be provided by the Midway Sewer District.

2. Your comment is noted. See General Response C: Separation of SASA from Other Airport Programs and Section 3.4.13 of this EIS.

LETTER 21.

United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle WA 98101

Alaska
Idaho
Oregon
Washington

EPA

APR 28 1992

REPLY TO
ATTN OF: WD-126

RECEIVED APR 1992

Ms. Sara Dalton
Federal Aviation Administration
Seattle Airports District Office
1601 Lind Avenue SW
Renton, Washington 98055-4056

Dear Ms. Dalton:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and § 309 of the Clean Air Act, we have reviewed the Draft Environmental Impact Statement (draft EIS) for the Port of Seattle South Aviation Support Area Seattle-Tacoma International Airport, SeaTac, King County, Washington. In response to the growth of the airport and the need for aircraft support facilities, the Port of Seattle proposes to prepare an area for maintenance hangers and related activities. This draft EIS analyzes three "build" alternatives and the required no-action alternative. The Port of Seattle would grade, pave, and extend utilities to the site. The airlines that lease the space would typically be responsible for construction of the actual structures.

Based on our review, we have rated the draft EIS EC-2 (Environmental Concerns - Insufficient Information). This rating and a summary of our comments will be published in the *Federal Register*. We are concerned about the potential effects to wetland and aquatic resources. Additional information is needed on alternatives to prevent wetland losses, mitigation plans, and noise impacts. Details of our comments are enclosed.

Thank you for the opportunity to review this draft EIS. Please contact Wayne Elson at (206) 553-1463 if you have any questions about our comments.

Sincerely,

Ronald A. Lee

Ronald A. Lee, Chief
Environmental Evaluation Branch

Enclosure

U.S. Environmental Protection Agency Comments
Draft Environmental Impact Statement
South Aviation Support Area

Wetland Effects

1 (1) Pursuant to 40 CFR 230.10(a), "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences." To facilitate Clean Water Act, Section 404, project review, the final EIS should provide a detailed alternatives analysis. In addition to the draft EIS alternatives discussion, the following information should be provided:

(a) Data regarding present passenger and aircraft operations levels as well as anticipated percentage increases over time.

(b) Design capacity of the current terminal. A portion of the proposed project is based on projected passenger increases and the need for terminal expansion. The expansion of the south terminal would necessitate the relocation of the three line maintenance facilities. Information regarding the feasibility of expanding the south terminal without relocating the line maintenance facilities should be provided. Innovative terminal expansion designs could minimize the project scope and hence project impacts.

The Section 404 permit application must demonstrate compliance with all requirements of the Section 404(b)(1) Guidelines. In the absence of sufficient information, a permit application would not meet Guideline requirements. For example, when the basic project purpose is vague or "speculative" in nature (e.g., projected needs, set-aside areas for future aviation and commercial expansion), demonstration of conformance to Section 230.10(a) is difficult. This section states that, "no discharge of dredged or fill material shall be permitted if there is a practicable alternative (e.g., alternative site location or design) to the proposed discharge which would have less adverse impact on the aquatic ecosystem ..." Without sufficient project information (e.g., required design specifications, scope), all appropriate and practicable measures to minimize potential harm to the aquatic ecosystem may not be assessed. Pursuant to Section 230.10(d), "no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize impacts of the discharge on the aquatic ecosystem (40 CFR 230.70). Therefore, the final EIS should provide detailed information regarding the basic project purpose, project need (supportive data), and project alternatives (please review EPA comments provided at the 12 December 1991 resource agency meeting).

Letter 21 - United States Environmental Protection Agency

1. Currently, the U.S. ARmy Corps of Engineers is considering a pre-application proposal for placement of fill in Des Moines Creek and associated wetlands. The segment of Des Moines Creek proposed for relocation is above the headwaters (i.e., less than 5 cfs mean annual flow) and the extent of fill is less than 2 acres. The applicant is currently preparing supporting data to address a number of review agency requests resulting from the pre-application meeting for the SASA project. It is the Corps' and the applicant's intent to pursue an Individual Permit under Section 404, including an alternatives analysis as part of the final application package.

For additional discussion of the projected growth of airport operations, terminal expansion, and review of siting alternatives, please refer to Sections 2.1, 3.2, and 3.14 as well as General Responses A, B, and C.

1 (c) Minimum site development area required to meet the basic project purpose;

(d) Area available for development along the airport's northeast side;

(e) Specific information concerning alternatives that were considered but rejected.

2 (2) A detailed discussion of potential construction and operation dewatering effects on Des Moines Creek and on and off-site wetlands is required. The draft EIS indicates that french drain systems would be modified to maintain groundwater flow to the creek during construction and operation. Design and location of the french drains and proposed manifold system should be provided. To ensure aquatic resource protection, stream and wetland monitoring as well as contingency plans should be developed.

3 (3) Site characteristics of the proposed industrial waste system location should be provided. In addition, alternative site locations that would minimize potential stream impacts should be explored.

4 (4) Discharges to waters of the United States (including natural, created, and restored wetlands) must meet applicable National Pollutant Discharge Elimination System effluent limits and State Water Quality Standards. Where applicable standards do not currently exist, all known, available, and reasonable methods of prevention, control, and treatment should be utilized. Stormwater and industrial waste must be pre-treated prior to entering Des Moines Creek or the wetland systems. The creek should not be used to contain potential chemical and industrial waste spills.

5 (5) The stormwater treatment system should be designed to allow free flow and movement of aquatic organisms during high and low flows. In addition, weir height should be established to maintain downstream flows during low precipitation years. The final EIS should include a maintenance schedule.

6 (6) Wetlands lost through bridge shading effects should be included in the mitigation ratio. In addition, replacement ratios should reflect both spatial and temporal losses as well as indirect effects (e.g., hydroperiod alteration, loss of seeps). Additional stream enhancement should occur to off-set past individual and cumulative impacts associated with the 1973, 1985, and 1986 jet fuel spills.

7 (7) The final EIS should include completed spill control and response plans. In addition, a source control and spill control assessment should be conducted.

8 (8) Fertilizer and pesticide use should be suspended in and adjacent to existing, enhanced, or restored wetlands and streams.

2. The Final EIS contains additional information on groundwater impacts in Section 4.9, Earth. The details of the Creek design will be determined as part of the permitting process.

3. An expanded discussion of the storm water runoff treatment system is included in the Final EIS.

4. The design of the storm water treatment system and storm water management facility will follow all applicable rules and regulations.

5. The proposed outlet structure for the storm water control pond of the Storm Water Management Facility would allow for movement of aquatic organisms in a manner approximating existing conditions. The existing Des Moines Creek storm sewer "daylights" at the approximate location of the proposed pond inflow. Movement of organisms upstream through the storm sewer in its present condition is limited during low flows due to steep drops in culverts and through structures. A maintenance schedule for the pond would be developed during final design and approval of the Storm Water Management Facility.

6. Wetland losses through shading effects will be included in the wetland impact and mitigation acreages.

The final mitigation design will address spatial impacts. Because the affected creek channel flows through parking lots and a golf course with little or no buffer of native vegetation, the SASA project would have little spatial impact to the Creek or adjacent natural areas. Temporal impacts (i. e. tbe time required for mitigation to functionally replace the impacted system) would be mitigated by the long-term functional improvements proposed (vegetation buffers, fisheries habitat, improved storm water detention).

The conceptual mitigation plan has not been designed to off-set past and cumulative impacts.

7. Please see the response to Letter 19, Comment 21.

8. Your comment is noted.

9 (9) Alternative industrial waste transport systems should be evaluated. The proposed transport pipe would expose the creek to potential industrial waste leaks and spills. Greater detail is required regarding distance of exposed pipe; emergency notification, operations, and containment; spill control and response; and potential habitat impacts,

10 (10) Project construction and operation may affect groundwater volume and flow pattern (e.g., construction and operation dewatering, decreased recharge). The draft EIS states that, "further reduction in these critical low flows will reduce available fish rearing habitat and increase water temperatures." Information pertaining to the maintenance of summer low flows in Des Moines Creek should be provided.

11 (11) Option 1A operation and maintenance impacts, page 4-92, is incorrect.

12 (12) Water quality data was collected on 18 December 1991. To fully assess potential acute and chronic effects of heavy metals and other contaminants, it is necessary to obtain summer water temperatures.

13 (13) Proposed tank farm spill control measures (e.g., increased berm height, clay liner) should be incorporated into any final project design. In addition, we support the conversion of the runway drainage system from a closed pipe system to open grass-lined swales.

14 (13) The final EIS should include the following mitigation elements:

(a) Clear and specific project goals and measures for determining success (e.g., criteria related to hydrology, plant and wildlife species diversity, percent vegetation cover, vegetation density, plant height, root development, canopy stratification);

(b) Baseline invertebrate and summer water temperature data;

(c) Detailed performance standards;

(d) Mitigation implementation schedule including yearly target criteria (e.g., vegetation density) and project completion date;

(e) Detailed contingency plans and maintenance requirements;

(f) Detailed plans regarding grading, hydrologic alterations, water control structures, irrigation systems, exotic vegetation control, soil amendments, erosion control, and bank stabilization;

9. See response to Letter 4, Comment 3 for a discussion of alternate Runoff Treatment Facility piping systems. See response to Letter 19, Comment 21 for discussion of spill control and response plans.

10. Please see the response to Letter 4, Comment 5.

11. Your comment is acknowledged. The text of the Final EIS has been revised.

12. Additional baseline monitoring of several water quality parameters will be carried out prior to work along the creek.

13. Your comment is noted.

14. A detailed mitigation program is currently being developed for SASA and will be finalized in coordination with permitting and review agencies as part of the permit application process. The conceptual plan presented in the Draft EIS provides an overview of the mitigation concept. The detailed plan developed for permit approval will include measures for implementing the plan, monitoring project success, contingency plans and maintenance requirements. Refer to new Appendix O for additional information.

14 (g) Channel and instream structure elevation (deviation from proposed construction design should be reported and contingency plans enacted);

(h) Monitoring protocol and report schedule (minimum of 10 years);

(i) Protection of mitigation sites in perpetuity;

(j) A final as built plan indicating streambed elevations, slopes, and plantings, and any installations or structures.

15 (14) The final EIS should include information regarding potential runway extension impacts on the mitigation site.

16 (15) Golf course weirs and other potential fish blockage devices should be removed from the SASA site. In addition, stream flows should be maintained near documented optimums. To meet the intent of stated mitigation objectives, native fishes should be allowed to repopulate the upper Des Moines Creek.

17 (16) To reduce erosion beneath the proposed taxiway bridge, shade tolerant vegetation should be planted.

18 (17) Details regarding past stream relocation projects utilizing clay liners should be provided. Detailed monitoring and contingency plans should be provided.

19 (18) Riprap should not be utilized in the restored stream channel.

20 (19) A detailed soil erosion and sediment control plan as well as maintenance requirements should be developed.

21 (20) Soil storage should not occur adjacent to wetlands, ponds, or streams.

Noise effects

22 A narrative discussion which qualitatively discusses noise impacts is needed. Except for references to Federal and local noise criteria the draft EIS lacked a lucid discussion of just what the noise effects are. Will direct and indirect noise resulting from the new aircraft support facilities be noticeable? Will people who live and work in the area typically be able to discern any increase in single event noise levels or the shifting of a Ldn contour? Also noise criteria in and of themselves do not equal importance as the draft EIS implies. Noise impacts, while meeting criteria, could be very bothersome and disruptive to many people.

23 The draft EIS discusses noise from aircraft ground operations, flight operations and vehicle traffic. The effects from these sources are admittedly difficult to analyze

15. The SASA mitigation site selection process considered a number of other project proposals related to future airport plans, including the runway safety area extension. These future projects will not impact the SASA mitigation site or require future relocation of a portion of the mitigation project.

16. Please see the response to Comment 14.

17. Please see the response to Comment 14.

18. Please see the response to Comment 14.

19. Please see the response to Comment 14.

20. Please see the response to Comment 14.

21. Your comment is noted.

22. Your comment is noted. The Final EIS noise section provides additional information and qualitatively discusses the noise impacts.

23 and discuss cumulatively. To help disclose cumulative noise effects we suggest graphs which would plot dBA for each alternative at the representative receptor locations in Table 4.4-8. The vertical axis would include the dBA scale and the horizontal axis would include the 24-hour time scale. The plots could be based on a worst-case or typical daily scenario with the objective of revealing the incremental effect of each of the alternatives compared to no-action.

24 Table 4.4-5 on page 4-44 would be more meaningful if it included average daily aircraft run-ups for alternate 1, the no-action alternative as well as each of the action alternatives. The incremental effects of the action alternatives would be easier to understand.

23. Your comment is noted.

24. Your comment is noted.

SUMMARY OF THE EPA RATING SYSTEM FOR DRAFT ENVIRONMENTAL IMPACT STATEMENTS: DEFINITIONS AND FOLLOW-UP ACTION *

Environmental Impact of the Action

LO–Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplish with no more than minor changes to the proposal.

EC–Environmental Concerns

The EPA review has identified environmental impacts that should be avoid in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO–Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU–Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1–Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2–Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoid in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3–Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussion are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640 policy and Procedures for the Review of Federal Actions Impacting the Environment.

LETTER 22.

APR 1992
RECEIVED

April 27, 1992

SASA PROJECT COMMENTS

I protest the length of time allotted for the comment period. For anyone to think that a citizen could possibly read, investigate and critique a 600 page technical volume covering a dozen major environmental subjects on a $150 million dollar construction project in a few weeks is not believable.

I do not understand how or why the FAA would be involved in this project in the first place. It appears to me that the Port of Seattle is condemning land and is building facilities, using local taxpayer financing, (over $100 million bonds sold already) for private business - which should be illegal. You have not allowed these taxpayers time to respond with necessary changes.

I ordered a copy of the DEIS by phone the same day it was announced in the Seattle Times that it was about to be distributed. (March 14, I believe). I received a copy on April 16, leaving about 10 days to review it. This would be impossible for even a team of 50 experts to do in that time. The comment period should be about 6 months, certainly no less than 3. Since there is absolutely no reason to rush this project, it appears to me that there is a conspiracy by the Port and the FAA, to bypass as much as possible, the environmental impact of this project.

This document is so incomplete, misleading, biased and full of errors and omissions as to be classified one step away from from fiction. I notice references to people involved in composing it, but curiously nothing in the text can be attributed to any reference. Are we not entitled to know who was responsible for each part of this shoddy work, or was it all "narrated and edited" by ghost writers to give it the right "slant"?

Some DEIS comments:

1 Several aspects of run-off water have not been addressed. For example, I could not find the details on how the run-off holding ponds are constructed to prevent containments from leaching into the aquifer. Miller Creek protection is inadequate.

2 There is no information on excavation and fill to prepare the area.

3 What is the Port contributing to the cost of roads to handle traffic changes and increases?

4 The noise impacts are not covered. Hush houses are not even included in two options, even though maintenance will continue thru 24 hours and sustained and burst engine run-ups will have to be made at night to get airplanes back in service by early morning. There is no commitment that hush houses will be included. The hush houses shown in the diagrams only have 3 sides. There is no technical data included as to the construction, use, or exact effectiveness of hush houses or their cost, life, etc. I assume this plan will prohibit engine testing during sleeping hours because of these omissions.

Every section I have had time to review in the short time alloted has major problems. This document needs to be redone - by some experts who will seriously look at the environmental impacts. Otherwise you should change it's name to DPEIS. (Draft Partial Environmental Impact Statement)

Thomas C Reno

Thomas C. Reno
13766 16th Ave. SW
Seattle, Washington

Letter 22 - Thomas C. Reno

1. Storm water management on the site was reviewed holistically, and mitigation of all normal storm water impacts were considered.

   Please see the response to Letter 10, Comment 6.

2. Section 3.3, Alternatives Selected for Further Study, and Section 4.9, Earth, include discussions of the necessary excavation and fill to prepare the area.

3. As stated in the EIS section on traffic mitigation, should the project proceed, the Port would contribute toward appropriate mitigation in proportion to the project's share of traffic.

4. The hush facility is only included in the alternatives that feature a base maintenance facility (Alternatives 2 and 3). Under Alternative 1 and Option 1A, engine run-ups would be conducted on the four sites that have already been designated for that use at the main airport. Run-ups higher than idle power would not occur on the SASA site unless they were done in a hush facility.

   The Final EIS includes more information on the hush facility in Section 4.4, Noise.

LETTER 23.

Doug Sutherland, City Manager

CITY OF SEATAC - 19215 - 28th Avenue South - SeaTac, Washington 98188 - (206) 878-9100

April 27, 1992

William E. Brougher
Director, Aviation Facilities & Maintenance
Port of Seattle, SEPA Responsible Official
Pier 66, P.O. Box 1209
Seattle, Washington 98111

APR 1992 RECEIVED

Dear Mr. Brougher:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT COMMENTS FOR THE PROPOSED SOUTH AVIATION SUPPORT AREA (SASA) PROJECT

The City of SeaTac, as an affected jurisdiction and supporter of the joint SASA/Aviation Business Center (ABC) mixed use commercial development project, has reviewed the SASA DEIS. The proposed SASA project may impact the City and the SeaTac community in a variety of ways. The proposal contributes to the following significant impacts on the SeaTac community: soils, water quality/quantity, sensitive wetlands, fish and wildlife habitat, traffic, land use, air quality, noise, recreation, aesthetics/urban design; public services/utilities and economics. While the DEIS in most respects addresses the concerns expressed in the scoping comments provided by the City in the fall of 1991, the City offers some additional comments on the DEIS.

COORDINATION WITH OTHER AREA PROPOSALS

1 In regard to Figure 3.4.1 the King County Regional Justice Center site boundaries are drawn incorrectly. They should extend to the mobile home park to the south.

In regard to Figure 4.1-1a Generalized Land Use, the site where SeaTac City Hall is located is illustrated primarily as office, the site should be the governmental services category as listed in the legend.

Letter 23 - City of SeaTac

1. Your comment is noted. Figure 3.4-1 has been revised for the Final EIS. The City of SeaTac is one of a number of groups leasing office space at the former Angle Lake School. "Office/professional" seems a reasonable categorization of this use.

LAND USE: Section 4.1.2 on Applicable Plans and Policies apparently assumes that the uses proposed for the SASA project are compatible with those uses permitted in the Aviation Business Center (ABC) zoning classification. While the Aviation Business Center (ABC) District includes supportive language for the SASA project, specific aviation uses should be included within the ABC land use and zoning changes. The scale and nature of the uses could potentially have a greater impact on adjacent land uses than those which might be developed in the ABC. Several of these impacts, such as noise and aesthetics/urban design, are addressed elsewhere in the DEIS. Nonetheless, more consideration may need to be given to SASA's design compatibility with existing and potential adjacent land uses.

2 **While this is not necessary from the Port's perspective, amendments to the Comprehensive Plan Land Use Element and the Zoning Code appear to be necessary for consistency with City of SeaTac policy. A rezone to the designated SASA property area may also be necessary.**

Equally important for the City is the recognition and establishment of the ABC district area adjacent to the SASA project. This was best identified and recognized within the Do Nothing Alternative. Alternatives One and Two increasingly are less beneficial to the City of SeaTac. It is not clear in the DEIS how each of these alternatives synergistically address both SASA and the anticipated mixed use development within the ABC District as it might relate to the greatest benefit and the least negative impacts to the City and to SASA.

In addition, the ABC zone also has several **other standards related to design, including for example the development of linked pedestrian pathways and open space. How open space and pedestrian access, if any, is incorporated into the design of the SASA is not made clear. If the SASA DEIS is equating impacts based on a comparison to the ABC zone standards, then all applicable standards** of the ABC zone should be analyzed.

3 ECONOMICS: The City of SeaTac is interested in the costs and benefits of the SASA facility relative to the different tax base shifts that would occur under the various alternatives under consideration. The most conservative (versus a mid range assessed value) estimated assessed value for new construction by use type for the SeaTac area was obtained from the Commercial Appraisal Section of the King County Assessor's Office. While this does allow for a safe reading on the future, it does not present a middle of the road picture of what is possible if commercial development were to occur within the ABC area in conjunction with SASA.

2. Your comment is noted. Detailed environmental impact analysis of ABC development is not a part of this EIS, which addresses aviation uses. Because it is Port-owned property proposed as an airport use, the SASA development does not fall under the jurisdiction of the ABC zone. The SASA project is separate from ABC-type development. The Port will work with the city of SeaTac in updating Comprehensive Plan and Zoning Code under GMA.

   The height, bulk, and view impacts of the SASA project are covered in Section 4.13, Aesthetics and Urban Design. The cumulative economic impacts are addressed under Section 4.3, Induced Socioeconomic Impacts.

   As noted in the EIS, there may be potential for ABC development to utilize air rights over a portion of the SASA site and facilities. In the absence of specific proposals and plans, further evaluation of impacts potentially affecting the ABC area is too speculative. See General Response D: Commercial Development Assumptions. Pedestrian access is not shown within SASA because the facilities would not be open to the public. Open space and pedestrian access within ABC would be governed by City of SeaTac requirements.

3. Estimates of assessed value by use type supplied by the King County Assessor's Office fall within a relatively narrow band, i.e. $85-100 per square foot for retail, and $40-50 per square foot for industrial. The lower end of these ranges was used in this analysis ($85 retail; $40 industrial) so as not to overstate property tax revenues. Using the upper end of the range would result in slightly higher estimated property tax revenues. However, given the uncertainties associated with projecting the timing, nature and size of various developments, this is not a material difference. Moreover, the key issue is that these values were applied uniformly across the No-Action and each of the three action alternatives.

4 Equally important is how the alternative scenarios evaluate ABC commercial district employment versus SASA employment. For example on page 4-18, new operational job multipliers are identified as 1.74 for aviation facility jobs and 1.32 for commercial development jobs. Therefore, this paragraph states that aviation maintenance facility would create .74 additional indirect and induced jobs in the regional economy while commercial development would generate .32 indirect and induced jobs. This translates into aviation-related jobs generating over twice as many indirect and induced jobs over commercial development jobs. However, this is misleading because commercial development allows for significantly higher density and potentially 20 to 40,000 direct jobs versus SASA's 1,643 (Alt. 1), 3,687 (Alt. 2) and 4,155 (Alt. 3) total site and facility development jobs. This is not discussed in the DEIS and should be addressed as a long term impact on the City as well as the Puget Sound region.

5 The negative impact on existing property owners does not appear to be discussed relative to the economic uncertainty/impact that this project has upon investors interested in developing specific mixed use/commercial/industrial projects. The SASA EIS should address, mitigate and minimize the negative economic impacts of uncertainty and maximize the positive impacts of redevelopment on property owners within this area.

NOISE: Potentially significant noise impacts may result from the runup of engines. There are three areas of concern about noise in the DEIS that relate to the Regional Justice Center.

6 The first is that substantial engine runup activity would occur at night (p. 3-4/Section 3.4.7) and would impact the RJC. It is the City's understanding that there would not be night time activity that would significantly impact surrounding communities such as would be experienced within the mobile home parks to the south, Angle Lake residential community to the east and a Regional Justice Center (RJC) to the south. If this understanding is incorrect, then the SASA EIS apparently does not adequately address, mitigate and minimize noise impacts on surrounding SeaTac Citizens and employees within and adjacent to the ABC commercial district. This viewpoint is based on the noise impacts described by the DEIS for the RJC facility; if such a heavily insulated facility will be adversely impacted by engine runup noise, then adjacent residential and commercial properties will be equally or even more greatly impacted.

Second, the DEIS inadequately accounts for the steady noise reduction occurring as a result of new jet technology and the hush house that is supposed to mitigate noise to adjacent ABC district users. By 1996, the first full year of operation for the RJC and other ABC District users, applicable FAA noise contours will be at only 70 dBA.

4. Employment multipliers are used to estimate the number of indirect and induced jobs created for every new direct job created. The number of employees who could be located in a given commercial or non-commercial development is a different issue, one which was not analyzed in this project.

5. Your comment is noted. Such an analysis is outside the scope of this EIS.

6. In Section 3.4, Coordination with Other Area Proposals, the SASA Draft EIS acknowledges the potential King County Regional Justice Center site in the city of SeaTac. Since the SASA Draft EIS was released, King County has released a Final EIS on their proposal. A site in Kent has been selected by the King County Council for the Justice Center. As discussed in Section 3.4, the site has been selected by the Federal Bureau of Prisons for construction of a federal detention center.

Finally, the sentence referring to the RJC site selection and typical residential uses in the second paragraph of Section 3.4.7 should be taken out or reworded to reflect the reality of RJC construction and uses. Jail cells are not typical residential uses. The construction of the RJC can and would account for noise insulation. Because "typical" single family homes are built to different construction standards, residential uses do not in any way reflect the actual use of RJC jail cells.

6 The DEIS is not clear why the potential noise impact on inmates at the RJC from Alternative One without the hush house is a problem. The DEIS references information requested from Julie Wiebusch, noise consultant on the North SeaTac Park Community Center and from Gordon Edberg, the Architect for the Alaska Airline Reservations building south of South 200th Street and west of 28th Avenue South. Ms. Wiebusch describes her firm's experience with similar projects that have noise impacts. For example she indicated that a 1024 bed medium security correctional facility is currently being designed and constructed in Airway Heights, Washington. The site is impacted by noise from Spokane International Airport, Fairchild Airforce Base and Spokane Raceway Park and a drag racing strip. One of the flight patterns from Fairchild is directly over the site and the drag strip is adjacent to the site. The facility was designed for worst case conditions to minimize sleep interference in the cells, ensure intelligible communications between the tower, the control center and the various guards, and provide a workable office environment during the noisiest events. Reducing interior noise levels, according to Ms. Wiebusch, would be a factor in establishing criteria for the construction of a correctional facility. However, by its very nature, a correctional facility is typically built from massive elements such as concrete or masonry to provide for adequate security. This type of construction is effective in reducing noise levels.

Other facilities have been successfully designed and constructed on noisy sites. Within the City of SeaTac, the North SeaTac Park Community Center was recently designed and is under construction on property near the north end of Sea-Tac International Airport. Double frame construction and heavier glazing was incorporated into the design to ensure comfortable interior noise levels.

Architect Gordon Edberg was contacted by telephone to determine if any sound insulation was incorporated into the Alaska Airlines Reservation Center southeast of the proposed RJC site. Mr. Edberg indicated that noise reduction efforts in the building included carpeted office cubicles around the reservation operators.

Given this information from these two consultants, it is unclear why Alternative One is a problem for the RJC facility.

TRAFFIC/STORM DRAINAGE: The SASA proposal will generate substantial new levels of traffic flowing onto the east-west South 188th Street corridor, South 200th Street corridor and onto the already heavily congested north-south International Boulevard (SR-99) route if South Access/ 509 and the 28th/24th Avenue South arterial are not constructed. In order to mitigate the SASA development, South Access/509 along with the 28th/24th Avenue South arterial are essential.

It is not clear how the SASA EIS addresses and mitigates the impacts relative to Transportation Demand Management (TDM) measures, High Capacity Rail Transit, Personal Rapid Transit (PRT) and auto usage on local streets. Also important to consider is the capacity, funding and timing of this proposal relative to the EIS's on South Access/509 and the 28th/24th Avenue South arterial that will provide substantial direction and mitigation for the SASA project.

7 Based upon requirements of the Growth Management Act (GMA) and concurrency requirements, it is the intent of the City Administration to promote the orderly growth and development of the city. The City will require that new growth and development pay a proportionate share of the cost of new transportation facilities. In order that individual developments do not pay arbitrary or duplicate fees for the same transportation impacts, the City intends to develop impact fees. These fees will be based upon standards and shall be imposed through established procedures and criteria. Therefore, in lieu of performing a transportation impact analysis and developing a mitigation plan, the applicant may volunteer to contribute mitigation payments based upon the City's transportation impact fees. Although, these fees are unknown at this time, they will be in accordance with SHB 2929 and be based upon fair share contributions by all beneficiaries.

The DEIS needs to address site specific and construction related traffic mitigations in greater detail. The City requests that these mitigations will be evaluated on a project specific basis.

8 Storm drainage design for the project shall be in accordance with the latest version of the King County Water Design Manual.

9 RECREATION: The partial removal of the Tyee golf course to a nine hole course or complete removal results in significant loss and impacts on recreation within the SeaTac community. It is the City's understanding that the SASA EIS will address, mitigate and minimize the impacts on recreation loss for SeaTac Citizens and nearby employees within the ABC commercial district that may now use this 18 hole golf course.

7. The Mitigation Measures subsection of Section 4.12, Transportation, describes the measures that would be used to mitigate the transportation-related impacts of the project. Mitigation measures related to transportation demand management (TDM) are described in the transportation management program (TMP) section and measures to mitigate the impacts of auto usage on the streets are described in the Roadway and Intersection Improvements section. The Port could be required to contribute to the High Capacity Rail Transit and Personal Rapid Transit (PRT) projects if they provide a significant improvement to the SASA site development. Until these planned transit service improvements are better defined, however, the specific benefits and contribution amounts cannot be determined. Please also see the response to Letter 19, Comment 28. The South Access Roadway/SR 509 Extension project and the 28th/24th Avenue South arterial improvement project are two of the planned roadway and intersection improvements to which the SASA project could contribute as appropriate.

The comments regarding potential transportation impact fees in the City of SeaTac are noted. The Port of Seattle may choose to mitigate the transportation impacts of aviation-related development on the SASA site through contributions to the City of SeaTac's transportation impact fee program.

The detail provided in the Mitigation Measures subsection is typical for a project of this nature. The comment requesting that the mitigation measures be evaluated on a more specific basis is acknowledged.

8. Your comment is noted.

9. As described in the EIS, use of the golf course would cease with construction of SASA, and significant portions would be converted to SASA uses. The existing golf course is an interim use pending use of airport property for aviation uses. If sufficient property is available to reestablish a golf course, the Port will consider proposals at the appropriate time.

(10) **AESTHETICS/URBAN DESIGN:** Design review of the project aesthetics and urban design criteria for building placements, site planning, landscaping, relationships to the ABC mixed use commercial/office/hotel development and the relationship to the various forms of pedestrian and vehicular circulation does not appear to be adequately addressed within the DEIS. See land use discussion above.

WATER QUALITY AND QUANTITY: The SASA proposal could impact the water runoff quality and quantity flowing into Des Moines Creek within the Cities of SeaTac and Des Moines without substantial consideration relative to possible fuel spills. The following issues and concerns need to be clarified and addressed in detail within the FEIS:

(11) 1. The Sea-Tac Business Park Master Drainage Plan (MDP) is referenced extensively as a model and basis for the proposed and anticipated storm volumes. As this plan has not been adopted or approved by the City, any dependence on the data within the DEIS needs to reflect conservative projections.

(12) 2. The Des Moines Creek Relocation scenarios appear to be considered an improvement over the present status of the creek. However, there may need to be more detailed coordination (or documentation) with the Army Corp of Engineers or Muckleshoot Indians on key issues such as:

A. What mitigation is feasible or should the relocation be avoided altogether?

B. What type of Army Corp permits are necessary?

C. Would an alternative analysis for Des Moines Creek be required under the proposed DEIS concept for replacement and relocation?

(13) 3. Water Quality (4.6) - Storm Water Runoff Table 4.6-3

This table references a study that was done in 1983 that appears to have dealt with suspended sediment loads from roof runoff for all construction alternatives. The table gives an average sediment load rate of 50 (lbs/ac/yr) as the variable for each alternative. Reviewing that section, several questions arise on the table:

A. What was method used to arrive at the 50 (lbs/ac/yr) as reflected in the table for each alternative?

B. Was the study based on a standard urban area or an urban area with an airport generating airborne pollutants?

10. Due to the functional requirements of the SASA facility, public access to the site is not possible. Therefore, the various forms of pedestrian and vehicular circulation discussed in the ABC zone are not possible. In regard to site planning and urban design, there is presently no existing or proposed mixed-use development adjacent to the site to which the proposal could relate. However, future development in the area is not precluded by the proposal. Due to the proposed level of the deck and first floor of hangars and shops, the visual impact of the build alternatives could be less than if other developments were to locate on the site. Ample areas have been provided for landscaping within parking areas and for landscape buffers.

11. The information provided in both the Sea-Tac Business Park Master Drainage Plan (MDP) and the Hydrological and Hydraulic Simulation Study for Drainage Control in Des Moines Creek (HSS) were used for preparation of the storm water modeling in the SASA project. The MDP was used primarily for structural information, while the HSS was relied upon to provide hydrologic parameters used in the model. All information used in the SASA model was checked and the results of the SASA model were verified with the two existing models.

12. Currently, the U.S. Army Corps of Engineers is considering a pre-application proposal for placement of fill in Des Moines Creek and associated wetlands. The segment of Des Moines Creek proposed for relocation is above the headwaters (i.e., less than 5 cfs mean annual flow) and the extent of fill is less than 2 acres. The applicant is currently preparing supporting data to address a number of review agency requests resulting from the pre-application meeting for the SASA project. It is the Corps' and the applicant's intent to pursue a Section 404 individual permit for SASA. Please also refer to Letter 21, Comment I.

13. The referenced table does not contain any estimates of sediment loads from runoff. A literature search was done on contaminants from roof runoff in urban situations and no reliable data were found. In order to make a conservative comparison between the alternatives, sediment loading data from pavement in urban situations was used. It is unlikely that roof runoff would have sediment loading as high as paved areas, and it is noted in Table 4.6-3 that these figures should only be used as a comparison between the various alternatives.

The loading itself was calculated based on flow-weighted samples taken from a known area of paving in several urban situations which were analyzed for total sediment. The concentrations found were used in a calculation for annual loading which takes into account the volume of runoff coming from the site, the amount of rainfall in an average year, and the average length of time between storms.

13 c. If the study was done in 1983, is it still valid with advances in aircraft and automobile technology?

I want to thank the Port of Seattle for the opportunity to comment and contribute to The SASA DEIS. Again, I want to emphasize our support for the SASA project as it may address the benefits from the SASA project and the commercial mixed use alternative development scenarios.

Sincerely,

Doug Sutherland, City Manager

A:\SASADEIS.LET MTE/4-27-92

PUBLIC HEARING

DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE SOUTH AVIATION SUPPORT AREA

7:00 p.m.

Tyee High School
4424 S. 188th Street
SeaTac, Washington

HEARD BEFORE: JOHN GALT, HEARING EXAMINER

REPRESENTATIVES PRESENT:

JOE SIMS, PORT OF SEATTLE
SARAH DALTON, FAA
DENNIS HASKELL, TRA

MR. SIMS: Good evening, ladies and gentlemen. We are going to start the Hearing if you can find a seat. I'm Joe Sims, the Director of Planning for SeaTac Airport, and I'd like to welcome you here. This is a hearing on what we call the SASA Project EIS. Many of you have earlier had a chance to see some of the information that the Open House had available preceding this hearing. We are not in this process answering questions, but if you have afterwards something that you wanted to get some information on, I am sure there will be some staff here after the hearing is over available around the back and sides of the room that could help you with that.

This is a project that deals with a hundred acres south of the Sea-Tac airport terminal area that is emphasizing maintenance operations by airlines. There are some alternatives here that are being depicted in the EIS.

We have at the table Dennis Haskell on the far right, who is the head of the consulting team doing the EIS, and on my left, Sarah Dalton from the F.A.A.

What I'm going to do now is turn it over to the Hearing Examiner who will conduct the hearing and will explain to you the ground rules that will be followed. I will also point out for those of you who haven't seen it, there is a comment sheet available in the back which can also be used for mailing in comments through the 27th of this month. Also, there is a handout available that you can take with you that shows information about the project.

With that, I'll turn it over to John Galt who is a Hearing Examiner for Snohomish County, and he will explain the ground rules and the procedures and conduct of the meeting, and then we get underway.

THE HEARING EXAMINER: Thank you, Joe. Good evening, ladies and gentlemen. On behalf of the F.A.A. and the Port of Seattle, I'd like to welcome you again to tonight's Public Hearing regarding the draft EIS for SASA, the South Aviation Support Area. My name is John Galt. I am a Hearings Examiner from Snohomish County. I have been retained to moderate tonight's hearing specifically because I don't work for the F.A.A., I don't work for the Port of Seattle, I don't work for any of its consultants, and I don't live anywhere around the airport. My interest is solely to insure that we have a fair, orderly and timely hearing this evening.

There is a sign-up sheet on the table at the back corner of the room. It looks like this. If you have not signed up to speak tonight and want to do so, there's plenty of time for you to walk back there and put your name on the sheet.

I'd like to say a word or two about the EIS process because I find in these hearings that quite frequently, the audience is somewhat perplexed or mystified as to how the EIS system works in the State of Washington. Preparation of the EIS IS a two step process. First, the lead agency and its EIS consultant prepare a draft report. The draft report is distributed for review by the public, affected agencies and agencies with expertise in environmental issues. This review process assists the lead agency and its consultant in producing a complete and accurate final EIS by providing an opportunity for comments on the study's methodology, needed additional information and mitigation measures.

Tonight's Hearing is part of that review process of the draft EIS. The final EIS will be prepared after the draft review process has been completed and it will respond to the comments received that relate to SASA. The final EIS will be available to the F.A.A. and Port of Seattle decision-makers before they make any implementation decisions regarding the SASA project.

Part of my job tonight is to ensure that as many of you as possible have the opportunity to present oral comments on the draft EIS. I have therefore been asked to strictly enforce the three minute time limit for speakers. We have a timer over here at the other table, and she has a card that has 30 seconds marked on one side and a big double zero on the other side. When you get to 30 seconds from three minutes, she'll hold up the 30 second side, and than when the time is up, she'll hold up the side that looks like the stop sign with the double zero on it. I would ask that everybody try to stop their comments as promptly as you can after you see the time is up. I am not going to chop you off in mid-sentence, but I have been asked out of fairness to everybody to see to it that we adhere to the three minute limit as much as we can, and I need your cooperation in that.

If you don't speak tonight, if you have a lot of detailed and technical comments that you want to offer, or if you just simply feel that three minutes isn't enough time for you to present the information that you want for this draft review process, I want to assure you that written comments will be just as important as the oral comments tonight. In fact, if your comments are technically oriented, they probably are easier to put in writing than they are to explain verbally in a Hearing such as this. Written comments may be sent to the F.A.A. at the address that's listed on the handout material. Written comments must be postmarked by April 27th in order to be considered in the final EIS preparation process.

I hope that when we leave tonight, we can all depart knowing that we have treated one another with courtesy and respect and that we have allowed others to present their views without disruption or intimidation. In other words, that a fair and civil Hearing has occurred. Part of my job so to ensure that that happens. I trust that I can count on your cooperation. Demonstrations of agreement or disagreement will only detract from that objective and will reduce the amount of time for others to speak.

Please help our court reporter, who is here to record your comments from which a written transcript will be prepared, by speaking closely into the microphone. That will also help the audience to hear your comments because you will be speaking towards the three people here on the study team. The court reporter would also ask that even though I will be calling you by name that when you sit down and first start your comments, please give your name again, and then she would like you to spell the last name for her, please.

I'm going to call three names at a time to help speed the process along. I will be calling the names exactly in the order that you signed up on the sign-up sheets. The first name that I call will be the speaker, and then the next two will sort of be in the on-deck circle, if you will pardon a baseball analogy there.

Our first speaker tonight is Ron Colsen, who will be followed by Mary Cline and then Joan Bell. Mr. Colson? Do I have Ron Colson here? I thought the gentleman that was getting up in the third row was Ron Colson, but he went in the wrong direction.

Let's move then to Mary Cline. We'll come back later and see if Mr. Colson has come back. Ms. Cline?

MS. CLINE: My name is Mary Cline, C-l-i-n-e. I am the President of the Highline School Board, and I am speaking on behalf of the Highline School Board.

The Highline School District has several concerns regarding the impacts of the proposed South Aviation Support Facility on our schools. The concerns are related to the noise, air pollution and traffic impacts on schools in the vicinity of the proposed project. The effects on schools does not appear to have been addressed in the EIS.

1

Regarding noise, our most immediate concern is for Madrona Elementary School which is located just four blocks southeast of the SASA site. The EIS addresses some limitations that will be imposed on noise generated at night, but our schools operate during the day, and the limitations do not apply during the normal school day.

1-7. Please see the response to Letter 3.

We also note that the hush facility is open to the east and will provide little noise abatement in the easterly direction. (2)

We believe that Madrona Elmentary School will be a recipient of increased noise from the SASA facilities. Therefore, the School District will be forced to install noise reduction measures in the existing school or add such measures to a new school when built. In either case, the District will incur the $1.5 million cost because schools are not currently eligible for assistance from the noise remedy program. (3)

We feel that when the airport causes a noise problem, the airport should pay to remedy the problem, not the surrounding citizens who live with the adverse effects of the airport's improvements.

The School District is also very concerned about the potential for increased air pollution at Madrona Elementary School. Madrona will be downwind from the SASA during periods of northwesterly wind, the fair weather winds, which invite children to play outside. (4) The EIS indicates that the emissions from the SASA will add up to ten percent to the already high level of aircraft emissions. Unlike noise, which the School District can reduce inside its buildings, it is not feasible for the District to protect its students and staff from air pollution.

5

Third, the District has serious concerns about the levels of traffic that will be generated by the SASA. Chinook Middle School and Tyee High School are located on S. 188th Street. Many students attending Chinook and Tyee must cross S. 188th Street. Madrona Elementary School is located on 30th Avenue S. 30th Avenue and S. 204th Street are rapidly becoming alternate routes for drivers trying to avoid the S. 200th and International Boulevard intersection. That has increased traffic past the school.

Both 30th Avenue S. and S. 204th Street lack curbs and sidewalks, and the increase in the traffic is already raising concerns for the safety of pedestrians. Any increase in traffic from the SASA will exacerbate those problems.

6

Lastly, the EIS assumes a future connection between 28th Avenue S. and 24th Avenue S. which will create a through route between S. 188th and Kent-DesMoines Road. We believe the street will become a heavily used alternative north/south route. That is a concern for the School District because we have a school complex, including Midway Intermediate School and Pacific Middle School, with frontage on 24th Avenue S. There are high levels of school bus, auto and pedestrian traffic around those schools. Nearly all of 24th Avenue is without curbs and sidewalks, and we find any proposal which dumps significant amounts of additional traffic on 24th Avenue S. south of 16th Avenue S. to be unacceptable.

I have a summary paragraph, but I understand my time is up.

THE HEARING EXAMINER: How long is your summary?

MS. CLINE: Not very long.

THE HEARING EXAMINER: Go ahead.

MS. CLINE: To summarize, the Highline School District has serious with develpment of the SASA because of additional:

No. 1. Noise at Madrona Elementary School which SeaTac Airport has thus far chosen not to mitigate.

No. 2. Additional air pollution also at Madrona Elementary School which we cannot mitigate at any cost.

No. 3. Additional traffic along S. 188th, S. 200th and 30th Avenue S. creating greater hazards for students who must cross these streets.

No. 4. The unresolved questions of 28th and 24th Avenue S. and how that traffic will be routed to avoid Midway Intermediate School, Pacific Middle School and Mt. Rainier High School complex.

Thank you.

THE HEARING EXAMINER: Thank you. The next

7

speaker will be Joan Bell who will be followed then by Jean Mohler and Denny Lensegrav. I apologise if I don't got your names quite right. I will do tha best I can. Miss Bell?

MS. BELL: My name is Joan Bell, B-e-l-l, a member of CAASE and RCAA. Our community is being attacked again, folks. Is there a capacity crunch? Port officials say they have to move existing maintenance facilities so they can more easily accommodate the traveling public, especially the international visitors being courted. The European Study Mission being organised by the Greater Seattle Chamber of Commerce leeves April 21st to promote European trade through Seattle. Sagar, VanAsse, VanWyk, Patricia Davis, Paul Schell and Andrea Beinecker all plan to go as Port representatives.

8

If they really balieved the airport to be short of space in the terminal passenger areas, they wouldn't bu soliciting more customers. They know that there are some hours of the day when it's really deserted at the airport. Planes that avoid the peak hours can land easily.

The hush facility. If you like to read horror stories, get a copy of the technical appendices on tha SASA project. How will the airport deal with tha noiso

8. Please see the response to Letter 1.

of the proposed maintenance base? Don't worry, they plan to build a hush facility designed for narrow body planes. If these narrow bodies are not too different in design one from the other, the hush facility should be able to achieve noise reduction of about ten db. The Port would like us to believe that this puny amount of noise reduction will actually make an appreciable difference to the ear-splitting noise of airplane engines doing runups at 80 to 90 percent of engine power for ten minutes at a time. The charts suggest that two percent of runups could be at night.

Excavation impacts. Now read about the process of constructing this monstrous maintenance base. All the major intersections of our community are discussed 8 dispassionately, describing the destruction, gridlock, mud and chugging trucks controlling our lives for months. The estimate is about nine weeks for the job, but everyone knows this is deliberately optimistic to encourage approval of the project.

Consider the excavation traffic impacts. Some existing material would need to be excavated and removed from the site, and some new material would need to be brought. So far, only one such site has been identified on the current Port property, the runway safety area extension site at the south end of the current runways, but other potential sites for the excavated material are located up to ten miles from the SASA site.

Four truck routes are analyzed. Ten percent would use 188th and International Boulevard to access north sites, 25 percent would use 188th and SR 509 to access other north sites, 65 percent would use 188th to access I-5, 20 percent then going north and 45 percent south. The acceleration of trucks is estimated at a quarter the acceleration of passenger vehicles. The project would tie up our major access routes for months. Alternative Three generates 4,142 daily trips.

We would find the construction phase noisy, dirty and frustrating, but the real impact would be the monstrous maintenance base created. The loud, reverberating noise would invade our homes both through the air and under the ground as infrasound that cracks cement foundations. I recommend the No Alternative, the No Action Alternative. The airport should not be allowed to intrude into the neighborhoods any more violently than it does at this time.

THE HEARING EXAMINER: Thank you, Miss Bell. Next is Jean Mohler, who will be followed by Denny Lensegrav and Russ Richter.

MS. MOLLER: Thank you very much. My name is Jean Mohler. I am with CAASE and RCAA.

8

I am here this evening to discuss with you the silence that resounds within the EIS when you deal with water supply. As a former Water Commissioner in the Highline Water System, I am shocked to see that you did not deal and mention at all how much water you intend to use, not only for this facility, but for its companion, the third runway. (9)

I also wish to register an objection to the fact that you have bifurcated a single project by having us deal with the same project in two separate areas. Each of these is in the opinion of most of us the same project. (10)

The City of Seattle, in responding to the flight plan, made a statement that they could not guarantee water because we are critically short. Currently, the Cedar River Watershed is at capacity and the Tolt is at near capacity. Yet we're being asked to go ahead as citizens within this community to underwrite a water supply at very cheap water rates to the Port of Seattle that we do not know whether we will be able to supply you.

We buy our water from Seattle, Ladies and Gentlemen, and if Seattle doesn't have it, the Highline Water District doesn't have it. In November of 1989, the Highline Water District in a letter to Barbara Hinkel

9. The project would require 10,000 gpm (gallons per minute) to meet fire flow requirements. Other water requirements have not been determined. Please see the response to Letter 5.

10. See General Response C: Separation of SASA from other Airport Programs.

mentions this in commenting upon the Comprehensive Water Plan. I will read to you one part. It says, "Clearly the demands on the existing water system in the South King County critical water service supply area will be affected by the size and the nature of the expansion of the South Aviation Support Facility of the Port of Seattle." This issue is not adequately addressed in the environmental impact statement for SASA. (11)

When you do your final EIS, respectfully, I request that you tell us how much water you're going to need, not only for this facility, but for the third runway project and the future expansion of the terminal. All of these projects are the same, notwithstanding the fact that you have divided them into separate parts.

And finally, Ladies and Gentlemen, I would like to ask you to deal quite decisively with the vibrations through the earth. You have also left that out, and most of us who are here tonight realize that those sounds going through tha -- vibrations do crack the foundations in adjacent buildings, and that is also an area that you have not dealt with, period. Thank you very much. (12)

THE HEARING EXAMINER: Thank you, Miss Mohler. Denny Lensegrav, who will be followed by Russ Richter and Dan Caldwell.

MR. LENSEGRAV: Mr. Chairman, my name is Dennis

11. Your comment is noted. Water supply is discussed in the Section 4.17, Public Services and Utilities.

12. Ground-borne vibration is not a common environmental problem except near vibration sources such as railroads or construction sites. Otherwise, shaking of houses is almost always caused by airborne noise. Airborne noise, which consists of compression waves in air, can interact with building components causing noticeable vibrations. A common manifestation of this phenomena is windows rattling as aircraft fly over or trucks pass by.

It is extremely unlikely that runups in the hush facility will generate ground-borne vibration that is perceptible at distances greater than 30 to 40 feet from the hush facility. For ground-borne vibration to have the potential of damaging structures, amplitudes must be at least 100 times greater than the threshold of perception for a typical human.

There are two potential ways in which aircraft runups could cause ground-borne vibrations:

1. *Vibration energy propagating from the aircraft engine through the aircraft structure and tires into the ground.* This is an inefficient vibration propagation path, at least partially because pneumatic tires are effective vibration isolators. It is extremely unlikely that this would be a significant path for ground-borne vibration from the hush facility. Tests of ground-borne vibration at jet engine test cells, where the jet engine is bolted to a structure that is attached directly to the ground, have shown that ground-borne vibration is not perceptible to even the most sensitive humans at distances greater than 300 feet from the test cell.

2. *Vibration of the hush facility structure causing ground-borne vibration.* Noise from the jet engine would cause the hush facility structure to vibrate. This vibration would then propagate through the structure foundation into the ground. It is conceivable for this process to result in perceptible vibration at distances 30 to 40 feet from the building.

Given that 1) ground-borne vibration from runups within the hush facility would be much lower than that caused by testing in a jet engine test cell, and 2) the distance between the hush facility and the nearest residence is greater than 1,000 feet, there is virtually no possibility of ground-borne vibration being perceptible or causing any damage to nearby structures.

Lensegrav. I don't mind being on deck besause I work for Puget Power, and I am the business manager in Renton, 620 S. Grady Way, and my last name is apolled L-e-n-s-e-g-r-a-v.

I just have a short few comments I'd like to make. First of all, the existing electrical service that we have that serves SeaTac Airport comes out of two substations, and they're called North SeaTac substation, which is on International Boulevard next to the Seafirst Bank, and than the South SeaTac substation which is on 188th Street.

Without getting into any datail, those substations are distribution system type substations which are 12.5 KV in nature. Currently, those distribution substations are at various times during the day at peak limits. So what's happening here is that we are having to review our reliability options with airport operations and maintenance, and those have been ongoing for the last approximately three months.

Now, this project leaves us with something, and it leaves us with something in mind here is what we have to do. We have one other option in dealing with voltage, and that's called transmission voltage. The project is going to be of such a magnitude, whether it's Option One, One A, Two or Three that we're going to have to have a transmission substation to serve this project.

The substation voltage would then have to be at 115 KV which we have an existing substation on 28th Avenue S. which may be the appropriate one, but we would have to inform SeaTec Airport that if we do have to build a new substation, it will take about three years in length. Also, we, as a serving utility for the airport, we promise to work diligently and provide the electrical needs at the airport for this project, should it go.

Thank you very much.

THE HEARING EXAMINER: Thank you Mr. Lensegrav. Russ Richter will be followed by Dan Caldwell, and then Tom Crowley

MR. RICHTER: Is there anyone here from Alaska Airlines?

THE HEARING EXAMINER: Mr. Richter, your turn, sir.

MR. RICHTER: I know it was. Thank you.

A maintenance facility should provide services as required to maintain a fleet of airplanes for 100 percent airworthiness. Economics dictate that airplanes on the ground do not generate profitable revenues. King County is currently the 13th most populated county in the entire nation. By the year 2010, just 18 years from now, the county is projected to increase to 2 million. In

13

13. Presently, the substation at South 188th Street is operating at full capacity. It is not practical to upgrade this station. The Puget Power Substation at 28th Avenue South and South 200th Street, called Sweptwing Substation, has the capacity to serve the SASA site during the initial three years it would take to construct a new substation, according to discussions with Puget Power. The Port would need to provide a transformer for a temporary distribution center. The power usage for a typical hangar is approximately 325 Kilowatts.

conjunction, the costs of living, taxes, housing, food, clothing and support services in King County are higher than any other county in the state.

What effect would this have on Alaska Airlines if it decides to settle south of the airport?

1. Inflated costs for support services, et cetera, for maintaining a maintenance facility.

2. Employee illness, absenteeism as a result of having to work in an environment at the south end of the airport affected by overhead and around airport noise and pollution.

3. Employees working next to average happy Port of Seattle employees who earn approximately $40,000 per year. Be prepared for extensive union negotiations to keep up with the Joneses.

4. By the year 2005, Boeing forecasts a doubling of air travel. If a maintenance facility is constructed at the south end, where will it expand to to accommodate increased air traffic projected by the Port in the next 15 years? In the safety crash zone?

5. Employees who feel the adverse effect of trying to cope with an already overtaxed transportation system getting to and from work where gridlocks are a common, everyday occurrence.

6. King County, highest cost of living in the state,

(14)

14. Your comment is noted.

would adversely affect employee content and turnover.

7. Overpopulated Puget Sound area projected to worsen will greet Alaska Airline employees with inflated housing costs if a house can be found, transportation costs for commuting, and living costs. Employees will be unable to acquire a place of residence in close proximity to their place of work.

14

Don't draw on the nipple that the Port of Seattle has enticed you with. How can you have any confidence in an organization that falsely inflates other Port Director's salaries in order to justify a pay increase for their chief who quit, whose purpose was to energize an agency suffering from an unclear sense of purpose and spending on automatic pilot, a Port that has been criticized by the public for office furniture procurement which they later reduced to only two million.

Locate a maintenance facility in the area that is unaffected by the aforementioned adverse conditions where business can expand and employee efforts are unhindered. We need to regionalize Moses Lake. Thank you.

THE HEARING EXAMINER: Thank you, Mr. Richter. Dan Caldwell? Following Mr. Caldwell will be Tom Crawley, and we'll go back to Ron Colson if he is here at that time.

MR. CALDWELL: I am Dan Caldwell. The address is

19547 Second Avenue S., and it's right at the other side of the airport.

THE HEARING EXAMINER: Would you spell the last name for her, please?

MR. CALDWELL: C-a-l-d-w-e-l-l.

THE HEARING EXAMINER: Thank you. Go ahead.

MR. CALDWELL: I was going to touch on just three points: The noise, that's probably been stressed pretty heavily as it is; the staff credibility which I have had a terrible experience with; and safety.

On the noise, my favorite piece or favorite song is Ravel's Bolero. At 60 decibels, I'd get awfully tired of his Bolero pretty fast. We have a lot of noise coming along steadily. Enough said on noise.

On the staff credibility, I was former Commissioner of Highline Water District last year and I ran head-on into a staff credibility problem. In fact, it made the news all around everywhere else. The staff had gone ahead telling people that they had permission to build a tower on our Manson Hill tank site for radar for the planes coming in.

Apparently, there was a large public objection to that tower, but us at the Highline Water District had never been notified of their plans. A friend of mine braced me, brought me to one of the meetings. I wasn't even aware of its existence. I come to a meeting to find the SeaTac Council of Representatives, well, the Hearing Examiner at the meeting and some of SeaTac staff and consultants. I heard them say to the people that it was an administrative decision by the Water District and not by the Commissioners.

Now, I was a Commissioner and I knew otherwise, and I brought it to the attention of the people at that time that the District was not even aware that they planned to build on the District's property at Manson Hill. They had been going around telling people it was all predone, it just requires a minor decision that's going to be made. As I said, staff credibility.

I have a real question on the contents of those EIS statements because as a Commissioner and making the decisions, I knew these lines, I heard them. They hadn't even contacted the District.

Now, on the safety, I have lived here many years, and I remember these old Boeings, early Boeings that came out of SeaTac, but I look at the airport, and I don't see the charts here tonight, but there were patterns around here last night showing the dence crowd of airplanes coming into the area. SeaTac was not built big enough to start, and now it's a situation it's almost as bad as putting the Convention Center over the freeway. We have a situation like that at the airport here. It is too small, and there's no way you can expand that airport up to a safe level of operation.

The additional expansion should be somewhere else, Moses Lake, where there's room for a pilot error. We had an error recently coming out of New York. It may or may not have been a pilot error. Sounds like ice on the wings, but that was just a human error. Now, at SeaTac, you don't have forgiveness. You have a high bank at both ends of that airport. You make a little error, come in just a little low, you won't be knocking the landing gear off. It will be picking people up off the hillside. There's no place for that plane to make a mistake.

We have the Teneriffe example. A 747 landed on top of another 747 crossing runways. Only had three runways. Just the law of averages says it's going to catch up with us unless they spread the risk so there won't be that little error, that small human error or that small malfunction.

Thank you for your attention.

THE HEARING EXAMINER: Thank you, Mr. Caldwell. Tom Crawley?

MR. CRAWLEY: My name is Thomas Crawley. I live at 614 SW. 187th. That's C-r-a-w-l-e-y.

Thank you for allowing us this forum. I have some experience living next to a maintenance facility in Los Angeles, and I have experience in test cell runups. Prior to the stage two airplanes, of course, the test cell runup would knock you out of your bed. And today, we're looking forward to test cells with the quieter engines.

Yet two years ago, we had a runup at about 6:15 in the morning, and I called the noise hotline, and they said, Oh, what's all this? And having spent 10,000 hours in Boeing airplanes, I am familiar with what it sounded like, and I said, you know, this is a 737, and it's running at probably 98 or 99 percent. And so they said, Well, we'll get back to you. Nothing happened on it.

15

I am concerned that this could occur with this test facility. These engines have to be run up. It's a fact of life in aviation, and I don't see anyplace where we have any protection from that. We're all familiar with the noise, and we've scene what's happened, and the result is that as the noise has increased, rather than drying to decrease the noise, what has happened is that the Port's solution has been, Let's insulate the houses or let's buy the houses. I don't think that's an acceptable solution, so I think that the Environmental Impact Statement should address this issue of this noise level is the only acceptable issue, and this is what will

15. Your comment is noted.

happen if it exceeds it so that the citizens around the airport will be protected from that. Thank you.

THE HEARING EXAMINER: Thank you, Mr. Crawley. Let me try Mr. Colson one more time. Is Ron Colson here? Mr. Colson is not.

That's the last person that I have on the sign-up list. Is there anybody that would like to speak for three minutes who has not yet spoken and who maybe just didn't get to the sign-up sheet or who has had a change of heart in the last few minutes and now decides they'd like to speak?

MR. HARKNESS: Yeah, I want to speak. Jerry Harkness, H-a-r-k-n-e-s-s. I live on North Hill, and I'm tired of the noise. I get noise 10:30 at night, and now you want to run this thing over on us with this maintenance hangar. If you want all these projects, then buy every house from Federal Way all the way to Seattle, clearcut everybody, and build your God-damned airport. But we're just tired of it. We hear all this noise. It's a constant noise. Buy them all out.

You can have four runways if you want to. We shouldn't have to put up with that. We're still paying for the second runway. We have noise, and we've got another 20 years that we have to put up with that before the noise is even mediated on that, and you want us to

(16)

16. Your comment is noted.

put up with a third runway, a maintenance hangar, more parking, more freeways coming in here. If you want businesses and everything down here, then buy everybody out. All the way from Seattle to Federal Way because that's what it's going to take.

THE HEARING EXAMINER: Thank, Mr. Harkness. Is there anybody else who wishes to comment on the draft EIS on SASA?

MR. GRAVES: I have something I'd like to say.

THE HEARING EXAMINER: Yes, sir. I would remind you to begin with your name and spell your last name.

MR. GRAVES: Yes. I'm Raymond Graves. Last name is spelled G-r-a-v-e-s. I am a CAASE member. In looking over the SASA draft EIS statement, I've only gotten into it very briefly, but I notice in the construction phases they talk in terms of should, may and might as far as the hours of construction are concerned and the way they are going to hold down dust. It's all in forgiving terms.

When you write an EIS statement or put a limit on any construction project to limit the contractors, it should be will and shall, not should. The contractors should not be given the option to deviate from the rules that are laid down in the EIS statement. If they have those deviations, then as time goes on and if they get rushed and get behind schedule, then they will be able to

17

17. If built, all construction documents for the project will use the appropriate language. It is a common convention in environmental documents not to use the words "shall" and "will" because the use of such words presumes that the project will be constructed.

use the excuse that we didn't tell you we would not construct after 11:00 o'clock at night, we would not drive piling after 0:00 o'clock in the evening, we would not start at certain times, but we find we're behind time, and it said we should and we may, and they will. Thank you.

THE HEARING EXAMINER: Thank, Mr. Graves. Last call? Thank you very much. On behalf of the F.A.A. and the Port of Seattle, I thank you for your participation and your attention tonight. Please drive safely on your way home. The displays are here, and as Mr. Sims said, he is sure that some of the staffers will be around for a while to talk with you about them if you care to do that. Thank very much.

(THE HEARING WAS ADJOURNED AT 7:40 p.m.)

Glossary

GLOSSARY

AL: A-weighted Level (AL). The level, in decibels, of the mean-square, A-weighted sound pressure during a specified period, with reference to the square of the standard reference sound pressure of 20 micropascals.

AOA: Airport Operating Area. Any area enclosed by the Airport security fence, including ramps, aprons, runways, taxiways, gate positions, Airport parking areas, and FAA facilities.

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.

Air Pollution: Air that contains one or more chemicals in high enough concentrations to harm humans, other animals, vegetation or materials.

Air Rights: The rights to use the space above a property as a separate negotiable part of the property which can by sold or leased independently. The air space can be utilized in two ways: 1) for a separate development over and above the existing use or structure, or 2) as transferable development rights for development above another property.

Aircraft: Any machine capable of deriving support in the atmosphere from reactions of the air.

Airside: That portion of an airport which includes the aircraft manoeuvering areas such as runways, taxiways and apron area.

Approach Lights: A system of lights which provides pilots with visual guidance to runway thresholds in periods of reduced visibility or darkness.

Apron: The part of an aerodrome, other than the manoeuvering area, intended to accommodate the loading of passengers and cargo, the refueling, servicing, maintenance and parking of aircraft, and any movement of aircraft, vehicles and pedestrians necessary for such purposes.

BTU: British thermal unit. The amount of heat required to raise one pound of liquid water one degree Fahrenheit; 1kWh -3,414 BTU.

CALINE3: A computer model the EPA uses, in conjunction with MOBILE4, to estimate vehicle air emissions. CALINE3 calculates the concentration of pollutants at receptor locations.

dB: Decibel. A measure of sound levels. The dB scale is logarithmic, therefore a 10dB increase in sound level is 10 times higher than before. A 20dB increase is 100 times (10 X 10) greater than before.

dBA: Is the dB measurement of sound with appropriate adjustments for the various frequencies to approximate human hearing in the threshold range.

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.

Effluent: Any material that flows outward from something. An examples is storm water from drainage areas.

Engine Run-up: A routine procedure for testing an aircraft engine at a high power setting. Engine run-ups are normally conducted by maintenance personnel checking an engine descrepancy. The Port of Seattle has established nightime restrictions on engine run-ups.

Erosion: Wearing away of rock or soils by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical and chemical forces.

Engine Run-up: A routine procedure for testing an aircraft engine at a high power setting. Engine run-ups are normally conducted by maintenance personnel checking an engine discrepancy. The Port of Seattle has established nighttime restrictions on engine run-ups.

Federal Aviation Administration (FAA): A federal agency under the Department of Transportation (DOT) which was established by Congress to provide for the regulation and promotion of civil aviation, in particular to foster its development and safety and to provide for the safe and efficient use of airspace by both civil and military aircraft. The FAA has exclusive jurisdiction over aircraft in flight.

Federal Air Regulations (FAR): Mandatory requirements and standards issued by the FAA to govern all civil aviation activities in the U.S.A.

Fines: Silt and clay-sized particles in soil. Defined numerically as the percent, by weight, passing the U.S. No. 200 sieve during a particle size analysis of a soil sample.

French drains: Shallow gravel-filled trench, usually with perforated pipe running longitudinally along bottom of trench, to intercept and carry ground water to adjacent stream or pond.

GMA: Growth Management Act of 1990 (also called 2929). The Act requires all cities and counties in the state to do some planning and calls for the fastest growing counties to plan extensively in accordance with state goals. Supplemented in 1991 by the State Legislature.

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.

Hydraulic Permit: A permit granted by Washington Departments of Fisheries and Wildlife for work to be performed on or near a body of water, such as a river.

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.

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 soil to drain quickly, as energy is imparted to the soil mass during an earthquake. The soil type most susceptible to liquefaction is loose, saturated sand below the water table.

Level of Service (LOS): A measure of the effect of a number of factors on 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, "B" is good flow with little delay, "C" is stable flow with frequent delay, "D" is congested flow with long delay, "E" is unstable flow with continuous backup, and "F" is forced flow with extensive backup. Traditionally, traffic facilities are designed to operate at LOS "C".

Mitigation: Mitigation includes avoiding an adverse impact by not taking a certain action or parts of an action; minimizing adverse impacts by limiting the degree or magnitude of the action and its implementation; rectifying an adverse impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating an adverse impact over time by preservation and maintenance operations during the life of the action; and compensating for adverse impacts by replacing or providing substitute resources or environments.

MOBILE4: A computer model the EPA uses, in conjunction with CALINE3, to estimate vehicle air emissions. MOBILE4 calculates the amount of pollutants emitted by a certain vehicle.

NPDES: National Pollutant Discharge Elimination System (NPDES) is part of the *Clean Water Act*, which requires point source dischargers to obtain permits. These permits are referred to as NPDES permits and are administered by the Washington Department of Ecology.

Noise Level Reduction (NLR): The amount of noise level reduction in decibels achieved through incorporation of noise attenuation (between outdoor and indoor levels) in the design and construction of a structure.

Noise Contour: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

Non-attainment Area: An area in which the federal or state standards for ambient air quality are being exceeded.

PCB: Polychlorinated biphenyl (PCB). One of a group of toxic persistent chemicals used in electrical equipment for insulating purposes and in gas pipeline systems as a lubricant. Further sale or new use was banned by law in 1979.

Port of Seattle: A Washington municipal corporation whose boundaries are coextensive with those of King County, and which operates Seattle-Tacoma International Airport as well as marine-related facilities.

Reverse Thrust: A method used to slow the forward movement of, or sometimes back up, an aircraft operating on the ground by redirecting engine thrust towards the front of the aircraft.

Riparian: Relating to, living in, or located on the bank of a natural watercourse, such as a river.

Sound Exposure Level (SEL): The level, in decibels, of the time integral of squared A-weighted sound pressure during a specified period or event, with reference to the square of the standard reference sound pressure of 20 micropascals and a duration of one second.

Sediment: Material suspended in or settling to the bottom of a liquid. Sediment input comes from natural sources, such as erosion of soils and weathering of rock; or anthropogenic sources, such as forest or agricultural practices, or construction activities. Certain contaminants tend to collect on and adhere to sediment particles.

Stage 2 Aircraft: Aircraft which meet noise levels prescribed in FAR Part 36 which are less stringent than those established for Stage 3 aircraft. Since 1973, only aircraft that meet Stage 2 (or higher) standards have been produced. Stage 2 aircraft types include Boeing 727s, some 737s, some 747s, DC9s and some DC10s.

Stage 3 Aircraft: Aircraft which meet the most stringent noise levels prescribed in Federal Air Regulation (FAR) Part 36. Since 1977, only Stage 3 aircraft have been approved for new design. Stage 3 aircraft types include Boeing 737-300s, 757s, 767s, some 747s, Lockeed

L1011s, MD80s, some DC10s, and the Airbus. Nearly all civil jet aircraft now being manufactured meet Stage 3 requirements.

Taxi: To operate an airplane under its own power on the ground other than during takeoff and landing.

TMODEL2: TMODEL2 is a transportation modelling system used to build and calibrate travel demand forecasting models. The system is used to forecast the impacts of alternative roadway network or land-use scenarios.

Tributary: A stream that flows into another.

UST: Underground storage tank.

Watershed: The geographic region from which water drains into a particular river or body of water. A watershed includes hells, lowlands, and the body of water into which the land drains. Watershed boundaries are defined by the ridges of separating watersheds.

Weir: A low dam or fence built across a stream primarily to control water level or to divert water into another facility.

Wetlands: Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoils and is saturated with water or covered by shallow water at some time during the growing season each year.

References

REFERENCES

Alexander, G. 1991. Personal communication of October 14, 1991. Port of Seattle Police Department, Sea-Tac International Airport, SeaTac, Washington.

Anderson, T. 1992. Personal communication of February 4, 1992. Research and Development, Port of Seattle Police, Sea-Tac Airport, SeaTac, Washington.

Batcho, A. 1991. Personal communication of October 29, 1991. Des Moines Chapter of Trout Unlimited. Des Moines, Washington.

Bourque, P.J.. 1987. The Washington State input-output study for 1982. University of Washington Graduate School of Business Administration.

Bretz, J.H. 1913. Glaciation of the Puget Sound Region, Washington Geological Survey Bulletin 8. 244 p.

Colt, C. 1991. Personal communication of October 25, 1991. U.S. Environmental Protection Agency, Region X, Seattle, Washington.

Cowardin, L.M., V. Careter, F.C. Golet, and E.T. Laroe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, FWS/OBS-79/31, 103pp.

Cropp, T. 1991. Personal communication of November 6, 1991. Washington Department of Wildlife, Mill Creek, Washington.

Curry, S. 1991. Personal communication of October 4, 1991. Seattle-King County Department of Public Health, Seattle, Washington.

Easterbrook, D.J. 1986. Stratigraphy and chronology of Quaternary deposits of the Puget Lowland and Olympic Mountains of Washington and the Cascade Mountains of Washington and Oregon. Pages 145-159. In Sibrava, V., Bowen, D.Q.. and Richmond, G.M. editors. Quaternary Glaciations in the Northern Hemisphere: Quaternary Science Reviews, Vol. 5. Pergamon Press, New York, NY.

Environmental Science and Engineering, Inc. 1991. Results of Remedial Investigation and Feasibility Study for the Port of Seattle Facility, PanAm Hangar, Seattle-Tacoma International Airport, SeaTac, Washington, October, 1991.

Federal Aviation Administration. 1985. "Aviation Noise Effects," Report FAA-EE-85-2.

Federal Interagency Committee for Wetland Delineation. 1989. Federal manual for identifying and delineating jurisdictional wetlands. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S.D.A. Soil Conservation Service, Washington, D.C. Cooperative technical publication. 107 pp.

Federal Interagency Committee of Urban Noise. 1980. Guidelines for Considering Noise in Land Use Planning and Control. Section 1.

Final Package of Mediated Noise Abatement Actions for Seattle-Tacoma International Airport Agreed to by the SeaTac Airport Noise Mediation Committee on March 31, 1990.

Freeze, R.A., and J.A., Cherry. 1979. Groundwater. Prentis-Hall, Inc. Englewood Cliffs, New Jersey. 604 p.

Fry, B. 1991 Personal communication of November 18, 1991. Washington Natural Gas Company. Seattle, Washington.

Gangnes, J. 1991. Personal communication of October 30, 1991. SeaTac Fire Department, SeaTac, Washington.

Hargis, M. 1991. Personal communication of October 16, 1991. Puget Sound Air Pollution Control Agency (PSAPCA), Seattle, Washington.

Herrera Environmental Consultants. 1989. Des Moines Creek restoration project. Prepared for Municipality of Metropolitan Seattle by Herrera Environmental Consultants, Inc. and Hall and Associates, Seattle, Washington.

Hitchcock, C.L., and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA.

Johnson, A. 1989. Flow analysis and water quality related to salmonids in Des Moines Creek. Draft technical report to R.W. Beck and Associates for the Sea-Tac Master Drainage Plan. Watershed Dynamics, Inc., Auburn, Washington.

Johnson, A. 1991. Personal communication of December 12, 1991. Municipality of Metropolitan Seattle (Metro), Seattle, Washington.

KCPW. 1990a. King County, Washington, surface water design manual. Surface Water Management Division of King County Public Works, Seattle, Washington.

KCPW. 1990b. Hylebos Creek and lower Puget Sound basins current and future conditions report. King County Surface Water Management Division and the City of Federal Way, Federal Way and Seattle, Washington.

Kidd, G. 1991. Personal communication of December 18, 1991. City of SeaTac, SeaTac, Washington.

King County Planning and Community Development. 1989. Sea-Tac area update. King County Planning and Community Development, Bellevue, Washington.

King County Surface Water Management. 1989. Bear Creek Basin current and future conditions analysis. King County Surface Water Management Division, Seattle, Washington.

Kittle, L.L. 1986. Des Moines Creek freshwater damage assessment. Memorandum to Greg Sorlie. State of Washington Department of Ecology, Olympia, Washington.

Knapp, M. 1992. Personal communication of January 23, 1992. City of SeaTac Department of Planning and Community Development, SeaTac, Washington.

Kobriger, N.P., T.V. Dupius, W.A. Kreutzberger, F. Stearns, G. Gutenspergen, and J.R. Keough. 1983. Guidelines for the management of highway runoff on wetlands. National Cooperative Highway Research Program Report #264. Transportation Research Board, National Research Council, Washington, D.C.

Kroll Atlas Company. 1950, 1958, 1972, 1987. Kroll Atlas, Seattle South. Kroll Atlas Company, Seattle, Washington.

Liesch, B.A., C.E.Price, and K.L. Walters. 1963. Geology and Groundwater Resources of Northwest King County, Washington. Washington Division of Water Resources Water Supply Bulletin 20: Washington Division of Water Resources, Olympia, Washington. 241 p., 3 plates.

Lindner, B. 1991. Personal communication of October 25, 1991. Puget Sound Power and Light Company, Seattle, Washington.

Luzier, J.E. 1969. Geology and Groundwater Resources of Southwestern King County, Washington. Washington Department of Water Resources Water Supply Bulletin No. 28, Olympia, WA. 260 p., 6 plates.

Maines, C. 1991. Personal communication of November 7, 1991. Washington Department of Fisheries, Olympia, Washington

Mestre Greve Associates & P&D Aviation. 1992. Flight Plan Project Working Paper 12B - Air Quality Assessment, prepared for Puget Sound Regional Council & Port of Seattle.

Metsker Map Company. 1926, 1936. Metsker historical maps, Seattle. Metsker Map Company, Tacoma, Washington.

Molenaar, D., P. Grimstad, and K.L. Walters. 1980. Principal Aquifers and Well Yields in Washington. U.S. Geological Survey and State of Washington Department of Ecology. Scale = 1:500,000, one sheet.

Morrow, E. 1991. Personal communication of December 12, 1991. Port of Seattle, Seattle, Washington.

Mullineaux, D.R., H.H. Waldron, and M. Rubin. 1965. Stratigraphy and Chronology of Late Interglacial and Early Vashon Glacial Time in the Seattle Area, Washington. U.S. Geological Survey Bulletin 1194-0: U.S. Geological Survey, Denver, Co. 10 p.

Port of Seattle. 1988. Final environmental impact statement for Seattle-Tacoma International Airport parking facilities expansion. Port of Seattle, Seattle, Washington.

Port of Seattle. 1991. Comprehensive Water System Plan. Port of Seattle, Sea-Tac International Airport, SeaTac, Washington. pp. 6-12.

Port of Seattle. SeaTac International Airport Schedule of Rules and Regulations, No. 4, Section 7-8.

Powers, P.D. and J.F. Orsborn. 1985. Analysis of barriers to upstream fish migration. Report prepared for Bonneville Power Administration by Albrook Hydraulics Lab. Washington State University, Pullman, Washington. DOE/BP-297.

Puget Sound Air Pollution Control Agency. 1990. Air Quality Data Summary for the Counties of King, Kitsap, Pierce, and Snohomish, Seattle, Washington.

Puget Sound Air Pollution Control Agency. 1993. 1991 Air Quality Data Summary for the Counties of King, Kitsap, Pierce, and Snohomish, Seattle, Washington.

R.W. Beck and Associates. 1990. Sea-Tac Business Park Master Drainage Plan, Vol 1. Prepared for King County Department of Public Works by R.W. Beck and Associates. February, 1990.

Reed. 1987. Wetland plants of the State of Washington - 1989 (as applied by the Seattle District of the U.S. Army Corps of Engineers). U.S.D.I., Fish and Wildlife Service WELUT - 86/W12.47.

Reppert, R.T., W. Sigelo, E. Stakhiv, L. Messman, and C. Meyers. 1979. Wetland values - Concepts and methods for wetland evaluation. U. S. Army Corps of Engineers. Institute of Water Resources. Springfield, Virginia (IWR research report 79-R1) 109 pp.

Resource Planning Associates. 1989. Water quality and best management practices manual for commercial and industrial businesses, City of Seattle, Seattle, Washington.

Robel, J. 1991. Personal communication of October 29, 1991. Washington Department of Fisheries, Olympia, Washington.

Robinson, E. 1991. Personal communication of September 26, 1991. Port of Seattle Fire Department, Sea-Tac International Airport, SeaTac, Washington.

Schneider, P. 1991. Personal communication of November 8, 1991. Washington Department of Wildlife. Mill Creek, Washington.

Schueller, T.R. 1987. Controlling urban runoff: a practical manual for planning and designing urban BMPs. Prepared for Department of Environmental Programs of the Metropolitan Washington, D.C. Council of Governments, Washington, D.C.

Seattle-King County Department of Public Health. 1984. Abandoned landfill study in the City of Seattle. Seattle-King County Department of Public Health. 121p.

Seattle-King County Department of Public Health. 1985. Abandoned landfill study in King County. Seattle-King County Department of Public Health. 148p.

Shively, R. 1991. Personal communication of December 11, 1991. Tyee Valley Golf Club, SeaTac, Washington.

Snyder, D.E., P.S. Gale, and R.F. Pringle. 1973. Soil Survey, King County area, Washington. U.S.D.A., Soil Conservation Service, Washington, Agricultural Experimental Station. 100p.

Snyder, D.E., P.S. Gale, and R.P. Pringle. 1973. Soil Survey of King County Area, Washington. United States Dept. of Agriculture, Soil Conservation Service. 106 p., 21 sheets.

Society of Alternative Engineers AIR 1751. Prediction Methods for Lateral Attenuation of Airplane Noise during Takeoff and Landing.

Soil Conservation Service. 1991. Hydric soils of the United States. U.S.D.A., Soil Conservation Service. 93 pp.

Spicer, C.W., M.W. Holdren, T.F. Lyon, and R.M. Riggin. 1984. Composition and photochemical reactivity of turbine engine exhaust (ESL-TR-84-28). Battelle Columbus Laboratories for the Engineering Services Laboratory, Air Force Engineering and Services Center, Tyndall Air Force Base, Florida.

Stetz, E. 1991. Personal communication of November 5, 1991. Port of Seattle, Seattle, Washington.

Thorson, R.M. 1989. Glacio-isostatic response of the Puget Sound area, Washington. Pages 1163-1174. Geological Society of America Bulletin, Vol. 101, No. 9.

U.S. Environmental Protection Agency (EPA). 1971. "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," NTIS 300.2.

U.S. Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. EPA 550/9-74-004. Sections 2-3.

U.S. EPA. 1983. Results of the nationwide Urban Runoff Program. United States Environmental Protection Agency, Water Planning Division, Washington, D.C.

U.S. EPA. 1991. User's guide to Mobile4.1 (Mobile Source Emissions Model). Ann Arbor, Michigan.

U.S. Federal Aviation Administration. Federal Aviation Regulation Part 150, Chapter 1, Appendix A, Table 1, Land Use compatibility with Yearly Day-Night Average Sound Levels, effective 3/16/88.

Waldron, H.H. 1962. Geology of the Des Moines Quadrangle, Washington. United States Geological Survey. Map GQ 159.

Walker and Associates. 1936, 1946, 1956, 1960, 1969, 1974, 1980, 1985, 1990. Aerial photographs. Walker and Associates, Tukwila, Washington.

Washington State Department of Ecology. 1990. Underground Storage Tank List, November 8, 1990.

Washington State Department of Ecology. 1991a. Air Quality Program. Seattle Tacoma International Airport: Air Pollutant Contribution, Air Quality Program.

Washington State Department of Ecology. 1991b. Stormwater management manual for the Puget Sound basin, draft. Publication no.80-73. Department of Ecology, Water Quality Division, Stormwater Unit, Olympia, Washington.

Washington State Department of Ecology. 1991c. Washington State Wetlands Rating System for Western Washington. Lacey, WA.

Washington State Department of Ecology. 1991d. Registered Underground Storage Tank List. Washington State Department of Ecology. Database, Olympia, Washington.

Washington State Department of Revenue. 1990. Population and per capita assessed values on counties, cities and town and unincorporated areas, by county.

Watson, T. 1991. Personal communication of December 23, 1991. Port of Seattle, Seattle, Washington.

Wells, B. 1991. Personal communication of October 1991. Port of Seattle, Seattle, Washington.

Wilkie, C. 1992. Personal communication of January 23, 1992. SeaTac Police Department, SeaTac, Washington.

Williams, R.W., R.M. Laramie, and J.J. Ames. 1975. A catalog of Washington streams and salmon utilization. Volume 1, Puget Sound. Washington Department of Fisheries, Olympia, Washington.

Distribution List

DISTRIBUTION LIST

David A. Aggerholm
Port of Seattle

Robert F. Angle
18968 Marine View Drive

Director Anita Lammert
Seattle Dept. of Human Resources

Anne Fennessy
Port of Seattle

Bill Anschuetz
Port of Seattle

Barbara J. Trejo
WA Dept. of Ecology NWRO

Jack S. Block
Port of Seattle

Bill Bowlin
Highline Community Council

Forest Brooks
6917 So. 131st Street

Bill Brougher
Port of Seattle

Curtis D. Tanner
U.S. Fish & Wildlife Service

Jeff Dahlstrom
12413 - 14th Avenue So.

Patricia Davis
Port of Seattle

Deborah Munt
Department of Ecology

Dennis Rans
2406 So. 121st Place

Dept. of Natural Resources
Lands and Mineral Div.

Jack McCollough
Helles, Ehrman, White & McAuliffe

Jackie Der
306 Municipal Bldg

City of Des Moines
Planning Director

Duwamish Tribal Office
15507 First Avenue So.

Port of Everett
Attn: Dir. of Planning

Federal Aviation Administration
Sea. Airports Dist. Office

Federal Aviation Administration
Airports Division

Government Publication Div.
Univ. of Wash. Libraries

Gary Grant
Port of Seattle

Jennifer Rapacz
Seattle-King County
Economic Dev. Council

King County
Bldg. & Land Development

King County
Bldg. & Land Development

King County
Water District 125

King County Library
Foster Branch

King County Library
Boulevard Park Branch

Rebecca McIntyre
Tasley and Brain

State Dept. of Wildlife

State Dept. of Natural Resources

State Dept. of Transportation

State Dept. of Arch. & Historic
Preservation

State Dept. of Ecology
Attn: Dan Cargill

State Dept. of Ecology
Env. Review Section

State Dept. of Ecology
Northwest Regional Office

State Dept. of Fisheries
Attn: Joe Roebell

State Dept. of Fisheries
115 General Admin. Bldg

State Dept. of Nat. Res.
Attn: Planning Section

State Dept. of Trans.
Environmental & Special
Services Engineer

State Parks & Recreation Commission

Suquamish Tribe
Attn: Phyllis Meyers

Tacoma-Pierce Cnty C of C
Attn: David Graybill

Trout Unlimited
Des Moines Creek Chapter

Tukwila City Hall
6200 Southcenter Blvd.

U.S. Army Corps of Engineers

U.S. Army Corps of Engineers

U.S. Army Corps of Engineers

U.S. Army Corps of Engineers

U.S. Bureau of Indian Affairs
Puget Sound Agency

U.S. Coast Guard
Attn: Port Operations

U.S. EPA Region 10
Environ. Eval. Branch

U.S. National Marine
Fisheries Service

USDI Fish & Wildlife Service
Fish & Wildlife Enhancement

Warren Lawless
Neighborhood Directories

King County Library
Burien Branch

King County Library
Valley View Branch

King County Public Works
Attn: Douglas Mattoon

League of Women Voters
Attn: Lucy Copass

Julie M. Lemay
15109 Sunwood Blvd

Linda Strout
Port of Seattle

Local Government 01-03-07
Information Center

AFL-CIO Maritime Trades
Attn: Neil Dietz

Metro Environmental Plng
Attn: Val Batey

Paige Miller
Port of Seattle

Muckleshoot Indian Tribe
Fisheries Department

Normandy Park City Hall
801 SW 174th

NW Steelhead Salmon
Council—Elliott Bay

Portwatch
Martin & Diana Swain

Puget Sound Air Pollution
Control Agency

Puget Sound Council
of Governments

Puget Sound Water Quality
Authority

Andrea Riniker
Port of Seattle

Walter Ritchie
Port of Seattle

Rosie Courtney
Port of Seattle

Paul Schell
Port of Seattle

City of SeaTac
Land Use Division

SeaTac Planning Commission
City of SeaTac

Seattle/King County
Dept. of Public Health

Seattle City Light
Environmental Affairs Div.

Seattle Public Library
Documents Dept.

City of Seattle
Dept. of Construction &
Land Use, Room 400

City of Seattle
Citizens Service Bureau

City of Seattle
Neighborhoods Off., Diers

Seattle/King Co. Economic
Development Council

Shorewood on the Sound
Community Club

Joe Sims
Port of Seattle

Southwest King County
Chamber of Commerce

State Department of
Transportation, Dist. 1

List of Preparers

LIST OF PREPARERS

Stanley C. Allison - B.A., Urban Studies with an emphasis on transportation planning, Stanford University, 1979; J.L.A.I., Landscape Architecture, Harvard University, 1985. Airport Planner, TRA Architecture Engineering Planning Interiors, Ltd. (TRA) Prior experience: two years, Senior Land Planner, POD, Inc., Dallas, Texas; three years in private consulting practice emphasizing urban planning and landscape architecture. Responsible for Light Emissions section.

Steven R. Alverson - B.S., Aeronautics, Dowling College, 1981. Two years as Manager - Sacramento Office, Harris Miller Miller & Hanson Inc., noise and vibration consultants. Prior experience: five years as Airport Noise Officer, City and County of Denver; three and one-half years as airport noise consultant, P&D Technologies; one and one-half years as aviation planner, PRC Speas. Responsible for aircraft noise analyses in the noise section of the EIS.

Douglas E. Barrett - B.A., Physics, Cornell University, 1986. M.A., Environmental Studies, Brown University. 1991. Four years with Harris Miller Miller & Hanson Inc. as transportation noise and vibration consultant. Assisted in aircraft noise analyses for the noise section of the EIS.

Bonnie Berk - B.A., Political Science and Sociology, Brandeis University, 1977; M.P.P., University of California, Berkeley, 1979, M.B.A., University of Washington, 1989. President, Berk & Associates, public finance and economics consultants. Prior experience: 13 years as a policy analyst and project manager; served as Financial Projects Administrator, Metro; Research Scientist, Battelle Human Affairs Research Centers. Responsible for the Induced Socioeconomic Impacts section.

Sarah P. Dalton - B.S., Engineering/Psychology, Tufts University, Medford, MA, 1979; B.S., Civil Engineering, University of Washington, Seattle, Washington, 1985, Seattle Metropolitan Region Planning Officer, Seattle Airports District Office. Seven years Environmental Specialist for the Seattle and Helena Airports District Offices. Responsible for review and coordination of the SASA draft EA.

Rowena E. DeFato - B.S., Environmental Biology, University of Missouri-Columbia, 1986. Environmental Scientist, Parametrix, Inc. Prior experience: Lake Stevens Journal, one year as an environmental reporter covering environmental issues and three years in environmental consulting with an emphasis in the hazardous waste field for ERM Northwest. Responsible for the Hazardous Materials and Waste section.

Kathleen Evans - B.A., Geography, California State University, Chico, 1984; M.A., Geography, University of Washington, 1987; Environmental Analyst, Parametrix, Inc. Responsible for compiling and editing the EIS.

Cynthia A. Felice - B.A., Political Science, SUNY Geneseo, 1976; graduate work in urban planning, UCLA, 1977-79. Prior experience: 13 years as policy analyst and transportation planner, including nine months with Port of Seattle Aviation Division. Responsible for Induced Socioeconomic Impacts section.

Paul S. Fendt, P.E., - B.S. Geological Engineering, University of North Dakota, 1981. Prior experience: six years as Surface Water Management Engineer, Polk County, Florida. Currently employed as Stormwater Engineer, Parametrix. Responsible for the Hydrology element of the Water section.

Eric Hansen - B.A., Physical Oceanography, University of Washington, 1975; M.S. Civil Engineering, University of Washington, 1978. Senior Consulting Scientist, TRC Environmental Consultants, consultants in air quality and environmental noise. Prior experience: two years transportation planner, San Juan County; three years Metro environmental planning supervisor; three years air quality and noise consulting at Earth Technology Corporation (Fugro Northwest); two years air quality consulting URS Company. Assisted in preparing the air quality and environmental noise sections of the EIS.

Dennis Haskell - B. Architecture, University of Virginia, 1967; M. Architecture and M. City Planning, University of Pennsylvania, 1970. Principal and Planning Director with TRA, Ltd. Prior Experience: seven years as Associate and Urban Design Manager, TRA; three years as Associate and Lead Architect, KCM; three years as Associate and Project Director, Joyce Copeland Vaughan and Nordfors; member of American Institute of Architects, American Institute of Certified Planners, and Urban Land Institute. Responsible as Project Director for consultant team preparing preliminary design and EIS.

Barbara A. Hinkle - B.A., Urban Planning and Design; M.S. Environmental Science, University of Washington, 1984. Environmental Management Specialist Engineering, Port of Seattle. Prior experience: Boeing Company Corporate, Commercial and Facility and Planning. Responsible for staff, BECE, and document analysis, and compilation.

George R. Johnston - B.S., Environmental Science, Western Washington University, 1982; B.A., Education, Western Washington University, 1985. Prior experience: two years as city planner with local government agencies; five years teaching secondary mathematics and science. Currently environmental planner for Parametrix. Responsible for Public Services/Utilities section.

Steven W. Kingsley - B.S., Civil Engineering, Northeastern University, 1991. Designer, W & H Pacific. Prior experience: two years with SEA Consultants, Cambridge, Massachusetts, responsible for design and construction management of water pollution control projects; two years with Holden Engineering, Concord, New Hampshire, responsible for design of civil/site engineering projects.

Kas Kinkead - B.A., Urban Studies, Vassar College, 1980; MLA Landscape Architecture candidate, University of Washington. Environmental Planner, TRA, Ltd. Prior experience: two and one-half years experience in site planning, graphics and EIS documents, including Port of Seattle Central Waterfront EIS (1990), Seattle Center Master Plan EIS (1990), and South Lake Union Park EIS (1990).

Paul A. Konrady P.E. - B.S., Civil Engineering, Iowa State University, 1979. Senior Associate with W & H Pacific, Bellevue, Washington. Manager of development services in the Puget Sound region. Experience includes planning, engineering and environmental services for a broad range of public and private land development projects. Principal responsible for the civil engineering elements of the environmental documentation.

Joseph Lamont, Jr. - B.S.C.E., Civil Engineering, University of Washington, 1950; LLD, Law, Geneva College, 1973. Senior Partner, Dames & Moore. Prior experience: 41 years of geotechnical engineering experience in the Pacific Northwest with Dames & Moore, including a wide variety of airport-related projects. These include projects involving subgrade evaluation for runways and taxiways, the development of recommendations for pavement sections, and foundation design of buildings. Responsible for consultation and review of Earth section of EIS and technical appendix.

Karl B. Lewis - B.A., University of California at San Diego, 1975; J.D., University of Southern California School of Law, 1977; M.P.A., University of Southern California, 1979. Prior experience: 14 years as attorney for Federal Aviation Administration, responsible for environmental law and other aspects of administrative law. Responsible for overall regional legal review of draft and final EA text.

James W. MacIsaac, P.E. - BSCE, Seattle University, 1964; MSCE, Transportation, University of Washington, 1965. President, the TRANSPO Group, Inc. Prior experience: managed and directed transportation projects for the Puget Sound Council of Governments, Tudor Engineering Company and Alan M. Voorhees & Associates; visiting instructor in Transportation Engineering at Seattle University and the University of Washington. Responsible for project direction and quality control of the Transportation section.

Richard W.M. McLaren - B.Sc., Civil Engineering, University of Glasgow, 1973; M.Sc. (Eng.), Civil Engineering, Queen's University, 1976. Senior Engineer, Dames & Moore. Prior Experience: 17 years of geotechnical engineering experience in North America, including several airport projects. These include geotechnical investigations and designs for taxiways, aprons and hangars, and for other airport-related facilities. Responsible for preparation of Earth section of FEIS and technical appendix.

John L. Meerscheidt - B.A. Economics, University of Washington, 1980; M.P.A., University of Washington, 1989. Three years with Parametrix as an analyst/economist. Prior experience: one year at R.W. Beck and Associates as a Legislative and Regulatory Analyst, one year at the Washington State Energy Office as a Program Evaluation Intern, Two years in American Peace Corps - Nepal managing construction of drinking water systems. Responsible for Energy and Natural Resources section of the EIS.

Jan E. Monroe - B.S., Urban Studies, Portland State University, 1977; M.P.A., Portland State University, 1988. Prior experience: Ten years as Planning Director, Newport Oregon, four years as Airport Manager, Newport Oregon, Past President League of Oregon Cities Planning Directors, Past Environmental Specialist/Airport Planner Northwest Mountain Region FAA. Responsible for forecast, purpose and need sections of FEIS.

Cayla D. Morgan - B.S., Communications, University of Idaho, Moscow, ID, 1979; Elementary Teaching Credential, Boise State University, Boise, Idaho, 1985; Masters of Urban Planning, University of Oregon, Eugene, OR, 1992. Current position: FAA Airport Planner/Environmental Specialist, Seattle Airports District Office. Responsible for review and coordination of the SASA document.

Dennis G. Ossenkop - B.S., Interdisciplinary: Mathematics and Physics, Portland State University, 1965; M.B.A., University of Puget Sound, 1979. Regional Environmental Officer, Airports Division. Prior experience: 3 years with U.S.E.P.A. (environmental evaluation and noise control) and 12 years with FAA in development of environmental and noise compatibility program documentation. Responsible for regional technical review, text preparation, editing of FEIS.

John N. Perlic, P.E. - BSCE, West Virginia University, 1983; completed course work requirements for MSCE degree, Transportation Studies, University of Washington 1989. Transportation Engineer, The TRANSPO Group, Inc. Prior experience: Transportation engineer, Bureau of Project Location, New Jersey Department of Transportation, transportation engineer and planner, Entranco Engineers and TDA, Inc. Responsible for preparation of the Transportation section and all technical analysis.

Geraldine H. Poor - B.A., Human Biology, M.S. Civil Engineering, Stanford University, 1985. Planner II, Aviation Planning, Port of Seattle. Prior experience: Four years Douglas Aircraft Company Facilities Planning. Responsible for document analysis, compilation, and review.

Kathleen Rossi - B.S., Environmental Studies, Western Washington University, 1972; M.U.P, Urban Planning, University of Washington, 1981. Environmental Planner with Parametrix for one and one-half years. Prior experience: three years, Environmental Planner, Port of Seattle; four years in planning consulting. Responsible for preparation of summary sections.

Kenneth W. Sargent - B.A., Biology, Hamline University, 1982; M.S. Environmental Biology, University of Minnesota-Duluth, 1986. Wetland Biologist, Parametrix. Prior Experience: Three years as Research Associate with the University of Wisconsin working on EPA projects developing methodology to measure ecosystem functions in wetland habitats. One year with Dakota County Public Health Department as an Environmental Health Specialist.

One year with the Watershed Council as a wetlands specialist. Responsible for wetland mapping and evaluation.

Marc L. Stifelman - B.S., Environmental Studies, Rutgers University, 1989. Two years as wetland Biologist, Parametrix, Inc. Prior wetlands experience includes three years with other consulting firms in the Puget Sound Basin and in New Jersey. Responsibilities: delineating wetlands and preparing technical reports for EIS.

Carl E. Stivers - B.A. Biology, Grinnell College, 1987. Water Quality Specialist with Parametrix. Prior experience: Two years experience as water quality specialist and wetland biologist for private consulting firm in Baltimore, Maryland. Two years as water quality specialist. Responsible for Water Quality element of the Water section.

Thomas R. Strong - B.S., Chemical Engineering, University of Arizona, 1969; M.S., Chemical Engineering, University of Arizona, 1978; Ph.D., Biology, University of Colorado, 1987. Wildlife Biologist, Parametrix, Inc. Prior experience: six years of research in avian ecology and physiology; two years as biological consultant, with projects in wetlands and wildlife. Responsible for Vegetation and Wildlife elements of the Biotic Communities section and the Threatened and Endangered Species Section of EIS.

Robert D. Sullivan, - B.S., Fisheries, University of Washington, 1980. Six years as a Fisheries Biologist, Parametrix, Inc. Prior experience: five years as Fisheries Biologist with the Quinault Indian Nation. Responsible for the implementation and supervision of aquatic field studies, data analysis and report preparation for Fisheries element of the Biotic Communities section.

David N. Torgeson P.E. - B.S.C.E., University of Missouri at Rolla, 1971. 21 years as civil engineer in private and public practice. Registered Professional Engineer since 1976. Member A.S.C.E. Currently Senior Project manager for W & H Pacific, Bellevue, Washington. Project Manager for civil design elements, preparation of alternatives. Prior experience: five years municipal experience as City engineer for City of Mercer Island, Washington.

Mark S. Van Wormer, P.E., - B.S. Civil Engineering and B.S. Surveying, Ohio State University, 1983. Currently project engineer for W & H Pacific. Responsible for designing civil plans for site development. Prior experience: Three years with Civil Engineering Associates, Columbus, Ohio, designed plans for roadway improvements and commercial and private site developments. Five years with Ohio Department of Transportation. Managed the construction of various bridge and highway projects.

Robert A. Wells - B.S., Geology, Yale University, 1969; graduate work, biological oceanography, University of Washington 1976-1979. Planner II, Aviation Planning, Port of Seattle. Prior experience: 12 years with Port of Seattle including 10 years in Environmental Management section. Responsible for document analysis, compilation, and review.

Michael Woodland - B.A., Architecture, University of Washington, 1979; M.A. Candidate, Architecture and Urban Design, University of Washington. Urban Designer with TRA, Ltd. Prior experience: six years with TRA Planning Services. One year with Studio La Rocca, Viterbo, Italy. Two years with City of Seattle on Shorelines Master Plan team. Responsible for the Land Use and the Aesthetics and Urban Design sections of EIS.

Index

INDEX