

SEATAC STORMCEPTOR PERFORMANCE MONITORING REPORT

SeaTac, Washington

Prepared for:
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April 23, 2001
Project No. KB98618A

INTRODUCTION

Performance monitoring of a Stormceptor 900 stormwater removal facility was undertaken to determine removal efficiencies of flow-weighted composite samples collected during rainfall events. The facility was located at a new gasoline station/convenience store adjacent to Interstate 5 in the City of SeaTac, Washington.

SAMPLING METHODS

The inflow and outflow of the Stormceptor were fitted with automatic Isco® samplers that collected samples at pre-determined discharge intervals. Once monitoring was triggered by a target water level, the instruments collected samples after a set volume of water passed through the system. Sample collection frequency was proportional to changes in site runoff during the storm event.

A tipping bucket rain gage was installed on the roof of the service station to provide a record of site rainfall at 15-minute intervals during each event. However, the monitoring equipment malfunctioned during the May and October events, and the rainfall totals for these events were documented from the Sea-Tac Airport climate station, located approximately 2 miles west of the study site.

The original sampling plan was to capture a storm event following 3 days of dry weather. However, the dry weather provision proved difficult during the 1999 water year (October 1998 through September 1999). Western Washington had over 100 days of measurable rainfall. The 3 days of dry weather stipulation was later abandoned.

The first flush of the initial storms was segregated and analyzed separately from the remainder of the sample collection. The first flush analysis was a stipulation of the Stormceptor monitoring protocol dated June 1998. The separate analysis of the first flush component was abandoned at the client's request following the first two storms. Total suspended solids (TSS) from the first flush were analyzed prior to the analysis of the remainder of the samples. Analysis of the first flush sample was used to screen the pollutant loading for each storm to determine whether the runoff was sufficiently concentrated ($TSS > 50 \text{ mg/L}$) to allow for performance evaluation.

The unit received parking lot and driveway runoff from approximately 1 acre of impervious surface surrounding the gasoline station and convenience store, exclusive of roof runoff. However, a detention chamber and flow splitter immediately upgradient of the Stormceptor diverted flow during the first three storms of the study. This diversion resulted in lower than expected discharge to the facility. The City of SeaTac granted permission to bypass the diversion for the fourth and final storm event in October.

The detention chamber diversion during the first three storm events, the subsequent diversion bypass during the final event, and discrepancy between the inflow and outflow discharge

measurements were noted. The apparent sensor discrepancies may have been caused by debris clogging the inflow sensor.

Storm events were sampled on March 13, April 25, May 3, and October 28, 1999 (Appendix). Twenty-four hour rainfall amounts varied from 0.17 inches to 0.80 inches. TSS solids, conductivity, total nitrogen, total phosphorus (TP), and petroleum products were analyzed from the inflow and outflow stations from all storms. Total metals were analyzed from the inflow and outflow of all storms except October 28th, when an insufficient volume was collected to perform the metals analyses.

At the conclusion of the complete monitoring program, sediment samples were collected from the inlet and outlet of a detention chamber immediately upgradient of the Stormceptor and from the Stormceptor forebay (August 8, 2000). The sediment samples were analyzed for grain size.

Samples were collected at the end of each storm and transported on ice in a cooler to the analytical laboratory. The water samples were analyzed at AmTest Analytical Laboratory (AmTest), a state-accredited laboratory in Redmond, Washington. Sample transport and delivery was documented using a chain of custody form. The analytical results from AmTest were accompanied by a methodology section that identified the method references, detection limit, and analysis date. With the exception of the March 13, 1999 storm, which occurred on a Saturday, all samples were delivered to the laboratory within 4 hours. The March 13, 1999 samples were delivered to the laboratory on Monday, March 15, 1999.

RESULTS AND REMOVAL EFFICIENCIES

The results and removal percentages for each storm event are listed in Table 1. TSS removal ranged from 65 percent to 96 percent. Conductivity increased slightly during two events, and the overall reduction in conductivity ranged from -8 percent to 38 percent. Total nitrogen removal ranged from 13 percent to 70 percent. TP removal ranged from 16 percent to 56 percent. Total oil and grease was below detection during the first storm. However, a more sensitive analysis was conducted on subsequent samples, with results above detection. Diesel removal percentages ranged from 0 percent to 89 percent, and oil removal ranged from 54 percent to 94 percent. Gasoline was below detection during all events.

Total copper removal ranged from 19 percent to 93 percent. Total zinc removal ranged from -8 percent to 90 percent. TP metal removal ranged from 26 percent to 89 percent. Total lead and mercury were below detection during all storm events.

Event-weighted means were calculated by discharge and rainfall for each of the 24-hour sampling periods (Table 2).

SEDIMENT GRAIN SIZE ANALYSIS

The sediment sample from the detention chamber immediately upgradient of the Stormceptor had less fine material than the sample from the Stormceptor forebay. Sixty-one percent of the Stormceptor material passed the 400 (fine) sieve, compared to 11 percent of the detention chamber inlet sediment (Appendix).

CONCLUSIONS

Although accurate discharge measurements at the site were difficult to obtain during several of the storm events, the removal efficiency of the facility was measured for storms ranging from 0.2 to 0.8 inches per 24 hours. The first flush component of the first two storms had higher removal percentages than the overall storm. Event-weighted removal of TSS ranged from 88 percent to 93 percent. The Stormceptor removed more fine sediment than the upstream detention chamber.

APPENDIX

**Water Quality Results
Discharge and Rainfall Results
Grain Size Analysis**

Sea Tac StormCeptor Water Quality Results

24 Hour Rainfall = 0.80 inches

Parameter	First Flush Inflow	First Flush Outflow	First Flush	Storm Inflow	Storm Outflow	Storm
	Result	3/13/99	% Removal	Result	3/13/99	% Removal
Total Suspended Solids	100	6	94%	23	8	65%
Conductivity (umhos/cm)	74	46	38%	59	55	7%
Total Nitrogen (mg/l)	2.6	0.8	70%	1.20	0.43	64%
Total Phosphorus (mg/l)	0.076	0.064	16%	0.064	0.049	23%
Total Petroleum Hydrocarbon (mg/l)	NA	NA	NA	1	1	0%

24 Hour Rainfall = 0.17 inches

Parameter	First Flush Inflow	First Flush Outflow	First Flush	Storm Inflow	Storm Outflow	Storm
	Result	4/25/99	% Removal	Result	4/25/99	% Removal
Total Suspended Solids	300	40	87%	55	18	67%
Conductivity (umhos/cm)	99	100	-1%	93	100	-8%
Total Nitrogen (mg/l)	2.4	1.40	42%	2.1	1.40	33%
Total Phosphorus (mg/l)	0.72	0.32	56%	0.70	0.38	46%
Gasoline (ug/l)	1300	440	66%	400	440	-10%
Diesel (ug/l)	9600	1100	89%	2200	1100	50%
Oil (ug/l)	35000	2200	94%	4800	2200	54%

Parameter	Storm Inflow	Storm Outflow	Storm	Storm Inflow	Storm Outflow	Storm
	Result	5/3/99	% Removal	Result	10/28/99*	% Removal
Total Suspended Solids	16	5	69%	240	10	96%
Conductivity (umhos/cm)	61	56	8%	80	58	28%
Total Nitrogen (mg/l)	1.50	1.30	13%	2.70	1.70	37%
Total Phosphorus (mg/l)	NA	NA	NA	0.43	0.350	19%
Gasoline (ug/l)	100	100	0%	400	400	0%
Diesel (ug/l)	650	520	20%	1000	1000	0%
Oil (ug/l)	1400	500	64%	24000	2000	92%

24 Hour Rainfall on 5/3/99 was 0.18 inches; 24 hour rainfall on 10/28/99 was 0.30 inches.

Underline denotes result was below listed detection limit. First Flush not collected for last two storms at client's request.

* October 28 storm protocol did not require 3 days of dry weather as did previous storms.

Sea Tac StormCeptor Water Quality Metals Results

Total metals	First Flush Inflow 3/13/99 Result (mg/l)	First Flush Outflow 3/13/99 Result (mg/l)	First Flush Removal %
Aluminum	<u>0.02</u>	0.36	-1700%
Antimony	<u>0.020</u>	<u>0.020</u>	0%
Arsenic	<u>0.030</u>	<u>0.030</u>	0%
Boron	0.630	0.160	75%
Barium	0.013	0.012	8%
Beryllium	<u>0.005</u>	<u>0.005</u>	0%
Calcium	11.0	5.2	53%
Cadmium	<u>0.002</u>	<u>0.002</u>	0%
Cobalt	<u>0.003</u>	<u>0.003</u>	0%
Chromium	<u>0.006</u>	<u>0.006</u>	0%
Copper	0.014	0.006	57%
Iron	0.71	0.45	37%
Mercury	<u>0.01</u>	<u>0.01</u>	0%
Potassium	3.1	2.0	35%
Lithium	<u>0.02</u>	<u>0.02</u>	0%
Magnesium	1.4	0.7	51%
Manganese	0.075	0.090	-20%
Molybdenum	<u>0.01</u>	<u>0.01</u>	0%
Sodium	5.9	3.0	49%
Nickel	<u>0.01</u>	<u>0.01</u>	0%
Phosphorus	0.230	0.170	26%
Lead	<u>0.02</u>	<u>0.02</u>	0%
Sulfur	1.8	0.9	50%
Selenium	<u>0.03</u>	<u>0.03</u>	0%
Silicon	2.3	0.7	70%
Silver	<u>0.01</u>	<u>0.01</u>	0%
Tin	<u>0.02</u>	<u>0.02</u>	0%
Strontium	0.130	0.059	55%
Titanium	<u>0.01</u>	<u>0.01</u>	0%
Thallium	<u>0.03</u>	<u>0.03</u>	0%
Vanadium	<u>0.002</u>	<u>0.002</u>	0%
Yttrium	0.002	<u>0.001</u>	50%
Zinc	0.270	0.100	63%
Hardness (mg/l)	33	16	53%

Results in mg/l; underline denotes result was below listed detection limit.

Sea Tac StormCeptor Water Quality Metals Results

Total metals	Storm Inflow	Storm Outflow	Storm
	3/13/99 Result (mg/l)	3/13/99 Result (mg/l)	Removal %
Aluminum	0.21	0.17	19%
Antimony	<u>0.020</u>	<u>0.020</u>	0%
Arsenic	<u>0.030</u>	<u>0.030</u>	0%
Boron	<u>0.1</u>	<u>0.1</u>	0%
Barium	0.019	0.011	42%
Beryllium	<u>0.005</u>	<u>0.005</u>	0%
Calcium	8.1	6.2	23%
Cadmium	<u>0.002</u>	<u>0.002</u>	0%
Cobalt	<u>0.003</u>	<u>0.003</u>	0%
Chromium	<u>0.006</u>	<u>0.006</u>	0%
Copper	0.002	<u>0.002</u>	0%
Iron	0.22	0.26	-18%
Mercury	<u>0.01</u>	<u>0.01</u>	0%
Potassium	2.4	1.8	25%
Lithium	<u>0.02</u>	<u>0.02</u>	0%
Magnesium	0.8	0.7	17%
Manganese	0.051	0.043	16%
Molybdenum	<u>0.01</u>	<u>0.01</u>	0%
Sodium	3.1	2.7	13%
Nickel	<u>0.01</u>	<u>0.01</u>	0%
Phosphorus	0.100	<u>0.05</u>	50%
Lead	<u>0.02</u>	<u>0.02</u>	0%
Sulfur	1.7	1.3	24%
Selenium	<u>0.03</u>	<u>0.03</u>	0%
Silicon	1.0	0.7	30%
Silver	<u>0.01</u>	<u>0.01</u>	0%
Tin	<u>0.02</u>	<u>0.02</u>	0%
Strontium	0.089	0.067	25%
Titanium	<u>0.01</u>	<u>0.01</u>	0%
Thallium	<u>0.03</u>	<u>0.03</u>	0%
Vanadium	<u>0.002</u>	<u>0.002</u>	0%
Yttrium	<u>0.001</u>	<u>0.001</u>	0%
Zinc	0.140	0.150	-7%
Hardness (mg/l)	24	18	22%

Results in mg/l; underline denotes result was below listed detection limit.

Sea Tac StormCeptor Water Quality Metals Results

Total metals	First Flush Inflow	First Flush Outflow	First Flush
	4/25/99 Result (mg/l)	4/25/99 Result (mg/l)	Removal %
Aluminum	1.60	0.07	96%
Antimony	<u>0.020</u>	<u>0.020</u>	0%
Arsenic	<u>0.030</u>	<u>0.030</u>	0%
Boron	0.170	<u>0.1</u>	41%
Barium	0.040	0.004	90%
Beryllium	<u>0.005</u>	<u>0.005</u>	0%
Calcium	14.0	2.6	81%
Cadmium	<u>0.002</u>	<u>0.002</u>	0%
Cobalt	0.005	<u>0.003</u>	40%
Chromium	<u>0.006</u>	<u>0.006</u>	0%
Copper	0.027	0.002	93%
Iron	4.40	0.24	95%
Mercury	<u>0.01</u>	<u>0.01</u>	0%
Potassium	3.0	<u>1.0</u>	67%
Lithium	<u>0.02</u>	<u>0.02</u>	0%
Magnesium	1.8	0.3	84%
Manganese	0.170	0.030	82%
Molybdenum	0.02	<u>0.01</u>	50%
Sodium	5.7	1.2	79%
Nickel	<u>0.01</u>	0.01	0%
Phosphorus	0.750	0.080	89%
Lead	<u>0.02</u>	<u>0.02</u>	0%
Sulfur	3.5	0.9	74%
Selenium	<u>0.03</u>	<u>0.03</u>	0%
Silicon	2.2	0.2	91%
Silver	<u>0.01</u>	<u>0.01</u>	0%
Tin	<u>0.02</u>	<u>0.02</u>	0%
Strontium	0.120	0.022	82%
Titanium	0.05	<u>0.01</u>	80%
Thallium	<u>0.03</u>	<u>0.03</u>	0%
Vanadium	<u>0.002</u>	<u>0.002</u>	0%
Yttrium	<u>0.001</u>	<u>0.001</u>	0%
Zinc	0.530	0.054	90%
Hardness (mg/l)	42	8	82 %

Results in mg/l; underline denotes result was below listed detection limit.

Sea Tac StormCeptor Water Quality Metals Results

Total metals	Storm Inflow	Storm Outflow	Storm
	4/25/99 Result (mg/l)	4/25/99 Result (mg/l)	Removal %
Aluminum	0.56	0.29	48%
Antimony	<u>0.020</u>	<u>0.020</u>	0%
Arsenic	<u>0.030</u>	<u>0.030</u>	0%
Boron	0.150	0.1	33%
Barium	0.021	0.018	14%
Beryllium	<u>0.005</u>	<u>0.005</u>	0%
Calcium	12.0	12.0	0%
Cadmium	<u>0.002</u>	<u>0.002</u>	0%
Cobalt	<u>0.003</u>	<u>0.003</u>	0%
Chromium	<u>0.006</u>	<u>0.006</u>	0%
Copper	0.015	<u>0.002</u>	87%
Iron	0.87	0.92	-6%
Mercury	<u>0.01</u>	<u>0.01</u>	0%
Potassium	3.5	2.6	26%
Lithium	<u>0.02</u>	<u>0.02</u>	0%
Magnesium	1.3	1.3	0%
Manganese	0.150	0.140	7%
Molybdenum	0.02	0.04	-100%
Sodium	4.8	5.6	-17%
Nickel	<u>0.01</u>	<u>0.01</u>	0%
Phosphorus	0.730	0.41	44%
Lead	<u>0.02</u>	<u>0.02</u>	0%
Sulfur	4.5	4.2	7%
Selenium	<u>0.03</u>	<u>0.03</u>	0%
Silicon	1.5	0.9	40%
Silver	<u>0.01</u>	<u>0.01</u>	0%
Tin	<u>0.02</u>	0.02	0%
Strontium	0.110	0.100	9%
Titanium	0.02	<u>0.01</u>	50%
Thallium	<u>0.03</u>	<u>0.03</u>	0%
Vanadium	<u>0.002</u>	<u>0.002</u>	0%
Yttrium	<u>0.001</u>	<u>0.001</u>	0%
Zinc	0.240	0.260	-8%
Hardness (mg/l)	35	35	0%

Results in mg/l; underline denotes result was below listed detection limit.

Sea Tac StormCeptor Water Quality Metals Results

Total metals	Storm Inflow 5/3/99 Result (mg/l)	Storm Outflow 5/3/99 Result (mg/l)	Storm Removal %
Aluminum	0.22	0.29	-32%
Antimony	<u>0.020</u>	<u>0.020</u>	0%
Arsenic	<u>0.030</u>	<u>0.030</u>	0%
Boron	<u>0.100</u>	<u>0.100</u>	0%
Barium	0.012	0.014	-17%
Beryllium	<u>0.005</u>	<u>0.005</u>	0%
Calcium	7.2	7.3	-1%
Cadmium	<u>0.002</u>	<u>0.002</u>	0%
Cobalt	<u>0.003</u>	0.003	0%
Chromium	<u>0.006</u>	<u>0.006</u>	0%
Copper	0.021	0.017	19%
Iron	0.38	0.42	-11%
Mercury	<u>0.01</u>	<u>0.01</u>	0%
Potassium	1.7	1.7	0%
Lithium	<u>0.02</u>	<u>0.02</u>	0%
Magnesium	0.76	0.68	11%
Manganese	0.075	0.083	-11%
Molybdenum	<u>0.01</u>	<u>0.01</u>	0%
Sodium	3.5	2.9	17%
Nickel	<u>0.01</u>	<u>0.01</u>	0%
Phosphorus	0.390	0.290	26%
Lead	<u>0.02</u>	<u>0.02</u>	0%
Sulfur	2.8	2.3	18%
Selenium	<u>0.03</u>	<u>0.03</u>	0%
Silicon	0.8	0.6	25%
Silver	<u>0.01</u>	<u>0.01</u>	0%
Tin	<u>0.02</u>	<u>0.02</u>	0%
Strontium	0.069	0.071	-3%
Titanium	<u>0.01</u>	<u>0.01</u>	0%
Thallium	<u>0.03</u>	<u>0.03</u>	0%
Vanadium	0.015	<u>0.002</u>	87%
Yttrium	<u>0.001</u>	0.008	-700%
Zinc	0.240	0.190	21%
Hardness (mg/l)	21	21	0%

Results in mg/l; underline denotes result was below listed detection limit.

GRAIN SIZE ANALYSIS - MECHANICAL

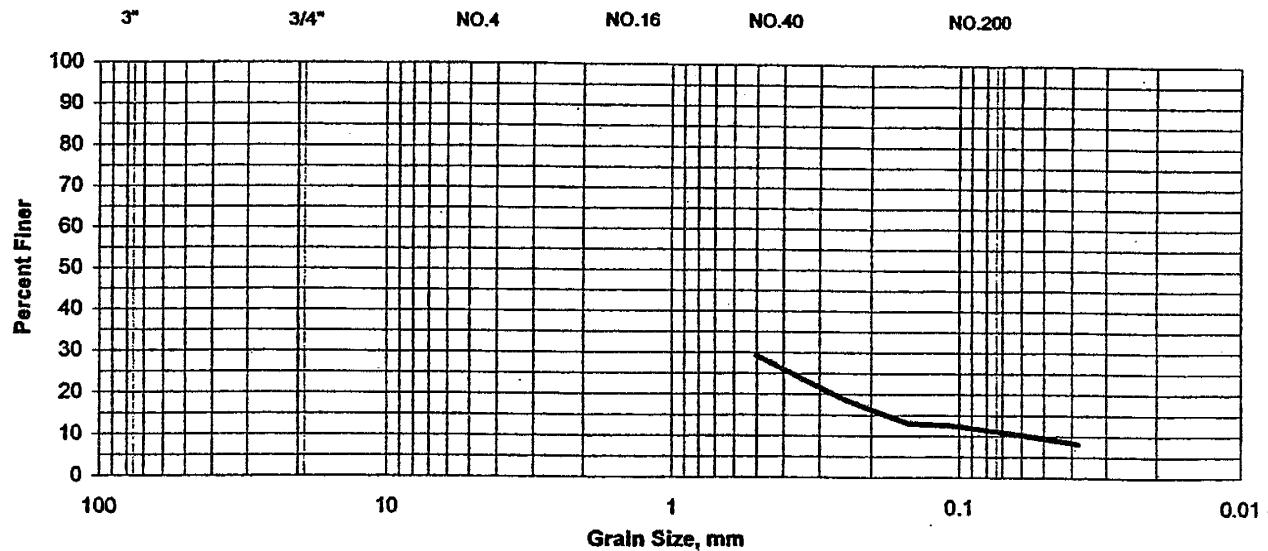
Date 4/27/00	Project Stormceptor Outflow	Project No. KB98618	Soil Description	
Tested By AMTEST # 00-A003854	EB/EP No.	Depth		

Wt. of Dry Sample + Tare	
Wt. of Tare	
Wt. of Dry Sample	0

Moisture Content = %

Sieve No.	Diam. (mm)	Wt. Retained	% Retained	% Passing	Specification Requirements	
					Minimum	Maximum
35	0.5		70.7	29.3		
60	0.25		81.1	18.9		
100	0.15		87.0	13.0		
140	0.106		87.5	12.5		
200	0.075		88.9	11.1		
270	0.053		90.3	9.7		
400	0.038		91.8	8.2		

US STANDARD SIEVE NOS.



	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

ASSOCIATED EARTH SCIENCES, INC.

911 5th Ave., Suite 100 Kirkland, WA 98033 206-827-7701 FAX 827-5424 179 Madrone Lane North Bainbridge Island, WA 98110 206-780-9370 FAX 780-9438

AESI
911 - 5th Avenue
Suite 100
Kirkland, WA 98033



Date Received: 3/17/00
Date Reported: 4/24/00

AmTest Inc.
14603 N.E. 87th St.
Redmond, WA
98052
Tel: 425 885 1664
Fax: 425 883 3495

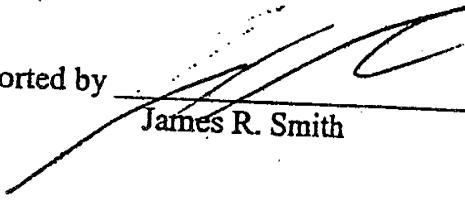
Attn: Tom Shugrue

GRAIN SIZE ANALYSIS

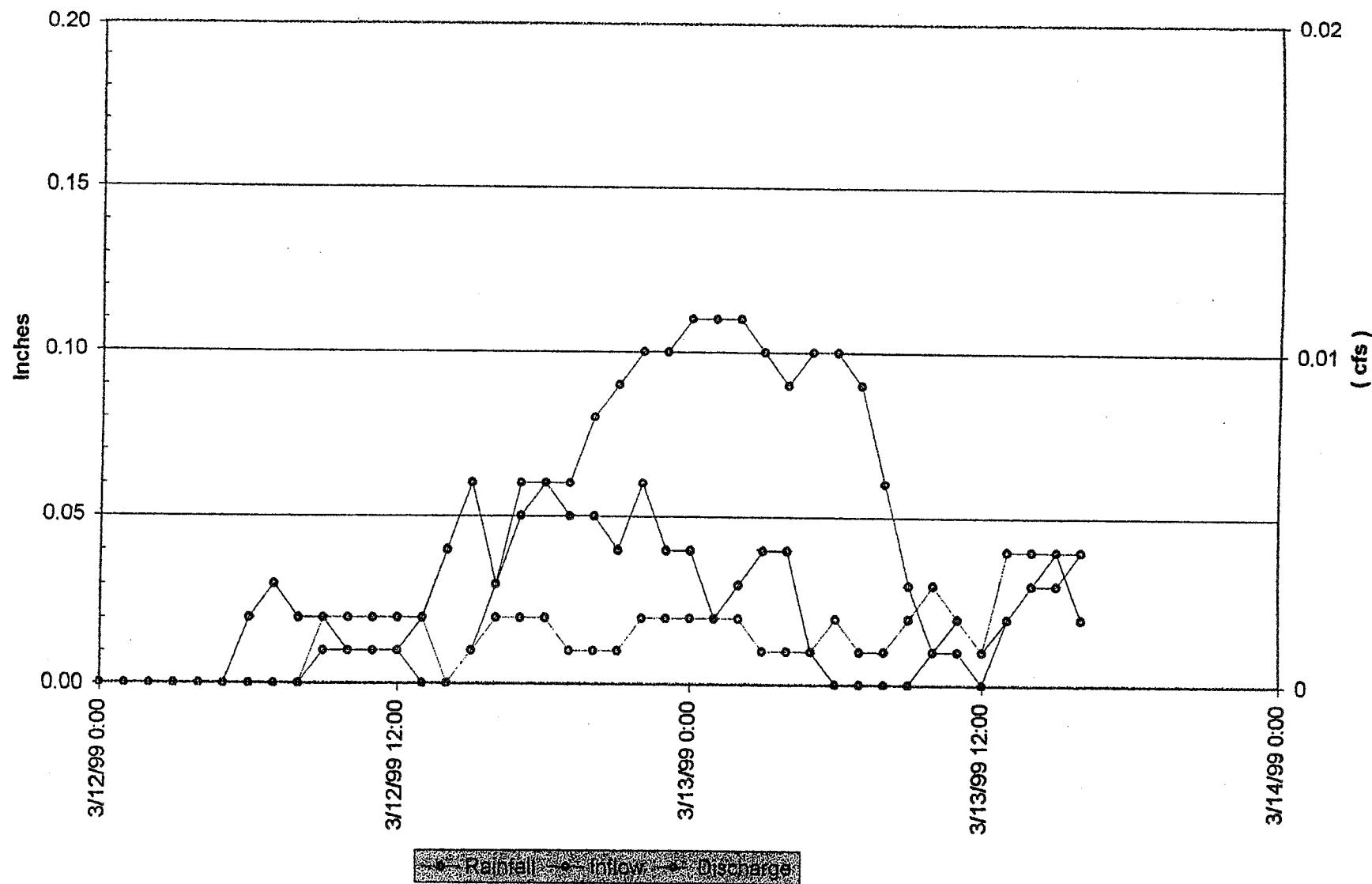
SAMPLE ID: 00-A003854
CLIENT ID: Seatac Outflow

Screen #	Opening (microns)	Retained (%)
35	500	70.7
60	250	10.4
100	150	5.9
140	106	0.5
200	75	1.4
270	53	1.4
400	38	1.5

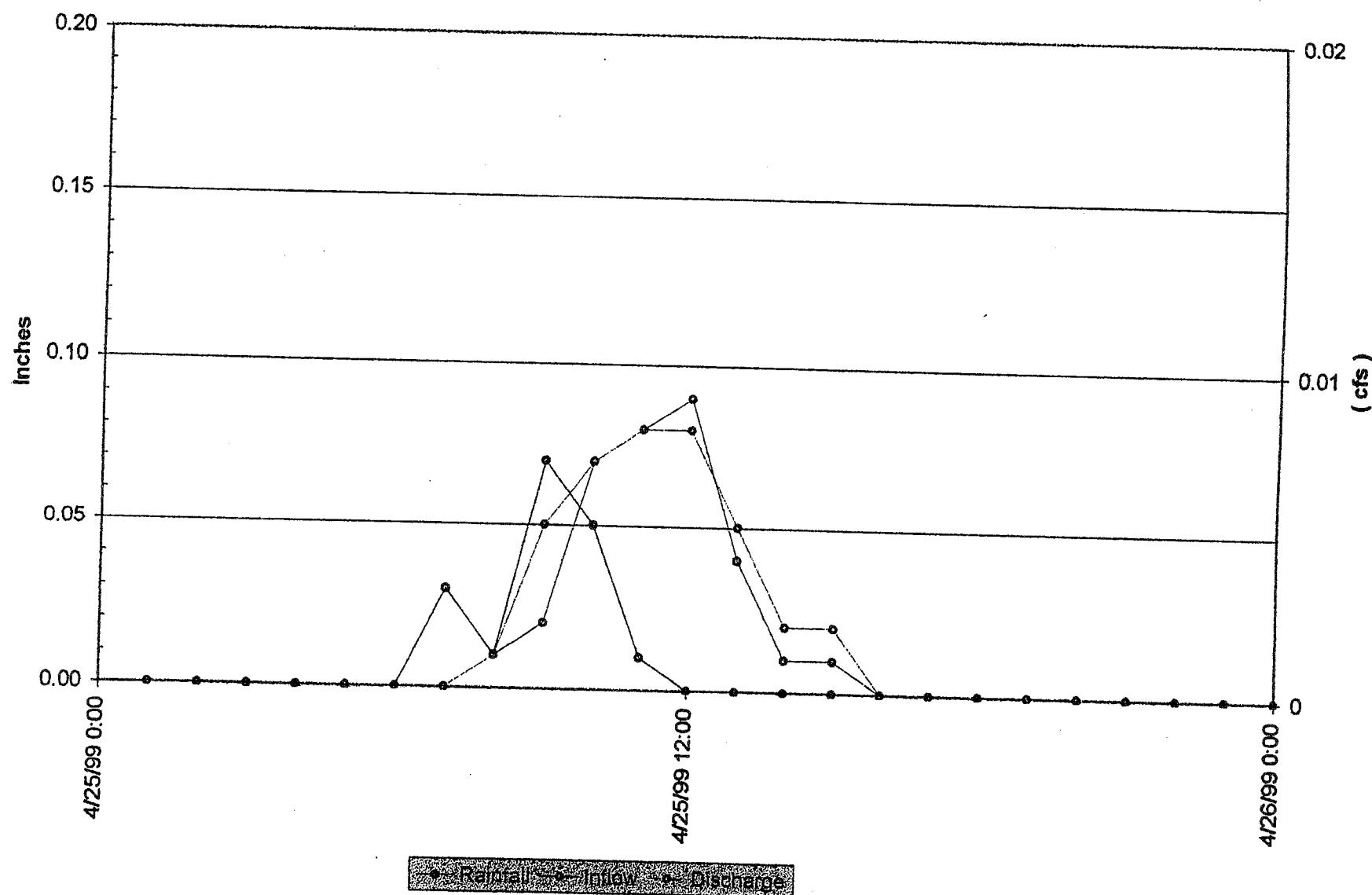
Reported by


James R. Smith

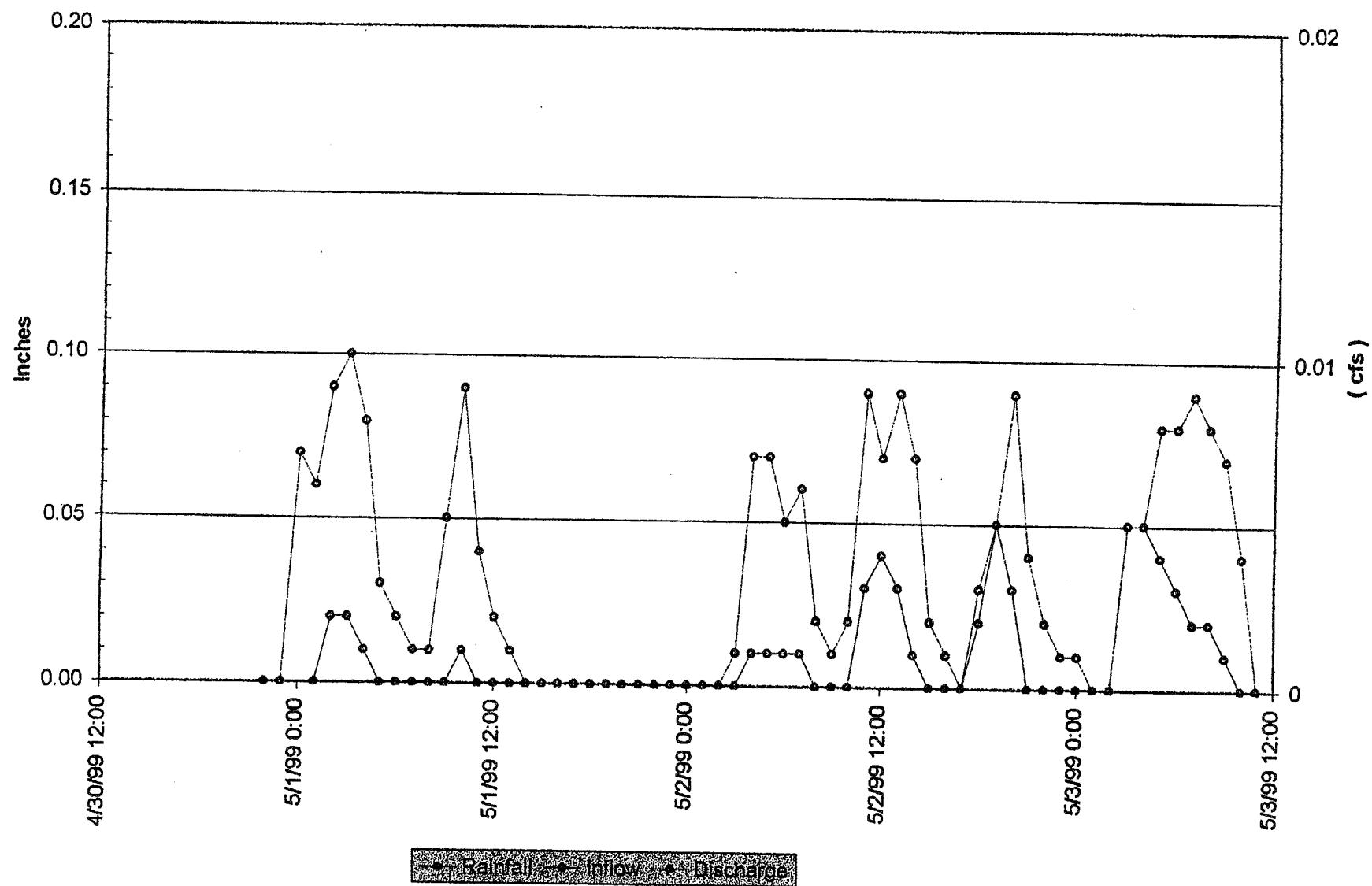
March 12, 1999 SeaTac Storm



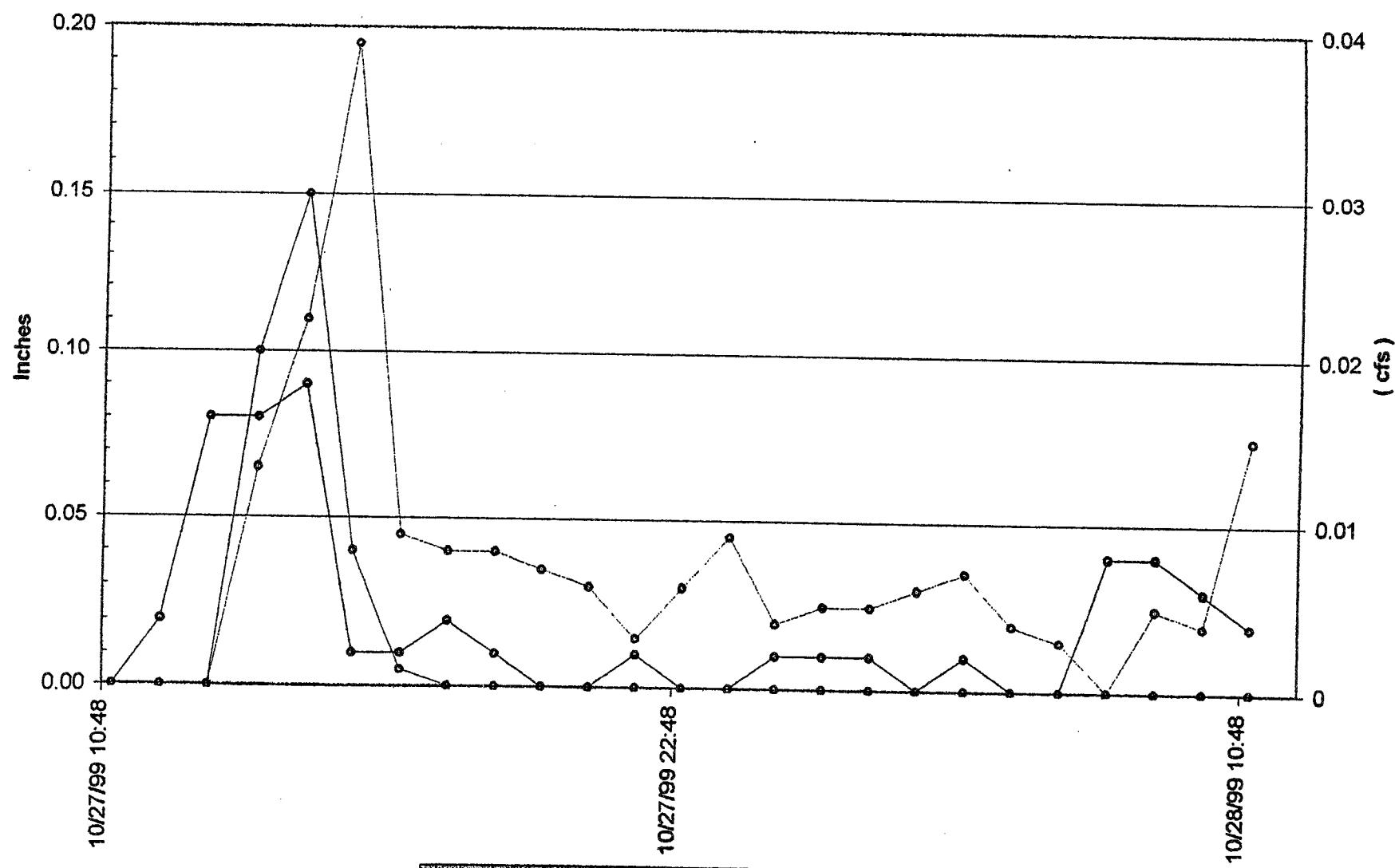
April 25, 1999 SeaTac Storm



May 3, 1999 SeaTac Storm



October 28, 1999 SeaTac Storm

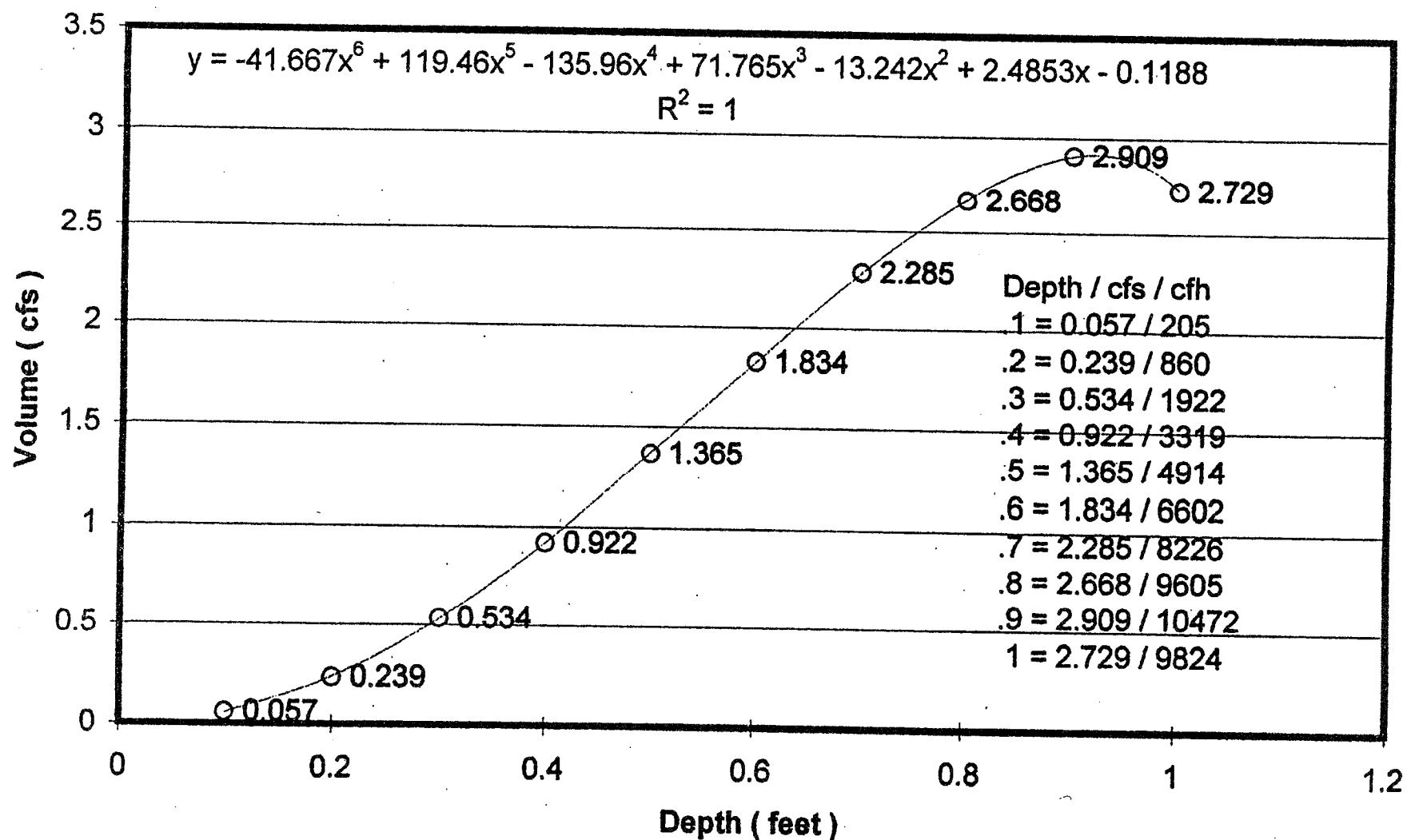


SeaTac Stormceptor

Job # KB98618A

Computed Using FlowPro 2.0
Diameter 1.0'
Manning's 0.012
Slope 0.5 %

Flow Calibration



GRAIN SIZE ANALYSIS - MECHANICAL

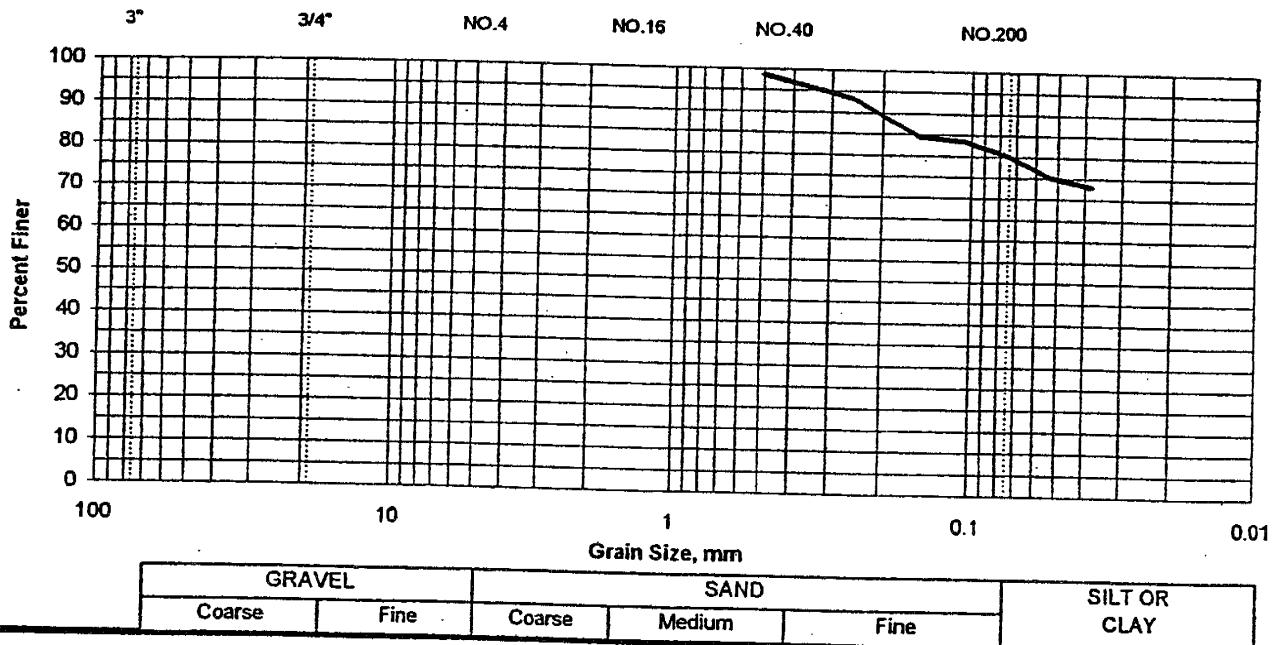
Date 4/27/00	Project Detention Chamber	Project No. KB98618	Soil Description	
Tested By	AMTEST # 00-A003853	EB/EP No.	Depth	

Wt. of Dry Sample + Tare	
Wt. of Tare	
Wt. of Dry Sample	0

Moisture Content = %

Sieve No.	Diam. (mm)	Wt. Retained	% Retained	% Passing	Specification Requirements	
					Minimum	Maximum
35	0.5		1.4	98.6		
60	0.25		6.9	93.1		
100	0.15		15.6	84.4		
140	0.106		16.5	83.5		
200	0.075		19.9	80.1		
270	0.053		24.9	75.1		
400	0.038		26.9	73.1		

US STANDARD SIEVE NOS.



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911 5th Ave., Suite 100 Kirkland, WA 98033 206-827-7701 FAX 827-5424 179 Madrone Lane North Bainbridge Island, WA 98110 206-780-9370 FAX 780-9438

GRAVEL		SAND			SILT OR CLAY
Coarse	Fine	Coarse	Medium	Fine	

1/2 hr



AESI
911 - 5th Avenue
Suite 100
Kirkland, WA 98033

Date Received: 3/17/00
Date Reported: 4/24/00

AmTest Inc.
14603 N.E. 87th St.
Redmond, WA
98052
Tel: 425 885 1664
Fax: 425 883 3495

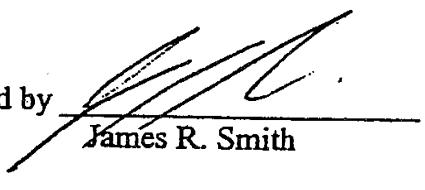
Attn: Tom Shugrue

GRAIN SIZE ANALYSIS

SAMPLE ID: 00-A003853
CLIENT ID: Detention Chamber Inflow

Screen #	Opening (microns)	Retained (%)
35	500	1.4
60	250	5.5
100	150	8.7
140	106	0.9
200	75	3.4
270	53	5.0
400	38	2.0

Reported by


James R. Smith



Am Test Inc.

14603 N.E. 87th St.
Redmond, WA
98052

Tel: 425 885 1664

Fax: 425 883 3495

April 1, 1999

Associated Earth Sciences
911 - 5th Avenue Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Dear Tom Shugrue:

Enclosed please find the analytical data for your Sea Tac project.

The following is a cross correlation of client and laboratory identifications for your convenience.

<u>CLIENT ID</u>	<u>MATRIX</u>	<u>AM TEST ID</u>	<u>TEST</u>
Inflow First Flush	Water	99-A003924	CONV, MET,
Inflow	Water	99-A003925	CONV, MET,
Outflow First Flush	Water	99-A003926	CONV, MET,
Outflow	Water	99-A003927	CONV, MET,

Your four (4) samples were received on Monday, March 15, 1999. This was a total of 48 hours 2 days after the samples were collected (03/13/99). At the time of receipt, the samples were logged in and properly maintained prior to their subsequent analysis.

The analytical procedures used by Am Test are well documented, and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

There was limited volume for samples 99-A003924 and 99-A003926 so we could not perform the Hydrocarbon Test.

Following the analytical data you will find the QC results and "Methodology Report". This table includes information relative to the detection limits, analyses dates and method reference.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

Kathy Fugiel

Director of Inorganic Laboratory

APR 28 1999



**AmTest Inc.
Professional
Analytical
Services**

14603 N.E. 87th St. Fax: 206 883 3490
Redmond, WA 98052 Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

Distribution: Original Accompanist, Student, C

Apr 1 1999



AmTest Inc.

14603 N.E. 87th St.
Redmond, WA
98052

Tel: 425 885 1664

Fax: 425 883 3495

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Dear Tom Shugrue:

Enclosed please find the analytical data for your Sea Tac project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AM TEST ID	TEST
Inflow First Flush	Water	99-A003924	CONV, MET,
Inflow	Water	99-A003925	CONV, MET,
Outflow First Flush	Water	99-A003926	CONV, MET,
Outflow	Water	99-A003927	CONV, MET,

TPA
requested

4/9

Mandan,
March 15

Your four (4) samples were received on Thursday, March 18 1999. This was a total of 120 hours (5 days) after sample collection (3/13/99). At the time of receipt, the samples were logged in and properly maintained prior to their subsequent analyses.

The analytical procedures used at Am Test are well documented, and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the QC results and "Methodology Report". This table includes information relative to the detection limits, analyses dates and method references.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Tom Shugrue".

Kathy Fugiel
Director of Inorganic Laboratory

Project #: KB98618A
PO Number: KB98618A

BACT = Bacteriological
CONV = Conventionals

MET = Metals
ORG = Organics

Apr 1 1999



AmTest Inc.

14603 N.E. 87th St.
Redmond, WA
98052

Tel: 425 885 1664

Fax: 425 883 3495

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Dear Tom Shugrue:

Enclosed please find the analytical data for your Sea Tac project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AM TEST ID	TEST
Inflow First Flush	Water	99-A003924	CONV, MET,
Inflow	Water	99-A003925	CONV, MET,
Outflow First Flush	Water	99-A003926	CONV, MET,
Outflow	Water	99-A003927	CONV, MET,

TPA
requested

4/9

Mandan,

March 15

Your four (4) samples were received on Thursday, March 18 1999. This was a total of 120 hours (5 days) after sample collection (3/13/99). At the time of receipt, the samples were logged in and properly maintained prior to their subsequent analyses.

The analytical procedures used at Am Test are well documented, and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the QC results and "Methodology Report". This table includes information relative to the detection limits, analyses dates and method references.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

Kathy Fugiel
Director of Inorganic Laboratory

Project #: KB98618A
PO Number: KB98618A

BACT = Bacteriological
CONV = Conventionals

MET = Metals
ORG = Organics

ANALYSIS REPORT

AmTest Inc.

14603 N.E. 87th St.

Redmond, WA

98052

Tel: 425 885 1664

Fax: 425 883 3495

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Date Received: 3/15/99
Date Reported: 3/19/99

Project Name: Sea Tack
Project #: KB98618A
PO Number: KB98618A

Water Samples

AM TEST Identification Number
Client Identification
Sampling Date

99-A003738
Inflow First Flush
3/13/99, 14:30

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Suspended Solids (mg/l)	100		1.0

Reported by:

A handwritten signature in black ink, appearing to read "Kathy Fugiel".

Kathy Fugiel

AMTEST

METHODOLOGY REPORT

AM TEST ID 99-A003738
CLIENT ID Inflow First Flush

MATRIX : Water
SAMPLED: 3/13/99

ANALYTE	UNITS	METHOD NUMBER	METHOD REFERENCE	DETECTION LIMIT *	DATE OF ANALYSIS
Total Suspended Solids	mg/l	160.2	EPA	1.0	3/17/99

SM = Standard Methods for the Examination of Water and Wastewater 18th ed.
SW-846 = Test Methods for Evaluating Solid Waste Physical/Chemical Methods
EPA = Methods for Chemical Analysis of Water and Wastes 1983
* Instrument Detection Limit

ANALYSIS REPORT



AmTest Inc.

Associated Earth Sciences
 911 - 5th Avenue
 Suite 100
 Kirkland, WA 98033
 Attention: Tom Shugrue

Date Received: 3/18/99
 Date Reported: 4/ 1/99

14603 N.E. 87th St.
 Redmond, WA
 98052
 Tel: 425 885 1664
 Fax: 425 863 3495

Project Name: Sea Tac
 Project #: KB98618A
 PO Number: KB98618A

Water Samples

AM TEST Identification Number
 Client Identification
 Sampling Date

99-A003924
 Inflow First Flush
 3/13/99, 14:30

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	< 0.02		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	0.63		0.1
Barium (mg/l)	0.013		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	11.		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	0.014		0.002
Iron (mg/l)	0.71		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	3.1		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	1.4		0.1
Manganese (mg/l)	0.075		0.002
Molybdenum (mg/l)	< 0.01		0.01
Sodium (mg/l)	5.9		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	0.23		0.01
Lead (mg/l)	< 0.02		0.05
Sulfur (mg/l)	1.8		0.02
Selenium (mg/l)	< 0.03		0.1
Silicon (mg/l)	2.3		0.03
Silver (mg/l)	< 0.01		0.1
Tin (mg/l)	< 0.02		0.01
Strontium (mg/l)	0.13		0.02
Titanium (mg/l)	< 0.01		0.003
Thallium (mg/l)	< 0.03		0.01
Vanadium (mg/l)	< 0.002		0.03
Yttrium (mg/l)	0.002		0.002
Zinc (mg/l)	0.27		0.001
Conventionals			

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 3/18/99
Date Reported: 4/ 1/99

Water Samples

AM TEST Identification Number 99-A003924
Client Identification
Sampling Date Inflow First Flush
3/13/99, 14:30

PARAMETER	RESULT	Q	D.L.
Conductivity (umhos/cm)	74.		0.5
Total Nitrogen (TKN) (mg/l)	2.6		0.25
Total Phosphorus (mg/l)	0.076		0.005

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 3/18/99
Date Reported: 4/ 1/99

Water Samples

AM TEST Identification Number 99-A003925
Client Identification Inflow
Sampling Date 3/13/99, 14:30

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	0.21		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	< 0.1		0.1
Barium (mg/l)	0.019		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	8.1		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	0.002		0.002
Iron (mg/l)	0.22		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	2.4		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	0.84		0.1
Manganese (mg/l)	0.051		0.002
Molybdenum (mg/l)	< 0.01		0.01
Sodium (mg/l)	3.1		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	0.10		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	1.7		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	1.0		0.03
Silver (mg/l)	< 0.01		0.1
Tin (mg/l)	< 0.02		0.01
Strontium (mg/l)	0.039		0.003
Titanium (mg/l)	< 0.01		0.01
Thallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	< 0.002		0.002
Uranium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.14		0.002

Conventionals

Conductivity (umhos/cm)	59.	0.5
Total Nitrogen (TKN) (mg/l)	1.2	0.25
Total Petroleum Hydrocarbon (mg/l)	< 1	1.0
Total Phosphorus (mg/l)	0.064	0.005
Total Suspended Solids (mg/l)	23.	1.0

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 3/18/99
Date Reported: 4/ 1/99

Water Samples

AM TEST Identification Number
Client Identification
Sampling Date

99-A003926
Outflow First Flush
3/13/99, 14:30

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	0.36		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	0.16		0.1
Barium (mg/l)	0.012		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	5.2		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.005
Copper (mg/l)	0.006		0.002
Iron (mg/l)	0.45		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	2.0		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	0.58		0.1
Manganese (mg/l)	0.090		0.002
Molybdenum (mg/l)	< 0.01		0.01
Sodium (mg/l)	3.0		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	0.17		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	0.9		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	0.7		0.1
Silver (mg/l)	< 0.01		0.01
Tin (mg/l)	< 0.02		0.01
Strontium (mg/l)	0.059		0.003
Titanium (mg/l)	< 0.01		0.01
Thallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	< 0.002		0.002
Yttrium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.10		0.002
Conventionals			
Conductivity (umhos/cm)	46.		0.5
Total Nitrogen (TKN) (mg/l)	0.77		0.25
Total Phosphorus (mg/l)	0.064		0.005
Total Suspended Solids (mg/l)	6.0		1.0

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 3/18/99
Date Reported: 4/ 1/99

Water Samples

AM TEST Identification Number 99-A003927
Client Identification Outflow
Sampling Date 3/13/99, 14:30

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	0.17		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	< 0.1		0.1
Barium (mg/l)	0.011		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	6.2		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	< 0.002		0.002
Iron (mg/l)	0.26		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	1.8		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	0.70		0.1
Manganese (mg/l)	0.043		0.002
Molybdenum (mg/l)	< 0.01		0.01
Sodium (mg/l)	2.7		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	< 0.05		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	1.3		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	0.7		0.1
Silver (mg/l)	< 0.01		0.01
Tin (mg/l)	< 0.02		0.02
Strontium (mg/l)	0.067		0.003
Titanium (mg/l)	< 0.01		0.01
Thallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	< 0.002		0.002
Yttrium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.15		0.002

Conventionals

Conductivity (umhos/cm)	55.	0.5
Total Nitrogen (TKN) (mg/l)	0.43	0.25
Total Petroleum Hydrocarbon (mg/l)	< 1	1.0
Total Phosphorus (mg/l)	0.049	0.005
Total Suspended Solids (mg/l)	o n	1 ^

AMTEST**METHODOLOGY REPORT**

AM TEST ID 99-A003924

CLIENT ID Inflow First Flush

MATRIX : Water
SAMPLED: 3/13/99

ANALYTE	UNITS	METHOD NUMBER	METHOD REFERENCE	DETECTION LIMIT *	DATE OF ANALYSIS
Conductivity	umhos/cm	120.1	EPA	0.50	3/19/99
Total Nitrogen (TKN)	mg/l	351.3	EPA	0.25	3/29/99
Total Phosphorus	mg/l	365.2	EPA	0.005	3/25/99
Silver	mg/l	200.7	EPA	0.01	3/24/99
Aluminum	mg/l	200.7	EPA	0.01	3/30/99
Boron	mg/l	200.7	EPA	0.03	3/24/99
Barium	mg/l	200.7	EPA	0.10	3/24/99
Beryllium	mg/l	200.7	EPA	0.003	3/30/99
Calcium	mg/l	200.7	EPA	0.005	3/24/99
Cadmium	mg/l	200.7	EPA	0.10	3/30/99
Cobalt	mg/l	200.7	EPA	0.002	3/24/99
Chromium	mg/l	200.7	EPA	0.003	3/24/99
Copper	mg/l	200.7	EPA	0.006	3/24/99
Iron	mg/l	200.7	EPA	0.002	3/30/99
Mercury	mg/l	200.7	EPA	0.01	3/24/99
Potassium	mg/l	200.7	EPA	0.010	3/24/99
Lithium	mg/l	200.7	EPA	1.0	3/30/99
Magnesium	mg/l	200.7	EPA	0.02	3/24/99
Manganese	mg/l	200.7	EPA	0.10	3/30/99
Molybdenum	mg/l	200.7	EPA	0.002	3/24/99
Sodium	mg/l	200.7	EPA	0.01	3/24/99
Nickel	mg/l	200.7	EPA	0.5	3/30/99
Phosphorus	mg/l	200.7	EPA	0.01	3/24/99
Lead	mg/l	200.7	EPA	0.05	3/24/99
Sulfur	mg/l	200.7	EPA	0.02	3/24/99
Antimony	mg/l	200.7	EPA	0.1	3/30/99
Selenium	mg/l	200.7	EPA	0.02	3/24/99
Silicon	mg/l	200.7	EPA	0.03	3/24/99
Tin	mg/l	200.7	EPA	0.1	3/30/99
Strontium	mg/l	200.7	EPA	0.02	3/24/99
Titanium	mg/l	200.7	EPA	0.003	3/30/99
Thallium	mg/l	200.7	EPA	0.01	3/24/99
Vanadium	mg/l	200.7	EPA	0.03	3/24/99
Yttrium	mg/l	200.7	EPA	0.002	3/24/99
Zinc	mg/l	200.7	EPA	0.001	3/24/99
Acid Dig. (Tot Metals)		3010	EPA	0.002	3/30/99
					3/23/99

SM = Standard Methods for the Examination of Water and Wastewater 18th ed.
 SW-846 = Test Methods for Evaluating Solid Waste Physical/Chemical Methods
 EPA = Methods for Chemical Analysis of Water and Wastes 1983
 * Instrument Detection Limit

Quality Control Summary

QC for 9918079

99-A003924
99-A003925
99-A003926
99-A003927

DUPLICATES

		sample value	duplicate value	RPD %
99-A003927 DUP: Total Nitrogen (TKN)	mg/l	0.43	1.0	80.
99-A003434 DUP: Total Phosphorus	mg/l	0.017	0.015	12.
99-A003598 DUP: Total Phosphorus	mg/l	< 0.005	< 0.005	
99-A003852 DUP: Total Phosphorus	mg/l	0.013	0.016	21.
99-A004051 DUP: Total Phosphorus	mg/l	3.3	2.9	13.
99-A004010 DUP: Total Suspended Solids	mg/l	45.	48.	6.5
99-A004020 DUP: Total Suspended Solids	mg/l	22.	22.	0.00
99-A004030 DUP: Total Suspended Solids	mg/l	26.	26.	0.00
99-A003919 DUP: Silver	mg/l	< 0.01	< 0.01	
99-A003983 DUP: Silver	mg/l	< 0.01	< 0.01	
99-A003919 DUP: Aluminum	mg/l	0.12	0.14	15.
99-A003919 DUP: Arsenic	mg/l	< 0.03	< 0.03	
99-A003919 DUP: Boron	mg/l	< 0.1	< 0.1	
-A003764 DUP: Barium	mg/l	0.295	0.274	7.4
-A003919 DUP: Barium	mg/l	0.018	0.018	0.00
99-A003919 DUP: Beryllium	mg/l	< 0.005	< 0.005	
99-A003983 DUP: Beryllium	mg/l	< 0.005	< 0.005	
99-A003919 DUP: Calcium	mg/l	20.0	19.4	3.0
99-A004038 DUP: Calcium	mg/l	5.45	5.40	0.92
99-A003919 DUP: Cadmium	mg/l	< 0.002	< 0.002	
99-A003983 DUP: Cadmium	mg/l	< 0.002	< 0.002	
99-A003919 DUP: Cobalt	mg/l	< 0.003	< 0.003	
99-A003919 DUP: Chromium	mg/l	< 0.006	< 0.006	
99-A003983 DUP: Chromium	mg/l	< 0.006	< 0.006	
99-A003919 DUP: Copper	mg/l	< 0.002	< 0.002	
99-A003983 DUP: Copper	mg/l	0.061	0.058	5.0
99-A003919 DUP: Iron	mg/l	0.77	0.79	2.6
99-A003919 DUP: Mercury	mg/l	< 0.01	< 0.01	
99-A003919 DUP: Potassium	mg/l	5.0	4.9	2.0
99-A003919 DUP: Lithium	mg/l	< 0.02	< 0.02	
99-A003919 DUP: Magnesium	mg/l	6.80	6.60	3.0
99-A004038 DUP: Magnesium	mg/l	1.67	1.70	1.8
99-A003919 DUP: Manganese	mg/l	1.27	1.24	2.4
99-A003919 DUP: Molybdenum	mg/l	< 0.01	< 0.01	
99-A003919 DUP: Sodium	mg/l	4.7	4.6	2.2
99-A003919 DUP: Nickel	mg/l	< 0.01	< 0.01	
99-A003983 DUP: Nickel	mg/l	< 0.01	< 0.01	
-A003919 DUP: Phosphorus	mg/l	0.21	0.23	9.1
A003919 DUP: Lead	mg/l	< 0.02	< 0.02	
A003919 DUP: Sulfur	mg/l	1.2	1.2	0.00
99-A003919 DUP: Antimony	mg/l	< 0.02	< 0.02	
99-A003983 DUP: Antimony	mg/l	< 0.02	< 0.02	
99-A003919 DUP: Selenium	mg/l	< 0.03	< 0.03	
99-A003919 DUP: Silicon	mg/l	5.9	5.7	3.4

**Quality Control Summary
(continued)**

QC for 9918079

99-A003919 DUP: Tin	mg/l	< 0.02	< 0.02	
99-A003919 DUP: Strontium	mg/l	0.131	0.128	2.3
99-A003919 DUP: Titanium	mg/l	< 0.01	< 0.01	
99-A003919 DUP: Thallium	mg/l	< 0.03	< 0.03	
99-A003919 DUP: Vanadium	mg/l	< 0.002	< 0.002	
99-A003919 DUP: Yttrium	mg/l	< 0.001	< 0.001	
99-A003844 DUP: Zinc	mg/l	< 0.002	< 0.002	
99-A003919 DUP: Zinc	mg/l	0.014	0.014	0.00
99-A003983 DUP: Zinc	mg/l	0.037	0.032	14.
99-A004038 DUP: Zinc	mg/l	0.006	0.010	50.

MATRIX SPIKES

		sample value	sample+spk value	spike value	Recovery %
99-A003927 SPIKE: Total Nitrogen (TKN)	mg/l	0.43	0.94	0.50	102.
99-A003435 SPIKE: Total Phosphorus	mg/l	0.016	0.19	0.20	87.0
99-A003599 SPIKE: Total Phosphorus	mg/l	< 0.005	0.18	0.20	90.0
99-A004053 SPIKE: Total Phosphorus	mg/l	3.2	22.	20.	94.0
99-A003920 SPIKE: Aluminum	mg/l	0.10	10.0	10.0	99.0
99-A003982 SPIKE: Aluminum	mg/l	0.37	10.3	10.0	99.3
99-A003920 SPIKE: Arsenic	mg/l	< 0.03	0.98	1.00	98.0
99-A003982 SPIKE: Arsenic	mg/l	< 0.03	0.97	1.00	97.0
99-A003920 SPIKE: Barium	mg/l	0.012	0.940	1.00	92.8
99-A003982 SPIKE: Barium	mg/l	0.004	0.950	1.00	94.6
99-A003920 SPIKE: Beryllium	mg/l	< 0.005	0.970	1.00	97.0
99-A003982 SPIKE: Beryllium	mg/l	< 0.005	0.980	1.00	98.0
99-A003920 SPIKE: Calcium	mg/l	12.7	21.0	10.0	83.0
99-A003982 SPIKE: Calcium	mg/l	4.33	13.0	10.0	86.7
99-A004039 SPIKE: Calcium	mg/l	3.46	12.5	10.0	90.4
99-A003920 SPIKE: Cadmium	mg/l	< 0.002	0.950	1.00	95.0
99-A003982 SPIKE: Cadmium	mg/l	< 0.002	0.960	1.00	96.0
99-A003920 SPIKE: Chromium	mg/l	< 0.006	1.00	1.00	100.
99-A003982 SPIKE: Chromium	mg/l	< 0.006	1.02	1.00	102.
99-A003920 SPIKE: Copper	mg/l	< 0.002	0.880	1.00	88.0
99-A003982 SPIKE: Copper	mg/l	0.768	1.62	1.00	85.2
99-A003920 SPIKE: Iron	mg/l	2.66	7.60	5.00	98.8
99-A003982 SPIKE: Iron	mg/l	0.05	5.15	5.00	102.
99-A003920 SPIKE: Potassium	mg/l	1.9	11.3	10.0	94.0
99-A003982 SPIKE: Potassium	mg/l	5.4	15.0	10.0	96.0
99-A003920 SPIKE: Magnesium	mg/l	4.19	13.0	10.0	88.1
99-A003982 SPIKE: Magnesium	mg/l	0.46	9.30	10.0	88.4
99-A004039 SPIKE: Magnesium	mg/l	1.34	10.6	10.0	92.6
99-A003920 SPIKE: Manganese	mg/l	1.03	1.92	1.00	89.0
99-A003982 SPIKE: Manganese	mg/l	0.196	1.11	1.00	91.4
99-A003920 SPIKE: Molybdenum	mg/l	< 0.01	0.97	1.00	97.0
99-A003982 SPIKE: Molybdenum	mg/l	< 0.01	0.96	1.00	96.0
99-A003920 SPIKE: Sodium	mg/l	4.9	15.0	10.0	101.
99-A003920 SPIKE: Nickel	mg/l	< 0.01	1.00	1.00	100.
99-A003982 SPIKE: Nickel	mg/l	1.10	2.00	1.00	90.0
99-A003920 SPIKE: Lead	mg/l	< 0.02	0.96	1.00	96.0
99-A003982 SPIKE: Lead	mg/l	0.05	1.00	1.00	95.0
99-A003982 SPIKE: Antimony	mg/l	< 0.02	0.85	1.00	85.0



Quality Control Summary (continued)

QC for 9918079

99-A003982 SPIKE: Selenium	mg/l	< 0.03	1.04	1.00	104.
99-A003920 SPIKE: Thallium	mg/l	< 0.03	0.91	1.00	91.0
99-A003982 SPIKE: Thallium	mg/l	< 0.03	0.94	1.00	94.0
99-A003920 SPIKE: Zinc	mg/l	0.010	0.960	1.00	95.0
99-A003982 SPIKE: Zinc	mg/l	0.018	1.01	1.00	99.2
99-A004039 SPIKE: Zinc	mg/l	0.002	0.940	1.00	93.8

STANDARD REFERENCE MATERIALS

Known	SRM: Total Nitrogen (TKN)	mg/l	measured value	true value	Recovery %
Known	SRM: Total Nitrogen (TKN)	mg/l	27.	34.	79.4
Known	SRM: Total Phosphorus	mg/l	8.2	8.8	93.2
Known	SRM: Total Phosphorus	mg/l	2.9	3.2	90.6
Known	SRM: Total Phosphorus	mg/l	2.9	3.2	90.6
Known	SRM: Total Phosphorus	mg/l	2.8	2.9	96.6
Known	SRM: Total Phosphorus	mg/l	2.8	2.9	96.6
Known	SRM: Total Phosphorus	mg/l	3.0	2.9	103.
Known	SRM: Total Phosphorus	mg/l	3.0	2.9	103.
Known	SRM: Total Suspended Solids	mg/l	110	100	110.
Known	SRM: Total Suspended Solids	mg/l	100	100	100.
Known	SRM: Silver	mg/l	1.80	2.00	90.0
Known	SRM: Aluminum	mg/l	10.1	10.0	101.
Known	SRM: Arsenic	mg/l	1.92	2.00	96.0
Known	SRM: Boron	mg/l	0.21	0.20	105.
Known	SRM: Barium	mg/l	1.83	2.00	91.5
Known	SRM: Beryllium	mg/l	1.92	2.00	96.0
Known	SRM: Calcium	mg/l	8.92	10.0	89.2
Known	SRM: Cadmium	mg/l	1.96	2.00	98.0
Known	SRM: Cobalt	mg/l	1.80	2.00	90.0
Known	SRM: Chromium	mg/l	2.00	2.00	100.
Known	SRM: Copper	mg/l	1.84	2.00	92.0
Known	SRM: Iron	mg/l	1.83	2.00	91.5
Known	SRM: Potassium	mg/l	89.0	100.	89.0
Known	SRM: Lithium	mg/l	0.22	0.20	110.
Known	SRM: Magnesium	mg/l	8.80	10.0	88.0
Known	SRM: Manganese	mg/l	1.80	2.00	90.0
Known	SRM: Molybdenum	mg/l	1.90	2.00	95.0
Known	SRM: Sodium	mg/l	19.0	20.0	95.0
Known	SRM: Nickel	mg/l	1.99	2.00	99.5
Known	SRM: Phosphorus	mg/l	9.70	10.0	97.0
Known	SRM: Lead	mg/l	1.86	2.00	93.0
Known	SRM: Sulfur	mg/l	2.0	2.0	100.
Known	SRM: Antimony	mg/l	1.00	1.00	100.
Known	SRM: Selenium	mg/l	1.98	2.00	99.0
Known	SRM: Silicon	mg/l	5.0	5.0	100.
Known	SRM: Tin	mg/l	1.1	1.0	110.
Known	SRM: Strontium	mg/l	1.82	2.00	91.0
Known	SRM: Titanium	mg/l	1.83	2.00	91.5
Known	SRM: Thallium	mg/l	1.97	2.00	98.5
Known	SRM: Vanadium	mg/l	0.182	0.200	91.0
Known	SRM: Yttrium	mg/l	0.180	0.200	90.0
Known	SRM: Zinc	mg/l	1.88	2.00	94.0

AMTEST**Quality Control Summary
(continued)**

QC for 9918079

BLANKS

		Result
BLANK:	Total Nitrogen (TKN)	mg/l < 0.25
BLANK:	Total Nitrogen (TKN)	mg/l < 0.25
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Suspended Solids	mg/l < 1
BLANK:	Total Suspended Solids	mg/l < 1
BLANK:	Silver	mg/l < 0.01
BLANK:	Silver	mg/l < 0.01
BLANK:	Aluminum	mg/l < 0.01
BLANK:	Aluminum	mg/l < 0.01
BLANK:	Arsenic	mg/l < 0.03
BLANK:	Arsenic	mg/l < 0.03
BLANK:	Boron	mg/l < 0.1
BLANK:	Boron	mg/l < 0.1
BLANK:	Barium	mg/l < 0.003
BLANK:	Barium	mg/l < 0.003
BLANK:	Beryllium	mg/l < 0.005
BLANK:	Beryllium	mg/l < 0.005
BLANK:	Calcium	mg/l < 0.1
BLANK:	Calcium	mg/l < 0.1
BLANK:	Cadmium	mg/l < 0.002
BLANK:	Cadmium	mg/l < 0.002
BLANK:	Cobalt	mg/l < 0.003
BLANK:	Cobalt	mg/l < 0.003
BLANK:	Chromium	mg/l < 0.006
BLANK:	Chromium	mg/l < 0.006
BLANK:	Copper	mg/l < 0.002
BLANK:	Copper	mg/l < 0.002
BLANK:	Iron	mg/l < 0.01
BLANK:	Iron	mg/l < 0.01
BLANK:	Mercury	mg/l < 0.01
BLANK:	Mercury	mg/l < 0.01
BLANK:	Potassium	mg/l < 1
BLANK:	Potassium	mg/l < 1
BLANK:	Lithium	mg/l < 0.02
BLANK:	Lithium	mg/l < 0.02
BLANK:	Magnesium	mg/l < 0.1
BLANK:	Magnesium	mg/l < 0.1
BLANK:	Manganese	mg/l < 0.002
BLANK:	Manganese	mg/l < 0.002
BLANK:	Molybdenum	mg/l < 0.01
BLANK:	Molybdenum	mg/l < 0.01
BLANK:	Sodium	mg/l < 0.5
BLANK:	Sodium	mg/l < 0.5



Quality Control Summary
(continued)

QC for 9918079

BLANK: Nickel	mg/l	< 0.01
BLANK: Nickel	mg/l	< 0.01
BLANK: Phosphorus	mg/l	< 0.05
BLANK: Phosphorus	mg/l	< 0.05
BLANK: Lead	mg/l	< 0.02
BLANK: Lead	mg/l	< 0.02
BLANK: Sulfur	mg/l	< 0.1
BLANK: Sulfur	mg/l	< 0.1
BLANK: Antimony	mg/l	< 0.02
BLANK: Antimony	mg/l	< 0.02
BLANK: Selenium	mg/l	< 0.03
BLANK: Selenium	mg/l	< 0.03
BLANK: Silicon	mg/l	< 0.1
BLANK: Silicon	mg/l	< 0.1
BLANK: Tin	mg/l	< 0.02
BLANK: Tin	mg/l	< 0.02
BLANK: Strontium	mg/l	< 0.003
BLANK: Strontium	mg/l	< 0.003
BLANK: Titanium	mg/l	< 0.01
BLANK: Titanium	mg/l	< 0.01
BLANK: Thallium	mg/l	< 0.03
BLANK: Thallium	mg/l	< 0.03
BLANK: Vanadium	mg/l	< 0.002
BLANK: Vanadium	mg/l	< 0.002
BLANK: Yttrium	mg/l	< 0.001
BLANK: Yttrium	mg/l	< 0.001
BLANK: Zinc	mg/l	0.005
BLANK: Zinc	mg/l	< 0.002



AmTest Inc.

14603 N.E. 87th St.
Redmond,
98052

Tel: 425 885 1664

Fax: 425 883 3495

Jun 2 1999

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Dear Tom Shugrue:

Enclosed please find the analytical data for your SeaTac Stormceptor project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AM TEST ID	TEST
SSI #1	Water	99-A006632	CONV, MET, Fuel ID
SSI #2	Water	99-A006633	CONV, MET, Fuel ID
SSD #1	Water	99-A006634	CONV, MET, Fuel ID
SSD #2	Water	99-A006635	CONV, MET, Fuel ID

Your four (4) samples were received on Thursday, April 29 1999. This was a total of 96 hours (4 days) after sample collection (4/25/99). At the time of receipt, the samples were logged in and properly maintained prior to their subsequent analyses.

The analytical procedures used at Am Test are well documented, and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the QC results and "Methodology Report". This table includes information relative to the detection limits, analyses dates and method references.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

Kathy Fugiel
Director of Inorganic Laboratory

Project #: KB 98618A
PO Number: KB 98618A

BACT = Bacteriological
CONV = Conventionals

MET = Metals
ORG = Organics

tu
rec'd
4/26
14:



**AmTest Inc.
Professional
Analytical
Services**

14603 N.E. 87th St. Fax: 206 883 3495
Redmond, WA
98052 Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

RCI. NO.

PROJECT NAME

SeaTac Stormceptor Monitoring

AMPLERS: *(Signature)*

Homer F. Welles

AMTEST I.D. NO.	CLIENT SAMPLE I.D. (25 Characters)	DATE	TIME	MATRIX	No. of Contact	TP	Condu	TCP	PT	Condu	TCP	PT	Remarks	
						1	2	3	4	5	6	7	8	9
10405	01032 SSI#1	4-25-91	0752	W	1	X	X	X						
10633	SSI#2	4-25-91	0859	W	1	X	X	X						
10634	SSO HAW SSD#1	4-25-91	0758	W	1	X	X	X						Don't Run Anything
10635	SSO HAW SSD#2	4-25-91	0811	W	1	X	X	X						Hold Until TSS results on SSI #1 reported to Tom Shugue

relinquished by: (*Signature*)

Date/Time
-26-99 143

Received by: (Signature)

Client Name

Associated Earth Sciences, Inc.

Client Address

911-5th Ave Suite 100
Kirkland, WA 98007 98033

Client Phone

425-827-7701 Fa

425-827-5424

Contact Person

P.O. No.

KB 98618A

ANALYSIS REPORT

AMTEST
LABORATORIES

AmTest Inc.

14603 N.E. 87th St.
Redmond, WA
98052
Tel: 425 885 1100
Fax: 425 883 3495

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Date Received: 4/26/99
Date Reported: 5/ 3/99

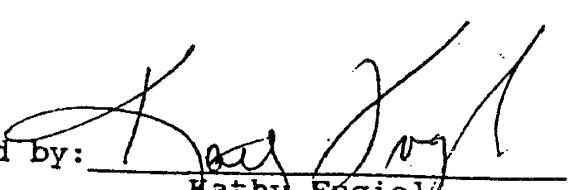
Project Name: SeaTac Stormceptor
Project #: KB98618A
PO Number: KB98618A

Water Samples

AM TEST Identification Number 99-A006405
Client Identification SSI #1
Sampling Date 4/25/99, 7:52

PARAMETER	RESULT	Q	D.L.
Conventionals			
Total Suspended Solids (mg/l)	300		1.0

Reported by:


Kathy Fugiel



**AmTest Inc.
Professional
Analytical
Services**

14603 N.E. 87th St. Fax: 206 883 3495
Redmond, WA 98052 Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

'RCJ. NO.

PROJECT NAME

SeaTac Stormceptor Monitoring

AMPLERS: (Signature)

Homer F. Wells

in quished by: (Signature)

Date/Time
4-26-99 | 1433

Received by: (Signature)

Client Name

[®] Associated Earth Sciences, Inc.

Client Address

911-5th Ave Suite 100
Kirkland, WA 98007 98033

Client Phone

~~425-827-7701~~ Fax ~~425-827-5424~~

Contact Person

son Tom Shugrue P.O. No. KB 98618A

AMTEST

METHODOLOGY REPORT

AM TEST ID 99-A006405
CLIENT ID SSI #1

MATRIX : Water
SAMPLED: 4/25/99

ANALYTE	UNITS	METHOD NUMBER	METHOD REFERENCE	DETECTION LIMIT *	DATE OF ANALYSIS
Total Suspended Solids	mg/l	160.2	EPA	1.0	4/30/99

= Standard Methods for the Examination of Water and Wastewater 18th ed.
846 = Test Methods for Evaluating Solid Waste Physical/Chemical Methods
* = Methods for Chemical Analysis of Water and Wastes 1983
* Instrument Detection Limit

ANALYSIS REPORT

AMTEST
LABORATORIES

AmTest Inc.

14603 N.E. 87th St.
Redmond, WA
98052
Tel: 425 885 3495

Fax: 425 885 3495

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Date Received: 4/29/99
Date Reported: 5/26/99

Project Name: SeaTac Stormceptor
Project #: KB 98618A
PO Number: KB 98618A

Water Samples

AM TEST Identification Number	99-A006632
Client Identification	SSI #1
Sampling Date	4/25/99, 7:52

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	1.6		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	0.17		0.1
Barium (mg/l)	0.040		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	14.		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	0.005		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	0.027		0.002
Iron (mg/l)	4.4		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	3.0		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	1.8		0.1
Manganese (mg/l)	0.17		0.002
Molybdenum (mg/l)	0.02		0.01
Sodium (mg/l)	5.7		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	0.75		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	3.5		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	2.2		0.1
Silver (mg/l)	< 0.01		0.01
Tin (mg/l)	< 0.02		0.02
Strontium (mg/l)	0.12		0.003
Titanium (mg/l)	0.05		0.01
Thallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	< 0.002		0.002
Yttrium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.53		0.002

Conventionals

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 4/29/99
Date Reported: 6/ 2/99

Water Samples

AM TEST Identification Number 99-A006632
Client Identification SSI #1
Sampling Date 4/25/99, 7:52

PARAMETER	RESULT	Q	D.L.
Conventionals			
Conductivity (umhos/cm)	99.		0.5
Total Nitrogen (TKN) (mg/l)	2.4		0.25
Total Phosphorus (mg/l)	0.72		0.005
Fuel Analyses (MODIFIED WTPH-HCID)			
Fuel Type	Diesel/Oil Range Organics		
Gasoline	< 1300		40.
Diesel	9600		100
Oil	35000		200
SURROGATES (% Recovery)			
Bromofluorobenzene	56.0		
2-Fluorobiphenyl	70.0		

All values are in ug/l (ppb).

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 4/29/99
Date Reported: 5/26/99

Water Samples

AM TEST Identification Number 99-A006633
Client Identification SSI #2
Sampling Date 4/25/99, 8:59

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	0.56		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	0.15		0.1
Barium (mg/l)	0.021		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	12.		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	0.015		0.002
Iron (mg/l)	0.87		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	3.5		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	1.3		0.1
Manganese (mg/l)	0.15		0.002
Molybdenum (mg/l)	0.02		0.01
Sodium (mg/l)	4.8		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	0.73		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	4.5		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	1.5		0.1
Silver (mg/l)	< 0.01		0.01
Tin (mg/l)	< 0.02		0.02
Strontium (mg/l)	0.11		0.003
Titanium (mg/l)	0.02		0.01
Thallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	< 0.002		0.002
Yttrium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.24		0.002

Conventionals

Conductivity (umhos/cm)	93.	0.5
Total Nitrogen (TKN) (mg/l)	2.1	0.25
Total Phosphorus (mg/l)	0.70	0.005
Total Suspended Solids (mg/l)	55.	1.0

ANALYSIS REPORT

AMTESTAssociated Earth Sciences
Tom ShugrueDate Received: 4/29/99
Date Reported: 6/ 2/99**Water Samples**

AM TEST Identification Number 99-A006633
Client Identification SSI #2
Sampling Date 4/25/99, 8:59

PARAMETER	RESULT	Q	D.L.
-----------	--------	---	------

Fuel Analyses (MODIFIED WTPH-HCID)

Fuel Type	Diesel/Oil Range Organics	
Gasoline	< 400	40.
Diesel	2200	100
Oil	4800	200

SURROGATES (% Recovery)

Bromofluorobenzene	54.0
2-Fluorobiphenyl	85.0

All values are in ug/l (ppb).

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 4/29/99
Date Reported: 5/26/99

Water Samples

AM TEST Identification Number 99-A006634
Client Identification SSD #1
Sampling Date 4/25/99, 7:58

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	0.07		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	< 0.1		0.1
Barium (mg/l)	0.004		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	2.6		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	0.002		0.002
Iron (mg/l)	0.24		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	< 1		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	0.29		0.1
Manganese (mg/l)	0.030		0.002
Molybdenum (mg/l)	< 0.01		0.01
Sodium (mg/l)	1.2		0.5
Nickel (mg/l)	0.01		0.01
Phosphorus (mg/l)	0.08		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	0.9		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	0.2		0.1
Silver (mg/l)	< 0.01		0.01
Tin (mg/l)	< 0.02		0.02
Strontium (mg/l)	0.022		0.003
Titanium (mg/l)	< 0.01		0.01
Thallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	< 0.002		0.002
Yttrium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.054		0.002

Conventionals

Conductivity (umhos/cm)	100	0.5
Total Nitrogen (TKN) (mg/l)	1.4	0.25
Total Phosphorus (mg/l)	0.32	0.005
Total Suspended Solids (mg/l)	40.	1.0

ANALYSIS REPORT**AMTEST**

Associated Earth Sciences
Tom Shugrue

Date Received: 4/29/99
Date Reported: 6/ 2/99

Water Samples

AM TEST Identification Number 99-A006634
Client Identification SSD #1
Sampling Date 4/25/99, 7:58

PARAMETER	RESULT	Q	D.L.
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Fuel Analyses (MODIFIED WTPH-HCID)

Fuel Type	None		
Gasoline	< 440		40.
Diesel	< 1100		100
Oil	< 2200		200

SURROGATES (% Recovery)

Bromofluorobenzene	63.0
2-Fluorobiphenyl	64.0

All values are in ug/l (ppb).

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 4/29/99
Date Reported: 5/26/99

Water Samples

AM TEST Identification Number 99-A006635
Client Identification SSD #2
Sampling Date 4/25/99, 8:11

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	0.29		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	< 0.1		0.1
Barium (mg/l)	0.018		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	12.		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	< 0.002		0.002
Iron (mg/l)	0.92		0.01
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	2.6		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	1.3		0.1
Manganese (mg/l)	0.14		0.002
Molybdenum (mg/l)	0.04		0.01
Sodium (mg/l)	5.6		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	0.41		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	4.2		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	0.9		0.1
Silver (mg/l)	< 0.01		0.01
Tin (mg/l)	0.02		0.02
Strontrium (mg/l)	0.10		0.003
Titanium (mg/l)	< 0.01		0.01
Thallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	< 0.002		0.002
Uranium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.26		0.002

Conventionals

Conductivity (umhos/cm)	100	0.5
Total Nitrogen (TKN) (mg/l)	1.4	0.25
Total Phosphorus (mg/l)	0.38	0.005
Total Suspended Solids (mg/l)	18.	1.0

ANALYSIS REPORT

AMTESTAssociated Earth Sciences
Tom ShugrueDate Received: 4/29/99
Date Reported: 6/ 2/99

Water Samples

AM TEST Identification Number 99-A006635
Client Identification SSD #2
Sampling Date 4/25/99, 8:11

PARAMETER	RESULT	Q	D.L.
Fuel Analyses (MODIFIED WTPH-HCID)			
Fuel Type	None		
Gasoline	< 440		40.
Diesel	< 1100		100
Oil	< 2200		200
SURROGATES (% Recovery)			
Bromofluorobenzene	60.0		
2-Fluorobiphenyl	62.0		

All values are in ug/l (ppb).

AMTEST**METHODOLOGY REPORT**AM TEST ID 99-A006632
CLIENT ID SSI #1MATRIX : Water
SAMPLED: 4/25/99

ANALYTE	UNITS	METHOD NUMBER	METHOD REFERENCE	DETECTION LIMIT *	DATE OF ANALYSIS
Conductivity	umhos/cm.	120.1	EPA	0.50	4/29/99
Total Nitrogen (TKN)	mg/l	351.3	EPA	0.25	5/10/99
Total Phosphorus	mg/l	365.2	EPA	0.005	5/ 4/99
Silver	mg/l	200.7	EPA	0.01	5/10/99
Aluminum	mg/l	200.7	EPA	0.01	5/10/99
Arsenic	mg/l	200.7	EPA	0.03	5/10/99
Boron	mg/l	200.7	EPA	0.10	5/10/99
Barium	mg/l	200.7	EPA	0.003	5/10/99
Beryllium	mg/l	200.7	EPA	0.005	5/10/99
Calcium	mg/l	200.7	EPA	0.10	5/10/99
Cadmium	mg/l	200.7	EPA	0.002	5/10/99
Cobalt	mg/l	200.7	EPA	0.003	5/10/99
Chromium	mg/l	200.7	EPA	0.006	5/10/99
Copper	mg/l	200.7	EPA	0.002	5/10/99
Iron	mg/l	200.7	EPA	0.01	5/10/99
Mercury	mg/l	200.7	EPA	0.010	5/10/99
Potassium	mg/l	200.7	EPA	1.0	5/10/99
Lithium	mg/l	200.7	EPA	0.02	5/10/99
Magnesium	mg/l	200.7	EPA	0.10	5/10/99
Manganese	mg/l	200.7	EPA	0.002	5/10/99
Molybdenum	mg/l	200.7	EPA	0.01	5/10/99
Sodium	mg/l	200.7	EPA	0.5	5/10/99
Nickel	mg/l	200.7	EPA	0.01	5/10/99
Phosphorus	mg/l	200.7	EPA	0.05	5/10/99
Lead	mg/l	200.7	EPA	0.02	5/10/99
Sulfur	mg/l	200.7	EPA	0.1	5/10/99
Antimony	mg/l	200.7	EPA	0.02	5/10/99
Selenium	mg/l	200.7	EPA	0.03	5/10/99
Silicon	mg/l	200.7	EPA	0.1	5/10/99
Tin	mg/l	200.7	EPA	0.02	5/10/99
Strontium	mg/l	200.7	EPA	0.003	5/10/99
Titanium	mg/l	200.7	EPA	0.01	5/10/99
Thallium	mg/l	200.7	EPA	0.03	5/10/99
Vanadium	mg/l	200.7	EPA	0.002	5/10/99
Yttrium	mg/l	200.7	EPA	0.001	5/10/99
Zinc	mg/l	200.7	EPA	0.002	5/10/99
Acid Dig. (Tot Metals)		3010	EPA		5/ 5/99

SM = Standard Methods for the Examination of Water and Wastewater 18th ed.
 SW-846 = Test Methods for Evaluating Solid Waste Physical/Chemical Methods
 EPA = Methods for Chemical Analysis of Water and Wastes 1983
 * Instrument Detection Limit



Quality Control Summary

QC for 9918688

99-A006632
99-A006633
99-A006634
99-A006635

DUPLICATES		sample	duplicate	RPD
		value	value	%
99-A006633 DUP: Total Nitrogen (TKN)	mg/l	2.1	2.0	4.9
99-A006062 DUP: Total Phosphorus	mg/l	< 0.005	< 0.005	
99-A006072 DUP: Total Phosphorus	mg/l	0.023	0.023	0.00
99-A006306 DUP: Total Phosphorus	mg/l	0.007	0.012	53.
99-A006548 DUP: Total Phosphorus	mg/l	0.069	0.063	9.1
99-A006640 DUP: Total Phosphorus	mg/l	< 0.005	0.005	
99-A006650 DUP: Total Phosphorus	mg/l	0.009	0.010	11.
99-A006538 DUP: Total Suspended Solids	mg/l	< 1	< 1	
99-A006640 DUP: Total Suspended Solids	mg/l	1.0	1.0	0.00
99-A006650 DUP: Total Suspended Solids	mg/l	3.0	3.0	0.00
99-A006632 DUP: Silver	mg/l	< 0.01	< 0.01	
99-A006632 DUP: Aluminum	mg/l	1.55	1.52	2.0
99-A006632 DUP: Arsenic	mg/l	< 0.03	< 0.03	
99-A006632 DUP: Boron	mg/l	0.17	0.13	27.
99-A006632 DUP: Barium	mg/l	0.040	0.055	32.
99-A006632 DUP: Beryllium	mg/l	< 0.005	< 0.005	
99-A006632 DUP: Calcium	mg/l	13.5	13.1	3.0
99-A006632 DUP: Cadmium	mg/l	< 0.002	< 0.002	
99-A006632 DUP: Cobalt	mg/l	0.005	0.003	50.
99-A006632 DUP: Chromium	mg/l	< 0.006	< 0.006	
99-A006632 DUP: Copper	mg/l	0.027	0.028	3.6
99-A006632 DUP: Iron	mg/l	4.42	4.09	7.8
99-A006632 DUP: Mercury	mg/l	< 0.01	< 0.01	
99-A006632 DUP: Potassium	mg/l	3.0	3.0	0.00
99-A006632 DUP: Lithium	mg/l	< 0.02	< 0.02	
99-A006632 DUP: Magnesium	mg/l	1.77	1.78	0.56
99-A006632 DUP: Manganese	mg/l	0.173	0.184	6.2
99-A006632 DUP: Molybdenum	mg/l	0.02	0.02	0.00
99-A006632 DUP: Sodium	mg/l	5.7	5.4	5.4
99-A006632 DUP: Nickel	mg/l	< 0.01	< 0.01	
99-A006632 DUP: Phosphorus	mg/l	0.75	0.75	0.00
99-A006632 DUP: Lead	mg/l	< 0.02	< 0.02	
99-A006632 DUP: Sulfur	mg/l	3.5	3.7	5.6
99-A006632 DUP: Antimony	mg/l	< 0.02	< 0.02	
99-A006632 DUP: Selenium	mg/l	< 0.03	< 0.03	
99-A006632 DUP: Silicon	mg/l	2.2	2.3	4.4
99-A006632 DUP: Tin	mg/l	< 0.02	< 0.02	
99-A006632 DUP: Strontium	mg/l	0.120	0.115	4.3
99-A006632 DUP: Titanium	mg/l	0.05	0.05	0.00
99-A006632 DUP: Thallium	mg/l	< 0.03	< 0.03	
99-A006632 DUP: Vanadium	mg/l	< 0.002	< 0.002	
99-A006632 DUP: Yttrium	mg/l	< 0.001	< 0.001	
99-A006632 DUP: Zinc	mg/l	0.533	0.501	6.2
99-A006633 DUP: Gaseoline	ug/l	< 400	< 400	

AMTEST

**Quality Control Summary
(continued)**

QC for 9918688

99-A006633 DUP: Diesel	ug/l	2200	2600	17.
99-A006633 DUP: Oil	ug/l	4800	4300	11.

MATRIX SPIKES

		sample value	sample+spk value	spike value	Recovery
99-A006633 SPIKE: Total Nitrogen (TKN)	mg/l	2.1	7.0	5.0	98.0
99-A006063 SPIKE: Total Phosphorus	mg/l	0.010	0.34	0.40	82.5
99-A006073 SPIKE: Total Phosphorus	mg/l	0.026	0.39	0.40	91.0
99-A006506 SPIKE: Total Phosphorus	mg/l	0.015	0.40	0.40	96.2
99-A006549 SPIKE: Total Phosphorus	mg/l	0.082	0.47	0.40	97.0
99-A006641 SPIKE: Total Phosphorus	mg/l	< 0.005	0.38	0.40	95.0
99-A006651 SPIKE: Total Phosphorus	mg/l	0.19	0.54	0.40	87.5
Duplicate SPIKE: Aluminum	mg/l	1.52	10.7	10.0	91.8
Duplicate SPIKE: Arsenic	mg/l	< 0.03	0.72	0.75	96.0
Duplicate SPIKE: Barium	mg/l	0.055	1.02	1.00	96.5
Duplicate SPIKE: Beryllium	mg/l	< 0.005	0.998	1.00	99.8
Duplicate SPIKE: Calcium	mg/l	13.1	21.7	10.0	86.0
Duplicate SPIKE: Cadmium	mg/l	< 0.002	0.930	1.00	93.0
Duplicate SPIKE: Chromium	mg/l	< 0.006	1.01	1.00	101.
Duplicate SPIKE: Copper	mg/l	0.028	1.03	1.00	100.
Duplicate SPIKE: Iron	mg/l	4.09	4.90	1.00	81.0
Duplicate SPIKE: Potassium	mg/l	3.0	13.6	10.0	106.
Duplicate SPIKE: Magnesium	mg/l	1.78	11.0	10.0	92.2
Duplicate SPIKE: Manganese	mg/l	0.184	1.08	1.00	89.6
Duplicate SPIKE: Molybdenum	mg/l	0.02	0.91	1.00	89.0
Duplicate SPIKE: Sodium	mg/l	5.4	17.0	10.0	116.
Duplicate SPIKE: Nickel	mg/l	< 0.01	1.06	1.00	106.
Duplicate SPIKE: Lead	mg/l	< 0.02	1.00	1.00	100.
Duplicate SPIKE: Antimony	mg/l	< 0.02	0.91	1.00	91.0
Duplicate SPIKE: Selenium	mg/l	< 0.03	0.98	1.00	98.0
Duplicate SPIKE: Thallium	mg/l	< 0.03	0.97	1.00	97.0
Duplicate SPIKE: Zinc	mg/l	0.501	1.31	1.00	80.9

STANDARD REFERENCE MATERIALS

		measured value	true value	Recovery	
Known	SRM: Total Nitrogen (TKN)	mg/l	30.	34.	88.2
Known	SRM: Total Phosphorus	mg/l	3.3	2.9	114.
Known	SRM: Total Phosphorus	mg/l	3.0	2.9	103.
Known	SRM: Total Phosphorus	mg/l	3.0	3.0	100.
Known	SRM: Total Phosphorus	mg/l	2.9	2.9	100.
Known	SRM: Total Phosphorus	mg/l	3.0	3.0	101.
Known	SRM: Total Suspended Solids	mg/l	92.	100	92.0
Known	SRM: Total Suspended Solids	mg/l	100	100	100.
Known	SRM: Silver	mg/l	1.15	1.00	115.
Known	SRM: Aluminum	mg/l	0.56	0.50	112.
Known	SRM: Arsenic	mg/l	0.11	0.10	110.
Known	SRM: Boron	mg/l	0.10	0.10	100.
Known	SRM: Barium	mg/l	0.109	0.100	109.
Known	SRM: Beryllium	mg/l	0.103	0.100	103.
Known	SRM: Calcium	mg/l	0.54	0.50	108.
Known	SRM: Cadmium	mg/l	0.110	0.100	110.



Quality Control Summary (continued)

QC for 9918688

Known	SRM: Cobalt	mg/l	0.110	0.100	110.
Known	SRM: Chromium	mg/l	0.102	0.100	102.
Known	SRM: Copper	mg/l	0.113	0.100	113.
Known	SRM: Iron	mg/l	0.55	0.50	110.
Known	SRM: Lithium	mg/l	0.12	0.10	120.
Known	SRM: Magnesium	mg/l	0.52	0.50	104.
Known	SRM: Manganese	mg/l	0.106	0.100	106.
Known	SRM: Molybdenum	mg/l	0.12	0.10	120.
Known	SRM: Sodium	mg/l	5.5	5.0	110.
Known	SRM: Nickel	mg/l	0.11	0.10	110.
Known	SRM: Phosphorus	mg/l	0.11	0.10	110.
Known	SRM: Lead	mg/l	0.11	0.10	110.
Known	SRM: Sulfur	mg/l	0.1	0.1	100.
Known	SRM: Antimony	mg/l	0.11	0.10	110.
Known	SRM: Selenium	mg/l	0.10	0.10	100.
Known	SRM: Silicon	mg/l	0.1	0.1	100.
Known	SRM: Tin	mg/l	0.10	0.10	100.
Known	SRM: Strontium	mg/l	0.116	0.100	116.
Known	SRM: Titanium	mg/l	0.11	0.10	110.
Known	SRM: Thallium	mg/l	0.11	0.10	110.
Known	SRM: Vanadium	mg/l	0.126	0.100	126.
Known	SRM: Yttrium	mg/l	0.116	0.100	116.
Known	SRM: Zinc	mg/l	0.102	0.100	102.

BLANKS

		Result
BLANK:	Total Nitrogen (TKN)	mg/l < 0.25
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Phosphorus	mg/l < 0.005
BLANK:	Total Suspended Solids	mg/l < 1
BLANK:	Total Suspended Solids	mg/l < 1
BLANK:	Silver	mg/l < 0.01
BLANK:	Aluminum	mg/l < 0.01
BLANK:	Arsenic	mg/l < 0.03
BLANK:	Boron	mg/l < 0.1
BLANK:	Barium	mg/l < 0.003
BLANK:	Beryllium	mg/l < 0.005
BLANK:	Calcium	mg/l < 0.1
BLANK:	Cadmium	mg/l < 0.002
BLANK:	Cobalt	mg/l < 0.003
BLANK:	Chromium	mg/l < 0.006
BLANK:	Copper	mg/l < 0.002
BLANK:	Iron	mg/l < 0.01
BLANK:	Mercury	mg/l < 0.01
BLANK:	Potassium	mg/l < 1
BLANK:	Lithium	mg/l < 0.02
BLANK:	Magnesium	mg/l < 0.1
BLANK:	Manganese	mg/l < 0.002
BLANK:	Molybdenum	mg/l < 0.01

AMTEST

Quality Control Summary
(continued)

QC for 9918688

BLANK: Sodium	mg/l	< 0.5
BLANK: Nickel	mg/l	< 0.01
BLANK: Phosphorus	mg/l	< 0.05
BLANK: Lead	mg/l	< 0.02
BLANK: Sulfur	mg/l	< 0.1
BLANK: Antimony	mg/l	< 0.02
BLANK: Selenium	mg/l	< 0.03
BLANK: Silicon	mg/l	< 0.1
BLANK: Tin	mg/l	< 0.02
BLANK: Strontium	mg/l	< 0.003
BLANK: Titanium	mg/l	< 0.01
BLANK: Thallium	mg/l	< 0.03
BLANK: Vanadium	mg/l	< 0.002
BLANK: Yttrium	mg/l	< 0.001
BLANK: Zinc	mg/l	< 0.002
BLANK: Gasoline	ug/l	< 40
BLANK: Gasoline	ug/l	< 200
BLANK: Diesel	ug/l	< 100
BLANK: Diesel	ug/l	< 500
BLANK: Oil	ug/l	< 200
BLANK: Oil	ug/l	< 1000
BLANK: Bromofluorobenzene	%	59.0
BLANK: Bromofluorobenzene	%	67.0
BLANK: 2-Fluorobiphenyl	%	58.0
BLANK: 2-Fluorobiphenyl	%	62.0

AMTEST
LABORATORIES

AmTest Inc.

14603 N.E. 87th St.
Redmond, WA
98052

Tel: 425 885 1664

Fax: 425 883 3495

Jun 2 1999

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

May

Dear Tom Shugrue:

Enclosed please find the analytical data for your Sea Tac project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AM TEST ID	TEST
Inflow	Water	99-A007212	CONV, MET, Fuel ID
Outflow	Water	99-A007213	CONV, MET, Fuel ID

Your two (2) samples were received on Tuesday, May 11 1999. This was a total of 192 hours, or 8 days after sample collection (5/3/99). At the time of receipt, the samples were logged in and properly maintained prior to their subsequent analyses.

Samples
recd
May 3rd,

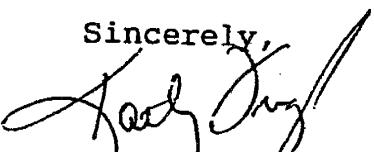
The analytical procedures used at Am Test are well documented, and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the QC results and "Methodology Report". This table includes information relative to the detection limits, analyses dates and method references.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,



Kathy Fugiel
Director of Inorganic Laboratory

Project #: KB99002B

BACT = Bacteriological
CONV = Conventional

MET = Metals
ORG = Organics

AVTEST

AmTest Inc.
Professional Analytical Services
Services Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

PROJ. NO. SRP Beaverdam, Seattle, WA SAMPLERS: (Signature)	PROJECT NAME Kittitas River Dam Flows	Analysis Requested		
		No. of Containers 2x Hand	TP	Ammonia (NH ₃)
			TDS Total TSS Total Dissolved Solids	Oil/Grease
			EC/CH + Col. Col. Dissolved	ICP metals
AMTEST I.D. NO.	CLIENT SAMPLE I.D. (25 Characters)	DATE	TIME	MATRIX
	SRP	.	.	.
	D Creek Upstream*	5/3/99		X
	D Creek Downstream*	5/3/99		X
	SRQ	"		X
	SR1	"		X
Remarks				
* W/W fax flow % by 5/4 All equal w/ per Tom 5/4/99				
Beaverdam				
62781	Swale	5/13/99		XX
62782	PC-12 trib	5/13/99		XX
7212	SeaTac Inflow	5/13/99		XX
7213	Outflow	"		XX
Analyze SeaTac if inflow > TSS 50 mg/l				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Client Name	
			AeS1	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Client Address	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Client Phone	Fax
Tom Rhwane	5/3/99 14:30		827 7701	827 5421
			Contact Person	P.O. No.

ANALYSIS REPORT

AMTEST
LABORATORIES

AmTest Inc.

14603 N.E. 87th St.
Redmond, WA
98052

Tel: 425 885 1664
Fax: 425 883 3495

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Date Received: 5/11/99
Date Reported: 6/ 2/99

Project Name: Sea Tac
Project #: KB99002B

Water Samples

AM TEST Identification Number 99-A007212
Client Identification Inflow
Sampling Date 5/ 3/99

PARAMETER	RESULT	Q	D.L.
ICP Metals by EPA Method 200.7			
Aluminum (mg/l)	0.22		0.01
Antimony (mg/l)	< 0.02		0.02
Arsenic (mg/l)	< 0.03		0.03
Boron (mg/l)	< 0.1		0.1
Barium (mg/l)	0.012		0.003
Beryllium (mg/l)	< 0.005		0.005
Calcium (mg/l)	7.2		0.1
Cadmium (mg/l)	< 0.002		0.002
Cobalt (mg/l)	< 0.003		0.003
Chromium (mg/l)	< 0.006		0.006
Copper (mg/l)	0.021		0.002
Iron (mg/l)	0.38		0.101
Mercury (mg/l)	< 0.01		0.01
Potassium (mg/l)	1.7		1.0
Lithium (mg/l)	< 0.02		0.02
Magnesium (mg/l)	0.76		0.1
Manganese (mg/l)	0.075		0.002
Molybdenum (mg/l)	< 0.01		0.01
Sodium (mg/l)	3.5		0.5
Nickel (mg/l)	< 0.01		0.01
Phosphorus (mg/l)	0.39		0.05
Lead (mg/l)	< 0.02		0.02
Sulfur (mg/l)	2.8		0.1
Selenium (mg/l)	< 0.03		0.03
Silicon (mg/l)	0.8		0.1
Silver (mg/l)	< 0.01		0.01
Tin (mg/l)	< 0.02		0.02
Strontrium (mg/l)	0.069		0.003
Titanium (mg/l)	< 0.01		0.01
Hallium (mg/l)	< 0.03		0.03
Vanadium (mg/l)	0.015		0.002
Yttrium (mg/l)	< 0.001		0.001
Zinc (mg/l)	0.24		0.002

Conventionals

ANALYSIS REPORT

AMTESTAssociated Earth Sciences
Tom ShugrueDate Received: 5/11/99
Date Reported: 6/ 2/99

Water Samples

AM TEST Identification Number 99-A007212
Client Identification Inflow
Sampling Date 5/ 3/99

PARAMETER	RESULT	Q	D.L.
Total Nitrogen (TKN) (mg/l)	1.5		0.25
Total Suspended Solids (mg/l)	16.		1.0

Fuel Analyses (MODIFIED WTPH-HCID)

Fuel Type	Diesel/Oil Range Organics	
Gasoline	< 100	40.
Diesel	650	100
Oil	1400	200

SURROGATES (% Recovery)

Bromofluorobenzene	55.0
2-Fluorobiphenyl	67.0

All values are in ug/l (ppb).

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 5/11/99
Date Reported: 6/ 2/99

Water Samples

AM TEST Identification Number 99-A007213
Client Identification Outflow
Sampling Date 5/ 3/99

PARAMETER	RESULT	Q	D.L.
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ICP Metals by EPA Method 200.7

Aluminum (mg/l)	0.29	0.01
Antimony (mg/l)	< 0.02	0.02
Arsenic (mg/l)	< 0.03	0.03
Boron (mg/l)	< 0.1	0.1
Barium (mg/l)	0.014	0.003
Beryllium (mg/l)	< 0.005	0.005
Calcium (mg/l)	7.3	0.1
Cadmium (mg/l)	< 0.002	0.002
Cobalt (mg/l)	0.003	0.003
Chromium (mg/l)	< 0.006	0.006
Copper (mg/l)	0.017	0.002
Iron (mg/l)	0.42	0.01
Mercury (mg/l)	< 0.01	0.01
Potassium (mg/l)	1.7	1.0
Lithium (mg/l)	< 0.02	0.02
Magnesium (mg/l)	0.68	0.1
Manganese (mg/l)	0.083	0.002
Molybdenum (mg/l)	< 0.01	0.01
Sodium (mg/l)	2.9	0.5
Nickel (mg/l)	< 0.01	0.01
Phosphorus (mg/l)	0.29	0.05
Lead (mg/l)	< 0.02	0.02
Sulfur (mg/l)	2.3	0.1
Selenium (mg/l)	< 0.03	0.03
Silicon (mg/l)	0.6	0.1
Silver (mg/l)	< 0.01	0.01
Tin (mg/l)	< 0.02	0.02
Strontium (mg/l)	0.071	0.003
Titanium (mg/l)	< 0.01	0.01
Thallium (mg/l)	< 0.03	0.03
Vanadium (mg/l)	0.008	0.002
Xenon (mg/l)	< 0.001	0.001
Zinc (mg/l)	0.19	0.002

Conventionals

Conductivity (umhos/cm)	56.	0.5
Total Nitrogen (TKN) (mg/l)	1.3	0.25
Total Suspended Solids (mg/l)	5.0	1.0

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 5/11/99
Date Reported: 6/ 2/99

Water Samples

AM TEST Identification Number 99-A007213
Client Identification Outflow
Sampling Date 5/ 3/99

PARAMETER	RESULT	Q	D.L.
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Fuel Analyses (MODIFIED WTPH-HCID)

Fuel Type	Diesel Range Organics	
Gasoline	< 100	40.
Diesel	520	100
Oil	< 500	200

SURROGATES (% Recovery)

Bromofluorobenzene	65.0
2-Fluorobiphenyl	64.0

All values are in ug/l (ppb).

AMTEST

METHODOLOGY REPORT

AM TEST ID 99-A007212
CLIENT ID InflowMATRIX : Water
SAMPLED: 5/ 3/99

ANALYTE	UNITS	METHOD NUMBER	METHOD REFERENCE	DETECTION LIMIT *	DATE OF ANALYSIS
Conductivity	umhos/cm	120.1	EPA	0.50	5/11/99
Total Nitrogen (TKN)	mg/l	351.3	EPA	0.25	5/21/99
Total Suspended Solids	mg/l	160.2	EPA	1.0	5/17/99
Silver	mg/l	200.7	EPA	0.01	5/17/99
Aluminum	mg/l	200.7	EPA	0.01	5/17/99
Arsenic	mg/l	200.7	EPA	0.03	5/17/99
Boron	mg/l	200.7	EPA	0.10	5/17/99
Barium	mg/l	200.7	EPA	0.003	5/17/99
Beryllium	mg/l	200.7	EPA	0.005	5/17/99
Calcium	mg/l	200.7	EPA	0.10	5/17/99
Cadmium	mg/l	200.7	EPA	0.002	5/17/99
Cobalt	mg/l	200.7	EPA	0.003	5/17/99
Chromium	mg/l	200.7	EPA	0.006	5/17/99
Copper	mg/l	200.7	EPA	0.002	5/17/99
Iron	mg/l	200.7	EPA	0.01	5/17/99
Mercury	mg/l	200.7	EPA	0.010	5/17/99
Potassium	mg/l	200.7	EPA	1.0	5/17/99
Lithium	mg/l	200.7	EPA	0.02	5/17/99
Magnesium	mg/l	200.7	EPA	0.10	5/17/99
Manganese	mg/l	200.7	EPA	0.002	5/17/99
Molybdenum	mg/l	200.7	EPA	0.01	5/17/99
Sodium	mg/l	200.7	EPA	0.5	5/17/99
Nickel	mg/l	200.7	EPA	0.01	5/17/99
Phosphorus	mg/l	200.7	EPA	0.05	5/17/99
Lead	mg/l	200.7	EPA	0.02	5/17/99
Sulfur	mg/l	200.7	EPA	0.1	5/17/99
Antimony	mg/l	200.7	EPA	0.02	5/17/99
Selenium	mg/l	200.7	EPA	0.03	5/17/99
Silicon	mg/l	200.7	EPA	0.1	5/17/99
Tin	mg/l	200.7	EPA	0.02	5/17/99
Strontium	mg/l	200.7	EPA	0.003	5/17/99
Titanium	mg/l	200.7	EPA	0.01	5/17/99
Thallium	mg/l	200.7	EPA	0.03	5/17/99
Vanadium	mg/l	200.7	EPA	0.002	5/17/99
Yttrium	mg/l	200.7	EPA	0.001	5/17/99
Zinc	mg/l	200.7	EPA	0.002	5/17/99
Acid Dig. (Tot Metals)		3010	EPA		5/13/99

* = Standard Methods for the Examination of Water and Wastewater 18th ed.
S = Test Methods for Evaluating Solid Waste Physical/Chemical Methods
E = Methods for Chemical Analysis of Water and Wastes 1983
Instrument Detection Limit

AMTEST

Quality Control Summary

QC for 9918850

99-A007212

99-A007213

DUPPLICATES

		sample value	duplicate value	RPD %
99-A007222 DUP: Total Nitrogen (TKN)	mg/l	0.80	0.73	9.2
99-A007467 DUP: Total Nitrogen (TKN)	mg/l	0.45	0.45	0.00
99-A007239 DUP: Total Suspended Solids	mg/l	6.0	5.0	18.
99-A007410 DUP: Total Suspended Solids	mg/l	< 1	< 1	
99-A007420 DUP: Total Suspended Solids	mg/l	1.0	< 1	
99-A007203 DUP: Silver	mg/l	< 0.01	< 0.01	
99-A007203 DUP: Beryllium	mg/l	< 0.005	< 0.005	
99-A007203 DUP: Cadmium	mg/l	< 0.002	< 0.002	
99-A007203 DUP: Chromium	mg/l	< 0.006	< 0.006	
99-A007203 DUP: Copper	mg/l	0.054	0.056	3.6
99-A007387 DUP: Copper	mg/l	2.39	2.42	1.2
99-A007203 DUP: Nickel	mg/l	< 0.01	< 0.01	
99-A007203 DUP: Zinc	mg/l	0.117	0.129	9.8
99-A006633 DUP: Gasoline	ug/l	< 400	< 400	
99-A006633 DUP: Diesel	ug/l	2200	2600	17.
99-A006633 DUP: Oil	ng/l	4800	4300	11.

MATRIX SPIKES

		sample value	sample+spk value	spike value	Recovery
99-A007223 SPIKE: Total Nitrogen (TKN)	mg/l	4.5	9.9	5.0	108.
99-A007468 SPIKE: Total Nitrogen (TKN)	mg/l	0.83	1.4	0.50	114.
99-A007073 SPIKE: Cadmium	mg/l	< 0.002	0.951	1.00	95.1
99-A007271 SPIKE: Cadmium	mg/l	< 0.002	0.995	1.00	99.5
99-A007073 SPIKE: Chromium	mg/l	< 0.006	0.824	1.00	82.4
99-A007271 SPIKE: Chromium	mg/l	< 0.006	0.917	1.00	91.7
99-A007073 SPIKE: Copper	mg/l	0.120	1.08	1.00	96.0
99-A007271 SPIKE: Copper	mg/l	0.052	1.00	1.00	94.8
99-A007073 SPIKE: Nickel	mg/l	< 0.01	0.98	1.00	98.0
99-A007271 SPIKE: Nickel	mg/l	0.02	1.04	1.00	102.
99-A007073 SPIKE: Lead	mg/l	< 0.02	0.60	0.90	66.7
99-A007271 SPIKE: Lead	mg/l	< 0.02	0.95	1.00	96.0
99-A007073 SPIKE: Zinc	mg/l	0.104	1.06	1.00	95.6
99-A007271 SPIKE: Zinc	mg/l	0.043	1.00	1.00	95.7

STANDARD REFERENCE MATERIALS

		measured value	true value	Recovery
Known	SRM: Total Nitrogen (TKN)	mg/l	31.	34.
Known	SRM: Total Nitrogen (TKN)	mg/l	31.	34.
Known	SRM: Total Suspended Solids	mg/l	98.	100
Known	SRM: Total Suspended Solids	mg/l	100	100
Known	SRM: Total Suspended Solids	mg/l	100	100
Known	SRM: Aluminum	mg/l	10.9	10.0
Known	SRM: Boron	mg/l	0.22	0.20
Known	SRM: Barium	mg/l	2.26	2.00
Known	SRM: Beryllium	mg/l	1.90	2.00
Known	SRM: Calcium	mg/l	10.2	10.0



Quality Control Summary (continued)

QC for 9918850

Known	SRM: Cadmium	mg/l	2.29	2.00	114.
Known	SRM: Cobalt	mg/l	2.10	2.00	105.
Known	SRM: Chromium	mg/l	2.11	2.00	106.
Known	SRM: Copper	mg/l	2.29	2.00	114.
Known	SRM: Iron	mg/l	2.22	2.00	111.
Known	SRM: Mercury	mg/l	2.80	2.00	140.
Known	SRM: Potassium	mg/l	98.0	100.	98.0
Known	SRM: Lithium	mg/l	0.20	0.20	100.
Known	SRM: Magnesium	mg/l	10.6	10.0	106.
Known	SRM: Manganese	mg/l	2.18	2.00	109.
Known	SRM: Molybdenum	mg/l	2.07	2.00	104.
Known	SRM: Sodium	mg/l	20.7	20.0	104.
Known	SRM: Nickel	mg/l	2.24	2.00	112.
Known	SRM: Phosphorus	mg/l	9.49	10.0	94.9
Known	SRM: Lead	mg/l	2.11	2.00	106.
Known	SRM: Sulfur	mg/l	2.2	2.0	110.
Known	SRM: Antimony	mg/l	2.17	2.00	108.
Known	SRM: Selenium	mg/l	2.00	2.00	100.
Known	SRM: Tin	mg/l	1.2	1.5	80.0
Known	SRM: Strontium	mg/l	2.26	2.00	113.
Known	SRM: Titanium	mg/l	2.00	2.00	100.
Known	SRM: Thallium	mg/l	1.95	2.00	97.5
Known	SRM: Vanadium	mg/l	0.198	0.200	99.0
Known	SRM: Yttrium	mg/l	0.193	0.200	96.5
Known	SRM: Zinc	mg/l	2.20	2.00	110.

BLANKS

		Result
BLANK:	Total Nitrogen (TKN)	mg/l < 0.25
BLANK:	Total Nitrogen (TKN)	mg/l < 0.25
BLANK:	Total Suspended Solids	mg/l < 1
BLANK:	Total Suspended Solids	mg/l < 1
BLANK:	Total Suspended Solids	mg/l < 1
BLANK:	Silver	mg/l < 0.01
BLANK:	Silver	mg/l < 0.01
BLANK:	Aluminum	mg/l < 0.01
BLANK:	Aluminum	mg/l < 0.01
BLANK:	Arsenic	mg/l < 0.03
BLANK:	Arsenic	mg/l < 0.03
BLANK:	Boron	mg/l < 0.1
BLANK:	Boron	mg/l < 0.1
BLANK:	Barium	mg/l < 0.003
BLANK:	Barium	mg/l < 0.003
BLANK:	Beryllium	mg/l < 0.005
BLANK:	Beryllium	mg/l < 0.005
BLANK:	Calcium	mg/l < 0.1
BLANK:	Calcium	mg/l < 0.1
BLANK:	Cadmium	mg/l < 0.002
BLANK:	Cadmium	mg/l < 0.002
BLANK:	Cobalt	mg/l < 0.003
BLANK:	Cobalt	mg/l < 0.003

AMTEST**Quality Control Summary
(continued)**

QC for 9918850

BLANK: Chromium	mg/l	< 0.006
BLANK: Chromium	mg/l	< 0.006
BLANK: Copper	mg/l	< 0.002
BLANK: Copper	mg/l	0.005
BLANK: Iron	mg/l	< 0.01
BLANK: Iron	mg/l	< 0.01
BLANK: Mercury	mg/l	< 0.01
BLANK: Mercury	mg/l	< 0.01
BLANK: Potassium	mg/l	< 1
BLANK: Potassium	mg/l	< 1
BLANK: Lithium	mg/l	< 0.02
BLANK: Lithium	mg/l	< 0.02
BLANK: Magnesium	mg/l	< 0.1
BLANK: Magnesium	mg/l	< 0.1
BLANK: Manganese	mg/l	< 0.002
BLANK: Manganese	mg/l	< 0.002
BLANK: Molybdenum	mg/l	< 0.01
BLANK: Molybdenum	mg/l	< 0.01
BLANK: Sodium	mg/l	< 0.5
BLANK: Sodium	mg/l	< 0.5
BLANK: Nickel	mg/l	< 0.01
BLANK: Nickel	mg/l	< 0.01
BLANK: Phosphorus	mg/l	< 0.05
BLANK: Phosphorus	mg/l	< 0.05
BLANK: Lead	mg/l	< 0.02
BLANK: Lead	mg/l	< 0.02
BLANK: Sulfur	mg/l	< 0.1
BLANK: Sulfur	mg/l	< 0.1
BLANK: Antimony	mg/l	< 0.02
BLANK: Antimony	mg/l	< 0.02
BLANK: Selenium	mg/l	< 0.03
BLANK: Selenium	mg/l	< 0.03
BLANK: Silicon	mg/l	< 0.1
BLANK: Silicon	mg/l	< 0.1
BLANK: Tin	mg/l	< 0.02
BLANK: Tin	mg/l	< 0.02
BLANK: Strontium	mg/l	< 0.003
BLANK: Strontium	mg/l	< 0.003
BLANK: Titanium	mg/l	< 0.01
BLANK: Titanium	mg/l	< 0.01
BLANK: Thallium	mg/l	< 0.03
BLANK: Thallium	mg/l	< 0.03
BLANK: Vanadium	mg/l	< 0.002
BLANK: Vanadium	mg/l	< 0.002
BLANK: Yttrium	mg/l	< 0.001
BLANK: Yttrium	mg/l	< 0.001
BLANK: Zinc	mg/l	< 0.002
BLANK: Zinc	mg/l	0.008
BLANK: Gasoline	ug/l	< 40
BLANK: Gasoline	ug/l	< 200



Quality Control Summary (continued)

QC for 9918850

BLANK: Diesel	ug/l	< 100
BLANK: Diesel	ug/l	< 500
BLANK: Oil	ug/l	< 200
BLANK: Oil	ug/l	< 1000
BLANK: Bromofluorobenzene	%	59.0
BLANK: Bromofluorobenzene	%	67.0
BLANK: 2-Fluorobiphenyl	%	58.0
BLANK: 2-Fluorobiphenyl	%	62.0

ANALYSIS REPORT

AMTEST

Associated Earth Sciences
Tom Shugrue

Date Received: 10/28/99
Date Reported: 11/29/99

Water Samples

AM TEST Identification Number 99-A018922
Client Identification Outflow, 1st Flush
Sampling Date 10/28/99, 11:10

PARAMETER	RESULT	Q	D.L.
Conventionals			
Conductivity (umhos/cm)	77.		0.5
Total Nitrogen (TKN) (mg/l)	2.2		0.25
Total Phosphorus (mg/l)	0.46		0.005
Total Suspended Solids (mg/l)	38.		1.0
Fuel Analyses (MODIFIED WTPH-HCID)			
Fuel Type	None		
Gasoline (ug/l)	< 400		40.
Diesel (ug/l)	< 1000		100
Oil (ug/l)	< 2000		200
SURROGATES (% Recovery)			
2-Fluorobiphenyl	31.0		

ANALYSIS REPORT

AMTEST
LABORATORIES

AmTest Inc.

14603 N.E. 87th St.
Redmond, WA
98052

Tel: 425 885 1664
Fax: 425 883 3495

Associated Earth Sciences
911 - 5th Avenue
Suite 100
Kirkland, WA 98033
Attention: Tom Shugrue

Date Received: 10/28/99
Date Reported: 11/29/99

Project Name: Sea-Tac

Oct.

Water Samples

AM TEST Identification Number	99-A018921
Client Identification	Inflow
Sampling Date	10/28/99, 11:20

PARAMETER	RESULT	Q	D.L.
Conventionals			
Conductivity (umhos/cm)	80.		0.5
Total Nitrogen (TKN) (mg/l)	2.7		0.25
Total Phosphorus (mg/l)	0.43		0.005
Total Suspended Solids (mg/l)	240		1.0
Fuel Analyses (MODIFIED WTPH-HCID)			
Fuel Type	None		
Gasoline (ug/l)	< 400		40.
Diesel (ug/l)	< 1000		100
Oil (ug/l)	24000		200
SURROGATES (% Recovery)			
2-Fluorobiphenyl	82.0		

ANALYSIS REPORT

AMTESTAssociated Earth Sciences
Tom ShugrueDate Received: 10/28/99
Date Reported: 11/29/99**Water Samples**

AM TEST Identification Number 99-A018923
Client Identification
Sampling Date Outflow
10/28/99, 11:10

PARAMETER	RESULT	Q	D.L.
Conventionals			
Conductivity (umhos/cm)	58.		0.5
Total Nitrogen (TKN) (mg/l)	1.7		0.25
Total Phosphorus (mg/l)	0.35		0.005
Total Suspended Solids (mg/l)	10.		1.0
Fuel Analyses (MODIFIED WTPH-HCID)			
Fuel Type	None		
Gasoline (ug/l)	< 400		40.
Diesel (ug/l)	< 1000		100
Oil (ug/l)	< 2000		200
SURROGATES (% Recovery)			
2-Fluorobiphenyl	50.6		

Reported by:

Kathy Fugle

AMTEST**METHODOLOGY REPORT****AM TEST ID 99-A018921
CLIENT ID Inflow****MATRIX : Water
SAMPLED: 10/28/99**

ANALYTE	UNITS	METHOD NUMBER	METHOD REFERENCE	DETECTION LIMIT *	DATE OF ANALYSIS
Conductivity	umhos/cm	120.1	EPA	0.50	11/ 2/99
Total Nitrogen (TKN)	mg/l	351.3	EPA	0.25	11/11/99
Total Phosphorus	mg/l	365.2	EPA	0.005	11/10/99
Total Suspended Solids	mg/l	160.2	EPA	1.0	11/ 2/99

S = Standard Methods for the Examination of Water and Wastewater 18th ed.
846 = Test Methods for Evaluating Solid Waste Physical/Chemical Methods
A = Methods for Chemical Analysis of Water and Wastes 1983
***** Instrument Detection Limit

AMTEST**Quality Control Summary**

QC for 9921567

99-A018921

99-A018922

99-A018923

DUPLICATES

		sample value	duplicate value	RPD %	
99-A019413	DUP: Total Nitrogen (TKN)	mg/l	< 0.25	< 0.25	
99-A019561	DUP: Total Nitrogen (TKN)	mg/l	0.89	0.73	20.
99-A018880	DUP: Total Phosphorus	mg/l	0.029	0.030	3.4
99-A019133	DUP: Total Phosphorus	mg/l	0.028	0.029	3.5
99-A018880	DUP: Total Suspended Solids	mg/l	1.0	1.0	0.00
99-A018923	DUP: Gasoline	ug/l	< 400	< 400	
99-A018923	DUP: Diesel	ug/l	< 1000	< 1000	
99-A018923	DUP: Oil	ug/l	< 2000	< 2000	

MATRIX SPIKES

		sample value	sample+spk value	spike value	Recovery
99-A019414	SPIKE: Total Nitrogen (TKN)	mg/l	24.	77.	50. 106.
99-A019562	SPIKE: Total Nitrogen (TKN)	mg/l	2.0	6.8	5.0 96.0
99-A018881	SPIKE: Total Phosphorus	mg/l	0.035	0.24	0.20 102.
99-A019134	SPIKE: Total Phosphorus	mg/l	0.030	0.22	0.20 95.0

STANDARD REFERENCE MATERIALS

		measured value	true value	Recovery
Known	SRM: Total Nitrogen (TKN)	mg/l	8.1	7.9 103.
Known	SRM: Total Nitrogen (TKN)	mg/l	7.7	7.9 97.5
Known	SRM: Total Phosphorus	mg/l	0.49	0.50 98.0
Known	SRM: Total Phosphorus	mg/l	0.50	0.50 100.
Known	SRM: Total Suspended Solids	mg/l	120	110 109.

BLANKS

		Result
	BLANK: Total Nitrogen (TKN)	mg/l < 0.25
	BLANK: Total Nitrogen (TKN)	mg/l < 0.25
	BLANK: Total Phosphorus	mg/l < 0.005
	BLANK: Total Phosphorus	mg/l < 0.005
	BLANK: Total Suspended Solids	mg/l < 1
	BLANK: Gasoline	ug/l < 400
	BLANK: Diesel	ug/l < 1000
	BLANK: Oil	ug/l < 2000
	BLANK: 2-Fluorobiphenyl	% 82.0



**AmTest Inc.
Professional
Analytical
Services**

14603 N.E. 87th St. Fax: 206 883 3495
Redmond, WA 98052 Tel: 206 885 1664

CHAIN OF CUSTODY RECORD

PROJ. NO.

PROJECT NAME

Analysis Requested

KB98618A
SAMPLES (C)

Sea Tac International

elinquished by: (Signature) ✓

Date/Time

Date/Time
3/17/00 12:15

Received by: (Signature)

Client Name:

三

Renounced by: (Signature)

Part II

Date/Time

Received by [Signature]

Client Address:

711 5th Ave. NYC 100

Signed and relinquished by: (Signature)

Date/Time:

Date/Time

Received for Laboratory by:
(Signature)

Client Phone

5

Contact Person

四三一