ecology and environment, inc.
101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537
International Specialists in the Environment

TECHNICAL ASSISTANCE TEAM

SITE ASSESSMENT REPORT
MARALCO ALUMINUM
KENT, WASHINGTON

TDD T10-8705-003

REPORT PREPARED BY: ECOLOGY AND ENVIRONMENT, INC.
PROJECT MANAGER: THOMAS ASHLEY
DATE: OCTOBER 1987

SUBMITTED TO: CARL G. KITZ, DEPUTY PROJECT OFFICER
SUPERFUND REMOVAL AND INVESTIGATION SECTION
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
SEATTLE, WASHINGTON

ecology and environment, inc.
101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537
International Specialists in the Environment

Site Assessment Report For
Maralco Aluminum
Kent, Washington

TDD T10-8705-003

Site Name/Address:

Maralco Aluminum
Post Office Box 1167
7730 South 202th Street
Kent, Washington 98032-3167

Investigation Participants:

Thomas M. Ashley, TATM-Chemical Engineer,
E&E, Seattle, WA
(206) 624-9537

Priscilla Anderson, TATM-Toxicologist,
E&E, Seattle, WA
(206) 624-9537

Norm Peck, Inspector, Washington State
Department of Ecology, Redmond, WA
(206) 867-7000

Principal Site Contacts:

Jeffrey H. Reynolds, Assistant Vice President,
Seafirst Bank - Leasco of Washington, Inc.
Seattle, WA.
(206) 358-7221

Quentin Steinberg, Lawyer, U.S. Bankruptcy
Court appointed Bankruptcy Examiner, Seattle, WA
(206) 622-5510

Date of Site Assessment:

June 25, 1987 (0800 to 1900 hours)

ABSTRACT

Pursuant to Technical Direction Document T10-8705-003, the Ecology & Environment, Inc. Technical Assistance Team performed a site assessment of Maralco Aluminum. The assessment was designed to verify the need for removal of several potentially hazardous by-products of the refining process located on the premises of this abandoned aluminum recycling/refining facility.

To accomplish this objective, a sampling plan was developed to characterize the by-products located on site and assess the possible off-site migration of these compounds.

The four compounds of primary interest (black dross, KBI dross, aluminum oxide and baghouse dust) displayed concentrations of priority pollutant metals which exceeded applicable background soil concentrations by up to three orders of magnitude. These compounds were generally characterized by antimony concentrations from 2.9 to 107 ppm, chromium concentrations from 21 ppm to 975 ppm, copper concentrations from 198 to 27,800 ppm, lead concentrations from 241 ppm to 861 ppm, nickel concentrations from 15 ppm to 438 ppm, and zinc concentrations from 1760 ppm to 16,500 ppm.

Sediment samples collected from the seasonal creek which trisects the Maralco premises indicated contamination of the creek by the black dross and/or aluminum oxide piles located immediately adjacent to it. In addition, the off-site migration of these compounds via the creek was analytically substantiated.

Ninety-six-hour fish toxicity tests conducted on samples of the KBI dross and baghouse dust resulted in mortality rates of 90% and 96% respectively, at the 100 ppm level, and a mortality rate of 100%, in both cases, at the 1000 ppm level. A 96-hour fish toxicity test conducted on an undiluted sample of surface water collected from the creek adjacent to the black dross pile resulted in a mortality rate of 100%.

Results of aqueous samples collected from a holding pond on site and the creek revealed concentrations of lead which exceeded Primary Drinking Water Standards and arsenic concentrations in excess of the Water Quality Criteria.

1.0 INTRODUCTION

Maralco Aluminum came to the attention of the U. S. Environmental Protection Agency (EPA) as a result of the expressed concern of the City of Kent. This abandoned aluminum recycling facility was originally identified as a potential environmental and health hazard by the City of Kent Fire Department in the course of a routine annual fire prevention inspection. Subsequent investigations by the City of Kent Engineering Department and the Washington State Department of Ecology (Ecology) were undertaken to assess the structural integrity of the Maralco Aluminum (Maralco) facilities and the potential for adverse environmental impact posed by several by-products and wastes stored on site (1,2).

The City of Kent Engineering Department inspection found the west wall of the 45,000 sq. ft. refinery structurally unsound. Accordingly, access to this building was limited (1).

The Ecology site inspection revealed that the black dross (the primary by-product of the refining process in terms of volume) "stored" on site contained appreciable concentrations of various priority pollutant metals including cadmium, chromium and lead. A discrete sample of pooled runoff from the black dross pile collected by Norm Peck of Ecology revealed cadmium (2.3 ppm), chromium (1.5 ppm), copper (1310 ppm), lead (7.9 ppm) and zinc (13.5 ppm) (3). The concentrations of cadmium and lead expressed above exceeded the EP Tox hazardous waste criteria for these metals of 1 ppm and 5 ppm, respectively (4).

In addition to the estimated 50,000 tons of black dross, other potentially hazardous substances located on site include; 500 lbs of baghouse dust, 10 tons of dross allegedly from Kawecki-Berylco, Inc., of Wenatchee, WA (KBI dross), and 5000 tons of aluminum oxide (5).

Pending the resolution of bankruptcy litigation initiated by Maralco ownership in May of 1983, the State of Washington has assumed the cost of site stabilization. Although the original scope of the stabilization included black dross disposal, funding constraints limited the stabilization to control of site drainage only. The stabilization was completed in July of 1987 at a cost of approximately $60,000 and involved: diversion of the seasonal creek which trisects the site to a location where runoff from the black dross pile is precluded, construction of a berm around the black dross pile to contain future runoff, and installation of gutters and trenches which facilitate the flow of uncontaminated site runoff to the storm sewer system (3).

In May of 1987, the Region 10 Superfund Removal and Investigation Section (SRIS) tasked the Ecology and Environment, Inc., (E&E) Technical Assistant Team (TAT) to perform a site assessment under Technical Direction Document

(TDD) T10-8705-003. The purpose of the assessment was to characterize the potentially hazardous substances stored on site and document conditions that may warrant a removal action.

2.0 OWNER/OPERATOR

Maralco Aluminum Company, Inc. and associated assets currently constitute a bankruptcy estate under the protectorship of the U.S. Bankruptcy Court. The court appointed bankruptcy examiner is Mr. Quentin Steinberg. The owners of Maralco Aluminum, Mr. Nace Halpin and Mr. Jack Lyon, initiated the bankruptcy proceedings in May of 1983. The primary creditor and mortgage holder, Seattle First National Bank, has taken an active interest in the site (5,6).

3.0 LOCATION

Maralco Aluminum is located in the NW 1/4 of the SE 1/4 of section 1, Township 22 North, Range 4 East, in King County Washington. The street address is 7730 South 202nd Street, Kent, Washington (see Figure 1).

4.0 DESCRIPTION OF SITE AND SURROUNDING AREA

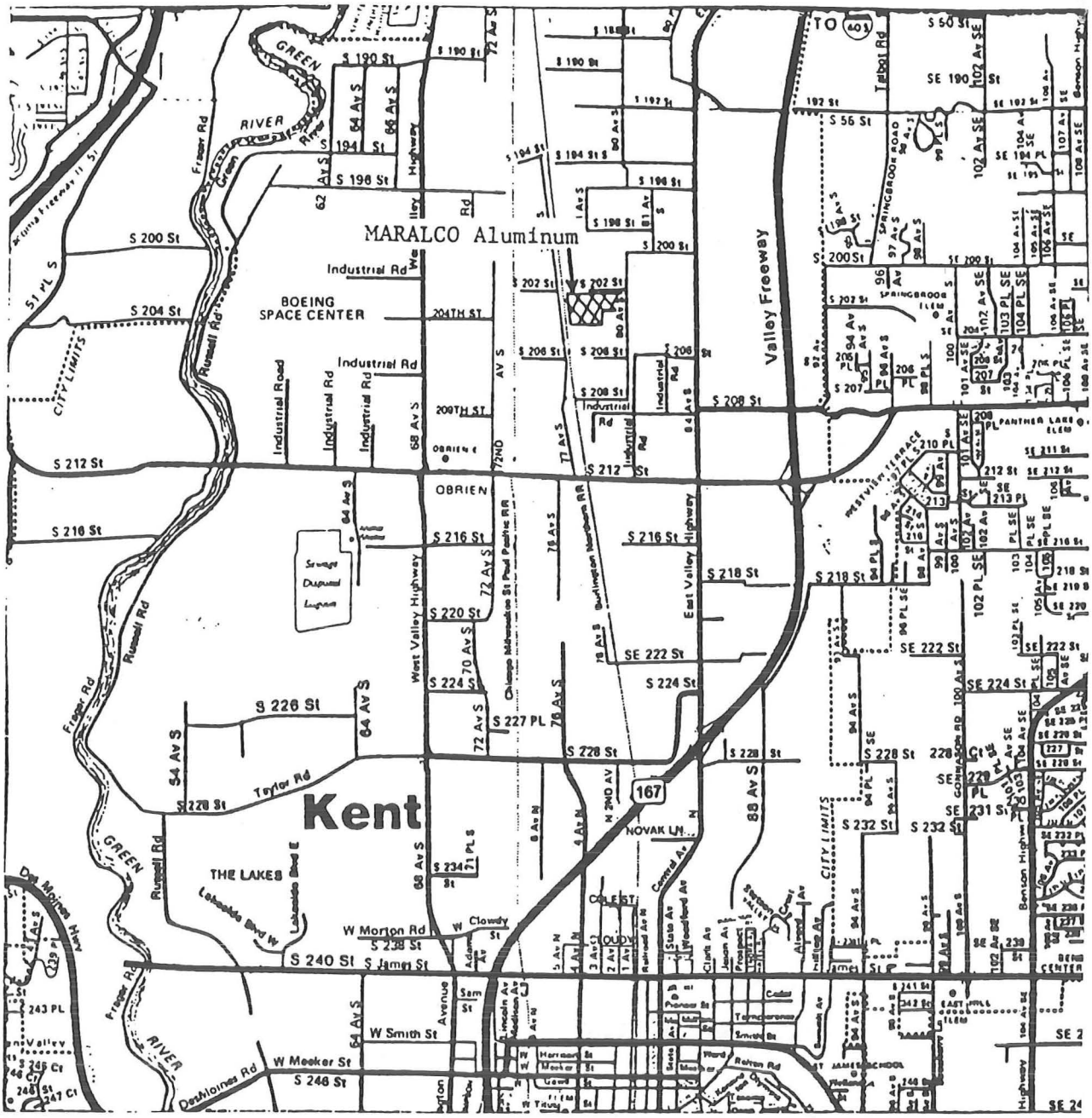
Maralco Aluminum occupies a 13-acre site in a high density industrial area approximately 2 miles north of the City of Kent proper. The site contains a large building (45,000 sq. ft.) where the refining process took place, including some raw materials storage, and two mobile homes which served as the business office and locker room facility (see Figure 2) (7).

The site also contains a residence, which is currently inhabited by Mr. Philip Stansfeld, Metallurgical Engineer and former Production Manager of Maralco. There are no other inhabited residences within 1/4 mile of the site. The site is bordered on the south side by a cedar lumbermill and a vacant lot, on the east side by a warehouse and 80th Avenue South, and on the north side by South 202nd Street. Burlington Northern Railroad tracks form the western border of the site.

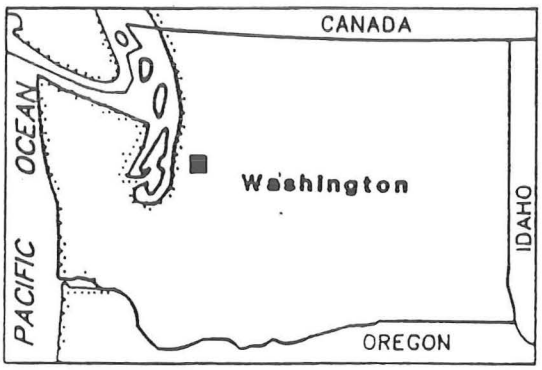
5.0 TOPOGRAPHY AND DRAINAGE

The site displays a gently undulating topography and is trisected by a seasonal creek which flows intermittently from September to early June (7).

The western one-third of the site displays the greatest elevation above the creekbed, approximately 12 feet, and is occupied by the refinery, business office/locker room and a parking lot. Prior to the completion of the state funded site stablilization, the runoff from the buildings and parking lot was directed to the storm sewer system, and all other site runoff, including that from the black dross and aluminum oxide piles, was directed to the creek.



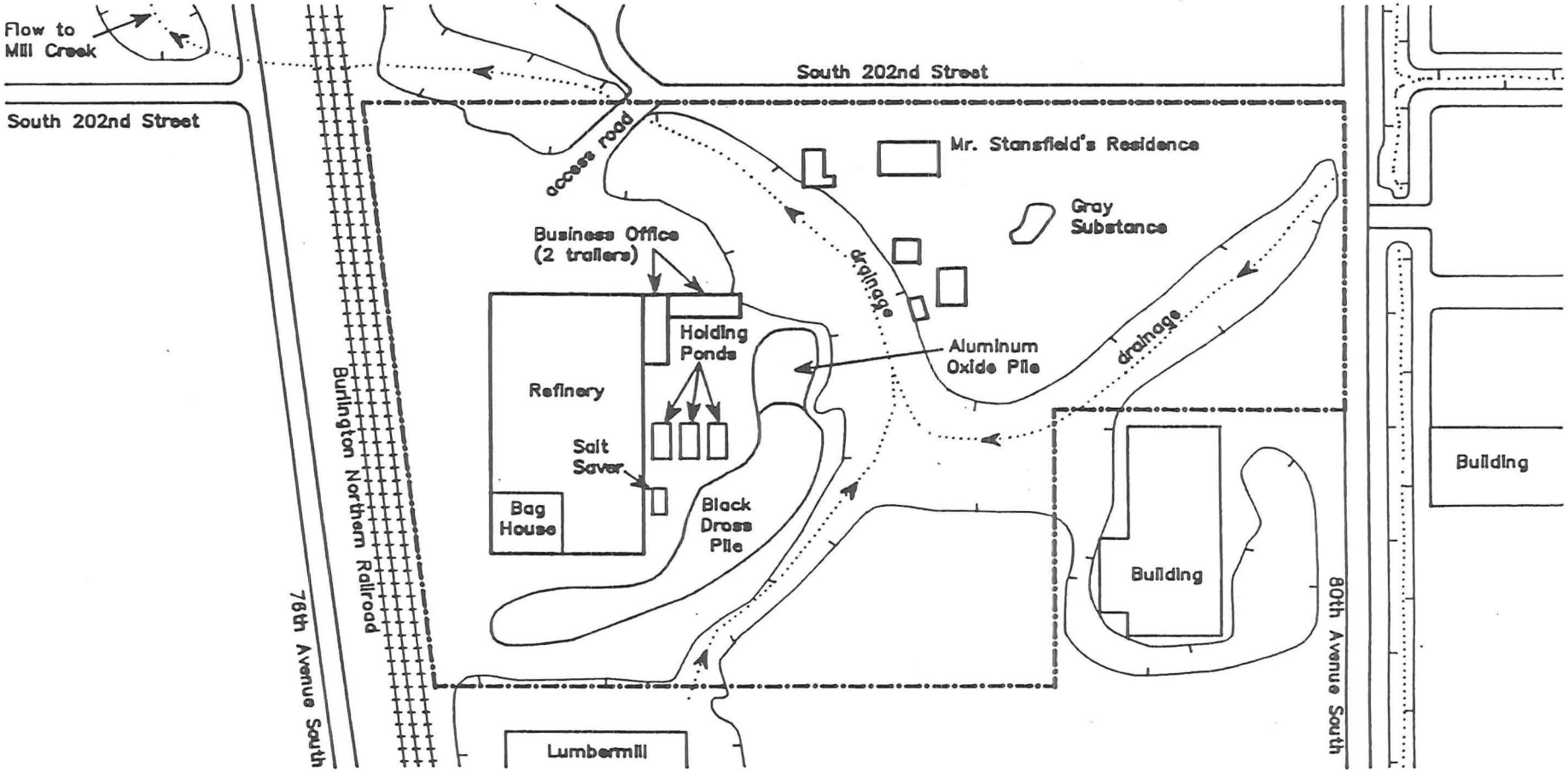
Scale: 1 Inch = 1/2 Mile



ecology & environment, Inc.	
Job: T10-8705-003	Waste Site: WA0518
Drawn by: TA	Date: Sept. 23, 1987

FIGURE 1
SITE LOCATION

MARALCO ALUMINUM COMPANY
Kent, WA



ecology & environment, Inc.	
Job: T10-8705-003	Waste Site: WA0518
Drawn by: D. P.	Date: Oct. 8, 1987

FIGURE 2
SITE MAP

6.0 GEOLOGY AND HYDROGEOLOGY

Maralco Aluminum is near the north-south axis of the Duwamish (Kent) Valley, a former embayment of Puget Sound. The east and west margins of the valley are defined by a dissected drift plain with elevations 350 to 600 feet above the valley floor. The valley is partially filled with sequences of recent alluvial and lacustrine deposits. These deposits are typically fine to medium grained sand, silt, peat silt, and clay. The average depth to bedrock is estimated to exceed 500 ft. (8).

White River Alluvium is the collective designation for the valley fill deposits that occur throughout the Kent Valley and beneath the Maralco Aluminum site. The alluvium consists predominantly of sand, silt and clay with occasional layers of sandy gravel to depths of over 360 feet in the site vicinity. Typically the upper 20 to 50 feet contain more discontinuous lenses of silt, clay and peat (8).

The regional ground water flow system in the Kent Valley is characterized by recharge within the uplands and discharge to the Green River. White River Alluvium is not considered to be a major ground water source in the Kent area because of its relatively low permeability and poor water quality. Many of the wells for which data are available exhibit a sulfur odor, natural gas (methane), and/or high iron concentrations in the water (8).

Both the Maralco production facility and the residence occupied by Mr. Stansfeld obtained their fresh water supply from the City of Kent water system (7).

7.0 OVERVIEW OF OPERATIONS AND SITE HISTORY

Maralco Aluminum was an aluminum recycling/refinery facility that produced aluminum alloy ingots from 1980 to 1986, using aluminum cans and copper and zinc scrap as the primary raw materials. Approximately two-thirds of Maralco's production over this time period was consumed by foreign markets located about the Pacific Rim, the residual one-third was consumed domestically. The facility was abandoned in November of 1986 (7).

8.0 PROCESS DESCRIPTION

The aluminum production industry is composed of two types of aluminum producers. The "primary" aluminum industry consists of large facilities which produce aluminum from bauxite ore, and those facilities which produce large quantities of various alloy types. The "secondary" industry, of which Maralco is a constituent, is composed principally of aluminum recyclers and other smaller facilities which use scrap metal, dross and used beverage containers (UBCs) as raw materials to produce specific alloys. The variety of alloys that these smaller facilities can produce is limited by the

type of raw materials used and the nature and flexibility of the applied refining process (7).

Maralco produced A380 series aluminum alloys. These alloys were used for die-casting applications (e.g. "mag" wheels) and were chemically characterized by a 1-4% copper content, an 8-12% silicon content, and a 0.5-3% zinc content (7).

At Maralco, UBCs, machining scrap, and KBI (Kawecki-Berylco, Inc.) dross were used as sources of metallic aluminum. Kawecki-Berylco, Inc. is a producer of aluminum master alloys located in Wenatchee, WA. The required copper and zinc were obtained in the form of machining scrap from various scrap metal dealers and silicon was procured directly from silica mining facilities. These elements were combined with salt (40% KCl, 60% NaCl) and processed (in batch) in two rotary barrel furnances (7).

The salt performs two important functions in the aluminum refining process. First, it coats liquid aluminum and thereby provides a barrier against oxidation of the metal. Secondly, it acts as a fluxing agent which removes non-metallic residues and metal oxides from the liquid metal. The salt, non-metallic residues and metal oxides, form a separate liquid phase which floats on the liquid metal. This separate phase is called slag or black dross and is the primary waste generated by the process (7,9).

Most of the black dross generated by Maralco was apparently disposed of on site. However, some was processed to recover the salt component for reuse in the rotary furnaces.

Salt was recovered from the black dross in a process called a "Salt Saver". In the initial step of this process, the dross was combined with water in three holding ponds located east of the refinery where the water soluble constituents of the dross, primarily the KCl and NaCl, were separated from the water insoluble constituents, primarily the metal oxides. The brine containing the water soluble compounds was subsequently flashed over a bed of hot salt to remove the water and thereby recover the salt in solid form. The insoluble metal oxide residues (primarily aluminum oxide) from the holding ponds were also disposed of onsite (7).

After removal from the rotary barrel furnaces, the liquid aluminum was transferred to two reverb furnaces, where the chemical composition of the alloy was fine-tuned by the addition of the required trace elements, and subsequently poured into ingots. Particulates were removed from the rotary barrel furnace gasses by a baghouse located in the southwest corner of the refinery (7).

9.0 TAT FIELD ACTIVITY

The E&E TAT arrived at the Maralco Aluminum facility at 0800 hours on June 25, 1987, and was granted access to the property by Mr. Jeff Reynolds, a Seafirst Bank representative. Ecology representatives Mr. Gary Bruger and Mr. Norm Peck were also on site at that time overseeing the state-funded site stabilization.

Mr. Reynolds and Mr. Peck accompanied the TAT on an initial site tour. During the tour, the refining by-products that were the focus of the site assessment were located and inventoried. The black dross and aluminum oxide piles were located east of the refinery building, immediately adjacent to the creek. In areas where the creek had been pumped dry to facilitate stabilization, the creek bed exhibited a layer of black sediment which resembled the dross. In some locations the black sediment was over six inches in depth.

The KBI dross was located in a concrete bin inside the refinery in the southwest corner of the building. Adjacent to the bin was the baghouse which removed particulate from the process gasses. Baghouse dust was found in each of eight metal ash receptacles below the baghouse hoppers.

Immediately following the initial site tour, at approximately 1100 hours, Mr. Reynolds left the site. For the remainder of the day the TAT collected samples of the refining by-products, on and off-site water, sediment and soil samples, and samples of other apparent waste products found on site (e.g., brine from one of the three Salt Saver holding ponds, an unknown gray substance located east of the Stansfeld residence, and a yellow area near the black dross pile).

10.0 SAMPLING PROGRAM

10.1 Previous Sampling

Samples of the black dross, baghouse dust and aluminum oxide were collected by Maralco in February and July 1986 and were analyzed for extractable metals in accordance with the EP Toxicity procedure (10). The results did not exceed EP Tox hazardous waste criteria (4,5). A ninety-six-hour fish toxicity test conducted on a sample of the baghouse dust resulted in mortality rates of 96% at the 100 ppm level and 100% at the 1000 ppm level (5,11).

Ninety-six-hour fish toxicity tests were also conducted on samples of the KBI dross and water from the creek by Ecology. The 96-hour fish toxicity test conducted on the KBI dross resulted in mortality rates of 90% and 100% at concentrations of 100 ppm and 1000 ppm, respectively (3,11). An undiluted sample of surface water collected from the creek adjacent to the black dross pile resulted in a mortality rate of 100% (3,11).

10.2 E&E Sampling Program

E&E's sampling program was designed to chemically characterize the refining by-products located on site and assess the extent of their migration. Sampling locations are shown in Figure 3.

Due to the nature of the refining process the associated by-products or wastes could not be expected to be chemically homogeneous, therefore composite samples were collected of the black dross, aluminum oxide, KBI dross and baghouse dust. For descriptive purposes these samples were designated C1 through C4, respectively, on Figure 3. Each composite was formed from a minimum of 4 discrete samples of equal volume.

Five soil and four sediment samples were collected to characterize the extent of contaminant migration from the dross and aluminum oxide piles. The five soil samples (S1 through S5 on Figure 3) were composites, each formed from equal volumes of soil from a minimum of 5 discrete locations. The background soil sample (S5) was collected from a vacant lot north of the northeast quadrant of the site. Four sediment grab samples were collected at various locations along the creek channel (samples B1 through B4 on Figure 3). The background sediment samples (B3 & B4) were collected adjacent to the culvert under 80th Avenue South where the creek enters the Maralco premises.

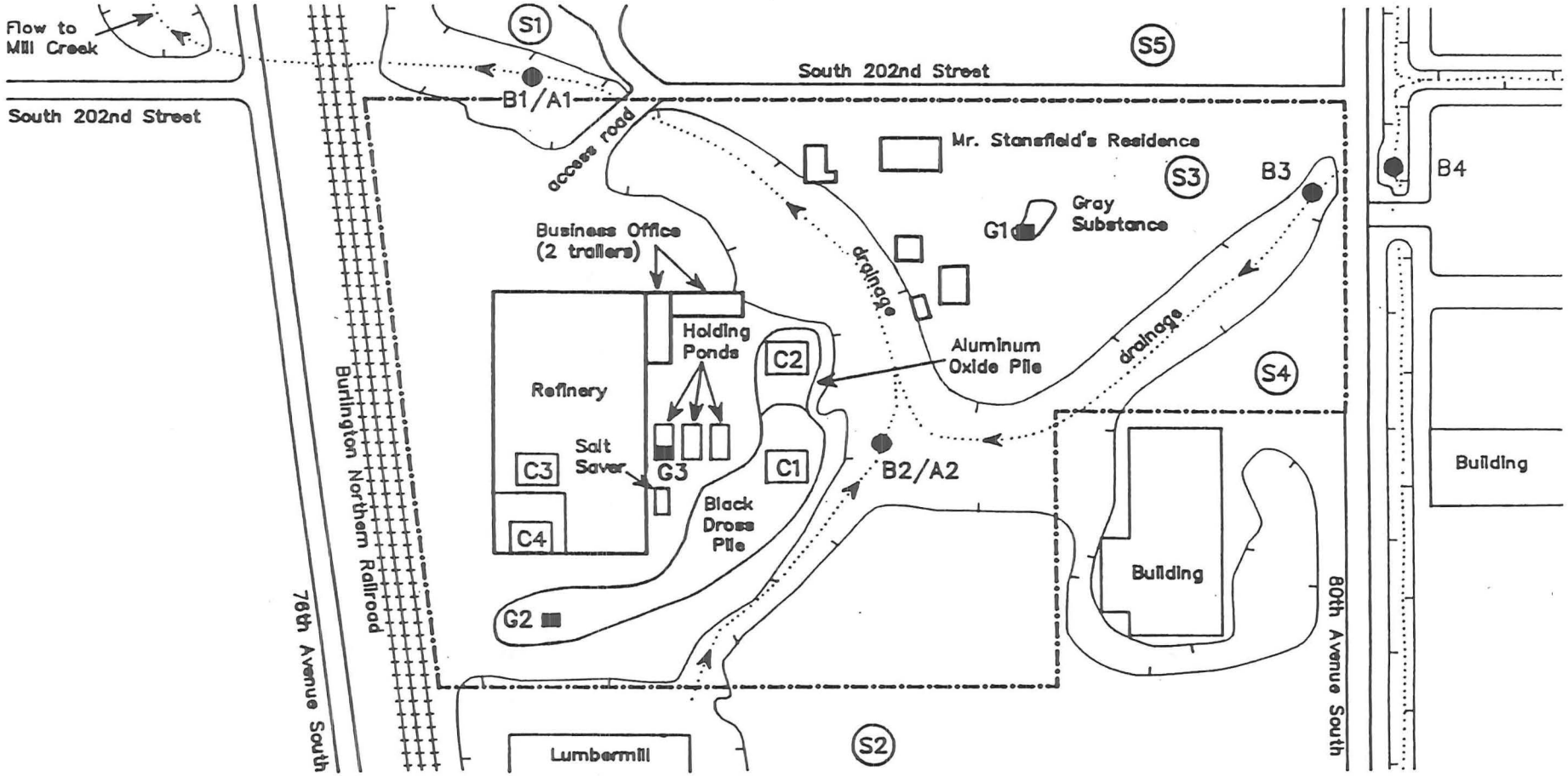
Surface water grab samples were collected from the creek at a point immediately adjacent to the black dross pile (sample A1) and further downstream, at an off-site location near the facility parking lot (sample A2). As the creek was not flowing at the time, these samples were collected from shallow pools in the creekbed. These samples were collected from the same locations as sediment samples B1 and B2. The lack of flow displayed by the creek precluded the acquisition of appropriate surface water background samples.

Grab samples were also collected at three other locations on the Maralco premises. These were:

a) A pile of gray sandy material, similar in appearance to black dross, located in the north east quadrant of the site, approximately 40 yards due east of Mr. Stanfeld's residence (sample G1).

b) A yellow colored area of the black dross. These yellow "spots" were randomly distributed throughout the black dross pile (sample G2).

c) The supernatant, or brine, from one of the three Salt Saver holding ponds east of the refinery (sample G3).



LEGEND

- Site boundary
- Drainage direction
- Depressed area
- A# ● Discrete aqueous sample designator
- B# ● Discrete sediment sample designator
- C# Composite solid sample designator
- S# Composite surface soil sample designator
- G# ■ Miscellaneous discrete sample designator

0 50 100 150 200

scale in feet

N

ecology & environment, inc.	
Job: T10-8705-003	Waste Site: WA0518
Drawn by: D. P.	Date: Oct. 8, 1987

FIGURE 3
SAMPLING LOCATIONS
MARALCO ALUMINUM COMPANY

All samples collected were analyzed for total priority pollutant metals. The solid, soil and sediment samples were also analyzed for leachable metals in accordance with the EP Tox procedure (12).

11.0 RESULTS AND DISCUSSION

11.1 Refining By-Product and Soil Sampling Results

11.1.1 Priority Pollutant Metals Analyses

Tables 1A and 1B present the results of priority pollutant metals analyses of the refining by-products and soil samples. The background soil sample (S5) showed antimony at a concentration of <0.5 ppm, chromium at 11 ppm, copper at 18 ppm, lead at 27 ppm, nickel at 14 ppm, and zinc at 66 ppm. Elevated levels of these six metals characterized the refining by-products and provided a "fingerprint" which was used to identify contaminant migration.

The refining by-products were generally characterized by antimony concentrations from 2.9 ppm to 107 ppm, chromium concentrations from 21 ppm to 975 ppm, copper concentrations from 198 ppm to 27,800 ppm, lead concentrations from 241 ppm to 861 ppm, nickel concentrations from 15 ppm to 438 ppm, and zinc concentrations from 1760 ppm to 16,500 ppm. In most cases, these concentrations exceeded applicable background soil concentrations by one to three orders of magnitude.

Soil sample S2, collected south of the site, indicated a 10 ppm increase in chromium, and 11 ppm increases in copper and nickel above their respective background levels. Soil sample S3, collected from the northeast quadrant of the site, indicated a 17 ppm increase in lead concentration above background. Although both of the samples showed elevated levels of the metals specified above, the concentrations of other metals which also characterized the black dross and aluminum oxide were consistent with background levels. Accordingly, appreciable airborne migration of the black dross or aluminum oxide was not indicated.

11.1.2 EP Toxicity Analyses

The results of EP Toxicity metals analyses of the refining by-products and soil samples are presented in Tables 2A and 2B. None of the by-products or soils generated an extract which exceeded EP Tox hazardous waste criteria (4).

11.2 Sediment Sampling Results

11.2.1 Priority Pollutant Metals Analyses

Results of priority pollutant metals analyses of the sediment samples are presented in Table 3A. Background sediment samples (B3 and B4) indicated the following

TABLE 1A
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF POTENTIALLY HAZARDOUS SUBTANCES FOUND AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	C1	C1 (DUPLICATE)	C2	C3	C4	G1	G2
DESCRIPTION	BLACK DROSS COMPOSITE	BLACK DROSS COMPOSITE	ALUMINUM OXIDE COMPOSITE	KBI DROSS COMPOSITE	BAGHOUSE DUST COMPOSITE	GREY POWDER GRAB	YELLOW DROSS GRAB
LOCATION	PILE SOUTH AND EAST OF REFINERY	PILE SOUTH AND EAST OF REFINERY	PILE EAST OF REFINERY	PILE IN SOUTHWEST CORNER OF REFINERY	BAGHOUSE IN SOUTHWEST CORNER OF REFINERY	PILE IN NORTHEAST QUADRANT OF SITE	PILE OF BLACK DROSS SOUTH OF REFINERY
METAL	CONCENTRATION (ppm)						
Antimony	19.0	16.0	57.0	2.9	107.	3.1	20.0
Arsenic	8.6	7.2	4.1	1.5	3.8	3.9	4.5
Beryllium	6.0	7.2	26.0	3.9	< 2.0	14.0	6.0
Cadmium	7.5	6.8	3.4	13.0	19.0	1.2	4.1
Chromium	588.	637.	442.	975.	21.0	233.	186.
Copper	13,300.	27,800.	2,610.	5,120.	198.	2,190.	2,710.
Lead	861.	241.	226.	307.	587.	146.	176.
Mercury	< 0.2	< 0.2	< 0.2	0.44	0.49	<0.1	0.27
Nickel	438.	355.	118.	81.0	15.0	110.	47.0
Selenium	< 0.3	< 0.3	< 0.3	< 0.2	1.5	< 0.3	0.48
Silver	< 3.0	< 3.0	< 3.0	< 2.0	6.9	< 3.0	< 3.0
Thallium	< 0.5	< 0.5	< 0.5	< 0.4	0.71	< 0.5	< 0.5
Zinc	7,600.	6,960.	1,760.	3,020.	16,500.	1,140.	1,130.

TABLE 1B
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF SURFACE SOIL
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	S1	S2	S3	S4	S5
DESCRIPTION	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	BACKGROUND SURFACE SOIL COMPOSITE
LOCATION	OFF SITE - VACANT LOT NORTH OF MARALCO PARKING LOT	OFF SITE - VACANT LOT SOUTH OF BLACK DROSS PILE	ON SITE - NORTHEAST QUADRANT OF SITE	ON SITE - SOUTHEAST QUADRANT OF SITE	OFF SITE - VACANT LOT NORTH OF NORTHEAST QUADRANT OF SITE
METAL	CONCENTRATION (ppm)				
Antimony	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Arsenic	2.8	4.3	12.0	11.0	9.2
Beryllium	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Cadmium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium	19.0	21.0	10.0	13.0	11.0
Copper	19.0	29.0	21.0	21.0	18.0
Lead	<10.0	26.0	44.0	27.0	27.0
Mercury	< 0.09	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	23.0	25.0	14.0	13.0	14.0
Selenium	< 0.2	0.34	< 0.2	< 0.2	< 0.2
Silver	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Thallium	< 0.4	< 0.4	< 0.4	< 0.5	< 0.4
Zinc	55.0	57.0	56.0	60.0	66.0

TABLE 2A
EP TOX METALS ANALYSES OF POTENTIALLY HAZARDOUS SUBSTANCES
FOUND AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	C1	C1 (DUPLICATE)	C2	C3	C4	G1	G2	
DESCRIPTION	BLACK DROSS COMPOSITE	BLACK DROSS COMPOSITE	ALUMINUM OXIDE COMPOSITE	KBI DROSS COMPOSITE	BAGHOUSE DUST COMPOSITE	GREY POWDER GRAB	YELLOW DROSS GRAB	MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY (4)
LOCATION	PILE SOUTH AND EAST OF REFINERY	PILE SOUTH AND EAST OF REFINERY	PILE EAST OF REFINERY	PILE IN SOUTHWEST CORNER OF REFINERY	BAGHOUSE IN SOUTHWEST CORNER OF REFINERY	PILE IN NORTHEAST QUADRANT OF SITE	PILE OF BLACK DROSS SOUTH OF REFINERY	
METAL	CONCENTRATION IN LEACHATE (ppm)							
Arsenic	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	5.0
Barium	0.82	0.82	0.01	0.60	0.30	0.29	0.66	100.0
Cadmium	0.14	0.01	0.016	0.01	0.25	0.01	0.05	1.0
Chromium	0.10	0.08	0.05	0.047	0.024	0.03	0.014	5.0
Copper	38	27.0	6.20	13.0	0.29	1.10	2.50	N/A
Lead	1.60	1.30	0.11	0.20	0.12	0.05	< 0.05	5.0
Mercury	< 0.001	0.002	< 0.001	0.001	0.002	0.001	< 0.001	0.2
Selenium	< 0.002	< 0.002	< 0.002	< 0.002	0.004	0.002	< 0.002	1.0
Silver	< 0.01	< 0.01	< 0.01	< 0.01	0.08	0.01	< 0.01	5.0
Zinc	78.0	16.0	16.0	23.0	605.	2.20	7.70	N/A

TABLE 2B
EP TOX METALS ANALYSES OF SURFACE SOIL
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	S1	S2	S3	S4	S5	
DESCRIPTION	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	SURFACE SOIL COMPOSITE	BACKGROUND SURFACE SOIL COMPOSITE	MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY (4)
LOCATION	OFF SITE - VACANT LOT NORTH OF MARALCO PARKING LOT	OFF SITE - VACANT LOT SOUTH OF BLACK DROSS PILE	ON SITE - NORTHEAST QUADRANT OF SITE	ON SITE - SOUTHEAST QUADRANT OF SITE	OFF SITE - VACANT LOT NORTH OF NORTHEAST QUADRANT OF SITE	
METAL	CONCENTRATION IN LEACHATE (ppm)					
Arsenic	0.002	< 0.002	< 0.002	< 0.002	0.003	5.0
Barium	< 0.01	0.01	0.13	0.04	< 0.01	100.0
Cadmium	< 0.01	< 0.01	0.01	< 0.01	< 0.01	1.0
Chromium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Copper	0.04	0.035	0.04	0.002	0.03	N/A
Lead	< 0.05	< 0.05	0.05	< 0.05	< 0.05	5.0
Mercury	0.001	< 0.001	< 0.001	0.001	< 0.001	0.2
Selenium	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	1.0
Silver	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Zinc	0.087	0.042	6.20	1.50	0.002	N/A

TABLE 3A
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF SEDIMENT
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	B1	B2	B3	B4
DESCRIPTION	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE
LOCATION	OFF SITE - NORTH OF MARALCO PARKING LOT	ON SITE - ADJACENT TO BLACK DROSS PILE	ON SITE - EASTERN SITE BOUNDRY	OFF SITE - DRAINAGE DITCH EAST OF SITE
METAL		CONCENTRATION (ppm)		
Antimony	1.2	3.2	< 0.6	< 0.6
Arsenic	19.0	5.8	4.4	5.2
Beryllium	< 3.0	5.0	< 2.0	< 3.0
Cadmium	< 2.0	4.5	< 1.0	< 2.0
Chromium	36.0	232.	14.0	14.0
Copper	262.	1,500.	16.0	21.0
Lead	64.0	144.	14.0	20.0
Mercury	0.26	< 0.2	< 0.2	< 0.1
Nickel	31.0	74.0	12.0	15.0
Selenium	0.35	< 0.3	< 0.2	< 0.3
Silver	< 3.0	< 3.0	< 2.0	< 3.0
Thallium	< 0.6	< 0.6	< 0.5	< 0.5
Zinc	365.	1,300.	58.0	67.0

concentrations of the "fingerprint" metals; antimony at <0.6 ppm, chromium at 14 ppm, copper at 21 ppm, lead at 20 ppm, nickel at 15 ppm, and zinc at 67 ppm.

The copper concentration (1500 ppm) in the sediment collected from the creekbed adjacent to the black dross pile (sample B2) was 71 times the background level. In addition, chromium and zinc concentrations were approximately an order of magnitude greater than their respective background sediment concentrations. The sediment sample collected off site, north of the parking lot (B1), showed copper at a concentration of 262 ppm (12-fold background) and zinc at a concentration of 365 ppm (5-fold background). Both of these samples displayed levels of the six "fingerprint" metals which exceeded background levels.

Accordingly, contamination of the creek by, and off-site migration of, the black dross and/or aluminum oxide were analytically verified.

11.2.2 EP Toxicity Analyses

Results of EP Toxicity metals analysis of the sediments are presented in Table 3B. None of the sediments generated an extract which exceeded the EP Tox hazardous waste criteria (4).

11.3 Aqueous Sampling Results

11.3.1 Priority Pollutant Metals Analyses

Results of priority pollutant metals analyses of the aqueous samples are presented in Table 4. Because the creek was not flowing at the time of the assessment, a background surface water sample could not be collected.

The sample of holding pond brine (G3) indicated a lead concentration (0.092 ppm) which exceeded the Primary Drinking Water Standard of 0.050 ppm, and concentrations of antimony (0.27 ppm) and arsenic (0.026 ppm) which exceeded Water Quality Criteria (0.146 ppm and 0.000022 ppm, respectively) (13,15).

The sample of water collected from the creek, north of the parking lot (A1), showed lead at a concentration of 0.087 ppm and arsenic at a concentration of 0.0038 ppm. These concentrations also exceeded the aforementioned standard and criteria.

12.0 SUMMARY

Maralco Aluminum is an abandoned aluminum recycling/refining facility located in a high density industrial area north of the City of Kent, Washington. The facility produced A380 series aluminum alloys from 1980 to 1986 using aluminum cans and machining scrap as the primary raw materials. Located on the 13-acre site were four by-products

TABLE 3B
EX TOX METALS ANALYSES OF SEDIMENT
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	B1	B2	B3	B4	
DESCRIPTION	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE CREEKBED SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE	DISCRETE BACKGROUND SEDIMENT SAMPLE	MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY (4)
LOCATION	OFF SITE - NORTH OF MARALCO PARKING LOT	ON SITE - ADJACENT TO BLACK DROSS PILE	ON SITE - EASTERN SITE BOUNDRY	OFF SITE - DRAINAGE DITCH EAST OF SITE	
METAL	CONCENTRATION IN LEACHATE (ppm)				
Arsenic	< 0.002	< 0.002	< 0.002	< 0.002	5.0
Barium	0.20	0.48	0.098	< 0.01	100.0
Cadmium	0.69	0.02	< 0.01	< 0.01	1.0
Chromium	< 0.01	0.01	< 0.01	< 0.01	5.0
Copper	0.15	0.81	0.034	0.026	N/A
Lead	< 0.05	< 0.05	< 0.05	< 0.05	5.0
Mercury	0.003	< 0.001	< 0.001	< 0.001	0.2
Selenium	< 0.002	< 0.002	< 0.002	< 0.002	1.0
Silver	< 0.01	< 0.01	< 0.01	< 0.01	5.0
Zinc	3.20	3.40	0.90	0.04	N/A

TABLE 4
TOTAL PRIORITY POLLUTANT METALS ANALYSES OF AQUEOUS SAMPLES
AT MARALCO ALUMINUM
JUNE 1987

SAMPLE DESIGNATION	A1	A2	G3	BLANK			
DESCRIPTION	DISCRETE SURFACE WATER SAMPLES	DISCRETE SURFACE WATER SAMPLES	HOLDING POND BRINE	TRANSPORT BLANK - CARBON-FREE WATER	PRIMARY DRINKING WATER STANDARD (13)	SECONDARY DRINKING WATER STANDARD (14)	CLEAN WATER ACT WATER QUALITY CRITERIA (15)
LOCATION	OFF SITE - CREEK NORTH OF MARALCO PARKING LOT	ON SITE - CREEK ADJACENT TO BLACK DROSS PILE	WESTERNMOST OF (3) HOLDING PONDS	(NOT APPLICABLE)			
METAL	CONCENTRATION (ppm)						
Antimony	0.0058	< 0.002	0.27 (B)	< 0.002	N/A	N/A	0.146
Arsenic	0.0038 (B)	< 0.001	0.026 (B)	< 0.001	0.05	N/A	0.000022
Beryllium	< 0.01	< 0.01	< 0.01	< 0.01	N/A	N/A	0.000037
Cadmium	< 0.005	< 0.005	< 0.005	< 0.005	0.01	N/A	0.010
Chromium	< 0.01	< 0.01	0.014	< 0.01	0.05	N/A	0.050
Copper	0.18	0.19	0.48	0.089	N/A	1.0	1.0
Lead	0.087 (A)	< 0.05	0.092 (A)	< 0.05	0.05	N/A	0.050
Mercury	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.002	N/A	0.000144
Nickel	< 0.05	< 0.05	< 0.05	< 0.05	N/A	N/A	0.0134
Selenium	< 0.001	< 0.001	0.0045	< 0.001	0.01	N/A	0.010
Silver	< 0.01	< 0.01	< 0.01	< 0.01	0.05	N/A	0.050
Thallium	< 0.002	< 0.002	< 0.002	< 0.002	N/A	N/A	0.013
Zinc	0.15	0.16	0.45	< 0.01	N/A	5.0	5.0

(A) - Values exceed Primary Drinking Water Standards
(B) - Values exceed CWA Water Quality Criteria

of the refining process: black dross, aluminum oxide, KBI dross and baghouse dust. Three other potentially hazardous substances identified on the Maralco premises were: a pile of gray, sandy material (similar in appearance to the black dross), brine from one of the Salt Saver holding ponds, and a yellow colored "spot" in black dross pile representative of the many yellow areas randomly distributed throughout the pile.

The site is trisected by a seasonal creek which feeds Mill Creek and, ultimately, the Green River. This creek runs immediately adjacent to the black dross and aluminum oxide piles located east of the refinery. A ninety-six-hour fish toxicity test conducted by Ecology on a sample of undiluted water from the creek resulted in a mortality rate of 100%. Ninety-six-hour fish toxicity tests conducted on samples of the baghouse dust and KBI dross resulted in mortality rates of 96% and 90% respectively, at the 100 ppm level, and 100%, in both cases, at the 1000 ppm level.

To characterize the wastes located on site and assess the possible off-site migration of these compounds, E&E, Inc. collected 16 solid and 3 aqueous samples for total priority pollutant metals analysis. The solid samples were also analyzed for extractable metals in accordance with the EP Tox procedure.

Background metals concentrations in soil and sediments were determined by the collection and analysis of samples from appropriate off-site locations. Because the creek was not flowing at the time of the site assessment, a surface water background sample could not be collected.

The samples of the four refining wastes, the gray sandy substances, and the yellow dross spot showed appreciable concentrations of antimony, chromium, copper, lead, nickel and zinc when compared to applicable background soil concentrations. Elevated levels of these six metals characterized the refining by-products and provided a fingerprint of the compounds which was used to identify contaminant migration. The by-products were generally characterized by:

- antimony concentrations from 2.9 to 107 ppm,
- chromium concentrations from 21 to 975 ppm,
- copper concentrations from 198 to 27,800 ppm,
- lead concentrations from 146 to 861 ppm,
- nickel concentrations from 15 to 438 ppm, and,
- zinc concentrations from 1130 to 16,500 ppm.

In most cases, these concentrations exceeded background soil levels by one to three orders of magnitude.

Results of sediment sample analyses indicated black dross/aluminum oxide contamination of, and off-site migration via, the creek which trisects the Maralco premises. Sediments collected from the creek showed elevated (in some cases greater than an order of magnitude) levels of all six fingerprint metals when compared with background sediment levels.

Soil sample results showed metals concentrations in on- and off-site soils consistent with background levels.

None of the solid, soil or sediment samples generated an extract which exceeded EP Tox hazardous waste criteria.

The samples of holding pond brine and off-site surface water from the creek showed lead concentrations (0.092 ppm and 0.087 ppm respectively) which exceeded the Primary Drinking Water Standard for lead of 0.050 ppm. In addition, the concentrations of antimony (0.27 ppm) and arsenic (0.026 ppm) displayed by the brine sample, and the concentration of arsenic (0.0038 ppm) displayed by the off-site water sample, exceeded Water Quality Criteria for these metals (i.e., antimony - 0.146 ppm, arsenic - 0.000022 ppm).

REFERENCES

1. Telephone conversation of 5/19/87. To: Jim Chandler. Inspector, City of Kent Engineering Department. From: Tom Ashley, E&E, Inc.

2. Telephone conversation of 5/20/87. To: Norm Peck, Inspector, Washington State Department of Ecology. From: Tom Ashley, E&E, Inc.

3. Washington State Department of Ecology Enforcement File on Maralco Aluminum.

4. Code of Federal Regulations, 40 CFR 261.24, Characteristic of EP Toxicity. July 1, 1985.

5. Washington State Department of Ecology Hazardous Waste File on Maralco Aluminum.

6. Telephone conversation of 6/9/87. To: Quentin Steinberg, Bankruptcy Examiner, Steinberg Law Firm. From: Tom Ashley, E&E, Inc.

7. Interview on 5/28/87. Philip Stansfeld, former Production Manager of Maralco by Tom Ashley, E&E, Inc.

8. Geology and Groundwater Resources of Southwestern King County, Washington, J.E. Luzier, USGS, 1969.

9. Dyer, J.C. and N.A. Mignone. 1983. Handbook of Industrial Residues. Van Noyes, Park Ridge, N.J.

10. Washington State Dangerous Waste Regulation, WAC 173-303.

11. Washington State Biological Testing Methods, DOE 80-12 as revised July 1981.

12. Extraction Procedure (EP) Toxicity Test Method, EPA Test Methods for Evaluating Solid Waste, SW-846, Method 1310.

13. Code of Federal Regulations, 40 CFR 141, National Interim Primary Drinking Water Regulations, July 1, 1985.

14. Code of Federal Regulations, 40 CFR 143, National Secondary Drinking Water Regulations, July 1, 1985.

15. Water Quality Criteria Documents, Federal Register, v. 45, No. 231, pp. 79318-79, November 28, 1980.