FACT SHEET FOR NPDES PERMIT WA-002465-1

Port of Seattle – Seattle-Tacoma International Airport

March 13, 2009

PURPOSE of this Fact Sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for the Port of Seattle, Seattle-Tacoma International Airport (STIA).

The Environmental Protection Agency (EPA) developed the NPDES permitting program as a tool to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” EPA delegated to Ecology the power and duty to write, issue, and enforce NPDES permits within Washington State. Both state and federal laws require any industrial facility to obtain a permit before discharging waste or chemicals to a water body.

An NPDES permit limits the types and amounts of pollution the Permittee may discharge. Those limits are based either on (1) the pollution control or wastewater treatment technology available to the industry, or on (2) the receiving water’s customary beneficial uses. This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit *and accompanying fact sheet* for public evaluation before issuing an NPDES permit.

PUBLIC ROLE in the Permit

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before we issue the final permit to the facility operator (WAC 173-220-050). Copies of the fact sheet and draft permit for the Port of Seattle, Seattle-Tacoma International Airport, NPDES permit WA-002465-1, were available for public review and comment from December 15, 2008, until the close of business January 15, 2009. For more details on preparing and filing comments about these documents, please see *Appendix A - Public Involvement*.

Before publishing the draft NPDES permit, the Port of Seattle, Seattle-Tacoma International Airport, reviewed it for factual accuracy. Ecology corrected any errors or omissions about the facility’s location, product type or production rate, discharges or receiving water, or its history.

After the public comment period closes, Ecology will summarize substantive comments and our responses to them. Ecology will include our summary and responses to comments to this fact sheet as *Appendix D - Response to Comments*, and publish it when we issue the final NPDES permit. The rest of the fact sheet will not be revised, but the full document will become part of the legal history contained in the facility’s permit file.

DISCHARGE LOCATIONS

INDUSTRIAL WASTEWATER (PART I)

OUTFALL #	OUTFALL LOCATION	RECEIVING WATER
001	East End Diffuser Latitude: 47° 24' 11" N Longitude: -122° 20' 13" W West End Diffuser Latitude: 47° 24' 11" N Longitude: -122° 20' 16" W	Puget Sound

STORMWATER ASSOCIATED WITH INDUSTRIAL ACTIVITIES (PART II)

Table II-S1A(1)-Existing and New Outfalls and Subbasins			
OUTFALL #	**OUTFALL LOCATIONS**	**SAMPLING POINT**	**RECEIVING WATER**
SDE4/SDS1	Latitude: 47° 25' 59" N Longitude: -122° 18' 7" W	At the Point of Discharge	Des Moines Creek (East Branch) (DME)
SDN1	Latitude: 47° 28' 1" N Longitude: -122° 18' 22" W	At the Point of Discharge	Lake Reba RB
SDS3/5	Latitude: 47° 25' 48" N Longitude: -122° 18' 42" W	At the Point of Discharge	Northwest Pond NP
SDS4	Latitude: 47° 25' 40" N Longitude: -122° 18' 26" W	At the Point of Discharge	Northwest Pond NP
SDS6/7	Latitude: 47° 26' 14" N Longitude: -122° 19' 5" W	At the Point of Discharge	Northwest Pond NP
SDN2/3/4	Latitude: 47° 28' 5" N Longitude: -122° 18' 47" W	At the Point of Discharge	Lake Reba RB
Pond M[1]	Latitude: 47° 28' 2" N Longitude: -122° 18' 50" W	At the Point of Discharge	Miller Creek MC
SDN3A	Latitude: 47° 27' 48" N Longitude: -122° 19' 19" W	At the Point of Discharge	Miller Creek MC
SDW1A	Latitude: 47° 27' 36" N Longitude: -122° 19' 18" W	At the Point of Discharge	Miller Creek MC
SDW1B	Latitude: 47° 27' 10" N Longitude: -122° 19' 13" W	At the Point of Discharge	Miller Creek MC
SDW2	Latitude: 47° 26' 54" N Longitude: -122° 19' 13" W	At the Point of Discharge	Walker Creek WC
Future Outfalls to be Activated as Part of the CDP Near Term Project Development			
SDN1OFF	Latitude: 47° 28' 2" N Longitude: -122° 18' 07" W	At the Point of Discharge	Lake Reba RB
SDD06A	Latitude: 47° 25' 35" N Longitude: -122° 18' 20" W	At the Point of Discharge	Des Moines Creek (East Branch)
SDD05A	Latitude: 47° 25' 48" N Longitude: -122° 18' 12" W	At the Point of Discharge	Des Moines Creek (East Branch)
SDD05B	Latitude: 47° 25' 58" N Longitude: -122° 18' 08" W	At the Point of Discharge	Des Moines Creek (East Branch)
Existing Outfalls and Subbasins to be Eliminated as Part of the Third Runway Project			
SDN2	Latitude: 47° 27' 56" N Longitude: -122° 18' 23" W	At the Point of Discharge	Lake Reba RB
SDN3	Latitude: 47° 28' 2" N Longitude: -122° 18' 42" W	At the Point of Discharge	Lake Reba RB
SDN4	Latitude: 47° 27' 57" N Longitude: -122° 18' 34" W	At the Point of Discharge	Lake Reba RB
Pond M[1]	Latitude: 47° 28' 2" N Longitude: -122° 18' 50" W	At the Point of Discharge	Miller Creek MC

[1] The Pond M outfall is an interim outfall until infrastructure modifications are complete. Once modifications are completed, this subbasin will discharge to Lake Reba via the SDN2/3/4 outfall and the Pond M outfall will be eliminated.

STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES (PART III)

EXISTING OUTFALL LOCATION 1	RECEIVING WATER	SAMPLING POINT
Latitude: 47˚ 28' 15" N Longitude: -122˚ 19' 00" W	Miller Creek #14	At the Point of Discharge
Latitude: 47˚ 28' 15" N Longitude: -122˚ 19' 00" W	Miller Creek #14-A	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 19' 00" W	Miller Creek #15	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 19' 00" W	Miller Creek #15-A	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 19' 00" W	Miller Creek #15-B	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 19' 15" W	Miller Creek #16	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 19' 15" W	Miller Creek #16-A	At the Point of Discharge
Latitude: 47˚ 27' 45" N Longitude: -122˚ 19' 15" W	Miller Creek #17	At the Point of Discharge
Latitude: 47˚ 27' 45" N Longitude: -122˚ 19' 15" W	Miller Creek #17-A	At the Point of Discharge
Latitude: 47˚ 27' 30" N Longitude: -122˚ 19' 30" W	Miller Creek #18	At the Point of Discharge
Latitude: 47˚ 27' 30" N Longitude: -122˚ 19' 30" W	Miller Creek #18-A	At the Point of Discharge
Latitude: 47˚ 27' 30" N Longitude: -122˚ 19' 15" W	Miller Creek #19	At the Point of Discharge
Latitude: 47˚ 27' 30" N Longitude: -122˚ 19' 15" W	Miller Creek #19-A	At the Point of Discharge
Latitude: 47˚ 27' 15" N Longitude: -122˚ 19' 30" W	Miller Creek #20	At the Point of Discharge
Latitude: 47˚ 27' 15" N Longitude: -122˚ 19' 30" W	Miller Creek #20-A	At the Point of Discharge
Latitude: 47˚ 27' 15" N Longitude: -122˚ 19' 15" W	Miller Creek #21	At the Point of Discharge
Latitude: 47˚ 27' 15" N Longitude: -122˚ 19' 15" W	Miller Creek #21-A	At the Point of Discharge
Latitude: 47˚ 28' 15" N Longitude: -122˚ 18' 45" W	Lake Reba # 28	At the Point of Discharge
Latitude: 47˚ 28' 15" N Longitude: -122˚ 18' 45" W	Lake Reba # 28 -A	At the Point of Discharge
Latitude: 47˚ 28' 15" N Longitude: -122˚ 18' 45" W	Lake Reba # 28 - B	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 45" W	Lake Reba # 29	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 45" W	Lake Reba # 29-A	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30-A	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30-B	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30-C	At the Point of Discharge
Latitude: 47˚ 28' 00" N Longitude: -122˚ 18' 30" W	Lake Reba # 30-D	At the Point of Discharge

EXISTING OUTFALL LOCATION 1	RECEIVING WATER	SAMPLING POINT
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 18’ 30” W	Lake Reba # 30-E	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 19’ 00” W	Northwest Ponds #4	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 19’ 00” W	Northwest Ponds #4-A	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 18’ 45” W	Northwest Ponds #5	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 18’ 45” W	Northwest Ponds #5-A	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 18’ 45” W	Northwest Ponds #5-B	At the Point of Discharge
Latitude: 47˚ 25’ 30” N Longitude: -122˚ 18’ 30” W	Des Moines Creek #7	At the Point of Discharge
Latitude: 47˚ 25’ 30” N Longitude: -122˚ 18’ 30” W	Des Moines Creek #7-A	At the Point of Discharge
Latitude: 47˚ 26’ 00” N Longitude: -122˚ 17’ 45” W	Des Moines Creek #9	At the Point of Discharge
Latitude: 47˚ 26’ 00” N Longitude: -122˚ 18’ 00” W	Des Moines Creek #10	At the Point of Discharge
Latitude: 47˚ 26’ 00” N Longitude: -122˚ 18’ 00” W	Des Moines Creek #10-A	At the Point of Discharge
Latitude: 47˚ 26’ 00” N Longitude: -122˚ 18’ 00” W	Des Moines Creek #10-B	At the Point of Discharge
Latitude: 47˚ 26’ 00” N Longitude: -122˚ 18’ 15” W	Des Moines Creek # 11	At the Point of Discharge
Latitude: 47˚ 26’ 00” N Longitude: -122˚ 18’ 15” W	Des Moines Creek # 11-A	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 18’ 15” W	Des Moines Creek #12	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 18’ 15” W	Des Moines Creek #12-A	At the Point of Discharge
Latitude: 47˚ 25’ 45” N Longitude: -122˚ 18’ 15” W	Des Moines Creek #12-B	At the Point of Discharge
Latitude: 47˚ 25’ 30” N Longitude: -122˚ 18’ 15” W	Des Moines Creek #13	At the Point of Discharge
Latitude: 47˚ 25’ 30” N Longitude: -122˚ 18’ 15” W	Des Moines Creek #13-A	At the Point of Discharge
Latitude: 47˚ 25’ 30” N Longitude: -122˚ 18’ 15” W	Des Moines Creek #13-B	At the Point of Discharge
Latitude: 47˚ 25’ 15 N Longitude: -122˚ 18’ 15” W	Des Moines Creek #25	At the Point of Discharge
Latitude: 47˚ 25’ 15 N Longitude: -122˚ 18’ 15” W	Des Moines Creek #25-A	At the Point of Discharge
Latitude: 47˚ 25’ 15 N Longitude: -122˚ 18’ 15” W	Des Moines Creek #25-B	At the Point of Discharge
Latitude: 47˚ 26’ 30 N Longitude: -122˚ 17’ 30” W	Des Moines Creek #29	At the Point of Discharge
Latitude: 47˚ 27’ 45” N Longitude: -122˚ 17’ 15” W	Gilliam Creek #26	At the Point of Discharge
Latitude: 47˚ 27’ 45” N Longitude: -122˚ 17’ 00” W	Gilliam Creek #27	At the Point of Discharge
Latitude: 47˚ 27’ 45” N Longitude: -122˚ 17’ 00” W	Gilliam Creek #27-A	At the Point of Discharge
Latitude: 47˚ 28’ 00” N Longitude: -122˚ 17’ 15” W	Gilliam Creek #28	At the Point of Discharge

EXISTING OUTFALL LOCATION 1	RECEIVING WATER	SAMPLING POINT
Latitude: 47˚ 28' 00" N Longitude: -122˚ 17' 15" W	Gilliam Creek #28-A	At the Point of Discharge
Latitude: 47˚ 27' 00" N Longitude: -122˚ 19' 30" W	Walker Creek #22	At the Point of Discharge
Latitude: 47˚ 27' 00" N Longitude: -122˚ 19' 30" W	Walker Creek #22-A	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 30" W	Walker Creek #23	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 30" W	Walker Creek #23-B	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 15" W	Walker Creek #24	At the Point of Discharge
Latitude: 47˚ 26' 45" N Longitude: -122˚ 19' 15" W	Walker Creek #24-A	At the Point of Discharge
Note: The geographic coordinates included in Table 1 are based on the NAD 83 datum. This existing outfall may also be used for future construction outfall.		

TABLE OF CONTENTS

INTRODUCTION

Table 1. General Facility Information

Applicant:	PORT OF SEATTLE
Facility Name and Address:	Seattle-Tacoma International Airport P.O. Box 68727 Seattle, WA 98168
Type of Treatment:	Oil and water separation, dissolved air floatation, settling
Type of Facility:	Air-Transportation
SIC Code:	4581 (Airport, Air Terminal) 4512 (Air Transportation) 4513 (Air Courier Services) 5171 (Bulk Petroleum Storage)
Discharge Location:	Part I – Marine Discharge Location: East End Diffuser Latitude: 47˚ 24' 11" N Longitude: -122˚ 20' 13" W West End Diffuser Latitude: 47˚ 24' 11" N Longitude: -122˚ 20' 16" W Part II – Freshwater Discharge Locations: See page 2 for Discharge Locations. Part III – Freshwater Discharge Locations: See page 3 for Discharge Locations.
Waterbody ID Number:	(i) WA-PS-0270 (ii) WA-09-2000 (iii) WA-09-2005
Receiving Water:	(i) Puget Sound (Industrial Wastewater and Stormwater Runoff) (ii) Des Moines Creek (Stormwater) (iii) Miller Creek (Stormwater) (iv) City of SeaTac Storm Sewer, tributary to Gillian Creek and the Green River (Stormwater) (v) Walker Creek (Stormwater) (vi) Northwest Ponds (Stormwater) (vii) Lake Reba (Stormwater)

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

Ecology adopted rules describing how we exercise our authority:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC),
- Water quality criteria for surface waters (chapter 173-201A WAC) and for ground waters (chapter 173-200 WAC)
- Sediment management standards (chapter 173-204 WAC).

These rules require any industrial facility operator to obtain an NPDES permit before discharging wastewater to state waters. They also define the basis for limits on each discharge and for other performance requirements imposed by the permit.

Under the NPDES permit program, Ecology must prepare a draft permit and accompanying fact sheet, and make it available for public review. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments on the draft permit, during a period of thirty (30) days (WAC 173-220-050). (See *Appendix A - Public Involvement* for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment. Ecology will summarize the responses to comments and any changes to the permit in *Appendix D.*

II. BACKGROUND INFORMATION

The federal Clean Water Act (CWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the CWA is National Pollutant Discharge Elimination System (NPDES) permits program, which is administered by the Environmental Protection Agency (EPA). The EPA has delegated responsibility to administer the NPDES permit program to the state of Washington on the basis of Chapter 90.48 RCW which defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the state include procedures for issuing permits (Chapter 173-220 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater and stormwater associated with industrial activity to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty (30) days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see *Appendix A - Public Involvement* of the fact sheet for more detail on the public notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, Ecology will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of Ecology's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in *Appendix D - Response to Comments.*

This permit is written in three parts.

- Part I is the regulatory requirements for the Industrial Wastewater System.
- Part II is the regulatory requirements for the permanent and general stormwater runoff excluding the construction runoff.
- Part III is construction stormwater runoff and dewatering activities.

The general conditions are equally applicable to Parts I, II, and III.

A. Description of the Facility

Seattle-Tacoma International Airport (STIA) is a major airport that serves the Pacific Northwest. The airport opened in 1944 and is owned and operated by the Port of Seattle (Port). STIA is situated entirely within the city of SeaTac and occupies more than 2,500 acres of land. The Port provides facilities for tenants engaged in passenger and air cargo transportation. In addition to the main terminal, which has four concourses, there are two satellite terminals. Industrial activities at the airport include aircraft and ground vehicle maintenance, fueling, washing, aircraft and ground deicing/anti-icing, and miscellaneous airport-related activities. This NPDES permit addresses industrial wastewater, uncontaminated construction dewatering water, and stormwater associated with industrial activity from airport operations to the waters of the state of Washington, sanitary sewers, and municipal storm drains. This permit also addresses stormwater associated with construction activity.

See Appendix E-H for complete descriptions of the facilities, outfall locations, history, and wastewater and stormwater treatment pertaining to Parts I, II, and III of the permit.

B. Permit Status

Port of Seattle, Seattle-Tacoma International Airport submitted an application for permit renewal on **March 3, 2008**. Ecology accepted it as complete on **June 11, 2008**.

Ecology issued the previous permit for this facility on **September 4, 2003, and modified on October 7, 2005, and August 7, 2007**. The previous permit placed effluent limits on BOD, oil and grease, TSS, pH, turbidity, ammonia, nitrite, total copper, and total zinc, total lead and arsenic.

Oil and Grease, BOD, TSS, and pH limits were applied to discharges under Part I. TSS, pH, Oil and Grease, Ammonia, Nitrate/Nitrites as N, Total Copper, Lead and Zinc limits were applied to Part II. Turbidity, pH, Oil and Grease, and Arsenic limits were applied to discharges under Part III.

C. Summary of Compliance With Previous Permit Issued September 4, 2003

Ecology maintained a regular presence at this site through the term of the previous permit. The Ecology senior inspector visited the entire site on a regular basis.

Seattle-Tacoma International Airport's wastewater treatment discharge has been in relatively good compliance during the history of the permit issued on **September 4, 2003.** Ecology assessed facility compliance based on our review of the facility's Discharge Monitoring Reports (DMRs) and on inspections conducted by Ecology.

D. Wastewater Characterization

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. Ecology's monitoring results are included in the data that follows. The effluent is characterized for three separate sources as follows:

Table 2. Wastewater Characterization

Part I - Industrial Wastewater - Maximum Concentration		
Parameter	**During Deicing Season**	**During Non-deicing Season**
BOD, mg/L	61	51
COD, mg/L	82.5	98.6
TOC, mg/L	29.2	37
TSS, mg/L	13	28
pH, S.U.	6 - 8.6	5.8 - 8.2
Oil and Grease, mg/L	4.03	0.86
Total Antimony, µg/L	1	1.8
Total Arsenic, µg/L	1	3.2
Total Cadmium, µg/L	0.3	1.9
Total Chromium, µg/L	5.7	4.9
Total Copper, µg/L	8.7	10.1
Total Lead, µg/L	Less than 1	0.5
Total Mercury, µg/L	Less than 0.2	0.1
Total Nickel, µg/L	1.1	2.5
Total Silver, µg/L	Less than 0.2	0.1
Total Zinc, µg/L	31	32
Total Cyanide, µg/L	Less than 10	5
Total Phenol, µg/L	1.1	Less than 1

Part II – Permanent and General Stormwater Runoff Concentration based on maximum flow weighted concentration from all outfalls	
Parameter	**Maximum Concentration**
BOD, mg/L	163
COD, mg/L	213
Total Organic Nitrogen mg/L	0.411
TSS, mg/L	1613
Total Phosphorus	0.101
pH, S.U.	5.6 - 8.56 (It is not flow weighted.)
Oil and Grease, mg/L	4.79 (It is not flow weighted.)
Total Antimony, µg/L	13
Total Arsenic, µg/L	6.3
Total Cadmium, µg/L	0.3
Total Chromium, µg/L	8.6
Total Copper, µg/L	287
Total Lead, µg/L	72
Total Nickel µg/L	10.3
Total Silver µg/L	0.4
Total Zinc µg/L	696
Total Phenol µg/L	4.9

Part III – Chemical Concentration Stormwater Continuous Runoff Treatment	
Parameter	**Maximum Concentration**
Non-Chemical Treatment	
Turbidity, NTU	The Port identified sixteen (16) events during which there were a 5 NTU or greater difference between upstream and downstream values. Eight (8) of the exceedances were not related to Port activity. Seven (7) of these non-Port-related exceedances occurred when the outfall discharge was less than 5 NTUs or the outfall discharge was less than 5 NTUs above the upstream value. In these cases, the 5 NTU increase downstream was due to other sources or natural in-stream changes between the up and downstream monitoring points. During one (1) of the non-Port-related exceedances, there was no discharge from the outfall therefore the exceedance was not related to Port activity. The other eight (8) were associated with airport construction activity and additional BMP measures were implemented immediately. The Port exceeded the 10% of background turbidity limit during two (2) instances. These two (2) exceedances were related to the November 2006 storm event bypasses.
pH, S.U.	There were nineteen (19) pH exceedances during this period. None of the exceedances were associated with Port activity. During all exceedances except for one, the upstream value was below the 6.5 effluent limit. The depressed pH of the creek in these instances is likely related to basin-wide effects of low pH rainwater on the receiving waters. The final pH incident—the upstream sample was greater than 8.5. During this specific event, the creek's natural pH was above 8.0. This elevated reading was most likely related to photosynthesis within Lake Reba.
Total Petroleum Hydrocarbon	During all of the monitoring events, the Port did not visually identify a sheen.
Arsenic	The Port met the Arsenic effluent limit during all monitoring events.
Continuous Chemical Construction Treatment	
Turbidity, NTU	The Port exceeded the 5 NTU maximum daily average six (6) operating days. These exceedances occurred during large and/or high intensity rain events. In order to process minimize the potential for a high turbid discharge during these events, the Port directed the treatment contactor to increase the discharge set point to greater than 5 NTUs in order to maximize treatment efficiency. These exceedances were associated with 753,467 gallons of the total 419 million gallons treated.
pH, S.U.	The Port CESF effluent was between 6.5 and 8.5 during all discharges except for one day. The pH value was 6.4 and occurred during the November 2006 storm event. The Port increased discharge capacity to maximize treatment efficiency. This exceedance was associated with 1,996,701 gallons of total 244 million gallons treated.
Total Petroleum Hydrocarbon	The Port did not visually identify a sheen during any of the treatment operations. Please note that due to truncated operations or operator error, less than four Total Petroleum Hydrocarbon samples may have been collected.
Arsenic	Arsenic monitoring was only applicable for the outfalls associated with the Third Runway Project. The Port met the arsenic effluent limit during all treatment operations.

III. PROPOSED PERMIT CONDITIONS

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and Chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (40 CFR 131.36).
- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described in general below and in more details in following sections.

The limits in this permit reflect information received in the application. Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants**.** Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Nor does Ecology usually develop permit limits for pollutants that were not reported in the permit application but that may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology, as described in 40 CFR 122.42(a), if significant changes occur in any constituent. Industries may be in violation of their permit until the permit is modified to reflect additional discharge of pollutants.

A. Design Criteria

IWS SYSTEM - In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria. The design criteria for this treatment facility are taken from the Engineering Report prepared by Kennedy/Jenks Consultants and are as follows:

Table 3: Design Criteria for the IWTP

Parameter	Design Quantity
Daily Peak Flow[a] @ Maximum Overflow Rate of 4.1 GPM	7.7 MGD
IWTP Hydraulic Capacity	8.3 MGD

[a] Reported Daily Peak Flow is limited by the capacity of existing outfall shared with Midway Sewer District. The hydraulic capacity of the IWTP is 8.3 MGD.

Design criteria for Parts II and III of the permit are based on general design criteria as specified by the *Western Washington Stormwater Manual*. The manual provides guidelines for design and operation of stormwater treatment and flow control facilities.

B. Technology-based Effluent Limits

See Appendix E-H for discussion of AKART and technology-based effluent limits pertaining to Parts I, II, and III of the permit.

C. Surface Water Quality-based Effluent Limits

The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) were designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet established surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily loading study (TMDL).

Numerical Criteria for the Protection of Aquatic Life and Recreation

Numerical water quality criteria are published in the Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical Criteria for the Protection of Human Health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (40 CFR 131.36). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative Criteria

Narrative water quality criteria (for example, WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330, 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

This facility must meet Tier I requirements.

- Existing and designated uses must be maintained and protected. No degradation may be allowed that would interfere with, or become injurious to, existing or designated uses, except as provided for in this chapter.

Ecology’s analysis described in this section of the fact sheet demonstrates that the existing and designated uses of the receiving water will be protected under the conditions of the proposed permit.

Mixing Zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric criteria, so long as the diluting wastewater does not interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric criteria.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control and treatment (AKART). Mixing zones typically require compliance with water quality criteria within 200 to 300 feet from the point of discharge; and use no more than 25% of the available width of the water body for dilution. We use modeling to estimate the amount of mixing within the mixing zone. Through modeling we determine the potential for violating the water quality standards at the edge of the mixing zone and derive any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter (by itself) has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water comprises 90% of the total volume at the boundary of the mixing zone. We use dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life **acute** criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Each aquatic life **chronic** criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two liters/day for drinking water.
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400; 2006). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. **Ecology must specify both the allowed size and location in a permit. (Both options applied here)**

   PART I: The proposed permit specifies the size and location of the allowed mixing zone.

   The maximum boundaries of the mixing zones are defined as follows:

   Chronic Mixing Zone: AC 173-201A-400(7)(b)(i) specifies mixing zones must not extend in any horizontal direction from the discharge ports for a distance greater than 200 feet plus the depth of water over the discharge ports as measured during mean lower low water (MLLW). Given a MLLW water depth of 148 feet (45.1 meters) for the Permittee's outfall, the horizontal distance therefore is 348 feet (106.1 meters). The mixing zone is a circle with radius of **348 feet (106.1 meters)** measured from the center of each discharge port. The mixing zone extends from the seabed to the top of the water surface. Chronic aquatic life criteria and human health criteria must be met at the edge of the chronic zone**.** The dilution factors associated with the chronic mixing zone is 202:1.

   Acute Mixing Zone: WAC 173-201A-400(8)(b) specifies that in estuarine waters a zone where acute criteria may be exceeded must not extend beyond 10% of the distance established for the maximum or chronic zone as measured independently from the discharge ports. The acute mixing zone is a circle with radius of **34.8 feet (10.6 meters)** measured from the center of each discharge port. The mixing zone extends from the seabed to the top of the water surface. Acute aquatic life criteria must be met at the edge of the acute zone. The dilution factors associated with the acute mixing zones is 72:1.

   PARTS II & III: For discharges specified under Part II of this permit, the Permittee did not request Ecology any mixing zone. Therefore, Ecology did not grant mixing zones for these outfalls. The effluent limits are based on water quality criteria after application of Water Effect Ratio and are to be met at the end of the pipe.

For discharges specified under Part III of this permit, for in-stream sampling, the Permittee is allowed to sample downstream at the point of complete mix that is not more than 100 feet from the point of discharge. For other sampling, all limits are to be applied at the end of the pipe. Mixing zone or dilution factors are not applied for these sampling events.

2. **The facility must fully apply "all known, available, and reasonable methods of prevention, control, and treatment" (AKART) to its discharge.**
Ecology has determined that the treatment provided and the pollution prevention activities practiced at STIA under **Parts I, II, and III** of the permit meet the requirements of AKART (see "Technology-based Limits").

3. **Ecology must consider critical discharge conditions.**
Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated water body uses). The critical discharge condition is often pollutant-specific or water body-specific.

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology uses the water depth at mean lower low water (MLLW) for marine waters. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: http://www.ecy.wa.gov/biblio/92109.html.

4. **Supporting information must clearly indicate the mixing zone would not:**
   - **Have a reasonable potential to cause the loss of sensitive or important habitat,**
   - **Substantially interfere with the existing or characteristic uses,**
   - **Result in damage to the ecosystem, or**
   - **Adversely affect public health.**

Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms, and set the criteria to protect all aquatic species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic criteria assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of being discharged.

The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers), because the buoyant plume rises in the water column. Ecology has additionally determined that this effluent will not exceed 33 degrees C for more than 2 seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics, and the discharge location. Based on this review, we conclude that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem or adversely affect public health.

5. **The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.**
Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant. We concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone.

6. **The size of the mixing zone and the concentrations of the pollutants must be minimized.**
At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. Because tidal currents change direction, the plume orientation within the mixing zone changes. The plume rises through the water column as it mixes, therefore, much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving water body. When a diffuser is installed, the discharge and the receiving water are more completely mixed in a shorter time period. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

7. **Maximum size of mixing zone.**
The authorized mixing zone does not exceed the maximum size restriction.

8. **Acute Mixing Zone.**

- **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**
Ecology determined the acute criteria will be met at 10% of the distance (or of the chronic mixing zone at the ten-year low flow).

- **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**
As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organism near the point of discharge (below the rising effluent).

- **Comply with size restrictions.**
The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

9. **Overlap of Mixing Zones.**
This mixing zone does not overlap another mixing zone.

D. Description of the Receiving Water

The IWTP facility discharges treated wastewater to **Puget Sound, marine water**. Discharge from this facility shares outfalls with Midway Sewage Treatment Facility (POTW). Runoff from other parts outside of IWS area is discharged to freshwater streams (Miller Creek, Des Moines Creek, Walker Creek, Lake Reba, and Northwest Pond) in the vicinity.

E. Designated Uses and Surface Water Quality Criteria

Applicable designated uses and surface water quality criteria are defined in Chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). Criteria applicable to this facility's discharge are summarized below.

Marine Discharges:

Aquatic life uses are designated using the following general categories. All indigenous fish and non-fish aquatic species must be protected in waters of the state.

(a) **Extraordinary quality** salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

(b) **Excellent quality** salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

(c) **Good quality** salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

(d) **Fair quality** salmonid and other fish migration.

Port of Seattle, Sea-Tac International Airport, Part I, IWS discharges to Puget Sound, an Extraordinary Marine waters. The Aquatic Life Uses and associated criteria for extraordinary marine waters are identified below.

Aquatic Life Uses and Associated Criteria

Extraordinary Quality	
Temperature Criteria - Highest 1D MAX	13°C (55.4°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	7.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
pH Criteria	pH must be within the range of 7.0 to 8.5 with a human-caused variation within the above range of less than 0.2 units.

- To protect **shellfish harvesting**, fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

- The **recreational uses** are primary contact recreation and secondary contact recreation.

Port of Seattle, Sea-Tac International Airport, Part I, IWS discharges to Puget Sound, the recreational uses are identified as primary contact, as shown below.

Recreational Use	**Criteria**
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 14 colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies /100 mL.

- The **miscellaneous marine water uses** are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

Freshwater Discharges:

Aquatic life uses. Aquatic life uses are designated based on the presence of, or the intent to provide protection for, the key uses identified in (a) of this subsection. It is required that all indigenous fish and nonfish aquatic species be protected in waters of the state in addition to the key species described below.

The categories for aquatic life uses are:

Salmonid spawning, rearing, and migration. The key identifying characteristic of this use is salmon or trout spawning and emergence that only occur outside of the summer season (September 16 - June 14). Other common characteristic aquatic life uses for waters in this category include rearing and migration by salmonids.

General criteria. General criteria that apply to all aquatic life fresh water uses are described in WAC 173-201A-260 (2)(a) and (b), and are for:

(i) Toxic, radioactive, and deleterious materials; and

(ii) Aesthetic values.

Port of Seattle, Sea-Tac International Airport, Parts II and III discharge to Miller Creek, Des Moines Creek, Walker Creek, Northwest Pond, and Lake Reba. This freshwater system has an aquatic life use of rearing and migration only and a recreation classification of secondary contact. The Aquatic Life Uses and associated criteria for rearing and migration only are identified below.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for, the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Aquatic Life Uses & Associated Criteria

Salmonid Rearing and Migration	
Temperature Criteria – Highest 7DAD MAX	17.5°C (63.5°F)
Dissolved Oxygen Criteria – Lowest 1-Day	Minimum 8.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- The recreational uses are extraordinary primary contact recreation, primary contact recreation, and secondary contact recreation. The recreational uses for this receiving water are identified below.

Recreational Uses and Associated Criteria

Recreational Use	**Criteria**
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.

- The **water supply uses** are domestic, agricultural, industrial, and stock watering.
- The **miscellaneous freshwater use**s are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

F. Evaluation of Surface Water Quality-based Effluent Limits for Numeric Criteria

For discharges under Part I, pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants—their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biological oxygen demand (BOD) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

Pollutant concentrations in the proposed discharge exceed water quality criteria despite using technology-based controls which Ecology determined fulfills AKART. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones described in chapter 173-201A WAC.

Ecology determined the dilution factors of effluent to receiving water for discharges under Part I that occur within these zones at the critical condition using list models, dye studies used. The dilution factors are listed in Table 4:

Table 4. Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	72:1	202:1
Human Health, Carcinogen		202:1
Human Health, Non-carcinogen		202:1

Ecology determined the impacts of immediate oxygen deficiency, pH, metals, and other toxics as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

BOD_5—This discharge (with technology-based limits) results in a small amount of BOD loading relative to the large amount of dilution occurring in the receiving water at critical conditions. Technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

pH—For Part I, compliance with the technology-based limits of 6.0 to 9.0 will assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water. For Parts II and III, we predict no violation of the pH criteria under critical conditions. Therefore, Ecology placed the technology-based effluent limits for pH in the permit.

Turbidity—For discharges under Part I, Ecology evaluated the impact of turbidity based on the range of turbidity in the effluent and turbidity of the receiving water. Due to the large degree of dilution, Ecology expects no violations of the turbidity criteria outside the designated mixing zone. For discharges to freshwater under Parts II and III, the permit requires turbidity monitoring to assess compliance with the water quality criteria for turbidity because of potential fluctuations in turbidity of both the receiving water and the effluent.

Toxic Pollutants—Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

There are heavy metals and organic pollutants present in the discharge to Puget Sound under Parts I and II. We conducted a reasonable potential analysis (See *Appendix C)* for discharges from Part I for these parameters to determine whether effluent limits would be required in this permit.

Calculations using all applicable data show no reasonable potential for this discharge to cause a violation of water quality standards. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

For discharges from Part II, Port of Seattle provided data demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. Ecology adjusted metals criteria on a site-specific basis and adjusted metals criteria using the water effects ratio approach established by the EPA, as generally guided by the procedures in *U.S. EPA Water Quality Standards Handbook*, December 1983, as supplemented or replaced.

G. Development of Water Quality Effluent Limits for the Seattle-Tacoma International Airport

Site-Specific Study

The Port of Seattle has completed a Site-Specific Study (e.g., Water Effects Ratio) for copper and zinc. The study was required by the STIA's 401 Certification for Master Plan Update (MPU) projects and the current NPDES permit. The study developed site-specific water quality objectives (SSWQOs) that incorporated water effect ratios and dissolved to total translators for each stream segment that receives existing and future STIA stormwater runoff. SSWQO-based effluent limits were subsequently derived using the10^{th} percentile hardness associated with the receiving water and assumed no dilution.

In the case of copper, the SSWQO-based effluent limits were less than the current effluent limitations. Zinc SSWQO-based effluent limits were greater than the current effluent limits. The study results are described in greater detail in Appendix G of this fact sheet. A summary of current and derived SSWQO-based limits are summarized below.

Table 5. Summary of Site-Specific Study Derived Water Quality-Based Effluent Limits and Current Limits

Receiving Water	Associated Outfalls	Copper		Zinc	
		Current	SSWQO-based	Current	SSWQO-based
East Branch Des Moines Creek	SDE4/S1, SDD05A, SDD05B, SDD06A	63.6	25.6	117.0	155.6
West Des Moines Creek and Northwest Ponds	SDS4, SDS3/SDS5, SDS6/SDS7	63.6	32.2	117.0	262.4
Lake Reba	SDN1, SDN2/3/N4, SDN10FF	63.6	28.5	117.0	147.5
Miller Creek	SDN3A, SDW1A, SDW1B	NA	59.7	NA	202.0
Walker Creek	SDW2	NA	47.9	NA	154.6

Effluent Limitations
Ecology's *Permit Writer's Manual* states that:

Ecology will only authorize the highest WER that allows a permittee to fall below the reasonable potential threshold…

However, calculation of a reasonable potential analysis (RPA) requires the availability of sufficient representative data. In general, the STIA's stormwater outfalls, subbasins, and BMPs are still at various stages of completion.

Thus, representative data are not available with which to conduct a RPA in most outfalls. Consequently, the SSWQO-based effluent limits for copper will be used on an interim basis for all outfalls except SDN1 and SDS4 and until such time as the discharge basins and associated BMPs are fully operational and sufficient data are available to conduct RPAs. Sufficient data was available to conduct RPAs on SDN1 and SDS4. The resulting analysis found that the SSWQO-based effluent limits for copper fell below the reasonable potential threshold. Hence, final limits of 28.5 μg/L and 32.2 μg/L are included in the permit for outfalls SDN1 and SDS4, respectively.

As noted in Table 5, zinc effluent limits based on the Site-Specific Study's water quality objectives were higher than the current limits which the Port is required to meet. A review of the STIA's recent outfall monitoring results indicates that zinc discharge concentrations generally fall at or below the current limit. Therefore, with the exception of SDN1 and SDS4, the current limits will be carried forward as interim limits in the renewed permit until sufficient data is available to determine if lower performance-based limits are appropriate. As noted above, sufficient data was available to conduct a RPA and performance analysis on representative discharges from SDN1 and SDS4. For SDN1, the SSWQO-based limit of 144.3 µg/L fell below the reasonable potential threshold. The performance-based limit of 157.0 µg/L was higher. However, after careful review of data, it was revealed that the very last data point was many times larger than the mean of the data, which indicated possible outlier. Omitting this data point, the resulting performance-based effluent limit fell right below the existing effluent limits of 117 µg/L. Therefore, a final water quality-based effluent limit of 117 µg/L is included in the renewed permit for SDN1. For SDS4, a WER reduction resulting in a water quality-based limit of 71.4 µg/L was needed to reach the reasonable potential threshold.

As an added measure to assess whether these limits are protective, the permit includes a requirement for the Port to develop a plan to complete in-situ toxicity tests in the receiving waters.

H. Whole Effluent Toxicity

Under Part I - The water quality standards for surface waters forbid discharge of effluent that causes toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly, by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.

- *Chronic toxicity tests measure various sublethal toxic responses* such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Ecology-accredited WET testing laboratories use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC, LC_{50}, EC_{50}, IC_{25}, etc. Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (http://www.ecy.wa.gov/biblio/9580.html), which is referenced in the permit. Ecology recommends that Port of Seattle send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute toxicity. The proposed permit will not impose an acute WET limit. Port of Seattle must retest the effluent before submitting an application for permit renewal. In addition,

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. Port of Seattle may demonstrate to Ecology that effluent toxicity has not increased, by performing additional WET testing after the process or material changes have been made.

In the current permit, acute effluent characterization was required on final effluent from the Industrial Wastewater System at the Seattle-Tacoma International Airport. The effluent characterization was initiated after completion of AKART in January 2007. Samples were collected four times in a year during deicing activities at the airport while the treatment plant was discharging to the Midway Sewer District outfall. Test methods followed USEPA guidelines for acute exposures to daphnids and fathead minnows. In addition to four samples collected to meet effluent characterization requirements, two additional samples were collected during the same period to meet the requirement for testing on samples collected once during the winter and once during the summer prior to submittal of the airport’s application for permit renewal.

Based on the overall lack of acute toxicity in previous testing, the Industrial Wastewater System effluent does not require additional ongoing toxicity monitoring under an acute limit. Industrial Wastewater System effluent monitoring should be conducting according to the schedule for monitoring when there is no permit limit for acute toxicity (once in the last summer and once in the last winter prior to submission of the application for the next permit renewal cycle).

In the current permit, chronic effluent characterization was required on final effluent from the Industrial Wastewater System at the Seattle-Tacoma International Airport. The effluent characterization was initiated after completion of AKART in January 2007. Samples were collected four times in a year during deicing activities at the airport while the treatment plant was discharging to the Midway Sewer District outfall. Test methods followed USEPA guidelines for short-term chronic exposure to mysid shrimp and Pacific topsmelt. In addition to four samples collected to meet effluent characterization requirements, two additional samples were collected during the same time period to meet the requirement for testing on samples collected once during the winter and once during the summer prior to submittal of the airport’s application for permit renewal.

Based on the overall lack of chronic toxicity in previous testing, the Industrial Wastewater System effluent does not require additional ongoing toxicity monitoring under a chronic limit.

Industrial Wastewater System effluent monitoring should be conducted according to the schedule for monitoring when there is no permit limit for chronic toxicity (once in the last summer and once in the last winter prior to submission of the application for the next permit renewal cycle.)

In the current permit, acute toxicity tests were required on outfalls discharging to Miller Creek, Des Moines Creek, Gilliam Creek, Walker Creek, Lake Reba, and Northwest Ponds using fathead minnows and a daphnid. An acute toxicity characterization was conducted on samples of discharges to these receiving water bodies, as required in the permit. Only one discharge (SDE4) resulted in an acute limit for toxicity, after considering the hardness of the receiving environment as a mitigating factor in acute toxicity of metals. However, this site resulted in no toxicity in the last five quarters in which it was tested demonstrating that the reduced metal loadings associated with implementation of best management practices has had the desired effect of reducing metals concentrations and incidence of acute toxicity. Therefore, an effluent limit for acute toxicity is not required at Station SDE4 in the permit renewal.

Based on the overall lack of acute toxicity in previous testing, the SDE4/S1, SDS3, SDS4, SDS5, SDN1, SDN2, SDN3, and SDN4 stations do not appear to require additional ongoing toxicity monitoring under an acute limit. However, Station SDS6 should be re-characterized for Effluent Characterization, along with the new outfalls, since this site was not fully characterized in prior events as a result of construction activities that have substantially altered the drainage basin at this site. The remaining SDE4/S1, SDS3, SDS4, SDS5, SDN1, SDN2, SDN3, and SDN4 stations should only require monitoring activities that would be associated with sites that do not require a permit limit for acute toxicity. Monitoring at these sites should be conducted once in the last summer and once in the last winter prior to submission of the application for the next permit renewal cycle.

In summary, acute toxicity testing requirements should be limited to Effluent Characterization on SDS6 and the new outfall locations once they become active, using fathead minnow and daphnids. Toxicity testing at the remaining locations should be conducted according to the schedule for stations with no acute limit (once in the last summer and once in the last winter prior to submission of the application for permit renewal.) In addition, the permit language should indicate that it is appropriate to adjust the hardness of the samples to match that of the receiving environment prior to conducting the toxicity tests.

I. Sublethal Toxicity

Toxic metals are common in stormwater and their concentrations can vary considerably. There are many sources of these metals, but road and parking lot runoff are the biggest sources. The following list focuses on those metals which are present in STIA stormwater and have known effects to either important regional fish species or proposed test organisms: Average copper concentrations (total and dissolved) in various stormwater studies in North America ranged from 6.5 to 150 µg/L (Makepeace et al, 1995). A study in Vancouver, BC found an average total copper concentration near 240 µg/L in industrial and commercial areas, with a maximum single sample concentration near 500 µg/L (Hall et al, 1988). A study of stormwater in Birmingham, AL, found average dissolved copper concentrations as high as

250 µg/L from the worst area while average total copper in the same area was 290 µg/L (Pitt et al, 1995). Outfall monitoring from Seattle-Tacoma International Airport during the period of July 1, 2007, through June 30, 2008, found total recoverable copper concentrations that ranged from 5 µg/L to 145 µg/L with a median of 15 µg/L (Port of Seattle, 2008)

Average zinc concentrations (total and dissolved) in various stormwater studies in North America ranged from 16.6 to 580 µg/L (Makepeace et al, 1995). A study in Vancouver, BC, found an average total zinc concentration near 1400 µg/L in commercial and residential areas with a maximum single sample concentration near 5400 µg/L (Hall et al, 1988). A study of stormwater in Birmingham, AL, found average dissolved zinc concentrations as high as 220 µg/L from the worst area while average total zinc in the same area was 250 µg/L (Pitt et al, 1995). Outfall monitoring from STIA during the period of July 1, 2007, through June 30, 2008, found total recoverable zinc concentrations that ranged from 6 µg/L to 178 µg/L with a median of 28 µg/L (Port of Seattle, 2008). Average lead concentrations (total and dissolved) in various stormwater studies in North America ranged from 20.9 to 1558 µg/L (Makepeace et al, 1995). A study in Vancouver, BC, found an average total lead concentration near 1000 µg/L in commercial and residential areas with a maximum single sample concentration near 4100 µg/L (Hall et al, 1988). A study of stormwater in Birmingham, AL, found average dissolved lead concentrations as high as 2.6 µg/L from the worst area while average total lead in the same area was 105 µg/L (Pitt et al, 1995). Outfall monitoring of from STIA during the period of July 1, 2007, through June 30, 2008, found total recoverable lead concentrations that ranged from 1 µg/L to 20 µg/L with a median of 1 µg/L (Port of Seattle, 2008).

Aircraft and runway deicers are other common stormwater contaminants with the potential for toxicity from airports. The main ingredient of a deicer formulation is either ethylene or propylene glycol. Other ingredients may include tolyltriazoles, corrosion inhibitors, surfactants, binding polymers, urea, potassium acetate, potassium formate, or sodium formate (Corsi, 2001). Outfall monitoring of from STIA during the period of July 1, 2007, through June 30, 2008, found ethylene glycol concentrations that ranged from 1000 µg/L to 5,000 µg/L with a median of 1000 µg/L and found propylene glycol concentrations that ranged from 1000 µg/L to 69100 µg/L with a median of 4430 µg/L (Port of Seattle, 2008).

Effects to Fish of Common Stormwater Pollutants - Copper is a ubiquitous stormwater pollutant and may be the worst-case toxic metal for adverse effects to salmonid health. The 96-hour LC50 for yearling coho salmon exposed to dissolved copper is in the range of 60 – 74 µg/L. Dissolved copper concentrations at or above 10 µg/L have been shown to reduce yearling coho feeding, growth, general health, and the ability to survive moving into seawater (Lorz et al, 1977).

Juvenile Chinook salmon exposed to dissolved copper concentrations at or above 50 µg/L for one (1) hour or to dissolved copper concentrations at or above 25 µg/L for four (4) hours lost a significant number of olfactory receptors resulting in a reduction in the ability to smell. Such a loss would reduce the ability to find prey, avoid predators, and return to the natal stream for spawning. A similar effect on the ability to smell might explain the impairment of coho migration in the study referenced above. Juvenile Chinook salmon exposed to 44 µg/L of dissolved copper quickly lost the ability to smell and avoid further copper exposure. Juvenile Chinook salmon without previous copper exposure actively avoid dissolved copper concentrations as low as 4 µg/L. After acclimation to 2 µg/L of dissolved copper, juvenile Chinook salmon no longer avoided dissolved copper at 4 µg/L. Juvenile rainbow trout were much less sensitive than Chinook to olfactory impairment from copper exposure in the same study (Hansen et al,1999).

Steelhead salmon embryos, alevins, and fry intermittently exposed to copper for 4.5 hours each day for 78 days exhibited greater impairment than other steelhead salmon of the same age continuously exposed to the same concentrations indicating that water quality criteria based on continuous exposures may be inadequately protective for intermittent exposures to contaminants in runoff from rain events (Seim et al, 1984). Fingerling rainbow trout exposed to dissolved copper concentrations of 10 µg/L for 24 hours showed greatly increased mortalities from a common viral salmon pathogen (IHN) compared to rainbow trout receiving a virus exposure but no copper and rainbow trout receiving a copper exposure but no virus (Hetrick et al, 1979).

Pillard (1995) measured the toxicity to fathead minnows of a propylene glycol type I deicer as a 48-hour LC50 of 790,000 µg/L (96-hour LC50 = 710,000 µg/L), a 7-day LC50 of 270,000 µg/L, and an NOEC for growth of 98,000 µg/L. The toxicity to daphnids in the same study of a propylene glycol type I deicer was a 48-hour LC50 of 1,020,000 µg/L, a 7-day LC50 of 660,000 µg/L, and an NOEC for reproduction of 600,000 µg/L. The study found the toxicity of an ethylene glycol type I deicer, of pure propylene glycol, and of pure ethylene glycol to all be an order of magnitude or more lower than the propylene glycol type I deicer. The toxicity thresholds for the pure propylene or ethylene glycols were much higher than the highest concentrations of these compounds found in the outfall monitoring from STIA during the period of July 1, 2007, through June 30, 2008 (Port of Seattle, 2008). Majewski et al (1978) found no mortalities in rainbow trout exposed for 24 hours to 5,000,000 µg/L propylene glycol although an increase in ventilation rate was found at 3,850,000 µg/L.

Polycyclic aromatic hydrocarbons (PAHs) are another class of compounds that are ubiquitous in urban runoff. PAHs are persistent, bioaccumulative, and often toxic. The most serious consequences known from PAH exposure to fish are to the early life stages. Weathered PAH concentrations in water as low as 1.0 ppb produced significant mortalities in pink salmon in laboratory exposures (Heintz, 1999).

Biological Monitoring - The best single toxicity test for stormwater monitoring is daphnid acute testing. Daphnids are known to be among the most sensitive of test organisms to metals and pesticides (Hall et al, 1988 and Werner et al, 2000). A typical 48-hour LC50 for daphnids exposed to copper sulfate will typically be in the range of 8.2 - 17.5 µg/L with statistically significant differences in survival as low as 5 µg/L (WA State, 2002) indicating that daphnid acute testing will provide protection for salmonids against the adverse effects of copper discussed above. Daphnid acute tests are widely available and relatively inexpensive. EPA has developed toxicity identification procedures for daphnids which have successfully identified unknown toxicants in stormwater (Anderson et al, 1991, Werner et al, 2000, and de Vlaming et al, 2000). For these reasons, daphnid acute testing is becoming a standard approach for urban runoff with examples such as a study of urban runoff toxicity around

Vancouver, BC (Hall et al,1988), an evaluation of the effectiveness of an urban runoff treatment marsh in Fremont, CA (Katznelson, 1995), and identification of toxicants entering San Francisco Bay in urban runoff (Anderson, 1991). Because the *Ceriodaphnia* in the 7-day chronic test must be generously fed in order to reproduce and the food can bind dissolved copper, the test is often less sensitive to copper than the 48-hour acute daphnid test which has no feeding. Because fish are more sensitive to type I deicer formulations than daphnids (Pillard, 1995), the rainbow trout 96-hour acute toxicity test is also needed on samples collected from stormwater discharges draining areas where deicers are applied.

Environment Canada has developed toxicity tests to protect early life stages of salmonids (McLeay et al, 1998). One of these, the rainbow trout embryo test, is the best available test for assessing the suitability of streams adjacent to the STIA for coho salmon spawning and will be sensitive to PAHs. Because this test is not at this time valid under WAC 173-205-050(1)(d), it cannot be used in a permit to characterize stormwater discharges. Adverse effects found by the test will be investigated further by the Permittee. Since other sources contribute stormwater to adjacent streams, adverse effects caused by receiving water samples might not be related to STIA runoff. It is important to see if local streams have healthy coho spawning habitat and to determine as much as possible if STIA activities or some other source are contributing to any impairment.

The current permit requires toxicity tests on ambient samples of receiving waters from Miller Creek, Des Moines Creek, Gilliam Creek, Walker Creek, Northwest Ponds, and Lake Reba using rainbow trout embryo tests. As a result of removal of industrial activities from the Engineering Yard, there are now no industrial discharges to Gilliam Creek, and no future monitoring efforts should be required in this water body. Samples from Miller Creek have not be collected since Spring 2005, since sampling requirements for this creek was transferred to Lake Reba.

Future monitoring of ambient conditions will occur in Des Moines Creek, Northwest Ponds, Lake Reba, Miller Creek, and Walker Creek. Sampling of Miller and Walker Creeks will only be required once the new discharge stations in these watersheds are activated.

The sublethal tests required in the current permit are 7-day trout embryo development tests, conducted according to Environment Canada guidelines. These tests are conducted once in each of the spring and fall, as well as once during a deicing/anti-icing event, for a total of three sampling events per year.

Because the new permit incorporates site-specific objectives for copper and zinc, the permit requires that a plan be developed to determine if it is appropriate to replace the 7-day trout embryo tests from the permit with an *in situ* salmonid monitoring program involving a 6- to 8-week exposure. This longer exposure incorporates a range of sensitive life-stages and, because of its extended exposure, is likely to incorporate a number of storm events. Thus, this exposure may provide a relevant method for evaluating the ability of the receiving environments surrounding the airport to support embryonic and larval development of a key indicator species for stream health. Results from this monitoring effort will support the ongoing evaluation of revised site-specific discharge objectives for copper and zinc, calculated on the basis of Water Effect Ratio tests, to ensure that they are being protective.

In situ tests should be conducted during the spring and fall, corresponding to the spawning regimes associated with local salmonids species (e.g., coho and cutthroat trout). The 7-day rainbow trout embryo test will still be applied during one deicing/anti-icing event each year. Thus, if a replacement *in situ* salmonid monitoring program involving a 6- to 8-week exposure is approved by Ecology, there will still be three sublethal tests conducted annually, one of which will be a laboratory test, and the other two would be an *in situ* exposure.

J. Human Health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology determined the applicant's discharges from Parts I, II, and III are unlikely to contain chemicals regulated to protect human health.

K. Sediment Quality

Parts I, II, & III - The aquatic sediment standards (Chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400).

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards. In addition, the Port in conjunction with the Midway Sewer District completed a sediment monitoring program. Sampling was initially conducted in 2006 in the vicinity of Midway's old and new outfall to Puget Sound. After Ecology review of these results, supplemental monitoring was conducted in 2007. Ecology determined that data from the 2007 sampling event demonstrated that sediment conditions are below Sediment Quality Standards in the vicinity of the outfall.

L. Ground Water Quality Limits

Parts I, II, & III - The ground water quality standards (Chapter 173-200 WAC) protect beneficial uses of ground water. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).

Seattle-Tacoma International Airport does not discharge wastewater to ground and therefore we imposed no permit limits to protect ground water.

M. Comparison of Effluent Limits With Limits of the Previous Permit Issued on September 4, 2003

Table 6. Comparison of Effluent Limits

Part I – Outfall #001 Discharges to Puget Sound				
Parameter	**Proposed Permit**		**Existing Permit**	
	Average Monthly [a]	**Maximum Daily [b]**	**Average Monthly [a]**	**Maximum Daily [b]**
Flow [c]	Report, MGD	Report, MGD	Report, MGD	Report, MGD
Oil and Grease	8 mg/L	15 mg/L	8 mg/L	15 mg/L
BOD_5 November through March	45 mg/L 500 lbs/day	Report, mg/L 3115 lbs/day	45 mg/L 500 lbs/day	Report, mg/L 3115 lbs/day
BOD_5 April through October	25 mg/L 130 lbs/day	Report, mg/L 1340 lbs/day	25 mg/L 130 lbs/day	Report, mg/L 1340 lbs/day
TSS	21 mg/L	33 mg/L	21 mg/L	33 mg/L
pH [d]	Daily minimum is equal to or greater than 6, and the daily maximum is less than 9.		Daily minimum is equal to or greater than 6, and the daily maximum is less than 9.	

Footnote:

[a] The average monthly and weekly effluent limitations are based on the arithmetic mean of the samples taken during a month, or a week.

[b] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average measurement of the pollutant over the day.

[c] The daily maximum flow is based on the Port's agreement with the Midway Sewer District. Based on this agreement, the combined flow from the IWS and Midway Sewer District must not exceed 90% of the capacity of the outfall, which is 18 MGD.

[d] Indicates the range of permitted values. When pH is continuously monitored, excursions between 5.0 and 6.0, or 9.0 and 10.0 shall not be considered violations provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 30 minutes per month. Any excursions below 5.0 and above 10.0 are violations. The instantaneous maximum and minimum pH shall be reported monthly.

Part II – The proposed permit retains similar limits for a majority of the parameters, and it is issued with reduced monitoring for certain parameters.

Part II – Discharges to Vicinity Freshwater Streams		
Parameter[4]	**Proposed Permit**	**Existing Permit**
	Maximum Daily [b]	**Maximum Daily [b]**
Flow – MG[2]/Event	Report	Report
Turbidity[3]	25 NTU	Report
TSS	N/A	100 mg/L
BOD	N/A	Report mg/L
pH – S.U.	Between 6.5 – 8.5 S.U.	Between 6.5 – 8.5 S.U.
Oil and Grease[5]	15 mg/L – No visible sheen	15 mg/L – No visible sheen
Total Glycol [6]	N/A	Report – mg/L
Ethylene Glycol [6]	Report – mg/L	
Propylene Glycol [6]	Report – mg/L	

Ammonia L[7]	19 mg/L	19 mg/L
Nitrate / Nitrite as N [7]	0.68 mg/L	0.68 µg/L
Total Copper [1]	DME – 25.6 µg/L RB – 28.5 µg/L NWP – 32.9 µg/L MC – 59.7 µg/L WC – 47.9 µg/L SDS4 – 32.2 µg/L SDN1 – 28.5 µg/L	63.6 µg/L
Total Zinc [1]	DME – 117 µg/L RB – 117 µg/L NWP – 117 µg/L MC – 117 µg/L WC – 117 µg/L SDS4 – 71.4 µg/L SDN1 – 117 µg/L	117 µg/L
Total Lead	Report	81.6 µg/L
Priority Pollutants[8]	Report	Report
Total Hardness	N/A	Reported as CaCO3

[1] DME – East Branch of Des Moines Creek
RB – Lake Reba
NWP – Northwest Pond
MC – Miller Creek
WC – Walker Creek
Limits specified here are considered interim effluent limits on all outfalls with the exception of SDN1 and SDS4. Copper and zinc limits for SDN1 and SDS4 are considered final. The final effluent limits for all other outfalls shall be evaluated as soon as, but no later than expiration date of this permit, when STIA stormwater outfalls and BMPs are completed and sufficient representative data to calculate water quality based final effluent limits are available.

[2] The Permittee shall estimate the flow if continuous flow measurement is not feasible.

[3] Turbidity effluent limits are at the end of the pipe. When this limit is exceeded, Permittee may immediately conduct in-stream sampling (i.e., upstream and downstream) to assess turbidity water quality criteria. Failure to meet the criteria is considered permit violation.

[4] Sampling shall be performed in accordance with the latest approved monitoring plan.

[5] Oil and Grease shall be measured by Ecology Method NWTPH-DX.

[6] For the existing permit, the total Glycol is the sum of Ethylene and Propylene Glycol. For the proposed permit Ethylene Glycol and Propylene Glycol are tested separately and concentration reported separately using EPA method SW 8015 which is a modified to determine glycol constituents. Monitoring must be during Deicing and Anti-icing months, November through March. Monitoring shall be during deicing and anti-icing months.

[7] Required only if urea is applied. If urea is not applied, Permittee must certify it.

[8] See fact sheet Appendix K for the list of priority pollutant chemicals. Samples shall be taken twice per year, once during wet season and once during dry season in year three (3), and the report shall be submitted to Ecology 180 days prior to permit expiration in conjunction with permit application.

Part III - The proposed permit maintains similar limits with reduced monitoring for certain parameters, for all parameters except for arsenic which is eliminated.

Part III – Discharges to Vicinity Freshwater Streams		
Parameter	**Proposed Permit**	**Existing Permit**
	Maximum Daily	**Maximum Daily**
Turbidity	Turbidity in the **receiving water** shall not exceed 5 nephelometric turbidity units (NTU) over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.[b]	Turbidity in the **receiving water** shall not exceed 5 nephelometric turbidity units (NTU) over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.[b]
Turbidity [c] (Batch or Continuous Chemical or Chitosan Treatment)	The maximum daily average shall not exceed 5 NTU [d].	The maximum daily average shall not exceed 5 NTU [d].
Total Petroleum Hydrocarbons	5 mg/L - No visible sheen at any time [e]	5 mg/L - No visible sheen at any time [e]
pH[f]	In the range of 6.5 to 8.5 – With the human-caused variation within the above range of less than 0.2 units.	In the range of 6.5 to 8.5 – With the human-caused variation within the above range of less than 0.2 units.
Arsenic µg/L	N/A	360

[a] The maximum daily effluent limitation is defined as the highest allowable daily discharge.

[b] In the **receiving water** here means at the point of complete mix to be determined by the Permittee.

[c] The chemical treatment referred here is for batch or continuous treatment with aids of polymer (as specified by the DOE SWMM) or chitosan. Chitosan includes multiple products under various trade names and have been approved for use by Ecology. The average daily effluent limitation is based on the arithmetic mean of number of samples taken per day from the continuous discharge, or in case of batch treatment, based on the number of batch discharged per day.

[d] The maximum daily average is defined as maximum value of daily averages taken during a calendar month.

[e] TPH numerical limit shall be applied and a sample shall be taken only when visible sheen is observed. The numerical limit will not apply when there is no visible sheen observed.

[f] Indicates the range of permitted values. In the receiving water here means at the point of complete mix to be determined by the Permittee.

IV. MONITORING REQUIREMENTS

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

A. Lab Accreditation

Ecology requires that all monitoring data (with the exception of certain parameters) must be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.*

B. Effluent Limits Below Quantitation

For the water quality-based effluent concentration limits below the capability of current analytical technology to quantify, the Quantitation Level is the level at which concentrations can be reliably reported with a specified level of error. When reporting maximum daily effluent concentrations, Ecology requires the facility to report NQ for non-quantifiable if the measured effluent concentration falls below the Quantitation Level. When calculating average monthly concentrations, facilities must use all the effluent concentrations measured below the Quantitation Level but above the Method Detection Level.

C. Effluent Limits Below Detection

The Method Detection Level (MDL) is the minimum concentration of a pollutant that can be measured and reported with a 99 percent confidence that its concentration is greater than zero (as determined by a specific laboratory method). When reporting maximum daily concentrations, Ecology requires industries to record ND for non-detectable if the concentrations are below the MDL. When calculating average daily concentrations, Ecology requires industries to use the reported value when it is above the MDL and zero for those values below the MDL.

V. OTHER PERMIT CONDITIONS

A. Reporting and Record Keeping

Ecology based permit condition S3 on our authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

B. Non-routine and Unanticipated Discharges

Occasionally, this facility may generate wastewater which was not characterized in the permit application because it is not a routine discharge and was not anticipated at the time of application. These wastes typically consist of waters used to pressure-test storage tanks or fire water systems or of leaks from drinking water systems. These generally clean waste waters may be contaminated with pollutants.

The permit authorizes non-routine and unanticipated discharges under certain conditions. The facility must characterize these waste waters for pollutants and examine the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and on any opportunities for reuse, Ecology may:

- Authorize the facility to discharge the water directly via the industrial wastewater outfall or through a stormwater outfall for clean water.
- Require the facility to treat or reuse the wastewater.

C. Spill Plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080].

Port of Seattle developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the facility to update this plan and submit it to Ecology.

D. Solid Waste Plan

Port of Seattle could cause pollution of the waters of the state through inappropriate disposal of solid waste or through the release of leachate from solid waste.

This proposed permit requires this facility to generate a solid waste plan designed to prevent solid waste from causing pollution of waters of the state. The plan must be submitted to Ecology for approval (RCW 90.48.080).

E. Treatment System Operating Plan

Ecology requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations (40 CFR 122.41(e) and WAC 173-220-150 (1)(g)). The facility will prepare and submit an operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-150). Implementation of the procedures in the Treatment System Operating Plan ensures the facility's compliance with the terms and limits in the permit.

F. General Conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual industrial NPDES permits issued by Ecology.

VI. PERMIT ISSUANCE PROCEDURES

A. Permit Modifications

Ecology may modify this permit to impose numerical limits, if necessary, to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for ground waters, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies. Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed Permit Issuance

This proposed permit includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of five (5) years.

VII. REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

1994. Permit Writer's Manual. Publication Number 92-109

Washington State Department of Ecology.

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/wastewater/index.html)

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A—PUBLIC INVOLVEMENT INFORMATION

Ecology proposes to reissue a permit to Seattle-Tacoma International Airport. The permit prescribes operating conditions and wastewater discharge limits. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Application on June 16, 2008, and June 23, 2008, in the *The Seattle Times* to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology placed a Public Notice of Draft on December 15, 2008, in *The Seattle Times* and *The Seattle Post-Intelligencer* to inform the public and to invite comment on the proposed reissuance of this National Pollutant Discharge Elimination System permit as drafted.

The notice –

- Tells where copies of the draft permit and fact sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Asks people to tell us how well the proposed permit would protect the receiving water.
- Invites people to suggest fairer conditions, limits, and requirements for the permit.
- Invites comments on Ecology's determination of compliance with antidegradation rules.
- Urges people to submit their comments, in writing, before the end of the Comment Period.
- Tells how to request a public hearing of comments about the proposed NPDES Permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled **Frequently Asked Questions about Effective Public Commenting** which is available on our website at http://www.ecy.wa.gov/biblio/0307023.html.

You may obtain further information from Ecology by telephone, 425-649-7201, or by writing to the permit writer at the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

The primary author of this permit and fact sheet is Ed Abbasi.

APPENDIX B—GLOSSARY

Acute Toxicity—The lethal effect of a compound on an organism that occurs in a short period of time, usually 48 to 96 hours.

AKART—An acronym for "all known, available, and reasonable methods of prevention, control and treatment."

Ambient Water Quality—The existing environmental condition of the water in a receiving water body.

Ammonia—Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation—The average of the measured values obtained over a calendar month's time.

Best Management Practices (BMPs)—Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5—Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass—The intentional diversion of waste streams from any portion of a treatment facility.

Chlorine—Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity—The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)—The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance Inspection - Without Sampling—A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling—A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Additional sampling may be conducted.

Composite Sample—A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity—Clearing, grading, excavation, and any other activity which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous Monitoring—Uninterrupted, unless otherwise noted in the permit.

Critical Condition—The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor (DF)—A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report—A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria—Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample—A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Industrial Wastewater—Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Major Facility—A facility discharging to surface water with an EPA rating score of $>$ 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation—The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)—The minimum concentration of a substance that can be measured and reported with 99% confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Minor Facility—A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone—An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in state regulations (chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)—The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH—The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Quantitation Level (QL)—A calculated value five times the MDL (method detection level).

Responsible Corporate Officer—A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Technology-based Effluent Limit—A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)—Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to receiving waters may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

State Waters—Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater—That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Upset—An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit—A limit on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into receiving waters.

APPENDIX C—TECHNICAL CALCULATIONS

3/11/2009 8:43 AM
Copy of tsdcalc0.3-05-09_checked.xlsx

REASONABLE POTENTIAL CALCULATION

NPDES Permit No.

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

				State Water Quality Standard		Max concentration at			CALCULATIONS									
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L			Pn	ug/L	CV	s	n				COMMENTS
ARSENIC (dissolved)	1.00	1.00		69.00	36.00	0.03	0.01	NO	0.95	0.55	1.00	0.60	0.55	5.00	2.32	72.00	202.00	
CADMIUM	0.99	0.99		42.00	9.30	0.01	0.00	NO	0.95	0.55	0.30	0.60	0.55	5.00	2.32	72.00	202.00	
CHROMIUM(HEX) 18540299	0.99	0.99		1100.00	50.00	0.18	0.07	NO	0.95	0.55	5.70	0.60	0.55	5.00	2.32	72.00	202.00	
COPPER	0.83	0.83		4.80	3.10	0.23	0.08	NO	0.95	0.55	8.70	0.60	0.55	5.00	2.32	72.00	202.00	
LEAD -	0.95	0.95		210.00	8.10	0.05	0.02	NO	0.95	0.22	1.00	0.60	0.55	2.00	3.79	72.00	202.00	
MERCURY	0.85	0.85		1.80	0.03	0.01	0.00	NO	0.95	0.22	0.20	0.60	0.55	2.00	3.79	72.00	202.00	
NICKEL -	0.99	0.99		74.00	8.20	0.06	0.02	NO	0.95	0.22	1.10	0.60	0.55	2.00	3.79	72.00	202.00	
SELENIUM				290.00	71.00	0.11	0.04	NO	0.95	0.22	2.00	0.60	0.55	2.00	3.79	72.00	202.00	
SILVER -	0.85	0.85		1.90		0.00	0.00	NO	0.95	0.22	0.10	0.60	0.55	2.00	3.79	72.00	202.00	
ZINC-	0.95	0.95		90.00	81.00	1.55	0.55	NO	0.95	0.22	31.00	0.60	0.55	2.00	3.79	72.00	202.00	
CYANIDE				1.00	1.00	0.53	0.19	NO	0.95	0.22	10.00	0.60	0.55	2.00	3.79	72.00	202.00	
DIELDRIN 60571 10P				0.71	0.00	0.00	0.00	NO	0.95	0.05	0.05	0.60	0.55	1.00	6.20	72.00	202.00	
ENDOSULFAN				0.03	0.01	0.00	0.00	NO	0.95	0.05	0.03	0.60	0.55	1.00	6.20	72.00	202.00	
ENDRIN 72208 14P				0.04	0.00	0.00	0.00	NO	0.95	0.05	0.05	0.60	0.55	1.00	6.20	72.00	202.00	
HEPTACHLOR				0.05	0.00	0.00	0.00	NO	0.95	0.05	0.05	0.60	0.55	1.00	6.20	72.00	202.00	
HEPTACHLOR EPOXIDE				0.05	0.00	0.00	0.00	NO	0.95	0.05	0.05	0.60	0.55	1.00	6.20	72.00	202.00	
PENTACHLOROPHENOL				13.00	7.90	0.22	0.08	NO	0.95	0.05	2.50	0.60	0.55	1.00	6.20	72.00	202.00	
Polychlorinated Biphenyls				10.00	0.03	0.04	0.02	NO	0.95	0.05	0.50	0.60	0.55	1.00	6.20	72.00	202.00	
CHLORPYRIFOS 2921882				0.01	0.01	0.47	0.17	NO	0.95	0.05	5.50	0.60	0.55	1.00	6.20	72.00	202.00	
DDT 50293 7P				0.13	0.00	0.65	0.23	NO	0.95	0.05	7.50	0.60	0.55	1.00	6.20	72.00	202.00	
DDT METABOLITE (DDE)				0.13	0.00	0.82	0.29	NO	0.95	0.05	9.50	0.60	0.55	1.00	6.20	72.00	202.00	
DDT METABOLITE (DDD)				0.13	0.00	0.99	0.35	NO	0.95	0.05	11.50	0.60	0.55	1.00	6.20	72.00	202.00	
DIAZINON				1.64	0.82	1.16	0.41	NO	0.95	0.05	13.50	0.60	0.55	1.00	6.20	72.00	202.00	
(lindane)				0.08	0.16	1.33	0.48	NO	0.95	0.05	15.50	0.60	0.55	1.00	6.20	72.00	202.00	
NONYLPHENOL				6.70	1.40	1.51	0.54	NO	0.95	0.05	17.50	0.60	0.55	1.00	6.20	72.00	202.00	
						1.68	0.60		0.95	0.05	19.50	0.60	0.55	1.00	6.20	72.00	202.00	
						1.85	0.66		0.95	0.05	21.50	0.60	0.55	1.00	6.20	72.00	202.00	
SULFIDE, HYDROGEN SULFIDE 7783064					2.00	2.02	0.72	NO	0.95	0.05	23.50	0.60	0.55	1.00	6.20	72.00	202.00	
TRIBUTYLTIN (TBT)				0.37	0.01	2.20	0.78	NO	0.95	0.05	25.50	0.60	0.55	1.00	6.20	72.00	202.00	

For all those parameters specified in the application as "Less Than Detection Value", half of the "Given Detection Value" were used in calculations.

APPENDIX D—RESPONSE TO COMMENTS

Comments by the public in response to the Draft NPDES permit number WA-002465-1 included the following issues. Ecology responses are in *italics.*

Questions:

1. How the Water Effect Ratio (WER) was derived.
Ecology conducted an informational meeting on March 4, 2009, to provide information about calculating WERs. Dr. Howard Bailey, PhD, of Nautilus Environmental, was the principle investigator and author of the WER for the Port of Seattle. He gave a presentation on the process and methods for the WER study. He answered many questions the community had concerning this matter. The net results of the WER are more stringent permit limits for copper than Ecology would have calculated based on standard assumptions absent the WER study.

2. How will increased use of the new third runway, as opposed to levels proposed in the EIS, affect water quality?
The BMPs for the third runway are designed to meet the effluent limits. The effectiveness of those BMPs is independent of the frequency of use. It is the Port's responsibility to meet the specified limits regardless of the frequency of the use.

3. Are there adequate BMPs in place to protect water quality during repavement of the first runway, a new 16L project?
The BMPs available are about 5 times larger than required and should be adequate for complying with the permit.

4. It appears that the discharges from the 16L project as a result of repavement may comingle with that of the part II runoff through common BMPs. How will permit limits from two different parts of the Permit will be resolved? Which part of the permit will be regulating such runoff?
It is true that runoff from different sections of the permit may comingle occasionally. The permit has adequate protective language to ensure compliance with the more restrictive of the two parts, i.e., Parts II and III.

APPENDIX E—PART I. INDUSTRIAL WASTEWATER SYSTEM

The Industrial Wastewater System (IWS) manages stormwater associated with industrial activities from airline and maintenance operations as well as wastewater from other airport-related operations. These contaminants consist primarily of spilled fuel, deicing and anti-icing fluids, detergents, and lubricants. The system includes collection and conveyance facilities, high biochemical oxygen-demand runoff segregation, runoff storage, and the industrial wastewater treatment plant (IWTP). These facilities along with additional information on all known, available, and reasonable methods of treatment determination (AKART) for IWS, an overview of aircraft deicing and anti-icing operations of STIA, discharge characterization, stormwater pollution prevention, and the mixing zone study are described below.

IWS Collection and Conveyance

The Port of Seattle restricts aircraft maintenance, fueling and deicing operations to those areas served by the IWS stormwater collection and conveyance system. As such, the IWS collects stormwater and industrial wastewater from the terminal areas, air cargo, deicing areas, hangars, and aircraft maintenance areas. These areas are contained within two IWS drainage basins: the North Service Basin and the South Service Basin. The IWS North Service Basin includes portions of the STIA between Taxiways A and B and Air Cargo Road, as well as the Weyerhaeuser Hanger and General Aviation area on the west side of the airfield. The IWS South Service Basin includes the Fuel Farm, Passenger Gate Ramp Areas, as well as aircraft hangers. Each drainage basin accounts for approximately half of the 375-acre IWS runoff collection area (see Figure A-1).

The conveyance system includes approximately 21 miles of piping, 510 manholes and catch basins, two below-grade vaults in the parking garage, and 11 pump stations. Table A-1 summarizes the pump stations that serve the IWS. These facilities are maintained on a regular basis as described in the Port's Stormwater Pollution Prevention Plan (SWPPP) and the *Inspection, Maintenance, and Operation Procedures Manual*. Each pump station listed in Table A-1 functions as a key structural source control (SSC) BMP by diverting runoff to IWS treatment from various drainage areas formerly drained by the SDS.

The existing IWS conveyance piping was originally designed for the 10-year, 24-hour storm event, consistent with the stormwater regulations in effect at that time. Currently, new storm drainage systems are designed for the 25-year, 24-hour storm event. Computer modeling of the conveyance system determined that portions of the system might be overloaded during 25-year, 24-hour storm events. Overloading may cause local ponding in the area of manhole tops during the storm event. As a result of this analysis, the Port installed watertight manhole covers in 1997 through 1998 to prevent flooding in areas that would pose a safety problem or may overflow to the SDS.

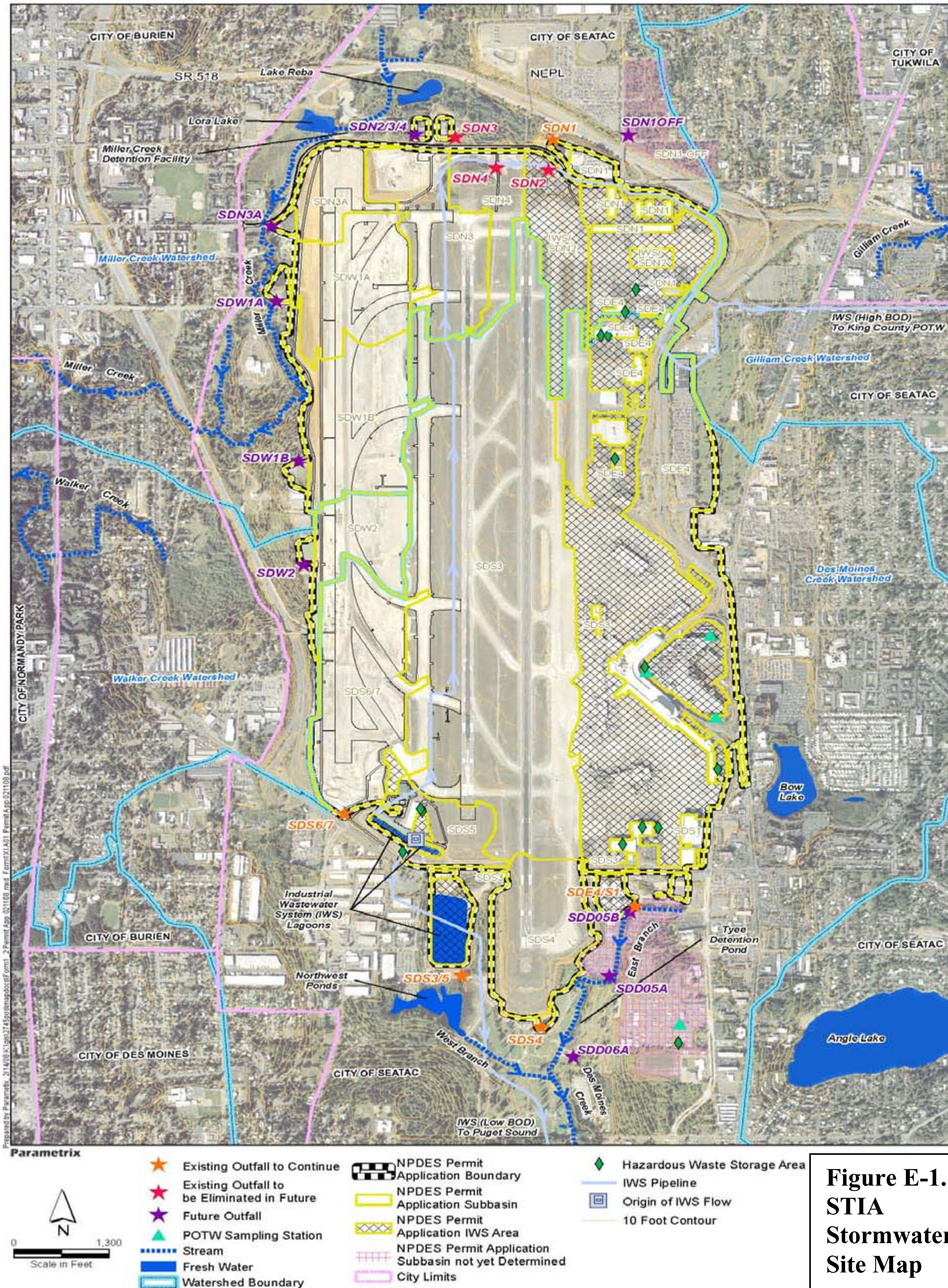

Figure E-1. STIA Stormwater Site Map

Table E-1. IWS Pump Stations

Location	Drainage Area (acres)	Design Flow (gpm)	Function	Flow Sources
Transiplex (N. Cargo)	35.6	2 @ 1350 each	Transfer water from ramp and taxiway areas from the SDS to IWS.	N. Cargo ramps, Taxiways A and B (formerly SDS subbasin SDN2)
N. Runway Snowmelt	6.6	300	BMP to divert snowmelt water from snow storage area from SDS to IWS. Also serves as a backup station for the Transiplex pump station.	N. Snowmelt/snow storage area (formerly drained to SDS subbasin SDN2)[1]
North Satellite (Central) Snowmelt Facility	0.7	750	BMP to divert snowmelt water from snow storage area from SDS to IWS.	Snowmelt/snow storage area (formerly drained to SDS subbasin SDE4)
Fire Station (North Satellite) PS	18.7	2150	BMP to transfer water from ramp and taxiway areas from the SDS to IWS.	N. Satellite ramp vicinity (formerly SDS subbasin SDE4)
South Snowmelt (Tank Farm)	0.3	750	BMP to divert snowmelt water from snow storage area from SDS to IWS.	South snowmelt/snow storage area
Parking garage	24.6 [2]	2 @1300 each	Diverts stormwater runoff from the parking garage to IWS.	Parking garage
Fuel Farm	5.1	2 @ 2500 each	Designed to transfer runoff and washdown water to IWTP.	Tank Farm
A Concourse (STEP) Lift Station	~ 1.3	950	Provides IWS lift over STS tunnel.	South terminal ramp area
C-1 List Station	~ 27	4 @ 4700 each	Lift Station for Concourse C	Gates and apron areas north of Concourse C

[1] The SDN2 runoff is pumped to the IWS for all flows up to the 6-month, 24-hour event.
[2] Roof top drainage area calculation from Parametrix Technical Memorandum, March 29, 2005.

IWS BOD Segregation

Prior to the storage and treatment, the IWS stormwater and wastewater is automatically analyzed and segregated based upon high or low biochemical oxygen demand (BOD) concentration. The primary source of BOD in the industrial wastewater is aircraft deicing/anti-icing fluids (glycols), although plane and vehicle wash water also exert BOD. Deicing fluids are highly biodegradable and when released into surface water will exert BOD. Measuring the BOD of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is used by bacteria as food. BOD is used to estimate the potential reduction of dissolved oxygen in receiving water after an effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment.

As noted below, the IWTP is primarily designed to treat runoff for fuel-related contamination. The plant is not capable of reducing high BOD concentrations caused by aircraft deicing operations. Runoff with low BOD concentrations can be discharged directly to Puget Sound after treatment for fuel-related contamination under the airport's NPDES permit. High BOD runoff must be segregated and pumped to the Val View Sewer District, which in turn is conveyed to King County's Renton Wastewater Treatment Plant for secondary treatment and discharge. The Port's Renton Wastewater Treatment Plant discharges are performed under a separate Industrial Waste Discharge Permit issued by the King County Department of Natural Resources (No. 7810-01). This permit allows the Port to discharge to the Renton plant 60,000 pounds per day of BOD at a maximum rate of 1,600 gallons per minute (2.3 million gallons per day (mgd)). As specified in the Industrial Waste Discharge Permit, Port and King County personnel collaboratively work together to meet the operational and permit needs of each other's treatment facilities.

BOD segregation is facilitated by in-stream monitoring for total organic carbon (TOC). TOC is used as an analytical surrogate for BOD because it can be quickly analyzed in the field with a high level of accuracy, precision, and correlation with BOD. This near real-time capability allows the Port to continuously monitor influent and effluent quality, effectively segregate high BOD runoff, and manage lagoon storage capacity.

As described further below, the airport's IWS includes three lagoons with capacities of 1.6, 3.3 and 76 million gallons (see Figure E-1). Using information provided by the influent TOC analyzers, plant operators segregate high concentration runoff to designated lagoons. Flexibility designed into the IWTP allows for separate and, if necessary, simultaneous processing and discharging of high BOD runoff to King County and low BOD runoff to Puget Sound. Effluent TOC meters are used by the IWTP operators to monitor the concentration and mass loading of treated effluent being sent to the Renton Wastewater Treatment Plant or directly to Puget Sound via Outfall 001. Since the segregation process became operational in January of 2007, the airport has reduced BOD loading to Puget Sound by over 95% while minimizing unnecessary use of the sanitary sewer conveyance and treatment capacity and reducing overall energy consumption (see IWS Stormwater Characterization below).

IWS Lagoon Storage

The storage of runoff from the IWS collection system is a critical component of the overall system as it allows for temporary containment of flows in excess of the plant's treatment capacity. The three IWS lagoons were originally designed to have a combined storage volume of 25.1 million gallons at the maximum normal operating water depth. Lagoon 1 was completed in 1965 and holds approximately 1.6 million gallons at the maximum normal operating water depth. Lagoon 2 was constructed in 1972 and has a capacity of approximately 3.3 million gallons at the maximum normal operating water depth. Lagoon 1 was cleaned and lined with a polyethylene liner in 1996. Lagoon 2 was cleaned and lined in 1997. Lagoon 3 was constructed in 1979, held approximately 20.2 million gallons at the maximum normal operating water depth, and was unlined. Lagoon 3 was cleaned, lined, and expanded to 76 million gallons in 2002. A summary of these and other recent system improvements is presented below (see IWS AKART Determination and System Improvements).

Lagoons 1 and 2 are located just north of the IWTP, while Lagoon 3 is located southeast, across South 188th Street (see Figure E-1). Piping and valves allow diversion of either service basin to either Lagoon 1 or 2. Flow may also be conveyed between Lagoons 1 and 2 or diverted directly to Lagoon 3. Two valves located in the Lagoon 1 and Lagoon 2 outlet structures, respectively, control the discharges from these lagoons into the IWTP. A pump station next to Lagoon 3 transfers water from Lagoon 3 to the IWTP influent head box. The Lagoon 3 design provides both an overflow spillway and an emergency decant drain drawing from mid-depth of the lagoon. This drain can be used as an alternative to allowing the lagoon to overflow from the spillway, thereby avoiding the release of any product that may be floating on the surface. As part of its normal operating procedures, IWTP staff maintain lagoon levels as low as practical at all times, thus reducing the probability of lagoon overflows.

Lagoon 3 was designed to contain estimated runoff resulting from an isolated 100-year storm assuming the entire capacity is available. However, multiple or continuous storm events are more typical of winter weather patterns in the Pacific Northwest region. A continuous simulation of the IWS performance was completed using the King County Regional Time Series (KCTRS) to demonstrate the system's capacity under various winter season operational scenarios (Parametrix, 2000). This analysis determined that zero overflows would occur when the 50-year KCTRS period of record was simulated and the plant was processing 2,847 gpm (4.1 mgd). As discussed in greater detail below, the combined maximum effective discharge capacity to Midway Outfall 001 and King County's Renton Wastewater Treatment Plant is 5,100 gpm (7.3 mgd). However, mass-based effluent limitations for IWS discharges to Puget Sound as well as to King County's Renton Wastewater Treatment Plant now dictate the volume of treated runoff the plant can discharge. During heavy aircraft deicing operations, the combined low and high BOD discharges to Puget Sound and King County County's Renton Wastewater Treatment Plant should be less than 4.1 mgd in order to meet current mass-based permit limitations. At a reduced combined discharge rate of 2,152 gpm (3.1 mgd), the 50-year KCTRS period of record simulation predicted that one overflow would occur. At a combined discharge rate of 1,667 gpm (2.4 mgd), the 50-year KCTRS period of record simulation predicted two overflows would occur.

During the previous permit period (October 2003 to November 2008), the IWS system was able to contain, process, and discharge all influent runoff with the exception of one extended high intensity storm event. Between November 2nd and the 7th, 2006, the Lower Puget Sound region received over 8.1 inches of rainfall. Examining the 50-year historic record, this 5-day storm was reported to be greater than the 50-year and close to or exceeding a 100-year predicted event recurrence.

Although the plant discharged to both the King County's Renton plant and directly to Puget Sound, 11 million gallons of stormwater was released from the IWS Lagoon 3 to the Northwest Ponds over a 12.5-hour period between approximately November 6th and November 7th. Combined plant discharge rates to Puget Sound and King County's Renton plant reached a high of 6,250 gpm (9.0 mgd) but varied due to hydraulic constraints and discharge authorizations from Midway and King County. At this time, mass-based effluent limitations were not in effect.

Industrial Wastewater Treatment Plant (IWTP)

The Industrial Wastewater Treatment Plant (IWTP) is located inside a building south of Lagoons 1 and 2 and north of South188th Street, just west of the tunnel under the west airport runway. The IWTP was originally designed and constructed in 1963/1964 for the purpose of capturing and treating fuel spills.

Prior to treatment, the influent water flows through mechanical screening devices. The screens are sized to remove objects larger than 0.5 square inches. Following screening, the treatment process consists of adding coagulation chemicals (normally aluminum sulfate) to the influent wastewater in a rapid mix chamber, gently mixing the chemicals in a flocculation tank for approximately ten minutes to coagulate particulates and oil droplets, and removing the floc and other oil particles in a dissolved air flotation (DAF) unit. There are a total of six treatment trains, each consisting of the above-unit processes.

The solids captured from the DAFs are discharged into a trough that runs the length of the building. This trough leads to a small sump and pump station located outside of the east end of the IWTP. The sump contents are pumped into a system of two decant tanks, which are piped together to allow sedimentation of the solids. Liquid decant is cycled back to Lagoon 1 or 3. The settled sludge is periodically removed by pump to a portable tanker for off-site disposal.

The IWTP generally operates after periods of significant rainfall. Even during winter months, operation may be intermittent depending on weather conditions. At temperatures below 35^{o}F, the efficiency of the plant declines significantly. The drop in treatment efficiency at low temperatures is caused by a reduction of the chemical reaction rate in the coagulation process. During the summer months, there is a potential for algal blooms in the IWS lagoons. IWTP operators may lower flow rates and switch coagulants from aluminum sulfate (alum) to aluminum chloride to enhance algae removal. However, some micro-algal blooms may result in elevated concentrations of suspended solids that are unrelated to airport activities.

The treated effluent flows by gravity from the DAFs to the IWS Pump Station. High and low BOD effluent flows to separate wet wells in the pump station. Effluent from the pump station is routed to one of three locations:

- High BOD effluent to the Val View Sewer District sewer system and King County's Renton Wastewater Treatment Plant for secondary treatment under KCDNR Permit No. No. 7810-01.
- Low BOD effluent to the Midway Sewer District outfall (001) for direct discharge to Puget Sound under Ecology NPDES permit No. WA-002465-1.
- Recycling back to Lagoon 1, 2, or 3 in cases where the effluent discharge determined otherwise results in a permit limit exceedance.

The hydraulic capacity of the IWTP is 5,764 gpm (8.3 mgd). However, the maximum flow that can be discharged to the Midway Sewer District outfall (001) is 3,500 gpm (5.0 mgd). This capacity is determined by limitations in the conveyance pipe downstream of the IWTP.

The Midway Sewer District and the Port of Seattle entered into a new thirty (30)-year agreement in February 1995, for the joint use of the Midway Sewer District outfall. This agreement set forth the terms of the treated water discharge as follows:

> "Under the terms of the agreement, the Port will cease to discharge effluent into the Airport Trunk Line in excess of 2,500 gpm, whenever the combined flow from the Port and Midway exceeds ninety percent (90%) of the present outfall capacity of twelve thousand five hundred (12,500) gpm."

The IWTP pump station and pipeline are capable of discharging up to 2,990 gpm (4.3 mgd) to the King County's Renton Wastewater Treatment Plant. However, these plant hydraulic capacities are effectively limited by either the mass-based effluent limitations as described above, hydraulic restrictions imposed by the Midway Sewer District, or permitted flow limits and at times other processing limitations imposed by King County.

The King County Department of Natural Resources (KCDNR) permit limits discharges to the Renton Wastewater Treatment Plant to 1,600 gpm (2.3 mgd) and 60,000 pounds per day of BOD. In addition, the permit reserves King County's and Val View Sewer District's authority to request that discharges to their system stop, as necessary, to prevent hydraulic overloading of the sewer conveyance systems or the Renton plant.

IWS AKART Determination and System Improvements

In previous permit cycles, the Port was required to complete engineering evaluations as needed to support a determination of all known, available, and reasonable methods of treatment (AKART) for runoff contaminated with aircraft deicing fluids. In response, the Port prepared an Engineering Report which was submitted to Ecology in December 1995. Two more addenda were also submitted in April 1987 and April 2002. These reports addressed AKART as well as several immediate improvement needs to the IWS collection and treatment system. The Engineering Reports and AKART analysis, together with the two addenda, were approved by Ecology in May 2002.

The NPDES Permit No. WA-002465-1, Special Condition S4 issued in 1998 stated that the Port "shall take all available and reasonable means to implement the AKART determination in the shortest practicable time, but no later than June 30, 2004." The actual date for implementing the AKART recommendation was tied to the completion dates for the embankment and utilities associated with the new runway because the proposed alignment of the AKART force main was along the utility corridor in the western portion of the proposed third runway embankment. Delays in obtaining the 401/404 permit and subsequent appeals caused embankment construction to fall behind schedule. As a result, AKART implementation was delayed beyond the 2004 deadline.

Based on the AKART engineering evaluations noted above, Ecology established a final effluent limitation of 250 mg/L of BOD for Outfall 001 in the September 2003 NPDES permit. That permit also stipulated that the "BOD_5 limits will be applicable one year after successful implementation and completion of AKART, i.e., July 1, 2007." This condition was appealed to the Pollution Control Hearings Board by the Airport Communities Coalition (ACC). The Board subsequently ruled that the AKART determination for the IWTP was improper and should be revised. Following a review of "Supplemental Information to Support Economic Reasonableness Determination of Industrial Waste System AKART Alternatives" (Kennedy Jenks, 2005) and other relevant information, Ecology revised the airport's NPDES permit on October 7, 2005, and reestablished the final BOD effluent concentration and established new mass limitations. In addition, Ecology specified that AKART must be achieved no later than January 1, 2007.

In preparation for AKART compliance as well as overall plant improvement, the Port began implementing a series of upgrades early as 1995. Final improvements to meet AKART were completed in the summer of 2006 to allow for the segregation of IWS low and high BOD runoff. Following issuance of a King County Waste Discharge Permit on July 21, 2006, the Port began start up testing of its segregation systems in December 2006. The plant was fully operational and compliant with AKART on January 1, 2007. A history of recent IWS improvements is provided in Table E-2. The total capital cost of these improvements is over $65 million.

Table E-2: IWS and IWTP Improvements

Improvement	Year(s)	Purpose/Description
Lagoons #1 and #2 were cleaned of all sludge and lined.	1996-1997	Lined with two-sided textured 100 mil polyethylene (PE). The lining includes a bottom-only geoweb and concrete liner placed on sand above the PE liner. This allows the operators to clean the pond easily. The concrete bottom also allows heavy equipment access to the lagoon.
New level controls installed on the existing dissolved air flotation (DAF) float sump on the east side of the IWTP building.	1996-1997	Alarm on high sump levels. Low-level alarm disables sludge transfer pump.
Metering pumps for flocculation chemical.	1996-1997	New Milton Roy metering pumps were installed to feed chemicals proportional to the DAF flow rate. The programmable logic controller (PLC) regulates pump speed to maintain a set point concentration of chemicals in the process. These pumps have a 100-to-1 turndown ratio. This turndown ratio allows a wide range of flocculent concentrations at varying flow rates. This ensures that the right concentration is used in the process. The pumps also rapidly adjust to different speeds.
Electric operators on all IWS conveyance system valves at the lagoons.	1997	Allow remote operation from the IWTP or the Maintenance Duty Officer (MDO).
New electrical supply installed for the IWTP, with replacement of the Motor Control Center (MCC), transformer, and incoming power feed.	1997	The new 800 amp Allen Bradley MCC provided the extra capacity required for the new DAF installation. The new transformer and power feed will provide a more reliable source of power to the IWTP.
A new Allen Bradley SLC/500 series PLC was installed to control and monitor the IWTP operations.	1997	A special program was written to allow the PLC to monitor all IWTP processes, adjust all pumps and control valves to meet set point values, and alarm all out-of-tolerance conditions. The program and PLC are expandable to provide for future changes needed to update the plant. Sufficient space exists at the PLC cabinet location to install a new panel for additional instruments.
New DAF influent flow controls	1997	Installed new Krohne 6-inch magnetic meters and actuated 8-inch Pratt butterfly valves to measure and control the flow influent to the DAFs. Three new Fisher-Potter single-loop controllers were installed to replace the local pneumatic control panel. These single-loop controllers work in conjunction with the new single-loop controllers in the control room and the new PLC. Flow totalizers are coupled to the single-loop controllers for each DAF to record the total flow passing through each DAF unit.
Final effluent sample pumping system.	1997	The air-driven double diaphragm pump draws a continuous stream system of liquid from the effluent manhole, providing a real-time sample for the effluent monitoring system.
A new final pH monitoring system was installed.	1997	Redundant in-line pH probes were installed in the final effluent sample pump pipeline feeding the effluent sampler.
A new effluent pH control system.	1997	Monitor the pH of the effluent and add sodium hydroxide to keep the pH within the range of 6 to 9.

Table E-2: IWS and IWTP Improvements

Improvement	Year(s)	Purpose/Description
New manually operated isolation 42-inch Pratt butterfly valve was installed on the influent pipeline to Lagoon #2.	1997	Isolates all influent to Lagoon #2 when training occurs at adjacent firefighting pit. Required because the fire pit drain is connected to the influent piping of Lagoon #2. Firefighting water can be directed any one of the three lagoons.
New IWS influent piping to the lagoons was increased in size from 42-inch concrete pipe to 48-inch polyethylene. New IWS manholes 333A, 148A, and 334C	1997	Accommodates the projected flows and route flows to the various lagoons as flow and level conditions demand.
IWS conveyance pipeline revisions in the IWTP vicinity.	1997	Accommodates increased IWS flows and minimize manhole surcharge problems. New IWS manholes 333A, 148A, and 334C with watertight, bolt-down covers. New Lagoon #3 inlet valve (Hydrogate) in IWS 334C operated remotely from the IWTP. New 42-inch pipe from IWS 333 to IWS 333A and IWS 334C. New 48-inch pipe from IWS 148 to IWS 148A and IWS 334C. New 48-inch pipe from IWS 334 to IWS 334C. New 42-inch pipe from IWS 334C under South 188th Street to IWS 334D, IWS 334E, and Lagoon #3 wing wall (entrance).
New Lagoon #3 pump station.	1997	Two new Hydromatic 200 HP pumps are capable of lifting 7.1 million gallons per day (mgd) up to the IWTP. This increase in size matches the capability of the effluent line from the IWTP to the Midway outfall. The pumps selected were submersible centrifugal to match other pump stations installed elsewhere at STIA. The pumps were installed in a pre-cast 28-foot-deep, 12-foot-diameter pump station wet well north of Lagoon #3. A 6,000-pound (lb) capacity jib crane was installed at the pump station for pump removal.
Installed 20-inch force main from new Lagoon #3 pump station to IWTP.	1997	Required to accommodate the 7.1 million gallons per day (mgd) from the lift station.
New Onan 350 kW standby generator was installed to provide backup power to the new pump station at Lagoon #3.	1997	The generator and new pump station controls were installed in a new 22-foot by 20-foot concrete block building located just west of the new pump station. The generator switches to backup power through an automatic transfer switch.
Sloped paving around the south side of IWTP building to two catch basins. Constructed new stormwater pump station.	1997	Sloped paving directs runoff to catch basins. The new pump station, activated by level switches, transfers collected fluids to Lagoons #1 or #2. The pump station consists of two submersible Hydromatic pumps in a subgrade vault. Each pump is sized to pump half of the projected stormwater collection for the 25-year, 24-hour storm. High-level alarm in the vault signals the IWTP to indicate a possible overflow condition. The roof drains from the IWTP building were left connected to the IWTP outfall.
New polyethylene tanks for storage of sodium hydroxide, aluminum sulfate, and aluminum chloride were installed in the IWTP.	1997	The tanks allow for bulk storage of treatment chemicals.

Table E-2: IWS and IWTP Improvements

Improvement	Year(s)	Purpose/Description
Two new Great Lakes Environmental 250-square-foot DAF units, including chemical feed pumps, reaeration system, and controls, were installed.	1997 - 1998	Increased the average plant capacity to 4 mgd. Because the STIA land outfall has a limiting capacity of approximately 7.1 mgd, the peak DAF overflow rate is limited to approximately 4.1 gallons per minute per square feet (gpm/sf) with 1,200 square feet (sf) of installed DAF capacity. The new DAF units' effluent meets or exceeds the quality of the existing DAF units.
New Lagoon #1 and #2 washdown pump station was installed.	1997 - 1998	Allows for cleaning the sides of the lagoons for reduced odors. On-demand pump station pressurizes two pipelines that encircle Lagoons #1 and #2. Washdown hydrants located at intervals around the lagoons. Designed to spray 160 gallons per minute (gpm) of washdown water 60 feet.
A new sanitary 8-inch polyvinyl chloride (PVC) sanitary sewer line was constructed from the IWTP across South 188th Street to the Midway Sewer District sewer pipeline in 16th Avenue South.	1997 - 1998	Replaced IWTP septic system with a new sanitary sewer line that connects the IWTP restroom, break room, and janitor's closet. The old septic system was disconnected, cleaned, and abandoned in place.
Programmable time-based influent and effluent samplers were installed.	1997 - 1998	The Sigma 900 MAX all-weather refrigerated sampler samples the influent and effluent at regular intervals. In addition, the samplers are programmed to sample when the pH is outside the control range. In this manner, the sample can be tested in the lab to verify the pH at the time of an excursion.
Watertight covers on manholes IWS 117 through IWS 120 serving the North Service Basin and IWS 144 through 147 and IWS 333 to 334 in the vicinity of the IWTP.	1997 - 1998	Watertight covers prevent manhole surcharging and ponding of water.
Catwalks were built around the Lagoon #1 and #2 skimmer houses. Catwalks were placed in the IWTP around the new DAFs. Catwalks were built around the Lagoons #1 and #2 skimmer houses. Catwalks were placed in the IWTP around the new DAFs.	1997-1998	Catwalks allow for better access and monitoring of the lagoons and DAFs. The IWTP catwalks were installed to allow the operator to walk the length of the plant at catwalk level.
A DAF washdown system was built on the catwalks above the DAFs.	1998	Washdown allows for more efficient cleaning of the DAF units.
Telemetry cable from IWTP to Lagoon #3 installed.	1998	Cable to provide telemetry between the IWTP and the Lagoon #3 pump station and generator building. The cable was installed in the abandoned 12-inch force main pipe from the demolished Lagoon #3 pump station.
Fiber optic cable to IWTP installed	1999	Cable provided e-mail access and phone upgrade at IWTP.
Flowmeter signal to website	2000 - 2001	Signal allows for remote monitoring of IWTP effluent flow rate.
Bird netting installed at Lagoons #1 and #2	2000	A bird-deterrent measure. Consists of 1.25-inch square polypropylene netting stretched over a cable support system. The netting entirely covers, but allows operator access to, Lagoons #1 and #2.

Table E-2: IWS and IWTP Improvements

Improvement	Year(s)	Purpose/Description
IWS pipe lining	1999-2007	Nearly all conveyance system piping has been inspected and cured in place pipe lining completed where found to be necessary.
BOD/TOC analyzer	2000-2007	Online TOC analyzers currently provide near real time BOD data for IWTP influent and effluent. BOD Analyzer installed in 2000, replaced by TOC analyzers in 2006 due to higher reliability. BOD has been found to correlate closely with TOC.
Lagoon #3 Expansion	2000-2002	Lagoon cleaned, expanded to approximately 76 million gallons (mg) capacity, and lined with a two-sided textured 100-mil polyethylene. The lining includes a bottom-only concrete-filled geoweb as in Lagoons #1 and #2.
AKART Pipeline and Pump Station	2006	Construction of an effluent pump station, pipeline, and appurtenances to convey treated IWS flows to the King County (KC) South Treatment Plant (STP), fulfilling the recommended AKART alternative identified in the 1995 Engineering Report, with minor modifications.
IWTP Improvements	2006	Various improvements have been installed at the IWTP to increase operational flexibility and enhanced reliability.
Lagoon 3 Pump Station Improvements	2007	A traveling screen was added to Lagoon 3 in front of the effluent pumps to remove debris that could clog the pumps. In addition, the power sources feeding the Lagoon 3 pump station (including relocating the emergency generator) were implemented to improve the reliability of the electrical systems.
Hydraulic Improvements	2008-2009	Modifications to the piping to maximize storage volume in Lagoons 1 and 2 are being designed and are planned to be implemented by the end of 2009.

Deicing/Anti-icing Operations

Deicing measures remove ice from the surface of aircraft, airfield, or runway. Anti-icing measures prevent ice accumulation on the surface of the aircraft, airfield, or runway. Deicing and anti-icing are normally conducted during freezing conditions, although some aircraft types such as MD-80s and 737's require deicer application at temperatures above the freezing point. Deicing may be conducted at a gate, on a cargo ramp, or occasionally at airline hangar complexes. All aircraft deicing occurs within the IWS collection area. Once a plane has been deiced or coated with an anti-icing fluid, the plane must take off within a specific amount of time or the chemicals must be reapplied.

Aircraft deicing and anti-icing is mandated by the Federal Aviation Authority (FAA) to ensure public safety. The application of aircraft deicers is under the control of the individual airlines. Airlines or ground service companies provide deicing/anti-icing services. The airline or ground service provider submits daily deicing/anti-icing usage reports to the Port.

Currently the FAA authorizes ethylene glycol-based and propylene glycol-based deicing/anti-icing for aircraft deicing or anti-icing. The amount of deicing/anti-icing fluid applied per plane is variable, based upon the size and type of aircraft, temperature of the aircraft, temperature of the fuel, outside temperature, humidity, length of time the plane has been on the ground, location of the aircraft, and the type and characteristics of the precipitation, frost, or ice. Table E-3 summarizes the aircraft deicing/anti-icing product usage reported by the Port during the previous permit cycle.

Ecology's Hazardous Waste and Toxics Reduction Program regulate hazardous waste in Washington State through Chapter 173-303 WAC, the Dangerous Waste Regulations. Ecology has determined that wastes containing more than ten percent ethylene glycol book-designate as state-only dangerous waste (DW) under WAC 173-303-100(5)(b). While that determination was made in the context of evaluating the toxicity of waste ethylene glycol-based as automobile and truck anti-freeze, it may be sufficiently broad to apply to aircraft deicing fluids as well. Wastes containing propylene or diethylene glycol are not included in the state-only waste designation.
In September 1995, the Port of Seattle applied for certification of the waste aircraft deicing fluids generated at STIA under WAC 173-303-075. The application included static acute fish and acute oral rat bioassays in accordance with the requirements of WAC 173-303-110(3)(b). Based on the results of the bioassays, Ecology certified that waste aircraft deicing fluids containing ethylene glycol generated at STIA are not dangerous wastes on October 20, 1995. This certificate was renewed in October 2000 and October 2005.

Table E-3: Annual Aircraft Deicing/Anti-icing Fluid Usage (Gallons)

	Type I		Type IV		Type II	
Application Period	**Ethylene Glycol**	**Propylene Glycol**	**Ethylene Glycol**	**Propylene Glycol**	**Propylene Glycol**	**Total**
4/07--3/08	--	163,844	--	4,870	--	168,714
4/06--3/07	--	189,298	--	9,438	--	198,736
4/05--3/06	1,820	77,608	55	2,800	--	82,283
4/04--3/05	15,137	117,245	--	8,275	--	140,657
4/03--3/04	11,423	99,083	45	4,102	1,625	116,278
4/02--3/03	1,305	104,185	--	800	275	106,565
4/01--3/02	15,137	117,245	--	8,275	--	140,657
4/00--3/01	11,423	99,083	45	4,102	1,625	116,278
4/99--3/00	1,305	104,185	--	800	275	106,565
4/98--3/99	8,580	197,954	--	475	1,745	208,754

Type I Fluids - Anti-ice/deice chemicals applied in an unthickened, liquid form, either diluted or undiluted.

Type II Fluids - Anti-ice/deice chemicals applied in a jelled or thickened form. Type II fluids are intended to adhere to aircraft surfaces up to approximately 80 knots.

Type IV Fluids - Similar to Type II but has longer holdover times. Type IV is normally used in severe icing conditions.

Discharge Characterization

Treated stormwater and wastewater from the IWS and discharged to Outfall 001 have been monitored on a daily basis for BOD, TSS, and oil and grease. Discharges are monitored weekly for COD and total glycols. Total recoverable metals are monitored either monthly or quarterly. In addition to these parameters, pH and flow are monitored continuously.

Table E-4 summarizes sampling results for BOD, COD, total glycol, TSS, and oil and grease along with the effluent limitation at time of sampling. The data is segregated into summer (April through October) and winter (November through March), consistent with the current BOD effluent limitations.

Sampling results for metals monitored on a monthly and quarterly basis are summarized in Table A-6. Metals data from both seasons, as well as before and after AKART, are included in the metals summary.

The previous NPDES permit required that Priority Pollutants be analyzed once during the wet season and once during the dry season in year three of the permit cycle. AKART was not implemented until year four of the permit cycle, therefore priority pollutants were analyzed in year four. The complete list of EPA Priority Pollutants (122 total) were analyzed for each season. The results of the wet season and dry season priority pollutant characterization are included in Table E-6. Table E-6 only includes data for those parameters that were detected at or above the Method Detection Limit (MDL) in at least one of the two samples.

Stormwater Pollution Prevention

STIA has implemented a Stormwater Pollution Prevention Plan (SWPPP) since 1994. The SWPPP describes the overall facility, site inspections, operations, activities and corresponding BMPS. The SWPPP also includes monitoring protocols. SWPPP implementation includes many operational and capital improvements to prevent the discharge of contaminants to surface waters.

Treatment as provided by the IWTP is the primary BMP used within the IWS. In addition to treatment, the Port and its tenants employ various operational source controls as part of the airport's SWPPP and demonstration of the Port's adaptive management process for stormwater management at STIA. Table E-7, *Industrial Activity and Source Control* describes the industrial activity, pollutants associated with each activity within the IWS and the associated BMPs.

Table E-4. Summary of BOD, COD, Glycol, TSS and Oil and Grease Results Before and After AKART Implementation During Winter and Summer (mg/L).

		BOD_5		COD		Total Glycols		TSS		Oil and Grease	
	AKART Status:	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Summer[2]	**Effluent Limit[1]**	NA	25/Rpt	Rpt/NA	Rpt/NA	NA	NA	21/33	21/33	8/15	8/15
	No. of Samples	115	97	45	26	49	26	78	97	90	96
	Median	4.4	6.5	18.9	30.1	1.0	1.0	7.5	8.0	1.0	0.2
	95th Percentile	49.3	21.5	69.6	94.3	69.2	13.7	14.0	21.0	2.5	0.6
	No. of Limit Exceedances	NA	0	NA	0	NA	NA	0	0	0	0
Winter[2]	**Effluent Limit[1]**	-- / --	45/Rpt	Rpt/NA	Rpt/NA	NA/NA	NA/NA	21/33	21/33	8/15	8/15
	No. of Samples	219	50	49	11	70	11	148	49	149	49
	Median	88.4	16.5	132.0	25.0	17.5	15.9	6.5	5.0	1.0	0.5
	95th Percentile	799.0	50.4	1,260.0	77.0	669.5	47.0	13.0	9.0	2.5	1.6
	No. of Limit Exceedances	NA	0	NA	0	NA	NA	0	0	0	0

Data summarize overall median ("med"), 95th percentile and number of representative stormwater samples collected per the NPDES permit.

1 Average monthly/maximum daily effluent limits as contained in permit at time of data collection.

2 The data is segregated into summer (April through October) and winter (November through March), consistent with the current BOD effluent limitations.

Table E-5. Summary of Metals Results for Discharges to Outfall 001 (µg/L)					
Parameter	**No. of Samples**	**Percent Not Detected**	**Median[1]**	**95th Percentile[1]**	**Maximum**
Arsenic	15	47%	1.7	12.5	12.5
Cadmium	14	43%	0.3	1.0	1.0
Chromium	15	74%	6.1	12.8	18.3
Copper	14	7%	6.1	12.8	18.3
Lead	8	88%	0.7	5.4	5.6
Mercury	8	100%	<0.2	<0.2	<0.2
Nickel	8	50%	4.8	5.0	5.0
Selenium	8	100%	<2.0	<2.0	<2.0
Silver	8	88%	0.1	10.2	13.0
Zinc	8	25%	17.5	47.7	53.0
Cyanide	6	100%	<10.0	<10.0	<10.0

[1] Median and 95th percentile values calculated using ½ the reported detection limit when parameter not detected.

Table E-6. Summary of Priority Pollutant Results for Discharges to Outfall 001 (µg/L)		
Parameter[1]	**Dry Season**	**Wet Season**
Antimony	1.8	1
Arsenic	1.1	0.7
Cadmium	0.3	0.3
Chromium	0.6	0.6
Copper	10.1	7.1
Nickel	1.8	0.9
Zinc	32	31
Chloroform	<MDL	0.2
Ethylbenzene	0.4	<MDL
Toluene (methylbenzene)	0.8	0.9
Phenol	<MDL	1.1

[1] Parameters listed include those detected in at least one sample. All others were reported as not detected.

Table E-7[1]. Part I - Operational Source Control BMP

Activity	Targeted Activities	Targeted Pollutants	BMP Key Approaches
General Industrial Activities	• Aircraft/vehicle/equipment maintenance. • Aircraft, ground vehicle, and equipment cleaning. • Aircraft, ground vehicle equipment storage. • Outdoor handling, storage, and disposal of waste materials. • Fuel storage and delivery. • Building and grounds maintenance. • Vehicle and equipment painting. • Garbage handling and disposal. • Aircraft deicing and anti-icing. • Aircraft lavatory servicing. • Potable water system flushing. • Roadway, ramp, and runway. maintenance and cleaning. • Fire suppression and AFFF. • Animal handling.	• Anti-freeze chemicals. • Batteries. • Deicing chemicals. • Fuel. • Herbicides. • Lavatory chemicals. • Oil and Grease. • Paint. • Pesticides. • Soap/cleaning chemicals. • Solvents. • Other.	• Maintain good housekeeping practices. • Minimize exposure to stormwater. • Perform preventative maintenance. • Follow spill prevention and response procedures. • Conduct facility inspections. • Provide training.
Aircraft, Vehicle, and Equipment Maintenance	• Aircraft/vehicle/equipment maintenance. • Aircraft/vehicle/equipment painting or stripping. • Apron/floor washdown. • Potable water system cleaning.	• Oil and grease. • Vehicle fluids. • Solvents/cleaning solutions. • Fuel. • Battery acid. • Paint.	• Conduct maintenance indoors or in a covered area. • Perform outdoor maintenance in IWS drainage areas only. • Clean catch basins regularly. • Collect and properly dispose of all fluids.
Aircraft, Vehicle, and Equipment Cleaning	• Aircraft/vehicle/equipment painting or stripping. • Aircraft/vehicle/equipment washing or cleaning.	• Oil and Grease. • Solvents. • Vehicle fluids. • Cleaning solutions.	• Use wash rack or designated area in IWS drainage area only. • Use dry washing techniques. • Recycle wash water or discharge appropriately. • Provide training.
Aircraft Deicing and Anti-icing	• Aircraft deicing and anti-icing. • Apron/floor washdown.	• Ethylene glycol. • Propylene glycol. • BOD.	• Perform deicing/anti-icing in IWS areas. • Apply only required amounts of fluid. • Clean ramp area when done. • Implement FAA recommendations. • Maintain tanks and secondary containment for deicing and anti-icing chemicals.
Vehicle and Equipment Painting	• Vehicle and equipment painting. • Pavement painting.	• Paint. • Metals.	• Use permitted paint booths.

Table E-7[1]. Part I - Operational Source Control BMP

Activity	Targeted Activities	Targeted Pollutants	BMP Key Approaches
	• Outdoor washdown.	• Solvents.	• Perform touch-up. painting indoors. • Store paint indoors. • Manage paint waste.
Aircraft and Vehicle Potable Water System Flushing	• Aircraft potable water system cleaning and flushing. • Water truck cleaning and flushing.	• Purine. • Chlorine bleach.	• Perform water truck flushing in designated areas only. • Collect all discharge from aircraft potable water flushing or water truck flushing, and discharge to a permitted sanitary sewer connection. • Do not discharge water to the ground or SDS.
Aircraft lavatory waste servicing	• Aircraft lavatory service. • Lavatory truck cleanout/back-flushing.	• Lavatory chemicals. • Lavatory waste. • Lavatory truck wash water.	• Do not discharge lavatory waste to sanitary sewer connections other than the STIA "biffy dump." • Do not perform lavatory truck cleanout or back-flushing at any location other than the STIA "biffy dump." • Use buckets or pans to capture drippage from aircraft lavatory access fittings. • Carry absorbent and other containment equipment on the lavatory service equipment.
Animal Handling	• Animal handling and cargo	• Fecal coliform	• Manage animal waste.

[1] This table is a brief summary of operational source control BMPs at STIA. For a detailed list of all OSC BMPs, please refer to the Storm Water Pollution Prevention Plan (SWPPP).

Mixing Zone Study

In September 2006, a technical memorandum addendum was prepared to supplement the mixing zone evaluations conducted in the original *Outfall Modeling Technical Memorandum No. 1* (*TM-1*) dated September 24, 2002 (URS 2002). *TM-1* documented mixing zone and hydraulics analyses that were performed in support of the Des Moines Creek Wastewater Treatment Plant Outfall Project for the Midway Sewer District (District), and identified the design criteria established for the new diffuser design. *TM-1* was submitted to the Washington Department of Ecology (Ecology) as a Mixing Zone Study, in compliance with the National Pollutant Discharge Elimination System (NPDES) permit requirements for the new outfall. The outfall, now completed and in use, serves the District (NPDES No. WA-002095-8) and STIA’s IWTP.

TM-1 included preliminary dilution modeling which evaluated various design options and operating conditions for the new outfall diffuser. The results of the preliminary analysis formed the design basis for the new diffuser. Subsequent to the preparation of *TM-1*, the detailed design of the diffuser was completed and the original modeling was updated using the most current dilution modeling software (Visual Plumes). The September 2006 addendum was prepared to provide an updated mixing zone analysis for the final diffuser configuration to verify compliance with water quality standards at the mixing zone limits, in accordance with the requirements of the NPDES discharge permits.

Based on the results of the reasonable potential calculations using the model derived dilution factors and effluent analysis, the new outfall diffuser was found to provide adequate mixing to meet Washington State water quality standards. The final dilution factors to be applied for the new outfall were determined to be 72 for the acute boundary and 202 for the chronic boundary based on year 2020 District flows and maximum IWTP flows. These dilutions translate to an acute critical effects concentration (ACEC) of 1.4% and a chronic critical effects concentration (CCEC) of 0.50% for whole effluent toxicity (WET) bioassays for both the District and IWTP discharges.

APPENDIX F—MIDWAY SEWER DISTRICT INDUSTRIAL WASTEWATER DISCHARGES

During the previous permitting period beginning September 4, 2003, the airport discharge industrial wastewaters to the Midway Sewer District from the following operations:

- Rental Car Wash Blowdown.
- Boiler Blowdown.
- Cooling Tower Blowdown.
- Equipment Wash Rack.

In addition to these past discharges, the airport anticipates the following addition industrial wastewater discharges to the Midway Sewer District within the next five-year period:

- New Equipment Wash Rack.
- Future Bus Maintenance Facility Bus Wash.

Rental Car Wash Blowdown

The car rental agencies use a multi-bay, partial closed-loop vehicle washing system located directly northeast of the main parking garage complex. The car wash facility operates 24 hours per day, 7 days per week, and washes approximately 3,100 vehicles per day during peak season. It is estimated that about 80 to 90 percent of the wash water is recycled. The remaining 10 to 20 percent is pumped to the Midway Sewer District.

The rental carwash blowdown was discharged to the IWTP via the IWS until approximately 2004. Surface runoff from areas outside the enclosed wash bays continues to drain to the IWS. In addition to rainfall, the IWS discharge also includes small amounts of drippage from the washed vehicles.

Blowdown discharge is measured by a flow meter. The maximum average monthly discharge to the Midway Sewer District sewer system between January 2005 and December 2007 was 52,345 gallons per day (gpd). The maximum daily discharge flow over this period was 64,986 gpd.

Boiler Blowdown

The airport boiler room is located on the bottom level of the parking garage. The boilers provide steam which is used to heat the airport terminal, concourses, and other areas, as well as to heat water for domestic and commercial usage.

Makeup water to the boilers is drawn from the municipal water supply. Boiler additives are injected to control corrosion and scale, and to disperse precipitates. The blowdown stream from the boilers has been connected to the Midway sanitary sewer since about 1971. Blowdown of the boilers is performed manually, with blowdown occurring approximately 5 days per week. The boiler waste stream typically includes both a surface and a bottom blow. Surface blow is discharged via a needle valve located at the top of the boiler water level. Bottom blowdown occurs once per day via a manual valve. The duration of bottom blowdown is determined based on field assay for chlorine.

Blowdown discharge is measured by a flow meter. The maximum average monthly discharge to the Midway Sewer District sewer system between January 2005 and December 2007 was 853 gpd. The maximum daily discharge flow over this period was 11,440 gpd. The relatively large maximum daily flow occurs when annual maintenance is performed on each of the four boilers.

Cooling Tower Blowdown

The cooling tower blowdown stream was connected to the Midway sanitary sewer in August 1995. The existing cooling loop, including basins for all cooling tower cells, has a capacity of about 200,000 gallons of water. Occasionally, the entire system is drained. New cooling towers were constructed in 1999. The cooling tower system was further expanded in the summer of 2002. The new system includes an automatic blowdown feature. The frequency of blowdown is based on conductivity readings. There are currently three chillers. One new chiller will come on line in 2008.

Heat is rejected by the chillers into the circulating cooling tower water, raising the water temperature. The heated circulating cooling tower water is pumped to up to five cooling towers, where heat is rejected due to evaporation. Dissolved solids build up in the circulating cooling tower water, requiring occasional blowdown of a portion of the water to the sanitary sewer. The blowdown occurs in batches from the cooling tower sumps.

Makeup water to the cooling tower is drawn from the City of Seattle supply to the airport. Biocides and corrosion and scale inhibitors are added to the cooling system. Because biocides are consumed by reaction with biological load and diluted by regulating makeup rates, the ultimate concentrations of additives reaching the blowdown are difficult to predict.

The blowdown amount is based on measurements of the circulating cooling tower water chemistry. The maximum average monthly discharge to the Midway Sewer District sewer system between January 2005 and December 2007 was 12,085 gpd. The maximum daily discharge flow over this period was 99,371 gpd.

The maximum average monthly flow is expected to increase in the next five years due to two new projects:

- A $30 million project to provide partially conditioned air at all gates, and
- Addition of a fourth chiller, which will allow peak loads to be met during hot weather periods.

The aggregate increase in loads from these projects is estimated to be 20% and 18%, respectively. The maximum average monthly discharge is projected to reach 16,700 gpd with the expansion.

Equipment Wash Rack

Over the previous five years, the Port intermittently discharged wash water from an equipment wash rack operated by Delta Airlines. The Delta wash rack was infrequently used and periodically exceeded pH limits of the permit. Use of this wash rack was discontinued in 2005.

The Port may install a new wash facility for Port and STIA tenant equipment. The Port's equipment wash rack is still in the preliminary design phase. However, demand surveys indicate that 20 to 50 pieces of equipment may be washed per day in the new facility. The new system is expected to minimize the amount of water consumed by maintaining a recycle ratio of 10 to 20 percent. On this basis, it is assumed that system blowdown from the Port-operated equipment wash rack will average approximately 5,000 gpd. The wash rack blowdown is expected to be of a chemical composition similar to that from the rental car wash.

Bus Maintenance Facility Bus Wash and Chassis Wash Bay

Bus Maintenance Facility is proposed to be constructed. The operations and maintenance site, including on-site bus parking and employee parking, would require about two acres. The facility would include space for maintenance and wash bays, tire and part storage, general repair, administrative offices, fleet and employee parking, fueling and vacuuming areas and landscaping.

Industrial discharges to the Midway sewer system would primarily consist of blowdown from a bus wash. Bus wash will include drive-through automated bus wash bay and chassis wash bay. No maintenance functions are planned for bus wash building, including windshield fluid refills or checking oil level or tire pressure. Trenched drains serving the chassis wash bay, bus wash bay, and reclaim water room will drain to an underground oil/water separator installed as required by code that will discharge to the sanitary sewer system.

It is estimated that the maximum average monthly discharge from bus maintenance facility bus wash system blowdown will be 3280 gpd. The maximum daily discharge flow is estimated to be 15350 gpd. It is estimated that the maximum average monthly discharge from chassis wash bay system blowdown will be 1100 gpd. The maximum daily discharge flow is estimated to be 1960 gpd.

APPENDIX G—PART II. GENERAL AND PERMANENT NONCONSTRUCTION STORMWATER

Introduction

The airport has managed a storm drainage system since commissioning in the 1940s with much of the current drainage infrastructure designed and constructed prior to 1969. The Storm Drainage System (SDS) drains over 900 acres, a little more than one-half of this area is impervious and primarily associated with airport industrial activities, with the remainder being pervious which consists of landscaped or fallow open spaces. On the north portion of STIA, the stormwater drainage is conveyed to Lake Reba and subsequently to Miller Creek, while in the south the drainage flows to the Northwest Ponds and Des Moines Creek. About 14 percent (121 acres) of the area drained by the SDS drains to Lake Reba and then to Miller Creek. This drainage represents less than 3 percent of Miller Creek's watershed. Approximately 86 percent of the total area drains to the Northwest Ponds and Des Moines Creek, which represents about 21 percent of the creek's watershed.

There are currently no industrial activities within Walker Creek drainage area. However, upon stabilization of and subsequent operation of the Third Runway, the future SDW2 subbasin will discharge stormwater associated with airport industrial activities to the Walker Creek drainage area.

Gilliam Creek received stormwater drainage from the STIA Engineering Yard (EY), but industrial activities were removed from this basin in 2005.

Receiving Water

Four creek basins, Miller, Des Moines Creek East, Des Moines Creek West, Walker and the STIA subbasins discharging to each of them, are briefly discussed below. Since 2004 the Port has installed numerous stormwater treatment facilities to remove pollutants from pollution generating surfaces (PGS). PGS includes roads, parking areas, STIA support areas, and aircraft taxiways and runways.

Miller Creek

Miller Creek is six miles in length. Miller Creek's watershed includes portions of Normandy Park, the city of SeaTac, and the city of Burien. Approximately 62 percent of the land use in the Miller Creek Basin is residential, 19 percent is commercial/industrial, and the remainder is open (parks, cemeteries, or forests/wetlands). The creek flows south under SR 518 and through the in-stream Miller Creek Regional Detention Facility, passing Lake Reba and Lora Lake.

The Port constructed Lake Reba in 1973 in compliance with a stipulated order (King County Superior Court No. 726259). Originally identified as the North Clear Zone Detention Pond, the pond was designed to provide 13.5 acre-feet of active storage, limit release rates to Miller Creek to 40 cubic feet per second and treat runoff from the northern portion of STIA. A study conducted in the mid-1990s confirmed that this facility provided removal of pollutants, specifically zinc and suspended solids (Port of Seattle, 1997). Although initially operated as a stormwater facility, in April 2005 Ecology determined that Lake Reba was constructed in a wetland and therefore constituted waters of the state, subject to regulation as a natural water body.

Miller Creek continues southward through land owned by the Port of Seattle. Portions of the creek in this vicinity have been relocated and were restored as mitigation during construction of the third runway. The creek then turns west and flows to Puget Sound, two miles distant.

The Miller Creek Basin is urbanized and exhibits rapid changes in stream flow typical of developed basins. The large amount of impervious areas produces much more runoff than occurred under native, forested conditions, and this runoff reaches surface water much more quickly. In 1992, King County constructed the in-stream Miller Creek Regional Detention Facility and the 1st Avenue South Regional Detention Facility (Ambaum Pond) as partial mitigation for increased flows attributed to regional development within the watershed.

Miller Creek Subbasins

There are four active STIA subbasins in the Miller Creek Basin: SDN-1 through SDN-4. All of these subbasins discharge to Lake Reba. In Subbasin SDN-2, runoff up to the 6-month event is pumped into the IWS. The only flow reaching Lake Reba from this subbasin comes from the occasional storm greater than the 6-month event.

There are four future subbasins in the Miller Creek Basin: SDN-2/3/4, SDN-3A, SDW-1A, and SDW-1B. These subbasins are associated with the third runway project. The outfalls are anticipated to be active after completion of the third runway project when the area is stabilized and no longer treated by Chitosan Enhanced Sand Filtration (CESF) systems.

SDN-1. The SDN-1 subbasin is located in the northeastern portion of the airport and discharges to Miller Creek via Lake Reba. Runoff from the subbasin includes flight kitchens, roads, and the roofs of several buildings. Several galvanized rooftops are painted in the SDN-1 subbasin as a source control measure to reduce zinc concentrations in stormwater. Bioswales along Air Cargo Road treat runoff from this roadway within the SDN1 subbasin. A stormwater detention pond was constructed to detain and treat stormwater from the SDN-1 subbasin. The detention pond was put into service in December 2006 and provides 7.15 acre-feet of live storage with 2.1 acre-feet of wet pond dead storage.

SDN-2. The SDN-2 subbasin is actually an IWS drainage area that collects runoff from over 42 acres of taxiways and cargo ramp areas. Runoff from the subbasin is collected and diverted to the IWS using two pump stations designed to divert runoff up to the water quality design flow rate to the IWS. Peak flows exceeding the capacity of the pump stations drain to the SDN-2 outfall which discharges to Miller Creek via Lake Reba. SDN-2 covers an aircraft cargo area and some taxiways. Within these areas industrial activities include cargo aircraft servicing/deicing and pavement deicing/anti-icing chemical applications.

All SDN-2 runoff exceeding the pump station capacity (above water quality design flow rate) will be combined with SDN-3 and SDN-4 outfalls and routed into two detention facilities with a single surface water outfall to Lake Reba. The two ponds will have a total of 15.8 acre-feet of storage. The new outfall will be SDN-2/3/4.

SDN-3. SDN-3 subbasin is located on the northern portion of the airport and discharges to Miller Creek via Lake Reba. SDN-3 contains airfield activities at the north end of the airport, including service roads, runways, taxiways, and associated infield areas. Infield areas are the open, grassed areas between taxiways and runways that are managed as filter strips to treat runoff from the adjacent pollution-generating surfaces (runways). As a source control measure, the Port conducts annual runway rubber removal of those portions of the runway subject to accumulation of aircraft tire tread worn off by repeated aircraft touchdowns.

The SDN-3 outfall will be eliminated and combined with SDN-2 and SDN-4 outfalls. The new outfall will be SDN-2/3/4.

SDN-4. SDN-4 subbasin is located on the northern portion of the airport and discharges to Miller Creek via Lake Reba. SDN-4 consists of service roads, runways, taxiways, and associated infield areas. Infield areas are the open, grassed areas between taxiways and runways that are managed as filter strips to treat runoff from the adjacent pollution-generating surfaces (runways).

The SDN-4 outfall will be eliminated and combined with SDN-2 and SDN-3 outfalls. The new outfall will be SDN-2/3/4.

SDN-2/3/4. The SDN-2/3/4 outfall will be activated upon the completion of two new detention facilities. This will eliminate the SDN-2, SDN-3, and SDN-4 outfalls. This new outfall will collect the combined SDN-2, SDN-3, and SDN-4 subbasins and discharge to two stormwater detention ponds. The detention ponds will provide 15.8 acre-feet of storage and will discharge to Miller Creek via Lake Reba.

SDN-3A. The SDN3-A outfall will be activated upon commissioning of the third runway. The SDN3-A subbasin discharges directly to Miller Creek and collects stormwater from the northwest portion of the third runway and taxiways. A detention pond and filter strips provide treatment.

SDW-1A. The SDW-1A outfall will be activated upon commissioning of the third runway. The SDW-1A subbasin discharges directly to Miller Creek and collects stormwater from the northwest portion of the third runway taxiways. A detention pond and filter strips provide treatment.

SDW-1B. The SDW-1B outfall will be activated upon commissioning of the third runway. The SDW-1B subbasin discharges directly to Miller Creek and collects stormwater from the western portion of the third runway and taxiways. A detention pond and filter strips provide treatment.

Des Moines Creek East

Des Moines Creek East begins at Bow Lake, one-quarter mile east of STIA. The creek flows mostly within pipes through the city of SeaTac and along the east side of STIA. The flow daylights in the southeast portion of STIA and flows through a golf course and the Tyee

Detention Facility (constructed by King County in 1989). Des Moines Creek East joins with Des Moines Creek West a short distance downstream of Tyee Detention Facility, south of the runways, and then crosses under South 200th Street. Des Moines Creek flows an additional two miles south and west to Puget Sound. The Des Moines Creek basin covers the cities of Des Moines, Normandy Park, and SeaTac and a small portion of the city of Burien.

The area of the Des Moines East Basin above its confluence with Des Moines West is 1,032 acres. The majority of this area, 617 acres, lies west of STIA in the city of SeaTac. Off-airport land uses include single family residential, a large mobile home park, a highly commercialized area along International Boulevard and a golf course.

Des Moines Creek is urbanized and exhibits large variations in stream flow that are characteristic of developed basins, similar to Miller Creek. The current level of development has increased the peak discharges in the creek system enough to cause flooding and erosion problems. In addition to the Tyee Detention Facility, several other projects have been constructed to reduce high flows in the creek.

Des Moines Creek East Subbasins

SDS-1. The SDS-1 subbasin was combined with the SDE-4 subbasin in 2007 and is no longer a separate outfall. The combined outfall discharges into the Des Moines Creek (East Branch). The outfalls were combined in order to facilitate treatment by a final bioswale prior to discharge. Stormwater quality and activities in the subbasins were similar. The SDS-1 outfall was eliminated from the permit by Minor Modification on August 7, 2007.

SDE-4/S1. The SDE-4/S1 subbasin combines the SDE-4 and SDS-1 subbasins into a single outfall to the East Branch of Des Moines Creek in August 2007 by NPDES Permit Minor Modification.

The SDS-1 area receives runoff from aircraft maintenance building rooftops, parking areas, cargo building rooftops, roads, and parking lots. In October 2006, a galvanized maintenance building rooftop was painted along with galvanized portions of an HVAC-I-beam superstructure on an adjacent office building (source separation). Two bioswales were also constructed in SDS-1. They are located in an approximately one-acre area along South 188th Street at the downstream end of the subbasin.

SDE-4 drains the passenger terminal area on the east side of STIA. This area receives runoff from roads, parking lots, terminal area roofs, and taxiways. Multiple BMPs constructed in the SDE-4 subbasin were designed to meet AKART requirements (basic treatment) and provide additional enhanced treatment for dissolved metals. The first was the SE Pond Tunnel Diversion Pipe. The pipe was designed to divert flows from the existing 60-inch storm drain pipeline that lies under International Boulevard and connects below grade with Des Moines Creek East and discharges from Bow Lake.

This diversion pipe allowed the Port to segregate the SDE-4 subbasin stormwater from city of SeaTac drainage plus Bow Lake discharges and conveys the SDE-4 subbasin stormwater to a site where airport runoff could be separately detained and treated. Construction on this tunnel and diversion pipe was complete on May 31, 2006, but it did not become active until the SE Pond detention and treatment project was completed in June 2007. The SE Pond detention and treatment project involved construction of an end-of-pipe facility incorporating an 11-acre-foot flow-control extended detention pond, a 600-cartridge media filtration vault providing enhanced treatment, and a bioswale. The SDE-4 subbasin was routed through the diversion pipe and into the pond, treatment system, and vegetated swale in June 2007.

SDD-05A, SDD-05B, and SDD-06A. The SDD-05A, SDD-05B, and SDD-06A subbasins and outfalls will be activated as part of the CDP near-term projects completion. This area will receive runoff from public roads, vehicle parking areas, rooftops, and landscaped areas. The SDD-05A/SDD-05B/SDD-06A outfalls will discharge to Des Moines Creek (East Branch).

Des Moines Creek West

Des Moines Creek West has its origins in the area southwest of the runways. The upper portion of its basin originates in a highly-developed area. The creek flows into a series of ponds known as the Northwest Ponds. Historical aerial photos indicate that the area occupied by the ponds was farmland until the late 1950s. The ponds were dredged during the following decade. The area of this basin above its confluence with Des Moines Creek East is 1,243 acres. Approximately 600 acres lies within the boundaries of the STIA. Off-airport land uses include streets, single family residential, warehouses, and a large wetland area south of the ponds.

The Northwest Ponds were enlarged to provide regional detention to control high flows in the middle and lower reaches of Des Moines Creek by the Des Moines Creek Basin Committee which consists of the Port of Seattle, City of SeaTac, City of Des Moines, and Washington State Department of Transportation. Additional committee projects include a high creek flow bypass pipe that conveys flows directly to Puget Sound via an existing outfall. Habitat improvements are being added to the stream channel south to S. 200th Street. Downstream, an undersized culvert under Marine View Drive has been replaced by a bridge to improve fish passage. Additional stream habitat improvement projects will continue to be constructed as further funding is secured.

There are three STIA subbasins in Des Moines West Basin: SDS-3/5, SDS-4, and SDS-6/7. All of these subbasins within the Des Moines West Basin receive runoff from runways, taxiways, and service roads. During 2003-2008, all of the subbasins that drain to the Des Moines West Basin were improved through the addition of a variety of water quality and flow control BMPs.

Des Moines Creek West Subbasins

SDS-2. SDS-2 drainage basin is located at the southwestern portion of the airport that consists of open space and an unpaved limited/maintenance access road. No industrial-related activities occur in this subbasin. The swale, through which SDS-2 discharges, was modified to promote infiltration. As a result, no runoff reaches the Northwest Ponds from this subbasin (Port of Seattle, 2006). The SDS-2 outfall was subsequently eliminated from the permit by Minor Modification on August 7, 2007.

SDS-3/5. The SDS-3/5 subbasin is located in the southern portion of the airport and combines the SDS-3 and the SDS-5 subbasins into one single outfall which discharges to the West Fork of Des Moines Creek via Northwest Ponds. This outfall was combined on August 7, 2007, by NPDES Permit Minor Modification.

SDS-3/5 drainage area is the largest at STIA, consisting primarily of runway, taxiway, limited/maintenance access roadways, and runway infield. The SDS-3/5 subbasin is treated by filter strips, bioswales, catch basin media filters and two Level 1 flow control detention facilities.

The 4.72-acre-foot detention facility for SDS-3 was completed December 2006 and went into service May 1, 2007, to provide flow control for the combined SDS-3 and SDS-5 subbasins. The majority of construction required to combine the SDS-5 subbasin with the SDS-3 subbasin was completed in 2004. SDS-5 was rerouted to the SDS-3 detention facility, in accordance with the Des Moines Creek flow-control plan update on August 28, 2007. In addition to the flow control BMP, existing filter strips in SDS-3 and SDS-5 were improved in October 2006 through edge dam removal, regrading, and reseeding. Catch basin media filters were installed in SDS-3 in July 2007.

SDS-4. SDS-4 drainage basin is located on the southern portion of the airport. SDS-4 drainage is collected at a stormwater facility located south of Runway 34R in the Tyee Valley Golf Course. This detention pond discharges to Northwest Ponds prior to entering Des Moines Creek West. The facility supplements the Des Moines Creek Regional Detention Facility by providing detention to the SDS-4 subbasin. SDS-4 formerly discharged directly to Des Moines Creek East just upstream of its confluence with Des Moines Creek West. Construction was completed on the 1.9-acre-foot detention facility for the SDS-4 subbasin in October 2006.

SDS-6/7. SDS6/7 is located on the southwestern portion of the airport and the drainage basin receives runoff from runways, taxiways, infield, and perimeter roads. In the summer of 2005, SDS-6 and SDS-7 were combined as a single discharge as a result of construction activities associated with the third runway. A 3.5-acre-foot vault was constructed in the fall of 2006 to provide detention for the SDS-6 subbasin. Areas formally associated with the SDS-7 subbasin have been incorporated into the SDS-6 subbasin and will be served by this same facility when it becomes operational. As part of the third runway construction, the runways and taxiways within the SDS-6/-7 subbasin will be treated with filter strips and bioswales. Although the flow control vault was completed in the fall of 2006, it will not become operational until the third runway is completed and the facility is no longer used for construction stormwater management. Throughout most of 2005-2008, the SDS6/7 subbasins were under redevelopment and associated runoff was chemically-treated for turbidity and pH control and managed under Part III of the NPDES Permit.

SDS-7. The SDS-7 subbasin was combined with the SDS-6 subbasin in 2005-2007 and is no longer a separate outfall. The combined outfall discharges into the Des Moines Creek (West Branch) via Northwest Ponds. The SDS-7 outfall was subsequently eliminated from the permit by Minor Modification on August 7, 2007.

Walker Creek Basin

Walker Creek is approximately two miles in length. It begins immediately west of Des Moines Memorial Drive, just inside the city of SeaTac, and heads westward through a series of wetlands and open water areas in the city of Burien and Normandy Park. Walker Creek joins Miller Creek before discharging into the Puget Sound.

Walker Creek Subbasins

SDW-2. STIA will discharge stormwater associated with industrial activities from one subbasin, SDW-2, to Walker Creek. The SDW-2 outfall is anticipated to be active in November 2009 after full activation of the third runway project and the area is stabilized and no longer treated by Chitosan Enhanced Sand Filtration systems. All stormwater will drain to a detention facility. This area will receive runoff from the runway, taxiways, and infield areas associated with the west portion of the third runway. A detention pond and infield filter strips provide treatment.

Gilliam Creek Basin

Previously STIA discharged stormwater associated with industrial activity through a city of SeaTac conveyance to Gilliam Creek, a tributary to the Green River. The Gilliam Creek subbasin, EY-01, was located on the northeastern edge of the airport. The 1.71-acre subbasin was eliminated as part of the South 160th Roadway Loop Project. All industrial activities within the EY subbasin were removed. A bioswale and detention pond have been constructed to manage all stormwater from the 160th Loop. No future industrial activities are planned in the Gilliam Creek Basin.

SDS Subbasin Activities

STIA stormwater discharges through a variety of outfalls and corresponding drainage areas. These areas will continue to change with the implementation of various capital improvement projects and drainage modifications. STIA has undergone significant changes associated with the Third Runway Project, Master Plan Upgrade Projects, and Stormwater Retrofits. The airport is an active facility, and subbasins and outfalls will continue to change through Comprehensive Development Plan implementation and as the Light Rail project nears completion.

STIA stormwater subbasins can be categorized according to their dominant activities: landside or airfield. These categories group subbasins together by similar land use and other characteristics. In general, passenger vehicle operations are absent from the airfield drainage subbasins while aircraft operations are absent from the landside subbasins except for SDE4/S1. Previous reports showed that concentrations of TPH, TSS, and other constituents were different for the landside and airfield categories (POS 1996a, 1997a.)

Table G-1, *STIA Subbasins and Associated Activity*, describes each active and future subbasin, receiving water, activities within each subbasin, and total pervious and non-pervious surfaces. The pervious and non-pervious acreage totals for future subbasins are provided for estimated areas upon activation.

Table G-1. STIA Subbasins and Associated Activities

Outfall Name	Receiving Water	General Category	Industrial Activity	Non-Industrial Activity	Pervious Activity (acres)	Impervious Area (acres)	Total Area (acres)
Existing Outfalls and Subbasins to Continue							
SDE4/S1[a]	Des Moines Creek (East Branch)	Landside	Limited portions of the airfield taxiways.	Public roads, vehicle parking areas, rooftops (terminal, hangar, cargo and other) and landscaped areas.	27.1	128.3	155.4
SDN1	Miller Creek via Lake Reba	Landside	Flight service kitchen.	Public roads, building rooftops and vehicle parking.	4.2	15.6	19.8
SDS3/5	Des Moines Creek (West Branch) via NW Ponds	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, open areas and building rooftops.	206.8	250.5	457.3
SDS4	Des Moines Creek (West Branch) via NW Ponds	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Runway infield and open areas.	41.9	24.5	66.4
SDS6/7	Des Moines Creek (West Branch) via NW Ponds	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Access roads, runway infield and open areas	58.4	44.2	102.6
Existing Outfalls to be Eliminated in Approximately November 2009							
SDN2[b]	Miller Creek via Lake Reba	Airfield	Ground surface deicing/anti-icing, snow storage, aircraft service, equipment parking, and aircraft taxi.	Perimeter road, taxiway infield and open areas.	0.0	0.0	0.0
SDN3	Miller Creek via Lake Reba	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	30.0	24.1	54.1
SDN4	Miller Creek via Lake Reba	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Access road, runway field and open areas.	13.8	8.0	21.8

Table G-1. STIA Subbasins and Associated Activities

Outfall Name	Receiving Water	General Category	Industrial Activity	Non-Industrial Activity	Pervious Area (acres)	Impervious Area (acres)	Total Area (acres)
Outfalls to be Activated in Approximately November 2009							
SDN2/3/4	Miller Creek via Lake Reba	Airfield	Ground surface deicing/anti-icing, snow storage, aircraft service, equipment parking, aircraft taxi, takeoff and landings.	Perimeter road, taxiway infield, runway infield, access road and open areas.	60.2	33.2	93.4
SDN3A	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	24.3	7.2	31.5
SDW1A	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings	Perimeter road, runway infield and open areas.	44.5	25.6	70.1
SDW1B	Miller Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	59.7	25.0	84.7
SDW2	Walker Creek	Airfield	Ground surface deicing/anti-icing, aircraft taxi, takeoff and landings.	Perimeter road, runway infield and open areas.	31.3	10.6	41.9
Future Outfalls to be Activated as Part of a CDP Near-Term Project Development							
SDN1OFF	Miller Creek via Lake Reba	Landside	Loading docks, vehicle maintenance and washing, equipment parking and maintenance.	Public roads, vehicle parking areas, rooftops (terminal, hangar, cargo, and other) and landscaped areas.	3.1	17.6	30.7
SDD06A[c]	Des Moines Creek (East Branch)	Landside	Loading docks, vehicle maintenance and washing, equipment parking and maintenance.	Public roads, vehicle parking areas, rooftops (terminal, hangar, cargo, and other) and landscaped areas.	TBD	TBD	TBD
SDD05B[c]	Des Moines Creek (East Branch)	Landside			38.7	43.3	82.0
SDD05A[c]	Des Moines Creek (East Branch)	Landside			TBD	TBD	TBD

[a] The SDE4/S1 subbasin areas reflect ongoing changes resulting from the 160^{th} Loop, North Expressway Realignment and Light Rail Projects.

[b] The SDN2 runoff is pumped to IWS for all flows up to the 6-month, 24-hour event. The SDN2 subbasin comprises approximately 46.5 acres, 40.0 of which are impervious. This area is included in acreages reported to the IWS.

[c] Multiple outfalls and subbasins are identified for the future development in the SDD06 and SDD05 subbasins. Attempts will be made to consolidate the outfalls identified as described in the CDP. However, multiple outfalls may be needed for hydraulic reasons.

[d] Areas reported are estimated based on analyses reported in the CDP Environmental Review.

Stormwater Pollution Prevention Plan

STIA has implemented a Stormwater Pollution Prevention Plan (SWPPP) since 1994. The SWPPP describes the overall facility, site inspections, operations, activities, and corresponding BMPS. The SWPPP also includes monitoring protocols. SWPPP implementation includes many operational source control and structural BMPs to prevent the discharge of contaminants to surface waters.

Operational Source Control BMPs

The airport employs a wide variety of operational source control BMPs specific to activities performed and targeted pollutants. These BMPs are to a great extent based on recommendations provided in Ecology's *Stormwater Management Manual for Western Washington (revised 2005)* and include development of a pollution prevention team, good housekeeping, preventative maintenance, spill prevention and emergency cleanup, employee training, and inspections and record keeping. In addition, the airport employs a number of BMPs to minimize pollution runoff from airport-specific practices such as those associated with runway deicing. These operational source control BMPs are a critical component to the SWPPP and demonstrate the Port's adaptive management process for stormwater management at STIA. Table G-2, *Industrial Activity and Operational Source Control BMP Summary Table* describes the industrial activity, pollutants associated with each SDS activity, and the BMPs.

Table G-2. Industrial Activity and Operational Source Control BMP Summary Table [1]

Activity	Targeted Activities	Targeted Pollutants	BMP Key Approaches
Ground surface deicing.	Ground surface deicing. Snow and ice management.	Deicing/anti-icing materials (for example, Potassium Acetate, Sodium Acetate, Calcium/magnesium Acetate), Traction Sand	Do not use urea- or chloride-containing deicing materials. Use approved materials for road, ramp, and runway anti-icing/deicing.
Aircraft, vehicle, and equipment storage.	Aircraft/vehicle/ equipment storage. Apron/floor washdown.	Oil and grease Vehicle fluids Metals	Store ground surface equipment in IWS drainage areas only. Store under cover. Remove batteries and drain fluids prior to long-term storage. Use drip pans or absorbent materials under equipment that may leak.
Outdoor handling, storage, and disposal of wastes and materials.	Loading/unloading. Cargo/handling. Fuel/chemical storage. AVE fueling. AVE Maintenance. Aircraft lavatory. servicing. Pesticide/herbicide usage.	Anti-freeze chemicals. Batteries. Deicing chemicals. Fuel. Herbicides. Lavatory chemicals. Oil and grease. Paint. Pesticides. Soap/cleaning chemicals. Solvents. Other.	Conduct loading/unloading undercover. Store materials and waste under cover. Use appropriate secondary containment. Transfer materials in paved areas away from drain inlets. Follow POS spill response procedures. Maintain readily accessible spill kits.

Table G-2. Industrial Activity and Operational Source Control BMP Summary Table [1]

Activity	Targeted Activities	Targeted Pollutants	BMP Key Approaches
Fuel storage and delivery.	Aircraft/vehicle/ equipment. Mobile fueling. Aircraft hydrant fueling. Stationary fueling stations. Fuel storage.	Petroleum products.	Keep spill response kits at fueling locations, including mobile fueling locations. Construct berms or curbing around fueling areas. Use absorbent materials and/or vacuum equipment for spills. Use proper equipment for fuel dispensing and tank monitoring to prevent spills, leaks, and overflows.
Building and grounds maintenance	Building maintenance. Grounds maintenance. Pesticide/herbicide use. Outdoor washdown.	Pesticides/herbicides/ fertilizers. Oil and grease. Zinc. Sediment. Landscape waste. Washdown waste. Building maintenance materials (paint, roofing, etc.).	Keep paved surfaces clean and swept. Clean catch basins regularly using vacuum trucks. Manage use of herbicides/fertilizers.
Garbage handling and disposal.	Garbage/solid waste management and disposal. Food service.	Dumpster waste. Trash compactor fluids. Foreign object debris. Biological Oxygen Demand.	Cover dumpsters. Perform dumpster washing off-site. Regularly inspect and clean waste storage areas. Recycle materials. Properly dispose of all fluids. Properly recycle or dispose of all universal wastes (for example, batteries, fluorescent bulbs).
Roadway, ramp, and runway maintenance and cleaning.	Snow and ice management. Road, ramp, and runway, cleaning/maintenance. Outdoor power washing. Runway rubber removal.	Oil & Grease. Fuel, Aqueous film-forming foam (AFFF). Deicing/anti-icing materials (for example, potassium acetate, sodium acetate, calcium/magnesium acetate). Solvent/cleaning solutions. Sediments. FOD.	Use dry sweepers to keep paved area clean. Maintain catch basins and oil/water separators. Use approved materials for road, ramp, and runway anti-icing/deicing. Collect and discharge road and ramp wash water to IWS.
Fire suppression and aqueous film forming foam discharge.	Firefighting equipment testing and flushing.	Aqueous film-forming foam (AFFF).	Perform testing operations in designated areas. Properly dispose or recycle AFFF discharge.

[1] This table is a brief summary of operational source control BMPs at STIA. For a detailed list of all OSC BMPs, please refer to the Storm Water Pollution Prevention Plan (SWPPP).

Structural Source Control, Treatment, and Stormwater Peak Runoff and Volume Control BMPs

The Port has completed many studies and capital improvement projects to improve water quality and flow control over the past five years. These studies and subsequent improvements resulted in a flow control and water quality retrofit of the entire airport to standards specified in the Comprehensive Stormwater Management Plan (Parametrix, July 2001) as modified by specified 401 Certification and NPDES permit. In support of these upgrades, the NPDES Permit Part II, S9.B and S9.C, required the Port to prepare and submit to Ecology an AKART (all known, available, and reasonable methods of stormwater treatment) Analysis and Engineering Report.

Each of the individual NPDES drainage basins was evaluated to determine whether the basin meets the requirement to provide AKART and, if not, what BMPs are needed to bring the basin to AKART. AKART is a technology-based process for pollutant control and must be implemented regardless of receiving water standards. The Port performed an AKART engineering analysis for the STIA stormwater system (R. W. Beck, 2005) and submitted the report to Ecology for review in January 2005. Ecology subsequently issued a letter in May 2005 stating concurrence with the Port's findings regarding AKART for STIA. A principal finding of the analysis is that to meet AKART, the Port must, to the greatest extent practicable, provide basic treatment for pollution-generating surfaces (PGS) draining to the existing outfalls.

A Facility Assessment (PMX, 2004, 2005) was completed to map existing drainage areas and site activities at STIA. Included was the delineation of pollution-generating surfaces and an inventory of structural BMPs, including a delineation of the areas tributary to each BMP. This information formed the basis for much of the analyses in the Engineering Report, assisting in determining pollution contributions from various activities or land uses and the extent of treatment that is currently being provided by existing BMPs.

The subsequent Engineering Report described the existing BMPs and proposed new stormwater treatment facilities and other BMPs at STIA that would enable attainment of AKART and water quality objectives, defined as meeting the previous NPDES Permit requirements. The Engineering Report evaluated water quality at each outfall to determine if each basin was meeting NPDES permit water quality limitations under existing conditions and AKART. The analysis also determined what, if any, additional BMPs (i.e., enhanced treatment menu BMPs for metals) would be required to meet effluent limits. The analysis was carried out for total suspended solids (TSS), zinc, copper, and lead.

The Engineering Report recommended construction of a number of new water quality treatment BMPs throughout the airport. These included but were not limited to:

- Enhance treatment media filtration for the SDE-4 subbasin.
- Wet pool treatment for the SDN-1 subbasin.
- Bioswale treatment in SDS1, SDS5.
- Improvements to airfield filter strips.

These improvements were completed before the compliance deadline of July 31, 2007. These new BMPs are supported by a large number of previously existing structural source control and treatment facilities. Included are a number of pump stations which functions as a key source control BMP by diverting runoff to the IWS from various drainage areas formerly within the SDS.

In addition to the water quality retrofits, the Port has built a series of flow control ponds and vaults that detain all stormwater runoff from the airport. The facility requirements were described in two proposed design refinements to the Comprehensive Stormwater Management Plan, one for Miller Creek basin facilities and a second for Des Moines Creek facilities (Parametrix, 2005 and Parametrix/RW Beck, 2004).

Table G-3 provides a summary of previously existing and new structural source control, treatment and runoff and flow control BMPs within each subbasin.

Table G-3. Structural Source Control, Treatment and Stormwater Peak Runoff and Volume Control BMPs

BMP Description	Port Drainage Basin	Port Drainage Subbasin	BMP TYPE
South STIA Substation Detention Pipe and Infiltration	Des Moines	SDE4/S1	Stormwater Peak Runoff Rate and Volume Control
SDE4 Pond	Des Moines	SDE4/S1	Stormwater Peak Runoff Rate and Volume Control/Treatment
Biffy Drainage Structural Source Control	Sanitary Sewer	SDE4/S1	Structural Source Control
Garage / IWS Pump Station	Des Moines	SDE4/S1	Structural Source Control
North Satellite Drainage Improvement	Des Moines	SDE4/S1	Structural Source Control
Paint ~4000ft of POS Guardrail	Des Moines	SDE4/S1	Structural Source Control
Rooftop Painting - Fed Ex & SW Air Cargo	Des Moines	SDE4/S1	Structural Source Control
Paint Alaska Rooftop and HVAC I-Beams	Des Moines	SDE4/S1	Structural Source Control
Air Cargo Rd N. Bioswale for STEP	Des Moines	SDE4/S1	Treatment
Air Cargo Rd S. Bioswale for STEP	Des Moines	SDE4/S1	Treatment
Bioswale (next to UA Fuel Farm)	Des Moines	SDE4/S1	Treatment
Bus Lot Swale/Emergency Pond Overflow Swale	Des Moines	SDE4/S1	Treatment
Doug Fox Infiltration Pipes	Des Moines	SDE4/S1	Treatment
Doug Fox Infiltration Trench	Des Moines	SDE4/S1	Treatment
Ecology Embankment	Des Moines	SDE4/S1	Treatment
NCBL (North Cruise Ship Bus Lot) Infiltration/Sand filter	Des Moines	SDE4/S1	Treatment
Rooftop Treatment (Aeroground)	Des Moines	SDE4/S1	Treatment
SDE4 Storm Filter Vault	Des Moines	SDE4/S1	Treatment
SDE4/S1 Bioswale	Des Moines	SDE4/S1	Treatment
STEP Storm Filter Vault	Des Moines	SDE4/S1	Treatment
North Alaska Bioswale	Des Moines	SDE4/S1	Treatment
NW Air Hangar/Cargo (Water Quality Vault 1)	Des Moines	SDE4/S1	Treatment
NW Air Hangar/Cargo (Water Quality Vault 2)	Des Moines	SDE4/S1	Treatment
South Alaska Bioswale	Des Moines	SDE4/S1	Treatment
SDN1 Pond (Wet/Level 2)	Miller Creek	SDN1	Stormwater Peak Runoff Rate and Volume Control/Treatment
Afco Building(s) Roof Painting	Miller Creek	SDN1	Structural Source Control
Air Cargo Road Bioswales	Miller Creek	SDN1	Treatment
Flight Kitchen Constructed Wetland	Miller Creek	SDN1	Treatment
Flight Kitchen Drainage Ditch/Bioswale	Miller Creek	SDN1	Treatment
Oil Water Separator - Flight Kitchen	Miller Creek	SDN1	Treatment
SDN2/3/4 Pond	Miller Creek	SDN2/3/4	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDN2/3/4	Treatment
Runway Filter Strips	Miller Creek	SDN3	Treatment
SDN3A Pond	Miller Creek	SDN3A	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDN3A	Treatment
Runway Filter Strips	Miller Creek	SDN4	Treatment

Table G-3. Structural Source Control, Treatment and Stormwater Peak Runoff and Volume Control BMPs

BMP Description	Port Drainage Basin	Port Drainage Subbasin	BMP TYPE
SDS3 Vault	Des Moines	SDS3/S5	Stormwater Peak Runoff Rate and Volume Control
Snow Shed Structural Source Control	Des Moines	SDS3/S5	Structural Source Control
Biofiltration Channel	Des Moines	SDS3/S5	Treatment
Catch Basin Inserts	Des Moines	SDS3/S5	Treatment
Runway Filter Strips	Des Moines	SDS3/S5	Treatment
S. 188th Street Bioswale	Des Moines	SDS3/S5	Treatment
SDS3A Vault	Des Moines	SDS3/S5	Treatment
Weyerhaeuser Bioswale	Des Moines	SDS3/S5	Treatment
Runway Filter Strips	Des Moines	SDS3/S5	Treatment
SDS5 Bioswales	Des Moines	SDS3/S5	Treatment
Starling Road Bioswale 2	Des Moines	SDS3/S5	Treatment
SDS4 Pond	Des Moines	SDS4	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Des Moines	SDS4	Treatment
SDS4 Oil Water Separator	Des Moines	SDS4	Treatment
SDS6 Vault	Des Moines	SDS6/7	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Des Moines	SDS6/7	Treatment
SDW1A Pond	Miller Creek	SDW1A	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDW1A	Treatment
SDW1B Pond	Miller Creek	SDW1B	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Miller Creek	SDW1B	Treatment
SDW2 Pond	Walker Creek	SDW2	Stormwater Peak Runoff Rate and Volume Control
Runway Filter Strips	Walker Creek	SDW2	Treatment

Stormwater Monitoring Program and Protocols

The Port has implemented a Stormwater Monitoring Program since the NPDES permit began covering stormwater (July 1994). This program covers the required stormwater monitoring (flows and water quality) and other supplemental sampling elected by the Port. The 1998 NPDES permit required the Port to prepare and submit the *Procedure Manual for Stormwater Monitoring* (POS, 1999x) and describes the target storms, sampling protocols, quality assurance, and representativeness criteria needed to ensure proper sampling and reporting. Ecology reviewed and approved this manual in March 1997 (Ecology, 1997a). The Port has submitted subsequent revisions incorporate reissued permits and permit modifications. The most recent revision was submitted in January 2008.

The NPDES permit defines the type of rainstorm that triggers sampling, sampling frequencies, and parameters. The Port's *Procedure Manual for Stormwater Monitoring* (POS 2008) describes the criteria for sampling storm events and describes all relevant sampling, programming, and handling necessary to comply with permit requirements. The Port utilizes automatic samplers which generally take a grab sample and then a flow-weighted composite sample. Each of these samples is analyzed for a different suite of constituents according to the NPDES permit. The Port reports data on Discharge Monitoring Reports where results from storms and samples meet the representativeness criteria of the manual. In addition to data provided in the DMRs other results from samples not meeting these criteria or those taken for other purposes are included in Annual Stormwater Monitoring Reports.

Stormwater Characterization

This section summarizes representative water quality data associated with STIA stormwater discharges. The outfall sampling locations described in Table G-1 have been used to characterize STIA runoff and provide feedback for adaptive management relative to the overall STIA Stormwater Management Program. Table G-4 summarizes over four years of stormwater data for each of the STIA outfalls from October 1, 2003 through January 31, 2008. Two distinct data periods are presented for most outfalls with the exception of SDN2, SDN3 and SDN4 which did not experience any change over the previous Permit cycle. The Pre-AKART data period for each outfall is defined as the time prior to flow control and water quality retrofit to meet AKART. The length of each pre-AKART period differs for each outfall depending upon when construction of the AKART BMPs was completed within each subbasin. Similarly the Post-AKART data period for each outfall begins when construction of all AKART BMPs was completed and the BMPs began receiving and treating stormwater. The permit effluent limit for each constituent is included in each table as a reference. The permit effluent limits became effective December 31, 2007. Prior to this period they were listed in the permit as benchmark limits.

Table G-4. Summary of STIA Stormwater Outfall Data [a]

Constituent	Permit Limit	SDE4 Pre-AKART 10/1/03 - 8/31/07			SDS1 Pre-AKART 10/1/03 - 8/31/07			SDE4/S1 Post-AKART 9/1/07 - 1/31/08		
(mg/l)	(mg/l)	**med**	**95th**	**n**	**med**	**95th**	**n**	**med**	**95th**	**n**
TSS	100	24	100	39	20	60	41	8.4	34	8
Turbidity(NTU)	na	26	90	53	53	138	50	3	37	8
pH (S.U.)	6.5 - 8.5	6.9	7.4	54	7	7.6	50	7.2	7.6	8
TPH	15	0.91	2.27	53	0.68	2.22	50	0.08	1.14	8
BOD_5	na	6.1	31	48	5.09	37	48	2	16	8
Total Glycol	na	1	4.1	41	2	20.1	40	2	4.2	6
Cu [b]	0.064	0.026	0.112	47	0.015	0.045	48	0.009	0.023	8
Pb [b]	0.082	0.016	0.096	47	0.003	0.012	48	0.002	0.01	8
Zn [b]	0.117	0.129	0.346	47	0.086	0.226	48	0.033	0.067	8
Hardness	na	13.1	58.2	25	9.7	21	26	22.9	39.9	7

Constituent	Permit Limit	SDS3 Pre-AKART 10/1/03 - 8/31/07			SDS5 Pre-AKART 10/1/03 - 8/31/07			SDS3/S5 Post-AKART 9/1/07 - 1/31/08		
(mg/l)	(mg/l)	**med**	**95th**	**n**	**med**	**95th**	**n**	**med**	**95th**	**n**
TSS	100	4.7	12	37	8.1	24	32	3	6	5
Turbidity(NTU)	na	2.4	12	47	7	80	49	1.4	9	5
pH (S.U.)	6.5 - 8.5	7.6	7.8	47	7.3	8	49	7.4	7.7	5
TPH	15	0.08	0.24	47	0.08	0.3	49	0.08	0.08	5
BOD_5	na	2	56	46	2	12	45	2	132	5
Total Glycol	na	2	66	38	2	2.5	37	4.9	62	4
Cu [b]	0.064	0.019	0.05	46	0.008	0.016	45	0.016	0.026	5
Pb [b]	0.082	0.001	0.004	46	0.001	0.003	45	<0.002	<0.002	5
Zn [b]	0.117	0.019	0.063	46	0.026	0.112	45	0.018	0.029	5
Hardness	na	83.1	129	25	19.4	51.9	24	45	72.7	5

Constituent	Permit Limit	SDS6 10/1/03 - 6/30/05			SDS7 10/1/03 - 6/30/05			SDS6/7 Post-AKART 7/1/05 - 11/30/06		
(mg/l)	(mg/l)	**med**	**95th**	**n**	**med**	**95th**	**n**	**med**	**95th**	**n**
TSS	100	6.5	21	13	38	76	10	10	268	9
Turbidity(NTU)	na	11	40	23	13	735	25	5.5	175	10
pH (S.U.)	6.5 - 8.5	7.4	8	23	7.4	7.9	25	7.6	8	10
TPH	15	<0.16	<0.16	23	0.09	0.43	24	<MDL	<MDL	10
BOD_5	na	<4	<4	19	2	29	18	4.2	9	9
Total Glycol	na	2	2.2	19	2	18.8	18	<4	<4	4
Cu [b]	0.064	0.007	0.012	19	0.008	0.024	18	0.005	0.017	9
Pb [b]	0.082	<0.002	<0.002	19	0.001	0.008	18	0.001	0.006	9
Zn [b]	0.117	0.022	0.067	19	0.035	0.135	18	0.02	0.051	9
Hardness	na	75.6	114.6	4	28.9	41.4	3	66.2	224.9	8

Table G-4. Summary of STIA Stormwater Outfall Data [(a)]

Constituent	Permit Limit	SDS4 Pre-AKART 10/1/03 - 11/30/06			SDS4 Post-AKART 12/1/06 - 1/31/08			SDN1 Pre-AKART 10/1/03 - 12/31/06			SDN1 Post-AKART 1/1/07 - 1/31/08		
(mg/l)	(mg/l)	**med**	**95th**	**n**	**med**	**95th**	**n**	**med**	**95th**	**n**	**med**	**95th**	**n**
TSS	100	3.8	17	27	3.8	9	14	23.5	122	32	4.5	10	15
Turbidity(NTU)	na	7.7	168	38	3.3	5	14	24	146	44	2.7	8	15
pH (S.U.)	6.5 - 8.5	7.7	8.2	38	7.7	8.2	14	6.3	7	44	7.3	7.7	15
TPH	15	0.08	0.22	38	0.08	0.1	14	0.58	2.27	44	0.14	0.43	15
BOD_5	na	2	32	33	2	17	14	4.2	28	41	2	14	15
Total Glycol	na	2	31.8	30	<4	<4	9	2	5	37	<4	<4	10
Cu [(b)]	0.64	0.018	0.029	33	0.015	0.049	14	0.021	0.086	40	0.009	0.015	15
Pb [(b)]	0.82	0.001	0.001	33	<0.002	<0.002	14	0.004	0.039	40	<0.002	<0.002	15
Zn [(b)]	0.117	0.022	0.062	33	0.016	0.038	14	0.130	0.363	40	0.046	0.074	15
Hardness	na	43.9	75.6	14	52.7	106	14	9.1	18	40	28.3	34.7	15

Constituent	Permit Limit	SDN2 10/1/03 - 1/31/08			SDN3 10/1/03 - 1/31/08			SDN4 10/1/03 - 1/31/08		
(mg/l)	(mg/l)	**med**	**95th**	**n**	**med**	**95th**	**n**	**med**	**95th**	**n**
TSS	100	28	590	15	7	43	38	3.3	15	39
Turbidity(NTU)	na	60	664	25	8.5	44	54	3.5	19	62
pH (S.U.)	6.5 - 8.5	6.7	7.6	25	7.6	8.1	54	7.7	8.2	62
TPH	15	0.43	4.24	25	0.08	0.16	54	0.08	0.14	62
BOD_5	na	2	16	26	2	40	48	2	8	48
Total Glycol	na	2	4.1	24	2	6.2	40	2	6.5	40
Cu [(b)]	0.64	0.031	0.313	26	0.008	0.02	48	0.021	0.045	47
Pb [(b)]	0.82	0.004	0.095	26	0.001	0.003	48	0.001	0.003	47
Zn [(b)]	0.117	0.030	0.580	26	0.03	0.165	48	0.023	0.055	47
Hardness	na	13.2	41.3	26	41.1	86.6	48	33.2	83.5	47

Table notes:

[a] Data summarize overall median ("med"), 95th percentile and number of representative stormwater samples collected per the NPDES permit.

[b] Total recoverable metals.

Priority Pollutants

Part II, Special Condition S1. A., Table 1 from the 2003-2008 NPDES permit required that Priority Pollutants be analyzed from all permitted outfalls once during the wet season and once during the dry season in year three of the permit cycle. The complete list of EPA Priority Pollutants (122 total) were analyzed at 10 active outfalls in each season for a total of 20 samples collected and analyzed for each constituent. The results of the wet season and dry season priority pollutant characterization are included in Table G-5, *Priority Pollutant Detection Summary*. Table G-5 only includes summary data for those parameters that were detected at or above the Method Detection Limit (MDL) in at least one sample.

Table G-5. Priority Pollutant Detection Summary

Priority Pollutant Detected Constituents	Units	Number of Samples	% Non Detect	Median	Maximum
Asbestos	mf/L	20	90% [1]	<MDL	0.38
2,3,7,8-TCDD	pg/L [3]	20	95% [1]	na[2]	na[2]
Antimony	µg/L	20	0%	1.05	12.6
Arsenic	µg/L	20	0%	1.15	6.8
Cadmium	µg/L	20	70% [1]	<MDL	1
Chromium	µg/L	20	0%	2.5	8.6
Copper	µg/L	20	0%	21.35	67.2
Lead	µg/L	20	40% [1]	1.5	30
Nickel	µg/L	20	0%	2.1	10.3
Silver	µg/L	20	90% [1]	<MDL	0.4
Zinc	µg/L	20	5% [1]	33	142
Hexavalent Chromium	mg/L	20	95% [1]	<MDL	0.031
Toluene[4]	µg/L	20	90% [1]	<MDL	0.3
Bis(2-ethylhexyl)phthalate[4]	µg/L	20	70% [1]	<MDL	4.6
Di-n-octylphthalate[4]	µg/L	20	95% [1]	<MDL	9

[1] Values qualified as non-detect calculated at 1/2 the reported detection limit.

[2] Median and Maximum not included on table. One value estimated at 1.8 picograms/liter was detected below the calibration range. All other values below the MDL.

[3] Picograms per liter.

[4] This compound is a common constituent that can be introduced during field sampling and laboratory procedures.

Whole Effluent Toxicity

The 2003 NPDES permit issued to the Port of Seattle by the Washington Department of Ecology required acute toxicity testing on stormwater samples from a number of stations at the Seattle-Tacoma International Airport. The testing and analysis were performed by Nautilus Environmental. Effluent characterization was conducted quarterly between May 2004 and February 2005 on stormwater samples collected from all active outfalls using acute toxicity tests with Daphnia pulex and fathead minnow (Pimephales promelas). Samples were also collected and tested from five of these outfalls during a deicing event in December 2005; deicing activities did not occur in the remaining catchments and, consequently, samples from the remaining eight stations were not collected. No toxicity was observed in samples from eight outfalls; however, toxicity was observed in one or more samples from five outfalls with D. pulex and from two outfalls with fathead minnow. Toxicity is defined as survival of less than 65 percent in the full-strength sample.

Toxicity that has been observed has largely resulted from divalent metal cations, particularly zinc, combined with the low hardness associated with stormwater. Of the active stations initially tested, only one site (SDE-4) was considered to have an effluent limit for acute toxicity. Adverse effects observed at two other stations (SDN-1 and SDS-1) during effluent characterization were shown to be caused by metals and were related to the low hardness associated with stormwater. After adjustment of hardness of samples from these two sites to match that of the receiving environment, these sites did not result in adverse effects during re-characterization. Thus, toxicity would not be expected in the environment at these two stations as a result of the increase in hardness associated with the receiving environment.

The Port has invested considerably in efforts to reduce metals in stormwater at SDE-4 and other stations, and these efforts appear to have improved performance. Monitoring at SDE-4 resulted in no acute toxicity during any of the four quarters in 2007. Moreover, this site has demonstrated a decreasing trend in concentrations of metals over time. For example, average zinc concentrations in samples from SDE-4 tested for toxicity in 2005 (n=3), 2006 (n=4), and 2007 (n=4) were 0.31, 0.15 and 0.06 mg/L, respectively. Similarly, average copper concentrations in these same samples were 0.066, 0.026, and 0.019 mg/L, respectively.

Collectively, the results of acute toxicity testing of stormwater samples from the airport have demonstrated a low frequency of adverse effects. Efforts made by the Port to reduce metals concentrations appear to have been effective in reducing both metals concentrations and toxicity as measured by acute toxicity tests.

TSS vs. Turbidity Sampling and Monitoring Study Summary

The TSS vs. Turbidity Sampling and Monitoring Study provided information on suspended solid concentrations in receiving waters which receive STIA stormwater discharges. The turbidity and total suspended solids (TSS) data determined the Port's compliance with turbidity-based water quality criteria. The objective of the study was to provide information to answer two questions.

1. Is the in-stream aquatic life turbidity criteria met at TSS concentrations of 100 mg/L or less in discharges from the Port's stormwater outfalls?

2. Are the in-stream aquatic life turbidity criteria met at a turbidity level of 25 NTU or less in the discharges from the Port's stormwater outfalls?

The initial approach to address the objective for this study involved determining regressions between outfall discharge and in-stream water quality. However, the regressions were weak at best and did not provide accurate predictions. In response, the data evaluation approach was revised to simply compare the actual turbidity and TSS data measured with respect to the state standard for turbidity.

During the data collection period for this study, numerous substantial water quality BMPs were constructed and put into service. As a result of the successful implementation of new stormwater BMPs, most outfalls had two distinct data sets, pre- and post-BMP. The pre- and post-BMP assessment of outfall TSS and turbidity and in-stream effective turbidity indicates an overall reduction in in-stream turbidities after BMPs were installed. This is especially the case for data from the E4, S1, and N1 outfalls. Other outfalls lack post-BMP data to show a clear trend. However, it is presumed that BMPs will even further reduce turbidities in both outfall discharge and in-stream.

Measured outfall turbidity was found to be consistently less than 25 NTU in the post-BMP period. In-stream water quality met the 5 NTU over background standard each time the outfall turbidity was at or less than 25 NTUs. In-stream turbidity exceeded the 5 NTU over background state water quality standard once. In this case the outfall turbidity was above 25 NTU. Based on this analysis it appears that 25 NTU outfall turbidity is protective of in-stream aquatic life turbidity criteria (5 NTU over background). Conversely, on several occasions effective in-stream turbidity exceeded the state standard when the outfall TSS concentration was less than 100 mg/L.

Receiving Water Studies - Sublethal Toxicity Testing

The 2003 NPDES permit required sublethal toxicity testing on ambient water samples from a number of stations at STIA (Nautilus Environmental, February 2008).

Six waterbodies that receive stormwater discharges were identified in the NPDES permit for sublethal toxicity testing: Miller Creek, Des Moines Creek, Gilliam Creek, Walker Creek, Northwest Pond, and Lake Reba. The planned stormwater discharge to Walker Creek has not yet been established and, consequently, samples were not tested from this location. Samples were collected from the following six stations:

- Miller Creek (MC-SSA) downstream of Lake Reba.
- East Branch of Des Moines Creek (DME).
- East-West Confluence (EWCONF), established approximately 150 m downstream of the confluence of the east and west branches of Des Moines Creek.
- Gilliam Creek (GC).
- Outlet of Northwest Pond (NPOUT).
- Outlet of Lake Reba (LROUT).

Sample collection was required once during the spring and fall each year as well as during runoff associated with a deicing/anti-icing event. Samples were not collected from Miller Creek after the spring 2005 event because sampling requirements were transferred to Lake Reba (part of the Miller Creek Basin) in the October 2005 permit modification. Sampling ceased at EWCONF after the spring 2007 event because flow from outfall SDS-4, which had previously discharged upstream of this site, was rerouted to Northwest Ponds, and there are no longer any Port discharges between DME and EWCONF. Gilliam Creek was not sampled after 2005 because the industrial activity (sand storage area) was removed from the EY drainage basin in November 2005, resulting in no Port NPDES industrial outfalls draining to Gilliam Creek.

In general, a very low frequency and degree of adverse effects were observed in samples collected from locations near STIA using rainbow trout embryo tests. Only two samples (one from EWCONF and one from NPOUT) exhibited an EC25 of less than 100 percent. A third sample (from MILLRCK) exhibited an EC25 of less than 100 percent, but appeared to be a testing anomaly rather than being indicative of a toxic effect. (EC25 is the concentration of material in water to which test organisms are exposed that is estimated to be effective in producing some sublethal response in 25% of the test organisms over a defined period of time.) Only one sample exhibited an EC50 of less than 100 percent; the NPOUT sample collected in spring 2004 event had an EC50 of 62.2 percent.

A toxicity identification/reduction evaluation (TI/RE) plan was prepared and implemented for site EWCONF as a result of observing an EC25 of less than 100 percent at this station in December 2005. There was limited evidence for adverse effects associated with subsequent samples from EWCONF after completing the three required tests as described in the TI/RE Plan. Follow-up treatments indicated that an organic contaminant rather than a divalent metal cation may have been responsible for the observed adverse effects; however, the cause is uncertain as the magnitude of the effect was relativity small.

Comprehensive Receiving Water and Stormwater

The Comprehensive Receiving Water and Stormwater (CRWS) Runoff Study was required by Part II, Special Condition S6, of the STIA NPDES Permit. The CRWS Runoff Study included the following major program elements:

- *Year-round Event-based (YEBS) Receiving Water/Stormwater Study* – field measurements and sampling to assess the impact of stormwater runoff from the STIA outfalls into receiving waters upstream and downstream of individual STIA outfalls.
- *In-Stream Biological Monitoring Study* – seasonal field sampling and analyses to characterize benthic macro-invertebrate communities at sites upstream and downstream of STIA outfalls.
- *Limnology Study of Lake Reba and Northwest Ponds* – seasonal field measurements and sampling to document chemical, physical, and biological conditions in Lake Reba and the Northwest Ponds.
- *Non-Port Sources to Stormwater* – evaluation of stormwater loads from non-Port sources into the creeks and recommended actions to improve water quality through source controls in the creek watersheds.
- *Winter Event-based (WEBS) Receiving Water/Stormwater Study* – field measurements and sampling to assess the impact of airport ground surface deicing related BOD on receiving waters.

The overall objective of the CRWS Runoff Study was to determine the effect of STIA stormwater runoff on the receiving waters and existing stream biological communities, and to provide data to characterize seasonal conditions in Lake Reba and the Northwest Ponds. A secondary objective of the CRWS Runoff Study was to develop and analyze data to determine the relative contribution of STIA stormwater, compared to other sources of pollutants in the watershed.

The CRWS Runoff Study was designed to collect seasonal monitoring data for two years, allowing it to capture the variation in stormwater conditions; whenever possible. The number of stormwater events targeted for sampling was developed using statistical analyses. Seasonal in-stream biological studies of the benthic macro-invertebrate communities were conducted each fall during a 3-year period. Site-specific studies of Lake Reba and the Northwest Ponds were performed over a 2-year period.

The study found few exceedances of benchmarks or acute toxicity standards. Airport discharges to Lake Reba and Miller Creek, as well as to Northwest Ponds and West Des Moines Creek, showed little or no impacts from airport discharges. Notable differences were found between up and downstream stations in East Des Moines Creek where the airport contributed less than 30% of the flow to this reach of the receiving water.

Discharges of pollutants from STIA were noted as declining as a result of best management practices implemented. Decreases were most evident at the airport's discharges to East Des Moines Creek where enhanced treatment has been implemented. The decreases were noted as demonstration that BMPs implemented by the Port of Seattle are effective.

The water quality of Miller Creek and Des Moines Creeks was found to be comparable to other urban creeks in the region. The study indicated that implementation of new stormwater BMPs by other local jurisdictions in the Miller and Des Moines Creek watersheds would lead to further water quality improvements in these streams.

The CRWS provided the following recommended Port actions:

- Assess recent BMPs for performance against that projected in Engineering Report and Permit Effluent limits.
- Improve and implement new BMPs, as necessary, to meet permit limits.
- Continue to implement the revised SWPPP emphasizing source control and pollution reduction.
- Implement the new BMP Operations and Maintenance Manual as part of SWPPP.
- Consider and implement low impact develop techniques where feasible and compatible with land use and wildlife hazard management plan.
- Support and actively engage in basin planning efforts in Miller and Des Moines Creeks.

Winter Event-based (WEBS) Receiving Water/Stormwater Study (Deicing Study)

The deicing study was one portion of the CRWS as required by Part II, Special Condition S6, of the STIA NPDES Permit. This study had two specific objectives. The first was to evaluate the correlation between BOD and COD. The second was to evaluate if, and to what extent, receiving water dissolved oxygen (DO) is affected by stormwater runoff containing ground deicing chemicals. Because of the unique nature of this portion of the CRWS, the deicing study was conducted separately and a separate report titled *Effects of Airport Ground Surface Deicing Biochemical Oxygen Demand on Receiving Water Dissolved Oxygen* was prepared by Taylor Associates Incorporated (TAI, April 2008).

During the winter of 2006/2007, a rigorous water quality study in the Miller Creek/Lake Reba and Des Moines Creek/Northwest Ponds systems was conducted to evaluate the two deicing study objectives. This most recent deicing study built onto work conducted by the Port over the past fourteen years to address impacts from ground deicers on receiving waters. These past studies concluded that deicer-containing runoff did not depress dissolved oxygen in the two streams due to cold temperatures, reaeration, and short transit times. Therefore, the focus of the most recent deicing study was on dissolved oxygen within Lake Reba and Northwest Ponds.

Continuous in-situ water quality (temperature, dissolved oxygen, and specific conductivity) was monitored at nine locations from November 2006 through February 2007. Additionally, water samples were collected at the nine locations over a total of 27 days during three sampling events to assess water quality before, during, and after deicing activities. Water samples were analyzed for BOD, COD, K^+, Na^+, and Ca^{2+}. The first sampling event in November 2006 assessed background water quality during a rainfall event when ground surface deicing operations were not occurring. The second and third events, in November-December 2006 and January 2007, respectively, assessed water quality immediately before, during, and after application of deicers to STIA ground surfaces within the SDS drainage area. Both deicing events were considered to represent worse-case conditions in that relatively large quantities of ground deicing chemicals were applied. In both cases, deicer applications were followed by an initial runoff period that released deicers into the receiving waters, then an extended dry period that minimized flushing.

The correlation between biochemical oxygen demand (BOD) and chemical oxygen demand (COD) in stormwater runoff was analyzed for using linear regression. The results of this analysis indicated a significant correlation between BOD and COD for the two sampling events when ground surface deicing was occurring.

The second objective was to evaluate if the BOD or COD due to deicer chemicals in stormwater runoff impacted DO levels in the receiving water bodies. Overall trends of water temperature, water level and flow rate, and DO throughout the winter were examined. Linear regression analyses were conducted to determine the extent of correlation between flow rate and DO, and between BOD/COD concentrations and DO. The three ions (K+, Na+, and Ca2+) provided an effective indication of the presence of deicers in stormwater and were instrumental in assessing potential relationships.

Dissolved oxygen trends varied greatly throughout the 2006/2007 winter due to numerous environmental factors. Besides the trends from expected mechanisms, such as dissolved oxygen solubility due to temperature and diurnal variation resulting from vegetation photosynthesis and respiration, a strong trend between flow rate (as quantified by water level at each location) and DO was observed. The deicing study found that naturally occurring low DO during times of low flow was likely caused by low-DO groundwater inflows (as evidenced by data from groundwater wells around NW Ponds) and high sediment oxygen demand.

Linear regression of Lake Reba outlet data showed a strong correlation between water level and DO. No correlation was found between BOD/COD and Lake Reba DO. Results of the linear regression of data from the outlet of Northwest Ponds also show a correlation between water level and DO, along with some correlation between BOD and DO. Overall the field observations and the resulting linear regression analyses showed that DO varies greatly due to natural fluctuation of water levels in Lake Reba and Northwest Ponds, while changes due to BOD from deicers is very minimal or non-discernable.

The study results were further assessed in terms of BOD kinetic rates and travel times within the receiving waters. This assessment concluded that the low average water temperature during the two deicing events (3.8°C to 4.9°C) and short hydraulic travel times (approximately 14 and 16 hours in Northwest Ponds and 15 to 21 hours Lake Reba) were instrumental in inhibiting the effects of BOD/COD on DO levels in the receiving waters even during even worst-case, winter deicing events.

Site-Specific Study

The airport's current NPDES permit (Part II, Condition S9C.1) requires the Port to comply with Condition J.2 of the §401 Certification for the Master Plan Update Improvements, and specifically states that the Port must: "[c]onduct a site specific study, e.g., Water Effect Ratio, which is a criteria adjustment factor accounting for the effect of site specific water characteristics of pollutants bioavailability and toxicity to aquatic life…".

The interest in developing site-specific criteria or objectives for metals originates in the fact that most of the original toxicity studies that led to the development of metals criteria were conducted in laboratory water, which typically does not contain constituents (e.g., dissolved organic carbon) that have the capacity to reduce the bioavailability of the metals. Thus, metals toxicity in site waters is typically lower than observed in laboratory tests or predicted simply on the basis of differences in hardness between laboratory water tests and site water. Conversely, it is possible that site-specific characteristics of certain parameters (e.g., pH) might increase toxicity compared with that predicted on the basis of laboratory toxicity tests conducted in laboratory water.

Site-specific evaluations of toxicity are generally conducted to obtain empirical comparisons between tests conducted in laboratory water and in the site water of interest. The ratio between the toxicity observed in site water and that observed in laboratory water provides a measure of the effect of site water on the bioavailability of the contaminant of interest. This ratio is referred to as the water-effect ratio (WER), and is used to adjust the water quality criterion as appropriate on a site-specific basis.

The site-specific water quality assessment study was prepared by Nautilus Environmental and their reports are entitled:

- *Derivation of Site-Specific Water Quality Objectives and Effluent Limits for Copper in Stormwater (April 2008), and*

- *Derivation of Site-Specific Water Quality Objectives and Preliminary Effluent Limits for Zinc in Stormwater (April 2008).*

The Nautilus reports present the development of site-specific water quality objectives (SSWQOs) for copper and zinc in streams that receive stormwater discharges from the Seattle-Tacoma International Airport (STIA). On the basis of these objectives, SSWQO-based discharge limits for copper and zinc were derived.

Nautilus based its overall approach on guidelines promulgated by the U.S. Environmental Protection Agency (USEPA) and consisted of water-effect ratio studies (WERs) conducted with *Ceriodaphnia dubia*. Strict QA/QC standards were applied to ensure that a rigorous approach was used and that data quality objectives were met. A minimum of four to five WER comparisons were used to derive a final WER for each site; this number exceeds the minimum required by USEPA and further ensures that the final WER is a robust measure of the bioavailability of copper and zinc in each stream. Supplemental comparisons were also conducted with rainbow trout to ensure that the site-specific objectives derived from data obtained with *C. dubia* were also protective of salmonids. Finally, the calculated values were then compared with the original dataset to confirm that they were, indeed, appropriate.

Nautilus determined water-effect ratios for sites located in the Des Moines, Miller, and Walker Creek drainages. The water-effect ratios varied among the sites and ranged from 1.79 to 4.60, based on dissolved copper and 0.91 to 3.86 for dissolved zinc.

It is generally recognized that toxicity is largely associated with the dissolved form of the metal. Therefore the site-specific WER's were developed directly from the dissolved metal fractions. However, Ecology expresses effluent limits as the total recoverable metal fraction. Therefore, the study also determined site-specific dissolved to total translators for each receiving water site. The translator values varied among the sites and ranged from 0.62 to 0.89 for copper and 0.57 to 0.78 for zinc.

In addition to WER and translator values, determination of SSWQOs requires the harness each receiving water site. Harness is necessary as it is the primary variable in Washington State's freshwater acute copper and zinc criterion. As a conservative measure, Ecology protocol requires use of the 10^{th} percentile harness in calculating site-specific criteria.

Tables G-6 and G-7 summarize the Table G-6 and G-7 provide summaries of the final dissolved WER, dissolved to total translator, 10^{th} percentile harness along with the derived SSWQOs for copper and zinc.

Table G-6. Summary of Parameters Used to Derive Site-Specific Adjustments for Copper

Site	Final Dissolved WER[1]	Dissolved/ Total Translator	10^{th} Percentile Hardness	Site-Specific Water Quality Objective
Des Moines Creek East	4.60	0.74	21.2	25.6
West Des Moines Creek and Northwest Ponds	2.68	0.78	50.8	32.2
Lake Reba	1.79	0.79	69.3	28.5
Miller Creek at 8^{th} Ave	3.01	0.62	64.9	59.7
Walker Creek	2.32	0.89	103.8	47.9

[1] WER values calculated from dissolved metal fractions.

Table G-7. Summary of Parameters Used to Derive Site-Specific Adjustments for Zinc

Site	Final Dissolved WER[1]	Dissolved/ Total Translator	10^{th} Percentile Hardness	Site-Specific Water Quality Objective
Des Moines Creek East	3.86	0.78	21.2	155.6
West Des Moines Creek and Northwest Ponds	2.27	0.57	50.8	262.4
Lake Reba	1.00	0.58	69.3	147.5
Miller Creek at 8^{th} Ave	1.57	0.63	64.9	202.0
Walker Creek	0.91	0.71	103.8	154.6

The SSWQOs were derived by multiplying the acute criterion using the 10th percentile hardness by the site-specific dissolved WER. The resulting value is then divided by the dissolved to total translator in order to express the objective as the total recoverable metal fraction as follows for copper and zinc:

$$\text{Total Recoverable Copper SSWQO} = (e^{(0.9422(\ln(\text{hardness}))-1.464}) \text{ (Diss. WER) / Diss./Total Translator}$$

$$\text{Total Recoverable Zinc SSWQO} = (e^{(0.8473(\ln(\text{hardness})) + 0.8604}) \text{ (Diss. WER) / Diss./Total Translator}$$

It is important to note that the above equations use the generic acute criterion without the default translator (e.g., 0.960 for copper and 0.978 for zinc). This is done because the WER data were already in dissolved form and did not have to be converted from total.

APPENDIX H—PART III. CONSTRUCTION STORMWATER

STIA has undergone significant facility upgrades and expansion. Construction activities from future development will continue. In 1997, the Port developed the Master Plan Update (MPU). Most of the MPU elements have been completed: South Terminal Expansion Project, Central Terminal Expansion, Satellite Transit System overhaul, and the Third Runway. The Port has developed the Comprehensive Development Plan (CDP), which includes facility modifications and development through the next fifteen years. In addition to the CDP, ongoing maintenance and infrastructure projects continue.

The procedures that the Port employs to develop the construction stormwater management requirements for a project are spelled out in detail in the Programmatic Construction Stormwater Pollution Prevention Plan (SWPPP). In addition, each individual project has a project-specific SWPPP that covers its particular stormwater requirements, including those for monitoring and erosion control.

Construction stormwater management, in general, and the development of the project-specific SWPPP, in particular, are managed in a systematic manner throughout the life of a project. The goal is to identify the construction stormwater requirements early and incorporate them into the project. At the outset, capital projects are initiated in response to a business opportunity or a regulatory requirement. The Port uses a formal project plan and definition process to identify the project goals and scope. Regulatory compliance is a standard objective of all projects. Once the general scope of a project is defined, an Environmental Review Questionnaire is completed to identify whether the project will have any environmental issues, such as air quality, hazardous materials, contaminated sites, or water quality. The Aviation Environmental staff reviews the information from the Questionnaire. They advise the project managers and designers about the environmental considerations and best management practices (BMPs) that are appropriate for the specific job.

During the design phase, the Port's in-house engineers or architect/engineer consultant design teams create the plans and specifications for the contract. Environmental considerations are an important element in the design phase. Each project is evaluated to determine if specifically engineered stormwater design is necessary or standardized BMPs from the manual will suffice. The design teams include stormwater specialists, as appropriate for the particular project. Typically a design undergoes a formal review by many of the project stakeholders at the 30%, 60%, 90%, and 100% design stages. The number of reviews may vary for different projects. During each review, the reviewers are chosen for their expertise in a given area. For the stormwater aspects of a project, environmental specialists and Professional Engineers conduct the reviews. The reviewers work to assure that the design meets the intent of the stormwater requirements established for the project. The Aviation Environmental staff reviews the design for its adequacy in terms of overall environmental compliance, including compliance with the NDPES permit.

Erosion and sediment control design is addressed in all earth-disturbing projects and other construction projects that have the potential to impact stormwater. Over the years, the Port has developed expertise managing construction projects under the increasing demands of the airport's NPDES permit. This experience has been applied toward the development of a master specification for stormwater (called "Section 02270 - Temporary Erosion and Sediment Control Planning and Execution"). This master specification and accompanying drawings clearly identify responsibilities and requirements. This master guide specification is modified during the design phase to fit the requirements of a particular project.

The NPDES permit includes construction stormwater outfalls and Stormwater Pollution Prevention Plan. Construction stormwater discharges may utilize the same stormwater conveyance system and outfalls as nonconstruction stormwater section or create additional stormwater outfalls.

Short-Term Construction Project - Resurfacing of the First Runway

This project is expected to proceed, beginning April 2009 and completing by the end of September 2009. The project will be required to meet the Port's construction stormwater permit requirements which include effluent limits for pH and turbidity and any other relevant effluent limits. In addition, the contractor will be required to adhere to best management practices (BMPs) specified in the latest edition of the Ecology *Western Washington Stormwater Manual*. Prior to notice to proceed, the contractor will be submitting a project-specific Erosion and Sediment Control Plan for Port review and approval. This plan will clearly identify specific BMPs to be used on the project and be updated regularly as site conditions warrant.

An on-site batch plant may be used to supply concrete for this project. If an on-site batch plant is used, the contractor will be required to obtain a separate sand and gravel permit and meet all other state and local requirements.

Stormwater Pollution Prevention Plan

Each project has a project-specific Stormwater Pollution Prevention Plan (SWPPP) that consists of three documents: a monitoring plan (developed by the Port); a Pollution Prevention Plan (PPP); and Contractor Erosions and Sediment Control Plan (CESCP). Both the PPP and the CESCP are prepared by the contractor but must be reviewed and accepted before the Port issues the Notice to Proceed to the contractor.

The SWPPP is a living document and is updated as site changes or unforeseen issues arise. Updates are reviewed and approved by Port staff.

Monitoring Plan

The monitoring plan includes a site assessment, monitoring and inspections, project stabilization, and reporting and record keeping requirements. All projects that disturb greater than one acre or are related to the MPU require a monitoring plan. The monitoring plan is submitted to Ecology thirty (30) days prior to ground-disturbing construction activity.

During the design phase, environmental staff identify construction outfall and determine if treatment is necessary. Stormwater associated with construction activities is categorized as non-treated, batch chemically treated, and continuous flow chemically treated.

<u>Outfall Designation</u>

The construction stormwater outfalls are identified by the point of discharge into the receiving water. The outfalls are named with a letter and number code. The letter depicts with basin.

D – Des Moines Creek
M – Miller Creek
W – Walker Creek
G – Gilliam Creek

The number is a chronological number to track multiple outfalls in each basin. Because unable to predict the exact location of future construction discharges, the outfalls are defined by a 15 second latitude and longitude grid box. See Figure D-1.

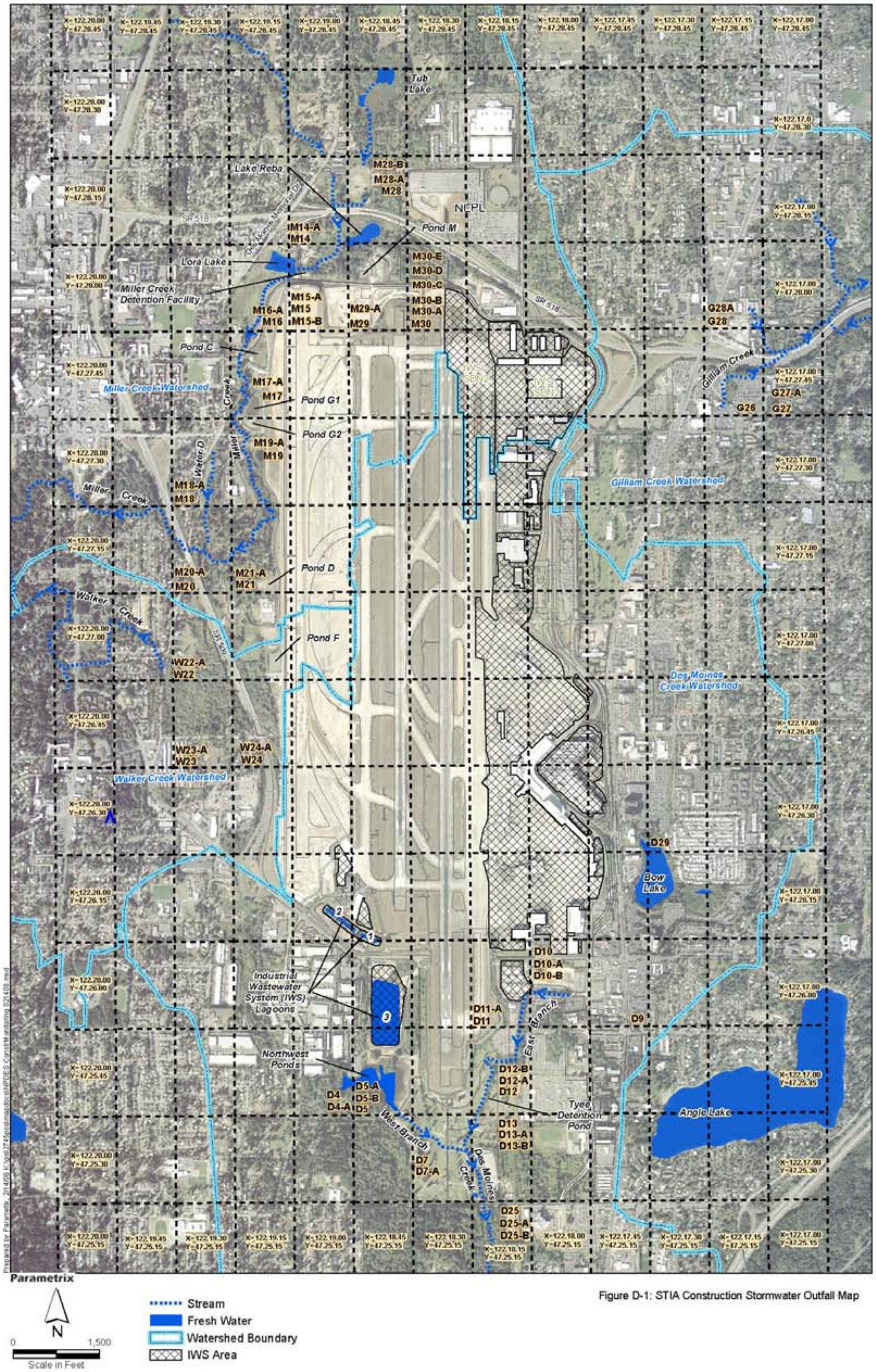

Figure D-1: STIA Construction Stormwater Outfall Map

<u>Non-Treated Stormwater</u>

During any storm event greater than 0.5 inches within a 24-hour period, the Port will measure in-stream for pH, turbidity, total petroleum hydrocarbons, and flow. Arsenic was sampled in historically-undisturbed areas out of concerns over fallout from the Asarco Smelter. All historically-undisturbed areas have since been redeveloped. Samples for pH and turbidity are collected upstream and downstream of the outfall. The outfall is observed for visual sheen. If a sheen is present, then a sample is collected and analyzed.

<u>Chemical Treatment</u>

STIA utilizes batch and continuous chemical treatment for construction stormwater. Ecology-approved technologies are utilized for treatment, and prior to discharge, the effluent is sampled for pH, turbidity, and flow. TPH sampling is performed in the detention area. Arsenic is sampled in historically undisturbed areas. The Port follows Ecology's GULD or CULD and BMP C250.

Pollution Prevention Plan

The Contractor Pollution Prevention Plan (PPP) consists of planning and implementing measures to prevent the pollution of soil and water, control and dispose of pollutants, spill prevention and response.

Contractor Erosion and Sediment Control Plan

The Contractor Erosion and Sediment Control Plan (CESCP) consists of planning, installing, inspecting, maintaining and removing temporary erosion and sediment control BMPs to prevent pollution of air and water, controlling and responding to eroded sediment and turbid water.

Near-term projects:

- Sound Transit Light Rail.
- Bus Maintenance Facility (Comprehensive Development Plan).
- Warehouse Facility (Comprehensive Development Plan).
- Consolidated Rental Car Facility.

Water Quality Characterization

Tables H-1 and H-2 describe the construction effluent characterization discharged into the surrounding fresh water for non-chemically and chemically-treated construction stormwater.

Table H-1: Non-Chemically Treated Outfalls 1/1/2005 - 12/31/07

Parameter	Unit	Average	Minimum	Maximum
Monthly Flow Rate	MGD	0.931	15.1	0.004
pH			5.72	10.23
Oil & Grease (TPH)	Visual	No Sheen	No Sheen	No Sheen
Turbidity - Variance between downstream and upstream	NTU	5.565	0	259
Arsenic [(a)]	µg/L	101.82	0.5	150

Table Note:

[a] The arsenic numbers are not representative because of the 42 analyses between 1/1/05 and 12/31/05, 24 of them were reported by NCA as non-detect at <300 µg/l. The remainder were analyzed by ARI with detects at from 2 to 4 µg/l. The effluent limit is 360 µg/l, so all are valid numbers but calculating Average, Min, Max does not give usable numbers.

Table H-2: Chemically-Treated Outfalls 1/1/2005 - 12/31/07

Parameter	Unit	Average	Minimum	Maximum
Monthly Flow Rate	MGD	0.67	0.025	2.763
pH		NA	6	8.5
Oil & Grease (TPH)	Visual	No Sheen	No Sheen	No Sheen
Turbidity	NTU	3.326	0.6	24.3
Arsenic	µg/L	< 125	< 125	< 125

APPENDIX I—PRIORITY POLLUTANTS

Priority Pollutants (Clean Water Act)

Chemical Name	CAS Registry Number (or EDF Substance ID)
ACENAPHTHENE	83-32-9
ACENAPHTHYLENE	208-96-8
ACROLEIN	107-02-8
ACRYLONITRILE	107-13-1
ALDRIN	309-00-2
ALPHA-ENDOSULFAN	959-98-8
ALPHA-LINDANE	319-84-6
ANTHRACENE	120-12-7
ANTIMONY	7440-36-0
AROCLOR 1016	12674-11-2
AROCLOR 1221	11104-28-2
AROCLOR 1232	11141-16-5
AROCLOR 1242	53469-21-9
AROCLOR 1248	12672-29-6
AROCLOR 1254	11097-69-1
AROCLOR 1260	11096-82-5
ARSENIC	7440-38-2
ASBESTOS (FRIABLE)	1332-21-4
BENZ(A)ANTHRACENE	56-55-3
BENZENE	71-43-2
BENZIDINE	92-87-5
BENZO(A)PYRENE	50-32-8
BENZO(B)FLUORANTHENE	205-99-2
BENZO(GHI)PERYLENE	191-24-2
BENZO(K)FLUORANTHENE	207-08-9
BENZYL BUTYL PHTHALATE	85-68-7
BERYLLIUM	7440-41-7
BETA-ENDOSULFAN	33213-65-9
BETA-LINDANE	319-85-7
BIS(2-CHLORO-1-METHYLETHYL) ETHER	108-60-1
BIS(2-CHLOROETHOXY)METHANE	111-91-1
BIS(2-CHLOROETHYL) ETHER	111-44-4
BIS(2-CHLOROISOPROPYL) ETHER	39638-32-9
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7
BIS(CHLOROMETHYL) ETHER	542-88-1
4-BROMOPHENYL PHENYL ETHER	101-55-3
CADMIUM	7440-43-9
CAMPHECHLOR	8001-35-2
CARBON TETRACHLORIDE	56-23-5
4-CHLOR-M-CRESOL	59-50-7
CHLORDANE	57-74-9
CHLOROBENZENE	108-90-7
CHLORODIBROMOMETHANE	124-48-1
CHLOROETHANE	75-00-3
2-CHLOROETHYL VINYL ETHER	110-75-8

CHLOROFORM	67-66-3
CHLOROMETHANE	74-87-3
2-CHLORONAPHTHALENE	91-58-7
2-CHLOROPHENOL	95-57-8
4-CHLOROPHENYL PHENYL ETHER	7005-72-3
CHROMIUM	7440-47-3
CHRYSENE	218-01-9
COPPER	7440-50-8
CYANIDE	57-12-5
DDD	72-54-8
DDE	72-55-9
DDT	50-29-3
DELTA-LINDANE	319-86-8
DI-N-OCTYL PHTHALATE	117-84-0
DI-N-PROPYLNITROSAMINE	621-64-7
DIBENZ(A,H)ANTHRACENE	53-70-3
1,2-DIBROMOETHANE	106-93-4
DIBUTYL PHTHALATE	84-74-2
1,4-DICHLOROBENZENE	106-46-7
1,2-DICHLOROBENZENE	95-50-1
1,3-DICHLOROBENZENE	541-73-1
3,3'-DICHLOROBENZIDINE	91-94-1
DICHLOROBROMOMETHANE	75-27-4
1,2-DICHLOROETHANE	107-06-2
1,1-DICHLOROETHANE	75-34-3
1,1-DICHLOROETHYLENE	75-35-4
DICHLOROMETHANE	75-09-2
2,4-DICHLOROPHENOL	120-83-2
1,2-DICHLOROPROPANE	78-87-5
1,3-DICHLOROPROPENE (MIXED ISOMERS)	542-75-6
DIELDRIN	60-57-1
DIETHYL PHTHALATE	84-66-2
DIMETHYL PHTHALATE	131-11-3
2,4-DIMETHYLPHENOL	105-67-9
4,6-DINITRO-O-CRESOL	534-52-1
2,4-DINITROPHENOL	51-28-5
2,4-DINITROTOLUENE	121-14-2
2,6-DINITROTOLUENE	606-20-2
1,2-DIPHENYLHYDRAZINE	122-66-7
ENDOSULFAN SULFATE	1031-07-8
ENDRIN	72-20-8
ENDRIN ALDEHYDE	7421-93-4
ETHYLBENZENE	100-41-4
FLUORANTHENE	206-44-0
FLUORENE	86-73-7
GAMMA-LINDANE	58-89-9
HEPTACHLOR	76-44-8
HEPTACHLOR EPOXIDE	1024-57-3
HEXACHLORO-1,3-BUTADIENE	87-68-3

HEXACHLOROBENZENE	118-74-1
HEXACHLOROCYCLOPENTADIENE	77-47-4
HEXACHLOROETHANE	67-72-1
INDENO(1,2,3-CD)PYRENE	193-39-5
ISOPHORONE	78-59-1
LEAD	7439-92-1
MERCURY	7439-97-6
METHANAMINE, N-METHYL-N-NITROSO	62-75-9
METHYL BROMIDE	74-83-9
N-NITROSODIPHENYLAMINE	86-30-6
NAPHTHALENE	91-20-3
NICKEL	7440-02-0
NITROBENZENE	98-95-3
4-NITROPHENOL	100-02-7
2-NITROPHENOL	88-75-5
PENTACHLOROPHENOL	87-86-5
PHENANTHRENE	85-01-8
PHENOL	108-95-2
PYRENE	129-00-0
SELENIUM	7782-49-2
SILVER	7440-22-4
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD)	1746-01-6
1,1,2,2-TETRACHLOROETHANE	79-34-5
TETRACHLOROETHYLENE	127-18-4
2,3,4,6-TETRACHLOROPHENOL	58-90-2
THALLIUM	7440-28-0
TOLUENE	108-88-3
1,2-TRANS-DICHLOROETHYLENE	156-60-5
TRIBROMOMETHANE	75-25-2
1,2,4-TRICHLOROBENZENE	120-82-1
1,1,2-TRICHLOROETHANE	79-00-5
1,1,1-TRICHLOROETHANE	71-55-6
TRICHLOROETHYLENE	79-01-6
2,4,6-TRICHLOROPHENOL	88-06-2
VINYL CHLORIDE	75-01-4
ZINC	7440-66-6

APPENDIX J—ACRONYM KEY

IWS – Industrial Wastewater System

IWTP – Industrial Wastewater Treatment Plant

STIA – Sea-Tac International Airport

AKART – All Known and Available and Reasonable Technology

SWPPP – Stormwater Pollution Prevention Plan

BOD – Biological Oxygen Demand

TOC – Total Oxygen Demand