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ALUMINUM COMPANY OF AMERICA (ALCOA)
CLASS II INSPECTION, JANUARY 1990

by
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Water Body No. WA-CR-1010
(Segment No. 26-WRIA-99)

December 1990

ABSTRACT

Ecology conducted a Class II Inspection at the Aluminum Company of America (Alcoa) operations near Vancouver, Washington, on January 28-31, 1990. All industrial effluent loadings were less than the daily maximum permit limits except oil and grease and benzo(a)pyrene. Effluent biochemical oxygen demand (BOD) and total suspended solids (TSS) concentrations were less than the sanitary effluent permit limits. Residual chlorine was greater than the permit limit in one grab sample. No acute or chronic toxicity was indicated in the industrial effluent (001) by rainbow trout, Microtox, *Daphnia magna*, or fathead minnow. Analysis results for the Near Outfall sample showed a relatively clean sediment. No acute toxicity was indicated by *Hyalella azteca* in the Near Outfall sediment sample. Lab results for permitted parameters compared well between Alcoa and Ecology although significant deficiencies were found in the laboratory review.

INTRODUCTION

The Washington State Department of Ecology (Ecology) conducted a Class II Inspection at the Aluminum Company of America (Alcoa) operations near Vancouver, Washington, on January 28-31, 1990, (Figure 1). Pat Hallinan and Keith Seiders, from the Ecology Compliance Monitoring Section, conducted the inspection. Steward Lombard and Lee Fearon, from the Ecology Quality Assurance Section, performed the laboratory review portion of the inspection. Also in attendance were Norm Glenn of the Compliance Monitoring Section and Wayne Wooster of the Industrial Section of Ecology. Larry McLellan, Vanalco Maintenance/Environmental Superintendant, provided assistance.

Alcoa holds the NPDES permit (#WA-000029-9) for the wastewater discharges from three companies that operate facilities at the site: Vanalco (primary aluminum smelting), Vanexco (anodizing and extrusion operations), and ACPC (wire making). Wastewater from the three operations is routed through one of two settling lagoons before being discharged (Outfall 001) into the Columbia River. Sludge from the lagoons is stored in an adjacent lagoon. Sanitary wastes generated at the complex are treated by a separate trickling filter secondary treatment system, then discharged through Outfall 002. Sludge from the sanitary treatment system is anaerobically digested, dewatered on sludge drying beds, and sent to a local sanitary landfill.

Objectives of the inspection included:

- Assess industrial and sanitary effluent compliance with NPDES permit limits.
- Determine industrial effluent toxicity using a suite of bioassays.
- Identify possible chemical pollutants in selected inplant wastewaters, settling lagoon influent, and lagoon effluent samples with a priority pollutant scan.
- Assess the impact of the industrial discharge on the receiving water sediments with chemical analysis for priority pollutants and toxicity testing using a *Hyallela* bioassay.
- Review Alcoa laboratory procedures to determine conformance to standard techniques. Split samples with the permittee to determine the comparability of laboratory results.
- Advance the state-of-the-art of compliance inspections by contributing to the ongoing developmental efforts with centrifugation.

PROCEDURES

Ecology collected both 24-hour composite samples and grab samples of industrial influent, sanitary effluent (Outfall 002), and sanitary influent. A 24-hour composite sample of inplant wastewater generated at Vanexco (anodizing effluent) was also collected. ISCO automatic

samplers collected an aliquot of wastewater every 30 minutes for 24 hours. Due to an equipment malfunction during the night, an approximately 14- to 19-hour composite sample of the industrial effluent (Outfall 001) was collected by Ecology. This sample data (Eco-001) must, therefore, be used with caution for comparison to permit parameters and sample splits. A composite sample of anode cooling water was collected by Ecology during the daily anode production. One hundred and sixty mLs of anode cooling water was collected every 15 minutes for eight hours. The ISCO composite samplers were cleaned for priority pollutant sampling prior to the inspection (Table 1).

Hand composites, consisting of three grab samples of industrial effluent, were collected for bioassay tests. A grab sample of plant intake water was also collected. Field transfer blanks were collected for both grab and composite samples (Table 1).

Three solids samples were collected for analysis; anaerobically digested sanitary sludge, industrial lagoon sludge, and particulates from centrifuged effluent. The digested sanitary sludge grab sample was taken from a tap on the anaerobic digester. The industrial lagoon sludge composite sample consisted of six grabs taken with an Eckman pipe dredge from scattered points in the sludge lagoon.

Effluent particulate matter was collected using two Alfa Laval bowl type continuous centrifuges (Model WSB/MAB 103) following procedures described by Andreasson (1991). A small peristaltic pump was used to pump effluent to the centrifuges. The centrifuges were cleaned prior to sampling following procedures described by Seiders (1989). The effluent dissolved fraction (centrate) was also sampled using an ISCO composite sampler.

Only one sediment sample was collected in the vicinity of the Alcoa outfall due to inclement weather during the inspection. The sediment sample was collected from the Columbia River approximately 60 to 70 feet downstream from the outfall diffuser. The outfall diffuser is located four miles downstream from the Interstate 5 Bridge at River Mile 103 (Outfall Latitude: 45N, 38', 58"; Longitude: 122W, 44', 41"). The sample was collected with a 0.1 meter square van Veen sampler following recommended Puget Sound Protocols (Tetra Tech, 1986). The sample consisted of six individual grabs in which the top two centimeters of sediment from each grab was removed, then composited. The composites were thoroughly mixed and then divided for separate analyses, except for samples for volatile organic analyses (VOA) which were taken directly from the van Veen sampler. The stainless steel tools used in the collection of the sediment samples were cleaned using the composite sampler cleaning procedure (Table 1).

Sampling times, parameters analyzed, and sample splits between Ecology and Alcoa are included in Table 2. Sample sites are shown on Figures 2 and 3. All samples were kept on ice and delivered to the Manchester Laboratory on February 1, 1990. A summary of the analytical methods and the laboratory conducting the analysis is given in Appendix A.

RESULTS AND DISCUSSION

Flow

An instantaneous check of the 002 effluent flowmeter, a 90° V-notch weir, showed it was correctly calibrated. Ecology was not able to confirm the accuracy of the 001 effluent flowmeter. Alcoa 001 flowmeter calibration records should be reviewed during the next Ecology inspection.

General Chemistry and NPDES Permit Compliance

High removals of suspended solids and turbidity indicated good settling in the industrial wastewater settling lagoons (92 and 89 percent removal, respectively) (Table 3). A twelve percent increase in fluoride in the settling lagoons may be attributed to the desorption of fluoride from the particulate matter in the lagoon due to precipitation during the inspection. Historically, fluoride concentration in the effluent has increased with precipitation (CH2M HILL, 1984). Chemical oxygen demand (COD) and cyanide concentrations were both very low in the industrial wastewater, as expected (0.005 mg/L each). All 001 effluent loadings were less than the daily maximum permit limits except oil and grease (202.0 and 781.6 lbs/d for two separate grab samples) and benzo(a)pyrene (0.006 lbs/d) (Table 4).

The trickling filter sanitary wastewater treatment system was operating satisfactorily at the time of the inspection. The influent BOD and TSS concentrations (73 and 106 mg/L, respectively) indicated a weak wastewater (Table 3). Effluent BOD and TSS concentrations were less than the 002 effluent permit limits (Table 4). The TSS removal efficiency (82 percent) did not meet the 30-day average 85 percent removal permit limit. The 85 percent removal requirement has been appealed by Alcoa and may be changed to 65 percent (Wooster, 1990). Effluent BOD_5 and TSS removal efficiencies (88 and 82 percent, respectively) were well above 65 percent removal.

Residual chlorine was greater than the permit limit in one grab sample and equal to the permit limit in the other. Chlorine system improvements such as an automatic vacuum feed system and dechlorination have been considered to correct this problem (CH2M HILL, 1990). Alcoa will be installing these improvements at the sanitary plant by April 1991 (Wooster, 1990).

Priority Pollutants - Water

A number of organic priority pollutants were detected at low levels in the industrial wastewater, though none were detected at levels exceeding water quality criteria (EPA, 1986) (Table 5). Results of the Polynuclear Aromatic Hydrocarbon analyses (PAH) were similar (Table 6). A complete listing of organic priority pollutant scan results is included in Appendix B.

Aluminum, nickel, and zinc were the only metals detected in the 001 effluent (Table 7). The nickel and zinc concentrations were much less than the corresponding acute and chronic water quality criteria (EPA, 1986). Zinc was detected in the plant intake water and all of the industrial

wastewater samples. Lead was also detected in the plant intake water, the anodizing effluent, and the settling lagoon influent. Ninety-six percent removal of total aluminum was achieved in the settling lagoon treatment system. A complete listing of the metals analyses results, including those metals not detected at the quantification limits, is included in Appendix C.

Bioassays - Water

No acute or chronic toxicity was indicated in the industrial effluent (001) by rainbow trout, Microtox, *Daphnia magna*, or fathead minnow (Table 8). All LC_{50}s were greater than 100 percent and all NOECs were equal to 100 percent effluent.

Priority Pollutants - Solids

Analysis results for the Near Outfall sample showed a relatively clean sediment (Table 9). All compounds detected were less than the No Effect Level of the Provincial Sediment Quality Guidelines (Persaud, 1990). These freshwater sediment guidelines have been used since Ecology does not yet have freshwater sediment criteria. The No Effect Level represents the level at which no toxic effects have been observed on aquatic organisms and at which all biological resources should be protected. The sediment quality in the Near Outfall sample was similar to the field control sample used by Johnson in a screening survey for chemical contaminants and toxicity in sediments at five Lower Columbia River ports (Johnson, 1988). Complete sediment chemistry results are listed in Appendices C and D.

A sediment sample at the 001 outfall should be taken in the next Ecology inspection.

The sanitary treatment system digested sludge was tested for total metals (Table 10), although Extraction Procedure Toxicity (EP Tox) for metals is required to determine the solid waste designation prior to placement into a landfill (Ecology, 1989). The EP Tox procedure gives information about the potential for sludge leachate toxicity in a landfill setting. A calculated value for the concentration of EP Tox metals is presented in Table 10. These concentrations were calculated assuming that the same metal concentration extracted by the total metal procedure would be extracted by the EP Tox procedure. Since the total metal procedure uses a much more vigorous extraction procedure (Tetra Tech, 1986) than the EP Tox procedure, it is likely that the EP Tox concentrations would be lower than the calculated values. The calculated values for lead and mercury were both slightly higher than the lower limits for dangerous waste classification. An EP Tox extraction (or its replacement - the TCLP procedure) should be performed on the sanitary sludge during the next Ecology inspection.

Results from the centrifuge study performed during the Class II Inspection at Alcoa are presented in Table 11.

Bioassays - Sediments

No acute toxicity was indicated by *Hyalella azteca* in the Near Outfall sediment sample (Table 9). The LC_{50} was greater than 100 percent.

Laboratory Review

Lab results for permitted parameters compared well between Alcoa and Ecology (Table 12).

The laboratory review was performed by Steward Lombard and Lee Fearon from the Ecology Quality Assurance Section. The most significant deficiencies found were that no quality assurance/quality control (QA/QC) procedures were practiced with any of the permit parameter analyses, the required detection limits for the Atomic Adsorption Spectrophotometry (AAS) metals analyses were not reliably achieved, and the cyanide analyses were being performed too infrequently. A technical report covering the visit to the Alcoa plant is presented in Appendix E.

The following recommendations were made:

1. Standard Operating Procedures (SOP) should be written and placed in a SOP Manual in support of departures from standard procedures in the Metals Analysis methodology.

2. A copy of Standard Methods (APHA, 1989) should be available as a reference in the laboratory.

3. The benzo(a)pyrene (BAP) loading factor for the activated carbon filters should be evaluated in order to prevent excursions to the BAP discharge limit.

4. Cyanide analyses should be run at least once every 14 days.

5. Addition of a graphite furnace and Heated Graphite Accessory (HGA) programmer accessories would achieve the required sensitivity for the AAS metals analysis. A record of the receipt dates of the metal standards is also recommended.

6. Inventory records should be kept of reagents ordered, date of receipt, date of opening, and date of final consumption.

7. Acids, bases and organic reagents should be stored separately from one another.

8. QA/QC procedures should be implemented for all of the permit parameter tests that are performed and records of the QA/QC results should be kept.

CONCLUSIONS AND RECOMMENDATIONS

Flow

Alcoa 001 flowmeter calibration records should be reviewed during the next Ecology inspection.

General Chemistry and NPDES Permit Compliance

High removals of suspended solids and turbidity indicated good settling in the industrial wastewater settling lagoons. All 001 effluent loadings were less than the daily maximum permit limits except oil and grease and benzo(a)pyrene.

The trickling filter sanitary wastewater treatment system was operating satisfactorily at the time of inspection. Effluent BOD and TSS concentrations were less than the 002 effluent permit limits. Residual chlorine was greater than the permit limit in one grab sample. Chlorine system improvements will be made to correct this problem.

Priority Pollutants - Water

A number of priority pollutants were detected at low levels in the industrial wastewater, though none were detected at levels exceeding water quality criteria.

Bioassays - Water

No acute or chronic toxicity was indicated in the industrial effluent (001) by rainbow trout, Microtox, *Daphnia magna*, or fathead minnow.

Priority Pollutants - Solids

Analysis results for the Near Outfall sample showed a relatively clean sediment. All compounds detected were less than the No Effect Level of the Provincial Sediment Quality Guidelines. A sediment sample at the 001 outfall should be taken in the next Ecology inspection.

Calculated values for the concentration of EP Tox metals for lead and mercury were both slightly higher than the lower limits for dangerous waste classification. It is likely that measured EP Tox concentrations would be lower than the calculated values. An EP Tox extraction (or its replacement - the TCLP procedure) should be performed on the sanitary sludge during the next Ecology inspection.

Bioassays - Sediments

No acute toxicity was indicated by *Hyalella azteca* in the Near Outfall sediment sample.

Laboratory Review

Lab results for permitted parameters compared well between Alcoa and Ecology.

The most significant deficiencies found in the laboratory review were that no QA/QC procedures were practiced with any of the permit parameter analyses, that the required detection limits for the AAS metals analyses were not reliably achieved, and that the cyanide analyses were being performed too infrequently.

The following recommendations were made:

1. A SOP should be written and placed in a SOP Manual in support of departures from standard procedures in the Metals Analysis methodology.

2. A copy of Standard Methods (APHA, 1989) should be available as a reference in the laboratory.

3. The benzo(a)pyrene (BAP) loading factor for the activated carbon filters should be evaluated in order to prevent excursions to the BAP discharge limit.

4. Cyanide analyses should be run at least once every 14 days.

5. Addition of a graphite furnace and HGA programmer accessories would achieve the required sensitivity for the AAS metals analysis. A record of the receipt dates of the metal standards is also recommended.

6. Inventory records should be kept of reagents ordered, date of receipt, date of opening, and date of final consumption.

7. Acids, bases and organic reagents should be stored separately from one another.

8. QA/QC procedures should be implemented for all of the permit parameter tests that are performed and records of the QA/QC results should be kept.

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FIGURES

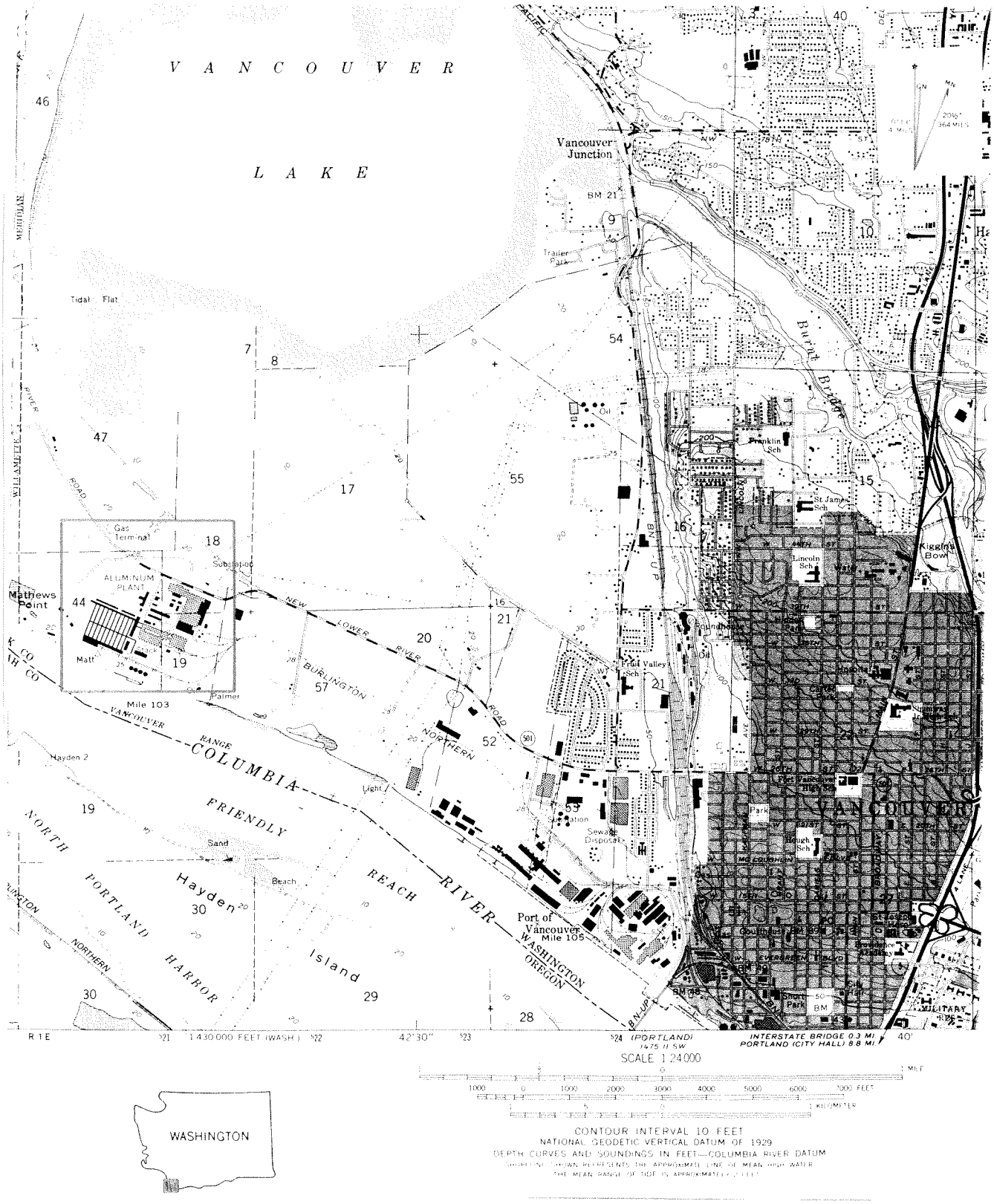

Figure 1 - Location Map - Alcoa, Vancouver, 1/90

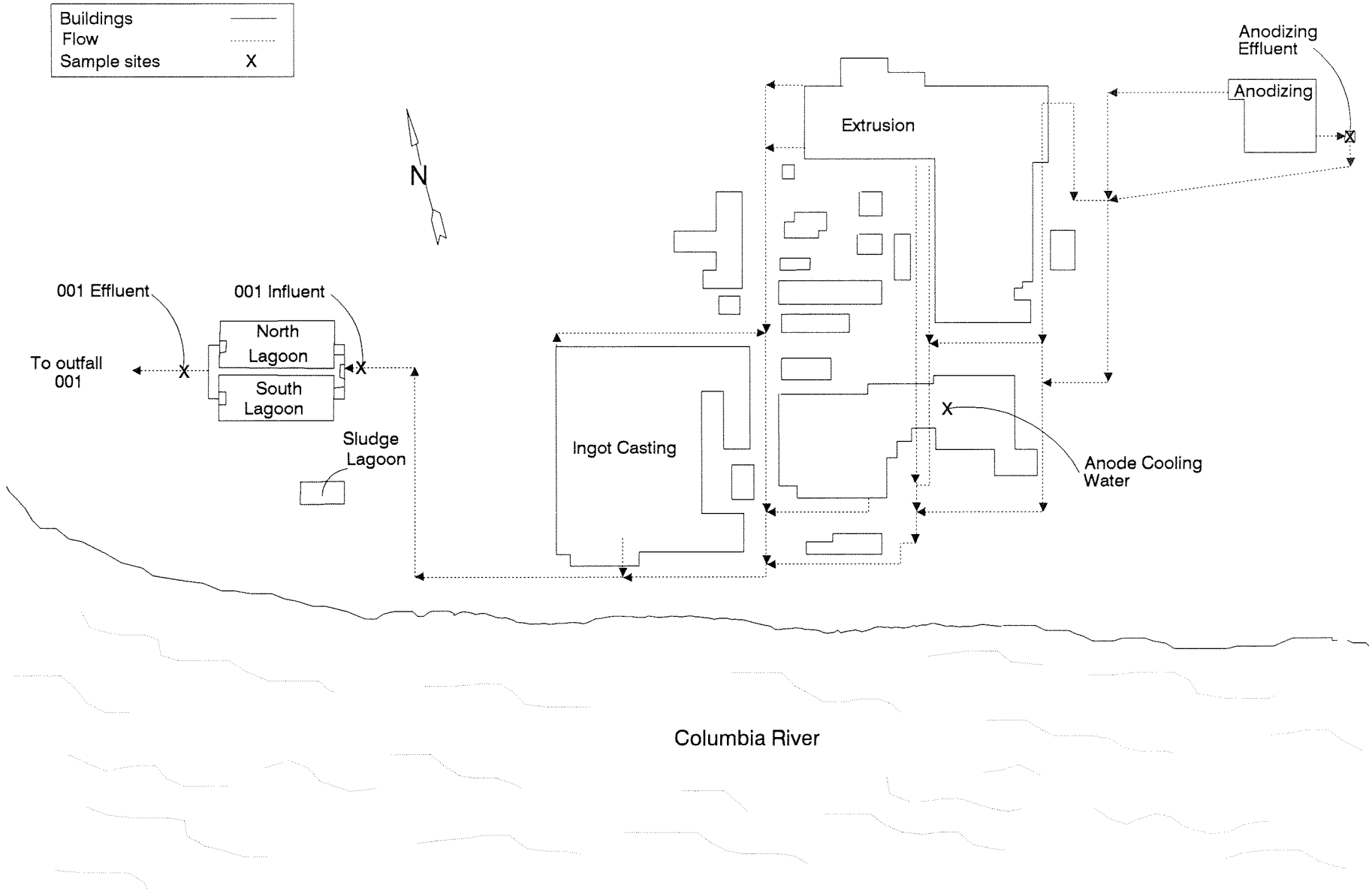

Figure 2 - Industrial Wastewater Sample Sites - Alcoa, Vancouver, 1/90

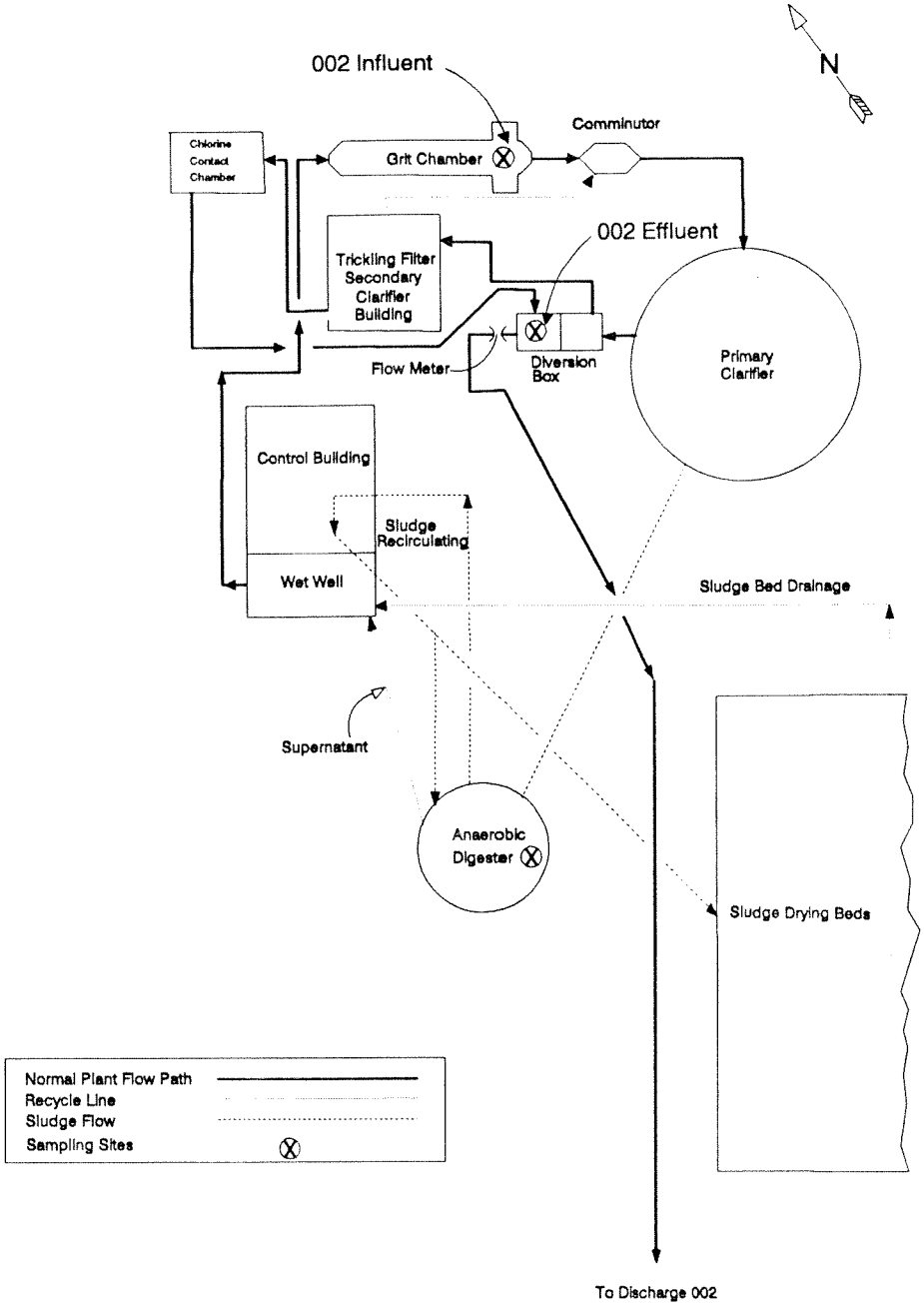

Figure 3 - Sanitary Wastewater Sampling Sites - Alcoa, Vancouver, 1/90

TABLES

Table 1. Priority Pollutant Cleaning and Field Transfer Blank Procedure - Alcoa, Vancouver, 1/90.

Priority Pollutant Sampling Equipment Cleaning Procedure

1. Wash with laboratory detergent.
2. Rinse several times with tap water.
3. Rinse with 10% nitric acid 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.

Field Transfer Blank Procedure

1. Pour organic free water directly into appropriate bottles for parameters to be analyzed from grab samples (VOA).

2. Run approximately one liter of organic free water through a compositor and discard.

3. Run approximately six liters of organic free water through the same compositor and put the water into appropriate bottles for parameters to be analyzed from composite samples (BNA, Pesticide/PCB, and metals).

Table 2 - Sampling Times and Parameters Analyzed - Alcoa, Vancouver, 1/90.

Parameter	Station:	Inf-001	Inf-001	Inf-001	Eff-001	Eff-001	Eco-001	Alcoa-001	Inf-002	Inf-002	Inf-002	Eff-002	Eff-002
	Type:	grab	grab	composite	grab	grab	composite	composite	grab	grab	composite	grab	grab
	Date:	1/30/90	1/31/90	1/30-31	1/30/90	1/31/90	1/30-31	1/30-31	1/30/90	1/31/90	1/30-31	1/30/90	1/31/90
	Time:	17:36	9:40	24 hr	19:19	8:49	14-19 hr	24 hr	16:36	13:40	24 hr	16:27	13:50
	Lab ID#:	058197	058198	058186	058195	058196	058184	058185	058202	058204	058200	058199	058201
GENERAL CHEMISTRY													
Turbidity				E			E	E			E		
pH				E			E	E			E		
Conductivity				E			E	E			E		
Alkalinity				E			E	E			E		
Hardness				E			E	E			E		
Cyanide		E	E	E	E	E	E	E/ALCOA					
Fluoride		E	E	E	E	E	E	E/ALCOA					
SOLIDS													
TS				E			E	E			E		
TNVS				E			E	E			E		
TSS		E	E	E/ALCOA	E	E	E/ALCOA	E/ALCOA	E	E	E	E	E
TNVSS				E			E	E			E		
BOD5											E		
COD									E	E	E	E	E
TOC													
NUTRIENTS													
NH3-N									E	E	E	E	E
NO3+NO2-N									E	E	E	E	E
Phosphorous - Total									E	E	E	E	E
% Solids													
Grain Size													
Fecal Coliform													E
Total Coliforms													
ORGANICS AND METALS													
Phenols													
Oil and Grease		E	E		E	E		ALCOA					
Aluminum				E**/ALCOA			E**/ALCOA	E**/ALCOA					
PRIORITY POLLUTANTS													
BNAs				E			E						
Pest/PCB				E			E						
VOA				E			E						
Metals				E**/ALCOA+			EE*/ALCOA+	E**/ALCOA+					
PAHs							E						
BIOASSAYS													
Rainbow Trout							E						
Microtox				E			E						
Daphnia magna							E						
Fathead Minnow							E						
Hyallela													
FIELD OBSERVATIONS													
Temp		E			E				E	E		E	E
pH		E			E				E	E		E	E
Conductivity		E			E				E	E		E	E
Chlorine:													
Free Available												E	E
Total Residual												E	E

E - Ecology analysis.
ALCOA - Alcoa analysis.

\+ Permit parameters only: Antimony, Nickel, Chromium, Zinc.
++ Benzo(a)pyrene only.
+++ Nickel only.

* (1) total recoverable and (1) dissolved metals.
** Total metals.

Table 2 - Sampling Times and Parameters Analyzed - Continued

	Station:	Eco-002	Alcoa-002	Anodizing Effluent	Eco-Anod	Alcoa-Anod	Intake	Sludge	Sediment Near Outfall	Transfer Blank
	Type:	composite	composite	composite	composite	composite	grab	grab	grab	--
	Date:	1/30-31	1/30-31	1/30-31	1/30-31	1/30-31	1/31/90	1/31/90	1/29/90	1/30/90
	Time:	24 hr	24 hr	24 hr	8 hr	NA	NA	NA	12:00	9:00
Parameter	Sample ID#:	058187	058188	058189	058190	058191	058192	058193	058180	058194
GENERAL CHEMISTRY										
Turbidity		E	E				E			
pH		E	E							
Conductivity		E	E							
Alkalinity		E	E							
Hardness				E	E		E			
Cyanide				E	E		E		E	E
Fluoride				E	E		E			E
SOLIDS										
TS		E	E	E						
TNVS		E	E	E						
TSS		E/ALCOA	E/ALCOA	E			E			
TNVSS		E	E	E						
BOD5		E/ALCOA	E/ALCOA							
COD		E	E							
TOC									E	
NUTRIENTS										
NH3-N		E	E				E			
NO3+NO2-N		E	E				E			
Phosphorous - Total		E	E				E			
% Solids								E	E	
Grain Size									E	
Fecal Coliform		ALCOA	ALCOA				E			
Total Coliforms							E			
ORGANICS AND METALS										
Phenols									E	E
Oil and Grease				E					E	
Aluminum				E**/ALCOA	E**		E**	E**	E**	E**
PRIORITY POLLUTANTS										
BNAs				E	E	E			E	E
Pest/PCB				E	E				E	E
VOA				E	E				E	E
Metals				E**/ALCOA+++	E**		E**	E**	E**	E**
PAHs					E/ALCOA++	E/ALCOA++				
BIOASSAYS										
Rainbow Trout										
Microtox										
Daphnia magna										
Fathead Minnow										
Hyallela									E	
FIELD OBSERVATIONS										
Temp				E	E					
pH				E	E					
Conductivity				E	E					

E - Ecology analysis.
ALCOA - Alcoa analysis.
+ Permit parameters only: Antimony, Nickel, Chromium, Zinc.
++ Benzo(a)pyrene only.
+++ Nickel only.
* (1) total recoverable and (1) dissolved metals.
** Total metals.

Table 3 – General Chemistry Results – Alcoa, Vancouver, 1/90.

Parameter	Station: / Lab ID#:	Inf-001 058197	Inf-001 058198	Inf-001 058186	Eff-001 058195	Eff-001 058196	Eco-001 058184	Alcoa-001 058185	Anodizing Effluent 058189	Eco-Anod 058190	Intake 058192
LABORATORY	UNITS										
Turbidity	NTU			18			1.9	1.5			0.4
pH	S.U.			7.2			7.4	7.2			
Conductivity	umho/cm			626			516	534			
Alkalinity	mg/L as CaCO3			190			105	110			
Hardness	mg/L as CaCO3			167			142	135	163	170	177
Cyanide	mg/L	0.009	0.005 (0.006)*	0.005	0.005 U	0.006	0.006	0.007	0.006	0.006	0.005 U
Fluoride	mg/L	1.19	0.886	2.52	5.46	2.40	5.34	4.93	0.960	1.15	0.285
SOLIDS											
TS	mg/L			497			343	350	1230		
TNVS	mg/L			410			286	281	1060		
TSS	mg/L	91	54	82	4	6	4	4	308		2
TNVSS	mg/L			63			1	2	238		
BOD5	mg/L										
COD	mg/L			0.005							
NUTRIENTS											
NH3-N	mg/L as N										0.02
NO3+NO2-N	mg/L as N										1.23
Phosphorous - Total	mg/L as P										0.19
Fecal Coliform	#/100 mL										1 U
Total Coliforms	#/100 mL										1 U
Oil and Grease	mg/L	48.7 (43.6)*	9.5 (9.3)*		6.9	27.1 (26.2)*			3.8(3.7)*		
FIELD OBSERVATIONS											
pH	S.U.		7.06		7.35				7.7	7.6	
Conductivity	umho/cm		660		560				1500	330	
Temp	deg. C		17.3		11.5				2.6	25.5	
Chlorine:											
Free Available	mg/L										
Total Residual	mg/L										

U - Indicates the compound was anlayzed for but not detected at the given detection limit.

*Duplicate analysis.

Table 3 – Continued – Alcoa, Vancouver, 1/90.

Parameter	Station: / Lab ID#:	Inf-002 058202	Inf-002 058204	Inf-002 058200	Eff-002 058199	Eff-002 058201	Eco-002 058187	Alcoa-002 058188
LABORATORY	UNITS							
Turbidity	NTU			27			10	10
pH	S.U.			7.4			6.7	7.4
Conductivity	umho/cm			519			409	421
Alkalinity	mg/L as CaCO3			201			103	102
Hardness	mg/L as CaCO3							
Cyanide	mg/L							
Fluoride	mg/L							
SOLIDS								
TS	mg/L			413			318	306
TNVS	mg/L			223			182	184
TSS	mg/L	118	133	106	18	16	19	18
TNVSS	mg/L			26			4	3
BOD5	mg/L			73			9	10
COD	mg/L	261	221	176	53.3	45.6	41.5	45.1
NUTRIENTS								
NH3-N	mg/L as N	16.6	18.7	15.0	1.59	3.55	2.24	2.26
NO3+NO2-N	mg/L as N	0.80	0.93	0.76	15.0	12.4	11.7	12.2
Phosphorous - Total	mg/L as P	4.95	3.15	3.35	1.64	1.91	1.64	1.62
Fecal Coliform	#/100 mL					6		
Total Coliforms	#/100 mL							
Oil and Grease	mg/L							
FIELD OBSERVATIONS								
pH	S.U.		7.7	7.6	7.3	7.5		
Conductivity	umho/cm		435	1340	350	1350		
Temp	deg. C		18.6	16.2	14.2	12.7		
Chlorine:								
Free Available	mg/L				0.5	0.5		
Total Residual	mg/L				1.0	1.5		

U - Indicates the compound was anlayzed for but not detected at the given detection limit

* - Duplicate analysis

Table 4 – Comparison of Inspection Results to NPDES Permit Limits – Alcoa, Vancouver, 1/90.

001 DISCHARGE

Parameter	NPDES Permit Limits Monthly Average (lbs/day)	NPDES Permit Limits Daily Maximum (lbs/day)	Inspection Data Ecology Composite (mg/L)	Inspection Data Grab Samples (mg/L)	Inspection Data Effluent Loading** (lbs/day)
Aluminum	35.0	80.0	0.70		20.5
TSS	400.0	760.0	4		117.1
Fluoride	100.0	200.0	5.34	5.46, 2.40	156.3
Oil and Grease	70.0	150.0		6.9, 26.7	202.0, 781.6
Benzo(a)pyrene*	0.002	0.004	0.048		0.006
Antimony	2.0	3.0	0.05 U		--
Nickel	2.4	3.4	0.04		1.2
Cyanide (total)	0.15	0.4	0.006	0.005 U, 0.006	0.18
Chromium	0.8	1.5	0.005 U		--
Zinc	1.8	3.9	0.02		0.59
pH (S.U.)	6 – 9	6 – 9		7.4	--

002 DISCHARGE

Parameter	NPDES Permit Limits 30-Day Average	NPDES Permit Limits 7-Day Average	Inspection Data Ecology Composite	Inspection Data Grab Samples
Influent BOD5 (mg/L)			73	
Effluent BOD5 (mg/L)	25.0	45.0	9	
(% removal)+	85		88	
Influent TSS (mg/L)			106	
Effluent TSS (mg/L)	30.0	45.0	19	
(% removal)+	85		82	
Residual Chlorine (mg/L)	0.1 – 1.0	0.1 – 1.0		1.0, 1.5
Fecal Coliform (#/100 mL)	200	400		6
pH (S.U.)	6.0 – 9.0	at all times		7.3, 7.5

U - Indicates compound was not detected at the given detection limit.

J - Indicates an estimated value when the result is less than specified detection limits.

* Benzo(a)pyrene measured at the anode cooling water using PAH Method 610 (see Appendix A).

** Based on flowrates reported by Alcoa (001 Effluent - 3.510 mgd; Anode Cooling Water - 15,400 gpd).

+85 percent removal requirement has been appealed.

Table 5 – Organic Priority Pollutants Detected in Water Samples – Alcoa, Vancouver, 1/90.

	Anodizing					EPA Water Quality Criteria+	
Station:	Inf–001	Eco–001	Effluent	Eco–Anod	Alcoa–Anod	Fresh Water	
Lab ID #:	058186	058184	058189	058190	058191	Acute	Chronic
VOA Compounds (ug/L)							
Acetone	15 J	220					
Chloroform	0.6 J	0.6 J	0.3 J	0.4 J		28,900*	1,240*
1,1,1–Trichloroethane	0.6 J	1	0.4 J	0.3 J			
Carbon Disulfide				3			
Bromodichloromethane	0.4 J	0.3 J	0.2 J				
2–Butanone		33					
Trichloroethene	2	2	2	1			
Napthalene				1		2,300*	620*
Ethenylbenzene	0.5 J	8					
Toluene		0.3 J		0.1 J		17,500*	
Dibromochloromethane	0.2 J	0.2 J	0.1 J				
cis–1,2–Dichloroethene	0.7 J	0.4 J	0.5 J	0.2 J			
Total Trichloronated Ethanes						18,000*	
BNA Compounds (ug/L)							
Benzo(a)Pyrene	0.9 J			32 J	56		
Dibenz(a,h)Anthracene				10 J	12 J		
Benzo(a)Anthracene	0.9 J			31 J	45		
Acenaphthene	0.2 J			9 J	9 J	1,700*	520*
Diethylphthalate	0.2 J		0.1 J				
Phenathrene	0.6 J			10 J	17		
Fluorene	0.06 J				1 J		
1–Methylnapthalene			0.3 J				
Naphthalene	0.06 J				0.6 J	2,300*	620*
2–Methylnapthalene			0.04 J				
o–Chlorophenol			0.3 J			4,380*	2,000*
Phenol			4			10,200*	2,560*
bis(2–Ethylhexyl)Phthalate	0.4 J						
Anthracene	0.1 J			2 J	4 J		
Pyrene	2 J	0.4 J		44	53		
Dimethyl Phthalate	0.5 J	2 J	0.3 J				
Benzo(g,h,i)Perylene	0.8 J			19 J	37		
Indeno(1,2,3–cd)Pyrene	0.6 J			17 J	30		
Benzo(b)fluoranthene	1 J			25 J	52		
Fluoranthene	2 J	0.4 J		54	65	3,980*	
Benzo(k)fluoranthene	0.9 J			23 J	36		
Chrysene	1 J			29 J	40		
Total Phthalates						940*	3*
Pesticide/PCBs (ug/L)							
Methoxychlor			0.026				0.03

J – Indicates an estimated value when the result is less than the specified detection limit.

*Insufficient data to develop criteria, value presented is the L.O.E.L. – Lowest Observed Effect Level.

+EPA, 1986.

Table 6 – Polynuclear Aromatic Hydrocarbon Analyses – Alcoa, Vancouver, 1/90.

							EPA Water Quality Criteria+	
	Station:	Eco-001	Eco-Anod		Alcoa-Anod		Fresh Water	
PAH Compound (ug/L)	Lab ID #:	058184	058190		058191		Acute	Chronic
Benzo(a)Pyrene		0.15	48		74			
Dibenzo(a,h)Anthracene		0.092 U	48		106			
Benzo(a)Anthracene		0.044	16		28			
Acenaphthene		0.46 U	25	U	34		1,700*	520*
Phenathrene		0.18	9.8		15			
Fluorene		0.055 U	3	U	2	NJ		
Naphthalene		0.28 U	15	U	14	U	2,300*	620*
Anthracene		0.015	1.3		3.4			
Pyrene		0.11 NJ	17		6.9	U		
Benzo(g,h,i)Perylene		0.19	53		101			
Indeno(1,2,3-cd)Pyrene		0.069	25		46			
Benzo(b)fluoranthene		INT	55		87			
Fluoranthene		0.30	27		37		3,980*	
Benzo(k)fluoranthene		0.026	17		26			
Acenaphthylene		0.34 U	19	U	17	U		
Chrysene		0.060	14		23			

U - Indicates the compound was analyzed for but not detected at the given detection limit.
NJ - Presumptive evidence of the presence of the material at an estimated quantity.
INT - Interference.

Table 7 – Metals Detected in Water Samples – Alcoa, Vancouver, 1/90.

Station:	Inf-001	Eco-001		Alcoa-001	Anodizing Effluent	Eco-Anod	Intake	EPA Water Quality Criteria+ Fresh Water	
Lab ID#:	058186	058184		058185	058189	058190	058192	Acute	Chronic
Metal	(mg/L)*	(mg/L)*	(mg/L)**	(mg/L)*	(mg/L)*	(mg/L)*	(mg/L)*	(mg/L)**	(mg/L)**
Aluminum	17.2	0.70	0.67	0.72	78.2	0.10		--	--
Beryllium					0.053	0.002		0.130***	0.0053***
Chromium	0.007				0.002	0.002		0.016(2.3)++	0.011(0.28)++
Copper	0.06				0.011			0.025	0.016
Lead	0.015				0.09		0.01	0.13	0.005
Nickel	0.12	0.04	0.04	0.04	0.53			1.9	0.21
Zinc	0.02	0.02	0.02	0.02	0.01		0.02	0.16	0.14

*Total metals.

**Total Recoverable metals.

***Insufficient data to develop criteria, value presented is the L.O.E.L. - Lowest Observed Effect Level.

+EPA, 1986. Hardness = 142 mg/L as CaCO3.

++Criteria presented are for hexavalent (trivalent) species.

Table 8 – Effluent Bioassay Results – Alcoa, Vancouver, 1/90.

Rainbow Trout 96-Hour Survival in 100% Effluent *(Oncorhynchus mykiss)*

	# of live test organisms		Percent
	Initial	Final	Mortality
001 Effluent	30	30	0
Control	30	30	0

Microtox

	EC50 (15 minutes at 15 C)
001 Effluent	data not suitable for reduction*
001 Influent	data not suitable for reduction*

Daphnia Magna 7-Day Survival and Reproduction

001 Effluent

Concentration (%vol/vol)	Survival (%)**	Total Reproduction**
Control	100	224
6.25% effluent	100	200
12.5% effluent	100	252
25% effluent	90	222
50.0% effluent	90	208
100.0% effluent	80	145
	NOEC = 100.0%	NOEC = 100.0%
	LC50 = >100.0%	

Fathead Minnow *(Pimephales promelas)* 7-Day Survival and Growth

001 Effluent

Concentration (%vol/vol)	Survival (%)**	Mean Weight Per Fish (mg)**
Control	91.7	0.407
6.25% effluent	48.3	0.378
12.5% effluent	95.0	0.366
25% effluent	95.0	0.382
50.0% effluent	95.0	0.403
100.0% effluent	90.0	0.365
	NOEC = 100.0%	NOEC = 100.0%
	LC50 = >100.0%	

*Indicates lack of sample toxicity

**Not significantly different from the control in any of the test concentrations.

NOEC – No Observed Effect Concentration: the highest concentration of effluent that did not cause an observable effect.

EC50 – Concentration causing the tested effect to 50% of the organisms.

LC50 – Concentration lethal to 50% of the organisms.

Table 9 – Priority Pollutants Detected in Sediment Samples and Sediment Bioassay – Alcoa, Vancouver, 1/90.

Priority Pollutants Detected

		Provincial Sediment Quality Guidelines+			
Sample:	Near Outfall	No Effect	Lowest Effect	Limit of	Field
Sample ID#:	058180	Level	Level	Tolerance	Control++
	mg/kg-dry	mg/kg dry	mg/kg dry	mg/kg dry	mg/kg dry
VOA Compounds					
Chloroform	0.0003 J				
BNA Compounds					
Phenol	0.048 J				
Fluoranthene	0.008 J				0.0005 J
Pyrene	0.016 J				
PAH (Total)			2	19.8	0.006
Di-n-Butylphthalate	0.020 J				0.025 J
N-Nitrosodiphenylamine	0.010 J				
Metals - Total					
Aluminum	6,410				7,800
Arsenic	2	4	6	33	2.1
Chromium	14	31	31	110	12
Copper	15	25	25	110	6
Nickel	14	31	31	90	9
Zinc	47	65	120	820	40
General					
Cyanide	0.60 U				
Oil and Grease	214(114)*				
Solids, Total (%)	71.1				73.1
TOC (% dry basis)	0.18		1	10	0.3
Grain Size: (% dry basis)					
Gravel	0				
Sand	88				
Silt	10				
Clay	2				

Sediment Bioassay

Hyalella azteca 10-Day Survival Test

	Percent Survival
Control	88.0
Near Outfall (058180)	86.0
	LC50 = >100.0%

U - Indicates compound was not detected at the given detection limit.
J - Indicates an estimated value when result is less than specified detection limit.
LC50 - Concentration lethal to 50% of the organisms.
*Duplicate analysis.
+Persaud, 1990.
++Johnson, 1988. Reference station taken at Reed Island.

Table 10 – Digested Sludge Analysis – Alcoa, Vancouver, 1/90.

	Sample: / Sample ID#:	002 Digested Sludge 058193 (mg/kg-dry)	Calculated Maximum Possible EP Tox Concentration (mg/L)	Dangerous Waste Criteria (mg/L)
Metals - Total				
Aluminum		29900		
Antimony		15		
Arsenic		14	0.70	5
Cadmium		9	0.45	1
Chromium		80	4.0	5
Copper		1100		
Lead		154	7.7	5
Mercury		5.1	0.26	0.2
Nickel		153		
Selenium		7.5	0.38	1
Silver		6	0.30	5
Zinc		1270		
General				
Solids, Total (%)		2.4		

*Ecology, 1989. Value represents concentration in extract at which the sample would be considered a dangerous waste.

Table 11 – Centrifuge Results, Priority Pollutants Detected – Alcoa, Vancouver, 1/90.

	Whole Effluent (ug/L)	Effluent Centrate* (ug/L)	Effluent Particulates** (ug/Kg–wet)	Effluent Concentrations (grams/1,000,000 gallons) Whole Effluent	Effluent Centrate*	Effluent Particulates**	Particulates** vs (mg/Kg–TOC)	Surrogate*** (Lagoon Sludge) (mg/Kg–TOC)	Surrogate*** (Lagoon Sludge) (ug/Kg–wet)
VOA Compounds									
Vinyl chloride	1 U			4 U				0.01 J	0.5 J
Methylene chloride	5 UJ			19 UJ				0.3 U	18 U
Acetone	220			833				0.3 U	18 U
cis 1,2–Dichloroethene	0.4 J			2 J				0.1 J	10 J
Chloroform	0.6 J			2 J				0.3 U	18 U
2–Butanone	33			125				0.3 U	18 U
1,1,1–Trichloroethane	1			4				0.3 U	18 U
Bromodichloromethane	0.3 J			1 J				0.3 U	18 U
Trichloroethene	2			8				0.1 J	5 J
Dibromochloromethane	0.2 J			1 J				0.3 U	18 U
4–Methyl–2–pentanone	1 U			4 U				0.3 U	18 U
Toluene	0.3 J			1 J				3.3	230
Ethyl benzene	1 U			4 U				0.2 J	13 J
Xylene (total)	1 U			4 U				0.2 J	16 J
BNA Compounds									
Phenol	2 U	3	27,000 U	8 U	11	0.41 U	257 U	314 U	22,000 U
4–Methylphenol	2 U	0.4 J	27,000 U	8 U	2 J	0.41 U	257 U	314 U	22,000 U
Naphthalene	2 U	0.06 J	27,000 U	8 U	0.2 J	0.41 U	257 U	314 U	22,000 U
Dimethylphthalate	2 J	2	27,000 U	8 J	8	0.41 U	257 U	314 U	22,000 U
Acenaphthene	2 U	1 U	1,700 J	8 U	4 U	0.03 J	16 J	23 J	1,600 J
Dibenzofuran	2 U	1 U	27,000 U	8 U	4 U	0.41 U	257 U	9 J	610 J
Diethylphthalate	2 U	0.2 J	27,000 U	8 U	1 J	0.41 U	257 U	314 U	22,000 U
Fluorene	2 U	1 U	27,000 U	8 U	4 U	0.41 U	257 U	12 J	860 J
Phenanthrene	2 U	0.1 J	6,800 J	8 U	0.4 J	0.10 J	65 J	243 J	17,000 J
Anthracene	2 U	1 U	980 J	8 U	4 U	0.01 J	9 J	31 J	2,200 J
Di–n–Butylphthalate	2 U	1 U	27,000 U	8 U	4 U	0.41 U	257 U	314 U	22,000 U
Fluoranthene	0.4 J	1 U	17,000 J	2 J	4 U	0.26 J	162 J	629	44,000
Pyrene	0.4 J	1 U	19,000 J	2 J	4 U	0.29 J	181 J	686	48,000
Benzo(a)anthracene	2 U	1 U	12,000 J	8 U	4 U	0.18 J	114 J	257 J	18,000 J
Chrysene	2 U	1 U	15,000 J	8 U	4 U	0.23 J	143 J	486	34,000
Benzo(b)fluoranthene	2 U	1 U	15,000 J	8 U	4 U	0.23 J	143 J	357	25,000
Benzo(k)fluoranthene	2 U	1 U	9,500 J	8 U	4 U	0.14 J	90 J	257 J	18,000 J
Benzo(a)pyrene	2 U	1 U	12,000 J	8 U	4 U	0.18 J	114 J	214 J	15,000 J
Indeno(1,2,3–cd)pyrene	2 U	1 UJ	9,800 J	8 U	4 UJ	0.15 J	93 J	157 J	11,000 J
Benzo(ghi)perylene	2 U	1 UJ	13,000 J	8 U	4 UJ	0.20 J	124 J	200 J	14,000 J
Pesticides									
Lindane	0.022 UJ	0.022 U	150 BJ	0.08 UJ	0.08 U	0.002 BJ	1 BJ	1 UJ	69 UJ
PCB 1248	0.12 UJ	0.22 U	2,260 J	0.45 UJ	0.83 U	0.03 J	22 J	128 J	8,930 J
PCB 1254	0.12 UJ	0.22 U	694 J	0.45 UJ	0.83 U	0.01 J	7 J	64 J	4,450 J

* Centrate – The portion of whole effluent that passes through the centrifuge.

** Particulates – The portion of whole effluent retained by the centrifuge.

*** Surrogate – A readily available solid material which may approximate the effluent particulates in chemical makeup and contaminant concentrations.

Table 11 – Centrifuge Results, Priority Pollutants Detected – Continued

	Whole Effluent (ug/L)	Effluent Centrate* (ug/L)	Effluent Particulates** (ug/Kg-wet)	Effluent Concentrations (grams/1,000,000 gallons) Whole Effluent	Effluent Centrate*	Effluent Particulates**	Particulates** vs (mg/Kg-dry)	Surrogate*** (Lagoon Sludge) (mg/Kg-dry)	Surrogate*** (Lagoon Sludge) (ug/Kg-wet)
Metals									
Antimony, Total	50 U	6.0 U	0.23 J	189 U	23 U	0.05 J	3 J	2 J	0.14 J
Antimony, Total recoverable		6.0 U			23 U				
Antimony, Dissolved		6.0 U			23 U				
Arsenic, Total	5 U	1.0 U	1.52	19 U	4 U	0.31	21	25	1.41
Arsenic, Total recoverable	5 U	1.0 U		19 U	4 U				
Arsenic, Dissolved		1.0 U			4 U				
Beryllium, Total	5 U		0.13 J	19 U		0.03 J	2 J	3 J	0.17 J
Beryllium, Total recoverable	5 U			19 U					
Beryllium, Dissolved									
Cadmium, Total	2 U	0.20 U	1.0 U	8 U	1 U	0.21 U	14 U	18 U	1.0 U
Cadmium, Total recoverable	2 U	0.20 U		8 U	1 U				
Cadmium, Dissolved		0.25 J			1 J				
Chromium, Total	5 U	4.0 U	3.2	19 U	15 U	1	44	73	4.1
Chromium, Total recoverable	5 U	4.0 U		19 U	15 U				
Chromium, Dissolved		4.0 U			15 U				
Copper, Total	10 U	2.0 U	66.4	38 U	8 U	14	907	1039	58.3
Copper, Total recoverable	10 U	2.0 U		38 U	8 U				
Copper, Dissolved		2.0 U			8 U				
Lead, Total	2 U	1.0 U	12 J	8 U	4 U	2 J	164 J	214 J	12 J
Lead, Total recoverable	2 U	1.3 J		8 U	5 J				
Lead, Dissolved		1.0 U			4 U				
Mercury, Total	0.2 U	0.08 J	0.166	1 U	0.3 J	0.03	2	1	0.034
Mercury, Total recoverable	0.2 U	0.02 U		1 U	0.1 U				
Mercury, Dissolved		0.082 J			0.3 J				
Nickel, Total	40	26 J	77.9	151	98 J	16	1064	1362	76.4
Nickel, Total recoverable	40	37 J		151	140 J				
Nickel, Dissolved		40 J			151 J				
Zinc, Total	20	16 J	50.4	76	61 J	10	689	314	17.6
Zinc, Total recoverable	20	14 J		76	53 J				
Zinc, Dissolved		40			151				
Aluminum, Total	700	312	11,300	2650	1181	2337	154372	301248	16,900
Aluminum, Total recoverable	670	324		2536	1226				
Aluminum, Dissolved		243			920				
General									
Percent Solids			7.32					5.61	
TOC (% dry basis)			10.5					7	
TSS (mg/l)	4								

* Centrate – The portion of the whole effluent that passes through the centrifuge.

** Particulates – The portion of the whole effluent retained by the centrifuge.

*** Surrogate – A readily available solid material which may approximate the effluent particulates in chemical makeup and contaminant concentrations.

Table 12 – Comparison of Sample Splits – Alcoa, Vancouver, 1/90.

Station:	Inf-001		Eco-001		Alcoa-001		Eco-002		Alcoa-002		Anodizing Effluent		Eco-Anode		Alcoa-Anode	
Lab ID#:	058186		058184		058185		058187		058188		058189		058190		058191	
Parameter (mg/L) Laboratory:	Ecology	Alcoa	Ecology	Alcoa	Ecology	Alcoa	Ecology	Alcoa	Ecology	Alcoa	Ecology	Alcoa	Ecology	Alcoa	Ecology	Alcoa
Aluminum	17.2	13.44	0.70	0.60	0.72	0.61					78.2	74.2				
TSS	82	76	4	1.2	4	1.6	19	16	18	15						
Fluoride	2.52		5.34		4.93	3.39										
Antimony	0.05 U	0.00	0.05 U	0.00	0.05 U	0.00										
Nickel	0.12	0.15	0.04	0.04	0.04	0.04					0.53	0.61				
Cyanide (Total)	0.005		0.006		0.007	0.002										
Chromium	0.007	0.005	0.005 U	0.002	0.005 U	0.002										
Zinc	0.02	0.043	0.02	0.027	0.02	0.031										
Benzo(a)pyrene													0.048	0.045	0.074	0.070
BOD5							9	11	10	12						

U – Compound was not detected at the given detection limit.

APPENDIX A

Appendix A – Ecology Analytical Methods – Alcoa, Vancouver, 1/90.

Analyses	Method Used	Laboratory
GENERAL CHEMISTRY		
Turbidity	EPA, 1979: 180.1	Ecology; Manchester, WA
pH	EPA, 1979: 150.1	Ecology; Manchester, WA
Conductivity	EPA, 1979: 120.1	Ecology; Manchester, WA
Alkalinity	EPA, 1979: 310.1	Ecology; Manchester, WA
Hardness	EPA, 1979: 130.2	Ecology; Manchester, WA
Cyanide	EPA, 1979: 335.3	Am Test Inc.; Redmond, WA
Fluoride	EPA, 1979: 340.3	Ecology; Manchester, WA
SOLIDS		
TS	EPA, 1979: 160.3	Ecology; Manchester, WA
TNVS & TNVSS	EPA, 1979: 106.4	Ecology; Manchester, WA
TSS	EPA, 1979: 160.2	Ecology; Manchester, WA
BOD5	EPA, 1979: 405.1	Ecology; Manchester, WA
COD	EPA, 1979: 410.1	Ecology; Manchester, WA
NUTRIENTS		
NH3-N	EPA, 1979: 350.1	Ecology; Manchester, WA
NO3+NO2-N	EPA, 1979: 353.2	Ecology; Manchester, WA
Phosphorous - Total	EPA, 1979: 365.1	Ecology; Manchester, WA
% Solids	APHA, 1989: 2540 G	Analytical Resources Incorporated; Seattle, WA
Grain Size	Tetra Tech, 1986	Analytical Resources Incorporated; Seattle, WA
TOC, solids	APHA, 1989: 5310	Analytical Resources Incorporated; Seattle, WA
Fecal Coliform	APHA, 1989: 9222 D	Ecology; Manchester, WA
Total Coliform	APHA, 1989: 9222 B	Ecology; Manchester, WA
Phenols	EPA, 1979: 420.2	Ecology; Manchester, WA
Oil and Grease	EPA, 1979: 413.1	Am Test Inc.; Redmond, WA
PRIORITY POLLUTANTS		
Semivolatiles, water	EPA, 1984: 625	Ecology; Manchester, WA
Semivolatiles, solids	EPA, 1986: 8270	Ecology; Manchester, WA
Volatiles, water	EPA, 1984: 624	Ecology; Manchester, WA
Volatiles, solids	EPA, 1986: 8240	Ecology; Manchester, WA
Pest/PCBs, water	EPA, 1984: 608	Ecology; Manchester, WA
Pest/PCBs, solids	EPA, 1986: 8080	Ecology; Manchester, WA
Metals, water/solids	EPA, 1984: 200	Columbia Analytical; Kelso, WA
PAH	EPA, 1984: 610	Ecology; Manchester, WA
BIOASSAYS		
Rainbow Trout	Ecology, 1981	Ecology; Manchester, WA
Microtox	Beckman, 1982	Ecology; Manchester, WA
Daphnia Magna	EPA, 1987	Ecology; Manchester, WA
Fathead Minnow	EPA, 1989	Northwestern Aquatic Sciences; Newport, OR
Hyallela	Nebeker, 1984	Ecology; Manchester, WA

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APPENDIX B

Appendix B – Organic Priority Pollutant Analyses on Water Samples – Alcoa, Vancouver, 1/90.

Station:	Inf-001	Eco-001	Anodizing Effluent	Eco-Anod	Alcoa-Anod
Lab ID #:	058186	058184	058189	058190	058191
VOA Compounds (ug/l)					
Carbon Tetrachloride	1 U	1 U	1 U	1 U	
Acetone	15 J	220	8 UJ	4 UJ	
Chloroform	0.6 J	0.6 J	0.3 J	0.4 J	
Benzene	1 U	1 U	1 U	1 U	
1,1,1-Trichloroethane	0.6 J	1	0.4 J	0.3 J	
Bromomethane	1 U	1 U	1 U	1 U	
Chloromethane	1 U	1 U	1 U	1 U	
Dibromomethane	1 U	1 U	1 U	1 U	
Bromochloromethane	1 U	1 U	1 U	1 U	
Chloroethane	1 U	1 U	1 U	1 U	
Vinyl Chloride	1 U	1 U	1 U	1 U	
Methylene Chloride	5 UJ	5 UJ	5 UJ	5 UJ	
Carbon Disulfide	1 U	1 U	1 U	3	
Bromoform	1 U	1 U	1 U	1 U	
Bromodichloromethane	0.4 J	0.3 J	0.2 J	1 U	
1,1-Dichloroethane	1 U	1 U	1 U	1 U	
1,1-Dichloroethene	1 U	1 U	1 U	1 U	
Trichlorofluoromethane	1 U	1 U	1 U	1 U	
Dichlorodifluoromethane	1 U	1 U	1 U	1 U	
1,2-Dichloropropane	1 U	1 U	1 U	1 U	
2-Butanone	1 U	33	1 U	1 U	
1,1,2-Trichloroethane	1 U	1 U	1 U	1 U	
Trichloroethene	2	2	2	1	
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	
1,2,3-Trichlorobenzene	1 U	1 U	1 U	1 U	
Hexachlorobutadiene	1 U	1 U	1 U	1 U	
Napthalene	1 U	1 U	1 U	1	
Total Xylenes	1 U	1 U	1 U	1 U	
2-Chlorotoluene	1 U	1 U	1 U	1 U	
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	
1,2,4-Trimethylbenzene	1 U	1 U	1 U	1 U	
DBCP	1 U	1 U	1 U	1 U	
1,2,3-Trichloropropane	1 U	1 U	1 U	1 U	
Tert-Butylbenzene	1 U	1 U	1 U	1 U	
Isopropylbenzene (cumene)	1 U	1 U	1 U	1 U	
p-Isopropyltoluene	1 U	1 U	1 U	1 U	
Ethylbenzene	1 U	1 U	1 U	1 U	
Ethenylbenzene	0.5 J	8	1 U	1 U	
Propylbenzene	1 U	1 U	1 U	1 U	
Butylbenzene	1 U	1 U	1 U	1 U	
4-Chlorotoluene	1 U	1 U	1 U	1 U	
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	
1,2-Dibromoethane (EDB)	1 U	1 U	1 U	1 U	
1,2-Dichloroethane	1 U	1 U	1 U	1 U	
Vinyl Acetate	1 U	1 U	1 U	1 U	
4-Methyl-2-Pentanone	1 U	1 U	1 U	1 U	
1,3,5-Trimethylbenzene	1 U	1 U	1 U	1 U	

Appendix B – Organic Priority Pollutant Analyses on Water Samples – Continued

Station:	Inf-001	Eco-001	Anodizing Effluent	Eco-Anod	Alcoa-Anod
Lab ID #:	058186	058184	058189	058190	058191
VOA Compounds, continued (ug/l)					
Bromobenzene	1 U	1 U	1 U	1 U	
Toluene	1 U	0.3 J	1 U	0.1 J	
Chlorobenzene	1 U	1 U	1 U	1 U	
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	
Dibromochloromethane	0.2 J	0.2 J	0.1 J	1 U	
Tetrachloroethene	1 U	1 U	1 U	1 U	
Sec-Butylbenzene	1 U	1 U	1 U	1 U	
1,3-Dichloropropane	1 U	1 U	1 U	1 U	
cis-1,2-Dichloroethene	0.7 J	0.4 J	0.5 J	0.2 J	
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	
2,2,4-Trimethylpentane	1 U	1 U	1 U	1 U	
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	
1,1-Dichloropropene	1 U	1 U	1 U	1 U	
2,2-Dichloropropane	1 U	1 U	1 U	1 U	
2-Hexanone	1 U	1 U	1 U	1 U	
1,1,1,2-Tetrachloroethane	1 U	1 U	1 U	1 U	
cis-1,3-Dichloropropene	1 U	1 U	1 U	1 U	
trans-1,3-Dichloropropene	1 U	1 U	1 U	1 U	
BNA Compounds (ug/l)					
Benzo(a)Pyrene	0.9 J	2 U	0.9 U	32 J	56
2,4-Dinitrophenol	REJ	REJ	REJ	REJ	REJ
Dibenz(a,h)Anthracene	1 U	2 U	0.9 U	10 J	12 J
Benzo(a)Anthracene	0.9 J	2 U	0.9 U	31 J	45
4-Chloro-3-Methylphenol	1 U	2 U	0.9 U	18 U	9 U
Benzoic Acid	7 U	8 U	4 U	88 U	44 U
Hexachloroethane	1 U	2 U	0.9 U	18 U	9 U
Hexachlorocyclopentadiene	3 U	3 U	2 U	35 U	18 U
Isophorone	1 U	2 U	0.9 U	18 U	9 U
Acenaphthene	0.2 J	2 U	0.9 U	9 J	9 J
Diethylphthalate	0.2 J	2 U	0.1 J	18 U	9 U
Di-n-Butylphthalate	1 U	2 U	0.9 U	18 U	9 U
Phenathrene	0.6 J	2 U	0.9 U	10 J	17
Butylbenzylphthalate	1 U	2 U	0.9 U	18 U	9 U
N-Nitrosodiphenylamine	1 U	2 U	0.9 U	18 U	9 U
Fluorene	0.06 J	2 U	0.9 U	18 U	1 J
Carbazole	1 UJ	2 UJ	0.9 UJ	18 UJ	9 UJ
Hexachlorobutadiene	1 U	2 U	0.9 U	18 U	9 U
Pentachlorophenol	7 U	8 U	4 U	88 U	44 U
2,4,6-Trichlorophenol	1 U	2 U	0.9 U	18 U	9 U
2-Nitroaniline	7 U	8 U	4 U	88 U	44 U
2-Nitrophenol	1 U	2 U	0.9 U	18 U	9 U
1-Methylnapthalene	1 U	2 U	0.3 J	18 U	9 U
Naphthalene	0.06 J	2 U	0.9 U	18 U	0.6 J
2-Methylnapthalene	1 U	2 U	0.04 J	18 U	9 U
2-Chloronapthalene	1 U	2 U	0.9 U	18 U	9 U
3,3'-Dichlorobenzidine	1 U	2 U	0.9 U	18 U	9 U

Appendix B – Organic Priority Pollutant Analyses on Water Samples – Continued

Station:	Inf-001	Eco-001	Anodizing Effluent	Eco-Anod	Alcoa-Anod
Lab ID #:	058186	058184	058189	058190	058191
BNA Compounds, continued (ug/l)					
2-Methylphenol	1 U	2 U	0.9 U	18 U	9 U
1,2-Dichlorobenzene	1 U	2 U	0.9 U	18 U	9 U
o-Chlorophenol	1 U	2 U	0.3 J	18 U	9 U
2,4,5-Trichlorophenol	7 U	8 U	4 U	88 U	44 U
Nitrobenzene	1 U	2 U	0.9 U	18 U	9 U
3-Nitroaniline	7 U	8 U	4 U	88 U	44 U
4-Nitroaniline	REJ	REJ	REJ	REJ	REJ
4-Nitrophenol	REJ	REJ	REJ	REJ	REJ
Benzyl Alcohol	1 U	2 U	0.9 U	18 U	9 U
4-Bromophenyl-phenylether	1 U	2 U	0.9 U	18 U	9 U
2,4-Dimethylphenol	1 U	2 U	0.9 U	18 U	9 U
4-Methylphenol	1 U	2 U	0.9 U	18 U	9 U
1,4-Dichlorobenzene	1 U	2 U	0.9 U	18 U	9 U
4-Chloroaniline	1 U	2 U	0.9 U	18 U	9 U
Phenol	2 U	2 U	4	18 U	9 U
bis(2-Chloroethyl)Ether	1 U	2 U	0.9 U	18 U	9 U
bis(2-Chloroethoxy)Methane	1 U	2 U	0.9 U	18 U	9 U
bis(2-Ethylhexyl)Phthalate	0.4 J	2 U	0.9 U	18 U	9 U
Di-n-Octyl Phthalate	1 U	2 U	0.9 U	18 U	9 U
Hexachlorobenzene	1 U	2 U	0.9 U	18 U	9 U
Anthracene	0.1 J	2 U	0.9 U	2 J	4 J
1,2,4-Trichlorobenzene	1 U	2 U	0.9 U	18 U	9 U
2,4-Dichlorophenol	1 U	2 U	0.9 U	18 U	9 U
2,4-Dinitrotoluene	1 U	2 U	0.9 U	18 U	9 U
Pyrene	2 J	0.4 J	0.9 U	44	53
Dimethyl Phthalate	0.5 J	2 J	0.3 J	18 U	9 U
Dibenzofuran	1 U	2 U	0.9 U	18 U	9 U
Benzo(g,h,i)Perylene	0.8 J	2 U	0.9 U	19 J	37
Indeno(1,2,3-cd)Pyrene	0.6 J	2 U	0.9 U	17 J	30
Benzo(b)fluoranthene	1 J	2 U	0.9 U	25 J	52
Fluoranthene	2 J	0.4 J	0.9 U	54	65
Benzo(k)fluoranthene	0.9 J	2 U	0.9 U	23 J	36
Acenaphthylene	1 U	2 U	0.9 U	18 U	9 U
Chrysene	1 J	2 U	0.9 U	29 J	40
Retene	1 U	2 U	0.9 U	18 U	9 U
4,6-Dinitro-2-Methylphenol	7 U	8 U	4 U	88 U	44 U
1,3-Dichlorobenzene	1 U	2 U	0.9 U	18 U	9 U
2,6-Dinitrotoluene	1 U	2 U	0.9 U	18 U	9 U
n-Nitroso-Di-n-Propylamine	1 U	2 U	0.9 U	18 U	9 U
4-Chlorophenyl-phenylether	1 U	2 U	0.9 U	18 U	9 U
bis(2-chloroisopropyl)Ether	1 U	2 U	0.9 U	18 U	9 U
Pesticides/PCBs (ug/l)					
4,4'-DDT	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Chlordane	0.11 UJ	0.12 UJ	0.065 U	0.11 UJ	
Lindane	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Dieldrin	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	

Appendix B – Organic Priority Pollutant Analyses on Water Samples – Continued

Station:	Inf-001	Eco-001	Anodizing Effluent	Eco-Anod	Alcoa-Anod
Lab ID #:	058186	058184	058189	058190	058191
Pesticides/PCBs, continued (ug/l)					
Endrin	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Methoxychlor	0.02 UJ	0.022 UJ	0.026	0.07 UJ	
4,4'-DDD	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
4,4'-DDE	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Heptachlor	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Aldrin	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
alpha-BHC	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
beta-BHC	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
delta-BHC	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
alpha-Endosulfan	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Heptachlor epoxide	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Endosulfan sulfate	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Endrin aldehyde	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Toxaphene	0.44 UJ	0.5 UJ	0.27 U	0.45 UJ	
Aroclor-1260	0.11 UJ	0.12 UJ	0.065 U	0.14 UJ	
Aroclor-1254	0.11 UJ	0.12 UJ	0.065 U	0.14 UJ	
Aroclor-1221	0.44 UJ	0.5 UJ	0.065 U	0.28 UJ	
Aroclor-1232	0.11 UJ	0.12 UJ	0.065 U	0.14 UJ	
Aroclor-1248	0.11 UJ	0.12 UJ	0.065 U	0.14 UJ	
Aroclor-1016	0.11 UJ	0.12 UJ	0.065 U	0.14 UJ	
beta-Endosulfan	0.02 UJ	0.022 UJ	0.013 U	0.023 UJ	
Aroclor-1242	0.11 UJ	0.12 UJ	0.065 U	0.14 UJ	

U - Indicates the compound was analyzed for but not detected at the given detection limit
J - Indicates an estimated value when result is less than specified detection limit
B- Indicates analyte was found in the blank as well as the sample, possible/probable blank contamination
M - Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters
UJ - Indicates compound was analyzed for but not detected at the given detection limit, and the internal standard on which the detection limit quantification was based was outside acceptance limits
REJ - Compound was not quantitated

APPENDIX C

Appendix C – Metals Analyses – Alcoa, Vancouver, 1/90.

Metal	Station: / Lab ID#:	Inf-001 058186 mg/L*	Eco-001 058184 mg/L*	Eco-001 058184 mg/L**	Alcoa-001 058185 mg/L*	Anodizing Effluent 058189 mg/L*	Eco-Anod 058190 mg/L*	Intake 058192 mg/L*	Sludge 058193 mg/kg-dry*	Sediment Near Outfall 058180 mg/kg-dry*
Aluminum		17.2	0.70	0.67	0.72	78.2	0.10	0.05 U	29900	6410
Antimony		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	15	10 U
Arsenic		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	14	2
Beryllium		0.005 U	0.005 U	0.005 U	0.005 U	0.053	0.002	0.005 U	1 U	1 U
Cadmium		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	9	1 U
Chromium		0.007	0.005 U	0.005 U	0.005 U	0.002	0.002	0.005 U	80	14
Copper		0.06	0.01 U	0.01 U	0.01 U	0.011	0.01 U	0.01 U	1100	15
Lead		0.015	0.002 U	0.002 U	0.002 U	0.09	0.002 U	0.01	154	10 U
Mercury		0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	5.1	0.1 U
Nickel		0.12	0.04	0.04	0.04	0.53	0.02 U	0.02 U	153	14
Selenium		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	7.5	0.5 U
Silver		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	6	2 U
Thallium		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	1 U	1 U
Zinc		0.02	0.02	0.02	0.02	0.01	0.01 U	0.02	1270	47

* - Total metals

** - Total Recoverable metals

U - Indicates the compound was analyzed for but not detected at the given detection limit

APPENDIX D

Appendix D – Organic Priority Pollutant Scans on Sediment Samples – Alcoa, 1/90.

Station:	Sediment Near Outfall	
Lab ID #:	058180	
VOA Compounds (ug/kg-dry)		
Carbon Tetrachloride	2	U
Acetone	2	U
Chloroform	0.3	J
Benzene	2	U
1,1,1-Trichloroethane	2	U
Bromomethane	2	U
Chloromethane	2	U
Dibromomethane	2	U
Bromochloromethane	2	U
Chloroethane	2	U
Vinyl Chloride	2	U
Methylene Chloride	2	U
Carbon Disulfide	2	U
Bromoform	2	U
Bromodichloromethane	2	U
1,1-Dichloroethane	2	U
1,1-Dichloroethene	2	U
Trichlorofluoromethane	2	U
Dichlorodifluoromethane	2	U
1,2-Dichloropropane	2	U
2-Butanone	2	U
1,1,2-Trichloroethane	2	U
Trichloroethene	2	U
1,1,2,2-Tetrachloroethane	2	U
1,2,3-Trichlorobenzene	2	U
Hexachlorobutadiene	2	U
Napthalene	2	U
Total Xylenes	2	U
2-Chlorotoluene	2	U
1,2-Dichlorobenzene	2	U
1,2,4-Trimethylbenzene	2	U
DBCP	2	U
1,2,3-Trichloropropane	2	U
Tert-Butylbenzene	2	U
Isopropylbenzene (cumene)	2	U
p-Isopropyltoluene	2	U
Ethylbenzene	2	U
Ethenylbenzene	2	U
Propylbenzene	2	U
Butylbenzene	2	U
4-Chlorotoluene	2	U
1,4-Dichlorobenzene	2	U
1,2-Dibromoethane (EDB)	2	U
1,2-Dichloroethane	2	U
Vinyl Acetate	2	U
4-Methyl-2-Pentanone	2	U
1,3,5-Trimethylbenzene	2	U

Station:	Sediment Near Outfall	
Lab ID #:	058180	
VOA Compounds, continued (ug/kg-dry)		
Bromobenzene	2	U
Toluene	2	U
Chlorobenzene	2	U
1,2,4-Trichlorobenzene	2	U
Dibromochloromethane	2	U
Tetrachloroethene	2	U
Sec-Butylbenzene	2	U
1,3-Dichloropropane	2	U
cis-1,2-Dichloroethene	2	U
trans-1,2-Dichloroethene	2	U
2,2,4-Trimethylpentane	2	U
1,3-Dichlorobenzene	2	U
1,1-Dichloropropene	2	U
2,2-Dichloropropane	2	U
2-Hexanone	2	U
1,1,1,2-Tetrachloroethane	2	U
cis-1,3-Dichloropropene	2	U
trans-1,3-Dichloropropene	2	U
BNA Compounds (ug/kg-dry)		
Benzo(a)Pyrene	250	U
2,4-Dinitrophenol	REJ	
Dibenz(a,h)Anthracene	250	U
Benzo(a)Anthracene	250	U
4-Chloro-3-Methylphenol	250	U
Benzoic Acid	1200	U
Hexachloroethane	250	U
Hexachlorocyclopentadiene	500	U
Isophorone	250	U
Acenaphthene	250	U
Diethylphthalate	250	U
Di-n-Butylphthalate	20	J
Phenathrene	250	U
Butylbenzylphthalate	250	U
N-Nitrosodiphenylamine	10	J
Fluorene	250	U
Carbazole	250	U
Hexachlorobutadiene	250	U
Pentachlorophenol	1200	U
2,4,6-Trichlorophenol	250	U
2-Nitroaniline	1200	U
2-Nitrophenol	250	U
1-Methylnapthalene	250	U
Naphthalene	250	U
2-Methylnapthalene	250	U
2-Chloronapthalene	250	U
3,3'-Dichlorobenzidine	250	U

Appendix D – Organic Priority Pollutant Scans on Sediment Samples – Continued

Station:	Sediment Near Outfall	
Lab ID #:	058180	
BNA Compounds, continued (ug/kg-dry)		
2-Methylphenol	250	U
1,2-Dichlorobenzene	250	U
o-Chlorophenol	250	U
2,4,5-Trichlorophenol	1200	U
Nitrobenzene	250	U
3-Nitroaniline	REJ	
4-Nitroaniline	REJ	
4-Nitrophenol	REJ	
Benzyl Alcohol	250	U
4-Bromophenyl-phenylether	250	U
2,4-Dimethylphenol	250	U
4-Methylphenol	250	U
1,4-Dichlorobenzene	250	U
4-Chloroaniline	250	U
Phenol	48	J
bis(2-Chloroethyl)Ether	250	U
bis(2-Chloroethoxy)Methane	250	U
bis(2-Ethylhexyl)Phthalate	NAR	
Di-n-Octyl Phthalate	250	U
Hexachlorobenzene	250	U
Anthracene	250	U
1,2,4-Trichlorobenzene	250	U
2,4-Dichlorophenol	250	U
2,4-Dinitrotoluene	250	U
Pyrene	16	J
Dimethyl Phthalate	250	U
Dibenzofuran	250	U
Benzo(g,h,i)Perylene	250	U
Indeno(1,2,3-cd)Pyrene	250	U
Benzo(b)fluoranthene	250	U
Fluoranthene	8	J
Benzo(k)fluoranthene	250	U
Acenaphthylene	250	U
Chrysene	250	U
Retene	250	U
4,6-Dinitro-2-Methylphenol	1200	U
1,3-Dichlorobenzene	250	U

Station:	Sediment Near Outfall	
Lab ID #:	058180	
BNA Compounds, continued (ug/kg-dry)		
2,6-Dinitrotoluene	250	U
n-Nitroso-Di-n-Propylamine	250	U
4-Chlorophenyl-phenylether	250	U
bis(2-chloroisopropyl)Ether	250	U
Pesticides/PCBs (ug/kg-dry)		
4,4'-DDT	8	UJ
Chlordane	41	UJ
Lindane	8	UJ
Dieldrin	8	UJ
Methoxychlor	8	UJ
4,4'-DDD	8	UJ
4,4'-DDE	8	UJ
Heptachlor	8	UJ
Aldrin	8	UJ
alpha-BHC	8	UJ
beta-BHC	8	UJ
delta-BHC	8	UJ
alpha-Endosulfan	8	UJ
Heptachlor epoxide	8	UJ
Endosulfan sulfate	8	UJ
Endrin aldehyde	8	UJ
Toxaphene	160	UJ
Aroclor-1260	50	UJ
Aroclor-1254	50	UJ
Aroclor-1221	100	UJ
Aroclor-1232	50	UJ
Aroclor-1248	50	UJ
Aroclor-1016	50	UJ
beta-Endosulfan	8	UJ
Aroclor-1242	50	UJ

U – Indicates the compound was analyzed for but not detected at the given detection limit.

J – Indicates an estimated value when result is less than specified detection limit.

B– Indicates analyte was found in the blank as well as the sample, possible/probable blank contamination.

M – Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

UJ – Indicates compound was analyzed for but not detected at the given detection limit, and the internal standard on which which the detection limit quantification was based was outside acceptance limits.

REJ – Compound was not quantitated.

NAR – No analysis result.

APPENDIX E

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES
QUALITY ASSURANCE SECTION

TECHNICAL REPORT

SUBJECT: Visit to Alcoa (Vanalco) in Support of EILS Class II Inspection

AUTHORS: Stewart R. Lombard and Lee C. Fearon

DATE: February 20, 1990

Background

Stewart Lombard and Lee Fearon evaluated the Record Keeping, QA/QC Procedures, and Analytical Methods used by the laboratory of the Alcoa (Vanalco) plant in Vancouver, WA. on January 30th in support of the unannounced EILS Class II NPDES inspection team headed by Pat Hallinan.

Ernest Sanders, Jr., Chemist was the primary interviewee and Larry McClellan, Environmental Supervisor was the secondary interviewee. Two key assistants of Larry McClellan were absent and could not be interviewed.

Vanalco operates an on-site laboratory to conduct their Permit Parameter Analyses. The expired permit was in the name of Alcoa and the new permit will be issued in the same name, since Alcoa owns the lagoons and treatment facilities. Vanalco presently operates these facilities.

Some of the required tests are being performed by Columbia Analytical Laboratories in Longview, WA. These tests are Total Suspended Solids, fecal coliform, and BOD tests for the Sanitary Lagoon area, and the Benzo (α) Pyrene test for the Anode cooling water.

The remaining required Permit Parameter tests are performed at the Vanalco laboratory. They consist of Total Suspended Solids, Permit Parameter Metals, Cyanide, Fluoride, Oil and Grease, and pH for the Industrial Lagoon area and Residual Chlorine for the Sanitary Lagoon area.

Detailed descriptions of the analytical parameters, methods employed, and recommended modifications necessary for improvement of analytical procedures, record keeping, validation, and reporting of results follow.

Evaluation of Procedures

Most of the analytical tests are performed on 24 hr. composites, except for the Benzo (α) Pyrene test, which is based upon a weekly composite. The weekly composite is extracted three times with methylene chloride and the combined extracts are sent out to Columbia Analytical Laboratories every Friday.

Occasionally (once in December, 1989, for example), the activated carbon filters used to absorb Benzo (α) Pyrene are not changed frequently enough and the chemist has observed an intense yellow color in the methylene chloride extract before it was sent to Columbia Analytical Laboratories for analysis.

A portion of the daily Industrial Lagoon composite sample is preserved with sodium hydroxide and stored in a refrigerator for 30 days. The cyanide tests are run on these samples once a month with a Technicon Auto Analyzer. The chloramine T colorimetric method is used. No QA/QC is implemented with the cyanide analyses.

Fluoride analyses are performed on a daily basis. Preliminary distillation of the samples is <u>not</u> done. The Fluoride ion specific electrode is used directly on the samples. No quality assurance/quality control samples are run.

The pH, Oil and Grease, and Total Suspended Solids tests were being performed according to accepted and approved procedures. The pH meter, low-temperature oven, dessicators, analytical balance, Buchner Funnel, and Separatory Funnels all appeared to be in good working order. No quality assurance measures, for data validation purposes, are being practiced with these tests.

The Permit Parameters of Aluminum, Antimony, Nickel, Chromium, and Zinc were being analyzed on a daily basis with a Perkin Elmer Model 5000 Atomic Absorption Spectrophotometer. The required method detection limits for these metals cannot be achieved with the flame atomic absorption spectrophotometer.

The absorbance readings of the lowest AAS standards for antimony and nickel were checked. The absorbances were less than 0.010 and the observed fluctuations in the readings were ± 0.001. The absorbances did not have a minimum of two significant figures and the uncertainties in the readings were greater than 10 %.

The chemist has modified the normal metals acid digestion procedure to effect a greater concentration factor for the AAS metals analyses. The water sample are digested with nitric acid in the customary manner, but the initial volume of 250 ml. is reduced to less than 50 ml. and then diluted to a final volume of 50 ml. for an effective concentration factor of 5.

The cyanide tests are being performed once a month on a set of 30 - 31 samples that have been preserved with sodium hydroxide and stored in a refrigerator. Since, the maximum holding time is 14 days, at least half of the samples in the set have exceeded this time. This practice is unacceptable.

Conclusions and Recommendations

(1.) The writing of SOPs and their presence in an accesible SOP Manual in support of necessary departures from standard procedures that have been implemented in the Metals Analysis methodology. Currently, there are none to cover these different procedures and the analytical staff consists of only one chemist. In his absence, the analyses cannot be performed, and the samples are held without action.

This is unacceptable procedure. The existence of written SOP manuals would make the above in-house methods available to qualified staff so that Permit Parameter tests could be performed, as required.

(2.) The presence and availability of EPA, ASTM, and APHA Standard Methods as reference sources in the laboratory would facilitate the correct execution of analytical methods by staff and lessen the dependence upon the presence of the single regular chemist.

(3.) The environmental staff thoroughly and carefully evaluate the Benzo (α) Pyrene loading factor for the activated carbon filters, so that the filters could be changed at the correct time and there would be no excessive upward excursions in the BAP discharge level.

(4.) The cyanide tests must be performed more frequently than once a month. They must be run at least once every 14 days. One purpose of the analyses is to allow corrective action if over-limit excursions occur. Violation of this intent as well as exceeding the authorized maximum holding times is not acceptable.

Most especially, since the cyanide test is run infrequently, QA/QC procedures must be implemented. These should consist of one duplicate for every ten samples and one matrix spike per set. For a set comprised of 14 samples, for example, two sample duplicates and one sample spike should be run.

(5.) A Graphite Furnace and HGA Programmer accessories would allow achievement of the required sensitivity for the AAS metals analyses without modifying the standard accepted and approved acid digestion procedures. Keeping a record book of the receipt dates of the 1,000 PPM analyte metal AAS standards so that the verification of their validity and condition is easily done, is strongly recommended.

(6.) Inventory records should be kept, in general, of reagents ordered, date of receipt, date of opening, and date of final consumption.

(7.) Acids, bases, and organic reagents should be stored separately from one another.

(8.) QA/QC procedures should be implemented for all of the Permit Parameter tests that are performed and clear and complete records of not only these tests, but also the QA/QC results should be kept.