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MOUNT VERNON WASTEWATER TREATMENT PLANT
Class II Inspection

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ABSTRACT

A Class II Inspection was conducted at the City of Mount Vernon Wastewater Treatment Plant (WTP) from December 9-11, 1991. The WTP was performing well during the inspection. The conventional parameters of BOD_5, TSS, and fecal coliform indicate a well-treated, high quality effluent. The effluent met permit limits for BOD_5, TSS, fecal coliform, and pH. Several organic priority pollutants were detected in the samples collected; of these chloroform and lindane were detected in the plant effluent. Of the metals detected in the effluent, only copper and silver were found in concentrations above chronic or acute EPA water quality criteria. Bioassay organisms showed no acute toxicity in the plant effluent. While *Daphnia magna* tests showed no chronic effects, fathead minnow tests indicated a LOEC of 12.5% effluent. A dye study found the effluent discharge was into a well mixed area in the river.

INTRODUCTION

A Class II Inspection was conducted at the City of Mount Vernon Wastewater Treatment Plant (WTP) from December 9-11, 1991. Conducting the inspection were Marc Heffner and Steven Golding of the Washington State Department of Ecology Compliance Monitoring Unit. Bill Fullner represented the City of Mount Vernon and assisted during the inspection.

The Mount Vernon WTP is an activated sludge facility discharging into the Skagit River (Figure 1). Discharge is regulated by NPDES permit No. WA-002407-4. The permit, issued in August 1987, expired in August 1992.

The inspection had four objectives:

1. Verify compliance with NPDES permit parameters;

2. Assess wastewater toxicity with pollutant scans and effluent bioassays;

3. Assess dilution characteristics of outfall structure by reviewing existing information and observing dye dispersion; and

4. Verify NPDES permit self-monitoring.

SETTING

Influent to the WTP is predominately domestic sewage. City personnel report the only major industrial contributor is a chicken processing plant which discharges 300-400 pounds of BOD_5 per day to the WTP. Darigold operates sporadically, contributing small organic loads several weeks per year. The Darigold plant was not operating during the inspection. Leachate from the Skagit County landfill is occasionally sent to the WTP for treatment. The leachate is brought by tank truck, deposited in a spare aeration basin, and slowly bled into the plant influent. The leachate is ordinarily sent to the City of Burlington WTP for treatment.

Expansion and upgrade of the WTP was completed in the fall of 1989 to increase capacity and improve performance. Prior to 1989, the plant had been hydraulically overloaded and regularly out of compliance with monthly permitted BOD_5 and TSS limits. The plant configuration after a 1972 upgrade included a primary clarifier, an oxidation tower (biofilter), a secondary clarifier, an anaerobic digester, and a sludge thickener. The 1989 upgrade included the following additions: three aeration basins, an aerobic digester, a secondary clarifier, a chlorine contact tank, a dissolved-air flotation thickener, an anaerobic digester, and a belt filter press (Figure 2).

The plant flow scheme includes a bar screen, an influent pump station, and a comminutor prior to the primary clarifier. The west Mount Vernon influent joins the plant flow just before the comminutor. The west Mount Vernon influent is primarily domestic sewage.

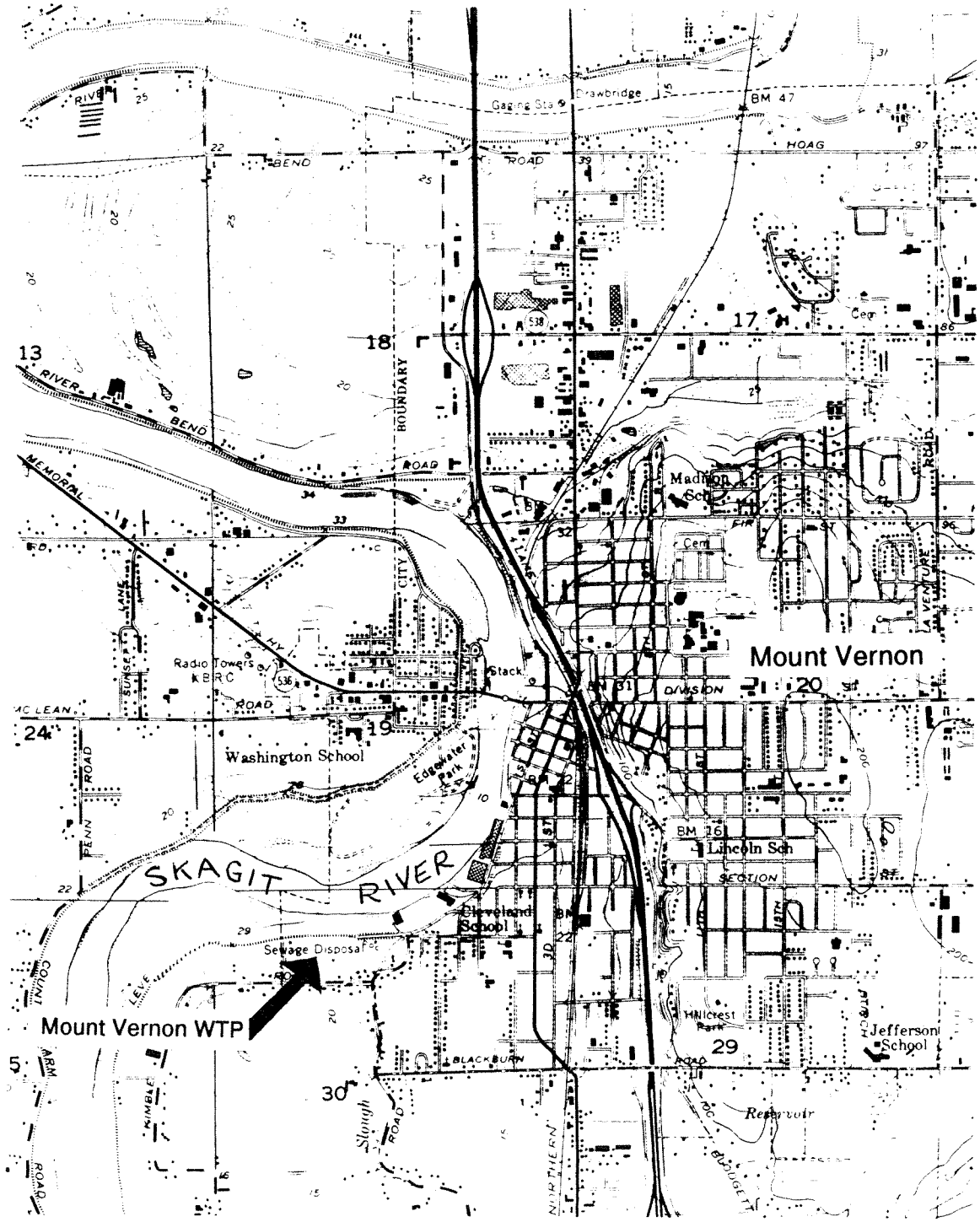
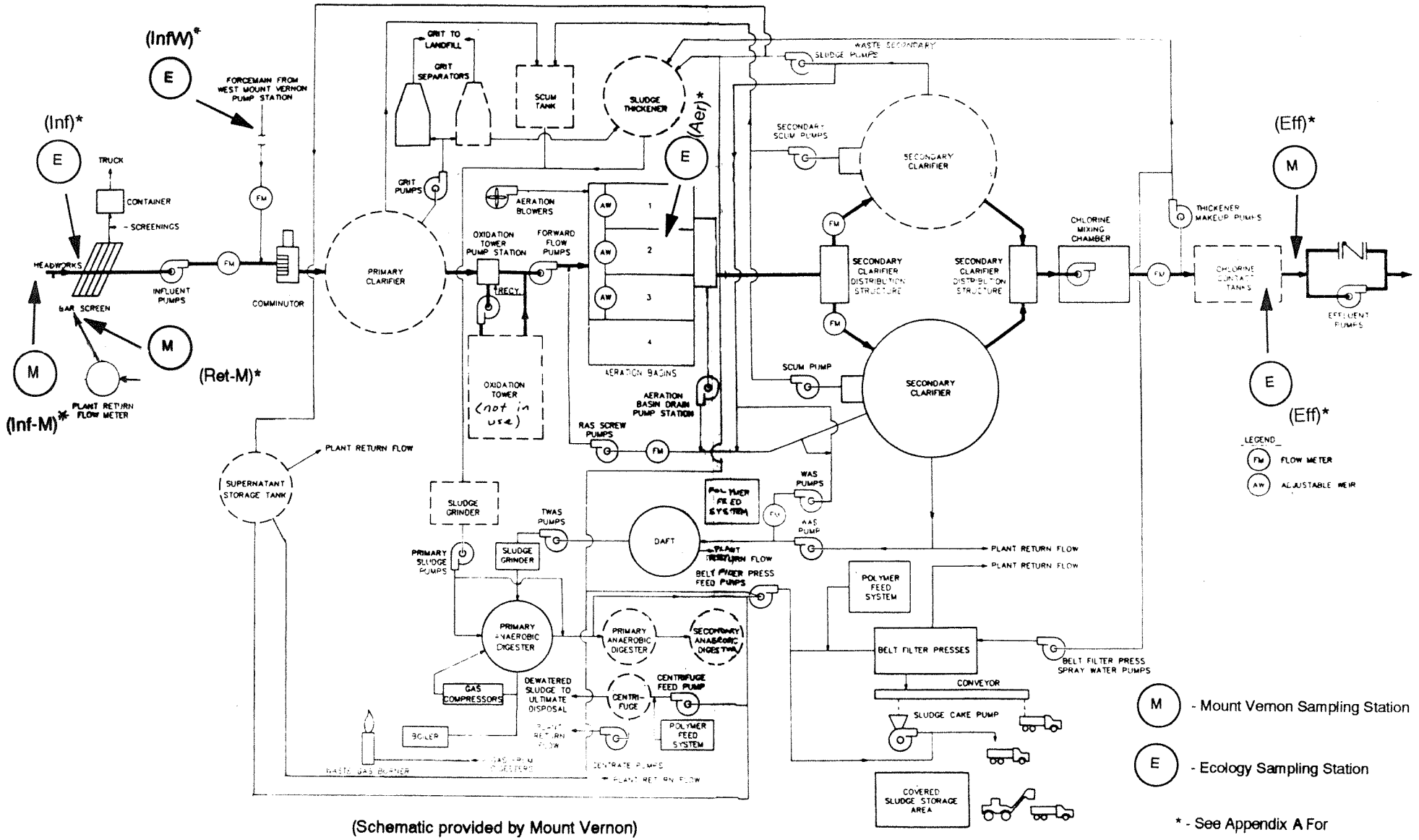


Figure 1 – Location Map – Mount Vernon, December 1991.

Figure 2 – Flow Schematic – Mount Vernon, December 1991.

Dashed lines indicate units existing prior to 1989 upgrade.



(Schematic provided by Mount Vernon)

During the inspection two aeration basins were being used to provide biological treatment. Available for future capacity requirements are the oxidation tower, a third aeration basin, and a fourth, larger aeration basin designed for use as an aerobic digester. The two reserve aeration basins have been used to hold landfill leachate. Both secondary clarifiers and chlorine contact basins were in use.

Sludge from the primary clarifier is thickened in the sludge thickener and routed to the primary anaerobic digester. Sludge from the two secondary clarifiers is thickened by a dissolved-air flotation thickener and routed to the primary anaerobic digester. Digested sludge is further thickened in the secondary digesters and/or supernatant tank (a converted clarifier) before land application. The sludge is dried with a belt filter press, then composted by contract when land application rates fall below sludge production rates.

PROCEDURES

Class II Inspection sampling included Ecology grab and composite samples. An effluent grab composite sample, consisting of two subsamples, was collected by Ecology for bioassay testing. Ecology Isco compositors were set up to collect influent and effluent samples (Appendix A, Figure 2). Equal volumes of sample were collected every 30 minutes for 24 hours (8:00 a.m. to 8:00 a.m.). The compositors were iced to keep samples cool.

Mount Vernon WTP personnel collected influent, effluent, and return flow composite samples (Appendix A; Figure 2). Mount Vernon composite samples were flow-proportional. The composite sampler for return flow malfunctioned during the inspection, collecting only a portion of the sample volume planned.

All composite samples were split for analysis by the Ecology and WTP laboratories. Samples collected, sampling times, and parameters analyzed are summarized in Appendix B. Ecology analytical methods and laboratories performing the analyses are summarized in Appendix C.

Quality Assurance/Quality Control (QA/QC)

Ecology quality assurance procedures for sampling included special cleaning of the sampling equipment prior to the inspection to prevent sample contamination (Appendix D). Chain-of-custody procedures were followed to assure the security of the samples (Huntamer and Hyre, 1991).

Most Ecology laboratory data met Ecology QA/QC guidelines and are considered to be reliable. Those data that did not meet the guidelines are appropriately qualified on the data tables.

Priority pollutant organics surrogate recoveries and matrix spike/matrix spike duplicate data are reasonable and acceptable within quality control limits. The data generated for metals analysis of water samples can be used without qualification. For the sludge sample, chromium, lead, and silver failed the serial dilution test and are qualified with an E (reported result is an estimate

because of the presence of interference). Antimony is qualified with an N because of low recovery in the corresponding quality control standard.

RESULTS AND DISCUSSION

Flow Measurements

Mount Vernon influent flow measurements were used to calculate permitted parameters in lbs/day. An in-line meter which did not lend itself to verification by Ecology was used. In the fall of 1991 the meter was checked by the manufacturer's technician. According to the technician, the meter is within +/- 1% accuracy (Siemer, 1992). The influent meter is used by the plant for all reporting purposes. An effluent meter is located between the flash mixer and the chlorine contact tank. It is an ultrasonic flow meter with an accuracy of +/- 2 1/2%, and is roughly calibrated to the influent meter.

During the inspection and on several subsequent checks by the operator, the effluent meter measured daily flows approximately 0.3 MGD to 0.4 MGD higher than the influent meter (approximately 10% of measured flow). The discrepancy between influent and effluent flow meter readings appears to be due to the poorly calibrated effluent meter. Because the effluent meter serves as a backup for the influent meter, the meter should be properly calibrated to assure flows are accurately measured.

Plant personnel suspect the Parshall flume for recycle flow is undersized. The flume becomes submerged at flows greater than 1.1 MGD. Recent repair of a leaky valve which allowed flow from the chlorine contact basin to return to the headworks has kept flows within the flume's operating range most of the time.

The west Mount Vernon flow enters the plant just prior to the comminutor before the primary clarifier. The flow meter was not functioning during the inspection, but an estimated flow for west Mount Vernon based on the prior week's flow is 0.04 MGD. The meter should be repaired.

NPDES Permit Compliance/General Chemistry

The WTP was performing well during the inspection. The conventional parameters of BOD_5, TSS, and fecal coliform indicate a well-treated, high quality effluent (Table 1). The effluent met permit limits for BOD_5, TSS, fecal coliforms, and pH (Table 2). Since the permit contains pre-upgrade design criteria, no influent loading comparison was made.

A comparison of influent ammonia and nitrate-nitrite concentrations indicate that the WTP was achieving partial nitrification at the time of the inspection. Ammonia concentrations from 7 mg/L to 11 mg/L in the influent were reduced to 2 to 3 mg/L in the effluent, while NO_2 + NO_3-N concentrations increased from 0.5 mg/L to 1 mg/L in the influent to 5 mg/L to

Table 1 – General Chemistry Results – Mount Vernon, December 1991.

Parameter	Location:	Inf-1	Inf-2	Inf-C	Inf-M	Ret-M	InfW-1	Aer-1	Aer-2
	Type:	grab	grab	E-comp	M-comp	M-comp	grab	grab	grab
	Date:	12/10	12/10	12/10-11	12/10-11	12/10-11	12/10	12/10	12/10
	Time:	1150	1435	0800-0800	0800-0800	0800-0800	1110	1005	1345
	Lab Log #:	508130	508131	508132	508133	508134	508135	508137	508138
GENERAL CHEMISTRY									
Conductivity (umhos/cm)		431	405	367	370		483		
pH (SU)									
Alkalinity (mg/L CaCO3)				121	117				
Hardness (mg/L CaCO3)				74.1	74.6				
TS (mg/L)				342	365	294	602	2200	2100
TNVS (mg/L)				156	122	149	160	520	580
TSS (mg/L)		91	93	112	106	57	356		
TNVSS (mg/L)				21	21	14	44		
% Solids									
% Volatile Solids									
BOD5 (mg/L)				110	90	51			
BOD INH (mg/L)									
COD (mg/L)		300	310	250	310	110	460		
TOC (water mg/L)		73.3	52.9	72.4	113	37.8	121		
TOC (soil)									
NH3-N (mg/L)		9.57	7.32	10.3	11.4	5.28	17.4		
NO2+NO3-N (mg/L)		0.890	0.964	0.796	0.484	4.59	0.322		
Total-P (mg/L)		4.61	3.9	3.28	3.01	2.67	6.33		
Total Persulfate N (TPN) (mg/L)									
F-Coliform MF (#/100mL)									
Fecal Coliform (sediment)									
FIELD OBSERVATIONS									
Temp (C)		13.3	12.1				12.8		
Temp-cooled (C)**				3.4	6.7	5.9			
pH		7.4	7.2	7.4	7.6	7.3	9.1		
Conductivity		332	311	305	329	285	460		
Chlorine									
	Total								
	Free								

** temperature of composite sample at the end of the sampling period.

M – sample obtained by Mount Vernon personnel
C – Department of Ecology composite sample
GC – Department of Ecology grab composite sample
grab – grab sample
comp – composite sample
Inf – influent
Ret – return flow from within plant
InfW – influent from west Mount Vernon
Aer – aeration basin
Sludge – sludge from anaerobic digestor
Eff – final effluent

Table 1 – Cont'd – Mount Vernon, December 1991.

Parameter	Locatn:	Eff–1	Eff–2	Eff–C	Eff–M	Eff–GC	Eff–3	Eff–4	Sludge
	Type:	grab	grab	E–comp	M–comp	grab–comp	grab	grab	grab
	Date:	12/10	12/10	12/10–11	12/10–11	12/10	12/11	12/11	12/11
	Time:	0920	1325	0800–0800	0800–0800	*	0905	1110	1045
	Lab Log #:	508140	508141	508142	508143	508144	508145	508146	508139 & 508147
GENERAL CHEMISTRY									
Conductivity (umhos/cm)		280	292	323	295	285			
pH (SU)									7.32
Alkalinity (mg/L CaCO3)				63.3	57.7	55.4			
Hardness (mg/L CaCO3)				72.6	74.6	74.6			
TS (mg/L)				258	238				
TNVS (mg/L)				138	112				
TSS (mg/L)		3	5	4	5	5			
TNVSS (mg/L)				1	2				
% Solids									2.31
% Volatile Solids									1.45
BOD5 (mg/L)				10	10				
BOD INH (mg/L)				9	7				
COD (mg/L)		32	25	34	31				
TOC (water mg/L)		10.2	10.7	12.0	13.4				
TOC (soil mg/Kg)									210000
NH3–N (mg/L)		0.169	1.83	3.42	1.92				
NO2+NO3–N (mg/L)		5.48	5.70	5.64	5.67				
Total–P (mg/L)		1.32	1.34	1.74	1.43				
Total Persulfate N (TPN) (mg/L)									2300
F–Coliform MF (#/100mL)							1U	7	500000
T–Coliform MF (#/100mL)									3000000
FIELD OBSERVATIONS									
Temp (C)		10.9	12.1				5.5		27.9
Temp–cooled (C)*				3.4	5.5				
pH		7.1	6.8	7.2	7.3		7.3		7.9
Conductivity		264	258	285	260		260		
Chlorine									
Total		0.4	0.4				0.3	0.4	
Free		<0.1	<0.1				<0.1	<0.1	

* Grab composite samples consist of two equal volumes of two grab subsamples.

Table 2 – NPDES Permit Limits and Inspection Results – Mt. Vernon – Dec. 1991.

	NPDES Limits		Inspection Results	
Parameter	Monthly Average	Weekly Average	Composite Samples	Grab Samples
BOD5	30 mg/l 1000 lbs/day 85 % removal	45 mg/L 1500 lbs/day	10 mg/L 381 lbs/day 91 % removal	
TSS	30 mg/l 1000 lbs/day 85 % removal	45 mg/L 1500 lbs/day	4 mg/L 152 lbs/day 96 % removal	
Fecal Coliform	200/100 mL	400/100 mL		7/100mL <1/100mL
pH		6.0 to 9.0 (continuous)		6.8; 7.3
Flow	--	--	4.57 MGD *	

* 24 hour influent flow measured by Mount Vernon.

6 mg/L in the effluent. The alkalinity in the effluent is somewhat low (approximately 60 mg/L). Observations of pH and alkalinity should be made to assure a lack of alkalinity does not inhibit treatment.

Mount Vernon made daily measurements of influent and effluent pH from composite samples. Because pH changes while a sample is held, pH measurements should be made from grab samples as specified in the permit.

Split Sample Comparison

Samples were split to determine the comparability of Ecology and permittee sampling and laboratory results. Both Ecology and Mount Vernon laboratory analyses found somewhat of a difference between samples collected and analyzed by Ecology and Mount Vernon (Table 3). Differences in sampling methods may be the cause. Mount Vernon composite samples were flow proportioned while Ecology samples were time proportioned. Also, the Ecology influent sample included return flow while the Mount Vernon sample did not. Influent BOD_5 and TSS for influent samples collected by Mount Vernon were lower than those collected by Ecology, but not significantly. Effluent BOD_5 and TSS samples from Mount Vernon and Ecology yielded results within 4 mg/L. Both Ecology and Mount Vernon sampling appear acceptable.

Comparing the results of two laboratories' analyses of the same samples gives an indication of the differences between laboratory procedures. In every case, Mount Vernon analyses of influent and effluent BOD_5 and TSS yielded somewhat lower values than those determined by Ecology. A statistical analysis found these differences are not significant (Lombard, 1992). Ecology and Mount Vernon fecal coliform results agreed closely, both 7/100mL or less. The Mount Vernon laboratory became accredited by Ecology in January 1991.

Influent, effluent, and return flow composite samples collected by Mount Vernon were above 4°C, the recommended temperature for sample preservation. Refrigeration of composite samples should be checked.

Priority Pollutants and Other Organics

Because the Eff-C sample was lost in the laboratory before the BNA analysis was made, Eff-GC (grab composite) was analyzed for BNA's.

Most organic compounds detected in the plant influent were at concentrations less than 10 μg/L (Table 4). The exception was acetone (influent concentrations 43 μg/L estimated; 34 μg/L estimated). Acetone is used for sampling apparatus cleaning and in the laboratory, often causing low level sample contamination. Lindane was also detected in the plant influent.

The west Mount Vernon influent sample contained benzoic acid, 4-methylphenol, and chloromethane at concentrations greater than 10 μg/L. Lindane was also detected. The west Mount Vernon collection system serves a residential area without known commercial or

Table 3 – Split Sample Results Comparison – Mount Vernon, December 1991.

Parameter	Analysis by:	Location: Inf–C Type: E–comp Date: 12/10–11 Time: 0800–0800 Lab Log #: 508132 Sampled by: Ecology	Inf–M M–comp 12/10–11 0800–0800 508133 Mt. Vernon	Ret–M M–comp 12/10–11 0800–0800 508134 Mt. Vernon	Eff–C E–comp 12/10–11 0800–0800 508142 Ecology	Eff–M M–comp 12/10–11 0800–0800 508143 Mt. Vernon	Eff Ef–grab 12/11
BOD5 (mg/L)							
	Ecology	110	90	51	10	10	
	Mount Vernon	97	70	--	9	5	
TSS (mg/L)							
	Ecology	112	106	57	4	5	
	Mount Vernon	96	80	40	2	3	
F–Coliform MF (#/100mL)							
	Ecology						7
	Mount Vernon						3
pH							
	Ecology	7.4	7.6	7.3	7.2	7.3	7.0
	Mount Vernon	7.0	7.3	7.5	7.2	7.4	*
Total Chlorine (mg/L)							
	Ecology						0.4
	Mount Vernon						0.5

* Mount Vernon did not measure grab pH

Eff – final effluent
Inf – influent
E–comp – Ecology composite sample
M–comp – Mt. Vernon composite sample
grab – grab sample
Ef–grab – effluent grab samples

Table 4 – Comparison of Data to Toxicity Criteria – Mount Vernon, December 1991.

Location:	Inf-1	Inf-2	InfW-1	Eff-1	Eff-2	Sludge		EPA Water Quality Criteria Summary	
Type:	grab	grab	grab	grab	grab	grab			
Date:	12/10	12/10	12/10	12/10	12/10	12/11			
Time:	1150	1435	1110	0920	1345	1045		Acute	Chronic
Lab Log #:	508130	508131	508135	508140	508141	508139		Fresh	Fresh
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/Kg	**	(ug/L)	(ug/L)
VOA Compounds									
Chloromethane	10 U	10 U	16	10 U	10 U	10 U		11,000 *(a)	
Acetone	++	++	9 UJ	3 UJ	10 U	7 UJ			
Carbon Disulfide	5 U	5 U	5 U	5 U	5 U	2 J			
Chloroform	2 J	3 J	4 J	3 J	2 J	5 U		28,900 *	1,240 *
2-Butanone (MEK)	4 J	10 U	10 U	10 U	10 U	3 J			
1,1,1-Trichloroethane	3 J	5 U	5 U	5 U	5 U	5 U		18,000 *(c)	
Benzene	1 J	1 J	5 U	5 U	5 U	5 U		5,300 *	
Tetrachloroethene	2 J	3 J	5 J	5 U	5 U	5 U		5,280 *	840 *
Toluene	3 J	2 J	6 J	5 U	5 U	43 U		17,500 *	
Chlorobenzene	5 U	5 U	5 U	5 U	5 U	2 J		250 *(g)	50 *(g)
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	4 J		32,000 *	
Total Xylenes	5 U	5 U	5 U	5 U	5 U	22			

Location:	Inf-C	InfW-1	Eff-C	Eff-GC***	Sludge	EPA Water Quality Criteria Summary	
Type:	E-comp	grab	E-comp	grab-comp	grab		
Date:	12/10-11	12/10	12/10-11	12/10	12/11		
Time:	0800-0800	1110	0800-0800	1330	1045	Acute	Chronic
Lab Log #:	508132	508135	508142	508144	508139	Fresh	Fresh
	ug/L	ug/L	ug/L	ug/L	ug/L	(ug/L)	(ug/L)
BNA Compounds							
Phenol	10 U	10 J		10 U	120 U	10,200 *	2,560 *
Benzyl Alcohol	8 J	13 J		10 U	120 U		
4-Methylphenol	10 U	24		10 U	120 U		
Benzoic Acid	7 J	570 D		50 U	620 U		
Diethyl Phthalate	10 U	5 J		10 U	120 U	940 *(i)	3 *(i)
Butylbenzyl Phthalate	10 U	2 J		10 U	120 U	940 *(i)	3 *(i)
Bis(2-Ethylhexyl)Phthalate	7 U	8 J		10 U	380		
Pesticide/PCB Compounds							
gamma-BHC (Lindane)	0.046	0.3	0.068		4 U	2.0	0.08

Inf – plant influent
InfW – influent from west Mt. Vernon
grab – grab sample
comp – composite sample
C – Ecology composite sample
Eff – effluent
GC – Ecology grab-composite sample
Sludge – anaerobic digester sludge

++ apparent contamination from the cleaning of sampling equipment.

U – The analyte was not detected at or above the associated value.

J – The analyte was positively identified. The associated numerical value is an estimate.

UJ – The analyte was not detected at or above the reported result.

D – The result was derived from an analysis of a sample that required a secondary dilution.

E – Reported result is an estimate because of the presence of interference.

P – The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.

+ Metals criteria based on hardness = 75

* Insufficient data to develop criteria. Value presented is the LOEL – Lowest Observed Effect Level.

** dry weight basis

*** BNA analyzed from Eff-GC because Eff-C sample was lost in laboratory.

(a) total halomethanes
(c) total trichloroethanes
(g) total chlorinated benzenes (excluding dichlorobenzenes)
(i) total pthalate esters

NOTE: SOME INDIVIDUAL COMPOUND CRITERIA OR LOELS MAY NOT AGREE WITH GROUP CRITERIA OR LOELS. REFER TO APPROPRIATE EPA DOCUMENT ON AMBIENT WATER QUALITY CRITERIA FOR FULL DISCUSSION.

Table 4 – (cont'd) – Mount Vernon, December 1991.

Location:	Inf–C	InfW–1	Eff–C	Eff–GC***		Sludge		EPA Water Quality Criteria Summary			
Type:	E–comp	grab	E–comp	grab–comp		grab					
Date:	12/10–11	12/10	12/10–11	12/10		12/11					
Time:	0800–0800	1110	0800–0800	1330		1045		Acute		Chronic	
Lab Log #:	508132	508135	508142	508144		508139		Fresh		Fresh	
	ug/L	ug/L	ug/L	ug/L		mg/Kg	**				
Metals*											
Arsenic		2.1 P	1.9 P	1.9 P		2.19					
Pentavalent								850	*	48	*
Trivalent								360		190	
Beryllium		1 U	1 U	1 U		0.28 P		130	*	5.3	*
Cadmium		2 U	2 U	0.14 P		4.0		2.8	+	0.9	+
Chromium		5 U	5 U	5 U		46.2 E					
Hexavalent								16		11	
Trivalent								1,372	+	164	+
Copper		73.2	142	19		747		14	+	9	+
Lead		6.9	13.5	1 U		152 E		57	+	2.2	+
Mercury		0.073 P	0.060 P	0.050 U		0.13 J		2.4		0.012	
Nickel		6.7	6.2	4.3 P		53.3		1,112	+	124	+
Selenium		2 U	2 U	2 U		2.32		260		35	
Silver		12.2	0.5 U	0.63 P		18.4 E		2.5	+	0.12	
Zinc		66.1	157	38		738		92	+	83	+

** dry weight basis

industrial activities. The west Mount Vernon flow rate was low (0.04 MGD est.), accounting for less than 1% of the plant influent during the inspection.

Chloroform and lindane were the only priority pollutant (PP) organics detected in the plant effluent. Chloroform concentration in the effluent was well below EPA water quality criteria (Table 4; EPA, 1986). Lindane was the only pesticide/organic PP compound detected. The lindane influent concentration from west Mount Vernon was 6.5 times higher than the WTP influent concentration. The lindane effluent concentration was well below the acute water quality criteria and 85% of the chronic water quality criteria.

In the sludge sample, five VOA compounds (including acetone) were found in concentrations from 2 to 22 ug/Kg. No pesticide/PCB compounds were detected in the sludge sample. The BNA scan detected only bis(2-Ethylhexyl)phthalate was found at a concentration which was lower than the mean from the national sewage sludge survey (Table 5; EPA,1990).

A complete list of parameters analyzed and analytical results is included in Appendix E. Several tentatively identified compounds (TICs) were also detected in influent and sludge samples (Appendix F). No TICs were identified in the effluent samples.

Priority Pollutant Metals

A number of priority pollutant metals were detected. Arsenic, cadmium, copper, nickel, silver, and zinc were found in the effluent sample (Table 4). The effluent copper concentration exceeded the acute and chronic EPA freshwater water quality criteria (EPA, 1986). Effluent concentrations of silver exceeded the chronic freshwater criteria.

Several metals were detected in the sludge. Copper, lead, and nickel were found in concentrations slightly higher than the mean from the national sewage sludge survey (Table 5).

Bioassays

Bioassay organisms showed no acute toxicity in the plant effluent (Table 6). Microtox tests resulted in an EC_{50} greater than 100% effluent. *Daphnia magna,* fathead minnow, and rainbow trout tests resulted in LC_{50}s greater than 100% effluent. *Daphnia magna* showed no chronic effects. Fathead minnow tests showed chronic toxicity with a LOEC of 12.5% effluent.

Dye Study

A dye study was carried out to physically locate the WTP discharge and assure the discharge was into a well mixed portion of the river. The Mount Vernon WTP outfall into the Skagit River consists of a submerged pipe with no diffuser. After locating the discharge in the river with a small dose of dye, two more 250 ml doses of fluorescent red dye were released into the effluent channel of the chlorine contact basins.

Table 5 – Comparison of Detected Compounds in Digested Sludge with the National Sewage Sludge Survey+ – Mount Vernon, December 1991.

Parameter	Location: Sludge Type: grab Lab Log # 508139 (mg/Kg***)	Data from EPA Sludge Survey* Geometric Mean ** (mg/Kg***)	Geometric Mean + 1 S.D. (mg/Kg***)	Number of Samples	Percent Detected %
VOA COMPOUNDS					
(no survey compounds detected)					
BNA COMPOUNDS					
Bis(2-ethylhexyl) Phthalate	16.45	74.7	673	200	62
PESTICIDE/PCB					
(none detected)					
METALS					
Arsenic	2.19	9.93	28.7	199	80
Beryllium	0.28P	0.37	0.71	199	23
Cadmium	4.0	6.9	18.7	198	69
Chromium	46.2E	118.6	458	199	91
Copper	747	741.0	1703	199	100
Lead	152E	134.0	332	199	80
Mercury	0.13J	5.22	20.8	199	63
Nickel	53.3	42.7	137.5	199	66
Selenium	2.32	5.16	12.5	199	65
Zinc	738	1202	2756	199	100

\+ EPA 1990. National Sewage Sludge Survey, Federal Register, 40 CFR Part 503, Vol. 55, No. 218.
* Geometric mean and standard deviation are exponential conversions of arithmetic mean and standard deviation for log-normal distributions and were derived utilizing the Method of Maximum Likelihood.
** In general, concentrations are a weighted combination of flow rate group estimates.
*** dry weight basis
Weighted combination of only two flow groups: flow ≥ 100 MGD and 10 < flow < 100+ MGD
++ Estimate from one flow group: 1<flow<10 MGD

J – The analyte was positively identified. The associated numerical value is an estimate.
P – The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.
E – Reported result is an estimate because of the presence of interference.

Table 6 – Effluent Bioassay Results – Mount Vernon, December 1991.

All tests on sample 508144 - Effluent Grab Composite Sample

Microtox

	EC50 (% effluent)	
Sample No.	5 minutes	15 minutes
508144	>100%	>100%

Daphnia magna - 7 day survival and reproduction test
(Daphnia magna)

Sample No. 508144

%effluent	# Tested*	# young produced	% survival
0	10	206	100
6.25	10	251	100
12.5	10	272	100
25	10	255	96
50	10	286	100
100	10	263	100

Chronic
NOEC= 100% effluent

Acute
LC50= >100% effluent

* 10 replicates per concentration, 1 organism per replicate

Fathead Minnow - 7 day survival and growth test
(Pimephales promelas)

Sample 508144

Sample Conc.	# Tested *	Percent Survival	Average Fish Weight (mg)
Control	30	96.7	0.21
6.25 % Effluent	30	100	0.17
12.5 % Effluent	30	96.7	0.12
25 % Effluent	31	90.3	0.14
50 % Effluent	30	93.3	0.11
100 % Effluent	30	96.7	0.12

Acute
LC50 = >100 % effluent

Chronic
NOEC = 6.25 % effluent
LOEC = 12.5 % effluent

* five replicates of 6 organisms

Table 6 – Continued – Mount Vernon, December 1991.

Rainbow Trout – 96 hour survival test
(Oncorhynchus mykiss)

Sample No. 508144

% Effluent	# Tested*	Percent Survival
0	30	100
3.13	30	100
6.25	30	100
12.5	30	100
25	30	100
50	30	100
100	30	100

* 3 replicates of 10 per replicate

NOEC – no observable effects concentration
LOEC – lowest observable effects concentration
LC50 – lethal concentration for 50% of the organisms
EC50 – effect concentration for 50% of the organisms

The dye was observed in the river near the bank approximately three minutes after release. The discharge was located at a point across the field from the solids handling building, 10 feet from the bank of the river. The dye moved downstream near the bank, but with no eddies or pockets of dye remaining along the bank. The dye completely dispersed within 20 to 30 yards downstream. The plant flow rate at the time of the dye study was measured on the plant flow meter to be 5.3 MGD. River flow on the day of the dye study was 22,700 cfs (USGS, 1992). Photographs were taken to document dispersion patterns and provided to Ecology NWRO. Based on these observations, it appears that the effluent was quickly diluted. A computer simulation of dispersal would be useful to confirm that dilution was adequate.

RECOMMENDATIONS AND CONCLUSIONS

Flow Measurements

Plant flow rate was not verified by Ecology. Flow is measured with in-line meters which do not lend themselves to verification by Ecology. There was a consistent discrepancy between influent and effluent flow meter readings.

- Since the effluent meter is intended as a back-up for the influent meter, recalibration to assure accurate measurement is recommended.

Plant staff suspect the Parshall flume for recycle flow is undersized and is therefore outside of its operating range a portion of the time. The west Mount Vernon flow meter was not functioning during the inspection.

- It is recommended that the west Mount Vernon influent meter be repaired.

NPDES Permit Compliance/General Chemistry

The WTP was performing well during the inspection. The conventional parameters of BOD_5, TSS, and fecal coliform indicate a well-treated, high quality effluent. The effluent met permit limits for BOD_5, TSS, fecal coliforms, and pH.

A comparison of influent ammonia and nitrate-nitrite concentrations indicates that the WTP was achieving partial nitrification at the time of the inspection. The alkalinity in the effluent was somewhat low.

- pH and alkalinity should be monitored and evaluated to assure that they do not inhibit biochemical reactions.

Split Sample Comparison

Samples of influent and effluent collected by Mount Vernon appeared to yield slightly lower BOD_5 and TSS results than those collected by Ecology samples. Analyses by Mount Vernon

appeared to yield BOD_5 and TSS results slightly lower than Ecology results from the same sample. The differences were not significant, however, so sampling and laboratory analysis are generally acceptable.

- Mount Vernon has been reporting daily measurements of influent and effluent pH from composite samples. Plant personnel should collect and analyze grab samples as required by the permit.

Priority Pollutant and Other Organics

Several organic priority pollutants were detected in the samples collected. Benzoic acid, a non-priority pollutant organic, was found in the west Mount Vernon influent sample (570 μg/L). Chloroform and lindane were the priority pollutant organics detected in the plant effluent.

In the sludge sample, chlorobenzene (2 ug/Kg est.), ethylbenzene (4 ug/Kg est.), and bis(2-Ethylhexyl)phthalate (380 μg/L) were the priority pollutant organics detected. Three non-priority pollutant organics were detected in the sludge sample at concentrations from 2 to 22 ug/Kg.

Priority Pollutant Metals

A number of priority pollutant metals were detected in the influent sample. Of these, arsenic, cadmium, copper, nickel, silver, and zinc were found in the effluent sample. Effluent concentrations of copper exceeded the acute and chronic EPA freshwater water quality criteria. Effluent concentrations of silver exceeded the chronic freshwater criteria by about four times. Copper, lead, and nickel were found in the sludge at concentrations slightly higher than the mean from the national sewage sludge survey.

Bioassays

No acute toxicity in the plant effluent was observed with Microtox, *Daphnia magna,* fathead minnow, and rainbow trout tests. While *Daphnia magna* tests showed no chronic effects, fathead minnow tests indicated chronic toxicity (LOEC of 12.5% effluent.)

Dye Study

The Mount Vernon WTP outfall into the Skagit River consists of a submerged pipe with no diffuser. Dye appeared in the river near the bank after release. The dye traveled downstream near the bank and completely dispersed within 20 to 30 yards downstream.

REFERENCES

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APPENDICES

Appendix A - Sampling Station Descriptions - Mount Vernon WTP, December 1991.

Ecology influent samples (Inf)

The grab and composite samples were collected just upstream of the bar screen. The sample included plant influent combined with in plant return flows. The composite sample intake was checked for rag accumulations and cleaned as necessary.

Mount Vernon composite influent sample (Inf-M)

The sample intake was permanently mounted in the influent manhole, upstream of return flow. The intake is located off the bottom of the pipe.

Influent from west Mount Vernon (InfW)

The sample was collected from flow falling from the culvert pipe into the wet well of the west Mount Vernon pump station.

Aeration basin (Aer)

Samples were collected from the walkway near the aeration basin outlet in a well-mixed zone.

In plant return flow (Ret-M)

The sample intake was permanently mounted in the return flow manhole. The location is just upstream of the point where the return flow joins the influent flow. The sampling intake is located off of the bottom of the pipe.

Return flow includes supernatant from the supernatant tank and sludge thickener, skimmings from the secondary clarifiers and chlorination basins, filtrate from the belt filter press (not in use during the inspection), and miscellaneous in-plant wastes.

Ecology effluent samples (Eff)

The composite sample was collected from the chlorine contact basin outlet channel at the upstream edge of the east basin overflow weir. The intake was positioned several inches from the bottom and side of the channel. The grab samples were collected as flow fell over the east basin overflow weir.

Effluent sampled by Mount Vernon (Eff-M)

The sampler intake was permanently mounted just upstream of the effluent weir where effluent falls into the outfall line.

Sludge

Sludge from the primary anaerobic digester was sampled from a line tap in the digester complex building.

Appendix B – Sampling Schedule – Mount Vernon, December 1991.

Parameter	Location:	Inf-1	Inf-2	Inf-C	Inf-M	Ret-M	InfW-1	Aer-1	Aer-2
	Type:	grab	grab	E-comp	M-comp	M-comp	grab	grab	grab
	Date:	12/10	12/10	12/10-11	12/10-11	12/10-11	12/10	12/10	12/10
	Time:	1150	1435	0800-0800	0800-0800	0800-0800	1110	1005	1345
	Lab Log #:	508130	508131	508132	508133	508134	508135	508137	508138
GENERAL CHEMISTRY									
Conductivity		E	E	E	E		E		
Alkalinity				E	E				
Hardness				E	E				
TS				E	E	E	E		
TNVS				E	E	E	E		
TSS		E	E	EM	EM	EM	E	E	E
TNVSS				E	E	E	E	E	E
% Solids									
% Volatile Solids									
BOD5				EM	EM	E			
BOD INH									
COD		E	E	E	E	E	E		
TOC (water)		E	E	E	E	E	E		
TOC (soil)									
NH3-N		E	E	E	E	E	E		
NO2+NO3-N		E	E	E	E	E	E		
Phosphorous-Total		E	E	E	E	E	E		
Total Persulfate N (TPN)									
F-Coliform MF									
F-Coliform (sediment)									
T-Coliform (sediment)									
ORGANICS									
VOC (water)		E	E				E		
VOC (soil)									
BNAs (water)				E			E		
BNAs (soil)									
Pest/PCB (water)				E			E		
Pest/PCB (soil)									
METALS									
PP Metals				E			E		
BIOASSAYS									
Salmonid (acute series)									
Microtox (acute)									
Ceriodaphnia (chronic)									
Fathead Minnow (chronic)									
FIELD OBSERVATIONS									
Temp		E	E				E		
Temp-cooled				E	E	E			
pH		E	E	E	E	E	E		
Conductivity		E	E	E	E	E	E		
Chlorine Residual									
Total									
Free									

E-comp – composite sample collected by Ecology
M-comp – composite sample collected by Mt. Vernon
E – Ecology laboratory analysis
M – Mt. Vernon laboratory analysis
grab – grab sample
comp – composite sample

Inf – influent
Ret – return flow from within plant
InfW – influent from west Mount Vernon
Aer – aeration basin
Eff – final effluent
Sludge – sludge from anaerobic digester

Appendix B – Cont'd – Mount Vernon, December 1991.

Parameter	Locatn:	Eff–1	Eff–2	Eff–C	Eff–M	Eff–GC	Eff–3	Eff–4	Sludge
	Type:	grab	grab	E–comp	M–comp	grab–comp	grab	grab	grab
	Date:	12/10	12/10	12/10–11	12/10–11	12/10	12/11	12/11	12/11
	Time:	0920	1325	0800–0800	0800–0800	*	0905	1110	1045
	Lab Log #:	508140	508141	508142	508143	508144	508145	508146	508139 & 47
GENERAL CHEMISTRY									
Conductivity		E	E	E	E	E			
Alkalinity				E	E	E			
Hardness				E	E	E			
TS									
TNVS									
TSS		E	E	EM	EM	E			
TNVSS									
% Solids									E
% Volatile Solids									E
BOD5				EM	EM				
BOD INH				E	E				
COD		E	E	E	E				
TOC (water)		E	E	E	E				
TOC (soil)									E
NH3–N									
NO2+NO3–N									
Phosphorous–Total									
Total Persulfate N (TPN)									E
F–Coliform MF							EM	E	
F–Coliform (sediment)									E
T–Coliform (sediment)									E
ORGANICS									
VOC (water)		E	E						
VOC (soil)									E
BNAs (water)				E					
BNAs (soil)									E
Pest/PCB (water)				E					
Pest/PCB (soil)									E
METALS									
PP Metals				E					E
BIOASSAYS									
Salmonid (acute series)				E					
Microtox (acute)				E					
Ceriodaphnia (chronic)				E					
Fathead Minnow (chronic)				E					
FIELD OBSERVATIONS									
Temp		E	E				E		E
Temp–cooled				E	E				
pH		E	E	E	E		E		E
Conductivity		E	E	E	E		E		
Chlorine Residual									
	Total	E	E				EM	E	
	Free	E	E				E	E	

* grab composite sample collected as two equal volumes at 1150 and 1435 on 12/10

Appendix C – Ecology Analytical Methods – Mount Vernon, December 1991.

Laboratory Analysis	Method Used for Ecology Analysis	Laboratory Performing Analysis
Conductivity	EPA, Revised 1983: 120.1	Manchester
pH	EPA, Revised 1983: 150.1	Sound An. Serv.
Alkalinity	EPA, Revised 1983: 310.1	Manchester
Hardness	EPA, Revised 1983: 130.2	Manchester
TS	EPA, Revised 1983: 160.3	Manchester
TNVS	EPA, Revised 1983: 160.3	Manchester
TSS	EPA, Revised 1983: 160.2	Manchester
TNVSS	EPA, Revised 1983: 160.2	Manchester
% Solids	APHA, 1989: 2540G	Sound An. Serv.
% Volatile Solids	EPA, Revised 1983: 160.4	Sound An. Serv.
BOD5	EPA, Revised 1983: 405.1	Manchester
BOD INH	EPA, Revised 1983: 405.1	Water Mngmt Labs
COD	EPA, Revised 1983: 410.1	Sound An. Serv.
TOC (water)	EPA, Revised 1983: 415.1	Manchester
TOC (soil)	EPA, Revised 1983: 415.1	Sound An. Serv.
NH3-N	EPA, Revised 1983: 350.1	Manchester
NO2+NO3-N	EPA, Revised 1983: 353.2	Manchester
Total-P	EPA, Revised 1983: 365.3	Manchester
Total Persulfate N (TPN)	EPA, Revised 1983: 351.3	Sound An. Serv.
F-Coliform MF	APHA, 1989: 9222D	Manchester
Fecal Coliform (sediment)	APHA, 1989:9221A/9221C	Manchester
Total Coliform (sediment)	APHA, 1989:9221A/9221	Manchester
VOC (water)	EPA-SW846, 1986:8260	Pac. NW Env. Lab
VOC (soil)	EPA-SW846, 1986:8240	Pac. NW Env. Lab
BNAs (water)	EPA-SW846, 1986:8270	Pac. NW Env. Lab
Pest/PCB (water)	EPA-SW846,1986:8080	Pac. NW Env. Lab
Pest/PCB (soil)	EPA-SW846,1986:8080	Pac. NW Env. Lab
PP Metals	EPA, Revised 1983:200-299	Manchester
Salmonid (acute series)	Ecology, 1981:80-12	Manchester
Microtox (acute)	Beckman, 1982	Manchester
Daphnia magna (chronic)	EPA,1987	Manchester
Fathead Minnow (chronic)	EPA, 1989	Manchester

Manchester - Ecology Manchester Laboratory
Sound An. Serv. - Sound Analytical Services, Inc.
Pac. NW Env. Lab - Pacific Northwest Environmental Laboratory, Inc.
Water Mngmt Labs - Water Managment Laboratories Inc.

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Appendix D - Priority Pollutant Cleaning Procedures - Mount Vernon, December 1991.

PRIORITY POLLUTANT SAMPLING EQUIPMENT CLEANING PROCEDURES

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO_3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity methylene chloride
6. Rinse with high purity acetone
7. Allow to dry and seal with aluminum foil

Appendix E – VOA, BNA, Pesticide/PCB and Metals Scan Results – Mount Vernon, December 1991.

Location:	Inf–1	Inf–2	InfW–1	Eff–1	Eff–2	Sludge
Type:	grab	grab	grab	grab	grab	grab
Date:	12/10	12/10	12/10	12/10	12/10	12/11
Time:	1150	1435	1110	0920	1345	1045
Lab Log #:	508130	508131	508135	508140	508141	508139
VOA Compounds	ug/L	ug/L	ug/L	ug/L	ug/L	ug/Kg*
Chloromethane	10 U	10 U	16	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	5 U	5 U	5 U	5 U	5 U	2 UJ
Acetone	43 J	34 J	9 UJ	3 UJ	10 U	7 UJ
Carbon Disulfide	5 U	5 U	5 U	5 U	5 U	2 J
1,1–Dichloroethene	5 U	5 U	5 U	5 U	5 U	5 U
1,1–Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U
trans–1,2–Dichloroethene	5 U	5 U	5 U	5 U	5 U	5 U
cis–1,2–Dichloroethene	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	2 J	3 J	4 J	3 J	2 J	5 U
1,2–Dichloroethane	5 U	5 U	5 U	5 U	5 U	5 U
2–Butanone (MEK)	4 J	10 U	10 U	10 U	10 U	3 J
1,1,1–Trichloroethane	3 J	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Acetate	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	5 U	5 U	5 U	5 U	5 U	5 U
1,2–Dichloropropane	5 U	5 U	5 U	5 U	5 U	5 U
cis–1,3–Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2–Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	1 J	1 J	5 U	5 U	5 U	5 U
trans–1,3–Dichloropropene	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	5 U	5 U	5 U	5 U	5 U	5 U
4–Methyl–2–Pentanone (MIBK)	10 U	10 U	10 U	10 U	10 U	10 U
2–Hexanone	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	2 J	3 J	5 J	5 U	5 U	5 U
1,1,2,2–Tetrachloroethane	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	3 J	2 J	6 J	5 U	5 U	43 U
Chlorobenzene	5 U	5 U	5 U	5 U	5 U	2 J
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	4 J
Styrene	5 U	5 U	5 U	5 U	5 U	5 U
Total Xylenes	5 U	5 U	5 U	5 U	5 U	22

U – The analyte was not detected at or above the associated value.

J – The analyte was positively identified. The associated numerical value is an estimate.

UJ – The analyte was not detected at or above the associated estimated value.

D – The result was derived from an analysis of a sample that required a secondary dilution.

E – Reported result is an estimate because of the presence of interference.

P – The analyte was detected above the instrument detection limit but below the established minimum quantitation limit.

N – The spike sample recovery is not within control limits.

E–comp – Department of Ecology composite samp
GC – Department of Ecology grab composite sample
grab – grab sample
comp – composite sample
Inf – influent
InfW – influent from west Mount Vernon
Sludge – sludge from anaerobic digester
Eff – final effluent

* dry weight basis

Appendix E_ (cont'd) – Mount Vernon, December 1991.

Location:	Inf-C	InfW-1	Eff-GC	Sludge
Type:	E-comp	grab	grab-comp	grab
Date:	12/10-11	12/10	12/10	12/11
Time:	0800-0800	1110	1330	1045
Lab Log#:	508132	508135	508144	508139
BNA Compounds	ug/L	ug/L	ug/L	ug/L
Phenol	10 U	10 J	10 U	120 U
Bis(2-Chloroethyl)Ether	10 U	10 U	10 U	120 U
2-Chlorophenol	10 U	10 U	10 U	120 U
1,3-Dichlorobenzene	10 U	10 U	10 U	120 U
1,4-Dichlorobenzene	10 U	10 U	10 U	120 U
Benzyl Alcohol	8 J	13 J	10 U	120 U
1,2-Dichlorobenzene	10 U	10 U	10 U	120 U
2-Methylphenol	10 U	10 U	10 U	120 U
Bis(2-Chloroisopropyl)Ether	10 U	10 U	10 U	120 U
4-Methylphenol	10 U	24	10 U	120 U
N-Nitroso-di-n-Propylamine	10 U	10 U	10 U	120 U
Hexachloroethane	10 U	10 U	10 U	120 U
Nitrobenzene	10 U	10 U	10 U	120 U
Isophorone	10 U	10 U	10 U	120 U
2-Nitrophenol	10 U	10 U	10 U	120 U
2,4-Dimethylphenol	10 U	10 U	10 U	120 U
Benzoic Acid	7 J	570 D	50 U	620 U
Bis(2-Chloroethoxy)Methane	10 U	10 U	10 U	120 U
2,4-Dichlorophenol	10 U	10 U	10 U	120 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	120 U
Naphthalene	10 U	10 U	10 U	120 U
4-Chloroaniline	10 U	10 U	10 U	120 U
Hexachlorobutadiene	10 U	10 U	10 U	120 U
4-Chloro-3-Methylphenol	10 U	10 U	10 U	120 U
2-Methylnaphthalene	10 U	10 U	10 U	120 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	120 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	120 U
2,4,5-Trichlorophenol	50 U	50 U	50 U	620 U
2-Chloronaphthalene	10 U	10 U	10 U	120 U
2-Nitroaniline	50 U	50 U	50 U	620 U
Dimethyl Phthalate	10 U	10 U	10 U	120 U
Acenaphthylene	10 U	10 U	10 U	120 U
2,6-Dinitrotoluene	10 U	10 U	10 U	120 U
3-Nitroaniline	50 U	50 U	50 U	620 U
Acenaphthene	10 U	10 U	10 U	120 U
2,4-Dinitrophenol	50 U	50 U	50 U	620 U
4-Nitrophenol	50 U	50 U	50 U	620 U
Dibenzofuran	10 U	10 U	10 U	120 U
2,4-Dinitrotoluene	10 U	10 U	10 U	120 U
Diethyl Phthalate	10 U	5 J	10 U	120 U
4-Chlorophenyl Phenylether	10 U	10 U	10 U	120 U
Fluorene	10 U	10 U	10 U	120 U
4-Nitroaniline	50 U	50 U	50 U	620 U
4,6-Dinitro-2-Methylphenol	50 U	50 U	50 U	620 U
N-Nitrosodiphenylamine	10 U	10 U	10 U	120 U
4-Bromophenyl Phenylether	10 U	10 U	10 U	120 U
Hexachlorobenzene	10 U	10 U	10 U	120 U
Pentachlorophenol	50 U	50 U	50 U	620 U

Appendix E (cont'd) – Mount Vernon, December 1991.

Location:	Inf-C	InfW-1	Eff-GC	Sludge
Type:	E-comp	grab	grab-comp	grab
Date:	12/10-11	12/10	12/10	12/11
Time:	0800-0800	1110	1330	1045
Lab Log#:	508132	508135	508144	508139
BNA Compounds (cont'd)	ug/L	ug/L	ug/L	ug/L
Phenanthrene	10 U	10 U	10 U	120 U
Anthracene	10 U	10 U	10 U	120 U
Di-n-Butyl Phthalate	10 U	10 U	10 U	120 U
Fluoranthene	10 U	10 U	10 U	120 U
Pyrene	10 U	10 U	10 U	120 U
Butylbenzyl Phthalate	10 U	2 J	10 U	120 U
3,3'-Dichlorobenzidine	20 U	20 U	20 U	250 U
Benzo(a)Anthracene	10 U	10 U	10 U	120 U
Chrysene	10 U	10 U	10 U	120 U
Bis(2-Ethylhexyl)Phthalate	7 U	8 J	10 U	380
Di-n-Octyl Phthalate	10 U	10 U	10 U	120 U
Benzo(b)Fluoranthene	10 U	10 U	10 U	120 U
Benzo(k)Fluoranthene	10 U	10 U	10 U	120 U
Benzo(a)Pyrene	10 U	10 U	10 U	120 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U	120 U
Dibenzo(a,h)Anthracene	10 U	10 U	10 U	120 U
Benzo(g,h,i)Perylene	10 U	10 U	10 U	120 U

Appendix E (cont'd) – Mount Vernon, December 1991.

Location:	Inf-C	InfW-1	Eff-C	Sludge
Type:	E-comp	grab	E-comp	grab
Date:	12/10-11	12/10	12/10-11	12/11
Time:	0800-0800	1110	0800-0800	1045
Lab Log#:	508132	508135	508142	508139
Pesticide/PCB Compounds	ug/L	ug/L	ug/L	ug/L
alpha-BHC	0.03 U	0.03 U	0.03 U	3 U
beta-BHC	0.06 U	0.06 U	0.06 U	6 U
delta-BHC	0.09 U	0.09 U	0.09 U	9 U
gamma-BHC (Lindane)	0.046	0.3	0.068	4 U
Heptachlor	0.03 U	0.03 U	0.03 U	3 U
Aldrin	0.40 U	0.04 U	0.40 U	4 U
Heptachlor Epoxide	0.83 U	0.83 U	0.83 U	83 U
Endosulfan I	0.14 U	0.14 U	0.14 U	14 U
Dieldrin	0.02 U	0.02 U	0.02 U	2 U
4,4'-DDE	0.04 U	0.04 U	0.04 U	4 U
Endrin	0.06 U	0.06 U	0.06 U	6 U
Endosulfan II	0.04 U	0.04 U	0.04 U	4 U
4,4'-DDD	0.11 U	0.11 U	0.11 U	11 U
Endosulfan Sulfate	0.66 U	0.66 U	0.66 U	66 U
4,4'-DDT	0.12 U	0.12 U	0.12 U	12 U
Methoxychlor	1.8 U	1.8 U	1.8 U	180 U
Endrin Aldehyde	0.23 U	0.23 U	0.23 U	23 U
Chlordane	0.14 U	0.14 U	0.14 U	14 U
Toxaphene	2.4 U	2.4 U	2.4 U	240 U
Aroclor-1016	0.65 U	0.65 U	0.65 U	65 U
Aroclor-1221	1.3 U	1.3 U	1.3 U	130 U
Aroclor-1232	0.65 U	0.65 U	0.65 U	65 U
Aroclor-1242	0.65 U	0.65 U	0.65 U	65 U
Aroclor-1248	0.65 U	0.65 U	0.65 U	65 U
Aroclor-1254	0.65 U	0.65 U	0.65 U	65 U
Aroclor-1260	0.65 U	0.65 U	0.65 U	65 U

Location:	Inf-C	InfW-1	Eff-C	Sludge-1
Type:	E-comp	grab	E-comp	grab
Date:	12/10-11	12/10	12/10-11	12/11
Time:	0800-0800	1110	0800-0800	1045
Lab Log#:	508132	508135	508142	508139
Metals Hardness = 100	ug/L	ug/L	ug/L	mg/Kg
Antimony	30 U	30 U	30 U	3.0 UN
Arsenic	2.1 P	1.9 P	1.9 P	2.19
Beryllium	1.0 U	1.0 U	1 U	0.28 P
Cadmium	2.0 U	2.0 U	0.14 P	4.0
Chromium	5 U	5.0 U	5.0 U	46.2 E
Copper	73.2	142	19	747
Lead	6.9	13.5	1.0 U	152 E
Mercury	0.073 P	0.060 P	0.050 U	0.13 J
Nickel	6.7	6.2	4.3 P	53.3
Selenium	2.0 U	2.0 U	2.0 U	2.32
Silver	12.2	0.50 U	0.63 P	18.4 E
Thallium	2.5 U	2.5 U	2.5 U	0.25 U
Zinc	66.1	157	38	738

Appendix F – VOA and BNA Scan Tentatively Identified Compounds (TICs) – Mount Vernon, December 1991.

TIC data are presented on the laboratory report sheets that follow.
Locations corresponding to the Lab Log# (appearing in a box on the laboratory report sheet) and data qualifiers are summarized on this page.

Location:	Inf-1	Inf-2	Inf-C	InfW-1	Sludge
Type:	grab	grab	E-comp	grab	grab
Date:	12/10	12/10	12/10-11	12/10	12/11
Time:	2250	1435	0800-0800	1110	1045
Lab Log#:	508130	508131	508132	508135	508139

NJ – indicates there is evidence the analyte is present. The associated numerical value is an estimate.
Inf – influent
InfW – influent from west Mount Vernon
Sludge – sludge from anaerobic digester
Eff – final effluent
GC – grab-composite sample
E-comp – Ecology composite sample

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
508130

Lab Name: PNELI_____ Contract: 22890905596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) WATER_ Lab Sample ID: 3802-04_____

Sample wt/vol: __5.0 (g/mL) ML__ Lab File ID: A9563_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ____ Date Analyzed: 12/16/91

Column (pack/cap) CAP___ Dilution Factor: 1.0_____

Number TICs found: __2

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN TERPENE	14.39	27	J NJ
2.		UNKNOWN TERPENE	15.62	3.0	J J

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
508131

Lab Name: PNELI_____ Contract: 22890905596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) WATER_ Lab Sample ID: 3802-05_____

Sample wt/vol: __5.0 (g/mL) ML__ Lab File ID: A9564_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ____ Date Analyzed: 12/16/91

Column (pack/cap) CAP___ Dilution Factor: 1.0_____

Number TICs found: __3

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN ALKANE	13.54	4.0	J
2.		UNKNOWN TERPENE	14.39	20	J
3.		UNKNOWN ALKANE	15.64	6.0	J

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
508132

Lab Name: PNELI_____ Contract: 22890905596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) WATER_ Lab Sample ID: 3802-07_____

Sample wt/vol: 1000_ (g/mL) ML__ Lab File ID: D3428_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ____ dec. ____ Date Extracted: 12/16/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 01/03/92

GPC Cleanup: (Y/N) N__ pH: _____ Dilution Factor: 1.0_____

Number TICs found: _22

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	6.10	40	J
2.		UNKNOWN	10.22	24	J
3.		UNKNOWN	11.15	18	J
4.		UNKNOWN FATTY ACID	16.35	20	J
5.		UNKNOWN FATTY ACID	18.82	64	J
6.		UNKNOWN	19.07	14	J
7.		UNKNOWN FATTY ACID	19.92	14	J
8.	58082	Caffeine (8CI)	20.05	28	J
9.		UNKNOWN	20.22	20	J
10.		UNKNOWN	20.89	130	J
11.		UNKNOWN FATTY ACID	21.15	760	J
12.		UNKNOWN FATTY ACID	22.07	12	J
13.		UNKNOWN CYCLOALKANE	22.37	12	J
14.		UNKNOWN FATTY ACID	22.99	820	J
15.		UNKNOWN FATTY ACID	23.19	480	J
16.		UNKNOWN FATTY ACID	23.34	36	J
17.		UNKNOWN	28.86	48	J
18.	80977	Cholestanol (VAN)	31.92	94	J
19.	57885	Cholesterol (8CI)	32.41	84	J
20.		UNKNOWN	33.26	10	J
21.		UNKNOWN	34.82	26	J
22.		UNKNOWN	9.54	28	J

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

508135

Lab Name: PNELI_____ Contract: 22890905596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) WATER_ Lab Sample ID: 3802-06_____

Sample wt/vol: __5.0 (g/mL) ML__ Lab File ID: A9565_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ____ Date Analyzed: 12/16/91

Column (pack/cap) CAP___ Dilution Factor: 1.0_____

Number TICs found: __1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN TERPENE	14.39	7.0	JNT

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.: 508135

Lab Name: PNELI_____ Contract: 22890905596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) WATER_ Lab Sample ID: 3802-06_____

Sample wt/vol: 1000_ (g/mL) ML__ Lab File ID: D3431_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ____ dec. ____ Date Extracted: 12/16/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 01/03/92

GPC Cleanup: (Y/N) N__ pH: _____ Dilution Factor: 1.0_____

Number TICs found: _21

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L_

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	107926	Butanoic acid (9CI)	4.62	200	NJ
2.		UNKNOWN	5.32	62	J
3.		UNKNOWN	6.12	180	J
4.	103822	BENZENEACETIC ACID	12.17	120	J
5.		UNKNOWN FATTY ACID	16.44	130	J
6.		UNKNOWN FATTY ACID	18.89	220	J
7.		UNKNOWN FATTY ACID	19.97	58	J
8.	58082	Caffeine (8CI)	20.09	70	J
9.		UNKNOWN	20.20	66	J
10.		UNKNOWN	20.90	62	J
11.		UNKNOWN FATTY ACID	21.27	2000	J
12.		UNKNOWN FATTY ACID	22.10	48	J
13.		UNKNOWN	22.69	46	J
14.		UNKNOWN	23.14	2800	J
15.		UNKNOWN FATTY ACID	23.34	1400	J
16.		UNKNOWN	28.87	110	J
17.	80977	Cholestanol (VAN)	31.97	460	J
18.	57885	Cholesterol (8CI)	32.46	280	J
19.		UNKNOWN	33.29	48	J
20.		UNKNOWN	34.72	110	J
21.		UNKNOWN	35.39	54	J

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

508139

Lab Name: PNELI_____ Contract: 22890905596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) SOIL__ Lab Sample ID: 3802-01_____

Sample wt/vol: __5.0 (g/mL) G___ Lab File ID: A9595_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ___0 Date Analyzed: 12/19/91

Column (pack/cap) CAP___ Dilution Factor: 1.0_____

Number TICs found: _12

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN ALKYLCYCLOHEXANE	12.22	65	J
2.		UNKNOWN ALKANE	12.92	120	J
3.		UNKNOWN	13.49	75	J
4.		UNKNOWN ALKANE	13.77	320	J
5.		UNKNOWN C3-ALKYLBENZENE	14.09	100	J
6.		UNKNOWN ALKANE	14.60	140	J
7.	91178	Naphthalene, decahydro-,	15.14	63	J
8.		UNKNOWN ALKANE	15.85	180	J
9.		UNKNOWN	16.65	76	J
10.		UNKNOWN ALKANE	17.77	140	J
11.		UNKNOWN ALKANE	19.07	86	J
12.		UNKNOWN ALKANE	19.54	100	J

1F

EPA SAMPLE NO.

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

508139RE

Lab Name: PNELI_____ Contract: 22890905596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) WATER_ Lab Sample ID: 3802-01RE____

Sample wt/vol: _30.0 (g/mL) ML__ Lab File ID: D3440_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ____ dec. ____ Date Extracted: 12/16/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 01/06/92

GPC Cleanup: (Y/N) N__ pH: _____ Dilution Factor: 1.0_____

Number TICs found: _21

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	18.25	420	J
2.		UNKNOWN ALKYLPHENOL	18.37	380	J
3.		UNKNOWN ALKYLPHENOL	18.45	550	J
4.		UNKNOWN ALKYLPHENOL	18.54	420	J
5.		UNKNOWN ALKYLPHENOL	18.85	720	J
6.		UNKNOWN ALKYLPHENOL	18.92	520	J
7.		UNKNOWN FATTY ACID	21.17	4800	J
8.		UNKNOWN	22.60	420	J
9.		UNKNOWN FATTY ACID	22.97	2000	J
10.		UNKNOWN FATTY ACID	23.15	950	J
11.		UNKNOWN ALKANE	27.77	350	J
12.		UNKNOWN	28.42	400	J
13.		UNKNOWN	28.92	500	J
14.		UNKNOWN ALKANE	29.39	680	J
15.	80977	Cholestanol (VAN)	32.02	6200	J
16.		UNKNOWN	32.56	5200	J
17.		UNKNOWN	32.69	720	J
18.		UNKNOWN	33.17	380	J
19.		UNKNOWN	34.01	850	J
20.		UNKNOWN	34.81	1600	J
21.		UNKNOWN	35.47	1300	J

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.
508139

Lab Name: PNELI_____ Contract: 2289090596

Lab Code: PNELI__ Case No.: 3802__ SAS No.: _____ SDG No.: 508130

Matrix: (soil/water) WATER_ Lab Sample ID: 3802-01_____

Sample wt/vol: _80.0 (g/mL) ML__ Lab File ID: D3432_____

Level: (low/med) LOW___ Date Received: 12/13/91

% Moisture: not dec. ____ dec. ____ Date Extracted: 12/16/91

Extraction: (SepF/Cont/Sonc) CONT Date Analyzed: 01/03/92

GPC Cleanup: (Y/N) N__ pH: _____ Dilution Factor: 1.0_____

Number TICs found: _21

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L_

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	15.99	480	J
2.		UNKNOWN	18.20	420	J
3.	25154523	Phenol, nonyl- (8CI9CI)	18.39	520	J
4.		UNKNOWN	18.79	750	J
5.		UNKNOWN ALKYLPHENOL	18.85	420	J
6.	57103	Hexadecanoic acid (9CI)	21.12	5000	J
7.		UNKNOWN	22.55	450	J
8.		UNKNOWN FATTY ACID	22.92	1100	J
9.		UNKNOWN	22.97	1100	J
10.		UNKNOWN FATTY ACID	23.12	1300	J
11.		UNKNOWN ALKANE	27.72	450	J
12.		UNKNOWN	28.37	400	J
13.		UNKNOWN	28.87	450	J
14.		UNKNOWN ALKANE	29.34	680	J
15.	80977	CHOLESTANOL	31.97	6000	J
16.		UNKNOWN	32.19	550	J
17.		UNKNOWN	32.52	5200	J
18.		UNKNOWN	33.37	820	J
19.		UNKNOWN	33.97	900	J
20.		UNKNOWN	34.74	1700	J
21.		UNKNOWN	35.44	1300	J