Annual Stormwater Monitoring Report

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for

Seattle-Tacoma International Airport

for the period June 1, 1997 through June 30, 1998

Port of Seattle

November 1998

AR 033384

Exhibit-2089

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LIST OF ACRONYMS

Acronym	Definition
AMA	Aircraft Movement Area (mainly runways, taxiways)
BMP	best management practice
BOD_5	5-day biochemical oxygen demand
DMR	discharge monitoring report
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FOG	fats, oils and grease
GC	gas-chromatographic
IR	infrared absorbance
IWS	industrial waste system (including the piping)
MDL	method detection limit
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
Port	Port of Seattle
ppb	parts per billion, same as µg/l or ppm/1000
ppm	parts per million, same as mg/l
RPD	relative percent differnce
SRES	Stormwater Receiving Environment Study
STIA	Seattle-Tacoma International Airport
SWPPP	Stormwater Pollution Prevention Plan
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
TSS	total suspended solids
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

This Annual Stormwater Monitoring Report has been prepared pursuant to Special Condition S2.E of the National Pollutant Discharge Elimination System (NPDES) permit for the Port of Seattle's (Port) Seattle-Tacoma International Airport (STIA). Special Condition S2.E of the permit states: "On or before October 1[1] of each year, the Permittee shall submit a report to the Department summarizing the results of the stormwater monitoring conducted pursuant to Special Condition S2.B or S3.E of this permit during the preceding twelve (12) month period from July 1 through June 30. The report shall present the analytical data, the Port's conclusions as to what is being learned from the data, and any new initiatives to be undertaken as part of the Stormwater Pollution Prevention Plan (SWPPP) for Airport Operations required in Special Condition S12." Special Condition 2SB also requires inclusion of specific storm events and hydraulic information.

The required hydraulic and hydrologic data are included in Appendix A. Analytical results are tabulated and summarized for each outfall in Appendix B. Field quality control data are presented in Appendix C.

The Port's stormwater data are compared to other generally accepted reference comparators. Box plots are used to present the sampling data. Box plots provided in numerous figures illustrate the central tendency, spread, and skew of the data.

In summary, STIA stormwater quality is better than regionally comparable runoff quality. Results continue to demonstrate that stormwater quality at the airfield outfalls under typical conditions is consistently better than regional commercial and industrial areas. Results also show that there are differences in stormwater quality between landside and airfield subbasins. However, the data tend to indicate that runoff from non-Port public roadways unfavorably biases STIA stormwater, especially in the landside outfall

1 A request for submittal extension until November 30, 1998 was granted to the Port by Washington State Department of Ecology (Ecology).

samples. Nonetheless, overall STIA results are generally lower than results for roadways and commercial areas.

Monitoring in the past year indicates improvements in stormwater quality after best management practices (BMPs) were implemented, especially those BMPs that rerouted drainage from the storm drain system to the IWS. BMPs implemented over the past year and performance data are discussed in Section 4.

Evaluation of the stormwater discharges at STIA is an ongoing process. A key factor in attaining improved water quality is implementation of BMPs. BMPs are evaluated as part of the SWPPP and are part of the NPDES permit requirement. Based on the data and conclusions presented in this report, as well as other knowledge regarding STIA activities, the following potential new initiatives have been identified.

1. Evaluate monitoring requirements in the permit and request modifications as appropriate, based on the effectiveness of BMPs or other changes at STIA.

2. Continue to investigate possible sources of fecal coliforms in SDE4 discharges.

3. Explore rerouting of drainage from several minor SDS3 drain inlets beneath the overhangs of the C Concourse that could be responsible for isolated elevated BOD_5 concentrations in SDS3.

4. Continue to monitor glycols in SDS1 discharges to verify the effectiveness of two capital BMPs designed to reduce and eliminate glycols and other pollutants by rerouting drainage to the IWS or sealing minor inlets.

5. Require contractors to implement source control and BMP related to construction activities.

6. Continue to evaluate tenant activities.

7. Revise and update the SWPPP on a regular basis.

1.0 INTRODUCTION

This Annual Stormwater Monitoring Report has been prepared pursuant to Special Condition S2.E of the National Pollutant Discharge Elimination System (NPDES) permit for the Port of Seattle's (Port) Sea-Tac International Airport (STIA). Special Condition S2.E of the permit states: "On or before October 1[1] of each year, the Permittee shall submit a report to the Department summarizing the results of the stormwater monitoring conducted pursuant to Special Condition S2.B or S3.E of this permit during the preceding twelve (12) month period from July 1 through June 30. The report shall present the analytical data, the Port's conclusions as to what is being learned from the data, and any new initiatives to be undertaken as part of the Stormwater Pollution Prevention Plan for Airport Operations required in Special Condition S12."

Additionally, the permit requires in Special Condition S2B that: "The permittee shall include the following data for each storm event in the Annual Stormwater Monitoring Summary Report...: date, duration, the number of dry hours preceding the storm event, total rainfall during the storm event (inches), maximum flow rate during the rain event (gallons per minute), and the total flow from the rain event (gallons). The Permittee shall also include a monthly summary of daily rainfall...".

This report summarizes and discusses the required data, the conclusions, and potential new initiatives to be undertaken. Some of these initiatives have also been identified in the STIA Stormwater Pollution Prevention Plan (SWPPP).

This report consists of the following sections:

- Chapter 2 presents the methods used to comply with reporting requirements including background information on the sampling requirements and subbasin descriptions

[1] A request for submittal extension until November 30, 1998 was granted to the Port by Washington State Department of Ecology (Ecology).

- Chapter 3 presents the sampling results including a discussion of the data

- Chapter 4 presents a summary BMP performance

- Chapter 5 provides conclusions based on the data

- Chapter 6 includes a discussion of potential new initiatives at STIA

- Chapter 7 contains documents cited and used in the preparation of this report.

2.0 METHODS

2.1 GENERAL

The following describes the methods used to gather information required in this report. The STIA stormwater monitoring program has been in place since 1993 pursuant to the NPDES permit. The permit was renewed in early 1998 and replaced with permit number WA-002465-1, issued February 20, 1998, and effective March 1, 1998. The Port conducted the required monitoring activities according to the specific guidelines and criteria of the Procedure Manual for Stormwater Monitoring (Port 1998a).

The new permit effective 1 March 1998 changed the sampling frequencies and parameters. Table 1 outlines the changes to the sampling program.

2.2 DESCRIPTION AND CATEGORIES OF SUBBASINS

Subbasin names are coded according to location: EY = engineering yard, TY = taxi yard, SDS1 - storm drain South number 1, SDW3 = storm drain West number 3, etc. The NPDES permit refers to outfalls by number; however, this report refers to subbasins and their outfalls by location (see Table 2). The Port identifies all manholes according to an alphanumeric scheme, some of which are referred to in this report.

Figure 1 shows the individual stormwater drainage subbasins and the STIA stormwater management boundaries. STIA stormwater subbasins have been classified into the general categories listed in Table 2. These categories group subbasins together that have similar land use and other characteristics. These categories include "landside," "airfield," and other non-specific, low-activity areas. Airfield subbasins SDS3, SDS4, SDN3, and SDN4 drain the Aircraft Movement Area (AMA), which includes the airport runways, taxiways, and open space. Airfield subbasins represent approximately 65 percent of the total STIA storm drainage area. Drainage area calculations are included at the end of the hydraulic and hydrologic estimates included in Appendix A.

In previous reports, the SDS1 subbasin was included in the "terminal" category. However, several stormwater diversion projects were undertaken near the terminal as a best management practice (BMP). SDS1 now drains mostly rooftops, minor ramp areas, and the currently expanding drainage from South 188th Street.[2] Therefore, it falls into neither category.

The remaining subbasins (SDE4, SDN1, EY, and TY) are associated with the activities on the "landside" of the airport, primarily public roads, parking, and passenger vehicle areas. Although 11 percent of the total impervious area of SDE4 drains portions of Taxiways A and B, the "landside" designation is appropriate because roads, parking, and other vehicle areas make up more than 50 percent of the total impervious area. Outfall SDN2 now discharges to the Industrial Waste System (IWS) via two pump stations constructed as BMPs in 1997.

2.3 SAMPLING LOCATIONS

The Port monitors stormwater discharges at 14 locations, one for each subbasin within the boundary of the permit. Figure 1 shows the location of the outfalls and monitoring locations.

Four monitoring locations (subbasins SDE4, SDN1, EY, and TY) are upstream from the final discharge point. Runoff contributions from other, non-STIA sources enter these storm drains and therefore necessitate monitoring at the first location, often a manhole, upstream of the majority of offsite inputs. Table 3 lists these offsite influences. Eliminating all offsite runoff is not possible for sampling stations in SDE4, SDS1, SDS2, and SDS3.

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[2] Drainage from recent S. 188th Street improvements, outside the Port's jurisdiction, is increasing the SDS1 drainage area.

2.4 STORM SAMPLING PROCEDURES AND ANALYTES

The Port's Procedure Manual for Stormwater Monitoring (Port 1998a) describes the criteria for sampling storm events, and describes all relevant sampling, programming, and handling necessary to comply with requirements of the permit. Table 4 lists required sampling frequencies, pollutant analytes, methods, and detection limits.

3.0 SAMPLING RESULTS

3.1 GENERAL

Data are discussed separately for results from grab samples, composite samples, and deicing event (glycol) samples because of the differences in sampling protocols (i.e., grab samples versus composite samples) and because some rainfall events sampled did not meet the "storm" standards. Following these discussions is a summary of data relating to BMP performance.

The required hydraulic and hydrologic data are included in Appendix A. Analytical results were validated according to the representativeness standards described in the Port's Procedure Manual for Stormwater Monitoring (Port 1998a). Analytical results are tabulated and summarized for each outfall in Appendix B. Field quality control data are presented in Appendix C. It should be noted that data previously submitted to Ecology in the monthly discharge monitoring reports (DMRs) represent samples collected from strictly those storms and sampling routines that fully met the standards of the Procedure Manual. This report summarizes all data collected at storm drain outfalls.

3.1.1 Method of Data Presentation and Comparisons

This report compares the Port's stormwater data to other generally accepted reference comparators listed in Table 5. In general, the reference comparator was selected as the more conservative of two City of Bellevue studies because they were comprehensive, local studies, and had similar sampling protocols.

Appendix A summarizes daily rainfall on a monthly basis graphically and in tabular form. In addition, the storm event information, including total rainfall, maximum flow rate, and total flow is included in Appendix A. In the past 13 months ending June 1998, rainfall meeting "storm" standards[3] occurred on 29 occasions. One month, July 1997, had no rainfall that qualified as a storm. The Port sampled 18 (62 percent) of these "storms," plus three other rainfall events ("non-storms") that did not meet the 0.20-inch minimum rainfall. To meet permit sampling requirements, it was necessary to sample a high proportion of all "storms." Despite incomplete, and therefore non-representative composite samples that resulted in these cases, the grab samples can still provide useful information.

"Non-storm" grab samples were collected on the same basis as grab samples taken from true "storms"; usually within minutes of the onset of runoff. Therefore, given the consistent sampling protocol, all grab sample results can be aggregated regardless of total rainfall.

Box plots (Figures 2 through 23) are used to present the sampling data. Box plots illustrate the central tendency, spread, and skew of the data. The bold line within a box represents the median value, while the bottom and top of a box show the 25th and 75th percentiles, respectively. In other words, 50 percent of the time the data fall within values highlighted by the box. SPSS software was used to generate the box plots (SPSS 1993).

The size of the box shows the variability, and the "whiskers" show the largest values that are not considered statistical outliers. When summarizing data to compare typical values, outliers usually represent unusual conditions, atypical of what one could expect on a day-to-day basis. SPSS reports two types of outliers: those more than 1.5 box-lengths from the 75th percentile as "o", and those more than 3.0 boxlengths as "*" each captioned with the date of occurrence (SPSS 1993). General box plots showing difference between runoff quality for each of the three subbasin activity types (airfield, terminal, and landside) may have smaller scales than the box plots showing the data of each outfall. The general box plots show the overall difference between the subbasin

3 A "storm" event is defined as having total rainfall of at least 0.20 inch, separated by more than 12 hours of dry weather from past or subsequent events, and preceded by a period of 48 hours with no more than 0.10 inch rainfall from discrete events.

categories while the outfall box plots have increased scales as appropriate to show outlying values.

Although outliers and anomalies exist in the data, the following discussion of the data focuses on the median values of the sampling results and the observed trends.

3.2 GRAB SAMPLE RESULTS

The following discussion includes results from all grab samples collected in the past year. The entire data set for grab sample results comprises 224 samples from "storms", plus 8 results from samples of other rainfall events that did not reach the minimum rainfall standard of 0.20 inches.

3.2.1 Fats, Oils, and Grease (FOG) and Total Petroleum Hydrocarbon (TPH)

The renewed NPDES permit changed several analytical parameters. The TPH method was changed from an infrared absorbance (IR) method (WTPH 418.1) to a gas-chromatographic (GC) method (NWTPH-Dx.) Because the new TPH method became effective 9 months into the current reporting cycle, data from both methods are presented in this section.

The results from the current year presented in Figures 2 and 3 continue to demonstrate that concentrations of petroleum-type pollutants in STIA stormwater are consistently less than in stormwater from other urban areas. The following bulleted items present a discussion of these results.

- STIA stormwater overall continues to have less petroleum-type pollutants than typical urban runoff. During the past year, more than 95 percent of STIA results were less than the Bellevue 1996 median of 3.7 miligrams per liter (mg/l), and only a single sample exceeded this value. The overall STIA median was

0.5 mg/l for TPH (IR), and 0.7 mg/l for TPH (GC). Overall, TPH was not detected above 1 mg/l in the majority of samples [65 percent of a total of 54 samples analyzed for TPH(IR)].

- Airfield stormwater (SDS3, SDS4, SDN3, and SDN4) contains far less FOG and TPH concentrations than runoff from the landside subbasins (SDE4, SDN1, and TY.) TPH was not detected in 73 (92 percent) of the 79 airfield outfall samples collected in the past four years.

- Most of the TPH detected in landside runoff is likely attributable to cars and trucks. Figure 4 shows that motor oil represents the majority of the TPH at these outfalls (SDE4, SDN1, and TY.)

- The IWS effectively isolates aviation-related fuel spills and drips from the storm drains. Detectable TPH concentrations are infrequent and low in stormwater from SDS subbasins, which are contiguous with aircraft service (IWS) areas.

- In the box plots, "SDN1" refers to samples collected at manhole SDN1-27. "SDN1up" refers to samples collected from manhole SDN1-22, upstream of offsite runoff from 9.9 acres of public roads.[4] Moving the SDN1 sampling station to a point above the influences of offsite runoff (non-Port, public roadway) decreased FOG and TPH concentration results in SDN1 outfall data and removed a high bias imparted to previous samples. This is shown graphically in Figure 5.

- FOG and TPH concentrations detected in SDS1 samples seem to be decreasing. Figure 6 shows a decrease in the ranges and median of FOG and TPH concentrations for samples collected after completion of two BMPs (discussed in Section 4) that rerouted stormwater in aircraft services area.

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[4] With Ecology's concurrence, in October 1996 the Port changed the sampling location for SDN1 from manhole SDN1-27 to manhole SDN1-22, upgradient from public road runoff.

3.2.2 Fecal Coliforms

Overall, the median value for fecal coliforms in 187 samples to date was 30 per 100 ml, with 75 percent of the results less than 230 per 100 ml. These results indicate that STIA stormwater contains fewer fecal coliforms than typical urban stormwater. More than 75 of the airfield subbasin samples showed fecal coliforms less than the comparative value of 201 per 100 ml.

Small animals and birds inhabit many of the respective drainage areas and are believed to be the sources of these infrequent findings. Urban stormwater often contains fecal coliforms in elevated numbers, and sanitary sewage is not always implicated.

In past reports, the Port showed that fecal coliforms were found principally in the landside subbasin SDE4. Current results for 5 of 10 SDE4 samples showed elevated results greater than or equal to 500 per 100 ml. However, four samples showed fecal coliforms less than this comparator. The 10th sample is not representative due to holding time being exceeded by 9+ hours. The Port is conducting a source tracing study intended to identify potential sources of contamination. Preliminary results, included in Section 4.6, do not indicate sanitary sewage as a source in storm or baseflows. Uncontaminated baseflow samples indicate that there is no continuous source of fecal coliform bacteria. Investigations are ongoing and results will be presented in subsequent Annual Stormwater Monitoring Reports.

3.3 COMPOSITE SAMPLE RESULTS

Results from composite samples are segregated from grab samples which represent only instantaneous values. Composite sample results, especially those from samples that comprise the entire hydrograph, represent an average value over a longer time period.

3.3.1 Suspended Solids and Turbidity

STIA outfalls continue to discharge typically less total suspended solids (TSS) and turbidity than urban areas. In the 4 year sampling history at STIA, more than 85 percent of the 230 TSS samples and 191 turbidity samples were below the comparative values of 50 mg/l, and 29 NTUs, respectively. As shown in Figures 8 and 9 results for the past year continue to be consistently low. Because of this consistency with past findings, only current year data are shown in the box plots.

The airfield outfalls continue to produce less TSS and turbidity than the landside subbasins (SDE4, SDN1 and TY). Results from all but two of 36 samples from the principal airfield subbasins (SDS3, SDN3, and SDN4) were less than one-half the regional comparative median values. Because these airfield outfalls represent about 61 percent of the total SDS area, the majority of STIA runoff is much lower in suspended material than runoff from comparable regional urban areas. Vehicle roadways and parking lots predominate in the landside subbasins and are surmised to be a principal source of suspended material.

3.3.2 Biochemical Oxygen Demand (BOD_5)

At STIA, principal sources of BOD_5 have been aircraft deicing glycols and ground (runway, taxiway, and roadway) deicing chemicals. Results for the past year continue to indicate overall low levels of BOD_5 in STIA stormwater. The median of 5.4 mg/l from 39 samples collected in the past year was below the 6.6 mg/l regional urban comparator (Bura 1984, see Table 5). Airfield outfalls (SDS3, SDS4, SDN3, and SDN4) continued to be generally lower in BOD_5 concentrations than landside outfalls SDE4 and SDN1. These observations are visible in overall data collected in the past 4 years (see Figures 10 and 11). These figures show that data from the past year are lower than previous results, notably for SDS1.

Principal sources of BOD_5 concentrations in the past were associated primarily with major winter weather episodes and the accompanying deicing events. Acetate-based ground surface deicers were the primary sources of BOD_5, with isolated indications of aircraft deicing glycols. All known direct sources of glycols have been eliminated from the storm drains.

In the past year, only two limited periods of winter weather (January 3, 1998 and January 9-13, 1998) occurred where the Port applied chemicals to ground surfaces (primarily runways and taxiways.) Compared to past years, snowfall and chemical usage, including aircraft glycols, was far less (Port 1998b, Port 1997c.) During the January 12, 1998 event, BOD_5 results ranged from non-detectable to 213 mg/l at the five outfalls sampled. Because glycol concentrations were either very low or not detected in these samples, the elevated BOD_5 concentrations were attributable to the acetate-based runway (ground) deicing chemicals.

It is important to note that the entire drainage area of outfall SDN2 was re-routed to the IWS in 1997 as a result of two BMPs, discussed in Section 4 of this report. These BMPs in SDN2 (two pump stations) eliminated drainage from areas that had been previous sources of BOD_5 resulting from aircraft and ground deicing materials. As a direct result of these BMPs, the vast majority of the runoff from SDN2 for the past year was pumped to the IWS. No discharges to the SDS were recorded during the 11-13 January snow event.

3.3.3 Ammonia

The current permit deleted ammonia from the list of required sample analytes. The principal source of ammonia in past stormwater samples was the urea applied as a runway deicer. The Port completely discontinued the use of urea by the end of 1996.

In the past year, ammonia concentrations in 20 samples from seven STIA outfalls continued to be well below any acute toxicity standard (see Figure 12). Because of the consistency with past findings, only current year data are shown on Figure 12. More than 75 percent of all data were below the regional comparator of 0.17 mg/l. In addition, ammonia was not detected in 35 percent of the samples. The maximum value detected was 0.24 mg/l at SDE4 on 16 December 1997. The current data show that ammonia concentration has decreased to background levels airport-wide.

3.3.4 Surfactants

The current permit deleted surfactants from the list of required sample analytes. Results from samples collected in the first eight months of the past year are included in Appendix B.

In the past year, 99 percent of the 20 sample results were less than 1 mg/l, and more than 70 percent were less than 0.2 mg/l. The maximum surfactant detected was 0.95 mg/l. Surfactant concentrations continue to be below levels of concern. This information is consistent with past reports. Because of the consistency with past findings, only current year data are shown in Figure 13.

3.3.5 Metals

This report presents total recoverable metals data for stormwater discharges from STIA outfalls as required in the NPDES permit. The discussion below focuses on copper, lead, and zinc; The remaining metals results are summarized in tabular form in Appendix B.

Washington State Water Quality Standards (WAC 173-201A) apply to the receiving waters, not to the discharges from a particular outfall. Stormwater discharges are diluted in receiving waters. Therefore, it is inappropriate to compare outfall sample results directly with Ecology or the U.S. Environmental Protection Agency (EPA) standards.

The Washington water quality standards for copper, lead, and zinc are based on the dissolved fraction of the metal. The dissolved fraction is generally used to determine potential toxicity, an approximation of what is actually available (i.e., the bioavailable fraction for uptake by aquatic organisms).

3.3.5.1 General Results. General results are discussed below; more detailed discussion follows under the bullets of the three predominant metals: copper, lead, and zinc. In addition, a summary of other metal data is provided as a final bullet.

Although copper concentrations detected in STIA outfalls exceed associated with typical urban sources, the concentrations are less than those associated with Interstate 5 runoff.

Airfield outfalls continue to contain less lead and zinc concentrations than typical urban sources. In the four-year permit sampling history, over 95 percent of the results for lead and zinc in airfield outfalls were below the median for comparable regional data for commercial areas. In addition, the entire data set for lead and zinc in 73 samples from airfield outfalls was less than the mean concentrations for highway runoff[5]. This is significant given that the commercial/industrial comparators cited (see Table 5) are conservative and reflect instream sample concentrations after outfall discharges mixed with receiving waters.

It should also be noted that lead and zinc concentrations detected in STIA airfield outfalls were far lower in lead and zinc than the landside outfalls. This is likely due to the amount of passenger vehicle usage in the landside areas, much of which is beyond the Port's jurisdiction. Finally, in the past four years, 98 percent of all lead results from the airfield outfalls were less than the acute standard.

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[5] The 1980-81 highway study median value for lead is 0.47 mg/l (Chui, Horner and Mar, 1982.) Since this study, the sources of lead in stormwater discharges nationwide have decreased considerably due to the phase-out of leaded gasoline.

- Copper. Copper concentrations in STIA stormwater continue to be lowest in discharges from two of the airfield outfalls, SDN3 and SDS4. Copper concentrations have declined significantly in SDS1 runoff since the rerouting of the storm drainage to the IWS in June 1997. As shown in Figures 14 and 15, the landside outfalls SDE4 and SDN1 display higher copper as well as do the airfield outfalls SDS3 and SDN4. However, these figures also show that the majority of STIA copper data were lower than in runoff from Interstate 5 (see Table 5). In addition, copper in urban runoff commonly exceeds the receiving water standards as demonstrated by several regional studies. Copper concentrations detected in landside outfall samples is likely related to the heavy vehicle activity within SDE4 and SDN1.

  Unlike the other airfield outfalls, subbasin SDS3 has elevated copper concentrations.

- Lead. Lead concentrations continue to be lowest in the airfield subbasins as shown in Figures 16 and 17. Overall, more than 75 percent of STIA lead data was lower than comparable regional data, shown by the upper reference line in Figure 16. In addition, more than 80 percent of the lead concentrations in STIA samples were well below the acute toxicity standard of 0.016 mg/l for total lead. This standard is calculated at 28 mg/l total hardness, a conservative value that represents the 10th percentile recorded for the SRES (Port 1997b.) Landside subbasins SDE4 and SDN1 tended to contain higher concentrations of lead than other outfalls (see Figure 18). The Port believes that vehicle activity in these subbasins is a potential source of lead. Much of this non-industrial vehicle activity takes place on public roadways that drain to the Port's outfalls and monitoring locations.

- Zinc. At all outfalls, zinc concentrations observed at STIA during the past four years of monitoring were considerably lower than the comparative value for highways (0.638 mg/l), and current data continue with these patterns as shown in Figure 19.

Zinc concentrations continue to be lowest in the airfield subbasins as indicated by the reference line in Figure 18. The majority (97 percent) of zinc data for the four airfield outfalls was lower than the median (0.161 mg/l) from the City of Bellevue's 1996 study. Total zinc concentrations for landside outfalls SDE4 and SDN1 were higher than those of the airfield outfalls (see Figure 18). 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.

In October 1996, the Port changed the sampling location for SDN1 from manhole SDN1-27 to manhole SDN1-22, upgradient from public road runoff. The changing of SDN1 sampling station resulted in generally lower zinc concentrations (see Figure 18). This difference indicates that runoff from Highway SR518 elevated zinc concentrations in samples collected at the downgradient location. This apparent difference in SDN1 data suggests that data collected prior to altering the location should be considered to contain a high bias.

In terms of potential toxicity, STIA monitoring results indicate that over 63 percent of the data from the four airfield outfalls was less than the toxic standard for total zinc calculated to be 0.04 mg/l using a highly conservative hardness value. In contract, the Bellevue 1996 study showed 61 percent of the 178 zinc samples taken exceeded the EPA standard. Given that all comparative regional zinc data in Table 5 are median values, most regional data would also exceed the standard.

All zinc results for landside outfalls SDE4 and SDN1 exceeded this standard. Again, comparing STIA outfall results directly to any water quality standard for surface water is extremely conservative since no account is made for mixing or the mitigating effects of the receiving water. The Port considers that roadway runoff is responsible for the elevated zinc values in the landside outfalls.

Finally, zinc concentrations have decreased considerably for outfall SDS1 discharges in the period since the Port rerouted 1.8 acres of aircraft service area to the IWS.

- Other Metals. Table 6 shows a summary of results for other metals analyzed in recently collected samples. These data are from samples collected between June 1997 and March 1998. Analysis requirements for these metals were deleted in the new NPDES permit. The vast majority of results for these other metals were non-detectable. Although nickel was detected, the 95th percentile of 0.017 mg/l was nearly 30 times less than the acute toxic standard for total recoverable nickel.

3.3.6 Deicing Event Samples

3.3.6.1 Background. The Port's Annual Glycol Reports (Port 1996, 1997c, 1998b) detail the history of glycol application airport-wide. These reports summarize data reported by the airlines for the volumes of both ethylene and propylene glycol applied and number of aircraft treated each day. The Federal Aviation Administration (FAA) authorizes only ethylene and propylene glycols for aircraft deicing and anti-icing. Port tenants perform all glycol application at STIA (applied by airlines or their ground service providers). However, to ensure public safety, aircraft pilots make the ultimate decision on whether to apply glycols or not.

As of June 1997, all ramp areas where aircraft are routinely deiced drain to the IWS. Prior to this date, drainage from several aircraft service areas of limited extent flowed to the SDS. As a result, the Port completed necessary SWPPP actions by implementing seven BMPs that rerouted this drainage to the IWS from the four affected SDS subbasins (SDE4, SDS1, SDS3, and SDN2.)

The glycol data discussed below encompass mostly composite samples collected during periods of aircraft deicing, representing average values during a storm event discharge.

3.3.6.2 Results. Overall, the 1997-1998 deicing season was much less severe than in the past two seasons. In contrast to the past, only a few inches of snow fell, which melted rapidly, during the single snow event of 12 January 1998. Little or no snow was plowed from aircraft service areas. As a result, about 30 percent fewer aircraft were deiced than in previous years, using from 65 to 81 percent less glycol than in the previous 12 month periods (Port 1998b.)

Comparing current year data to past years shows considerably lower glycol concentrations in STIA discharges (see Figure 20 through Figure 22). The 1998 data show much lower glycol concentrations due to: (1) less deicing activity as a result of recent warmer and drier weather patterns, and (2) multiple BMPs instituted to remove aircraft service areas from the storm drainage system.

In the past year, glycols were analyzed in 30 stormwater samples from seven outfalls. The majority of samples were collected at the monthly sampling locations (SDE4, SDS3, and SDN4.) Total glycol concentrations ranged from non-detectable to a maximum of 32 mg/l. The majority of these results (83 percent) were below the detection limits. Glycols were not detected during nine of the 11 "routine" aircraft deicing events sampled, with a maximum concentration of 32 mg/l detected in the 8 March 1998 sample from SDS3.

4.0 PERFORMANCE OF BEST MANAGEMENT PRACTICES

4.1 GENERAL

The following sections describe how recent stormwater monitoring data support the positive performance of many best management practices (BMPs) implemented in the past two years. Conclusions regarding BMP performance are presented below. Lists of completed overall BMPs and completed capital BMPs are included in Appendix D, Table D1 and Table D2, respectively. These tables are also included in the SWPPP.

4.2 SDN2 BMPs

Recent flow data show that the two pump stations in the former SDN2 area are effective. The entire drainage area of SDN2 was effectively rerouted to the IWS by late 1997. Two BMPs are likely responsible for this change:

1. The North Cargo Pump Station, completed and online in July 1997, removing 39.8 acres of taxiways, hardstands, and Cargo area 2.

2. The North Snowmelt Pump Station, completed and online in late 1997, removing drainage from the remaining 6.6 acres of SDN2, a small fraction of which is used to store snow plowed from nearby areas.

The Port has elected to operate these two pump stations continuously, well beyond the sole need to remove sources of glycols and BOD_5 from SDN2. These BMPS were originally intended to operate only in winter weather during cargo aircraft deicing, and when snow was plowed and melting in the storage area. Because of continuous operation, the majority of runoff is prevented from discharging at SDN2.

Continuous flow monitoring data at these pump stations and the SDN2 outfall show that only a single bypass occurred between 1 March and 30 June 1998. This was the only occasion that stormwater discharged from SDN2. The bypass occurred when rainfall exceeded the design rate of about 0.22 inches/hour. The bypass was less than an hour in duration, representing the peak of the hydrograph. Because no aircraft-deicing occurred in the SDN2 subbasin during or immediately before this bypass, sampling was not required per permit condition S2.4.

4.3 SDS1 BMPs

In the past two years, the Port rerouted drainage from storm drains to the IWS from two aircraft service areas totaling 35 acres in SDS1. The objective was not only to reduce glycols, but also to remove other potential pollutants that may be present in drainage from aircraft service areas. The effects of reducing glycols are discussed in Section. 3.3.6.

The first area rerouted drained about 1.8 acres of ramp near gate B12. Previous stormwater samples collected at the SDS1 outfall contained glycols at elevated concentrations during cold weather. As a result, the Port rerouted drainage from inlets SDS1-98 and SDS1-99 to the IWS via a structural reroute from manhole SDS1-100 to manhole IWS-190B.

The second area rerouted, about 16.8 acres, drained mostly ramp areas near the A and B concourses. This area previously drained to SDS1 only when higher peak flows surcharged manhole structure IWS-510 (designated SDS1-110 prior to the reroute). Monitoring data in the IWS510 outlet to SDS1 showed the resulting bypasses to SDS1 were of relatively short duration directly tied to periods of intense rainfall. The data showed that these bypasses occurred when rainfall exceeded about 0.2 inches/hour. Otherwise, all drainage from this second area normally discharges to the IWS.

Because of the unpredictability of these high-flow bypasses from IWS-510 to SDS1, there were few opportunities to collect samples explicitly for purposes of comparing data for conditions before and after this BMP was implemented. As a result only three of 20 storms monitored in the past 4-year period took place during these bypasses. Therefore, insufficient data is available to evaluate the effect this latter BMP had upon SDS1 discharges.

In recent samples, glycols were not detected in four of five samples collected at SDS1. Importantly, glycols were not detected in samples from the January 12 snow event where six aircraft were deiced in the area previously draining to SDS1. A minor amount of propylene glycol (6.1 mg/l) was detected in the 8 March 1998 sample. The Port is investigating removing the remaining ramp area of approximately 1 acre.

Figure D1 (in Appendix D) illustrates that prior to the drainage rerouting, glycols in SDS1 discharges were associated with deicing events involving a single aircraft. Sampling after the BMPs were implemented (Figure D1) shows that no glycols were detected for the two deicing events where more than 10 aircraft were deiced in the vicinity of the former SDS1 drainage area. Comparison of these two figures to past information shows the improvement. Comparing data from the five storm samples collected subsequent to the first BMP discussed above, with the results of the 15 samples collected prior to this BMP shows a decrease in other pollutants, especially metals (see Table 7 and the Box Plot in Figure D3, Appendix D).

Future samples from ongoing monitoring at SDS1 should help to determine the presence and degree of reduction in these parameters. Next year's data set should allow more statistical analysis for significance testing of these differences.

4.4 SDE4 BMPs

Between 1994 and 1997, the Port completed four BMPs in the SDE4 subbasin, rerouting drainage to the IWS from a total of over 17 acres. In order of completion, these BMPs include reroutes from SDE4 to the IWS for the following:

1. A flush gutter near gates D6-D9, removing approximately 5.3 acres of aircraft service area.

2. A flush gutter near Air Cargo 4, removing approximately 4.4 acres of aircraft service area.

3. A new pump station for flush gutter drainage near the North Satellite, removing 6.6 acres of ramp located intermediate between gates N11-N16 and the taxiways.

4. The North snowmelt pump station, removing 0.75 acres of snow storage area.

Because of these multiple changes on different dates, it is difficult to split the SDE4 data into "before" and "after" conditions. The net effect of these BMPs was about a 10 percent reduction in the total SDE4 subbasin area, and about a 13 percent reduction in impervious surface area. Removing these areas from SDE4 eliminated the remaining known aircraft service areas from the SDS. Similar to SDS1, the recent weather pattern has not yielded conditions sufficient to discern effects attributable to the many BMPs implemented in past years. However in the past year, glycols were detected in only one of a total of 8 samples collected. Glycol concentrations in this sample, collected during the only winter weather period in the past year, were very low (11.1 mg/l.) Though aircraft and runway deicing occurred during this event, it is not comparable to those of past years.

4.5 TAXI YARD BMPs

Data support favorable effects of various BMPs implemented at the Taxi Yard (TY). These BMPs include the use of oil-absorbent media in the catch basin insert "socks" ("Streamguard" units), and increased vigilance by the STITA Taxi Association, which leases this site.

Recent data continue to show low indicators of petroleum products in discharges. The median concentration for FOG in recent samples continues to remain below the comparative value of 3.7 mg/l. The TPH results from the first two samples collected pursuant to the current permit show very low values of just over 1 ppm. Data for TSS continue to be less than one half the BURP median of 50 mg/l.

The Port also built a car wash facility in the TY. The facility drains to the sanitary sewer and effectively separates vehicle washing from the storm drain system.

4.6 SUBBASIN SDE4: POLLUTANT SOURCE TRACING

As stated in the report (Section 3.2.2), fecal coliforms occasionally exceed levels typical of stormwater. The Port began a source tracing effort early in 1998 to identify the potential sources. Initial storm samples did not indicate distinct sources, and do not indicate gross contamination from sanitary sewage. Two baseflow samples, one each collected during the wet and dry season, were not contaminated, and had very low to non-detectable results. Table 7 summarizes the data for these initial samples. Manhole SDE4-47 is the NPDES sampling "outfall" location for SDE4. Other locations listed in the table are upgradient of this location.

According to the literature, surfactants, fluoride, ammonia and potassium are suitable indicators of potential contamination. Results can be compared to ranges indicating various sources of contamination. Ratios of ammonia to potassium of 0.9 and greater can be used to indicate the presence of sanitary wastewater (Lalor, Pitt, and Field, 1993.) Except for one occasion, results in Table 8 show these ratios at far less than 0.9. Fluoride concentrations indicate the presence of domestic water in baseflow samples, yet other parameters show that these baseflows are not contaminated with fecal coliforms, ammonia, or surfactants.

The source tracing effort is currently focusing more detail on the SDE4 drainage system by sampling up to 12 different progressively upgradient locations sequentially. These sampling locations isolate drainage sub-areas.

4.7 RUNWAY SKID MARK MATERIAL REMOVAL

To maintain proper braking friction for aircraft, the Port periodically removes accumulated material from skid marks deposited by landing aircraft. About biannually, this material is pressure washed from the runways, collected, and disposed as solid waste. About 7 cubic yards (5 m^3) of solids are removed annually. The waste was analyzed using toxicity characteristic leaching procedure (TCLP) for metals to ensure that it is properly disposed in accordance with applicable regulations.

Table 9 shows the results from recent composite samples of this particulate waste material, and estimates total annual mass removed for copper and zinc. Because lead was not detected, no estimates are provided. In terms of total mass, these estimates show that this process removes about 68 pounds (31 kg) of zinc, and 12 pounds (5.5 kg) of copper annually. Considering only the leachable fractions, much less is removed. Nonetheless, this practice amounts to a BMP for metals abatement, taking place primarily in SDS3 and to a lesser extent in SDN3 and SDS4.

4.8 OTHER BMPs

Other operational and source control BMPs are used at STIA including: employee, contractor, and tenant training in stormwater pollution prevention, implementation of a Spill Prevention, Control and Countermeasure Plan, implementation of Integrated Pest Management BMPs, pavement sweeping and periodic runway rubber removal, inspections for illicit connections and designation of the stormwater management team. The effects of these activities are difficult to quantify but are likely to have an impact on stormwater pollution prevention.

5.0 CONCLUSIONS

Overall, STIA stormwater quality is better than regionally comparable data. Results continue to demonstrate that stormwater quality at the airfield outfalls under typical conditions is consistently better than regional commercial and industrial areas. Results also show that there are differences in stormwater quality between landside and airfield subbasins. However, the data tend to indicate that runoff from non-Port public roadways unfavorably biases STIA stormwater, especially in the landside outfall samples. Nonetheless, overall STIA results are generally lower than results for roadways and commercial areas.

Monitoring in the past year indicates improvements in stormwater quality after BMPs were implemented especially as those BMPs that rerouted drainage from the SDS to the IWS. BMPs implemented over the past year and performance data were discussed in Chapter 4.

6.0 PROPOSED NEW INITIATIVES

Evaluation of the stormwater discharges at STIA is an ongoing process. A key factor in attaining improved water quality is implementation of BMPs. BMPs are evaluated as part of the SWPPP and are part of the NPDES permit requirement. Based on the data and conclusions presented in this report, as well as other knowledge regarding STIA activities, the following potential new initiatives have been identified.

1. Evaluate monitoring requirements in the permit and request modifications as appropriate, based on the effectiveness of BMPs or other changes at STIA.

2. Continue to investigate possible sources of fecal coliforms in SDE4 discharges.

3. Explore rerouting of drainage from several minor SDS3 drain inlets beneath the overhangs of the C Concourse that could be responsible for isolated elevated BOD_5 concentrations in SDS3.

4. Continue to monitor glycols in SDS1 discharges to verify the effectiveness of two capital BMPs designed to reduce and eliminate glycols and other pollutants by rerouting drainage to the IWS or sealing minor inlets.

5. Require contractor to implement source controls and BMP related to construction activities.

6. Continue to evaluate tenant activities.

7. Continue to revise and update the SWPPP on a regular basis.

7.0 REFERENCES

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Tables

TABLE 1 SUMMARY OF SAMPLING CHANGES UNDER NEW PERMIT

Change	Outfalls Affected
Increase sampling frequency from quarterly to monthly	SDE4 (002), SDS3 (005), SDN1 (006), SDN4 (011)
Decrease sampling frequency from quarterly to semi-annually	EY (012), TY (013)
Decrease sampling frequency from quarterly to annually	SDS1 (003), SDS4 (009), SDN3 (008)
Delete parameters: NH_3, surfactants, FOG	all
Change TPH method from WTPH 418.1 to NWTPH-Dx	all
Bypass sampling required (for N. Cargo and N. Snowmelt IWS Pump Stations)	SDN2 (007)

TABLE 2 OUTFALL NOMENCLATURE CROSS REFERENCE

Outfall Number in Permit	Port Nomenclature	Category
002	SDE4	landside
003	SDS1	none
004	SDS2	none
005	SDS3	airfield
006	SDN1	landside
007	SDN2	Drains to IWS
008	SDN3	airfield
009	SDS4	airfield
010	SDW3	none
011	SDN4	airfield
012	EY	landside
013	TY	landside
014	B	none
015	D	none

TABLE 3 OFFSITE INFLUENCES IN STIA MONITORING LOCATIONS[a]

Outfall (manhole)	Total Area (ac)	Offsite Area (ac)	Percent Offsite	Comment
SDE4 (SDE4-47)	149	0.6	<1%	Offsite area of SR99.
SDS1 (outfall)	10.7	5.1	47%	Offsite area of S. 188th St. includes area added by City in Fall 1997
SDS2 (outfall)	13.2	2.9+	21%	Offsite 16th Ave S., S. 188th St, and possible non-Port commercial area.
SDS3 (outfall)	462	3	<1%	Approximate offsite area of S. 188th St.
SDN1 (manhole SDN1-27)	24+	9.9+	>40%	Former SDN1 location includes public road runoff. Additional 49 acres enters below this point.
SDN1up (SDN1-22)	13.8	0	0%	Air cargo road is about 1/2 of SDN1.

Note:
(a) All area estimates are as of 27 October 1998 and subject to change.

TABLE 4 POLLUTANT ANALYTES, METHODS AND DETECTION LIMITS

			Subbasins			
Analyte	Method[(a)]	Detection limit (MDL) mg/l	SDE4, SDS3, SDN1, SDN4	EY TY, SDN2	SDS1, SDN2	SDS1, SDS2,SDN3, SDS4, SDW3, B, D
pH	150.1	0.10	X	X	X	
FOG (Oil and Grease)	413.1	1.0	n/a	n/a	n/a	n/a
TPH (IR)	418.1 mod[(b)]	1.0	n/a	n/a	n/a	n/a
TPH (GC)	NWTPH-Dx	0.15	X	X	X	X
Fecal coliforms	9221 E	2	X			X
TSS (total suspended solids)	160.2	0.50	X	X	X	X
Turbidity	180.1	0.10	X		X	X
BOD_5	405.1	4.0	X		X	
Total Ammonia	350.2S	0.010	n/a	n/a	n/a	n/a
Total Glycols[(c)]	GC FID	4	X		X	X
Total Recoverable copper, lead, zinc[(d)]	200	varies	X			
Surfactants	425.1	0.10	X*	X		

(a) Method refers to EPA-600/4-79-020, March 1979. Fecal coliform method refers to 18th edition of Standard Methods for the Examination of Water and Wastewater, or as revised.
(b) Washington State Department of Ecology method WTPH-418.1 Modified.
(c) Analyzed by Gas Chromatograph, Flame Ionization Detector.
(d) Lead by atomic absorption (AA) furnace, copper and zinc by ICP.

TABLE 5 STORMWATER QUALITY COMPARATORS[a]

Pollutant	Units	Study					WA State Standard[c]
		NURP, 1983	BURP, 1984	Metro, 1982	Bellevue, 1996[b]	Highway Runoff	
pH	std units		**5.2 - 7.4**		7.2 - 7.8		6.5 - 8.5
FOG	mg/l		*2.5*	7.8	**3.7**	30[d]	*no criteria*
TPH	mg/l				**3.7**		*no criteria*
Fecal coliforms	mpn per 100 ml	1000 to 21000	*980*		**201**		50
BOD_5	mg/l	9	***6.6***				*no criteria*
TSS	mg/l	100	***50***		82.3	106[e]	*no criteria*
Turb	mg/l		19		**29.4**		based on background
NH3[f]	mg/l		***0.17***		0.58		6.8 - 32.6[g]
glycols	mg/l	*not analyzed in any of these studies*					*no criteria*
Surf	mg/l				<MDL		*no criteria*
Cd (TR)[h]	µg/l			0.7	**1**		0.93[h]
Cr (TR)[h]	µg/l			7	**6.9**		612[h]
Cu (TR)[h]	µg/l	34		20	**10.4**	43[e]	5.3[h]
Pb (TR)[h]	µg/l	144	170	210	**26.3**	466[e]	16[h]
Zn (TR)[h]	µg/l	160	120	110	**161.4**	638[e]	40[h]
As (TR)[h]	µg/l			**13**			360[h]
Ni (TR)[h]	µg/l			**11**	7.3		483[h]
statistic reported:		median	mean[i], *median*	mean	log-normal median	mean	metals criteria[h] at hardness = 28 mg/l

Notes:

(a) Comparative Values in bold. Blank space means no data available, reported, or applicable.
(b) Bellevue, 1996 data for "Sturtevant Creek, downstream" site.
(c) Standards are for class AA receiving waters, see WAC 173-201A.
(d) Highway runoff in England (see Booth and Horner, 1995).
(e) Highway runoff from an I5 location in Seattle with 57,000 ADT, 43 to 54 storm samples in 1980-81 (Chui, Mar, and Horner, 1982).
(f) Ammonia values and standards expressed as total ammonia, not as ammonia-nitrogen.
(g) Ammonia standards for pH 6.5 to 8.0 and temperatures 5° to 20°C.
(h) Total recoverable metals. WA State acute standards expressed as total recoverable, calculated at 28 mg/l hardness using Ecology's "TSDCALC6.XLW" spreadsheet. The hardness value is the 10th percentile for the receiving waters (source: Stormwater Receiving Environment Monitoring Report, Port, 1997b). Hardness can vary between season.
(i) For Turb, Cr, Cu, Pb, and Zn, BURP 1984 data was mean of grab samples, therefore Bellevue, 1996 data are better comparators because they represent median.

TABLE 6 OTHER METALS (TOTAL RECOVERABLE, MG/l)

		Sb	AS	Be	Cd	Cr	Hg	Ni	Se	Ag	Tl
1998 Data set	count	17	17	17	18	17	17	17	17	17	17
	median	0.002	0.002	0.001	0.0003	0.005	0.0001	0.007	0.002	0.0005	0.001
	95th	0.002	0.005	0.001	0.0009	0.006	0.0003	0.017	0.004	0.0005	0.001
	75th	0.002	0.002	0.001	0.0003	0.005	0.0001	0.012	0.002	0.0005	0.001
	25th	0.002	0.002	0.001	0.0003	0.005	0.0001	0.003	0.002	0.0005	0.001
	#non-detected	17	13	16	14	16	14	6	14	17	16
	%non-detected	100%	76%	94%	78%	94%	82%	35%	82%	100%	94%
acute (@ 28 ppm		9	0.36	0.13	0.0009	0.612	0.002	0.483	0.02	0.0005	1.4

Acute criteria derived from Ecology's worksheet "TSDCALC6.xls".

TABLE 7

DECREASES IN POLLUTANTS IN SDS1 STORMWATER AFTER BMPS

Outfall SDS1 (003)	TSS	BOD5	Cu	Pb	Zn
Pre-BMP mean	**22.4**	**26.8**	**0.062**	**0.020**	**0.178**
Pre-BMP median	**17.0**	**16.5**	**0.042**	**0.013**	**0.188**
sample size	15	16	15	15	15
CV, %	4%	4%	60%	108%	38%
Post-BMP mean	**11.2**	**5.0**	**0.023**	**0.010**	**0.102**
Post-BMP median	**9.0**	**5.5**	**0.022**	**0.005**	**0.082**
sample size	4	4	5	5	5
CV, %	10%	12%	45%	98%	29%
% change in mean	-50%	**-81%**	**-62%**	*-50%*	**-43%**
% change in median	-47%	**-67%**	**-48%**	*-62%*	**-56%**

Changes assume independence between concentrations from concurrent storm events.

TABLE 8

SDE4 SOURCE TRACING RESULTS

Date	event	location	fecals, #/100ml (MF)	fecals, #/100ml (MPN)	Fl-, mg/l	NH3, mg/l	K +, mg/l	NH3/K +	Hard, mg/l	BOD5, mg/l	Cond, μs	surf, mg/l
5-Jan	rain	SDE4-47	420		0.22	0.042	1.08	0.04	26.5	<12	56	n/a
5-Jan	rain	SDE4-43	80		0.06	0.094	0.629	0.15	34.2	<12	57	n/a
5-Jan	rain	SDE3-91	960		0.09	0.223	1.54	0.14	36.6	<48	104	n/a
5-Jan	rain	SDE4-31	1460		0.14	0.019	0.25	0.08	14.1	<12	33	n/a
5-Jan	rain	SDE3-93	540		0.12	0.027	0.848	0.03	21.8	<12	40	n/a
9-Jan	baseflow	SDE4-47	<2		0.7	0.027	1.1	0.02	49.1	<4	104	0.053
9-Jan	baseflow	SDE4-43	no flow		no flow	no flow	no flow	no flow	no flow	no flow	no flow	no flow
9-Jan	baseflow	SDE3-91	no flow		no flow	no flow	no flow	no flow	no flow	no flow	no flow	no flow
9-Jan	baseflow	SDE4-31	<2		1.0	0.005	0.619	0.01	34.4	<4	65	<0.025
9-Jan	baseflow	SDE3-93	4		0.4	0.005	2.3	0.00	71.6	<4	162	0.049
15-Jul	rain	SDE4-47		>1600								
14-Aug	baseflow	SDE4-47	70		1.07	0.021	1.01	0.02	31.5	<4.0		0.036
16-Aug	storm	SDE4-47	1220	500		0.169	1.58	0.11	35.4		101	0.203
18-Sep	rain	SDE4-47	10600	500								
24-Sep	storm	SDE4-47		>1600	0.325	0.953	1.48	0.64	37.4		111	0.477
3-Oct	storm	SDE4-47	>186000	>1600								

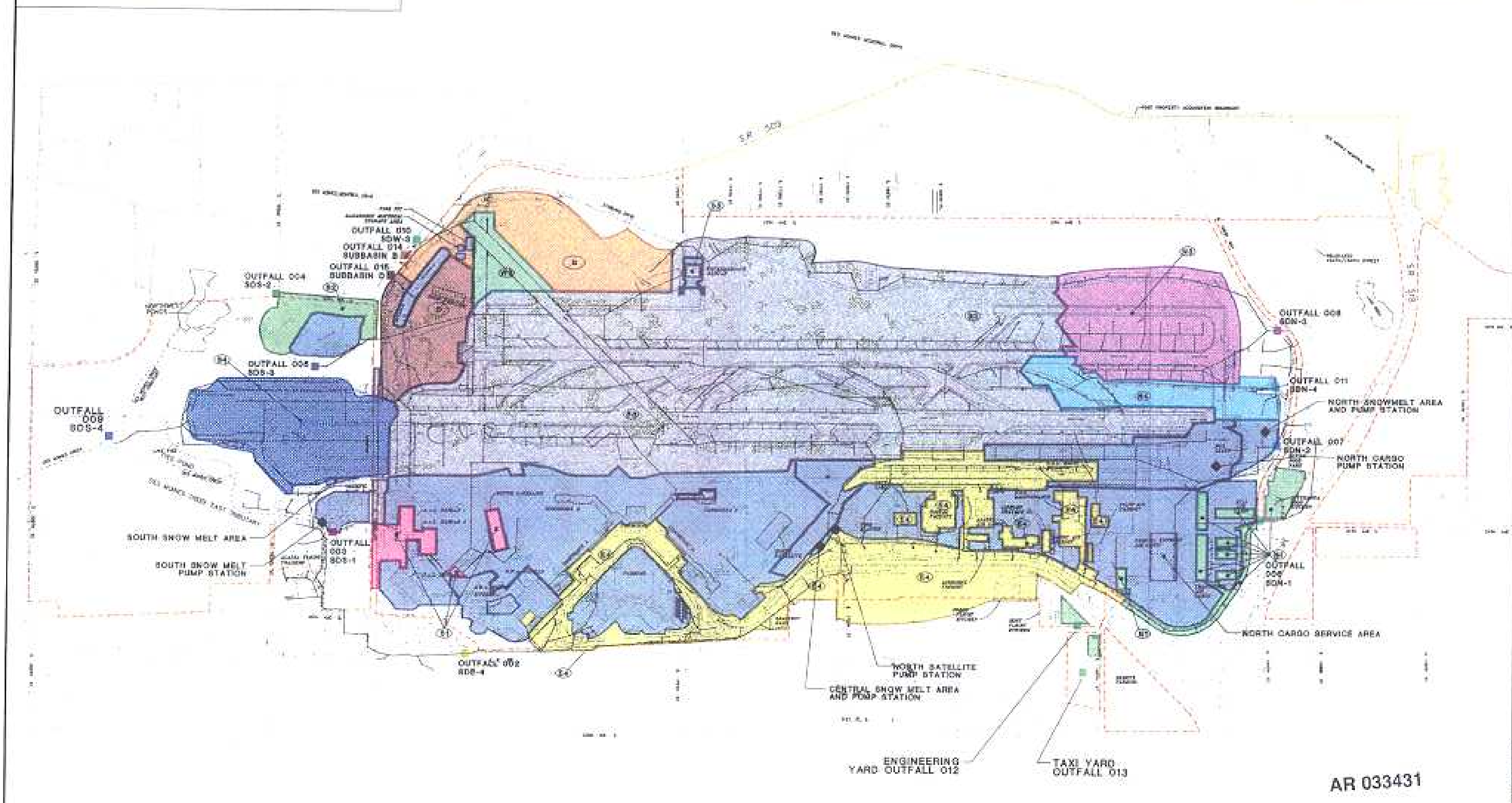
TABLE 9

METALS IN AIRCRAFT TIRE SKID MARK MATERIAL REMOVED FROM STIA RUNWAYS

		Metal		
		Cu	Pb	Zn
sample results	TCLP1 (mg/l)	0.042	*0.025*	6.25
	TCLP2 (mg/l)	n/a	*0.05*	n/a
	avg TCLP (mg/l)	0.042	0.0375	6.25
	total (mg/kg)	1294	93.4	7390
	sample density (g/cc)	0.847		
mass estimates	kg/m3 (TCLP)	0.0007	*0.0006*	0.11
	kg/m3 (total)	1.1	*0.1*	6.3
	lb/yd3 (total)	1.9	0.1	10.6
	relative fraction leached	0.06%	*0.80%*	1.69%
	approx volume removed**, m3	5		
	approx mass removed (TCLP), kg	0.004	0.003	0.53
	approx mass removed (total), kg	5.5	0.40	31.3

*lead not detected in both TCLP analyses.
1. Sampled by Scott Tobiason 8/14/98, analyzed by Aquatic Research, Inc
2. Sampled by Sarah Olson 9/10/98, analyzed by Philip Environmental
** estimate of total solids volume removed and

Figures



STORMWATER DRAINAGE BASIN COLOR CODES:

N1 SDN1 | S1 SDS1 | W3 SDW3 | IWS
N3 SDN3 | S3 SDS3 | SB B
N4 SDN4 | S4 SDS4 | SD D
E4 SDE4 | S2 SDS2

■ OUTFALL LOCATION ◆ PUMP STATION LOCATION

REVISIONS			
5	11/98	K/J	UPDATE FIGURE
4	10/98	K/J	UPDATE FIGURE
3	2/98	K/J	UPDATE FIGURE
2	12/97	K/J	UPDATE FIGURE
1	7/97	K/J	RELOCATED AND ADDED OUTFALL LOCATIONS

PORT OF SEATTLE

SEA-TAC INTERNATIONAL AIRPORT

COMPREHENSIVE STORM DRAINAGE SYSTEM PLAN AND DESIGN

DRAINAGE BASINS

978079.23

FIGURE 1

P85K002

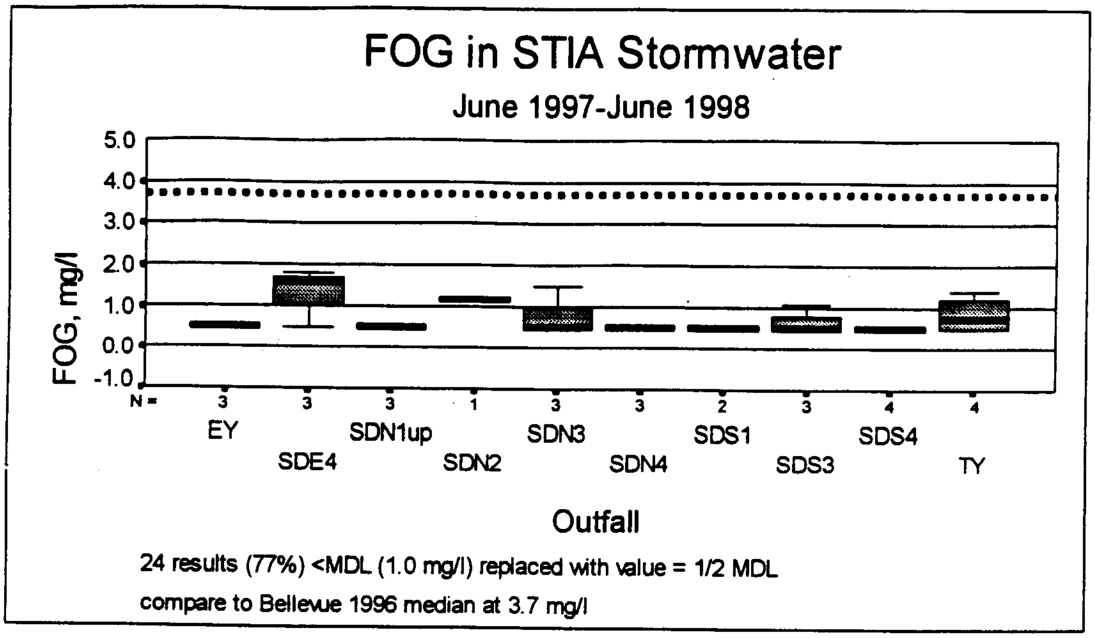


FIGURE 2 FOG FOR CURRENT YEAR

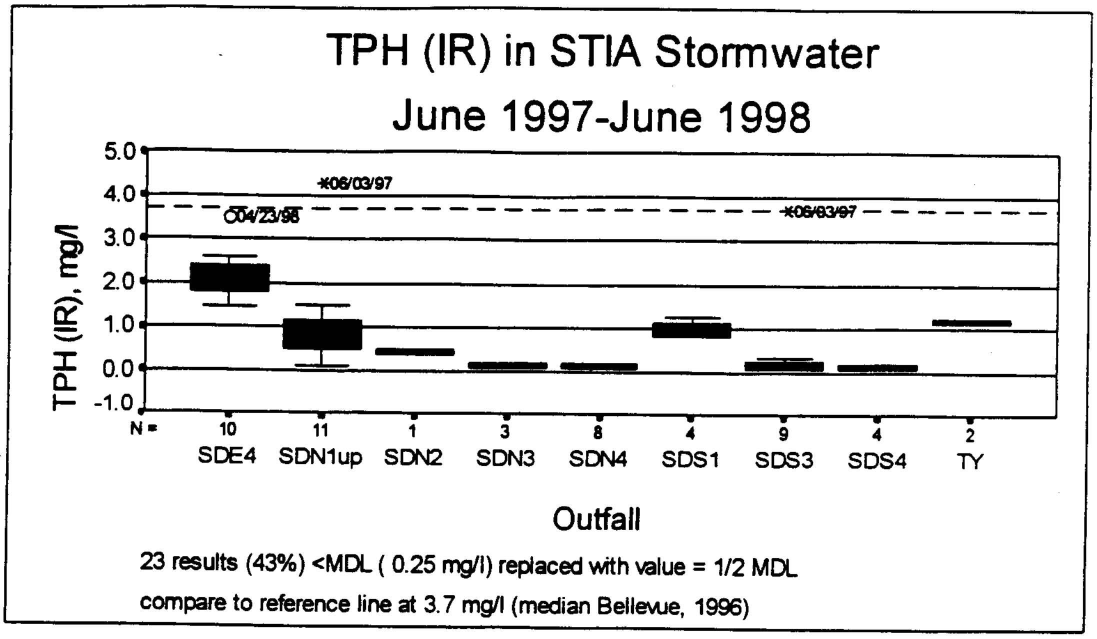


FIGURE 3 TPH (IR) COMPARED IN BOX PLOT FOR CURRENT YEAR

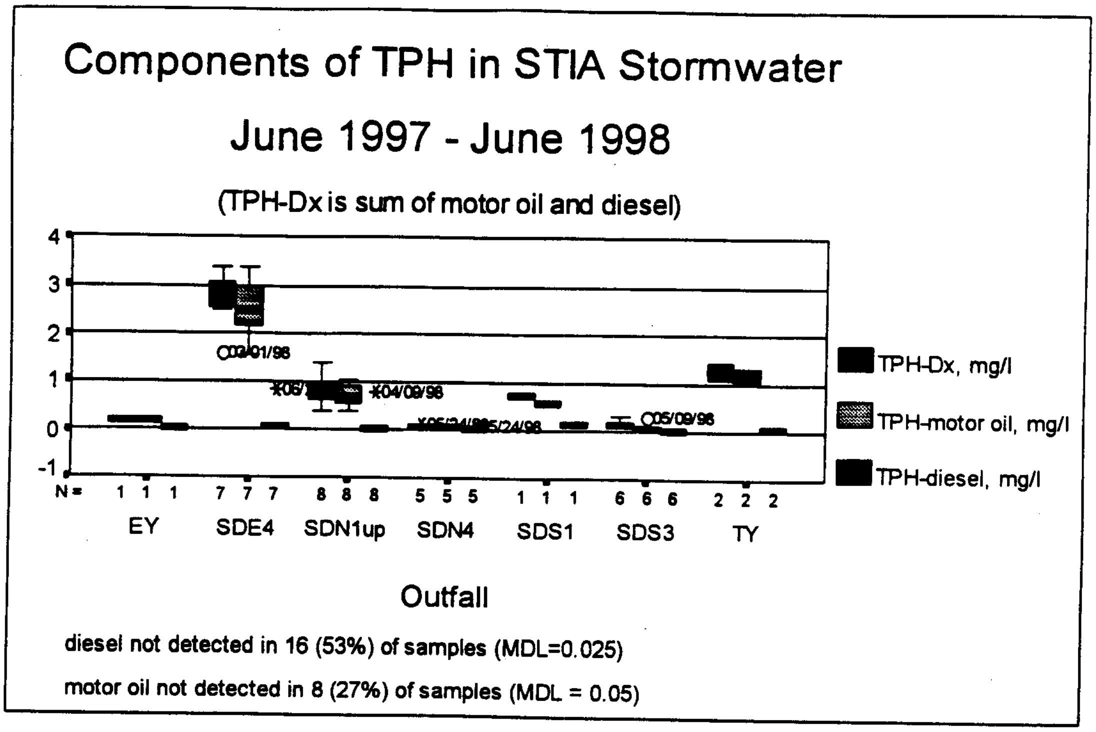


FIGURE 4 TPH-DX COMPARED IN BOX PLOT FOR CURRENT YEAR

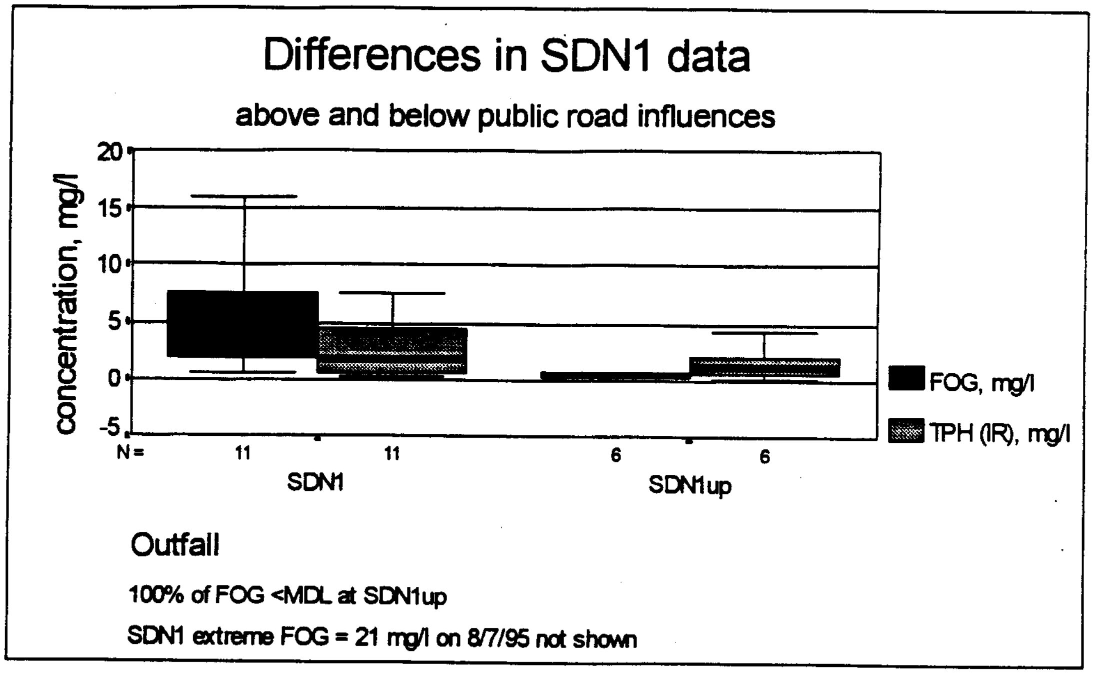


FIGURE 5 IMPROVEMENTS IN SDN1 DATA ABOVE PUBLIC ROADS

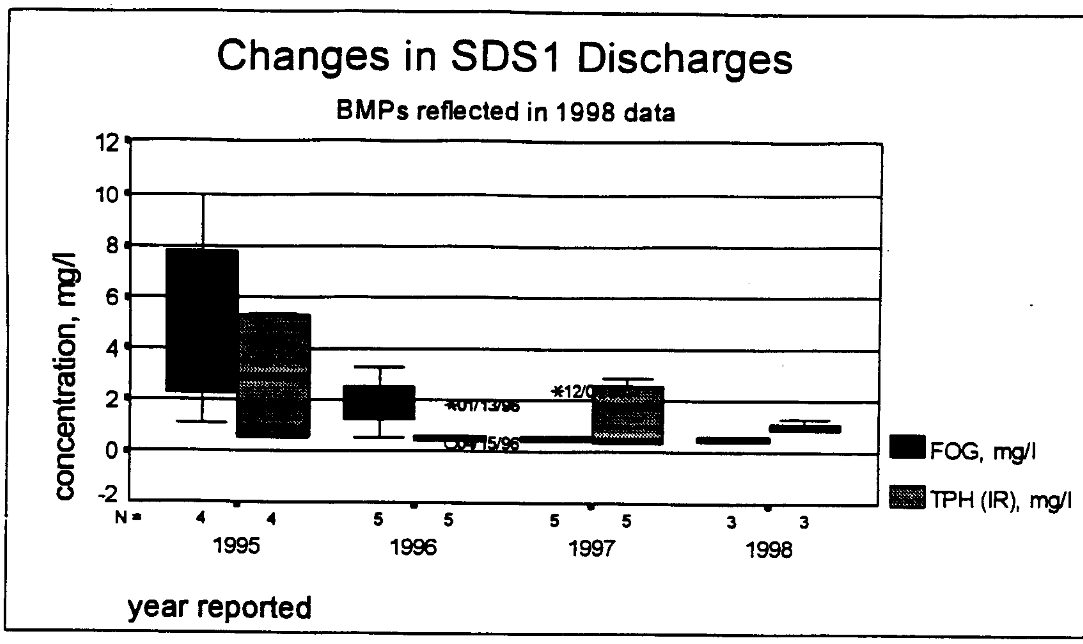


FIGURE 6 CHANGES IN SDS1 AFTER BMPS

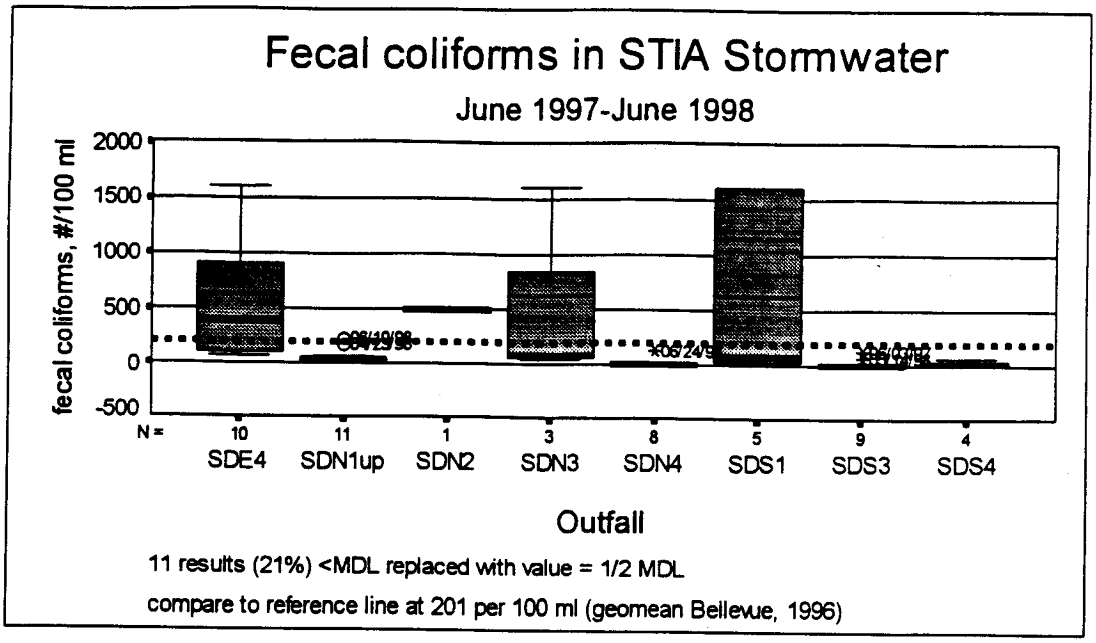


FIGURE 7 FECAL COLIFORMS

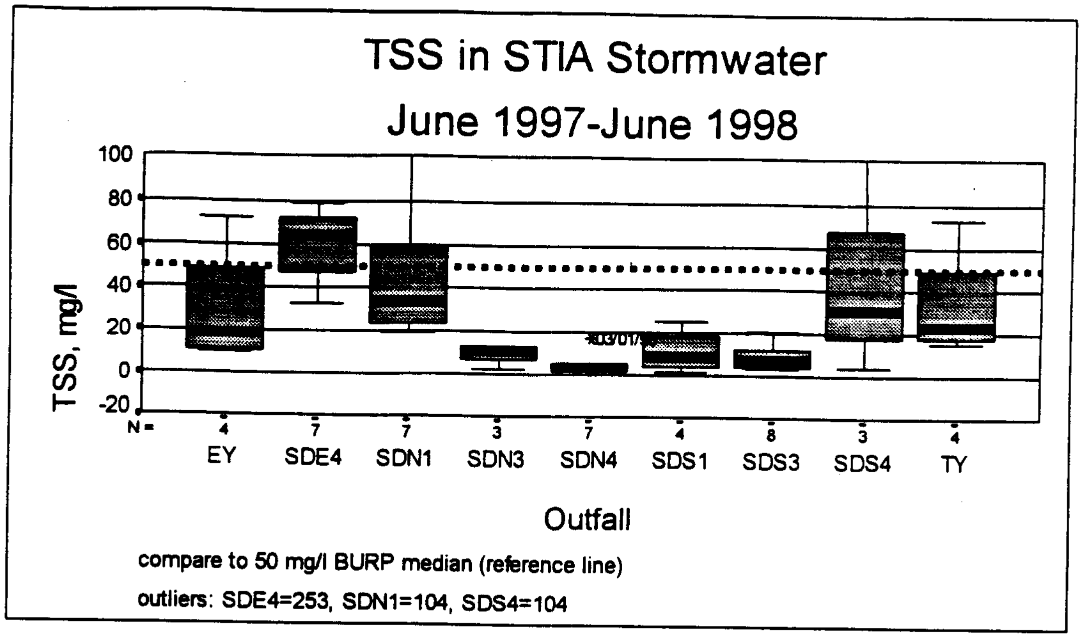


FIGURE 8 TSS FOR CURRENT YEAR

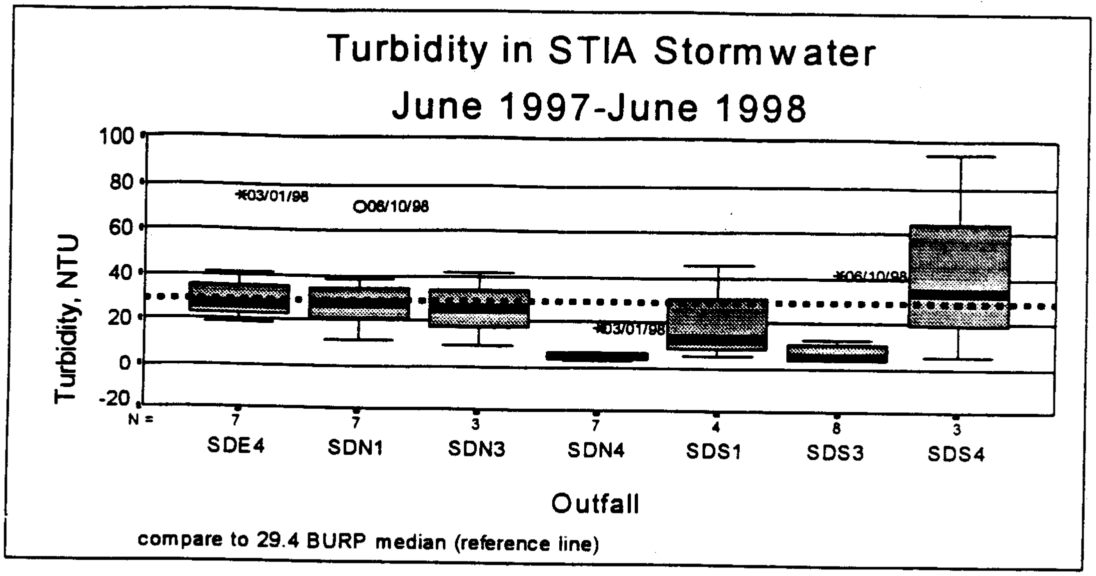


FIGURE 9 TURBIDITY FOR CURRENT YEAR

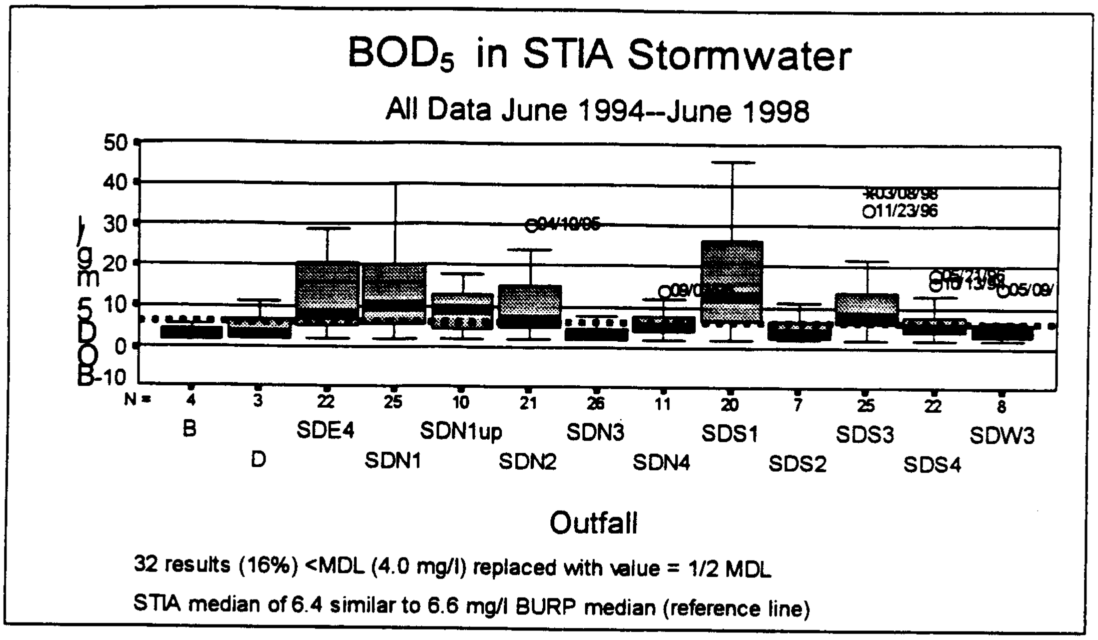


FIGURE 10 BOD$_5$ FOR PERMIT HISTORY[1]

[1] Because of the scale shown, 8 outlying values from data taken in previous years are not visible. Six of these occurred during major winter-weather deicing periods, and were related to ground deicing chemicals as explained in past Annual Stormwater Reports. One other outlier on 9/13/94 in SDN1was probably due to an inappropriate connection, since corrected, which was discussed in the 1997 Annual Stormwater Report.

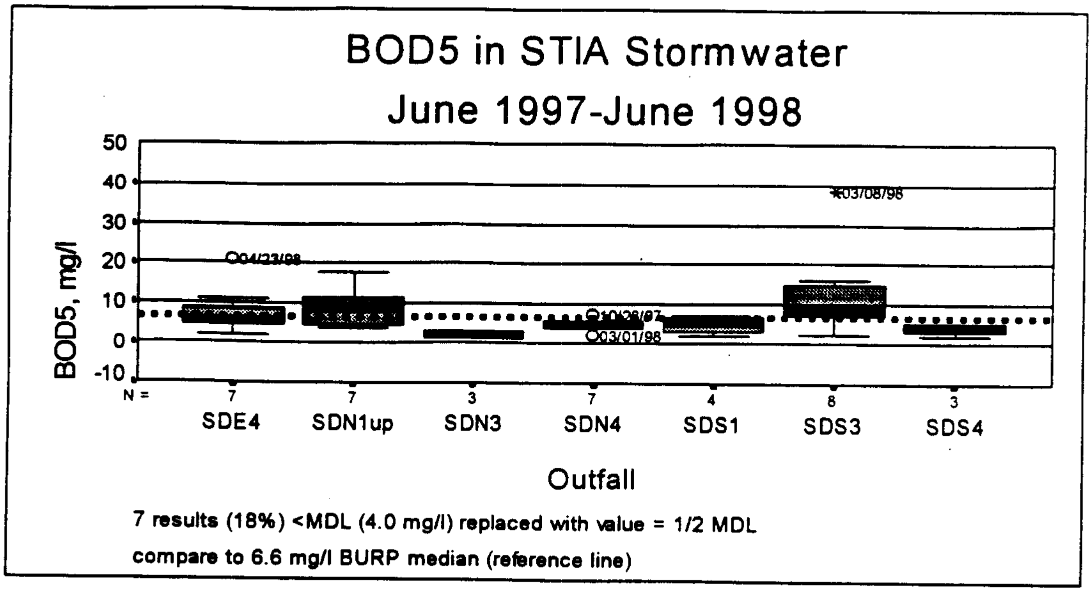


FIGURE 11 BOD_5 FOR CURRENT PERIOD

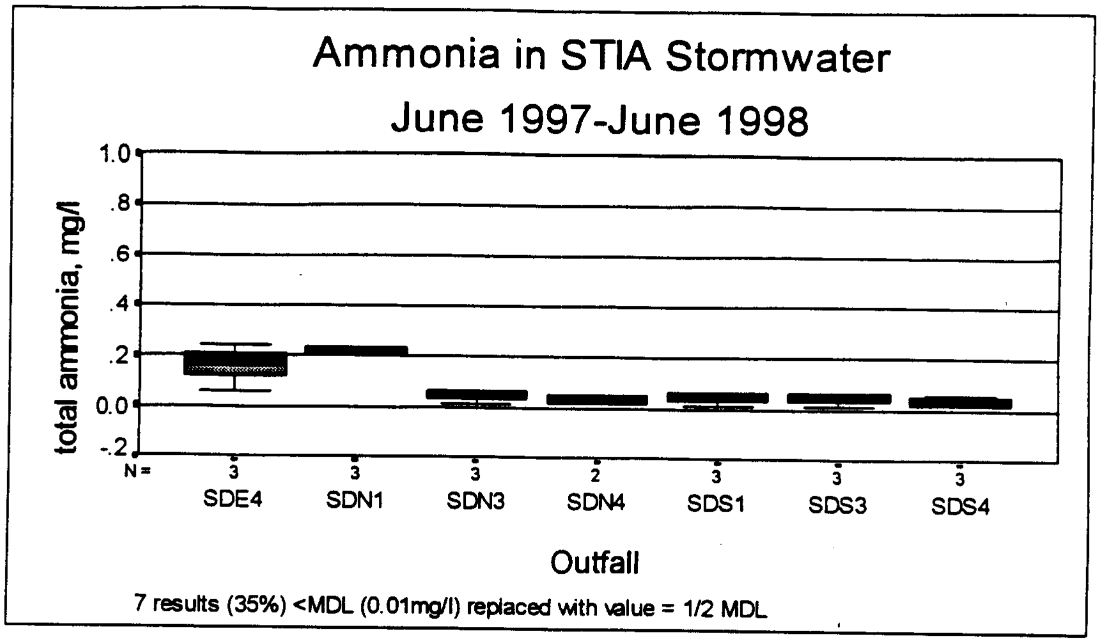


FIGURE 12 AMMONIA FOR CURRENT YEAR

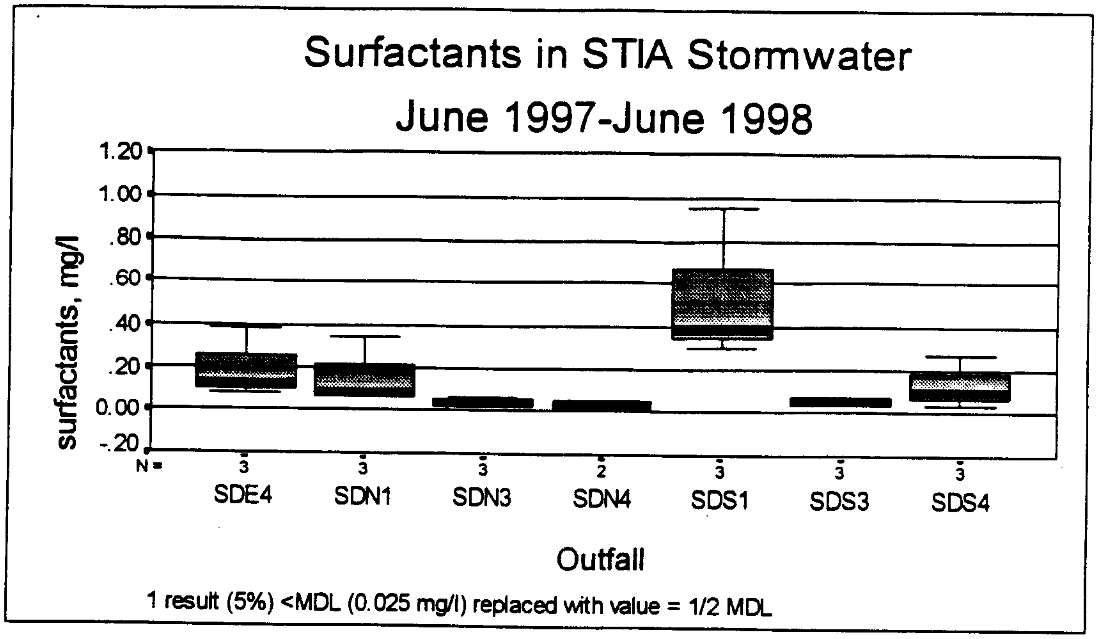


FIGURE 13 SURFACTANTS FOR CURRENT YEAR

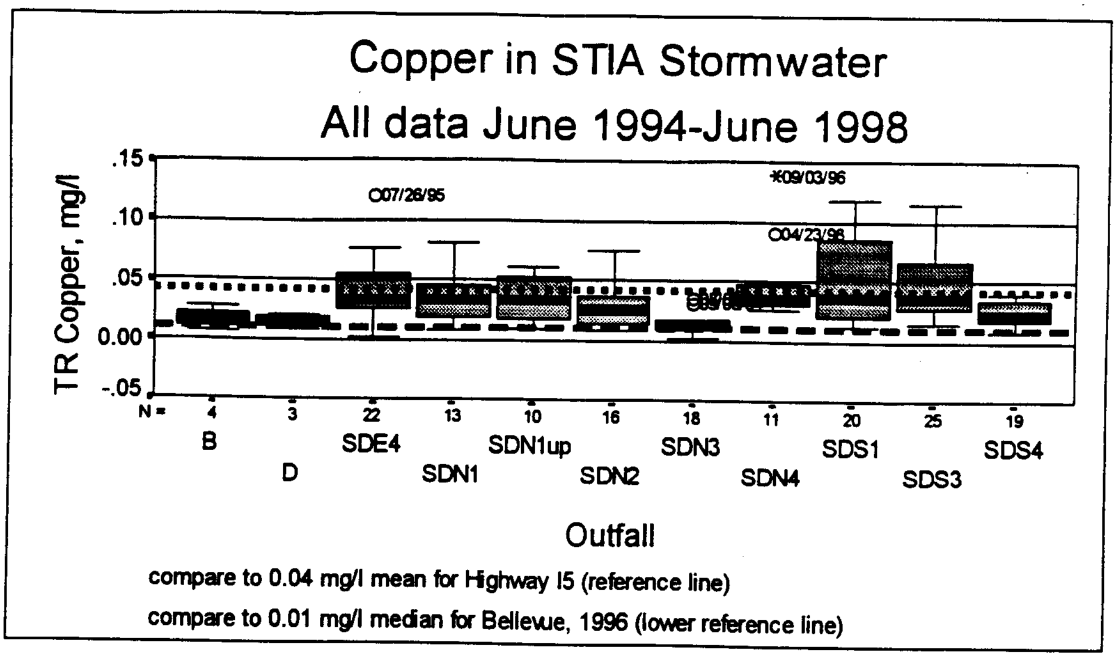


FIGURE 14 TOTAL COPPER FOR PERMIT HISTORY

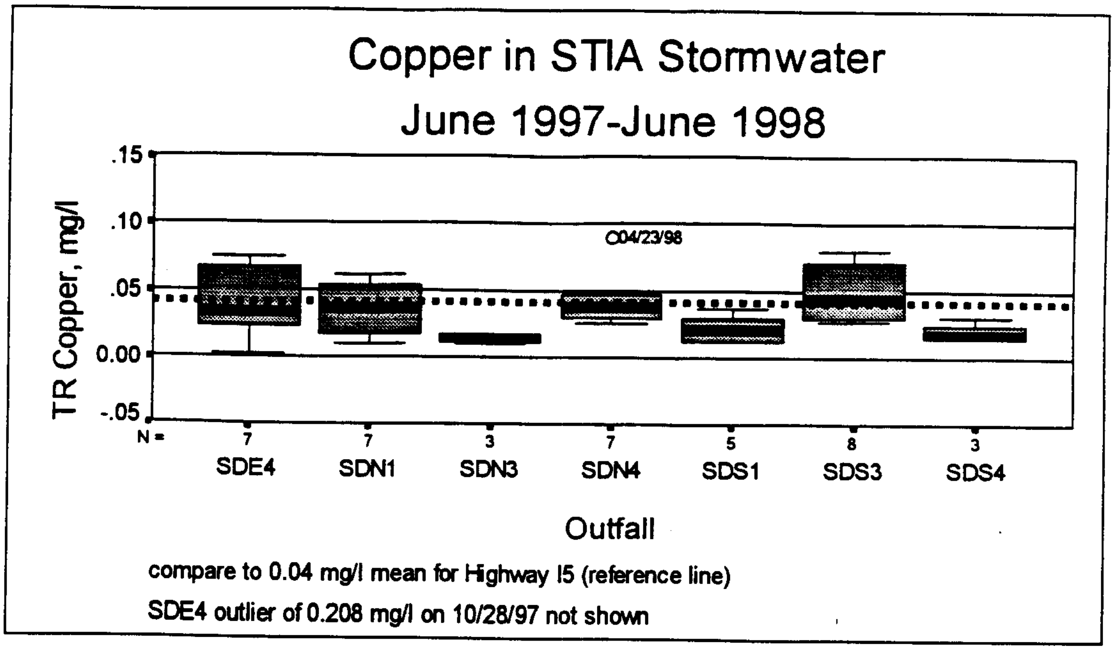


FIGURE 15 TOTAL COPPER FOR CURRENT YEAR

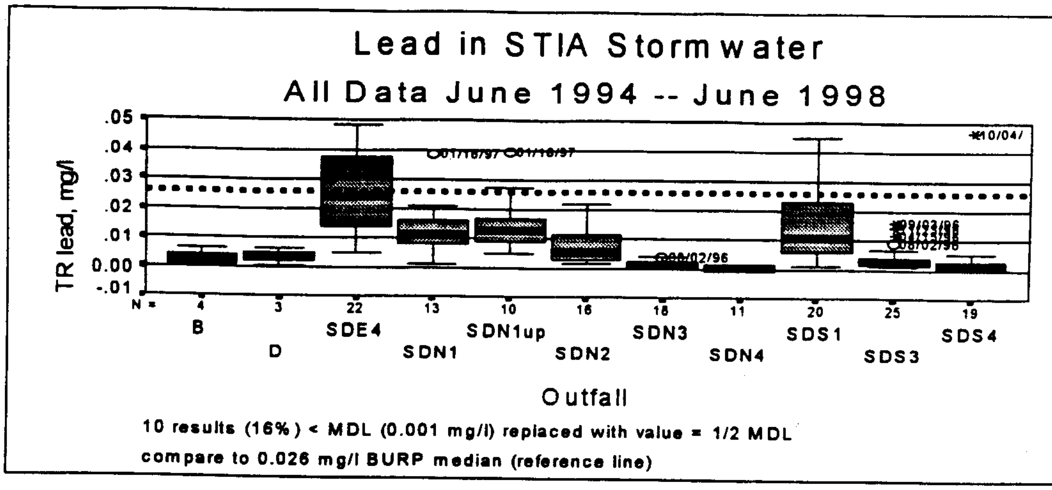


FIGURE 16 TOTAL LEAD FOR PERMIT HISTORY[1,2]

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1 With Ecology's concurrence, in October 1996 the Port moved the sampling location for SDN1 from manhole SDN1-27 to manhole SDN1-22, upgradient from public road runoff. The previous downgradient location was more convenient for sampling access, yet incorporated runoff from these non-Port areas. This report and the 1997 Annual Stormwater Report show considerably less FOG, TPH, and Zinc in samples taken at the location upgradient of this non-Port property.

2 Because of the scale shown, 3 outliers at SDE4 are not visible: they are 0.104 mg/l on 2/3/96, 0.098 mg/l on 4/16/96, and 0.076 mg/l on 1/16/97. A single outlier at SDS1 is also not visible, 0.088 on 4/15/96.

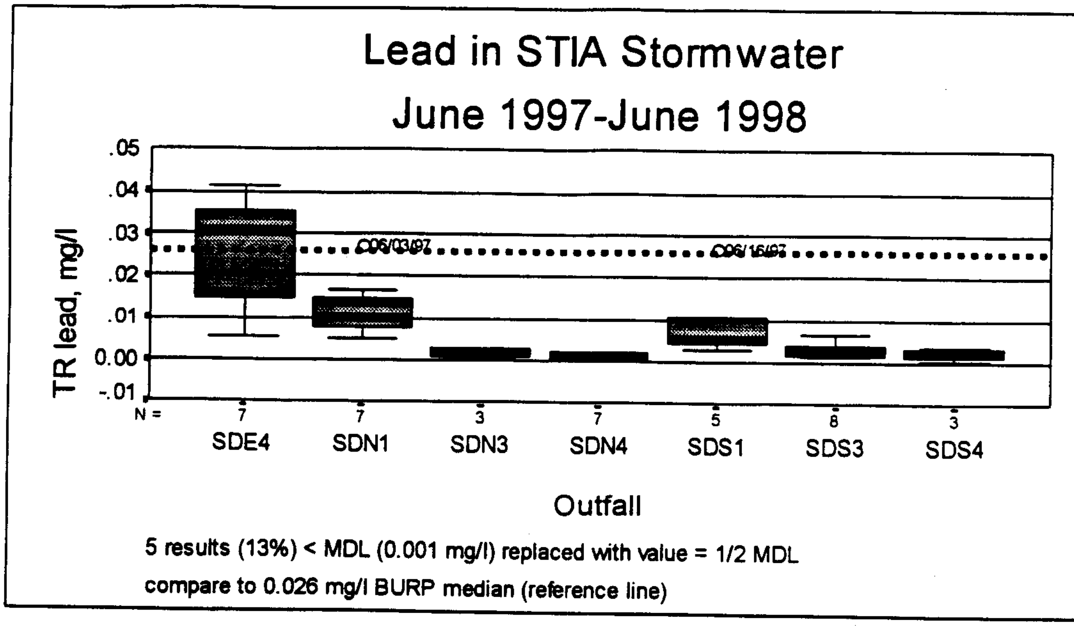

FIGURE 17 TOTAL LEAD FOR CURRENT YEAR

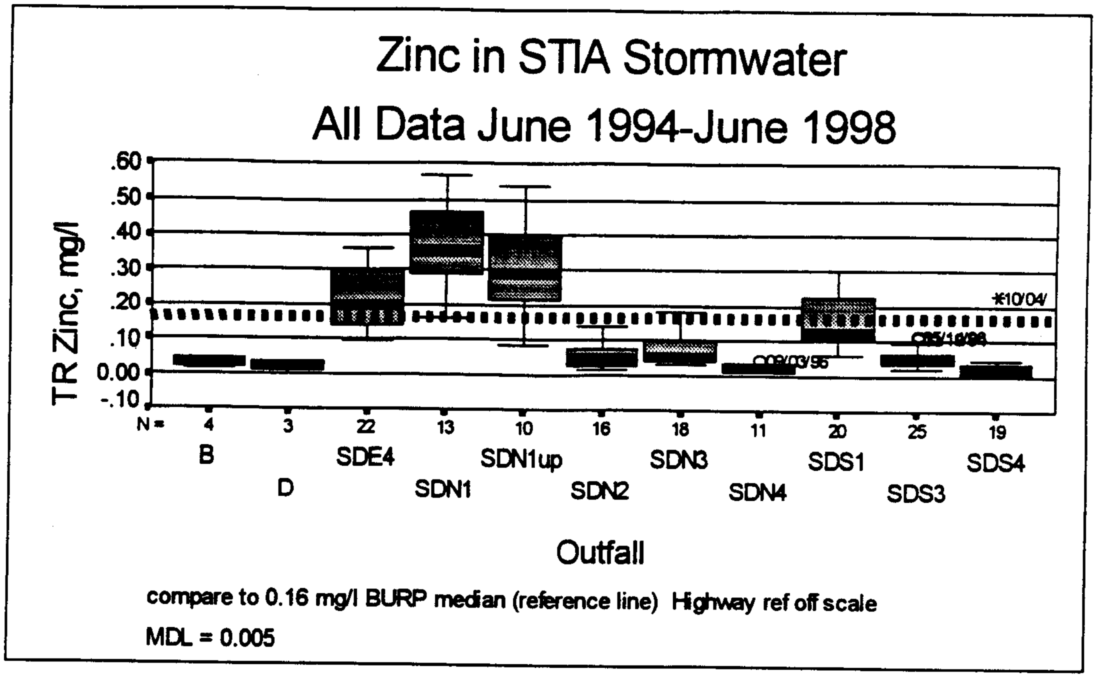

FIGURE 18 TOTAL ZINC FOR PERMIT HISTORY

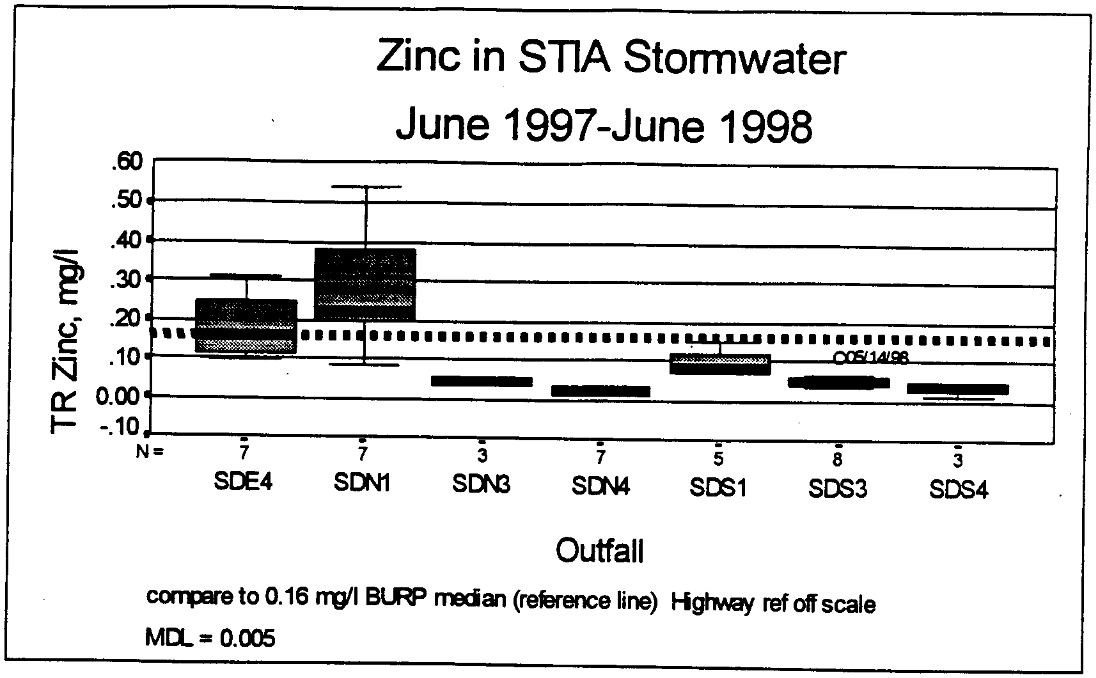

FIGURE 19 TOTAL ZINC FOR CURRENT YEAR

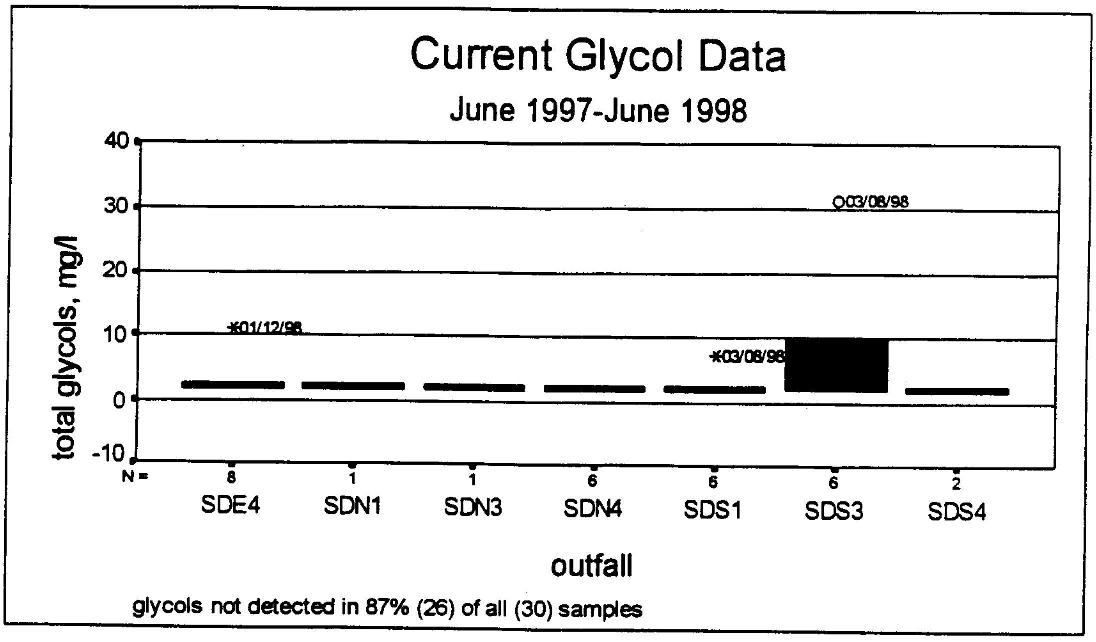

FIGURE 20 TOTAL GLYCOLS FOR CURRENT YEAR

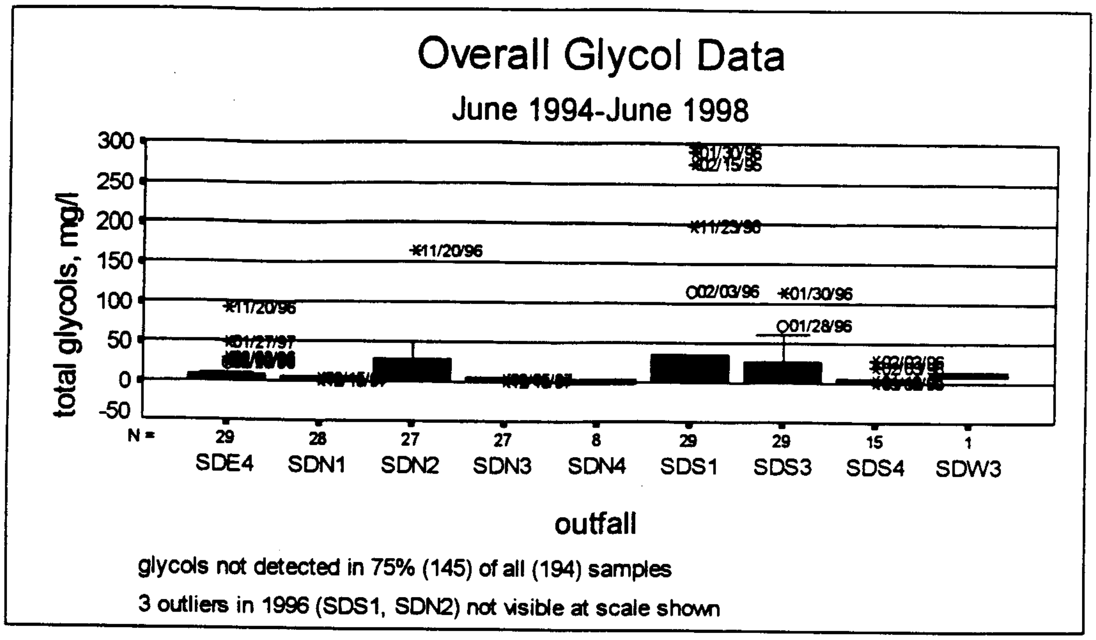

FIGURE 21 TOTAL GLYCOLS FOR PERMIT HISTORY

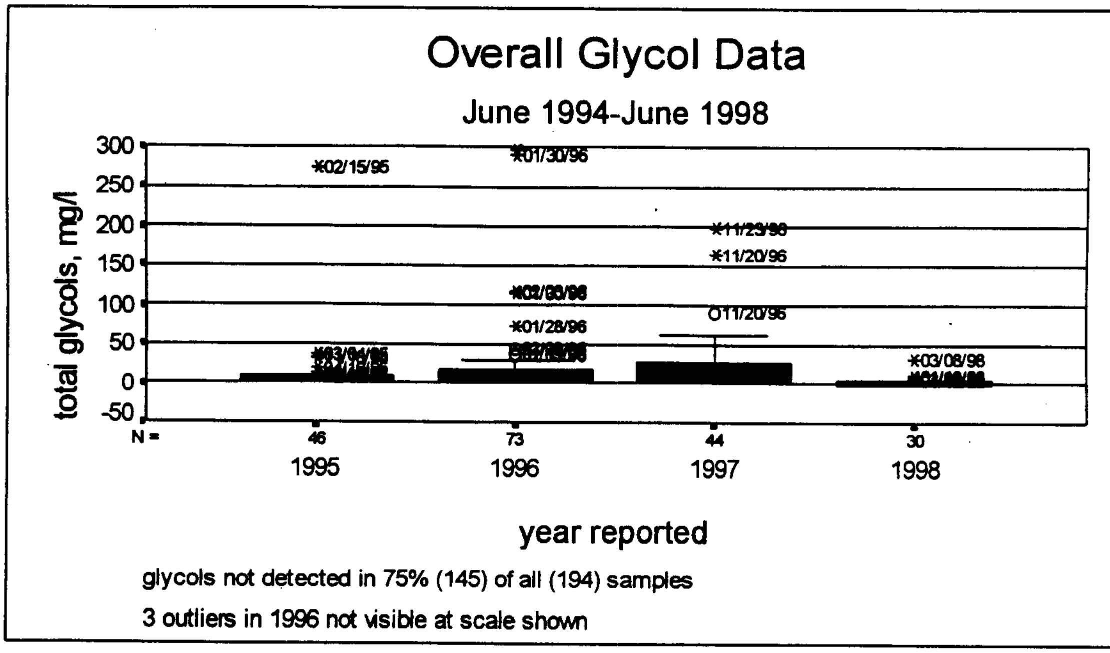

FIGURE 22 TOTAL GLYCOLS BY REPORTING YEAR

Appendix A

Hydraulic and Hydrologic Estimations

APPENDIX A

HYDRAULIC AND HYDROLOGIC ESTIMATIONS

This appendix presents hydraulic information required by the STIA NPDES permit. Paragraph 2 of Section C of NPDES permit special condition S3 states "The Permittee shall submit the following data for the storm event used: date, duration, the number of dry hours preceding the storm event, total rainfall during the storm event (inches), maximum flow rate (gallons per minute), and the total flow from the rain event (gallons)." Table A1 presents a summary of monitored storm events. Tables A2 and A3 present estimates of runoff volumes and peak discharge rates. Daily runoff values are presented in Table A4 and illustrated in the attached bar graphs shown as Figure A1.

Peak discharges presented in Table A3 are estimated by the "rational method" for each storm event sampled in the preceding year. The peak rate of each storm depends upon the time-of-concentration, or T_c, for the particular subbasin and the rainfall distribution of the particular storm. The WATERWORKS model was used to develop the T_c values presented in Table A5. A peak discharge, Q_p, is then estimated by the rational method using the following equation:

$$Q_p\ (\text{gpm}) = \frac{C \times I \times A \times 43560\ \text{ft}^3/\text{ac} \times 7.48\ \text{gal/ft}^3}{12\ \text{in/ft} \times 60\ \text{min/hr}}$$

where:

C = runoff coefficient = $(0.90(A_i) + 0.25(A_p))/A$

where :

A_i = the impervious area in acres, and

A_p = the pervious area in acres

I = peak intensity in inches/hour

A = subbasin area in acres

The Port's rain gauge records rainfall at 5-minute intervals, thereby resolving rainfall rates, or "intensities" for periods as short as 5-minutes. The rainfall record for the storm of interest is examined to determine the peak intensity for the time span that matches the time-of-concentration. The rain gauge allows the user to aggregate rainfall for multiples of the 5-minute recording interval that best approaches the times of concentration desired. This basin-specific intensity was then translated to an hourly peak intensity using the following equation:

$$I = i \times 60/T_c$$

where:

i = maximum rainfall depth (inches) of a time equal to the time of concentration

T_c = the time of concentration, displayed in Table A5.

For example, the T_c for SDE-4 is 21 minutes; therefore, the rainfall record for the storm of interest is examined to find the one period of 20 minutes that has the greatest rainfall depth.

As additional information, Table A6 provides changes in boundaries or percent of impervious surfaces.

Appendix A

Tables

TABLE A1

MONITORED STORM EVENTS

Stormdate	Depth, in.	Dur, hr	48hrant, in.	dryant, hr	Event Type*	Comment
06/03/97	0.26	16	0	76	NPDES	
06/16/97	0.36	28	0	135	NPDES	
06/21/97	0.27	11.8	0.12	68	NPDES	
08/25/97	0.2	10.5	0.07	96	NPDES	
10/28/97	0.47	10.8	0.08	26	NPDES	
11/06/97	0.16	4.4	0.01	72	NPDES	
11/16/97	0.47	12.6	0	222	NPDES	
11/19/97	0.65	39	0.12	24	NPDES	rain data missing: ant data estimated
12/15/97	1	33	0	87	NPDES	
01/12/98	1.13	48	0	123	NPDES	~2" snow preceded event
01/29/98	0.2	14	0	107	NPDES	
03/01/98	0.98	86	0.07	6	NPDES	
03/08/98	0.86	27	0	132	NPDES	
04/07/98	0.03	0.5	0.04	87	***non-storm***	non storm
04/09/98	0.09	17	0	62	***non-storm***	non storm
04/23/98	0.46	20	0	264	NPDES	
05/09/98	0.12	8	0	360	***non-storm***	non storm
05/14/98	0.21	8	0.01	125	NPDES	
05/24/98	0.58	11	0	87	NPDES	
06/10/98	0.28	10	0	288	NPDES	
06/24/98	0.43	4	0	288	NPDES	

* see criteria in Procedure Manual for Stormwater Monitoring (POS 1998a)
"dur" is rainfall duration in hours
"48hrant" is the total rainfall in the 48 hours preceding the event monitored
"dryant" is the duration of the antecedent dry period to the last measurable rainfall

TABLE A2

ESTIMATED RUNOFF VOLUMES FOR STORM EVENTS MONITORED JUNE 1997 THROUGH JUNE 1998

Monitored Event Date	Rainfall (in.)	Runoff Volumes for Sea-Tac Airport Sub-Basins, gallons												
		002 SDE-4	003 SDS-1	004 SDS-2	005 SDS-3	006 SDN-1	008 SDN-3	009 SDS-4	010 SDW-3	011 SDN-4	012 EY	011 TY	014 B	015 D
06/03/97	0.26	253,000			548,000	31,000				89,000	9,000	5,000		
06/16/97	0.36	569,000	17,000								12,000			104,000
06/21/97	0.27						53,000							
08/25/97	0.20							26,000						
10/28/97	0.47	1,056,000	32,000		2,291,000	128,000	199,000			160,000				
11/06/97	0.16										5,000			
11/16/97	0.47						199,000	241,000				9,000		
11/19/97	0.65		51,000											
12/15/97	1.00	2,739,000	85,000			330,000	609,000			340,000				
01/12/98	1.13	3,153,000	99,000		6,982,000			892,000		384,000				
01/29/98	0.20				264,000			26,000			7,000	4,000		
03/01/98	0.98	2,677,000			5,807,000	323,000				333,000				
03/08/98	0.86	2,309,000	71,000		4,921,000	279,000		607,000		292,000	27,000	17,000		
04/07/98	0.03	0				0								
04/09/98	0.09	0				0								
04/23/98	0.46	1,005,000			1,005,000	1,005,000				1,005,000				
05/09/98	0.12	15,000			15,000	15,000								
05/14/98	0.21	141,000			141,000	141,000								
05/24/98	0.58									1,493,000	19,000			
06/10/98	0.28				306,000	306,000						6,000		
06/24/98	0.57	1,466,000								1,466,000				

Rainfall data from National Weather Service and/or Port of Seattle rain gage at Sea-Tac Airport
Runoff volumes based upon basin-specific engineering models
Annual sampling requirements for outfalls SDS2, SDW3, B, and D to be satisfied by end of 1998.
Note: equations built into embedded functions above apply for rainfall from 0.1" to 2.0"

Basin Areas, Ac	149	11	13	462	14	70	63	14	30	1	1	50	34
max runoff, gal/in	4,045,708	290,531	358,412	12,544,409	366,557	1,900,668	1,721,462	380,134	820,002	40,186	21,179	1,346,759	920,466
Impervious, Ac	97	9.2	1	224	10.2	27	20.8	7	8	1	1	1	3.2
Pervious, Ac	52	1.5	12.2	238	3.3	43	42.6	7	23	0	0	48	30.7
Cr	0.67	0.81	0.30	0.57	0.74	0.50	0.46	0.58	0.41	0.78	0.90	0.27	0.31
Cr est runoff, gal/in	2,723,386	235,004	107,252	7,089,492	271,660	951,692	797,466	218,577	339,133	31,225	19,061	358,955	286,594

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TABLE A3

ESTIMATED PEAK RUNOFF RATES FOR STORM EVENTS MONITORED JUNE 1997 THROUGH JUNE 1998

Monitored Event Date	Peak RI (in/hr)	Peak Runoff Rates for Sea-Tac Airport Sub-Basins, gpm												
		002 SDE4	003 SDS-1	004 SDS-2	005 SDS-3	006 SDN-1	008 SDN-3	009 SDS-4	010 SDW-3	011 SDN-4	012 EY	013 TY	014 B	015 D
06/03/97	0.06	2723	235	107	7087	272	951	797	219	339	31	19	359	287
06/16/97	0.07	3176	274	125	8269	317	1110	930	255	396	36	22	419	334
06/21/97	0.06	2723	235	107	7087	272	951	797	219	339	31	19	359	287
08/25/97	0.05	2269	196	89	5906	226	793	664	182	283	26	16	299	239
10/28/97	0.07	3176	274	125	8269	317	1110	930	255	396	36	22	419	334
11/06/97	0.06	2723	235	107	7087	272	951	797	219	339	31	19	359	287
11/16/97	0.18	8168	705	322	21262	815	2854	2392	656	1017	94	57	1077	860
11/19/97	0.15	6806	587	268	17718	679	2378	1993	546	848	78	48	897	716
12/15/97	0.10	4538	392	179	11812	453	1586	1329	364	565	52	32	598	478
01/12/98	0.24	10890	940	429	28349	1086	3806	3189	874	1356	125	76	1435	1146
01/29/98	0.06	2723	235	107	7087	272	951	797	219	339	31	19	359	287
03/01/98	0.09	4084	352	161	10631	407	1427	1196	328	509	47	29	538	430
03/08/98	0.05	2269	196	89	5906	226	793	664	182	283	26	16	299	239
04/07/98	0.03	1361	117	54	3544	136	476	399	109	170	16	10	179	143
04/09/98	0.02	908	78	36	2362	91	317	266	73	113	10	6	120	96
04/23/98	0.03	1361	117	54	3544	136	476	399	109	170	16	10	179	143
05/09/98	0.02	908	78	36	2362	91	317	266	73	113	10	6	120	96
05/14/98	0.05	2269	196	89	5906	226	793	664	182	283	26	16	299	239
05/24/98	0.06	2723	235	107	7087	272	951	797	219	339	31	19	359	287
06/10/98	0.03	1361	117	54	3544	136	476	399	109	170	16	10	179	143
06/24/98	0.14	6353	548	250	16537	634	2220	1860	510	791	73	44	837	669

Rainfall data from Port of Seattle and/or National Weather Service rain gage at Sea-Tac Airport

Peak runoff rates based upon "rational method": Q=CIA.

"A", Basin Areas, Ac	149	11	13	462	14	70	63	14	30	1	1	50	34
"I", Time of Concentratior	20	40	60	80	10	55	50	40	50	5	5	80	80
"Ai", Area Impervious, Ac	97	9.2	1	224	10.2	27	20.8	7	8	1	1	1	3.2
"Ap", Area Pervious, Ac	52	1.5	12.2	238	3.3	43	42.6	7	23	0	0	48	30.7
"C", runoff coefficient =((	0.67	0.81	0.30	0.57	0.74	0.50	0.46	0.58	0.41	0.78	0.90	0.27	0.31

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TABLE A4

1997-98 RAINFALL AT SEA-TAC AIRPORT

Day	Jun-97	Jul-97	Aug-97	Sep-97	Oct-97	Nov-97	Dec-97	Jan-98	Feb-98	Mar-98	Apr-98	May-98	Jun-98
Rainfall in inches													
1	0.01	0.01	0	0.03	0.59	0	0	0.58	0.08	**0.59**	0	0.01	0.01
2	0.01	0	0	0	0.2	0	0	0.01	0.1	0.17	0	0.01	0
3	**0.25**	0	0	0	0.59	0.16	0	0.11	0.05	0.05	0.03	0.01	0
4	0	0	0	0	0.49	0	0	0.31	0.1	0	0	0	0.01
5	0	0.13	0	0	0	0.15	0	0.95	0.03	0	0	0	0
6	0	0.02	0	0	0.2	**0.22**	0.01	0.37	0.01	0	0.01	0	0
7	0	0.21	0	0	0.11	0.7	0.14	0.3	0.01	0	***0.1***	0	0
8	0	0.5	0	0	0.69	0	0.01	0.01	0.18	**0.19**	0	0.01	0.01
9	0	0.02	0	0	0.02	0	0.08	0	0	**0.7**	0.03	***0.04***	**0.23**
10	0	0.32	0	0.01	0.07	0	0.06	0	0.17	0.15	***0.09***	0.01	**0.08**
11	0.06	0.01	0	0.01	0	0	0	0.01	0.33	0	0.14	0.01	0
12	0	0	0	0.01	0	0	0	**0.22**	0.5	0.01	0.02	0.01	0
13	0	0	0	0.3	0.02	0	0	**0.16**	0.18	0.01	0.01	0.02	0.01
14	0	0	0	0.04	0.1	0	0.01	0.8	0.1	0	0	**0.23**	0.01
15	0	0	0	**0.48**	0	0	**0.57**	0.05	0.03	0.06	0	0.01	0
16	0.02	0	0	0.81	0.01	**0.49**	1.17	0.52	0.03	0.04	0	0	0
17	**0.36**	0	0	0.74	0.21	0.11	0.03	0.18	0.13	0.01	0	0.01	0
18	0	0	0	0.03	0	0.01	0	0.39	0.31	0	0.01	0.01	0
19	0.02	0	0	0	0	**0.65**	0.02	0.02	0.1	0	0.01	0.01	0
20	**0.18**	0	0.07	0	0	0.01	0.18	0.07	0.18	0	0	0.01	0
21	**0.09**	0	0	0	0	0.01	0	0.31	0.13	0.19	0.01	0.01	0
22	0.01	0	0	0	0.02	0.21	0.08	0.19	0.03	0.79	0	0	0.01
23	0.02	0	0.08	0	0.01	0.46	0.02	0.88	0	0.43	**0.5**	0.01	0.07
24	0	0	**0.12**	0	0	0.11	0	0.27	0.01	0.25	0.08	**0.65**	**0.45**
25	0	0	**0.07**	0.37	0	0.01	0	0.19	0.16	0.16	0	0.14	0.01
26	0	0	0.41	0.44	0.08	0	0.04	0.01	0.01	0.01	0	0.37	0.01
27	0	0	0.25	0.01	0	0.01	0.03	0.01	0.05	0.01	0	0.52	0.01
28	0.45	0	0.03	0.01	**0.9**	0.18	0.01	0.04	0.66	0	0	0	0
29	0	0	0	0	1.2	0.35	0	**0.23**		0	0	0.01	0
30	0.01	0	0	0.16	0	0.03	0	0.01		0.06	0	0.01	0
31		0			0	0	0.1	0		0.12		0	
daily max	0.45	0.5	0.41	0.81	1.2	0.7	1.17	0.95	0.66	0.79	0.5	0.65	0.45
total	1.49	1.22	1.03	3.45	5.51	3.87	2.56	7.20	3.67	4.0	1.04	2.13	0.92
% avg*	99%	161%	90%	184%	171%	66%	43%	134%	92%	113%	45%	125%	61%
ytd	1.49	2.71	3.74	7.19	12.7	16.57	19.13	26.33	30	34	35.04	37.17	new year
%avg*	99%	120%	110%	136%	149%	116%	94%	102%	101%	102%	99%	100%	new year
avg*	1.5	0.76	1.14	1.88	3.23	5.83	5.97	5.38	3.99	3.54	2.33	1.7	1.5
avg cum*	1.5	2.26	3.4	5.28	8.51	14.34	20.31	25.69	29.68	33.22	35.55	37.25	new year
# "storms"	4	0	1	2	2	5	2	4	1	3	1	2	2
# sampled	**3**	**0**	**1**	**0**	**1**	**3**	**1**	**2**	**0**	**2**	**1**	**2**	**2**
month max*	3.82	2.39	4.59	5.95	8.95	10.71	11.85	12.92	9.11	8.4	6.53	4.76	3.82
month min*	0.13	T	0.01	T	0.31	0.74	1.37	0.58	0.35	0.57	0.33	0.12	0.13

*Source: National Weather Service (http://161.55.224.1/smith/climate/search.html)

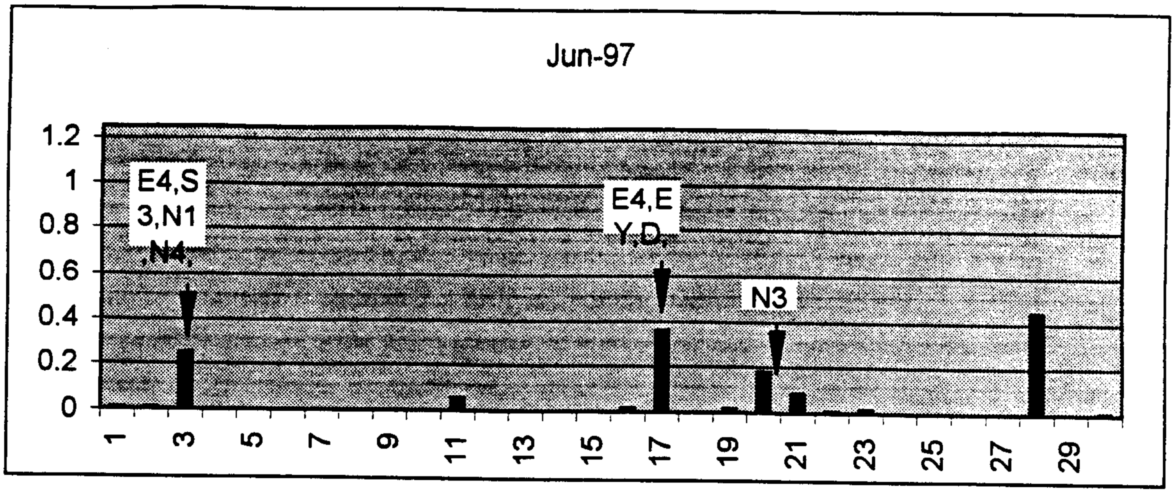
29 possible "storm" events

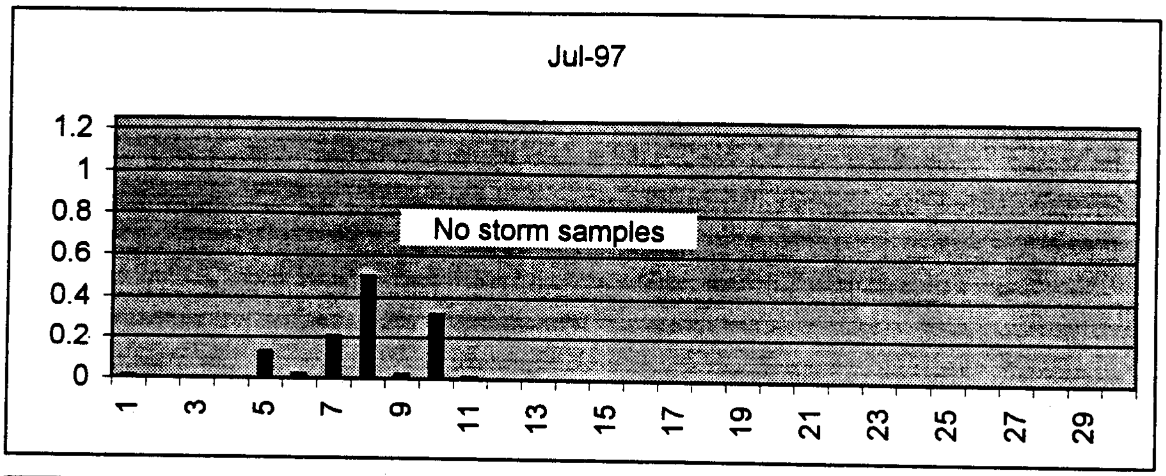
18 Sampled events (in bold in table)

3 non-"storms" sampled (grabs only)

TABLE A4

1997-98 RAINFALL AT SEA-TAC AIRPORT





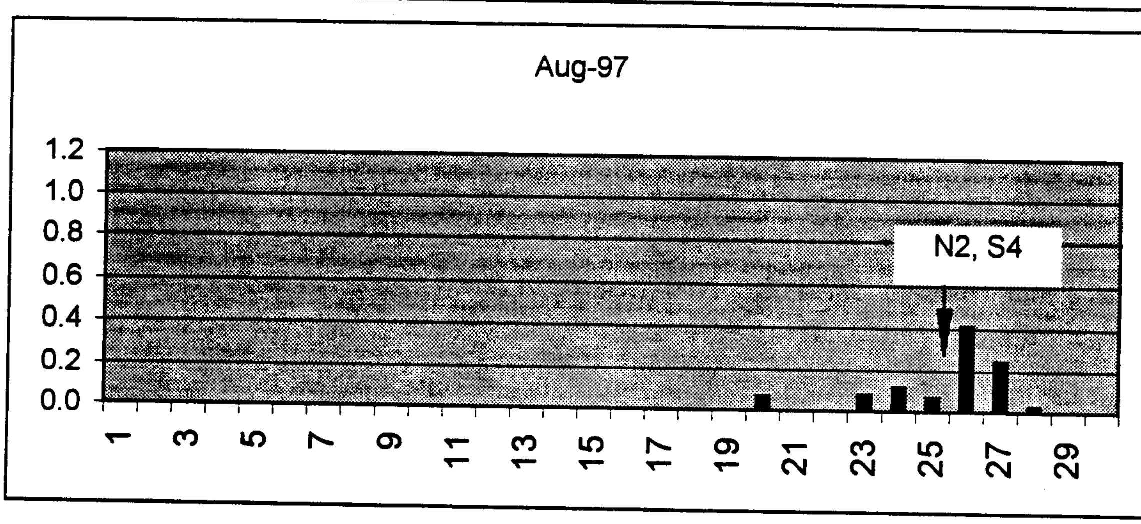
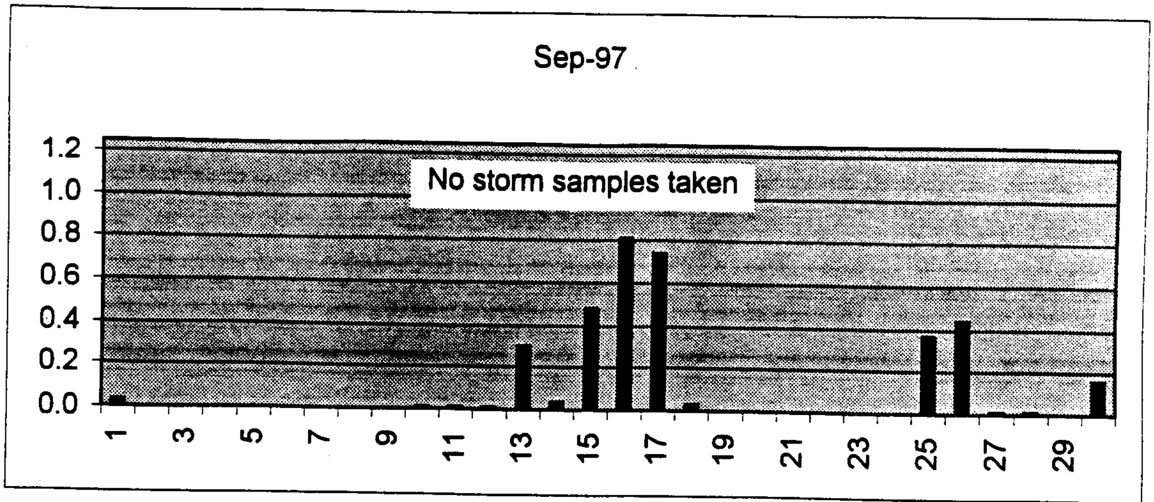
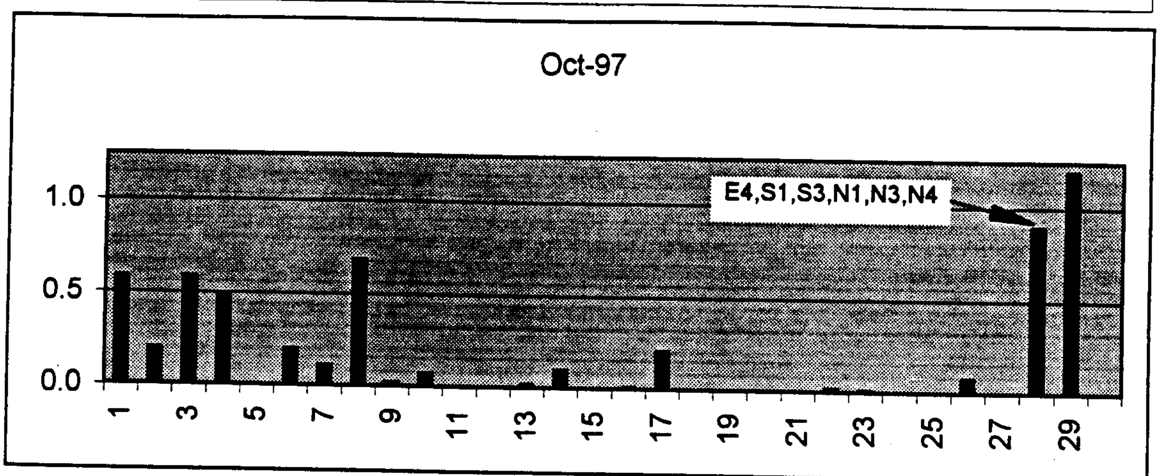


TABLE A4

1997-98 RAINFALL AT SEA-TAC AIRPORT





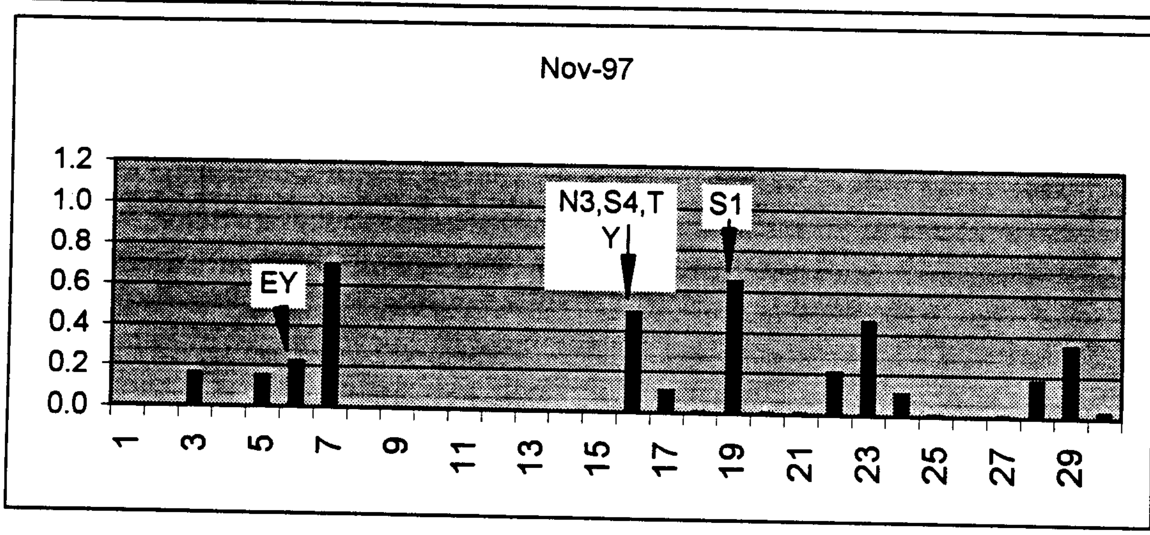
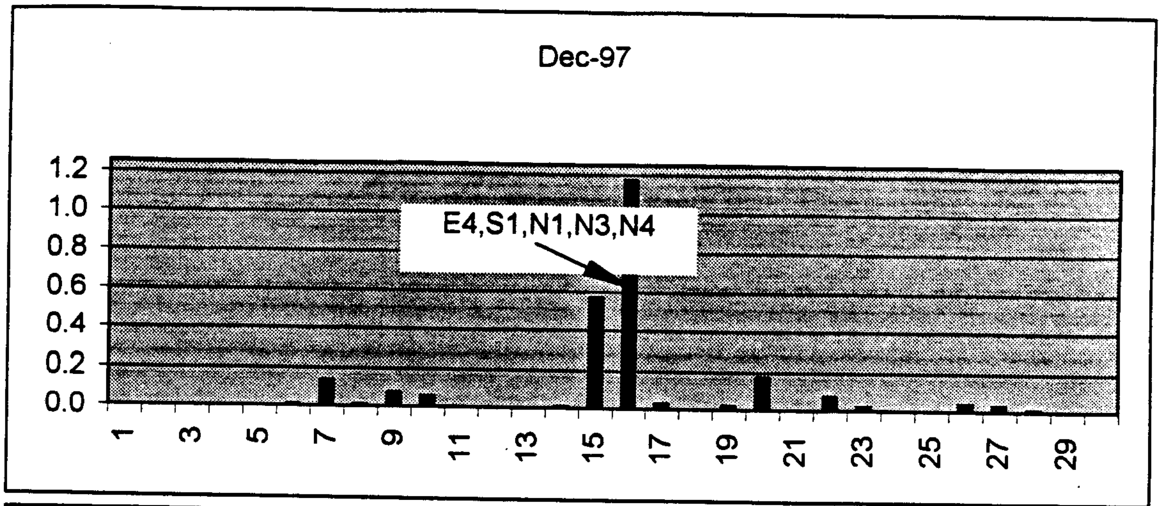
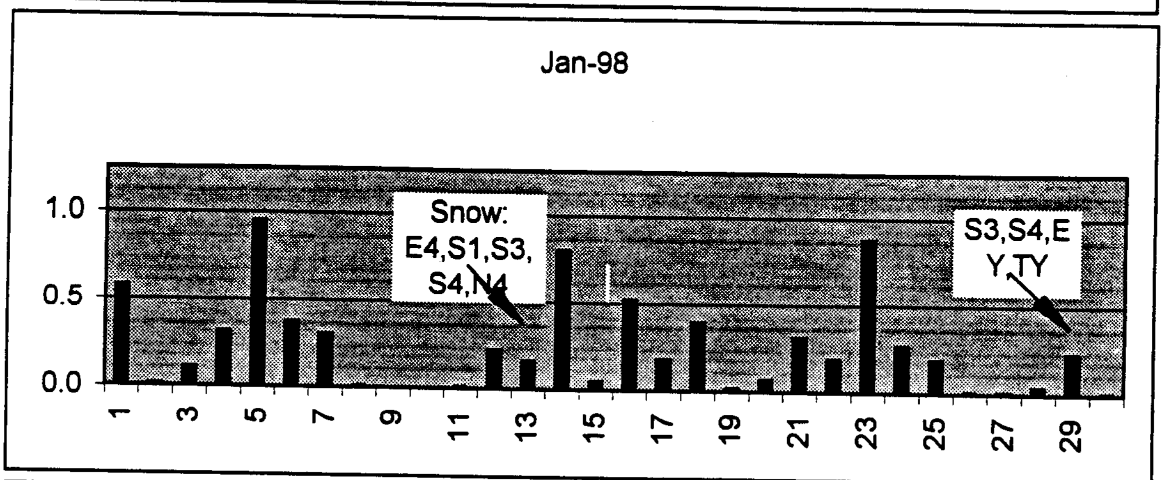


TABLE A4

1997-98 RAINFALL AT SEA-TAC AIRPORT





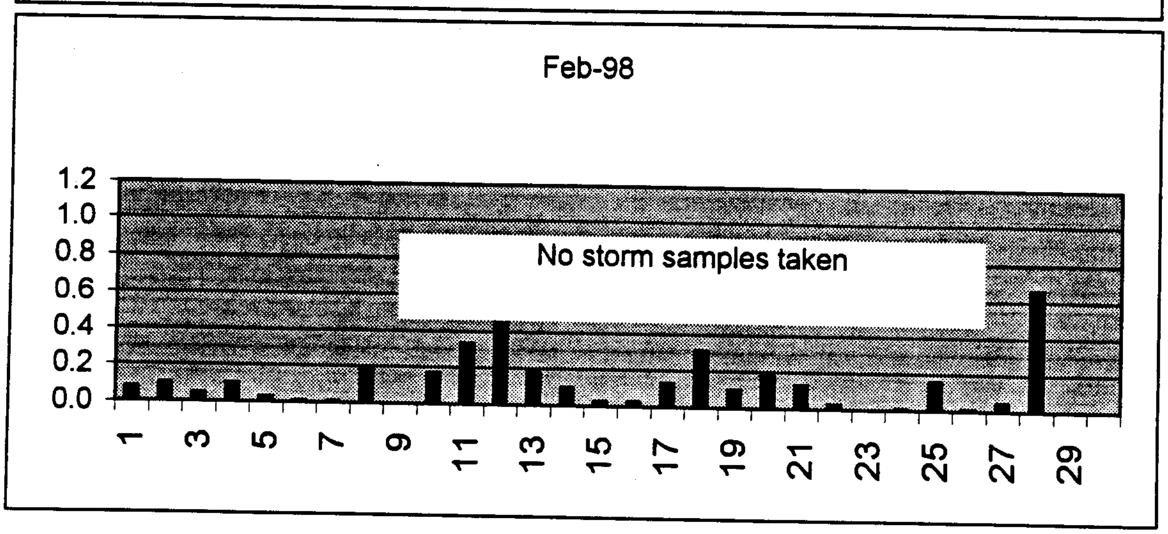
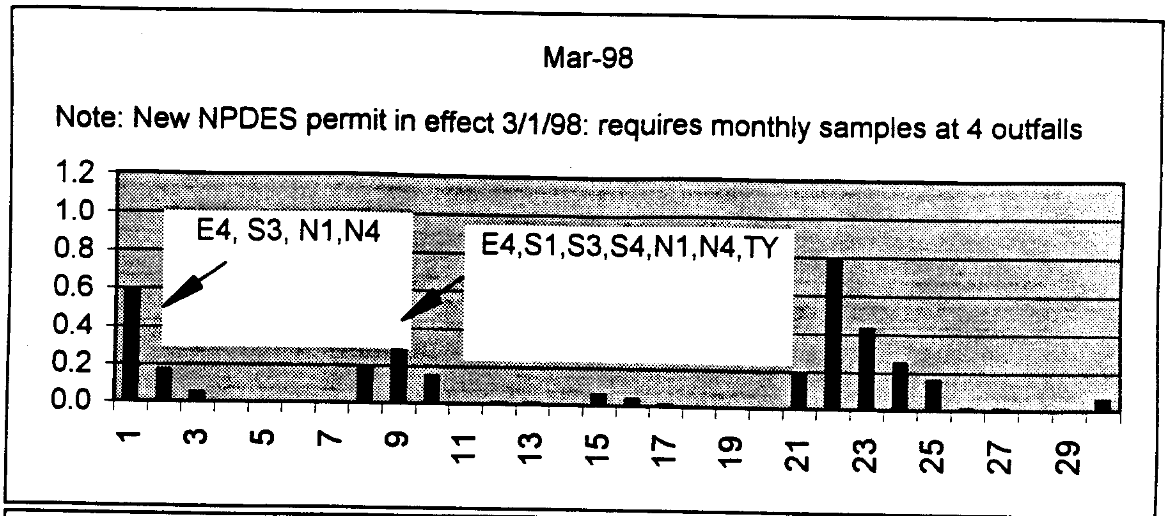
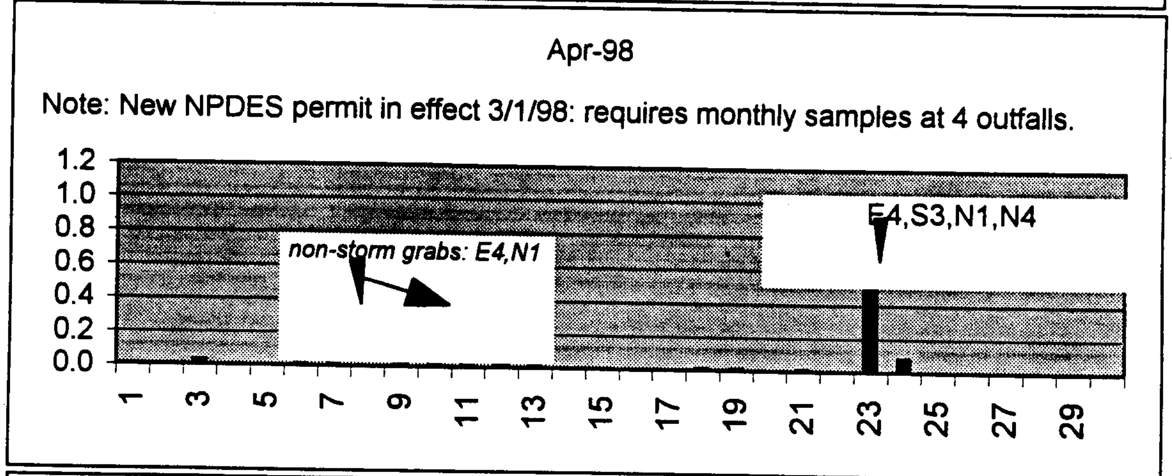


TABLE A4

1997-98 RAINFALL AT SEA-TAC AIRPORT





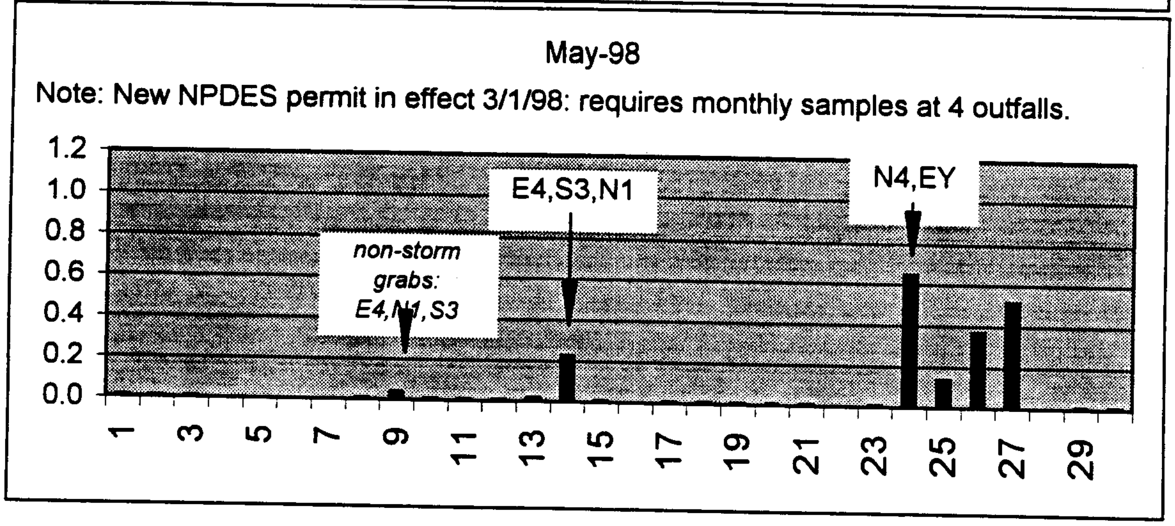


TABLE A4

1997-98 RAINFALL AT SEA-TAC AIRPORT

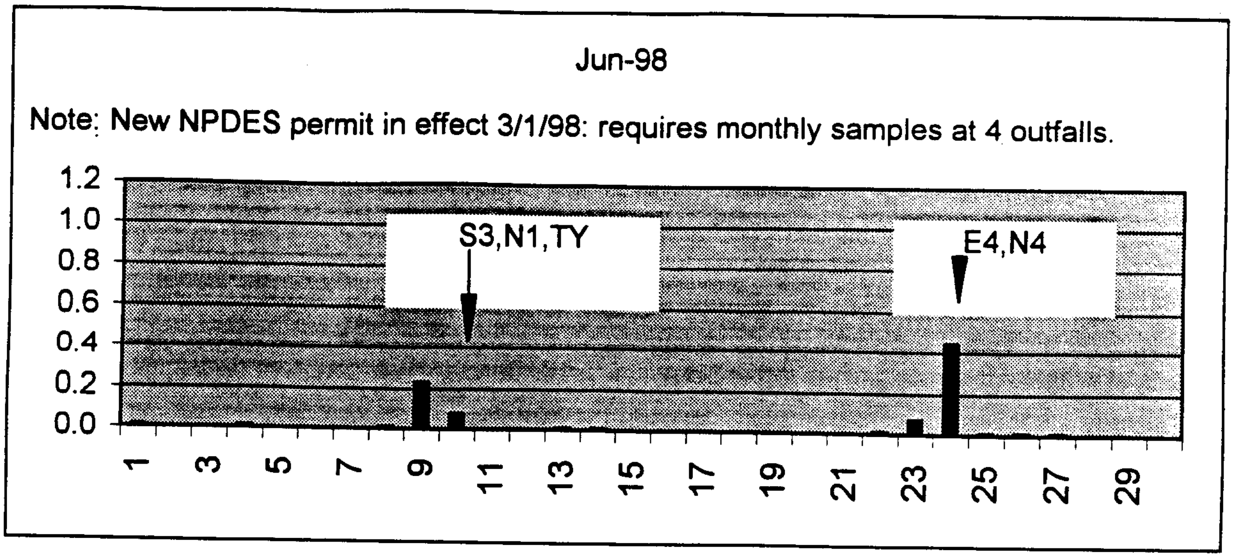


TABLE A5

SUMMARY OF SUBBASIN HYDROLOGIC CHARACTERISTICS

Subbasin	Outfall Number	A_p (acres)	A_i (acres)	Total Area (ac)	C	T_c (min)
SDE-4	002	52	97	149	0.77	21
SDS-1	003	0	6	6	.90	TBD
SDS-2	004	5	0	5	.25	60
SDS-3	005	222	202	424	0.56	78
SDN-1	006	0	14	14	.90	10
SDN-2	007	7	29	36	.77	50
SDN-3	008	43	17	60	.43	55
SDS-4	009	32	25	57	0.54	50
SDW-3	010	14	10	24	.52	38
SDN-4	011	20	6	26	0.40	TBD
Eng Yard	012	0	1.5	1.5	.90	5
Taxi Yard	013	0	2	2	.90	5
Subbasin B	014	40	0	40	0.25	TBD
Subbasin D	015	35	2	37	0.29	TBD

TABLE A6

Summary of SDS/IWS Drainage Basin Areas in 1994 and 1998

*** SUBJECT TO CORRECTION AND REFINEMENT ***

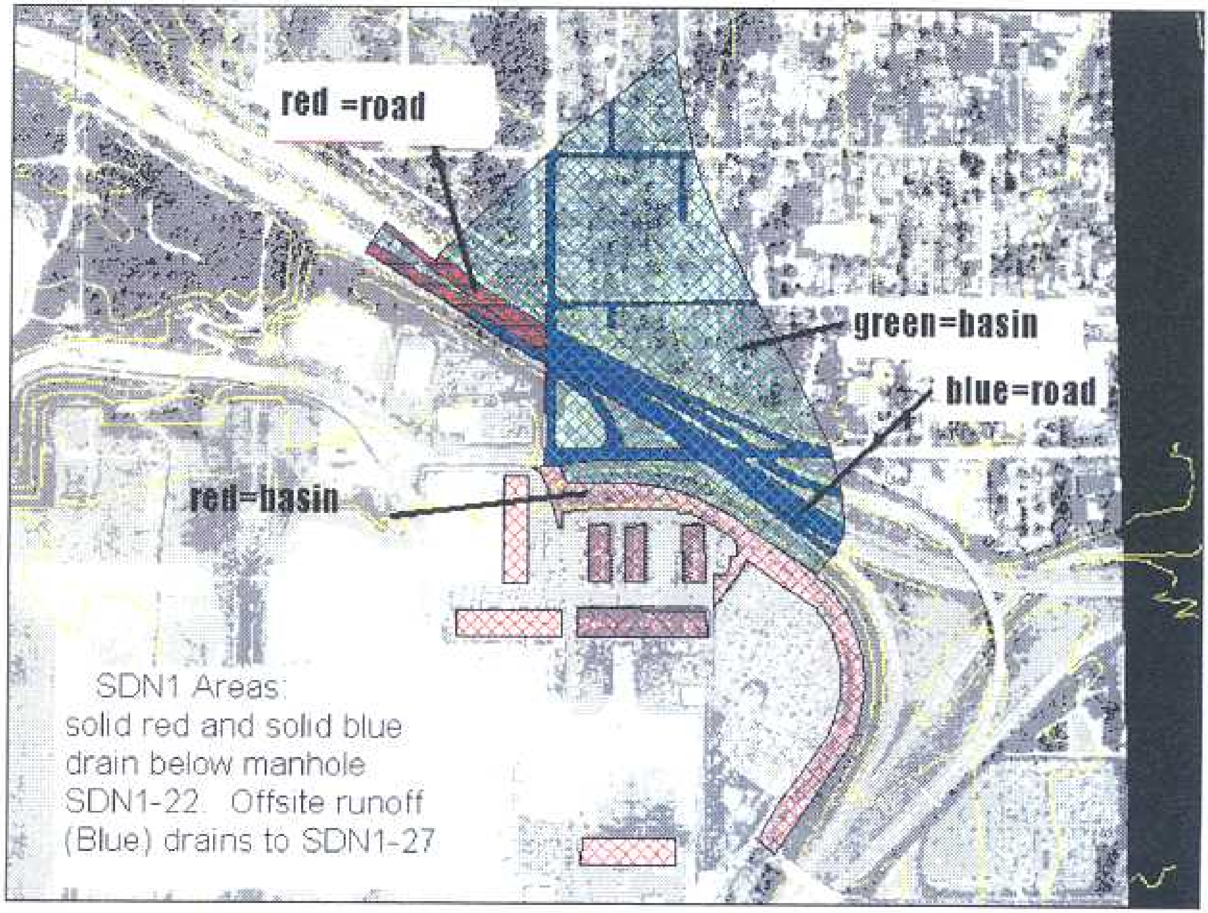
Drainage Basin	Base Year (1994) Perv. (acres)	Base Year (1994) Imperv. (acres)	Base Year (1994) Total (acres)	Changes 1994-1998 (See below)	Current (1998) Perv. (acres)	Current (1998) Imperv. (acres)	Current (1998) Total (acres)	Current (1998) total percent of each Creek perv	each Creek imperv	each Creek total	total percent of SDS perv	SDS imperv	SDS total	total percent of Airfield perv	Airfield imperv	Airfield total
Miller Creek SDS																
SDN-1 (above monitoring p	3.30	10.54	13.84	13	3.29	10.21	13.50	3%	16%	8%	0.6%	2.4%	1.4%			
SDN-1 (POS below mon. pt	0.42	5.00	5.42	--	0.42	5.00	5.42	0.4%	8%	3%	0.1%	1.2%	0.6%			
SDN-1 (offsite below mon.	33.88	12.06	45.94	--	33.88	12.06	45.94	33%	19%	28%	6.3%	2.8%	4.8%			
SDN-2	13.11	33.56	46.67	1,8	0.00	0.00	0.00	0%	0%	0%	0.0%	0.0%	0.0%	0%	0%	0%
SDN-3	49.80	20.11	69.91	14	42.86	27.04	69.90	42%	44%	42%	8.0%	6.3%	7.3%	12%	10%	11%
SDN-4	27.08	3.14	30.22	15	22.56	7.65	30.21	22%	12%	18%	4.2%	1.8%	3.1%	7%	3%	5%
Des Moines Creek SDS																
SDE-4	55.24	123.12	178.36	2,3,9,12,17	51.74	97.39	149.13	12%	27%	19%	9.7%	22.7%	15.5%			
SDS-1	1.48	10.98	12.46	5	1.47	9.23	10.70	0.3%	2.5%	1%	0.3%	2.2%	1.1%			
SDS-2	12.18	1.03	13.21	--	12.18	1.03	13.21	3%	0.3%	2%	2.3%	0.2%	1.4%			
SDS-3	259.11	186.47	445.58	4,14,15	238.05	224.28	462.33	55%	62%	58%	44.5%	52.4%	48.0%	69%	80%	74%
SDS-4	38.56	19.39	57.95	10,11	42.63	20.79	63.42	10%	6%	8%	8.0%	4.9%	6.6%	12%	7%	10%
W-3	14.30	10.55	24.85	14	7.04	6.98	14.02	2%	1.9%	2%	1.3%	1.6%	1.5%			
B	53.81	1.42	55.23	14	48.22	1.35	49.57	11%	0.4%	6%	9.0%	0.3%	5.1%			
D	34.02	0.35	34.37	14,15,16	30.66	3.20	33.86	7%	0.9%	4%	5.7%	0.7%	3.5%			
Other SDS																
Taxi Yard	0.00	0.78	0.78	--	0.00	0.78	0.78									
Engineering Yard	0.28	1.20	1.48	--	0.28	1.20	1.48									
IWS																
Primary drainage	11.75	246.11	257.86	,4,5,6,7,12,13,1	6.30	285.71	292.01									
North Snowmelt PS	--	--	--	8	6.39	0.24	6.63									
Central Snowmelt PS	--	--	--	9	0.05	0.70	0.75									
South Snowmelt PS	--	--	--	10	0.00	0.34	0.34									
North Cargo Area PS	--	--	--	1	6.46	33.33	39.79									
North Satellite PS	--	--	--	3	0.31	13.44	13.75									
IWS-510 Diversion	0.42	32.87	33.29	6,7	0.42	16.05	16.47									
TOTAL																
Miller Creek SDS	127.59	84.41	212.00	--	103.01	61.96	164.97									
% of SDS	21%	19%	20%		19%	14%	17%									
% of total	21%	12%	16%		19%	8%	12%									
Des Moines Creek SDS	468.70	353.31	822.01	--	431.99	364.25	796.24									
Other SDS	0.28	1.98	2.26	--	0.28	1.98	2.26									
total airfield	387.66	262.67	650.33		346.10	279.76	625.86									
% of SDS	65%	60%	63%		65%	65%	65%									
total SDS	596.57	439.70	######		535.28	428.19	963.47									
% of total	98%	61%	78%		96%	55%	72%									
IWS	12.17	278.98	291.15	--	19.93	349.81	369.74									
% of total	2%	39%	22%		4%	45%	28%									
Total drainage	608.74	718.68	######		555.21	778.00	######									

Detail of Drainage Basin Changes (boundary and/or percent impervious) Action	Year	Change in Drainage Area From:	To:	Total Acres
1. SWPPP No. 1 (STIA-9707): North Cargo Area Pump S	1997	SDN-2	IWS	39.79
2. SWPPP No. 2: Cargo Area 4 (at SDE2-29)	1996	SDE-4	IWS	4.40
3. SWPPP No. 3: (STIA-9452) North Satellite Pump Stati	1995	SDE-4	IWS	6.63
4. SWPPP No. 4: Gate C8 (at SDS2-17A)	1995	SDS-3	IWS	0.27
5. SWPPP No. 5: South Satellite Apron (at SDS1-100)	1997	SDS-1	IWS	1.75
6. SWPPP No. 6: Gate B5 (included in SWPPP No. 7)	1995	SDS-1	IWS	0.25
7.	1996	IWS	IWS	16.82
8. STIA-9759: North Snowmelt Pump Station	1998	SDN-2	IWS	6.63
9. STIA-9759: Central (Firestation) Snowmelt Pump Stati	1998	SDE-4	IWS	0.75
10. STIA-9759: South Snowmelt Pump Station	1998	SDS-4	IWS	0.34
11. STIA-9602: Runway 34R Safety Fill	1996	offsite	SDS-4	5.88
12. STIA-9723: Terminal Garage Expansion	1998	SDE-4	IWS	4.76
13. Tenant: Fed-Ex Cargo Expansion	1997	SDN-1	IWS	0.33
14. STIA-9721: Third Runway 16R-34L Interconnecting T	1998	W3,B,D	SDS-3	17.02
15. STIA-9420: Interconnecting Taxiways 16R-34L	1994	o change		0.00
16. STIA-9639: Snow Equipment Storage Shelter	1996	o change		0.00
17. STIA-????: D-Gate flush gutter reroute (at SDS3-33,	1994	SDE-4	IWS	5.26

NOTE: See corresponding figures that follow.

Appendix A

Figures


red =road
green=basin
blue=road
red=basin
SDN1 Areas:
solid red and solid blue
drain below manhole
SDN1-22. Offsite runoff
(Blue) drains to SDN1-27

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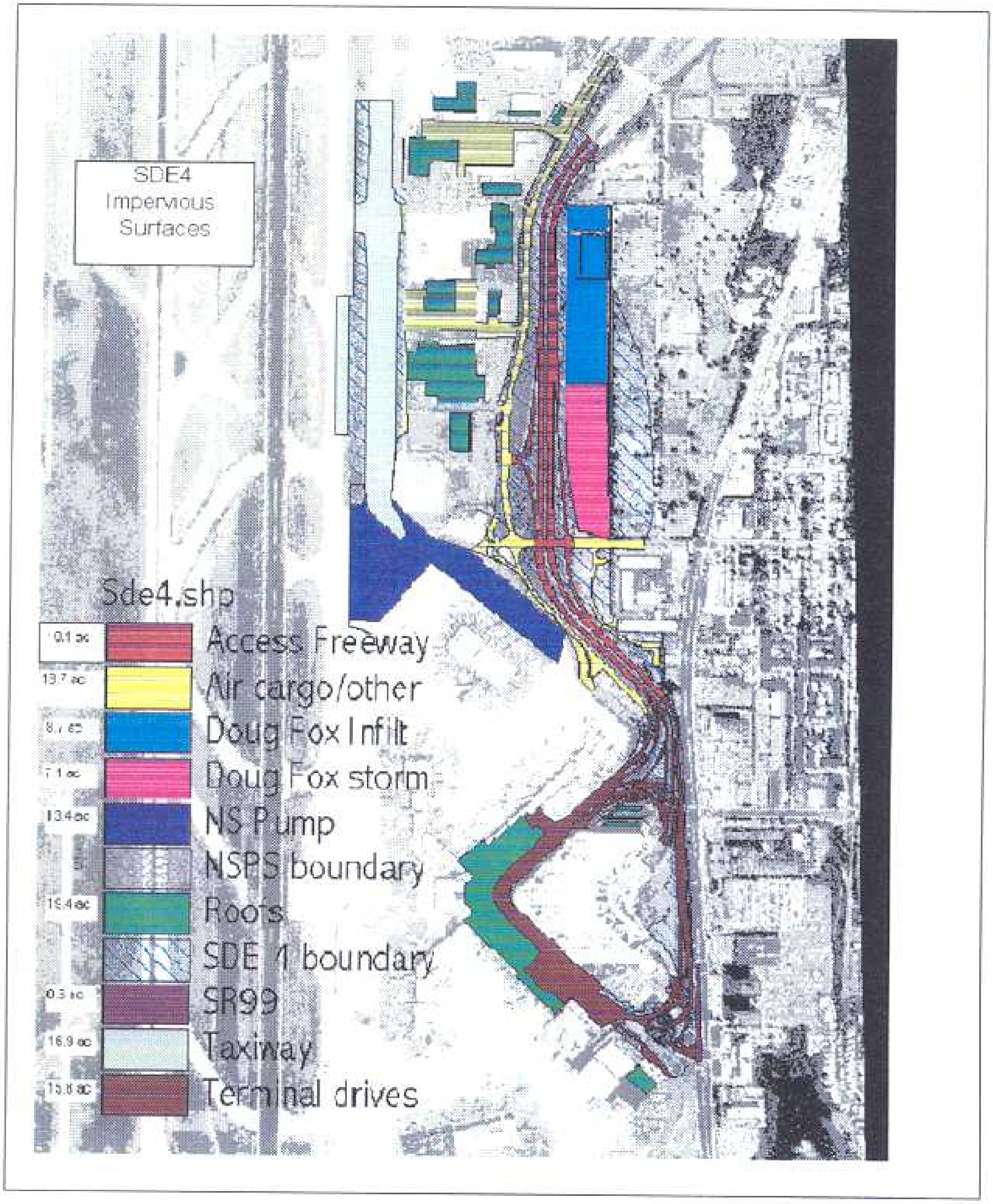
SDE4
Impervious
Surfaces
Sde4.shp
13.7 ac
16.9 ac
Access Freeway
Air cargo/other
Doug Fox Infilt
Doug Fox storm
NS Pump
NSPS boundary
Roofs
SDE 1 boundary
SR99
Taxiway
Terminal drives

AR 033470

Appendix B

Summarized Analytical Data for All Monitored Storm Events

Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
SDE4	SDE4 111394	11/11/94	storm	0.28	14	46	NPDES	1995	no		2.8	1.1				1100	
SDE4	SDE4 010795	1/7/95	storm	0.21	62		NPDES	1995	no	7	3.6	2.8				45	
SDE4	SDE4 041095	4/10/95	storm	0.29	18		NPDES	1995	no	6.6	0.55	1.1				260	
SDE4	SDE4 072695	7/26/95	storm	0.41	36		NPDES	1996	no	6.9	5.7	3.8				4000	
SDE4	SDE4 102695	10/25/95	storm	0.28	8		NPDES	1996	no	7.1	5.9	0.5				300	
SDE4	SDE4 020496 GRAB	2/3/96	storm	1.6	8		NPDES	1996	YES	7.9	17	8.8				22	
SDE4	SDE4 032296 GRAB	3/22/96	storm	0.21			StipAg	1996	no	7.1	2.8	3.9				20	
SDE4	SDE4 041696 GRAB	4/15/96	storm	0.49	16		NPDES	1996	no	6.39	2.8	3.35				17	
SDE4	SDE4 071796 GRAB	7/17/96	storm	0.27	31		NPDES	1997	no							220	comp failed
SDE4	SDE4 090396 GRAB	9/3/96	storm	0.29	1.2	76	NPDES	1997	no	7.31	3.1	2.64				1600	
SDE4	SDE4 121596 GRAB	12/15/96	nonstor	0.11	4	72	NPDES	1997	no	6.61	2.9	1.8				50	backup data in case short on data for 96 Q4
SDE4	SDE4 121996 GRAB	12/19/96	storm	0.36	37	103	NPDES	1997	no	6.45	3.3	1.97				220	
SDE4	SDE4 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	7.06	9	10				1600	
SDE4	SDE4 012797 GRAB	1/27/97	storm	0.41	26	109	StipAg	1997	no	6.17	0.8	5				50	
SDE4	SDE4 030597 GRAB	3/5/97	storm	0.39	20	42	NPDES	1997	no	6.33	~~103~~	3.06				[illegible]	FOG result not representative, laboratory error, see letter of May 15, 1997
SDE4	SDE4 053097	5/30/97	storm	1.64	36	14	NPDES	1997	no		1.1	1.2					backup FOG/TPH for March 1997 Lab errors (SDE4 030597 grab)
SDE4	SDE4 061697 GRAB	6/16/97	storm	0.36	28	135	NPDES	1998	no	8	1.6	1.48				188	
SDE4	SDE4 102897 GRAB	10/28/97	storm	0.47	10.8	26	NPDES	1998	no	6.5	0.5	2.09				1600	
SDE4	SDE4 121597 GRAB	12/15/97	storm	1	33	87	NPDES	1998	no	6.59	1.8	2.3				80	
SDE4	SDE4 030198 GRAB	3/1/98	storm	0.98	86	6	NPDES	1998	no	7.15		1.5	1.58	[illegible]	1.54	500	fecal coliform result not representative: exceeded holding time by 9+ hours
SDE4	SDE4 040798 GRAB	4/7/98	nonstor	0.03	0.5	87	NPDES	1998	no	7.03		2.4	3.4	[illegible]	3.4	110	NON-"STORM"
SDE4	SDE4 041098 GRAB	4/9/98	nonstor	0.09	17	62	NPDES	1998	no	6.86		2.27	3.1	0.05	3.05	900	NON-"STORM"
SDE4	SDE4 042398 GRAB	4/23/98	storm	0.46	20	264	NPDES	1998	no	6		3.5	2.5	0.025	2.48	500	
SDE4	SDE4 050998 GRAB	5/9/98	nonstor	0.12	8	360	NPDES	1998	no	7.03		1.8	2.53	0.09	2.44	1600	NON-"STORM"
SDE4	SDE4 051498 GRAB	5/14/98	storm	0.21	8	125	NPDES	1998	no	6.93		2.6	3.04	0.1	2.94	80	
SDE4	SDE4 062498 GRAB	6/24/98	storm	0.43	4	288	NPDES	1998	no	6.94		1.9	2.77	0.84	1.93	300	
SDS1	SDS1 101994	10/19/94	storm	0.2	32	120	NPDES	1995	no	5.76	1.1	0.5				10	
SDS1	SDS1 021695	2/15/95	storm	1.1	56		NPDES	1995	YES	6.6	3.4	5.3				4.5	
SDS1	SDS1 051195	5/11/95	storm	0.2	8		NPDES	1995	no	7.4	10	0.5					
SDS1	SDS1 060495	6/4/95	storm	0.7	28		NPDES	1995	no	6.4	5.6	5.4				60	
SDS1	SDS1 080795	8/6/95	storm	0.4	8		NPDES	1996	no	7.2	3.3	0.5				4	
SDS1	SDS1 101695	10/15/95	storm	0.35	12		NPDES	1996	no	7.1	1.2	0.5				200	
SDS1	SDS1 011396 GRAB	1/13/96	storm	0.37	20		NPDES	1996	no	7.1	0.5	1.8				0.5	
SDS1	SDS1 041696 GRAB	4/15/96	storm	0.49	16		NPDES	1996	no	6.65	2.5	0.32				4	
SDS1	SDS1 042296 GRAB	4/22/96	storm	2.83	8		StipAg	1996	no	7.54	1.9	0.58				23	
SDS1	SDS1 070396 GRAB	7/3/96	storm	0.23	12		NPDES	1997	no	5.88	0.5	0.35				2	Fecals exceeded 30 hour holding time, results not representative
SDS1	SDS1 071796 GRAB	7/17/96	storm	0.27	31		NPDES	1997	no							1600	foam seen downstream in DM Creek. comp failed, fecals make up for 7/3/96
SDS1	SDS1 080296 GRAB	8/2/96	storm	1.01	27	325	StipAg	1997	no	5.36	0.5	0.42				130	
SDS1	SDS1 120496 GRAB	12/4/96	storm	0.82	7.5	44	NPDES	1997	no	6.81	2.4	0.35				1600	
SDS1	SDS1 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	6.62	0.5	2.9				350	
SDS1	SDS1 041397 GRAB	4/13/97	storm	0.31	12		NPDES	1997	no	7.13	0.5	2.6				23	Reno deiced 4 aircraft 4/13/97
SDS1	SDS1 061797 GRAB	6/16/97	storm	0.36	28	135	NPDES	1998	no	7	0.5	0.95				1600	
SDS1	SDS1 102897 GRAB	10/28/97	storm	0.47	10.8	26	NPDES	1998	no	5.86	0.5	0.84				80	
SDS1	SDS1 111997 GRAB	11/19/97	storm	0.65	39	24	NPDES	1998	no			0.83				1600	
SDS1	SDS1 121597 GRAB	12/15/97	storm	1	33	87	NPDES	1998	no	6.09	0.5	1.3				23	
SDS1	SDS1 030898 GRAB	3/8/98	storm	0.86	27	132	NPDES	1998	no	6.22		0.95	0.72	0.16	0.56	1	fulfills qtrly deicing rqmt plus annual sample rqmt

AR 033472

Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
SDS2	SDS2 051095	5/9/95	storm	0.12	7.5		NPDES	1995	no	7.2	3.4	0.5				440	
SDS2	SDS2 051195	5/11/95	storm	0.2	8		NPDES	1995	no	7.4	1.4	0.5				780	
SDS2	SDS2 061095	6/10/95	storm	0.3	10	96	NPDES	1995	no	7.1	1.8	0.5				1400	
SDS2	SDS2 090595	9/5/95	storm				NPDES	1996	no	6.7	2.2	0.5				2600	
SDS2	SDS2 112396 GRAB	11/23/96	storm	0.63	34.1	72	NPDES	1997	YES	6.71	0.5	0.125				23	
SDS2	SDS2 120496 GRAB	12/4/96	storm	0.82	7.5	44	NPDES	1997	no	6.68	0.5	0.125				8	
SDS2	SDS2 011697 GRAB	1/16/97	storm	1.21	23	154	StipAg	1997	no	6.77	0.5	0.125				220	
SDS2	SDS2 021197 GRAB	2/11/97	storm	0.48	18	205	StipAg	1997	no	6.76	4	0.125				11	LAST FOR STIP AG
SDS3	SDS3 091494	9/13/94	storm	0.15	9	118	NPDES	1995	no	7.14	8.3	0.5				20	
SDS3	SDS3 101394	10/13/94	storm	0.32	14	480	NPDES	1995	no		1.4	0.5				1	
SDS3	SDS3 111994 grab	11/19/94	storm	0.42	24		NPDES	1995	no		0.5	0.5				2	
SDS3	SDS3 010795	1/7/95	storm	0.21	62		NPDES	1995	no	7.2	0.65	0.5				1	
SDS3	SDS3 041295	4/10/95	storm	0.29	18		NPDES	1995	no	7.3	0.55	0.5				1	
SDS3	SDS3 072695	7/26/95	storm	0.41	36		NPDES	1996	no	7.7	0.65	0.5				1.5	
SDS3	SDS3 101695	10/15/95	storm	0.35	12		NPDES	1996	no	7.4	1.4	0.5				1	
SDS3	SDS3 011396 GRAB	1/13/96	storm	0.37	20		NPDES	1996	no	7.4	0.5	0.5				0.5	
SDS3	SDS3 032296 grab	3/22/96	storm	0.21			StipAg	1996	no	7.5	0.5	0.5				13	
SDS3	SDS3 041696 GRAB	4/15/96	storm	0.49	16		NPDES	1996	no	7.38	1.2	0.31				1	
SDS3	SDS3 071796 GRAB	7/17/96	storm	0.27	31		NPDES	1997	no							1	fecals make up for 7/3/96 > hold time
SDS3	SDS3 080296 GRAB	8/2/96	storm	1.01	27	325	NPDES	1997	no	7.35	0.5	0.3				8	
SDS3	SDS3 090396 GRAB	9/3/96	storm	0.29	1.2	76	NPDES	1997	no	6.96	0.5	0.125				1600	
SDS3	SDS3 102196 GRAB	10/21/96	storm	0.68	4.1	64	NPDES	1997	no	6.97	0.5	0.125				130	
SDS3	SDS3 112396 GRAB	11/23/96	storm	0.63	34.1	72	StipAg	1997	YES	7.29	0.5	0.125				1	
SDS3	SDS3 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	6.87	3	0.54				30	
SDS3	SDS3 030597 GRAB	3/5/97	storm	0.39	20	42	NPDES	1997	no	7.22	0.5	0.125				1	
SDS3	SDS3 060397 GRAB	6/3/97	storm	0.26	16	76	NPDES	1998	no	7.49	0.5	3.7				130	
SDS3	SDS3 102897 GRAB	10/28/97	storm	0.47	10.8	26	NPDES	1998	no	7.13	0.5	0.125				13	
SDS3	SDS3 012998 GRAB	1/29/98	storm	0.2	14	107	NPDES	1998	no	7.26	1.1	0.125				1	
SDS3	SDS3 030198 GRAB	3/1/98	storm	0.98	86	6	NPDES	1998	no	7.69		0.125	0.19	0.08	0.11	1	
SDS3	SDS3 030998 GRAB	3/8/98	storm	0.86	27	132	NPDES	1998	no			0.125	0.075	0.025	0.05	1	backup monthly sample in case 3/1/98 sample didn't qualify under new permit
SDS3	SDS3 042398 GRAB	4/23/98	storm	0.46	20	264	NPDES	1998	no	7.39		0.125	0.075	0.025	0.05	1	
SDS3	SDS3 050998 GRAB	5/9/98	nonstor	0.12	8	360	NPDES	1998	no	7.07		0.34	0.33	0.025	0.31	17	NON-"STORM"
SDS3	SDS3 051498 GRAB	5/14/98	storm	0.21	8	125	NPDES	1998	no	7.23		0.26	0.18	0.05	0.13	70	CONSIDERABLE POLLEN IN SAMPLE
SDS3	SDS3 061098 GRAB	6/10/98	storm	0.28	10	288	NPDES	1998	no	7.51		0.125	0.075	0.025	0.05	4	
SDS4	SDS4 091494	9/13/94	storm	0.15	9	118	NPDES	1995	no	7.14	3	0.5				132	
SDS4	SDS4 101394	10/13/94	storm	0.32	14	480	NPDES	1995	no	7.02	1.2	0.5				70	
SDS4	SDS4 011295	1/11/95	storm	0.3	60		NPDES	1995	no	7.8	0.5	0.5				92	
SDS4	SDS4 051295	5/11/95	storm	0.2	8		NPDES	1995	no	7.5	1.8	0.5				16	
SDS4	SDS4 080795	8/6/95	storm	0.4	8		NPDES	1996	no	7.6	2.7	0.5				16	
SDS4	SDS4 101695	10/15/95	storm	0.35	12		NPDES	1996	no	7.7	1.7	0.5				275	
SDS4	SDS4 011496 GRAB	1/13/96	storm	0.37	20		NPDES	1996	no	7.4	0.5	0.5				440	
SDS4	SDS4 041696 GRAB	4/15/96	storm	0.49	16		NPDES	1996	no	7.63	2.7	0.125				350	
SDS4	SDS4 042296 GRAB	4/22/96	storm	2.83	8		StipAg	1996	no	7.15	0.5	0.125				1600	
SDS4	SDS4 070396 GRAB	7/3/96	storm	0.23	12		NPDES	1997	no	6.87	0.5	0.76				300*	Fecals exceeded 30 hour holding time, results not representative
SDS4	SDS4 071796 GRAB	7/17/96	storm	0.27	31		NPDES	1997	no							500	fecals make up for 7/4/96 grab that exceeded holding time
SDS4	SDS4 100396 GRAB	10/4/96	storm	0.59	8.1	18	NPDES	1997	no	6.74	0.5	0.125				500	
SDS4	SDS4 120496 GRAB	12/4/96	storm	0.82	7.5	44	NPDES	1997	no	6.78	0.5	0.125				80	
SDS4	SDS4 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	7.38	4	0.26				1600	
SDS4	SDS4 012797 GRAB	1/27/97	storm	0.41	26	109	StipAg	1997	no	7.45	3	0.125				30	
SDS4	SDS4 041997 GRAB	4/19/97	storm	1.16	26	64	NPDES	1997	no	7.4	0.5	0.5				50	

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Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
SDS4	SDS4 082497 GRAB	8/25/97	storm	0.2	10.5	96	NPDES	1998	no	7.77	0.5	0.125				70	
SDS4	SDS4 111797 GRAB	11/16/97	storm	0.47	12.6	222	NPDES	1998	no	7.46	0.5	0.125				29	
SDS4	SDS4 012998 GRAB	1/29/98	storm	0.2	14	107	NPDES	1998	no	7.21	0.5	0.125				4	matching composite not representative, not reported
SDS4	SDS4 030998 GRAB	3/8/98	storm	0.86	27	132	NPDES	1998	no	7.5	0.5	0.125				[illegible]	EXTRA GRAB (HAS MAKEUP COMP FOR 98QW)
SDW3	SDW3 051095	5/9/95	storm	0.12	7.5		NPDES	1995	no	7.3	0.5	0.5				1700	
SDW3	SDW3 051195	5/11/95	storm	0.2	8		NPDES	1995	no	7.4	1.1	0.5				73	
SDW3	SDW3 061095	6/10/95	storm	0.3	10	96	NPDES	1995	no	7	0.5	0.5				1000	
SDW3	SDW3 081795	8/16/95	storm	1.34	12		NPDES	1996	no	7.2	2.9	6.6				30000	
SDW3	SDW3 112396 GRAB	11/23/96	storm	0.63	34.1	72	NPDES	1997	YES	7.41	0.5	0.26				50	composite failed
SDW3	SDW3 011697 GRAB	1/16/97	storm	1.21	23	154	StipAg	1997	no	6.7	0.5					148	
SDW3	SDW3 021197 GRAB	2/11/97	storm	0.48	18	205	StipAg	1997	no	6.75	0.5	0.125				17	grab makes up for 12/4/96 missed grab
SDW3	SDW3 022697 GRAB	2/26/97	storm	0.24	25	167	StipAg	1997	no	6.13	9.7	0.125				[illegible]	grab makes up for 1/27/97 missed grab
B	B 120496 GRAB	12/4/96	storm	0.82	7.5	44	NPDES	1997	no	6.51	0.5	0.125				2	
B	B 012797 GRAB	1/27/97	storm	0.41	26	109	NPDES	1997	no	7.11	0.5	0.125				4	
B	B 041997 GRAB	4/19/97	storm	1.16	26	64	NPDES	1997	no	6.85	0.5	0.5				30	pairs with 3/6/97 composite for 97 spring quarter
D	D 120496 GRAB	12/4/96	storm	0.82	7.5	44	NPDES	1997	no	6.76	1.2	0.125				70	composite for this storm not representative, equipment malfunction
D	D 011797 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	6.95	3.9	0.47				350	no composite sample for this event, equipment malfunction
D	D 012797 GRAB	1/27/97	storm	0.41	26	109	NPDES	1997	no	7.11	13	0.125				170	makeup for 96Q4 (3 unsuccessful attempts)
D	D 021197 GRAB	2/11/97	storm	0.48	18	205	NPDES	1997	no	6.54	7.1	0.25				38	
D	D 030597 GRAB	3/5/97	storm	0.39	20	42	NPDES	1997	no	7.03	0.5	0.125				2	
D	D 061797 GRAB	6/16/97	storm	0.36	28	135	NPDES	1998	no	6.87	0.5	0.125				1600	
SDN1	SDN1 091494	9/13/94	storm	0.15	9	118	NPDES	1995	no	6.56	3.3	0.5				[illegible]	
SDN1	SDN1 101994	10/19/94	storm	0.2	32	120	NPDES	1995	no	6.83	1.8	0.5				180	
SDN1	SDN1 011295	1/11/95	storm	0.3	60		NPDES	1995	no	7.4	2.6	5.1				1000	
SDN1	SDN1 040795	4/6/95	storm	0.61	28		NPDES	1995	no	7.6	0.5	0.5				58	
SDN1	SDN1 080795	8/6/95	storm	0.4	8		NPDES	1996	no	7.8	21	5.6				42	
SDN1	SDN1 110795	11/6/95	storm	3.89	48		NPDES	1996	no	6.7	16	3.4				25	
SDN1	SDN1 020496 GRAB	2/3/96	storm	1.6	8		NPDES	1996	YES	7.4	7.3	7.5				100	
SDN1	SDN1 033196 GRAB	3/31/96	storm	0.64	0		StipAg	1996	no	6.9	8	4.1				340	xtra NPDES/Stip Ag
SDN1	SDN1 042296 GRAB	4/22/96	storm	2.83	8		NPDES	1996	no	7.26	1	0.25				6	
SDN1	SDN1 062396 GRAB	6/23/96	storm	0.46	10		StipAg	1996	no	5.52	2	0.92				23	xtra NPDES/Stip Ag
SDN1	SDN1 070396 GRAB	7/3/96	storm	0.23	12		NPDES	1997	no	6.17	2.8	1.8				900	Fecals exceeded 30 hour holding time, results not representative
SDN1	SDN1 071796 grab	7/17/96	storm	0.27	31		NPDES	1997	no							500	fecals make up for 7/4/96 grab that exceeded holding time
SDN1	SDN1 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	5.16	ample lost	3.6				161	paired up/down sample
SDN1up	SDN1up 100496 GRA	10/4/96	storm	0.59	8.1	18	NPDES	1997	no	7.23	0.5	0.5				500	paired up/down sample
SDN1up	SDN1up 011697 GRA	1/16/97	storm	1.21	23	154	NPDES	1997	no	4.37	0.5	2.1				23	paired up/down sample
SDN1up	SDN1 041397 grab	4/13/97	storm	0.31	12		NPDES	1997	no	4.57	0.5	1.08				33	
SDN1up	SDN1 060397 GRAB	6/3/97	storm	0.26	16	76	NPDES	1998	no	3.49	0.5	4.3				17	
SDN1up	SDN1 102897 grab	10/28/97	storm	0.47	10.8	26	NPDES	1998	no	6.54	0.5	0.125				50	
SDN1up	SDN1 121597 GRAB	12/15/97	storm	1	33	87	NPDES	1998	no	7.34	0.5	1.5				11	
SDN1up	SDN1 030198 GRAB	3/1/98	storm	0.98	86	6	NPDES	1998	no	6.33		0.48	0.68	0.025	0.65	2	
SDN1up	SDN1 030998 GRAB	3/8/98	storm	0.86	27	132	NPDES	1998	no	6.68		0.47	0.78	0.06	0.72	[illegible]	backup monthly sample in case 3/1/98 sample didn't qualify under new permit
SDN1up	SDN1 040798 GRAB	4/7/98	nonstor	0.03	0.5	87	NPDES	1998	no	5.56		0.34	0.89	0.05	0.84	[illegible]	NON-"STORM"
SDN1up	SDN1 041098 GRAB	4/9/98	nonstor	0.09	17	62	NPDES	1998	no	6.26		1.16	1.4	0.79	0.61	2	NON-"STORM"
SDN1up	SDN1 042398 GRAB	4/23/98	storm	0.46	20	264	NPDES	1998	no	5.35		1.2	0.97	0.025	0.95	170	
SDN1up	SDN1 050998 GRAB	5/9/98	nonstor	0.12	8	360	NPDES	1998	no	4.94		0.6	0.55	0.06	0.49	80	NON-"STORM"
SDN1up	SDN1 051498 GRAB	5/14/98	storm	0.21	8	125	NPDES	1998	no	6.21		0.56	0.41	0.025	0.39	50	CONSIDERABLE POLLEN IN SAMPLE
SDN1up	SDN1 061098 GRAB	6/10/98	storm	0.28	10	288	NPDES	1998	no	6.45		0.76	1.03	0.025	1.01	240	

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Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
SDN2	SDN2 090894	9/8/94	storm	0.69	22	93	NPDES	1995	no	6.82	1.8	0.5				3	
SDN2	SDN2 101394	10/13/94	storm	0.32	14	480	NPDES	1995	no		1.1	0.5				2	
SDN2	SDN2 111394	11/11/94	storm	0.28	14	46	NPDES	1995	no		0.5	0.5				30	
SDN2	SDN2 011295	1/11/95	storm	0.3	60		NPDES	1995	no	8	2.3	0.5				4	
SDN2	SDN2 041295	4/10/95	storm	0.29	18		NPDES	1995	no	7.6	4	5.2				1	
SDN2	SDN2 080795	8/6/95	storm	0.4	8		NPDES	1996	no	7	2.6	0.5				15	
SDN2	SDN2 101695	10/15/95	storm	0.35	12		NPDES	1996	no	7.3	1.9	0.5				1	
SDN2	SDN2 021796 GRAB	2/17/96	storm	1.29	12		NPDES	1996	no	7,6	0.5	0.5				10	
SDN2	SDN2 033196 GRAB	3/31/96	storm	0.64	0		StipAg	1996	no	6.7	0.5	0.5				16	xtra NPDES/Stip Ag
SDN2	SDN2 042296 GRAB	4/22/96	storm	2.83	8		NPDES	1996	no	7.17	0.5	0.125				50	
SDN2	SDN2 062396 GRAB	6/23/96	storm	0.46	10		StipAg	1996	no	6.83	1	0.46				2	xtra NPDES/Stip Ag
SDN2	SDN2 071796 grab	7/17/96	storm	0.27	31		NPDES	1997	no							4	xtra fecals analyzed
SDN2	SDN2 090396 GRAB	9/3/96	storm	0.29	1.2	76	NPDES	1997	no	7.24	1.6	0.29				900	some composite aliquots in grab
SDN2	SDN2 102196 GRAB	10/21/96	storm	0.68	4.1	64	NPDES	1997	no	6.45	0.5	0.32				2	
SDN2	SDN2 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	7.45	4.3	0.39				11	
SDN2	SDN2 041997 GRAB	4/19/97	storm	1.16	26	64	NPDES	1997	no	6.91	0.5	0.87				4	
SDN2	SDN2 082497 GRAB	8/25/97	storm	0.2	10.5	96	NPDES	1998	no	7.06	1.2	0.43				500	no composite, equipment malfunction
SDN3	SDN3 090894	9/8/94	storm	0.69	22	93	NPDES	1995	no	6.4	1.1	0.5				2200	
SDN3	SDN3 102694	10/25/94	storm	1.96	44	114	NPDES	1995	no		2.9	0.5				2	
SDN3	SDN3 010795	1/7/95	storm	0.21	62		NPDES	1995	no	7.8	0.55	0.5				1	
SDN3	SDN3 060495	6/4/95	storm	0.7	28		NPDES	1995	no	7	2.5	0.5				40	
SDN3	SDN3 071095	7/9/95	storm	0.81	13		NPDES	1996	no	7	3.3	0.5				800	
SDN3	SDN3 110795	11/6/95	storm	3.89	48		NPDES	1996	no	7.2	2.1	0.5				4	
SDN3	SDN3 011496 GRAB	1/13/96	storm	0.37	20		NPDES	1996	no	7.2	0.5	0.5				1	
SDN3	SDN3 033196 GRAB	3/31/96	storm	0.64	0		StipAg	1996	no	6.8	1.4	0.5				1	xtra NPDES/Stip Ag
SDN3	SDN3 041696 GRAB	4/15/96	storm	0.49	16		NPDES	1996	no	7.61	2	0.125				50	
SDN3	SDN3 042296 GRAB	4/22/96	storm	2.83	8		StipAg	1996	no	7.12	0.5	0.125				110	xtra NPDES/Stip Ag
SDN3	SDN3 080396 GRAB	8/2/96	storm	1.01	27	325	NPDES	1997	no	7.41	0.5	0.3				900	delayed hydrograph, very dry antecedent
SDN3	SDN3 112396 GRAB	11/23/96	storm	0.63	34.1	72	NPDES	1997	YES	7.32	0.5	0.125				14	insufficient sample for composite
SDN3	SDN3 120496 GRAB	12/4/96	storm	0.82	7.5	44	NPDES	1997	no	6.46	0.5	0.125				14	
SDN3	SDN3 122096 GRAB	12/19/96	storm	0.36	37	103	NPDES	1997	no	6.32	0.5	0.125				7	
SDN3	SDN3 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	6.68	1.4	0.125				4	
SDN3	SDN3 030597 GRAB	3/5/97	storm	0.39	20	42	NPDES	1997	no	7.18	36	0.125				[illegible]	FOG result not representative, laboratory error, see letter of May 15, 1997
SDN3	SDN3 053097	5/30/97	storm	1.64	36	14	NPDES	1997	no		0.5	0.125					BACKUP fog/tph for March lab errors on SDN3 030597 grab
SDN3	SDN3 062197 GRAB	6/21/97	storm	0.27	11.8	68	NPDES	1998	no	7.51	0.5	0.125				80	
SDN3	SDN3 102897 GRAB	10/28/97	storm	0.47	10.8	26	NPDES	1998	no	6.72	0.5	0.125				1600	
SDN3	SDN3 121597 GRAB	12/15/97	storm	1	33	87	NPDES	1998	no	7.28	1.5	0.125				50	HAD QC DUPLICATE ALSO: GOOD DUPLICATION
SDN4	SDN4 090396 GRAB	9/3/96	storm	0.29	1.2	76	NPDES	1997	no	6.63	1.2	0.125				280	taken in 2 BOTTLES: FOG/TPH, and fecals
SDN4	SDN4 120496 GRAB	12/4/96	storm	0.82	7.5	44	NPDES	1997	no	6.57	0.5	0.125				1	
SDN4	SDN4 011697 GRAB	1/16/97	storm	1.21	23	154	NPDES	1997	no	7.34	1.6	0.125				4	
SDN4	SDN4 030597 GRAB	3/5/97	storm	0.39	20	42	NPDES	1997	no	8.06	0.5	0.125				1	
SDN4	SDN4 060397 GRAB	6/3/97	storm	0.26	16	76	NPDES	1998	no	9.07	0.5	0.125				13	
SDN4	SDN4 102897 GRAB	10/28/97	storm	0.47	10.8	26	NPDES	1998	no	8.44	0.5	0.125				7	
SDN4	SDN4 121597 GRAB	12/15/97	storm	1	33	87	NPDES	1998	no	7.81	0.5	0.125				8	
SDN4	SDN4 030198 GRAB	3/1/98	storm	0.98	86	6	NPDES	1998	no	7.88		0.125	0.075	0.025	0.05	[illegible]	
SDN4	SDN4 030998 GRAB	3/8/98	storm	0.86	27	132	NPDES	1998	no	7.62		0.125	0.075	0.025	0.05	[illegible]	backup monthly sample in case 3/1/98 sample didn't qualify under new permit
SDN4	SDN4 042398 GRAB	4/23/98	storm	0.46	20	264	NPDES	1998	no	7.86		0.125	0.075	0.025	0.05	[illegible]	
SDN4	SDN4 052598 GRAB	5/24/98	storm	0.58	11	87	NPDES	1998	no	6.94		0.125	0.13	0.06	0.05	9	
SDN4	SDN4 062498 GRAB	6/24/98	storm	0.43	4	288	NPDES	1998	no	8.26		0.125	0.075	0.025	0.05	130	

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Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
EY	EY 091494	9/13/94	storm	0.15	9	118	NPDES	1995	no	6.93	2.2						
EY	EY 101394	10/13/94	storm	0.32	14	480	NPDES	1995	no	6.98	2.1						
EY	EY 030995	3/8/95	storm	2.16	114		NPDES	1995	no	6.6	0.5						
EY	EY 060495	6/4/95	storm	0.7	28		NPDES	1995	no	5.5	6.5						
EY	EY 072695	7/26/95	storm	0.41	36		NPDES	1996	no	5.8	4.1						
EY	EY 101695	10/15/95	storm	0.35	12		NPDES	1996	no	6.5	0.55						
EY	EY 021796 GRAB	2/17/96	storm	1.29	12		NPDES	1996	no	7.7	0.5						
EY	EY 042296 GRAB	4/22/96	storm	2.83	8		NPDES	1996	no	7.19	0.5						
EY	EY 052296 GRAB	5/21/96	storm	0.31	30		StipAg	1996	no	6.06	1						
EY	EY 062396 GRAB	6/23/96	storm	0.46	10		StipAg	1996	no	6.15	0.5						
EY	EY 070396 GRAB	7/3/96	storm	0.23	12		NPDES	1997	no	6.26	0.5						
EY	EY 102196 GRAB	10/21/96	storm	0.68	4.1	64	NPDES	1997	no	5.8	0.5						
EY	EY 021197 GRAB	2/11/97	storm	0.48	18	205	NPDES	1997	no	5.63	1.9						
EY	EY 030597 GRAB	3/5/97	storm	0.39	20	42	NPDES	1997	no	5.11	[illegible]						
EY	EY 060397 GRAB	6/3/97	storm	0.26	16	76	NPDES	1998	no	5.54	[illegible]						
EY	EY 110697 GRAB	11/6/97	storm	0.16	4.4	72	NPDES	1998	no	6.28	[illegible]						
EY	EY 012998 GRAB	1/29/98	storm	0.2	14	107	NPDES	1998	no	6.19	[illegible]						
EY	EY 052598 GRAB	5/24/98	storm	0.58	11	87	NPDES	1998	no				0.2	0.025	0.18		
TY	TY 090894	9/8/94	storm	0.69	22	93	NPDES	1995	no	7.91	3.9						
TY	TY 101994	10/19/94	storm	0.2	32	120	NPDES	1995	no	6.52	1.3						
TY	TY 030495	3/4/95	storm	0.18	24		NPDES	1995	no	6.9	5.7						
TY	TY 060495	6/4/95	storm	0.7	28		NPDES	1995	no	5.5	7.6						
TY	TY 081795	8/16/95	storm	1.34	12		NPDES	1996	no	6.8	2.3						
TY	TY 090595	9/5/95	storm				NPDES	1996	no		1.6						
TY	TY 101695-1	10/15/95	storm	0.35	12		NPDES	1996	no	6.7	19						
TY	TY 032296 GRAB	3/22/96	storm	0.21			StipAg	1996	no	6.9	3.9						
TY	TY 041696 GRAB	4/15/96	storm	0.49	16		NPDES	1996	no	6.06	3.7						
TY	TY 042296 GRAB	4/22/96	storm	2.83	8		NPDES	1996	no	7.31	2						
TY	TY 070396 GRAB	7/3/96	storm	0.23	12		NPDES	1997	no	6.15	1.4						
TY	TY 071796 grab	7/17/96	storm	0.27	31		StipAg	1997	no	5.91	1.9						
TY	TY 080296 GRAB	8/2/96	storm	1.01	27	325	StipAg	1997	no	6.43	1.6						
TY	TY 100496 GRAB	10/4/96	storm	0.59	8.1	18	NPDES	1997	no	7.19	1.4	1.34					
TY	TY 021197 GRAB	2/11/97	storm	0.48	18	205	NPDES	1997	no	5.72	5.1						
TY	TY 030597 GRAB	3/5/97	storm	0.39	20	42	NPDES	1997	no	5.98	48						FOG result not representative, laboratory error, see letter of May 15, 1997
TY	TY 060397 GRAB	6/3/97	storm	0.26	16	76	NPDES	1998	no	6.07	1.4						
TY	TY 111697 GRAB	11/16/97	storm	0.47	12.6	222	NPDES	1998	no	6.67	0.5						
TY	TY 012998 GRAB	1/29/98	storm	0.2	14	107	NPDES	1998	no	6.31	1						matching composite not representative, not reported
TY	TY 030998 GRAB	3/8/98	storm	0.86	27	132	NPDES	1998	no	6.83	0.5	1.2	1.41	0.09	1.32		EXTRA GRAB (HAS MAKEUP COMP FOR 98QW)
TY	TY 061098 GRAB	6/10/98	storm	0.28	10	288	NPDES	1998	no			1.2	1.05	[illegible]0.025	1.03		
result <MDL; value is 1/2 MDL							this data set includes			224	rainfall events that met "storm" criteria						
result [illegible]							this data set includes			8	rainfall events that did not meet "storm" criteria						

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Please note:
1. As of the current reporting period (June 97- June 98) the following outfalls have not yet been sampled under new permit Annual sampling and reporting requirements: SDS2 (004), SDN3 (008), SDS4 (009), SDW3 (010), B (014), D (015).
2. Because of several BMPs (IWS pump stations) there have been no sampleable discharges at SDN2 since July 1997.
3. The new NPDES permit dropped analysis requirements for the grab sample parameter FOG, and changed methods from TPH (418.1) to TPH (NWTPH-Dx).

Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
						[redacted]											
						SDE4			count	23	17	25	7	7	7	25	
						(Des Moines Creek)			median	6.9	2.8	2.3	2.77	0.05	2.48	260	
									95th	7.8	10.6	8.0	3.31	0.62	3.30	1600	
									75th	7.1	3.6	3.4	3.07	0.10	3.00	1100	
									25th	6.5	1.6	1.8	2.52	0.04	2.19	80	
									#non-detected	0	2	1	0	2	0	0	
									%non-detected	0%	12%	4%	0%	29%	0%	0%	
						SDS1			count	18	17	19	1	1	1	18	
						(Des Moines Creek)			median	6.6	1.1	0.8	0.72	0.16	0.56	42	
									95th	7.4	6.5	5.3	0.72	0.16	0.56	1600	
									75th	7.1	2.5	1.6	0.72	0.16	0.56	313	
									25th	6.1	0.5	0.5	0.72	0.16	0.56	6	
									#non-detected	0	8	4	0	0	0	2	
									%non-detected	0%	47%	21%	0%	0%	0%	11%	
						SDS2			count	8	8	8	0	0	0	8	
						(Des Moines Creek)			median	6.8	1.6	0.3				330	
									95th	7.3	3.8	0.5				2180	
									75th	7.1	2.5	0.5				935	
									25th	6.7	0.5	0.1				20	
									#non-detected	0	3	8				0	
									%non-detected	0%	38%	100%				0%	
						SDS3			count	22	19	25	6	6	6	26	
						(Des Moines Creek)			median	7.3	0.5	0.3	0.13	0.03	0.08	1	
									95th	7.7	3.5	0.5	0.30	0.07	0.27	130	
									75th	7.4	1.2	0.5	0.19	0.04	0.13	16	
									25th	7.2	0.5	0.1	0.08	0.03	0.05	1	
									#non-detected	0	10	19	3	4	3	13	
									%non-detected	0%	53%	76%	50%	67%	50%	50%	
						SDS4			count	19	19	19	0	0	0	19	
						(Des Moines Creek)			median	7.4	0.5	0.3				70	
									95th	7.8	3.1	0.5				1600	
									75th	7.6	2.3	0.5				395	
									25th	7.1	0.5	0.1				28	
									#non-detected	0	11	17				1	
									%non-detected	0%	58%	89%				5%	

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Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
						SDW3			count	8	8	7	0	0	0	8	
						(Des Moines Creek)			median	7.1	0.6	0.5				111	
									95th	7.4	7.3	4.8				20095	
									75th	7.3	1.6	0.5				1175	
									25th	6.7	0.5	0.2				42	
									#non-detected	0	4	5				1	
									%non-detected	0%	50%	71%				13%	
						B			count	3	3	3	0	0	0	3	
						(Des Moines Creek)			median	6.9	0.5	0.1				4	
									95th	7.1	0.5	0.5				27	
									75th	7.0	0.5	0.3				17	
									25th	6.7	0.5	0.1				3	
									#non-detected	0	3	3				0	
									%non-detected	0%	100%	100%				0%	
						D			count	6	6	6	0	0	0	6	
						(Des Moines Creek)			median	6.9	2.8	0.1				120	
									95th	7.1	11.5	0.4				1288	
									75th	7.0	6.3	0.2				305	
									25th	6.8	0.7	0.1				46	
									#non-detected	0	2	4				0	
									%non-detected	0%	33%	67%				0%	
						SDN1			count	12	11	12	0	0	0	12	
						(Miller Creek)			median	6.9	2.8	2.6				131	
									95th	7.7	18.5	6.5				2350	
									75th	7.4	7.7	4.4				380	
									25th	6.5	1.9	0.5				38	
									#non-detected	0	0	3	0	0	0	0	
									%non-detected	0%	0%	25%				0%	
						SDN1up			count	14	6	14	8	8	8	14	
						(Miller Creek)			median	6.2	0.5	0.7	0.84	0.04	0.69	28	
									95th	7.3	0.5	2.9	1.27	0.53	0.99	331	
									75th	6.5	0.5	1.2	0.99	0.06	0.87	73	
									25th	5.0	0.5	0.5	0.65	0.03	0.58	4	
									#non-detected	0	6	2	0	4	0	2	
									%non-detected	0%	100%	14%	0%	50%	0%	14%	
						SDN2			count	26	17	26	8	8	8	26	
						(No longer a stormdrain,			median	6.5	1.8	1.0	0.84	0.04	0.69	50	
						re-routed to IWS 1997)			95th	7.6	17.0	5.5	1.27	0.53	0.99	875	
									75th	7.1	3.3	3.1	0.99	0.06	0.87	178	
									25th	5.5	0.5	0.5	0.65	0.03	0.58	19	
									#non-detected	0	6	5	0	4	0	2	
									%non-detected	0%	35%	19%	0%	50%	0%	8%	

Grab sample data only		storm characteristics								grab sample analyte concentration, mg/l							
outfall	POS ID	storm date	event	depth, in.	dur, hrs	dryant, hrs	purpose	report	ground deice?	ph	FOG	TPH (IR)	TPH-Dx	TPH-D	TPH-MO	Fecals	comments
						SDN3			count	18	20	20	0	0	0	19	
						(Miller Creek)			median	7.2	0.8	0.1				14	
									95th	7.6	4.9	0.5				1660	
									75th	7.3	2.0	0.5				95	
									25th	6.7	0.5	0.1				3	
									#non-detected	0	9	19				4	
									%non-detected	0%	45%	95%				21%	
						SDN4			count	12	7	12	5	5	5	12	
						(Miller Creek)			median	7.8	0.5	0.1	0.08	0.03	0.05	6	
									95th	8.7	1.5	0.1	0.12	0.07	0.05	198	
									75th	8.1	0.9	0.1	0.08	0.03	0.05	10	
									25th	7.2	0.5	0.1	0.08	0.03	0.05	1	
									#non-detected	0	5	12	4	4	5	5	
									%non-detected	0%	71%	100%	80%	80%	100%	42%	
						EY			count	17	17	0	1	1	1	0	
						(City of Seatac)			median	6.2	0.5		0.20	0.03	0.18		
									95th	7.3	4.6		0.20	0.03	0.18		
									75th	6.6	1.9		0.20	0.03	0.18		
									25th	5.8	0.5		0.20	0.03	0.18		
									#non-detected	0	10		0	1	0		
									%non-detected	0%	59%		0%	100%	0%		
						TY			count	19	19	3	2	2	2	0	
						(City of Seatac)			median	6.5	1.9		1.23	0.06	1.18		
									95th	7.4	8.7		1.39	0.09	1.31		
									75th	6.9	3.9		1.32	0.07	1.25		
									25th	6.1	1.4		1.14	0.04	1.10		
									#non-detected	0	2		0	1	0		
									%non-detected	0%	11%		0%	50%	0%		

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Composite sample data		storm characteristics								analyte concentration, mg/l											
outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
SDE4	SDE4 111394	11/11/94	0.28		14	46	NPDES	1995	no	56	46	7	0.39	0.2	2.5	2.5	[illegible]	0.021	0.008	0.195	
SDE4	SDE4 111994	11/19/94	0.42	0.05	24	52	NPDES	1995	no			8			2.5	2.5	[illegible]				
SDE4	SDE4 010795	1/7/95	0.21	0	62	252	NPDES	1995	no	16	27	26	2.3	0.05				0.031	0.014	0.337	
SDE4	SDE4 041095	4/10/95	0.29	0	18	56	NPDES	1995	no	16	19	8	0.42	0.2	2.5	2.5	[illegible]	0.029	0.011	0.263	
SDE4	SDE4 072695	7/26/95	0.41	0	36		NPDES	1996	no	41	30	29	0.44	1.5				0.121	0.023	0.779	
SDE4	SDE4 081795	8/16/95	1.34	0.01	12		NPDES	1996	no						2.5	7.9	7.9				
SDE4	SDE4 102695	10/25/95	0.28	0.01	8		NPDES	1996	no	14	27	27	0.18	0.1				0.033	0.021	0.204	
SDE4	SDE4 020396	2/3/96	1.6	0	8		NPDES	1996	YES	210	190	74	2.5	0.1	14	12	26	0.054	0.104	0.279	
SDE4	SDE4 032296	3/22/96	0.21	0			StipAg	1996	no	44	19	12	0.64	0.3	[illegible]	2.5	[illegible]	0.057	0.026	0.361	
SDE4	SDE4 041696	4/15/96	0.49	0.09	16		NPDES	1996	no	53	11	6.54	0.128	0.123	[illegible]	[illegible]	[illegible]	0.078	0.0977	0.32	
SDE4	SDE4 051796	5/17/96	0.24	0	15		SRES	1996	no									0.027	0.011	0.11	has metals results only
SDE4	SDE4 052296	5/21/96	0.31	0.02	30		SRES	1996	no	8.8		22						0.045	0.018	0.243	
SDE4	SDE4 090396	9/3/96	0.29	0	1.2	76	NPDES	1997	no	40	15	7.06	0.182	0.15	2.5	2.5	[illegible]	0.053	0.0252	0.138	
SDE4	SDE4 122196	12/19/96	0.36	0	37	103	NPDES	1997	no	42	24	11.7	0.304	0.067	[illegible]	2.5	[illegible]	0.03	0.0289	0.171	
SDE4	SDE4 011697	1/16/97	1.21	0	23	154	NPDES	1997	no	140	1.5	12.8	0.053	0.135	2.5	2.5	[illegible]	0.042	0.0756	0.19	
SDE4	SDE4 012797	1/27/97	0.41	0	26	109	StipAg	1997	no	49	20	[illegible]	0.221	1.28	[illegible]	49.4	49.4	0.031	0.0486	0.148	
SDE4	SDE4 030697	3/5/97	0.39	0.24	20	42	NPDES	1997	no	30	14	4.36	0.082	0.318	[illegible]	[illegible]	[illegible]	0.023	0.0232	0.098	
SDE4	SDE4 060397	6/3/97	0.26	0	16	78	NPDES	1998	no	79	19	6.24	0.059	0.384	[illegible]	[illegible]	[illegible]	0.035	0.0332	0.122	
SDE4	SDE4 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	34	41	4.02	0.178	0.078	[illegible]	[illegible]	[illegible]	0.208	0.0164	0.106	
SDE4	SDE4 121697	12/15/97	1	0	33	87	NPDES	1998	no	66	30	[illegible]	0.244	0.119	[illegible]	[illegible]	[illegible]	0.024	0.0307	0.162	
SDE4	SDE4 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	253	75	5.4			[illegible]	[illegible]	[illegible]	0.003	0.0052	0.198	
SDE4	SDE4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no						[illegible]	[illegible]	[illegible]				taken for aircraft deicing only, grab failed (NLD)
SDE4	SDE4 042398	4/23/98	0.46	0	20	264	NPDES	1998	no	64	27	20.8			[illegible]	[illegible]	[illegible]	0.075	0.0415	0.312	
SDE4	SDE4 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no	60	21	11.1			[illegible]	[illegible]	[illegible]	0.062	0.0376	0.299	
SDE4	SDE4 062498	6/24/98	0.43	0	4	288	NPDES	1998	no	33	25	4.96						0.024	0.0132	0.095	
SDS1	SDS1 101994	10/19/94	0.2	0	32	120	NPDES	1995	no	2.5	11	12	0.13	0.5				0.084	0.006	0.234	
SDS1	SDS1 111994	11/19/94	0.42	0.05	24	52	NPDES	1995	no			46			14	2.5	14				
SDS1	SDS1 021695	2/15/95	1.1	0	56	86	NPDES	1995	YES	6.7	40	[illegible]	0.06	0.4	260	15	275	0.016	0.006	0.125	
SDS1	SDS1 051195	5/11/95	0.2	0.12	8		NPDES	1995	no	34	25	2		0.6				0.119	0.045	0.304	
SDS1	SDS1 060495	6/4/95	0.7	0	28	384	NPDES	1995	no	14	36	15	0.29	0.8				0.115	0.017	0.29	
SDS1	SDS1 080795	8/6/95	0.4	0	8		NPDES	1996	no	28	8.9	13	0.14	0.9				0.089	0.019	0.211	
SDS1	SDS1 101695	10/15/95	0.35	0	12		NPDES	1996	no	8.6	3.6	5	0.17	0.1				0.042	0.005	0.116	
SDS1	SDS1 011496	1/13/96	0.37	0	20		NPDES	1996	no	3.2	4	18	0.012	0.3	2.5	2.5	[illegible]	0.019	0.006	0.104	
SDS1	SDS1 041696	4/15/96	0.49	0.09	16		NPDES	1996	no	74	16	23.9	0.219	0.081	2.5	2.5	[illegible]	0.117	0.0883	0.255	
SDS1	SDS1 042296	4/22/96	2.83	0	8		StipAg	1996	no	17	6.3	9.28	0.023	0.134	2.5	2.5	[illegible]	0.012	0.0077	0.062	
SDS1	SDS1 052296	5/21/96	0.31	0.02	30		SRES	1996	no	7.8		29						0.035	0.0103	0.106	
SDS1	SDS1 070496	7/3/96	0.23	0	12		NPDES	1997	no	17	6	11.2	0.014	0.427	2.5	2.5	[illegible]	0.038	0.0127	0.188	
SDS1	SDS1 080296	8/2/96	1.01	0	27	325	StipAg	1997	no	15	7.2	12.5	0.005	0.663				0.102	0.015	0.209	
SDS1	SDS1 120496	12/4/96	0.82	0.16	7.5	44	NPDES	1997	no	22	21	40.5	0.005	0.055	2.5	24	29	0.028	0.0013	0.096	
SDS1	SDS1 011697	1/16/97	1.21	0	23	154	NPDES	1997	no	37	17	79	0.005	0.06	2.5	33.4	33.4	0.041	0.0273	0.112	
SDS1	SDS1 041397	4/13/97	0.31	0.04	12		NPDES	1997	no	49	27	21.2	0.005	0.574	2.5	2.5	[illegible]	0.071	0.0408	0.253	
SDS1	SDS1 061797	6/16/97	0.36	0	28	135	NPDES	1998	no	25	15	4.5	0.005		[illegible]	[illegible]	[illegible]	0.038	0.027	0.119	
SDS1	SDS1 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	12	46	7.18	0.005	0.953	[illegible]	[illegible]	[illegible]	0.03	0.0107	0.152	
SDS1	SDS1 112097	11/19/97	0.65	0.12	39	24	NPDES	1998	no			[illegible]		0.301	[illegible]	[illegible]	[illegible]	0.013	0.0043	0.082	
SDS1	SDS1 121697	12/15/97	1	0	33	87	NPDES	1998	no	1.8	6.2	6.44	0.016	0.391	[illegible]	[illegible]	[illegible]	0.013	0.0029	0.08	
SDS1	SDS1 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	6	12				[illegible]	6.1	7.1	0.022	0.0053	0.075	FULFILLS ANNUAL SAMPLE RQMT

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Composite sample data

outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
		storm characteristics								analyte concentration, mg/l											
SDS2	SDS2 051095	5/9/95	0.12	0	7.5	102	NPDES	1995	no	15	15	11									
SDS2	SDS2 051195	5/11/95	0.2	0.12	8		NPDES	1995	no	7.8	6.1	4									
SDS2	SDS2 061095	6/10/95	0.3		10	96	NPDES	1995	no	18	8.2	8									
SDS2	SDS2 090595	9/5/95					NPDES	1996	no	52	28	5	0.012								
SDS2	SDS2 120496	12/4/96	0.82	0.16	7.5	44	NPDES	1997	no	37	29	2									
SDS2	SDS2 011797	1/16/97	1.21	0	23	154	StipAg	1997	no	16	19	2									
SDS2	SDS2 021197	2/11/97	0.48	0	18	205	StipAg	1997	no	32	39	3									LAST FOR STIP AG
SDS3	SDS3 090894	9/8/94	0.69	0	22	93	NPDES	1995	no						2.5	2.5	5				
SDS3	SDS3 091494	9/13/94	0.15	0	9	118	NPDES	1995	no	4.5	5.8	8	0.061	0.3				0.041	0.004	0.031	
SDS3	SDS3 101394	10/13/94	0.32	0	14	480	NPDES	1995	no	6.7	12	22	1.2	0.1				0.053	0.003	0.076	
SDS3	SDS3 111994	11/19/94	0.42	0.05	24	52	NPDES	1995	no	2.3	4.9	18	0.12	0.05	2.5	2.5	5	0.027	0.004	0.108	glycols and BOD on labjob "J 014"
SDS3	SDS3 010795	1/7/95	0.21	0	62	252	NPDES	1995	no	2	3.7	5	0.14	0.05				0.016	0.002	0.058	
SDS3	SDS3 041295	4/10/95	0.29	0	18	56	NPDES	1995	no	1	1.9	4	1.7	0.05	2.5	2.5	5	0.041	0.002	0.044	
SDS3	SDS3 072695	7/26/95	0.41	0	36		NPDES	1996	no	20	15	8	0.085	0.2				0.087	0.005	0.069	
SDS3	SDS3 101695	10/15/95	0.35	0	12		NPDES	1996	no	2.2	3	5	0.12	0.05				0.032	0.002	0.037	
SDS3	SDS3 011496	1/13/96	0.37	0	20		NPDES	1996	no	1.6	2.1	8	0.025	0.05	2.5	2.5	5	0.029	0.002	0.054	
SDS3	SDS3 032296	3/22/96	0.21	0			StipAg	1996	no	4.1	2.9	8	0.021	0.05	2.5	2.5	5	0.028	0.002	0.054	
SDS3	SDS3 041696	4/15/96	0.49	0.09	16		NPDES	1996	no	20	6.6	6.36	0.036	0.033	2.5	2.5	5	0.046	0.0116	0.074	
SDS3	SDS3 052296	5/21/96	0.31	0.02	30		SRES	1996	no	2.6		14						0.035	0.0011	0.036	
SDS3	SDS3 080296	8/2/96	1.01	0	27	325	NPDES	1997	no	19	13	9.8	0.045	0.107				0.115	0.0091	0.097	
SDS3	SDS3 090396	9/3/96	0.29	0	1.2	76	NPDES	1997	no	33	16	11.4	0.077	0.046				0.08	0.0158	0.062	
SDS3	SDS3 102196	10/21/96	0.68	0	4.1	64	NPDES	1997	no	4.8	4.2	2	0.005	0.013	2.5	2.5	5	0.025	0.0033	0.022	
SDS3	SDS3 112396	11/23/96	0.63	0	34.1	72	StipAg	1997	YES	16	9.2	34.2	0.005	0.013	18	10	28	0.388	0.0141	0.061	
SDS3	SDS3 011697	1/16/97	1.21	0	23	154	NPDES	1997	no	5.6	0.7	9.78	0.025	0.013	2.5	2.5	5	0.029	0.0018	0.042	
SDS3	SDS3 030597	3/5/97	0.39	0.24	20	42	NPDES	1997	no	3.4	2.5	2	0.015	0.04	2.5	2.5	5	0.018	0.0018	0.037	
SDS3	SDS3 060397	6/3/97	0.26	0	16	76	NPDES	1998	no	10	6	2.5	0.012	0.073				0.054	0.0043	0.039	
SDS3	SDS3 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	3.6	5.3	15.9	0.005	0.035				0.028	0.0028	0.037	
SDS3	SDS3 013098	1/29/98	0.2	0	14	107	NPDES	1998	no	3.6	5.4	13.5	0.005	0.054	5.4	4.2	9.6	0.028	0.0019	0.055	
SDS3	SDS3 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	21	13	8.2			[illegible]	[illegible]	[illegible]	0.034	0.0065	0.045	
SDS3	SDS3 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	3.2	5.2	38.3			23	8.7	31.7	0.037	0.0015	0.034	backup monthly sample in case 3/1/98 sample didn't qualify under new permit
SDS3	SDS3 042398	4/23/98	0.46	0	20	264	NPDES	1998	no	7.3	4	9.4			[illegible]	[illegible]	[illegible]	0.081	0.0011	0.064	
SDS3	SDS3 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no	14	9.5	6.32			[illegible]	[illegible]	[illegible]	0.076	0.0032	0.116	
SDS3	SDS3 061098	6/10/98	0.28	0	10	288	NPDES	1998	no	8	42	8.3						0.068	0.0018	0.06	
SDS4	SDS4 091494	9/13/94	0.15	0	9	118	NPDES	1995	no	2.8	1.3	8	0.233	0.2				0.02	0.004	0.009	
SDS4	SDS4 101394	10/13/94	0.32	0	14	480	NPDES	1995	no	5.7	5.6	16	0.029	0.1				0.036	0.001	0.047	
SDS4	SDS4 111994	11/19/94	0.42	0.05	24	52	NPDES	1995	no			5			2.5	2.5	5				
SDS4	SDS4 011295	1/11/95	0.3	0.04	60	24	NPDES	1995	no	3.5	8.4	3	2	0.05				0.017	0.003	0.019	
SDS4	SDS4 021695	2/15/95	1.1	0	56	86	NPDES	1995	YES			[illegible]	2.5		2.5	2.5	5				
SDS4	SDS4 051295	5/11/95	0.2	0.12	8		NPDES	1995	no	7.7	5.3	4		0.05				0.008	0.0005	0.01	
SDS4	SDS4 080795	8/6/95	0.4	0	8		NPDES	1996	no	4.2	3.7	9	0.018	0.2				0.02	0.002	0.016	
SDS4	SDS4 101695	10/15/95	0.35	0	12		NPDES	1996	no	6.6	4.2	5	0.049	0.05				0.023	0.001	0.022	
SDS4	SDS4 011496	1/13/96	0.37	0	20		NPDES	1996	no	20	6	6	0.02	0.05	2.5	2.5	5	0.018	0.0005	0.019	
SDS4	SDS4 020596	2/3/96	1.6	0	8		SRES	1996	YES			13	0.025		14	7.2	21.2				
SDS4	SDS4 041696	4/15/96	0.49	0.09	16		NPDES	1996	no	26	14	4.64	0.128	0.013	[illegible]	2.5	5	0.041	0.0054	0.031	
SDS4	SDS4 042296	4/22/96	2.83	0	8		StipAg	1996	no	19	8.9	6.44	0.047	0.013	[illegible]	2.5	5	0.033	0.0005	0.017	
SDS4	SDS4 052296	5/21/96	0.31	0.02	30		SRES	1996	no	4.8		18						0.036	0.0008	0.018	
SDS4	SDS4 070496	7/3/96	0.23	0	12		NPDES	1997	no	20	11	6	0.084	0.029	2.5	2.5	5	0.024	0.001	0.02	

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Composite sample data		storm characteristics								analyte concentration, mg/l											
outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
SDS4	SDS4 100496	10/4/96	0.59	0.08	8.1	18	NPDES	1997	no	4310	2650	6.04	0.027	0.069				0.18	0.0469	0.228	TSS, Turb not typical: high turbidity from POS construction site (34R safety fill).
SDS4	SDS4 120496	12/4/96	0.82	0.16	7.5	44	NPDES	1997	no	11	6.5	2	0.014	0.013	2.5	2.5	5	0.023	0.0018	0.032	
SDS4	SDS4 011797	1/16/97	1.21	0	23	154	NPDES	1997	no	17	2.2	3.92	0.12	0.013				0.031	0.0016	0.024	
SDS4 .	SDS4 012797	1/27/97	0.41	0	26	109	StipAg	1997	no	12	9.1	4.3	0.017	0.013				0.017	0.0011	0.02	
SDS4	SDS4 041997	4/19/97	1.16	0	26	64	NPDES	1997	no	42	12	4.44	0.067	0.079	2.5	2.5	5	0.039	0.0029	0.038	
SDS4	SDS4 082497	8/25/97	0.2	0.07	10.5	96	NPDES	1998	no	104	95	5.38	0.033	0.273				0.032	0.0036	0.044	
SDS4	SDS4 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no	31	34	4.54	0.056	0.095				0.019	0.0021	0.039	
SDS4	SDS4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	3.8	5.7	2	0.039	0.035	[illegible]	[illegible]	[illegible]	0.016	0.0005	0.012	makeup comp for 98Qw non-rep comp, has extra grab
SDW3	SDW3 051095	5/9/95	0.12	0	7.5	102	NPDES	1995	no	88	310	15									
SDW3	SDW3 051195	5/11/95	0.2	0.12	8		NPDES	1995	no	20	25	4									
SDW3	SDW3 061095	6/10/95	0.3		10	96	NPDES	1995	no	5.7	2.3	5									
SDW3	SDW3 081795	8/16/95	1.34	0.01	12		NPDES	1996	no	56	20	6									
SDW3	SDW3 120496	12/4/96	0.82	0.16	7.5	44	NPDES	1997	no	7.2	2.6	2									grab missed
SDW3	SDW3 011697	1/16/97	1.21	0	23	154	StipAg	1997	no	7.1	1	4.18									
SDW3	SDW3 012797	1/27/97	0.41	0	26	109	StipAg	1997	no	3.2	3.2	6.7									
SDW3	SDW3 021197	2/11/97	0.48	0	18	205	StipAg	1997	no	2.2	1.9	2									no grab sample taken
B	B 120496	12/4/96	0.82	0.16	7.5	44	NPDES	1997	no	91	110	2						0.028	0.0063	0.041	
B	B 011797	1/16/97	1.21	0	23	154	NPDES	1997	no	37	40	5.66						0.018	0.0015	0.034	no grab sample for this event, equipment malfunction
B	B 012897	1/27/97	0.41	0	26	109	NPDES	1997	no	23	35	3.28						0.015	0.0019	0.028	
B	B 030697	3/5/97	0.39	0.24	20	42	NPDES	1997	no	13	23	2						0.007	0.0005	0.017	had QC dupe. no grab sample (no liquid detected). pairs with 4/19/97 grab
D	D 012897	1/27/97	0.41	0	26	109	NPDES	1997	no	38	35	11.3						0.016	0.0038	0.023	makeup for 96Q4 (3 unsuccessful attempts)
D	D 021297	2/11/97	0.48	0	18	205	NPDES	1997	no	38	49	3						0.008	0.0005	0.003	
D	D 030597	3/5/97	0.39	0.24	20	42	NPDES	1997	no	34	25	2						0.021	0.0061	0.022	
SDN1	SDN1 091494	9/13/94	0.15	0	9	118	NPDES	1995	no	21.5	6.4	194	0.025	1.3				0.064	0.008	1.03	
SDN1	SDN1 101994	10/19/94	0.2	0	32	120	NPDES	1995	no	13	10	8	0.5	0.2				0.034	0.008	0.416	
SDN1	SDN1 111994	11/19/94	0.42	0.05	24	52	NPDES	1995	no			6			2.5	2.5	5				
SDN1	SDN1 011295	1/11/95	0.3	0.04	60	24	NPDES	1995	no	22	30	4	0.37	0.05				0.02	0.016	0.285	
SDN1	SDN1 021695	2/15/95	1.1	0	56	86	NPDES	1995	YES			31	0.54		6.1	2.5	6.1				
SDN1	SDN1 030595	3/4/95	0.18	0	24	158	StipAg	1995	no	1	3.5	4	0.005		2.5	2.5	5				
SDN1	SDN1 030995	3/8/95	2.16	0	114	88	StipAg	1995	no	14	17	6	0.35		2.5	2.5	5				
SDN1	SDN1 040595	4/4/95	0.17	0	4	270	StipAg	1995	no	6	7.6	5	0.078		2.5	2.5	5				
SDN1	SDN1 040795	4/6/95	0.61	0.04	28	60	NPDES	1995	no	18	6.2	40	0.005	0.05	2.5	2.5	5	0.009	0.001	0.286	
SDN1	SDN1 080795	8/6/95	0.4	0	8		NPDES	1996	no	56	16	27	0.011	0.05				0.035	0.009	0.464	
SDN1	SDN1 110795	11/6/95	3.89	0.09	48		NPDES	1996	no	15	14	8	0.52	0.05				0.023	0.013	0.375	
SDN1	SDN1 020496	2/3/96	1.6	0	8		NPDES	1996	YES	130	150	15	1.7	0.1	2.5	2.5	5	0.019	0.021	0.288	
SDN1	SDN1 041696	4/15/96	0.49	0.09	16		StipAg	1996	no	47	7.1	2	0.103		2.5	2.5	5				
SDN1	SDN1 042296	4/22/96	2.83	0	8		NPDES	1996	no	31	9.5	8.8	0.184	0.048	2.5	2.5	5	0.016	0.0111	0.16	
SDN1	SDN1 051396	5/13/96	0.99	0.07	20	12	StipAg	1996	no	14	15	4.22	0.027		2.5	2.5	5				
SDN1	SDN1 052296	5/21/96	0.31	0.02	30		StipAg	1996	no	11	7.3	10.2	0.164	0.657	2.5	2.5	5	0.027	0.0074	0.299	xtra NPDES/Stip Ag
SDN1	SDN1 062396	6/23/96	0.46	0	10		StipAg	1996	no	36	8.3	20	0.684	0.124	2.5	2.5	5	0.08	0.013	0.569	xtra NPDES/Stip Ag
SDN1	SDN1 062396 A	6/23/96	0.46	0	10		SRES	1996	no	22		16	0.63					0.081	0.0104	0.506	
SDN1	SDN1 070496	7/3/96	0.23	0	12		NPDES	1997	no	51	18	10.7	0.142	0.098	2.5	2.5	5	0.046	0.0193	0.355	
SDN1	SDN1 071796	7/17/96	0.27	0	31		StipAg	1997	no	19	2.1	25.1	0.859	0.2	2.5	2.5	5				foam observed at MC3

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Composite sample data		storm characteristics								analyte concentration, mg/l											
outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
SDN1	SDN1 080296	8/2/96	1.01	0	27	325	StipAg	1997	no	35	20	14.2	0.46		2.5	2.5	5				
SDN1	SDN1 090396	9/3/96	0.29	0	1.2	76	StipAg	1997	no	49.3	15	9.88	0.528		2.5	2.5	5				
SDN1	SDN1 091496	9/13/96	0.72	0	48	144	StipAg	1997	no	50	22	10.3	0.298		2.5	2.5	5				
SDN1	SDN1 091996	9/18/96	0.38	0.02	20	28	StipAg	1997	no	3.6	7	2	0.253		2.5	2.5	5				
SDN1	SDN1 011697	1/16/97	1.21	0	23	154	NPDES	1997	no	66	30	23.6	0.387	0.058				0.039	0.0387	0.343	paired up/down sample
SDN1up	SDN1up 100496	10/4/96	0.59	0.08	8.1	18	NPDES	1997	no	21	6.7	2	0.122	0.013				0.025	0.0156	0.219	paired up/down sample
SDN1up	SDN1up 011697	1/16/97	1.21	0	23	154	NPDES	1997	no	62	29	9.94	0.227	0.08				0.03	0.0396	0.391	paired up/down sample
SDN1up	SDN1 041397	4/13/97	0.31	0.04	12		NPDES	1997	no	34	19	17	0.109	0.621				0.042	0.0128	0.433	downstream location at SDN1-27
SDN1up	SDN1 060397	6/3/97	0.28	0	16	76	NPDES	1998	no	77	30	17.9	0.219	0.347				0.038	0.0274	0.211	
SDN1up	SDN1 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	19	28	4	0.215	0.086				0.019	0.0168	0.222	
SDN1up	SDN1 121597	12/15/97	1	0	33	87	NPDES	1998	no	22	21	4.68	0.226	0.063	1	1	2	0.017	0.013	0.191	
SDN1up	SDN1 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	104	39	4.62						0.01	0.0066	0.084	
SDN1up	SDN1 042398	4/23/98	0.46	0	20	264	NPDES	1998	no	26	12	12.8						0.062	0.0049	0.401	
SDN1up	SDN1 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no	43	21	8.8						0.053	0.0103	0.54	
SDN1up	SDN1 061098	6/10/98	0.28	0	10	288	NPDES	1998	no	34	71	9.84						0.056	0.0086	0.36	
SDN2	SDN2 090894	9/8/94	0.69	0	22	93	NPDES	1995	no	3.2	4.1	11	0.005	0.2				0.028	0.007	0.022	
SDN2	SDN2 101394	10/13/94	0.32	0	14	480	NPDES	1995	no	6.5	8.1	86	0.44	0.2				0.059	0.005	0.067	
SDN2	SDN2 111394	11/11/94	0.28		14	46	NPDES	1995	no	2	5.4	7	0.041	0.05				0.013	0.004	0.03	
SDN2	SDN2 111994	11/19/94	0.42	0.05	24	52	NPDES	1995	no			10			2.5	2.5	5				
SDN2	SDN2 011295	1/11/95	0.3	0.04	60	24	NPDES	1995	no	7.5	14	4	1.3	0.05				0.035	0.022	0.076	
SDN2	SDN2 030595	3/4/95	0.18	0	24	158	StipAg	1995	no	2.4	2.1	2	0.021		36	2.5	36				
SDN2	SDN2 040795	4/6/95	0.61	0.04	28	60	StipAg	1995	no	7.2	4.8	15	0.005		2.5	2.5	5				
SDN2	SDN2 041295	4/10/95	0.29	0	18	56	NPDES	1995	no	5.6	4.9	30	5	0.05	2.5	19	19	0.025	0.003	0.098	
SDN2	SDN2 080795	8/6/95	0.4	0	8		NPDES	1996	no	8.9	5.1	6	0.091	0.2				0.028	0.01	0.049	
SDN2	SDN2 101695	10/15/95	0.35	0	12		NPDES	1996	no	1.25	1.8	5	0.021	0.1				0.016	0.002	0.024	
SDN2	SDN2 021796	2/17/96	1.29	0	12		NPDES	1996	no	1	2	6	0.005	0.05	6.3	11	17.3	0.009	0.005	0.027	
SDN2	SDN2 041696	4/15/96	0.49	0.09	16		StipAg	1996	no	15	11	2	0.044		2.5	2.5	5				
SDN2	SDN2 042296	4/22/96	2.83	0	8		NPDES	1996	no	5.3	2.5	6.64	0.005	0.013	2.5	2.5	5	0.013	0.0028	0.017	
SDN2	SDN2 051396	5/13/96	0.99	0.07	20	12	StipAg	1996	no	5.6	5.3	4.86	0.045		2.5	2.5	5				
SDN2	SDN2 052296	5/21/96	0.31	0.02	30		StipAg	1996	no	10	2	5.08	0.043	0.266	2.5	2.5	5	0.014	0.0016	0.076	xtra NPDES/Stip Ag
SDN2	SDN2 062396 A	6/23/96	0.46	0	10		SRES	1996	no	48		24	0.12					0.076	0.0216	0.138	
SDN2	SDN2 062396	6/23/96	0.46	0	10		StipAg	1996	no	33	7.5	18.3	0.166	0.026	2.5	2.5	5	0.055	0.0117	0.076	xtra NPDES/Stip Ag
SDN2	SDN2 090396	9/3/96	0.29	0	1.2	76	NPDES	1997	no	10	10	12.3	0.034	0.068				0.033	0.0062	0.042	
SDN2	SDN2 102196	10/21/96	0.68	0	4.1	64	NPDES	1997	no	4.2	2.9	4.5	0.005	0.013	2.5	2.5	5	0.01	0.0024	0.02	
SDN2	SDN2 011697	1/16/97	1.21	0	23	154	NPDES	1997	no	8.8	1.5	120	0.005	0.038	2.5	50.9	50.9	0.018	0.011	0.048	
SDN2	SDN2 041997	4/19/97	1.16	0	26	64	NPDES	1997	no	17	8.5	2	0.478	0.063	2.5	2.5	5	0.042	0.0191	0.083	
SDN3	SDN3 090894	9/8/94	0.69	0	22	93	NPDES	1995	no	2.1	5.1	5	0.061	0.05				0.032	0.002	0.063	
SDN3	SDN3 102694	10/25/94	1.96	0	44	114	NPDES	1995	no	9.2	8	4	0.038	0.05							
SDN3	SDN3 111994	11/19/94	0.42	0.05	24	52	NPDES	1995	no			4			2.5	2.5	5				
SDN3	SDN3 010795	1/7/95	0.21	0	62	252	NPDES	1995	no	0.62	1.6	2	0.011	0.05				0.003	0.001	0.052	
SDN3	SDN3 021695	2/15/95	1.1	0	56	86	NPDES	1995	YES			90	1.2		2.5	2.5	5				
SDN3	SDN3 030595	3/4/95	0.18	0	24	158	StipAg	1995	no	1	2.3	3	0.005		2.5	2.5	5				
SDN3	SDN3 030995	3/8/95	2.16	0	114	88	StipAg	1995	no	5	12	3	0.016		2.5	2.5	5				
SDN3	SDN3 040595	4/4/95	0.17	0	4	270	StipAg	1995	no	1	1.8	3	0.25		2.5	2.5	5				
SDN3	SDN3 060495	6/4/95	0.7	0	28	384	NPDES	1995	no	15	25	8	0.005	0.05				0.011	0.001	0.126	
SDN3	SDN3 071095	7/9/95	0.81	0	13		NPDES	1996	no	21	24	7	0.005	0.1				0.036	0.004	0.18	
SDN3	SDN3 110795	11/6/95	3.89	0.09	48		NPDES	1996	no	15	16	3	0.005					0.01	0.001	0.068	
SDN3	SDN3 011496	1/13/96	0.37	0	20		NPDES	1996	no	3.8	4.7	5	0.011	0.05	2.5	2.5	5	0.01	0.002	0.047	

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Composite sample data

outfall	sample ID	event (storm characteristics)	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS (analyte concentration, mg/l)	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
SDN3	SDN3 020496	2/3/96	1.6	0	8		StipAg	1996	YES		9.7		0.14		2.5	2.5	5				storm after runway deice
SDN3	SDN3 040196	3/31/96	0.64	0.01	0		StipAg	1996	no	11	16	5	0.013	0.2	2.5	2.5	5	0.015	0.002	0.101	xtra NPDES/Stip Ag
SDN3	SDN3 041696	4/15/96	0.49	0.09	16		NPDES	1996	no	27	22	2	0.04	0.013	2.5	2.5	5	0.018	0.0034	0.121	
SDN3	SDN3 042296	4/22/96	2.83	0	8		StipAg	1996	no	15	9.5	6.56	0.034	0.013	2.5	2.5	5	0.016	0.0013	0.063	xtra NPDES/Stip Ag
SDN3	SDN3 051396	5/13/96	0.99	0.07	20	12	StipAg	1996	no	16	18	2	0.075		2.5	2.5	5				
SDN3	SDN3 052296	5/21/96	0.31	0.02	30		StipAg	1996	no	16	5.2	2	0.005		2.5	2.5	5				
SDN3	SDN3 062396 A	6/23/96	0.46	0	10		SRES	1996	no	7.3		5	0.014					0.004	0.0003	0.051	
SDN3	SDN3 080396	8/2/96	1.01	0	27	325	NPDES	1997	no	26	26	2	0.005	0.041				0.037	0.0043	0.156	delayed hydrograph, very dry antecedent
SDN3	SDN3 120496	12/4/96	0.82	0.16	7.5	44	NPDES	1997	no	16	14	2	0.01	0.013	2.5	2.5	5	0.018	0.0021	0.033	
SDN3	SDN3 122196	12/19/96	0.36	0	37	103	NPDES	1997	no	2.6	4.5	4	0.021	0.013	2.5	2.5	5	0.011	0.0005	0.045	
SDN3	SDN3 011797	1/16/97	1.21	0	23	154	NPDES	1997	no	13	13	4.92	0.132	0.013				0.012	0.0005	0.043	
SDN3	SDN3 030597	3/5/97	0.39	0.24	20	42	NPDES	1997	no	10	10	2	0.005	0.036	6.2	2.5	6.2	0.011	0.0005	0.032	
SDN3	SDN3 062197	6/21/97	0.27	0.12	11.8	68	NPDES	1998	no	2.2	10	2	0.005	0.037				0.014	0.0005	0.048	
SDN3	SDN3 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no	12	42	2	0.05	0.061				0.018	0.0019	0.049	
SDN3	SDN3 121697	12/15/97	1	0	33	87	NPDES	1998	no	11	26	2	0.016	0.032	1	1	2	0.011	0.002	0.04	good QC duplicate
SDN4	SDN4 090396	9/3/96	0.29	0	1.2	76	NPDES	1997	no	8	3	14.1	0.6	0.036				0.139	0.0005	0.047	
SDN4	SDN4 120496	12/4/96	0.82	0.16	7.5	44	NPDES	1997	no	7	4.5	8.46	0.005	0.013	2.5	2.5	5	0.034	0.0015	0.023	
SDN4	SDN4 011697	1/16/97	1.21	0	23	154	NPDES	1997	no	11	1.7	12.1	0.192	0.013				0.036	0.0005	0.025	
SDN4	SDN4 030597	3/5/97	0.39	0.24	20	42	NPDES	1997	no	3.8	2.5	[illegible]	0.014	0.056	[illegible]	[illegible]	5	0.031	0.0005	0.019	
SDN4	SDN4 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	2.8	6	7.38	0.005	0.045	[illegible]	[illegible]	2	0.039	0.0018	0.024	
SDN4	SDN4 121697	12/15/97	1	0	33	87	NPDES	1998	no	2.6	3.9	4.68	0.025	0.013	[illegible]	[illegible]	2	0.026	0.0011	0.022	
SDN4	SDN4 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	17	18	2			[illegible]	[illegible]	2	0.031	0.0014	0.029	
SDN4	SDN4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	3.2	6.1	4.06			[illegible]	[illegible]	[illegible]	0.049	[illegible]	0.018	backup monhtly sample in case 3/1/98 sample didn't qualify under new permit
SDN4	SDN4 042498	4/23/98	0.46	0	20	264	NPDES	1998	no	2	3.5	5.44						0.091	0.0005	0.029	
SDN4	SDN4 052598	5/24/98	0.58	0	11	87	NPDES	1998	no	3.7	5.5	5.2			1	1	2	0.03	0.0005	0.027	
SDN4	SDN4 062498	6/24/98	0.43	0	4	288	NPDES	1998	no	4	4	4.54						0.047	0.001	0.018	
EY	EY 091494	9/13/94	0.15	0	9	118	NPDES	1995	no	24.9				0.3							
EY	EY 101394	10/13/94	0.32	0	14	480	NPDES	1995	no	25				0.2							
EY	EY 030995	3/8/95	2.16	0	114	88	NPDES	1995	no	3.2				0.05							
EY	EY 060495	6/4/95	0.7	0	28	384	NPDES	1995	no	25				0.2							
EY	EY 072695	7/26/95	0.41	0	36		NPDES	1996	no	56				0.2							
EY	EY 101695	10/15/95	0.35	0	12		NPDES	1996	no	12				0.05							
EY	EY 021796	2/17/96	1.29	0	12		NPDES	1996	no	24				0.05							
EY	EY 042296	4/22/96	2.83	0	8		NPDES	1996	no	39				0.054							
EY	EY 052296	5/21/96	0.31	0.02	30		StipAg	1996	no	28				0.511							
EY	EY 062396	6/23/96	0.46	0	10		StipAg	1996	no	262				0.058							
EY	EY 070496	7/3/96	0.23	0	12		NPDES	1997	no	16				0.079							
EY	EY 102196	10/21/96	0.68	0	4.1	64	NPDES	1997	no	12	4.3			0.013							
EY	EY 021297	2/11/97	0.48	0	18	205	NPDES	1997	no	8.6											
EY	EY 030597	3/5/97	0.39	0.24	20	42	NPDES	1997	no	17											
EY	EY 061797	6/16/97	0.36	0	28	135	NPDES	1998	no	72											
EY	EY 110697	11/6/97	0.16	0.01	4.4	72	NPDES	1998	no	10											
EY	EY 013098	1/29/98	0.2	0	14	107	NPDES	1998	no	12											
EY	EY 052598	5/24/98	0.58	0	11	87	NPDES	1998	no	26											

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Composite sample data

outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
		storm characteristics								analyte concentration, mg/l											
TY	TY 090894	9/8/94	0.69	0	22	93	NPDES	1995	no	4				0.3							
TY	TY 101994	10/19/94	0.2	0	32	120	NPDES	1995	no	10				0.4							
TY	TY 030495	3/4/95	0.18	0	24	158	NPDES	1995	no	18				0.05	2.5	2.5	5				
TY	TY 060495	6/4/95	0.7	0	28	384	NPDES	1995	no	22				0.4							
TY	TY 081795	8/16/95	1.34	0.01	12		NPDES	1996	no	20				0.1							
TY	TY 101695-1	10/15/95	0.35	0	12		NPDES	1996	no	480				0.05							
TY	TY 032296	3/22/96	0.21	0			NPDES	1996	no		12			0.3							
TY	TY 041696	4/15/96	0.49	0.09	16		NPDES	1996	no	30				0.032							
TY	TY 042296	4/22/96	2.83	0	8		NPDES	1996	no	23				0.041							
TY	TY 070496	7/3/96	0.23	0	12		NPDES	1997	no	28				0.183							
TY	TY 071896	7/17/96	0.27	0	31		StipAg	1997	no	13				0.475							
TY	TY 080296	8/2/96	1.01	0	27	325	StipAg	1997	no	33				0.204							
TY	TY 100496	10/4/96	0.59	0.08	8.1	18	NPDES	1997	no	17	4										
TY	TY 021297	2/11/97	0.48	0	18	205	NPDES	1997	no	29											
TY	TY 030697	3/5/97	0.39	0.24	20	42	NPDES	1997	no	188											possible insert (BMP) failure indicated by elevated FOG and TSS
TY	TY 060397	6/3/97	0.26	0	16	76	NPDES	1998	no	73											
TY	TY 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no	26											
TY	TY 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	15											
TY	TY 061098	6/10/98	0.28	0	10	288	NPDES	1998	no	20											makeup comp for 98Qw, has extra grab

[redacted]

Please note:

1. As of the current reporting period (June 97- June 98) the following outfalls have not yet been sampled under new permit Annual sampling and reporting requirements: SDS2 (004), SDN3 (008), SDS4 (009), SDW3 (010), B (014), D (015).
2. Because of several BMPs (IWS pump stations) there have been no sampleable discharges at SDN2 since July 1997.
3. The new NPDES permit dropped analysis requirements for the following composite sample parameters: surfactants (surf), ammonia (NH3), and 10 metals.

[redacted]

SDE4		TSS	Turb	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn
	count	21	20	22	16	16	19	19	19	22	22	22
	median	44.0	24.5	8.0	0.23	0.14	2.5	2.5	5	0.034	0.024	0.196
	95th	210.0	80.8	28.9	2.35	1.34	4	16	28	0.119	0.097	0.360
	75th	64.0	30.0	18.8	0.43	0.30	2.5	2.5	5	0.056	0.037	0.294
	25th	33.0	19.0	5.6	0.17	0.10	1	1	2	0.028	0.015	0.141
	#non-detected	0	0	2	0	1	18	16	16	0	0	0
	%non-detected	0%	0%	9%	0%	6%	95%	84%	84%	0%	0%	0%

SDS1		TSS	Turb	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn
	count	19	18	20	16	17	14	14	14	20	20	20
	median	15.0	13.5	12.8	0.02	0.40	3	3	5	0.038	0.011	0.122
	95th	51.5	40.9	79.7	0.24	0.91	100	27	118	0.117	0.047	0.291
	75th	26.5	24.0	25.2	0.13	0.60	3	5	12	0.085	0.021	0.217
	25th	7.3	6.5	7.0	0.01	0.13	1	1	3	0.021	0.006	0.102
	#non-detected	0	0	2	6	0	12	10	9	0	0	0
	%non-detected	0%	0%	10%	38%	0%	86%	71%	64%	0%	0%	0%

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Composite sample data		storm characteristics								analyte concentration, mg/l											
outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
							SDS2		count	7	7	7	1	0	0	0	0	0	0	0	
									median	18.0	19.0	4.0	0.012								
									95th	47.5	36.0	10.1	0.01								
									75th	34.5	28.5	6.5	0.01								
									25th	15.5	11.6	2.5	0.01								
									#non-detected	0	0	2	0								
									%non-detected	0%	0%	29%	0%								
							SDS3		count	25	24	25	19	19	15	15	15	25	25	25	
									median	4.8	5.4	8.2	0.04	0.050	3	3	5	0.037	0.003	0.054	
									95th	20.8	15.9	31.8	1.25	0.210	20	9	29	0.109	0.014	0.106	
									75th	14.0	10.1	13.5	0.10	0.064	3	3	5	0.068	0.004	0.064	
									25th	3.2	3.5	6.3	0.01	0.038	2.5	2.5	5.0	0.028	0.002	0.037	
									#non-detected	1	0	2	4	9	12	12	12	0	0	0	
									%non-detected	4%	0%	8%	21%	47%	80%	80%	80%	0%	0%	0%	
							SDS4		count	19	18	22	19	18	10	10	10	19	19	19	
									median	12.0	7.5	5.2	0.05	0.05	3	3	5	0.023	0.002	0.020	
									95th	524.6	478.2	17.9	2.05	0.21	9	5	14	0.055	0.010	0.065	
									75th	23.0	11.8	7.6	0.10	0.09	3	3	5	0.035	0.003	0.035	
									25th	5.3	5.4	4.3	0.03	0.02	3	3	5	0.018	0.001	0.018	
									#non-detected	0	0	2	0	9	9	9	9	0	4	0	
									%non-detected	0%	0%	9%	0%	50%	90%	90%	90%	0%	21%	0%	
							SDW3		count	8	8	8									
									median	7.2	2.9	4.6									
									95th	76.8	210.3	12.1									
									75th	29.0	21.3	6.2									
									25th	5.1	2.2	3.5									
									#non-detected	0	0	2									
									%non-detected	0%	0%	25%									
							B		count	4	4	4	0	0	0	0	0	4	4	4	
									median	30.0	37.5	2.6						0.016	0.002	0.031	
									95th	82.9	99.5	5.3						0.026	0.006	0.040	
									75th	50.5	57.5	3.9						0.020	0.003	0.036	
									25th	20.5	32.0	2.0						0.013	0.001	0.025	
									#non-detected	0	0	2						0	1	0	
									%non-detected	0%	0%	50%						0%	25%	0%	
							D		count	3	3	3	0	0	0	0	0	3	3	3	
									median	38.0	35.0	3.0						0.016	0.004	0.022	
									95th	38.0	47.6	10.5						0.021	0.006	0.023	
									75th	38.0	42.0	7.2						0.018	0.005	0.023	
									25th	36.0	30.0	2.5						0.012	0.002	0.012	
									#non-detected	0	0	1						0	1	1	
									%non-detected	0%	0%	33%						0%	33%	33%	

Composite sample data: outfall | sample ID

storm characteristics: event | rain, in | 48hr ant, in. | dur, hrs | dry ant, hrs

Obj | report | ground deice?

analyte concentration, mg/l

comments

Obj		TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn
SDN1	count	23	22	25	24	13	18	18	18	13	13	13
	median	22.0	12.0	10.2	0.32	0.10	2.5	2.5	5	0.034	0.011	0.355
	95th	65.0	30.0	38.2	0.83	0.91	3.0	2.5	5	0.080	0.028	0.753
	75th	48.2	17.8	20.0	0.52	0.20	2.5	2.5	5	0.046	0.016	0.464
	25th	14.0	7.2	6.0	0.10	0.05	2.5	2.5	5	0.020	0.008	0.288
	#non-detected	1	0	2	2	4	17	18	17	0	0	0
	%non-detected	4%	0%	8%	8%	31%	94%	100%	94%	0%	0%	0%
SDN1up	count	10	10	10	6	6	1	1	1	10	10	10
	median	34.0	24.5	9.3	0.22	0.08	1.0	1.0	2	0.034	0.013	0.291
	95th	91.9	56.6	17.5	0.23	0.55	1.0	1.0	2	0.059	0.034	0.492
	75th	57.3	29.8	12.1	0.22	0.28	1.0	1.0	2	0.050	0.017	0.399
	25th	23.0	19.5	4.6	0.15	0.07	1.0	1.0	2	0.020	0.009	0.213
	#non-detected	0	0	1	0	1	1	1	1	0	0	0
	%non-detected	0%	0%	10%	0%	17%	100%	100%	100%	0%	0%	0%
SDN2	count	20	19	21	20	15	13	13	13	16	16	16
	median	6.9	4.9	7.0	0.04	0.05	2.5	2.5	5	0.027	0.006	0.049
	95th	33.8	11.3	86.0	1.49	0.22	18.2	31.8	42	0.063	0.022	0.108
	75th	10.0	7.8	15.0	0.13	0.15	2.5	2.5	17	0.037	0.011	0.076
	25th	4.0	2.3	5.0	0.01	0.04	2.5	2.5	5	0.014	0.003	0.026
	#non-detected	1	0	2	6	6	11	10	9	0	0	0
	%non-detected	5%	0%	10%	30%	40%	85%	77%	69%	0%	0%	0%
SDN3	count	24	24	26	26	17	16	16	16	18	18	18
	median	11.0	11.0	3.0	0.02	0.04	2.5	2.5	5	0.013	0.002	0.052
	95th	25.3	26.0	7.8	0.22	0.12	3.4	2.5	5	0.036	0.004	0.160
	75th	15.3	19.0	5.0	0.05	0.05	2.5	2.5	5	0.018	0.002	0.093
	25th	3.5	5.2	2.0	0.01	0.01	2.5	2.5	5	0.011	0.001	0.046
	#non-detected	2	0	10	8	10	15	16	15	0	4	0
	%non-detected	8%	0%	38%	31%	59%	94%	100%	94%	0%	22%	0%
SDN4	count	11	11	11	6	6	7	7	7	11	11	11
	median	3.8	4.0	5.2	0.02	0.0	1.0	1.0	2	0.036	0.001	0.024
	95th	14.0	12.1	13.1	0.50	0.1	2.5	2.5	5	0.115	0.002	0.038
	75th	7.5	5.8	7.9	0.15	0.0	1.8	1.8	4	0.048	0.001	0.028
	25th	3.0	3.3	4.3	0.01	0.0	1.0	1.0	2	0.031	0.001	0.021
	#non-detected	0	0	2	2	3	7	7	7	0	6	0
	%non-detected	0%	0%	18%	33%	50%	100%	100%	100%	0%	55%	0%
EY	count	18	1	0	0	12	0	0	0	0	0	0
	median	24.5	4.3			0.1						
	95th	100.5	4.3			0.4						
	75th	27.5	4.3			0.2						
	25th	12.0	4.3			0.1						
	#non-detected	0	0			4						
	%non-detected	0%	0%			33%						

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Composite sample data		storm characteristics								analyte concentration, mg/l											
outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
							TY		count	18	2	0	0	12	0	0	0	0	0	0	
									median	22.5	8.0			0.2							
									95th	232	11.6			0.4							
									75th	30	10.0			0.3							
									25th	17	6.0			0.1							
									#non-detected	0	0			2							
									%non-detected	0%	0%			17%							
							All Airfield		count	79	77	84	70	60	48	48	48	73	73	73	
							(SDS3, SDS4,		median	7	6	5	0.03	0.05	3	3	5	0.030	0.002	0.040	
							SDN3, SDN4)		95th	31	36	21	1.20	0.20	11	6	17	0.101	0.010	0.123	
									75th	16	13	8	0.08	0.06	3	3	5	0.039	0.003	0.060	
									25th	4	4	3	0.01	0.01	3	3	5	0.018	0.001	0.024	
									#non-detected	3	0	16	14	31	43	44	43	0	14	0	
									%non-detected	4%	0%	19%	20%	52%	90%	92%	90%	0%	19%	0%	

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1998 Composites only		storm characteristics								analyte concentration, mg/l											
outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
SDE4	SDE4 060397	6/3/97	0.26	0	16	76	NPDES	1998	no	79	19	6.24	0.059	0.384	1	1	2	0.035	0.0332	0.122	
SDE4	SDE4 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	34	41	4.02	0.178	0.078	1	1	2	0.208	0.0164	0.106	
SDE4	SDE4 121697	12/15/97	1	0	33	87	NPDES	1998	no	66	30	2	0.244	0.119	1	1	2	0.024	0.0307	0.162	
SDE4	SDE4 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	253	75	5.4			1	1	2	0.003	0.0052	0.196	
SDE4	SDE4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no						1	[illegible]	2				taken for aircraft deicing only, grab failed (NLD)
SDE4	SDE4 042398	4/23/98	0.46	0	20	264	NPDES	1998	no	64	27	20.8			1	1	2	0.075	0.0415	0.312	
SDE4	SDE4 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no	60	21	11.1			1	1	2	0.062	0.0376	0.299	
SDE4	SDE4 062498	6/24/98	0.43	0	4	288	NPDES	1998	no	33	25	4.96						0.024	0.0132	0.095	
SDS1	SDS1 061797	6/16/97	0.36	0	28	135	NPDES	1998	no	25	15	4.5	0.005		1	1	2	0.038	0.027	0.119	
SDS1	SDS1 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	12	46	7.18	0.005	0.953	1	1	2	0.03	0.0107	0.152	
SDS1	SDS1 112097	11/19/97	0.65	0.12	39	24	NPDES	1998	no			2		0.301	1	1	2	0.013	0.0043	0.082	
SDS1	SDS1 121697	12/15/97	1	0	33	87	NPDES	1998	no	1.8	6.2	6.44	0.016	0.391	1	1	2	0.013	0.0029	0.08	
SDS1	SDS1 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	6	12				1	6.1	7.1	0.022	0.0053	0.075	FULFILLS ANNUAL SAMPLE RQMT
SDS3	SDS3 060397	6/3/97	0.26	0	16	76	NPDES	1998	no	10	6	2.5	0.012	0.073				0.054	0.0043	0.039	
SDS3	SDS3 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	3.6	5.3	15.9	0.005	0.035				0.028	0.0028	0.037	
SDS3	SDS3 013098	1/29/98	0.2	0	14	107	NPDES	1998	no	3.6	5.4	13.5	0.005	0.054	5.4	4.2	9.6	0.028	0.0019	0.055	
SDS3	SDS3 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	21	13	8.2			1	1	2	0.034	0.0065	0.045	
SDS3	SDS3 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	3.2	5.2	38.3			23	8.7	31.7	0.037	0.0015	0.034	backup monhtly sample in case 3/1/98 sample didn't qualify under new permit
SDS3	SDS3 042398	4/23/98	0.46	0	20	264	NPDES	1998	no	7.3	4	9.4			1	1	2	0.081	0.0011	0.064	
SDS3	SDS3 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no	14	9.5	6.32			1	1	2	0.076	0.0032	0.116	
SDS3	SDS3 061098	6/10/98	0.28	0	10	288	NPDES	1998	no	8	42	8.3						0.068	0.0018	0.06	
SDS4	SDS4 082497	8/25/97	0.2	0.07	10.5	96	NPDES	1998	no	104	95	5.38	0.033	0.273				0.032	0.0036	0.044	
SDS4	SDS4 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no	31	34	4.54	0.056	0.095				0.019	0.0021	0.039	
SDS4	SDS4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	3.8	5.7	2	0.039	0.035	[illegible]	1	2	0.016	0.0005	0.012	makeup comp for 98Qw non-rep comp, has extra grab
SDN1	SDN1 060397	6/3/97	0.26	0	16	76	NPDES	1998	no	77	30	17.9	0.219	0.347				0.038	0.0274	0.211	
SDN1	SDN1 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	19	28	4	0.215	0.086				0.019	0.0168	0.222	
SDN1	SDN1 121597	12/15/97	1	0	33	87	NPDES	1998	no	22	21	4.68	0.226	0.063	1	1	2	0.017	0.013	0.191	
SDN1	SDN1 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	104	39	4.62						0.01	0.0066	0.084	
SDN1	SDN1 042398	4/23/98	0.46	0	20	264	NPDES	1998	no	26	12	12.8						0.062	0.0049	0.401	
SDN1	SDN1 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no	43	21	8.8						0.053	0.0103	0.54	
SDN1	SDN1 061098	6/10/98	0.28	0	10	288	NPDES	1998	no	34	71	9.84						0.056	0.0086	0.36	
SDN3	SDN3 062197	6/21/97	0.27	0.12	11.8	68	NPDES	1998	no	2.2	10	2	0.005	0.037				0.014	0.0005	0.048	
SDN3	SDN3 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no	12	42	2	0.05	0.061				0.018	0.0019	0.049	
SDN3	SDN3 121697	12/15/97	1	0	33	87	NPDES	1998	no	11	26	2	0.016	0.032	1	1	2	0.011	0.002	0.04	good QC duplicate
SDN4	SDN4 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no	2.8	6	7.38	0.005	0.045	1	1	2	0.039	0.0018	0.024	
SDN4	SDN4 121697	12/15/97	1	0	33	87	NPDES	1998	no	2.6	3.9	4.68	0.025	0.013	1	1	2	0.026	0.0011	0.022	
SDN4	SDN4 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no	17	18	2			1	1	2	0.031	0.0014	0.029	
SDN4	SDN4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	3.2	6.1	4.06			1	1	2	0.049	0.0005	0.018	backup monhtly sample in case 3/1/98 sample didn't qualify under new permit
SDN4	SDN4 042498	4/23/98	0.46	0	20	264	NPDES	1998	no	2	3.5	5.44						0.091	0.0005	0.029	
SDN4	SDN4 052598	5/24/98	0.58	0	11	87	NPDES	1998	no	3.7	5.5	5.2			1	1	2	0.03	0.0005	0.027	
SDN4	SDN4 062498	6/24/98	0.43	0	4	288	NPDES	1998	no	4	4	4.54						0.047	0.001	0.018	

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		storm characteristics								analyte concentration, mg/l											
outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
EY	EY 061797	6/16/97	0.36	0	28	135	NPDES	1998	no	72											
EY	EY 110697	11/6/97	0.16	0.01	4.4	72	NPDES	1998	no	10											
EY	EY 013098	1/29/98	0.2	0	14	107	NPDES	1998	no	12											
EY	EY 052598	5/24/98	0.58	0	11	87	NPDES	1998	no	26											
TY	TY 060397	6/3/97	0.26	0	16	76	NPDES	1998	no	73											
TY	TY 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no	26											
TY	TY 030998	3/8/98	0.86	0	27	132	NPDES	1998	no	15											
TY	TY 061098	6/10/98	0.28	0	10	288	NPDES	1998	no	20											makeup comp for 98Qw, has extra grab

[redacted]

Please note:
1. As of the current reporting period (June 97- June 98) the following outfalls have not yet been sampled under new permit Annual sampling and reporting requirements: SDS2 (004), SDN3 (008), SDS4 (009), SDW3 (010), B (014), D (015).
2. Because of several BMPs (IWS pump stations) there have been no sampleable discharges at SDN2 since July 1997.
3. The new NPDES permit dropped analysis requirements for the following composite sample parameters at all outfalls: surfactants (surf), ammonia (NH3), 10 metals, and turbidity at EY and TY only.

[redacted]

		TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn
SDE4	count	7	7	7	3	3	7	7	7	7	7	7
	median	64.0	27.0	5.4	0.18	0.1	1.0	1.0	2	0.035	0.031	0.162
	95th	200.8	64.8	17.9	0.24	0.4	1	1	2	0.168	0.040	0.308
	75th	72.5	35.5	8.7	0.21	0.3	1.0	1.0	2	0.069	0.035	0.248
	25th	47.0	23.0	4.5	0.12	0.1	1	1	2	0.024	0.015	0.114
	#non-detected	0	0	1	0	0	7	7	7	0	0	0
	%non-detected	0%	0%	14%	0%	0%	100%	100%	100%	0%	0%	0%
SDS1	count	4	4	4	3	3	5	5	5	5	5	5
	median	9.0	13.5	5.5	0.01	0.4	1	1	2	0.022	0.005	0.082
	95th	23.1	41.4	7.1	0.01	0.9	1	5	6	0.036	0.024	0.145
	75th	15.3	22.8	6.6	0.01	0.7	1	1	2	0.030	0.011	0.119
	25th	5.3	11.0	4.1	0.01	0.4	1	1	2	0.014	0.004	0.080
	#non-detected	0	0	1	2	0	5	4	4	0	0	0
	%non-detected	0%	0%	25%	67%	0%	100%	80%	80%	0%	0%	0%
SDS3	count	8	8	8	3	3	5	5	5	8	8	8
	median	7.7	5.7	8.9	0.01	0.1	1	1	2	0.045	0.002	0.050
	95th	18.6	31.9	30.5	0.01	0.1	19	8	27	0.079	0.006	0.098
	75th	11.0	10.4	14.1	0.01	0.1	5	4	10	0.070	0.003	0.061
	25th	12.5	11.7	15.0	0.01	0.1	9	5	14	0.073	0.004	0.063
	#non-detected	0	0	0	2	0	3	3	3	0	0	0
	%non-detected	0%	0%	0%	67%	0%	60%	60%	60%	0%	0%	0%

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outfall	sample ID	event	rain, in	48hr ant, in.	dur, hrs	dry ant, hrs	Obj	report	ground deice?	TSS	Turb (NTU)	BOD5	NH3	Surf	E-glycol	P-glycol	total glycols	Cu	Pb	Zn	comments
										storm characteristics: rain, 48hr, dur, dry — analyte concentration, mg/l											
							SDS4		count	3	3	3	3	3	1	1	1	3	3	3	
									median	31.0	34.0	4.5	0.04	0.1	1	1	2	0.019	0.002	0.039	
									95th	96.7	88.9	5.3	0.05	0.3	1	1	2	0.031	0.003	0.044	
									75th	67.5	64.5	5.0	0.05	0.2	1	1	2	0.026	0.003	0.042	
									25th	9.4	11.5	2.5	0.03	0.0	1	1	2	0.017	0.001	0.018	
									#non-detected	0	0	1	0	0	1	1	1	0	1	0	
									%non-detected	0%	0%	33%	0%	0%	100%	100%	100%	0%	33%	0%	
							SDN1		count	7	7	7	3	3	1	1	1	7	7	7	
									median	34.0	28.0	8.8	0.22	0.1	1.0	1.0	2	0.038	0.010	0.222	
									95th	95.9	61.4	16.4	0.23	0.3	1.0	1.0	2	0.060	0.024	0.498	
									75th	60.0	34.5	11.3	0.22	0.2	1.0	1.0	2	0.054	0.015	0.381	
									25th	21.7	20.2	4.6	0.22	0.1	1.0	1.0	2	0.017	0.006	0.182	
									#non-detected	0	0	0	0	0	1	1	1	0	0	0	
									%non-detected	0%	0%	0%	0%	0%	100%	100%	100%	0%	0%	0%	
							SDN3		count	3	3	3	3	3	1	1	1	3	3	3	
									median	11.0	26.0	2.0	0.02	0.04	1.0	1.0	2	0.014	0.002	0.048	
									95th	11.9	40.4	2.0	0.05	0.06	1.0	1.0	2	0.018	0.002	0.049	
									75th	11.5	34.0	2.0	0.03	0.05	1.0	1.0	2	0.016	0.002	0.049	
									25th	5.7	16.4	2.0	0.01	0.03	1.0	1.0	2	0.012	0.001	0.043	
									#non-detected	0	0	3	1	0	1	1	1	0	1	0	
									%non-detected	0%	0%	100%	33%	0%	100%	100%	100%	0%	33%	0%	
							SDN4		count	7	7	7	2	2	5	5	5	7	7	7	
									median	3.2	5.5	4.7	0.02	0.03	1.0	1.0	2	0.039	0.001	0.024	
									95th	13.1	14.4	6.8	0.02	0.04	1.0	1.0	2	0.078	0.002	0.029	
									75th	3.9	6.1	5.3	0.02	0.04	1.0	1.0	2	0.048	0.001	0.028	
									25th	2.7	3.9	4.2	0.01	0.02	1.0	1.0	2	0.030	0.001	0.019	
									#non-detected	0	0	1	1	1	5	5	5	0	3	0	
									%non-detected	0%	0%	14%	50%	50%	100%	100%	100%	0%	43%	0%	
							EY		count	4	0	0	0	0	0	0	0	0	0	0	
									median	19.0											
									95th	65.1	Note: new permit deleted turbidity and surfactants										
									75th	37.5											
									25th	11.4											
									#non-detected	0											
									%non-detected	0%											
							TY		count	4	0	0	0	0	0	0	0	0	0	0	
									median	23.0											
									95th	66	Note: new permit deleted turbidity and surfactants										
									75th	38											
									25th	19											
									#non-detected	0											
									%non-detected	0%											

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Other 1998 metals data			storm charcteristics																		
order	outfall	sample ID	event	rain, in	48hr ant, in	dur, hrs	dryant, hrs	objective	report	ground deice?	ph	Sb	AS	Be	Cd	Cr	Hg	Ni	Se	Ag	Tl
18	SDE4	SDE4 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no											
19	SDE4	SDE4 042398	4/23/98	0.46	0	20	264	NPDES	1998	no											
20	SDE4	SDE4 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no											
21	SDE4	SDE4 062498	6/24/98	0.43	0	4	288	NPDES	1998	no											
37	SDS1	SDS1 061797	6/16/97	0.36	0	28	135	NPDES	1998	no		0.0015	0.0015	0.001	0.0008	0.005	0.00005	0.017	0.0015	0.0005	0.0005
38	SDS1	SDS1 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no		0.0015	0.0015	0.001	0.00124	0.005	0.00005	0.017	0.0032	0.0005	0.0005
39	SDS1	SDS1 112097	11/19/97	0.65	0.12	39	24	NPDES	1998	no					0.00025						
40	SDS1	SDS1 121697	12/15/97	1	0	33	87	NPDES	1998	no		0.0015	0.0051	0.001	0.00025	0.005	0.00005	0.0025	0.0015	0.0005	0.0005
41	SDS1	SDS1 030998	3/8/98	0.86	0	27	132	NPDES	1998	no											
59	SDS3	SDS3 060397	6/3/97	0.26	0	16	76	NPDES	1998	no		0.0015	0.0015	0.002	0.00057	0.005	0.00017	0.015	0.0015	0.0005	0.0005
60	SDS3	SDS3 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.007	0.0015	0.0005	0.0005
61	SDS3	SDS3 013098	1/29/98	0.2	0	14	107	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.011	0.0015	0.0005	0.0005
62	SDS3	SDS3 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no											
63	SDS3	SDS3 030998	3/8/98	0.86	0	27	132	NPDES	1998	no											
64	SDS3	SDS3 042398	4/23/98	0.46	0	20	264	NPDES	1998	no											
65	SDS3	SDS3 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no											
66	SDS3	SDS3 061098	6/10/98	0.28	0	10	288	NPDES	1998	no											
83	SDS4	SDS4 082497	8/25/97	0.2	0.07	10.5	96	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.012	0.0015	0.0005	0.0005
84	SDS4	SDS4 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.0025	0.0015	0.0005	0.0005
85	SDS4	SDS4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.0025	0.0015	0.0005	0.0005
109	SDN1up	SDN1 060397	6/3/97	0.26	0	16	76	NPDES	1998	no		0.0015	0.0015	0.001	0.00059	0.01	0.00023	0.014	0.0015	0.0005	0.0005
110	SDN1up	SDN1 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.01	0.0034	0.0005	0.0005
111	SDN1up	SDN1 121597	12/15/97	1	0	33	87	NPDES	1998	no		0.0015	0.004	0.001	0.00025	0.005	0.00005	0.005	0.0015	0.0005	0.0005
112	SDN1up	SDN1 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no											
113	SDN1up	SDN1 042398	4/23/98	0.46	0	20	264	NPDES	1998	no											
114	SDN1up	SDN1 051498	5/14/98	0.21	0.01	8	125	NPDES	1998	no											
115	SDN1up	SDN1 061098	6/10/98	0.28	0	10	288	NPDES	1998	no											
147	SDN3	SDN3 062197	6/21/97	0.27	0.12	11.8	68	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00033	0.006	0.0015	0.0005	0.0005
148	SDN3	SDN3 111797	11/16/97	0.47	0	12.6	222	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.006	0.0015	0.0005	0.0005
149	SDN3	SDN3 121697	12/15/97	1	0	33	87	NPDES	1998	no		0.0015	0.0052	0.001	0.00025	0.005	0.00005	0.007	0.0048	0.0005	0.0014
154	SDN4	SDN4 102897	10/28/97	0.47	0.08	10.8	26	NPDES	1998	no		0.0015	0.0015	0.001	0.00025	0.005	0.00005	0.0025	0.0015	0.0005	0.0005
155	SDN4	SDN4 121697	12/15/97	1	0	33	87	NPDES	1998	no		0.0015	0.0054	0.001	0.00025	0.005	0.00005	0.0025	0.0015	0.0005	0.0005
156	SDN4	SDN4 030198	3/1/98	0.98	0.07	86	6	NPDES	1998	no											
157	SDN4	SDN4 030998	3/8/98	0.86	0	27	132	NPDES	1998	no											
158	SDN4	SDN4 042498	4/23/98	0.46	0	20	264	NPDES	1998	no											
159	SDN4	SDN4 052598	5/24/98	0.58	0	11	87	NPDES	1998	no											
160	SDN4	SDN4 062498	6/24/98	0.43	0	4	288	NPDES	1998	no											

	Sb	AS	Be	Cd	Cr	Hg	Ni	Se	Ag	Tl
[redacted]	17	17	17	18	17	17	17	17	17	17
	0.002	0.002	0.001	0.0003	0.005	0.0001	0.007	0.002	0.0005	0.001
	0.002	0.005	0.001	0.0009	0.006	0.0003	0.017	0.004	0.0005	0.001
	0.002	0.002	0.001	0.0003	0.005	0.0001	0.012	0.002	0.0005	0.001
	0.002	0.002	0.001	0.0003	0.005	0.0001	0.003	0.002	0.0005	0.001
	17	13	16	14	16	14	6	14	17	16
	100%	76%	94%	78%	94%	82%	35%	82%	100%	94%
	9	0.36	0.13	0.0009	0.612	0.002	0.483	0.02	0.0005	1.4

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Deicing event data: 1998 samples

POS ID	outfall	event date	event characteristics: 24 hr a/c deiced	48 hr a/c deiced	depth in.	48hrant in.	dryant, hrs	sample type	ground deice?	Analytes, mg/l: BOD5	E-glycol	P-glycol	total glycols	K+	Ca2+	Mg2+	note
SDE4 060397	SDE4	6/3/97	1	2	0.26	0	76	flow-wt comp	no	6.24	1	1	2				
SDS1 061797	SDS1	6/16/97	1	2	0.36	0	135	flow-wt comp	no	4.5	1	1	2				
SDE4 102897	SDE4	10/28/97	9	12	0.47	0.08	26	flow-wt comp	no	4.02	1	1	2				
SDN4 102897	SDN4	10/28/97	9	12	0.47	0.08	26	flow-wt comp	no	7.38	1	1	2				
SDS1 102897	SDS1	10/28/97	9	12	0.47	0.08	26	flow-wt comp	no	7.18	1	1	2				
SDS1 112097	SDS1	11/19/97	9	27	0.65	0.12	24	flow-wt comp	no	2	1	1	2				
SDE4 121697	SDE4	12/15/97	24	39	1.0	0	87	flow-wt comp	no	2	1	1	2				
SDN1 121597	SDN1	12/15/97	24	39	1.0	0	87	flow-wt comp	no	4.68	1	1	2				
SDN3 121697	SDN3	12/15/97	24	39	1.0	0	87	flow-wt comp	no	2	1	1	2				1
SDN4 121697	SDN4	12/15/97	24	39	1.0	0	87	flow-wt comp	no	4.68	1	1	2				
SDS1 121697	SDS1	12/15/97	24	39	1.0	0	87	flow-wt comp	no	6.44	1	1	2				
SDE4 011398	SDE4	1/12/98	181	266	1.13	0	123	avg of time co	yes	213	6	5.1	11.1	7.44	42.1	32.9	2
SDN4 011298	SDN4	1/12/98	181	266	1.13	0	123	time comp	yes	120	1	1	2	93.8	6.12	31.1	2
SDS1 011198	SDS1	1/12/98	181	266	1.13	0	123	time comp	yes	6	1	1	2	2.24	12.4	33.9	2
SDS3 011298	SDS3	1/12/98	181	266	1.13	0	123	time comp	yes	17.3	1	5	5	15.5	10.1	30.2	2
SDS4 011298	SDS4	1/12/98	181	266	1.13	0	123	time comp	yes	6	1	1	2	5.34	16.8	34.7	2
SDS3 013098	SDS3	1/29/98	5	9	0.20	0	107	flow-wt comp	no	13.5	5.4	4.2	9.6				
SDE4 030198	SDE4	3/1/98	11	21	0.98	0.07	6	flow-wt comp	no	5.4	1	1	2				
SDN4 030198	SDN4	3/1/98	11	21	0.98	0.07	6	flow-wt comp	no	2	1	1	2				
SDS3 030198	SDS3	3/1/98	11	21	0.98	0.07	6	flow-wt comp	no	8.2	1	1	2				
SDE4 030998	SDE4	3/8/98	15	42	0.86	0	132	flow-wt comp	no		1	1	2				3
SDN4 030998	SDN4	3/8/98	15	42	0.86	0	132	flow-wt comp	no	4.06	1	1	2				4
SDS1 030998	SDS1	3/8/98	15	42	0.86	0	132	flow-wt comp	no		1	6.1	7.1				5
SDS3 030998	SDS3	3/8/98	15	42	0.86	0	132	flow-wt comp	no	38.3	23	8.7	31.7				4
SDS4 030998	SDS4	3/8/98	15	42	0.86	0	132	flow-wt comp	no	2	1	1	2				6
SDE4 042398	SDE4	4/23/98	6	8	0.46	0	264	flow-wt comp	no	20.8	1	1	2				
SDS3 042398	SDS3	4/23/98	6	8	0.46	0	264	flow-wt comp	no	9.4	1	1	2				
SDE4 051498	SDE4	5/14/98	4	7	0.21	0.01	125	flow-wt comp	no	11.1	1	1	2				
SDS3 051498	SDS3	5/14/98	4	7	0.21	0.01	125	flow-wt comp	no	6.32	1	1	2				
SDN4 052598	SDN4	5/24/98	3	5	0.58	0	87	flow-wt comp	no	5.2	1	1	2				

	BOD5	E-glycol	P-glycol	total glycols
count	28	30	30	30
# <MDL	7	27	25	25
% <MDL	25%	90%	83%	83%
maximu	213	23	8.7	31.7

1. HAD QC DUPLICATE: GOOD DUPLICATION
2. Sample was 24-hour time composite
3. taken for aircraft deicing only, GRAB FAILED (NLD)
4. BACKUP MONTHLY SAMPLE IN CASE 3/1/98 SAMPLE DIDN'T QUALIFY UNDER NEW PERMIT
5. FULFILLS ANNUAL SAMPLE RQMT
6. MAKEUP COMPOSITE FOR 98QW NON-REPRESENTATIVE COMP, HAS EXTRA GRAB

1. Data for 1997-98 reporting period: all glycol samples.
2. The number of aircraft deiced in the 1 and 2 day period prior to sampling are listed in "24 hr a/c deiced" and "48 hr a/c deiced", respectively.

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Non-representative composite samples: 1998 data						Analyte, mg/l																			
POS ID	outfall	event	purpose	event	type	TSS	Turb	BOD5	NH3	total glycols	Sb	AS	Be	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag	Tl	Zn
D 061787	D	6/16/97	NPDES	storm	non-represntative comp	18	47	<4.0								0.0161	0.0053						0.018
SDS4 012998	SDS4	1/29/98	NPDES	storm	non-represntative comp	2.0	3.4	<4.0	0.020		<0.003	<0.003	<0.002	<0.0005	<0.010	0.0222	<0.001	<0.0001	0.028	<0.0003	<0.001	<0.001	0.028

These composite samples did not meet representativeness criteria and were not reported in the DMRs, according to the Procedure Manual for Stormwater Monitoring (POS 1998a). These data are reported here only and not considered in any previous analysis or discussion.

1. The D 061797 sample extended into the baseflow (standing water) after the storm hydrograph.
2. THe SDS4 012998 sample did not represent enough of the discharge hydrograph (completed too soon.)

Appendix C

Field Quality Control Data

APPENDIX C

FIELD QUALITY CONTROL DATA

Table C1 presents data for field quality control samples. These data demonstrate the adequacy and level of confidence of the Port's sampling protocols and results. Because the majority of field blank data were near or below analyte detection limits, the results confirm that little or no contamination occurred in the automatic sampling process. Furthermore, duplicate samples collected by the automatic samplers usually displayed little relative percent difference (RPD) between a particular sample and its duplicate sample. The majority of duplicate analytes had an RPD of less than 20 percent. Only a limited number of cases exhibited more than the 20 percent RPD criterion commonly used to discern significant differences. Such differences would account for the variability of the composition of the discharge and the precision of the sampling technique.

Appendix C

Table

TABLE C1 FIELD QC SAMPLE DATA (MG/l)

sample ID	event	type	FOG	TPH (IR)	Fecals	TSS	Turb	BOD5	NH3	total glycols	Surf	Cu	Pb	Zn
Field (equipment) blanks														
SDS1 102897 BLANK	10/28/97	eqpt blank	1	0.25	13	0.5	0.21	4	0.010	4	0.025	0.006	0.001	0.016
SDN3 121697	12/15/97	eqpt blank	3.7	0.25	2	1.3	0.46	4	0.010	4	0.025	0.005	0.001	0.013
SDN1 042398	4/23/98	eqpt blank		0.25	2	0.25	0.1	4		4		0.005	0.001	0.003
Duplicate composite samples														
SDN3 121597 GRAB DUPE	12/15/97	grab	1	0.25	130									
SDN3 121597 GRAB		grab	1.5	0.25	50									
RPD			50%	0%	-62%									
SDN1 102897 DUPE	10/28/97	comp				19	27	4.74	0.218		0.090	0.014	0.013	0.255
SDN1 102897		comp				19	28	4	0.215		0.086	0.019	0.017	0.222
RPD						0%	4%	-16%	-1%		-4%	40%	31%	-13%
SDN3 121697 DUPE	12/15/97	comp				13	26	4	0.010	4	0.025	0.010	0.002	0.044
SDN3 121697		comp				11	26	4	0.016	4	0.032	0.011	0.002	0.040
RPD						-15%	0%	0%	60%		28%	12%	-5%	-9%
SDN1 042398 DUPE	4/23/98	comp				25	12	11.7				0.026	0.001	0.162
SDN1 042398		comp				26	12	12.8				0.026	0.005	0.401
RPD						4%	0%	9%				1%	400%	148%
SDN1 061098 DUPE	6/10/98	comp				33	66	9.1				0.083	0.0153	0.067
		comp				34	71	9.8				0.056	0.009	0.36
RPD						3%	8%	8%				-33%	-41%	437%

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Appendix D

BMP Tables and Figures

Appendix D

Tables

APPENDIX D

TABLE D1

OPERATIONAL AND SOURCE CONTROL BMP SUMMARY[a]

ACTIVITY	BMP	TYPE	STATUS	RESPONSIBLE ORGANIZATION
Aircraft servicing	Restrict to IWS areas or drains blocked	Operational	Ongoing	AFLOB
	Store glycol in IWS areas	Operational	Ongoing	HSES/AFLOB
	Confine parking of lavatory waste trucks to IWS	Operational	Ongoing	HSES/AFLOB
	Identify and connect problem SDS areas to IWS	Operational	Ongoing	AV/PMG
	Restrictions for fueling on taxiway Alpha	Operational	Ongoing	AFLOB
	Monitor certain SDS outfalls during deicing per NPDES permit	Operational	Ongoing	HSES
AMA anti-icing/deicing	Minimize chemical use[b]	Operational	Ongoing	AFLOB
	Use CMA/sand mixture for roadways.	Operational	Ongoing	GALOB/Maintenance
Snow storage	Operate pump stations to divert snowmelt to IWS.	Operational	Ongoing	GALOB/Maintenance
Spill control	Implement Spill Plan	Operational	In effect	AV/PMG
Construction sites education/training	Require erosion and sediment control BMPs	Source control	Ongoing	PMG
	Restrict equipment servicing	Source control	Ongoing	AFLOB
	Encourage contractors to use secondary containment	Source control	Ongoing	PMG
	Concrete cutting and washout			PMG
	Provide contractor/inspector training	Operational	Ongoing	HSES
Erosion of bare ground surfaces in non-construction areas	Implement soil erosion and control BMPs in contractor staging areas	Source control	Ongoing	PMG/Maintenance
	Emphasize and enforce contractor responsibility for BMPs in contractor staging areas	Source control	In effect	PMG
	Control erosion from temporary soil stockpiles	Source control	In effect	PMG/Maintenance
Vehicle washing and maintenance	Prohibit vehicle washing in SDS areas	Source control	Ongoing	PMG/HSES
	Place signs in key locations	Operational	In effect	Maintenance
	Clean sumps in Taxi Yard annually	Source control	Ongoing	Maintenance
	Sweep Taxi Yard and control litter	Source control	Ongoing	Maintenance
	Maintain catch basin inserts	Source control	Ongoing	Maintenance

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APPENDIX D

TABLE D1

OPERATIONAL AND SOURCE CONTROL BMP SUMMARY[a]

ACTIVITY	BMP	TYPE	STATUS	RESPONSIBLE ORGANIZATION
Landscape management	Strive to use environmentally benign chemicals	Operational	In effect	Maintenance
	Follow proper cleaning/disposal procedures	Operational	In effect	Maintenance
	Apply during dry periods	Operational	In effect	Maintenance
	Restrict use near waterways	Operational	In effect	Maintenance
	Incorporate BMPs in contractor specifications	Operational	In effect	Maintenance
	Implement IPM Plan	Operational	In effect	Maintenance
	Give priority to biological methods of pest management	Operational	Ongoing	Maintenance
	Apply fertilizer	Operational	Ongoing	Maintenance
	Conduct regular weeding and pruning	Operational	Ongoing	Maintenance
	Follow Ecology guidelines for herbicide application	Operational	Ongoing	Maintenance
	Apply herbicides/pesticides according to instructions	Operational	Ongoing	Maintenance
	Dethatch	Operational	Ongoing	Maintenance
	Trim ivy-covered areas	Operational	Ongoing	Maintenance
	Fertilize shrubs and trees by hand	Operational	Ongoing	Maintenance
	Do not use beauty bark in drainages	Operational	Ongoing	Maintenance
	Maintain stream corridors	Operational	Ongoing	Maintenance
	Prohibit Roundup use within 50 feet of a water body	Operational	Ongoing	Maintenance
	Do not apply pesticides or fertilizer on rainy days	Operational	Ongoing	Maintenance
	Avoid catch basin grates when applying fertilizer or pesticides	Operational	Ongoing	Maintenance
AOA maintenance	Sweep pavement frequently	Source control	In effect	Maintenance
	Inspect catch basin sumps annually and clean as needed	Source control	Ongoing	Maintenance
	Store and dispose of sediments properly	Operational	In effect	Maintenance
	Construct secondary containment for used engine fluids	Operational	Ongoing	Maintenance

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APPENDIX D

TABLE D1

OPERATIONAL AND SOURCE CONTROL BMP SUMMARY[(a)]

ACTIVITY	BMP	TYPE	STATUS	RESPONSIBLE ORGANIZATION
Inappropriate connections and discharges	Inspect outfalls for evidence of illicit connections	Operational	Ongoing	HSES
Temporary storage of surplus and used materials	Do not store liquids in westside yard	Operational	In effect	Maintenance
	Engineering Yard:			
	Place signs on surplus storage	Operational	Ongoing	Maintenance
	Control entry of surplus materials	Operational	Ongoing	Maintenance
Tenant activities in SDS areas	Monitor and educate tenants	Operational	Ongoing	Tenant
	Deice aircraft according to procedures	Operational	Ongoing	Tenant
	Encourage drip pans beneath fueling trucks if leakage is	Operational	Ongoing	Tenant
	observed	Operational	Ongoing	Tenant
	Sweep around dumpsters	Operational	Ongoing	Tenant
	Store liquids in secondary containment	Operational	Ongoing	Tenant
	Do not store used fluids or hazardous waste in SDS areas	Operational	Ongoing	Tenant
	Do not maintain vehicles or equipment in SDS areas	Operational	Ongoing	Tenant
	Inspect catch basin grates	Operations	Ongoing	HSES
	Require tenant water pollution control plans	Operations	Ongoing	HSES
	Encourage tenant compliance with Port SWPPP	Source control	In effect	Tenant
	Require tenant spill control plans			
Other Operational BMPs	Designate a SWPPP implementation monitor	Operational	Ongoing	HSES
	Conduct regular inspections	Operational	Ongoing	HSES
	Assemble Pollution Prevention Team	Operational	Ongoing	AV/PMG
	Conduct SDS outfall monitoring	Operational	Ongoing	HSES
	Sign catch basins (dump no waste)	Operational	Ongoing	Maintenance
	Establish packing material source control	Operational	Ongoing	AV/PMG

Notes:

(a) Excluding capital source control BMPs that have been completed.
(b) It is anticipated that using an alternative chemical may require capital investment.

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APPENDIX D

TABLE D2

SUMMARY OF COMPLETED BMPs

TYPE	BMP	STORM DRAIN SYSTEM	DATE COMPLETED	COST (if readily available)
Source Control (SC)	Terminate glycol use for ground deicing	All	12/95	--
SC	Store Chemicals in IWS Area		12/95	--
Treatment	Connect snow storage areas to IWS	SDE4 (008), SDN2 (007)	By 11/1/97	--
Treatment	Connect Port Maintenance Shop Yard to IWS	SDE4 (002)	8/96	--
Treatment	Connect Loading Dock Dumpster slot drain to sanitary	SDE4 (002)	10/95	$25K
Treatment	Connect North Cargo Area (Area 114) to IWS via lift station	SDN2 (007)	6/97	$188K
Treatment	Connect Cargo Area 4 (Area 100) to IWS	SDE4 (002)	8/96	$13K
Treatment	Connect North Satellite (Area 106/107) to IWS	SDE4 (002)	10/95	$300K
SC	Seal SDS inlet near Gate C8	SDS3 (005)	12/95	$10K
SC	Seal SDS inlet near Gate B5	SDS3 (005)	12/95	$10K
Treatment	Connect SDS area between the South Satellite and the B Concourse to the IWS	SDS1 (003)	5/97	$149K
Treatment	Connect SDS area between the South Satellite and the NW Hangar to the IWS	SDS1 (003)	8/96	$88K
Treatment	Connect Area 112/311 (D Concourse) to IWS	SDE4 (002)	11/95	--
Treatment	Connect Area 314 (C Concourse) to IWS	SDS3 (005)	11/95	--
SC	Relocate Hazardous Materials sheds		7/95	$4K

APPENDIX D

TABLE D2

SUMMARY OF COMPLETED BMPs

TYPE	BMP	STORM DRAIN SYSTEM	DATE COMPLETED	COST (if readily available)
Treatment	Connect Taxi Yard Wash Pad to sanitary sewer	TY (013)	7/95	$30K
SC	Evaluate alternative chemicals for anti-icing and deicing	All	12/95	--
SC	Store anti-icing chemicals in IWS areas	All	12/95	--
Treatment	Connect airfield maintenance sediment storage yard to IWS	SDW3 (010)	7/95	--
Treatment	Connect Federal Express loading dock area to IWS	SDN1 (006)	7/97	Tenant Project

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Appendix D

Figures

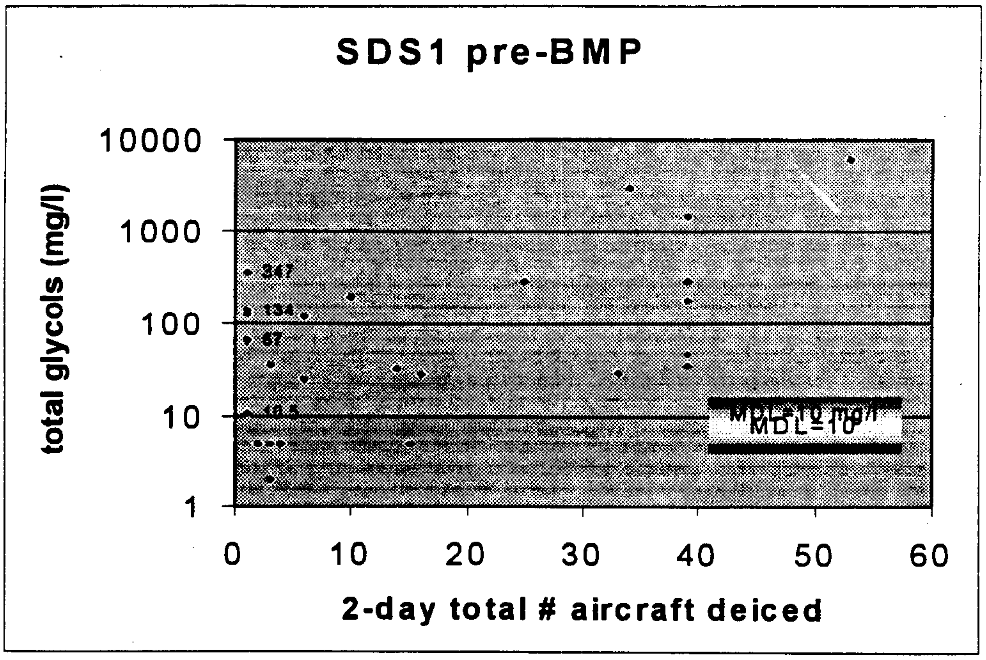

FIGURE D1 GLYCOLS IN SDS1 DISCHARGES PRIOR TO BMPS

AR 033507

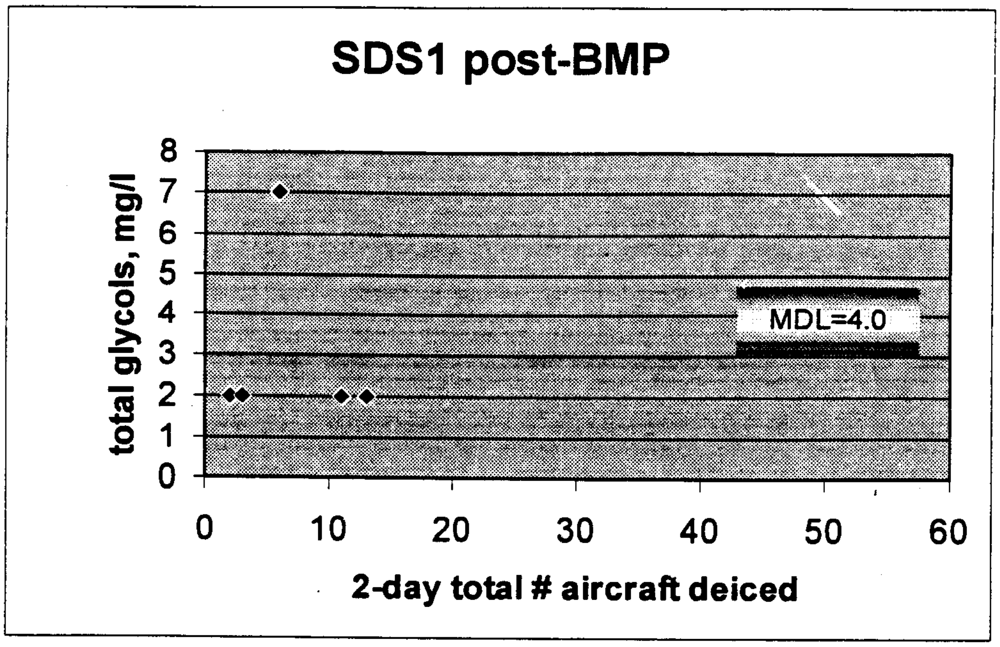

FIGURE D2 GLYCOLS IN SDS1 DISCHARGES AFTER BMPS

AR 033508

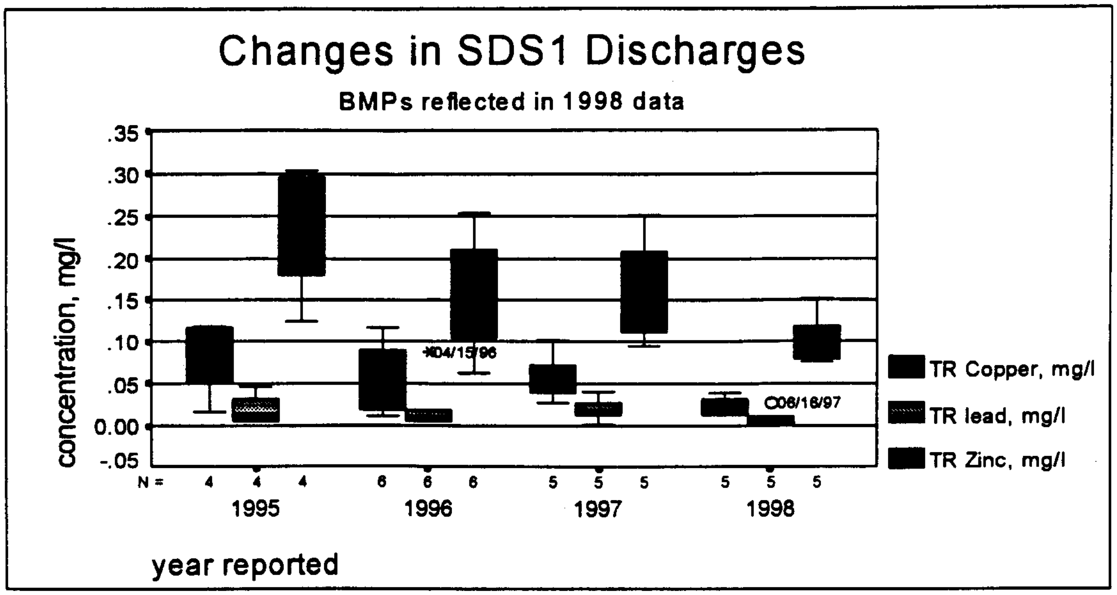

FIGURE D3 CHANGES IN METALS AT SDS1

AR 033509