Port of Seattle

Annual Stormwater Monitoring Report

for

Seattle-Tacoma International Airport

for the period July 1, 2000 through June 30, 2001

September 2001

1 EXECUTIVE SUMMARY

This Annual Stormwater Monitoring Report has been prepared pursuant to Special Condition S2.E of the NPDES permit for the Port of Seattle's Seattle-Tacoma International Airport (STIA). This report covers required stormwater sampling for the 14 outfalls listed in permit condition S2.B. The Port took a total of 61 grab and 59 composite stormwater samples from a total of 22 storm events in the past year, bringing the 7-year totals to over 400 samples and 168 storm events. The Port complied with all sampling and reporting requirements in the NPDES permit.

In summary, STIA stormwater quality, especially airfield runoff, continues to have constituent concentrations lower than those reported in comparable regional studies. Results continue to demonstrate that most constituent concentrations in STIA airfield outfall discharges are much lower than those from the landside outfalls. This difference is most likely due to higher vehicular use in the landside areas and a higher degree of biofiltration present in the airfield subbasins. Nonetheless, overall STIA results are generally lower than results from other studies for roadways and commercial areas.

The Port is continuing to investigate management options for the zinc in runoff associated with two cargo buildings with galvanized metal rooftops. This work is a follow up to whole effluent toxicity (WET) testing findings reported in 2000. Recent work has focused on stormwater treatment alternatives where several media have been tested in controlled laboratory experiments, including commercially available CSF® deciduous leaf compost produced by Stormwater Management (Portland OR) and specially modified soybean hulls developed by the U.S. Department of Agriculture. Both the leaf compost and the soybean hulls are agricultural waste products that can be recycled as water-treatment media.

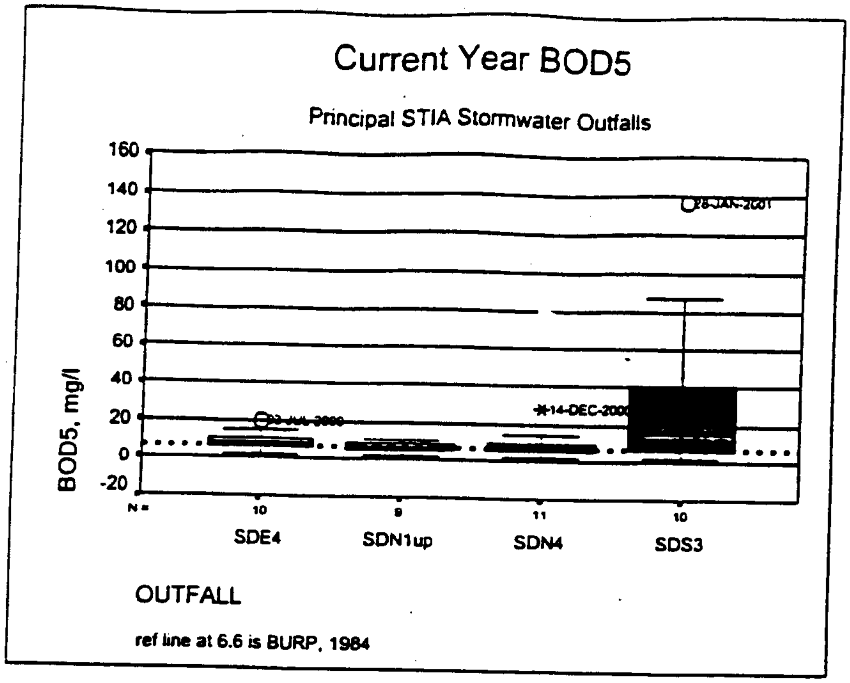

Figure 7 BOD_5 for Current Year

4.5.3 Metals

All data reported below are for total recoverable metals. It is important to note that Washington State Water Quality Standards (WAC 173-201A) apply to the receiving waters, not to the discharges from a particular outfall. See the discussion in Section 3.3 concerning the STIA monitoring locations relative to the receiving streams.

The Washington State water quality standards for copper, lead, and zinc are based on toxicity associated with the dissolved fraction of the metal. Because of complex water chemistry, only a portion of the dissolved fraction is actually bioavailable (Hall et al., 1997). Thus, direct comparisons of dissolved metals with standards may result in "false positives" where a sample is not actually toxic. Results for dissolved copper and zinc analyzed in WET testing and source tracing studies (POS, 2000b) at the Port's principal outfalls have shown that dissolved fractions were often substantially less than the 96% to 98% ratios applied by default in the water quality standards (Ecology's and EPA's). The comparisons offered below are based on the total recoverable metal using the non-specific ratios (partitioning coefficients) provided in the water quality standards and Ecology's TSDCALC8 workbook. The application of site-specific coefficients for these calculations would be more appropriate.

4.5.3.1 Copper

Overall, in 312 samples in the past six years, the median copper value for all outfalls sampled is 0.024 mg/l. Airfield and landside outfall data in this case are similar, with medians ranging from 0.020 to 0.031 mg/l. See Figure 8. Nearly 80% of all STIA copper data to date (312 samples) are less than the 0.040-mg/l median from the City of Portland's sampling results (City of Portland, 1993.)

These comparisons are more representative of outfall discharges than the Bellevue, 1995 median of 0.01 mg/l that was for *instream* stormwater samples. However, note that the comparators listed in Table 4 show that urban runoff typically exceeds receiving water standards for copper when compared directly and without mixing.

In samples from the minor subbasins SDS2, SDS5, SDS6, and SDS7 not associated with landside or airfield activity, median copper ranges from 0.005 to 0.013 mg/l, where all data has been substantially less than the two comparators cited here. Nearly half of the copper data for these four outfalls has been below the receiving water standard of 0.010 mg/l. Passenger vehicle roads and/or parking is very limited to non-existent in these four subbasins.

Copper results from the past year exhibited no new maxima, though an SDS3 result of 0.111 from the August 18, 2000 sample ranked third in the total of 58 samples to date. In past years, some samples associated with certain seasons and/or weather patterns have resulted in elevated copper. The top three SDS3 copper results all occurred in samples from storms in the month of August after extended dry periods of 2 weeks to 33 days (in 1996, 1998, and 2000). Though the length of the dry antecedent period may be significant in its effect on copper, there may be other important determinants such as rainfall intensity.

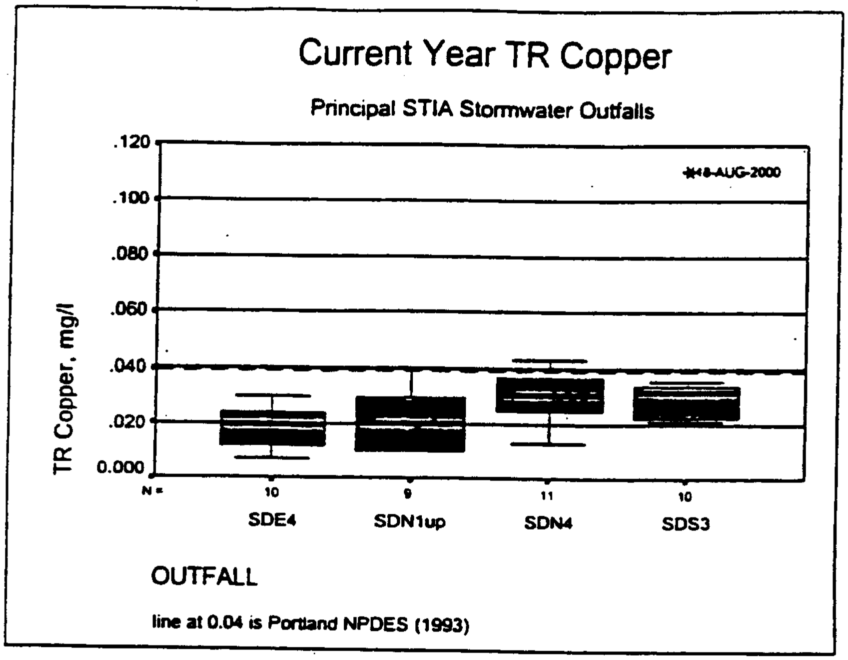

Figure 8 Total Recoverable Copper for Current Year

4.5.3.2 Lead and zinc

Samples from airfield outfalls continue to contain less lead and zinc concentrations than typical urban sources. In the seven-year permit sampling history, the vast majority of the 312 results for lead and zinc in all STIA outfalls were below the median for comparable regional data for commercial areas. For the four airfield outfalls, which comprise more than 65% of the total SDS, nearly all (more than 97%) of the 145 sample results to date for lead and zinc were less than the comparators.

These comparisons have added significance given that the commercial/industrial comparators cited (see Table 4) are very conservative data. Plus, these Bellevue (1995) lead and zinc comparators reflect *instream* sample concentrations after outfall discharges were mixed with receiving waters. Thus, metals in the vast majority of STIA stormwater, especially airfield runoff, are generally far lower than those measured in other local and regional studies. Current results continue these patterns, See Figure 9 and Figure 10.

Much of the airfield outfall lead and zinc data are below water quality standards. All but one of 145 lead results in the past seven years are below the standard of 0.039 mg/l calculated at a hardness of 56 mg/l (Table 4.) In fact, lead was not detected in 50% of these 145 total samples. Airfield zinc was similar in that more than 85% of the 145 results are less than the standard of 0.072 mg/l at 56 mg/l hardness[5]. See Figure 9 and Figure 10.

Importantly, lead and zinc concentrations measured in airfield outfall samples were far lower than those in the landside outfall samples were. The overall median lead and zinc values for principal airfield outfalls SDS3 and SDN4 (0.041 and 0.021 mg/l respectively) were three to ten times *less* than for the landside outfalls SDE4 and SDN1 (0.134 and 0.192 mg/l, respectively). See Figure 9 and Figure 10. This difference is likely associated with a higher degree of passenger and service vehicle usage in the landside areas.

The lead result of 0.035 mg/l from the SDN1 sample of 12/14/00 was associated with elevated TSS and turbidity in the sample. These TSS and turbidity results were new maxima for SDN1, representing outliers most likely associated with truck traffic. See Section 4.5.1. Though not an overall outlier, this lead result ranked third overall in the 37-sample history for SDN1, and was near the

[5] In two storms in 1999, hardness values in seven Miller and Des Moines Creek instream composite samples ranged from 41 to 74 mg/l with a median of 56 mg/l

historical maximum of 0.048 mg/l of January 13, 1999. Though not unusual, the zinc result in this sample was in the 78th percentile for all SDN1 data.

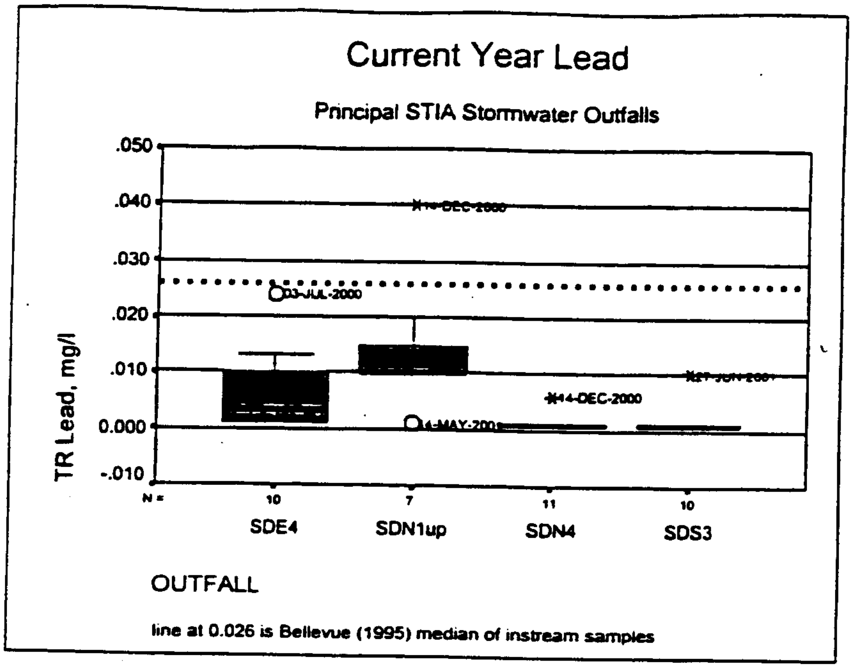

Figure 9 Total Recoverable Lead for Current Year

The landside subbasins experience considerable vehicle traffic where tire wear is a likely source of zinc (EPA 1993). Roads and parking areas constitute more than 50 percent of the impervious surfaces draining to SDE4 and SDN1. The lower results for the airfield outfall samples are most likely attributable to the fact that airfield runoff flows through grass areas prior to draining to the piping system. Certain portions of landside subbasins SDE4 and SDN1 will be assessed for appropriate BMP retrofits, such as biofiltration, according to the recent CSMP (Parametrix 2001).

Zinc associated with runoff from galvanized roofing material appears to effect only outfall SDN1. Unlike SDE4, where several metal-roofed cargo buildings make up a few percent of the total impervious area in the subbasin, three similar cargo buildings comprise nearly 30% of the total impervious area drained by SDN1 (at the sampling station). Five WET tests in 1998-99 did not indicate toxicity in the SDE4 samples, while significant toxicity was found in multiple SDN1 samples. Source-tracing indicated that the SDN1 toxicity was attributable to zinc (POS 2000b; Tobiason and Logan 2000). However, the SDN1 sampling point tested is more than ½ mile upgradient from Lake Reba (a detention facility) and its outfall to Miller Creek. Several instream samples below the Lake Reba outfall have shown much less zinc than the SDN1 data and have not indicated toxicity (POS, 1997c, Parametrix 1999).

Despite the benefits provided by the Reba detention facility, the Port has been collaborating with other researchers in investigating several options for mitigating the zinc in the SDN1 (rooftop) runoff. Because re-roofing or painting costs appear high, runoff treatment by media filtration appears as a potential cost effective solution. According to the manufacturer of the roofing material, painting it would cause product warranty problems. Therefore, there are more issues to consider than cost alone.

Stormwater treatment media tested recently in controlled laboratory experiments include commercially available CSF® deciduous leaf compost produced by Stormwater Management Inc. (Portland, Ore.) and specially-modified soybean hulls developed by the U.S. Department of Agriculture Agricultural Research Service Southern Regional Research Center (New Orleans, La.). Both the leaf compost and the soybean hulls are agricultural waste products that can be recycled as water-treatment media. Other media tested proved less suitable or even generated some degree of toxicity.

Implementation concepts include deploying the media in commercially available Stormfilter™ cartridges in below-grade, pre-cast vaults; or in cartridges adapted for above-grade downspouts. These options amount to a new stormwater BMP option that appears much more cost-effective than re-roofing or painting to eliminate zinc sources. Further studies will characterize the long-term performance and operations and maintenance costs for these options for dealing with metal rooftop runoff. In addition, in the coming year, the Port will begin evaluating other rooftop runoff according to the provisions of the CSMP (Parametrix 2001).

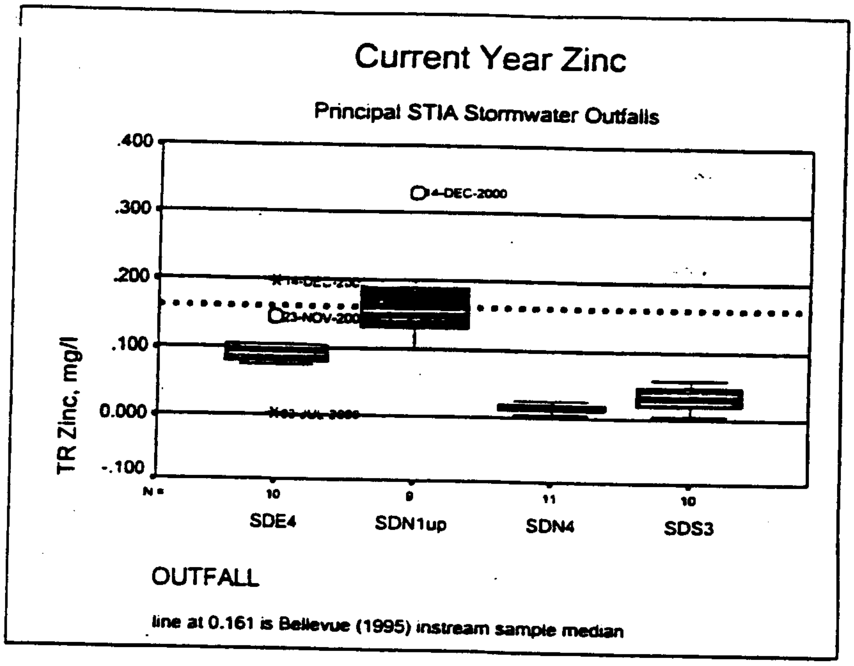

Figure 10 Total Recoverable Zinc for Current Year

4.6 Deicing Event Samples

The permit requires sampling and analysis for glycols during "deicing events". The Port conducts this sampling according to the Ecology-approved Procedure Manual (POS, 1999a.) The glycol data discussed below encompass mostly composite samples collected during periods of aircraft deicing, representing average values during a storm event discharge. Some of the data are from grab samples as required for outfalls SDS1 and SDN2. The two major deicing events

AR 017901