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We are transmitting the following materials: DRAFT BMP ASSESSMENT  
FOR EXISTING SDS SUBBASINS.

Comments:

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Sincerely,

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# DRAFT

## Seattle-Tacoma International Airport WQ BMP Assessment June 11, 1999

### 1. PURPOSE AND SCOPE

This document is prepared in support of the Water Quality Certification for the Seattle-Tacoma International Airport (STIA) Master Plan Upgrades. It describes the status of existing stormwater runoff treatment best management practices (BMPs) and proposed BMP upgrades to comply with redevelopment requirements.

This document does not discuss BMPs for future Third Runway SDS subbasins, since these will be designed in compliance with the Department of Ecology Stormwater Management Manual for the Puget Sound (the Ecology Manual).

Hydrologic (flow) controls will not be discussed. The Port of Seattle (the Port) has demonstrated in other analyses that hydrologic controls for existing and future development will comply with Ecology Manual requirements.

### 2. REGULATORY REQUIREMENTS

Ecology has stated that the Master Plan Upgrades are considered "redevelopment." The Ecology Manual defines redevelopment as follows:

Redevelopment - means, on an already developed site, the creation or addition of impervious surfaces, structural development including construction, installation or expansion of a building or other structure, and/or replacement of impervious surface that is not part of a routine maintenance activity; and land disturbing activities associated with structural or impervious redevelopment.

The Ecology Manual requires a Stormwater Site Plan for redeveloped sites greater than one acre with 50% or more existing impervious area (STIA has approximately 50% impervious area). The Stormwater Site Plan must include a schedule for implementing the stormwater Minimum Requirements "to the maximum extent practicable, for the entire site (emphasis not added)."

### 3. BMP IMPLEMENTATION HIERARCHY

In accordance with the requirement to implement stormwater runoff treatment BMPs to the maximum extent practicable on the entire site, the Port agrees to undertake the following:

1. Implement treatment BMPs in all new SDS subbasins in compliance with the Ecology Manual.
2. For all portions of existing SDS subbasins that will be redeveloped as part of Master Plan projects, implement BMPs in compliance with the Ecology Manual.
3. For portions of existing subbasins that are anticipated to be redeveloped as part of projects within the next 20 years (e.g. the North Air Terminal), implement BMPs during those redevelopment actions.
4. For portions of existing subbasins that are not anticipated to be redeveloped, nothing is proposed. In the event that later redevelopment occurs, BMPs will be assessed at that time.

The Port will apply stormwater treatment BMPs as described above to pollution-generating impervious surfaces (PGIS). The King County Surface Water Design Manual defines PGIS as follows:

**Pollution-Generating Impervious Surface (PGIS):** Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to vehicular use or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall. Metal roofs are also considered to be PGIS unless they are treated to prevent leaching.

Infrequently used maintenance roads (such as those in the runway infields) and coated rooftops are not considered PGIS. Water quality treatment BMPs are not required and will not necessarily be provided for these impervious areas. Relative to PGIS, non-PGIS is not considered to generate significant amounts of pollution.

#### 4. DESCRIPTION OF BMPs

The three primary BMPs that will be used for stormwater runoff treatment are filter strips, bioswales, and wetvaults. Stormwater treatment wetlands and infiltration facilities will be used to a limited extent in some areas. These facilities are briefly described below.

- **Filter strips** treat runoff as it sheet-flows directly off of impervious surfaces onto long, shallow-sloped grassy areas. Flow velocity is slowed by grass, enhancing the settling of particulates. Vegetation also mechanically traps particles. Some water infiltrates into the ground as it flows over the vegetated area, further filtering out particles. Removal of metals and organic compounds is also significant, as these pollutants bind to trapped particles and/or the organic material in the soil and vegetation. Filter strips will be the primary water quality BMP for existing and proposed runways and taxiways.
- **Bioswales** are grassy, flat-bottomed swales that receive runoff after it is collected and concentrated (in most cases, runoff passes through a detention facility before

entering a bioswale). Although flow depth and flowpath length are typically greater than for filter strips, the pollutant-removal mechanisms are the same.

- **Wetvaults** provide a permanent pool (dead storage) to settle out particulates and metals and organic compounds that bind to particulates. Wetvaults are designed to enhance settling by using "plug flow," whereby inflowing stormwater displaces the clean water already in the vault as a unit.
- **Stormwater treatment wetlands** are used in a limited capacity at STIA. They function by settling out particulates and sorbed metals and organics, as well as providing biological uptake of metals and nutrients.
- **Infiltration facilities** are also used infrequently at STIA. Infiltration facilities consist of basins, vaults, or trenches constructed to enhance infiltration of stormwater into the ground. These facilities provide both flow control and water quality benefits; pollutants are filtered out as water percolates through the top layers of soil.

## 5. STIA BMP ASSESSMENT

Attachment 1 provides a summary of the BMP assessment. The assessment consisted of a subbasin-by-subbasin inventory of (1) PGIS, (2) existing runoff treatment BMPs, (3) additional proposed BMPs per Section 3, and (4) estimated costs for additional BMPs. The methods used for this analysis are described below.

### 5.1 Subbasin Areas

Only subbasins with permitted outfalls are included in this analysis. Subbasin areas on Attachment 1 represent the area of existing subbasins as they will be configured upon completion of the Master Plan. Significant subbasin areas that will be redeveloped within the next 20 years are not included in the analysis; it is assumed that BMPs in these areas will be upgraded to the maximum extent possible during redevelopment. For example, Subbasin SDS-4 north of South 170<sup>th</sup> Street was not included in the analysis, because BMPs will be installed during the construction of North Air Terminal projects.

### 5.2 Existing BMPs

Existing BMPs were assessed using a combination of existing engineering plans, airphotos, historical information, and direct observation and measurement. For example, for existing runway and taxiway drainage, cross-sections in original plans showed flow over long grassy strips before discharging to catchbasins in the infield. Although these original cross-sections were not available for all runways and taxiways, the drainage plan was similar for many other areas; thus, filter strips were assumed for these other areas.

To date, some ground-truthing has occurred. Additional ground-truthing must be performed to confirm BMP sizes and locations.

Bioswales are conservatively assumed to be trapezoidal, 6 feet wide at the base, 2-inch-deep flow (regularly mowed), with 3:1 side slopes.

### 5.3 Assessment of BMP Coverage

Adequacy of BMP coverage per the Ecology Manual was assessed for each subbasin. For each acre of PGIS, BMP size requirements were calculated for the water quality design flow, which is the runoff from the 6-month, 24-hour storm. Runoff from this storm (1.8 inches) is 0.24 cfs. Based on this flow, the approximate required size per acre of each BMP was calculated (Table 1).

BMP	Required Size Per Acre
Bioswale	1500 square feet
Filter Strip	7000 square feet
Wetvault	0.106 acre-feet
Stormwater Wetland	1500 square feet

No BMPs or costs were included for non-STIA-owned areas included in subbasin boundaries (e.g., S. 188<sup>th</sup> Street).

### 5.4 Identification of Additional BMPs

For subbasins where BMP coverage is not provided per the Ecology Manual, additional treatment BMPs were identified to provide runoff treatment to the maximum extent practicable.

In some cases, the total BMP coverage for a subbasin may be numerically correct, while some portions of the PGIS do not receive sufficient treatment per the Ecology Manual. Under these circumstances, additional BMPs were identified for these areas.

### 5.5 Removal of PGIS from Subbasins

For certain limited areas (e.g., the Upper and Lower Terminal Drives), the most appropriate BMP for runoff treatment is diversion to the IWS. SDS diversions to the IWS will be included in the implementation hierarchy identified in Section 3.

Rooftop coatings were also identified as a BMP to convert PGIS to non-PGIS.

## 6. RESULTS AND DISCUSSION

The BMP inventory and identification of additional BMPs is discussed below by subbasin. Additional information pertinent to stormwater quality is also included.

#### SDN-1A (cargo building rooftops and Air Cargo Road)

The cargo building rooftops will be coated with a rubberized or polyvinyl material to prevent metal leaching; when coated, drainage from these rooftops may be separated

from Air Cargo Road drainage and discharged directly. A wetvault is proposed for Air Cargo Road, which will be widened in 2001 or 2002.

SDN1-B (flight kitchen rooftops and parking lots South 154<sup>th</sup> Street)

A stormwater wetland and bioswale are sized to treat the drainage area, but it appears that some of the PGIS does not discharge via these BMPs. Options for routing all PGIS through these BMPs will be investigated.

SDN-2

This basin is routed to a pump station, which is designed to bypass the 6-month, 24-hour storm to the IWS. Filter strips also provide runoff treatment.

SDN-3

This subbasin appears to be in compliance. Filter strips for runways and taxiways must be verified.

SDN-4

This subbasin appears to be in compliance. Filter strips for runways and taxiways must be verified.

SDE-4 (south of South 170<sup>th</sup> Street)

This area is among the most complex of the SDS subbasins. BMPs proposed for this area include wetvaults and bioswales for the South Access Freeway and Link (in compliance with the Ecology Manual), when constructed. The Upper and Lower Terminal Drives will be routed to the IWS. No other major redevelopments of the existing PGIS area are currently planned. However, if this area undergoes substantial reconstruction, BMPs will be installed to the maximum extent practicable.

SDE-4 (NEAT area)

This cargo area north of South 170<sup>th</sup> Street is proposed to undergo substantial redevelopment as part of the North End Terminal (NEAT) project, which will add new passenger terminal and ground transportation facilities. BMPs for this area will be installed per the Ecology Manual during NEAT construction.

SDE-4 (taxiways)

A small section of taxiways is included in SDE-4. It appears that filter strips may serve the taxiway area, although the width may not be fully adequate, per Ecology Manual requirements. However, because the infields in this location would not allow for a significant widening of the filter strips, no additional BMPs are currently proposed for this area. If this area undergoes substantial reconstruction, BMP area will be increased to the maximum extent practicable.

SDE-4 (Doug Fox Parking)

Currently, drainage plans indicate that an infiltration facility and bioswale serve this parking lot. Effective operation of the infiltration facility must be confirmed. This area

may be reconfigured as part of NEAT development. Additional BMP requirements for the existing area will be deferred until after the NEAT configuration is finalized.

#### SDS-1

The Alaska Airlines hangar parking lot is the largest PGIS area in this subbasin. This area may be converted to rooftops or IWS as part of the South Terminal Expansion Project (STEP). However, if any or all of the parking area remains, bioswales will be installed to treat the area per the Ecology Manual. Also as part of STEP, two catchbasins that potentially drain a portion of the Aircraft Movement Area will be routed to the IWS. The area under the South Satellite overhangs (subject to precipitation blow-in) may also be plumbed to the IWS.

#### SDS-2

The PGIS in this area consists of a gravel parking lot used intermittently for rental car parking. It is proposed that this parking lot be removed. However, if it remains, a bioswale will be installed to treat the area, per the Ecology Manual.

#### SDS-3

BMP coverage per Ecology Manual requirements is provided for approximately 100 acres out of 235 acres of PGIS. Of the remaining 135 acres requiring additional treatment, 45 acres consist of taxiway area near the terminal, on which no major redevelopment is planned. Installation of runoff treatment BMPs in this area would not be practicable. Options for increasing BMPs coverage for the remaining taxiway, to the maximum extent practicable, will be investigated.

#### SDS-4

This subbasin appears to be in compliance. Filter strips for runways and taxiways must be verified.

#### SDS-5 (formerly SDW-3D) and SDS-6 (formerly SDW3-B)

Bioswales will be constructed to treat runoff from the Perimeter Road, to the maximum extent practicable. This may be achieved by reconfiguring the existing road ditches to create bioswales.

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**BMP INVENTORY, RETROFIT REQUIREMENTS, AND COST ESTIMATES**

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**BMP INVENTORY, RETROFIT REQUIREMENTS, AND COST ESTIMATES**

Basin	Perv Area (ac)	Non-PGIS (ac)	Poll Gen Imper Area (ac)	Tot Area (ac)	Exist BMPs	Exist FS Area	Exist BS Area	Exist WL Area	BMPs Provide Treatment for Acres	Shortfall Acres	Tmnt Req'd				TOTAL TREATED AREA	
											0.11 ac/in	1500 sf/ac	7000 sf/ac	Costs \$1,000 per 1000 sf		
SDN-1 (Roadtop and AC Road)	3.4	9.1	3.6	16.1	none	0	0	0	0.0	3.6	0.38	0	0	253,000	0	3.6
SDN1B (Piggy Back)	0.4	1.8	3.2	5.4	WQ trmt wetland and BS	0	3,500	1,500	0.7	2.5	0	3,750	0	0	0	3.2
SDN-2	5.3	0.1	2.1	7.5	WQ design storm flows to IWS FS 1700'x45	76,500	0	0	2.1	-	0	0	0	0	0	2.1
SDN-3	49.7	0.0	24.7	74.4	FS 6800'x115'	782,000	0	0	24.7	-	0	0	0	0	0	24.7
SDN-4	21.2	0.0	9.0	30.2	FS 2400'x40'	96,000	0	0	9.0	-	0	0	0	0	0	9.0
SDE-4 south of 170th sanitary area	2.7	12.7	58.6	74.0	none	0	0	0	0.0	58.6	4.07	16,800	0	0	2	49.6
SDE-4 Dump For Parking	10.1	0.0	18.8	28.9	FS 2000'x25'	50,000	0	0	4.6	14.2	0	0	0	0	0	4.6
SDS-1	1.4	5.2	2.6	9.2	none	0	0	0	0.0	2.6	0.78	14,140	0	0	0	18.2
SDS-3	180.6	0.0	234.6	415.2	FS 24000'x70'	1,680,000	0	0	100.0	134.6	0	0	627,200	0	0	189.6
SDS-4	32.5	0.0	32.3	64.8	FS 3000'x120'	360,000	0	0	32.3	-	0	0	0	0	0	32.3
SDS-5 Kennedy SDW-3B	28.3	1.7	2.5	32.5	none	0	0	0	0.0	2.5	0	3,750	0	0	0	2.5
SDS-6 Kennedy SDW-3B	14.3	0.0	3.0	17.3	none	0	0	0	0.0	3.0	0	4,500	0	0	0	3.0