MARALCO SIT 4.4.1

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

DRAFT REPORT

PHASE I FEASIBILITY STUDY REPORT
MARALCO SITE
KENT, WASHINGTON

MARCH 1991

SUBMITTED BY:

MK-ENVIRONMENTAL SERVICES
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SECTION 1

INTRODUCTION/EXECUTIVE SUMMARY

MK-Environmental Services was contracted by the State of Washington, Department of Ecology (Ecology) to perform a Phase I Remedial Investigation/Feasibility Study (RI/FS) at the Maralco Site. The work was started in January 1990 and has included:

- Determination of the extent of the contamination on the eastern portion of the site and remediation methods that will allow for the earliest transfer of that property.
- Survey of the property to define the site boundaries and landmarks to the extent needed to yield information and data to perform the activities in the work plan.
- Preliminary characterization of the nature and extent of contamination of soil, groundwater and surface water identified at the Maralco site.
- Evaluation of the feasibility of an interim expedited response technology to process and recycle the black dross waste pile.
- Recommendation of additional areas of work to be completed in future studies.

The results of the Phase I RI/FS have been summarized into two reports, and the information will support an informed risk management decision regarding the limits and/or the extent of the contamination and the remedial options for the Maralco site.

The Phase I RI results are contained in the Phase I Remedial Investigation Report, Maralco Site, dated February 1991. The Phase I FS results are presented in this report.

Section 2 of the Phase I FS is a discussion of the Maralco site and the background information. Section 3 and 4 describes the FS activities, including the pilot plant operation and the results of the FS. Section 5 is a presentation of ARARs and Section 6 discusses alternate Interim Action Response Technologies that could be considered at the Maralco site. Section 7 addresses the marketing of the recycled product.

In summary, the results of the Phase I FS are as follows:

- Washing the black dross, recovering the washed oxide and discharging the wastewater is technically feasible.

- The black dross pile could be remediated in approximately 13 months.

- The unit cost of remediating the black dross pile is in the range of per ton of black dross. This cost does not include any allowance for one time construction costs, third party oversight, or contractor profit. It also does not reflect any credits for the sale of aluminum oxide or aluminum metal.

- There is a potential market for the recycled aluminum oxide product, however, final contract terms and prices have not been determined.

SECTION 2

MARALCO SITE DESCRIPTION AND BACKGROUND

The Maralco site is a 13 acre industrial property located at 7730 South 202nd Street, Kent, Washington. The Maralco Aluminum Company, Inc. (Maralco) operated an aluminum recycling/refinery facility at the site from 1980 to 1986. The facility produced aluminum alloy ingots from aluminum cans and aluminum metal scrap. Waste products from the operation included black dross, furnace slag, and baghouse dust. During the first year of operation, these wastes were transported off-site to the Cedar Hills landfill. After 1981, the waste material was stored on-site.

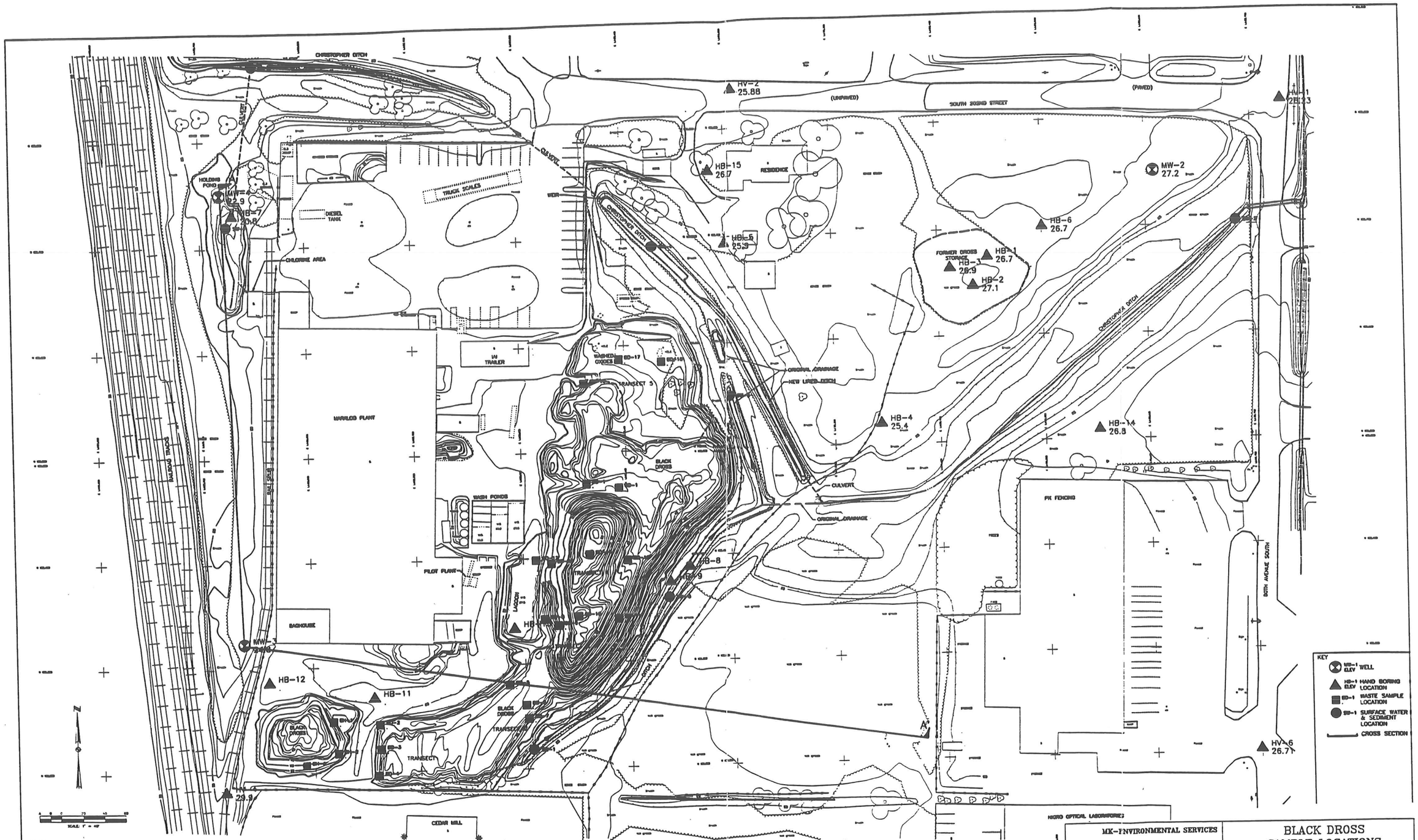
Maralco filed for bankruptcy in May of 1983, and ceased operations in November 1986. The property is currently managed by a bankruptcy examiner. The site remediation activities are funded by the State of Washington, Toxic Controls Account. Ecology has entered into a court agreement with the secured creditors on the property to begin RI/FS activities.

2.1 REGULATORY HISTORY

In February 1986, Ecology received a complaint from the Metro Industrial Wastewater Section expressing concern that leachate from the dross pile was entering the storm drainage system and/or surface waters due to the large amount of dross and the lack of runoff control and waste containment. Ecology personnel visited the site in March 1986 and collected samples of the black dross, "baghouse dust", later alleged to be Kawecki-Berylco, Inc. (KBI) dross, and creek waters (Ecology Request for Administrative Order DE-86-N228 dated December 3, 1986).

The black dross was "book designated" a Moderate Risk dangerous waste as defined by WAC 173-303-040(55) (1986 citation) by Ecology in accordance with WAC 173-303-101(4) on the basis of oral rat toxicity bioassay results for sodium chloride and potassium chloride. The baghouse dust and the KBI dross are extremely hazardous wastes due to fish bioassay toxicity (Ecology Technical Information Memorandum No. 86-1, December 3, 1986).

An enforcement action was never carried out at the site, presumably due to the bankruptcy filing. Ecology performed a surface water and runoff control remediation project to prevent contaminants from washing into nearby ditches from the main black dross pile in 1987. This action consisted of lining the ditch adjacent to the north end of the dross pile and re-routing the drainage ditch along a portion of the pile.



DATUM:
HORIZONTAL - CITY OF KENT SECTION BREAKDOWN
VERTICAL - N.G.V.D. FROM U.S.C.& G.S. BM C-407 RESET
SITE B.M.: ELEV. 28.64
CHISELED SQUARE ON N.W. CORNER OF CONCRETE TRANSFORMER PAD. NEAR N.E. CORNER OF LARGE BUILDING.

HORTON DENNIS & ASSOC. INC.	MARALCO ALUMINUM SITE	MK-ENVIRONMENTAL SERVICES Bellevue, WA
	1' CONTOURS	Job No: 2121 / Scale: Not to scale
		Date: 3/01/91 / Drafter: LMH / Figure No: 3-1 / File Name:

BLACK DROSS SAMPLE LOCATIONS
Kent, WA

However, surface water has continued to flow in the old channel adjacent to the dross pile, and the southern end of the new lined channel is consistently dry.

In 1987, Ecology and Environment, Inc. (E & E) performed a Site Assessment at the Maralco site for the U.S. Environmental Protection Agency (EPA). The results of this assessment are discussed in the Phase I Remedial Investigation Report.

In the winter of 1990, Ecology contracted MK-Environmental Services, Inc. (MK) to perform a Phase I RI/FS at the site, which included overseeing the operation of a pilot plant to test remediation of the black dross. International Aluminum Inc. (IAI) was subcontracted by MK to design, construct, and operate the pilot plant.

2.2 WASTE GENERATION PROCESSES

The Maralco site was a secondary aluminum refinery designed to recycle used aluminum beverage cans and other aluminum scrap. The Maralco process involved melting and processing the aluminum scrap in both rotary barrel and reverberatory furnaces. The rotary barrel furnace operation at Maralco was the source of the black dross. The following is a brief description of the rotary barrel furnace operation for recycling aluminum product:

- A quantity of the sodium chloride and potassium chloride mix is charged and brought to a molten state in a gas-firing, rotating, brick-lined furnace.
- With burners off, the aluminum material is "charged" into the molten salt in the furnace.
- The furnace is rotated with the molten salt coming into direct contact with the aluminum and coating the product.
- The furnace is then fired to bring the mixture to temperature, which upon being reached, results in the stratification of the molten salt (with any resulting oxides) atop the molten metal.
- The lower molten aluminum strata is then tapped from the bottom of the furnace for alloying.
- The salt-oxide phase is poured off for disposal.

This method of melting aluminum has been utilized in the Pacific Northwest since the mid-1950's. The principal advantages of this method of melting aluminum are:

- The prevention of melting loss by coating the product, thus preventing contact with oxygen during and after melting.

- The flexibility of the furnace in keeping alloy integrity by melting in discrete batches.

- The ability to condense quickly by melting large quantities of light gauge and/or feathery materials using the molten salt as a heat sump.

The main disadvantage of the rotary barrel furnace is the production of black dross. As explained above, the salt acted as a flux to remove impurities and to prevent oxidation of the aluminum, resulting in a black dross product. The fresh black dross is approximately 50% salts (E & E, June, 1987). Weathering of the dross, especially in the Pacific Northwest, may reduce the salt content in the dross pile by simple washing. The black dross was taken from the furnace and placed in an outside pile, directly on the ground. Particulate materials from the smelting operations were collected in a baghouse, and the baghouse materials were also placed on the black dross pile. The baghouse, with partially filled bags, remains inside the Maralco building.

Primary alloy materials included metallic silicon, copper and zinc. These were added to the melt in the approximate percentages of 7%, 1% and 1.5% respectively to produce aluminum alloys (E & E, June, 1987). Alloys comprised about one-half of the product line. Other secondary alloy metals included iron, manganese, chrome, tin, nickel, and titanium.

The other half of the product line was aluminum sows produced from used beverage containers. The scrap used contained varying amounts of associated heavy metals. Average production was 1.5 million pounds of product per month over 69 months of operation. Chlorine was used to remove magnesium from the product by the formation of magnesium chloride (MgCl), which was also discharged to the waste pile.

During the later part of operations, salt was recovered from the black dross in a process called a "salt saver". In this process, the dross was mixed with water in three concrete holding ponds, where the potassium and sodium chloride were removed from the metal oxides by a series of washes. The brine was subsequently flashed over a bed of hot salt to remove the water and recover the salt for reuse. The insoluble metal oxide residues from the ponds were disposed on-site in the "oxide lagoon," an unlined lagoon at the north end of the dross pile. Berms for the "oxide lagoon" were formed of black dross.

Components of the black dross combined with water to produce gases according to the following reactions (Reynolds & Olper, 1990):

Hydrogen: $Al + 3H_2O \rightarrow Al(OH)_3 + 3/2H_2$
Ammonia: $AlN + 3H_2O \rightarrow Al(OH)_3 + NH_3$
Methane: $Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$
Phosphene: $AlP + 3H_2O \rightarrow Al(OH)_3 + PH_3$
Hydrogen Sulfide: $Al_2S_3 + 6H_2O \rightarrow 2Al(OH)_3 + H_2S$

The amounts of these gases produced depends on the concentrations of impurities and the availability of water.

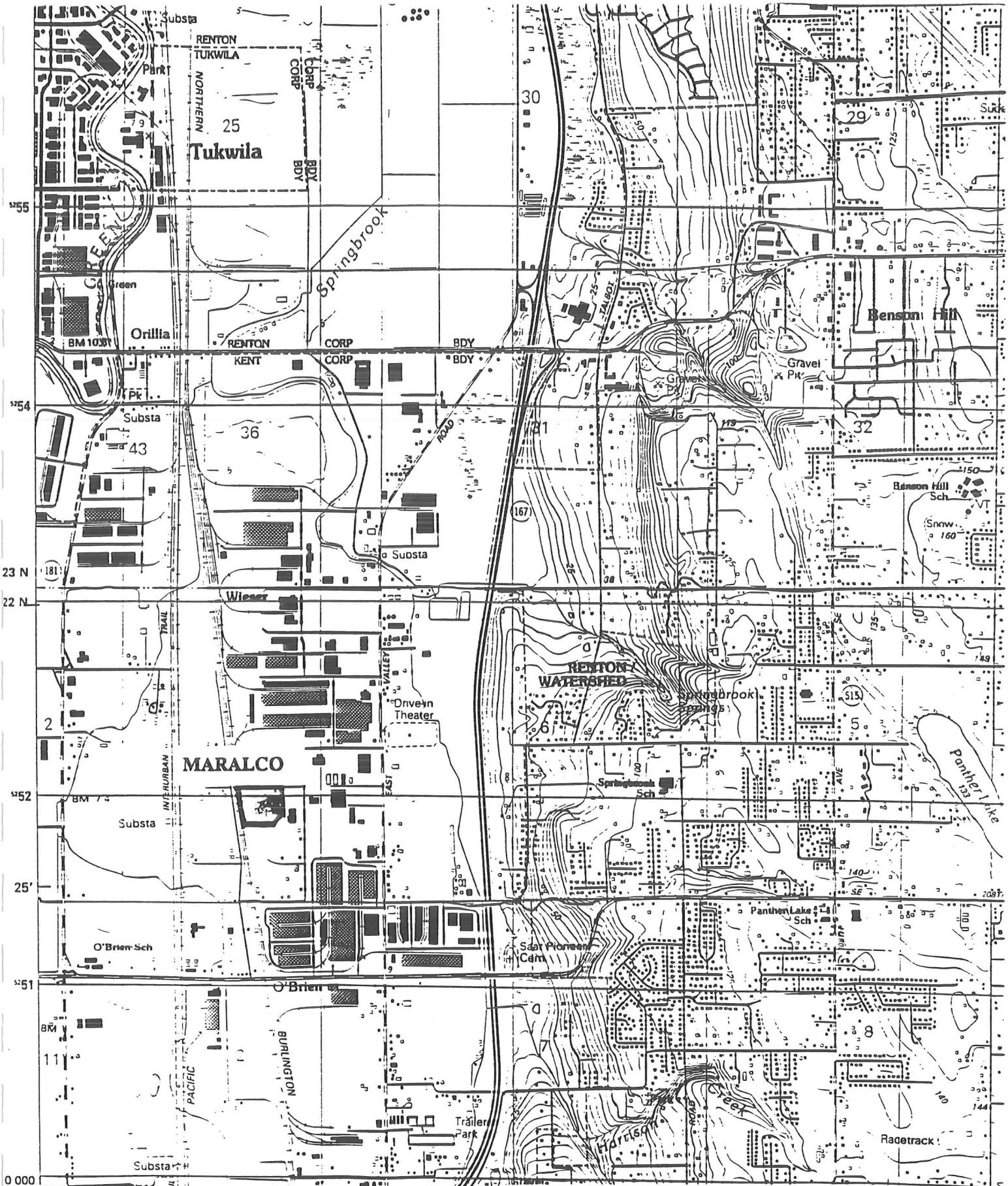
The findings of the preliminary assessment performed by E & E (1987) and the assessment of Ecology indicated that four types of waste materials are present at Maralco. They include an estimated of 50,000 tons of black dross, 10 tons of KBI dross, 5,000 tons of aluminum oxide (in the "oxide lagoon"), and 500 pounds of baghouse dusts.

2.3 SITE DESCRIPTION

Maralco Site, approximately 13 acres in size, is located in Kent, Washington, within the NE 1/4 of the SE 1/4 of Section 1, Township 22 North, Range 4 East. Surrounding land use is light industrial. The location of the site is shown in Figure 2-1. The site topography is generally flat, with elevations of approximately 24-26 feet above mean sea level (MSL). The black dross pile forms a hill up to 61 ft. MSL to the east and to the south of the Maralco building (Figure 2-2).

The site is bounded on the north by South 202nd Street, which ends at the northeast corner of the parking lot, and by the Christopher Ditch along the western edge of the northern boundary. On the east, the site is bordered by 80th Avenue South to about the middle of the site, and by a light industrial building containing Lifetime Doors, Inc. and the PK Fencing Company. To the south, an open field is adjacent to the eastern portion of the property, and the Colonial Cedar Mill borders the site just south of the Maralco building and the dross pile. To the west, the site is bounded by Northern Pacific Railroad tracks.

A farmhouse and outbuildings are located to the northeast of the Christopher Ditch at the west end of S. 202nd St. The farmhouse has been on the site since at least 1968 and is currently occupied by Mr. Philip Stansfeld of IAI. A stand of dense blackberry bushes curves around to the east and south of the house. This brush contains scrap wood, broken bottles, paint cans, appliances, and other miscellaneous items.



MK-ENVIRONMENTAL SERVICES Bellevue, WA		LOCATION MAP MARALCO SITE Kent, WA	
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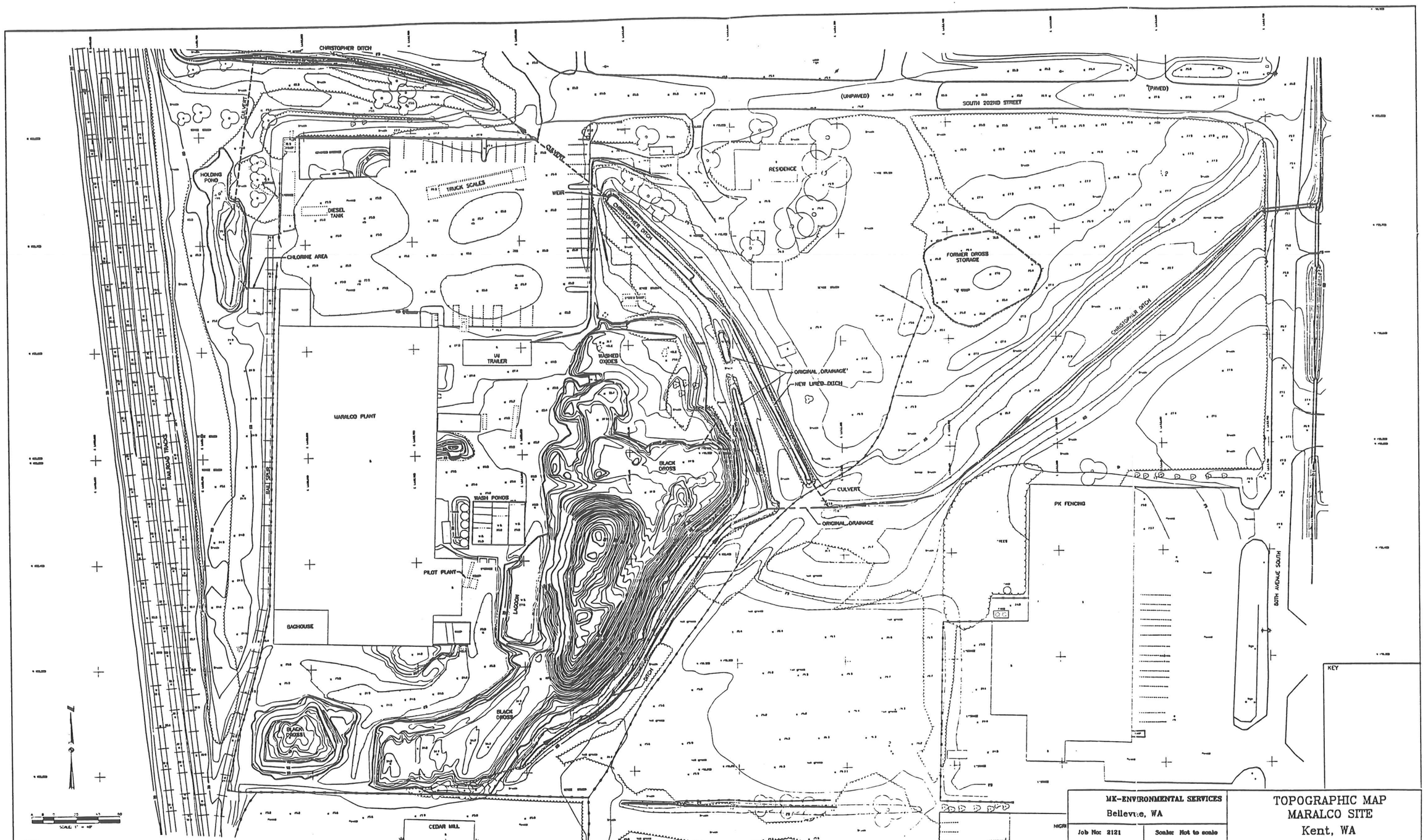
Date: 3/01/91	Drafter: LMH	Figure No: 2-1	File Name:



MK-ENVIRONMENTAL SERVICES Bellevue, WA		TOPOGRAPHIC MAP MARALCO SITE Kent, WA	
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Date: 3/01/91	Drafter: LMH	Figure No: 2-2	File Name:

HORTON DENNIS & ASSOC. INC. 320 SECOND AVENUE SOUTH KIRKLAND, WA 98033-6857		MARALCO ALUMINUM SITE 1' CONTOURS	DEGROSS AERIAL MAPPING

The Maralco processing facilities were located to the west of the drainage ditches and included a parking lot and truck scales, the refinery building, five metal, above-ground, vertical water storage tanks, and three concrete basins (just east of the building). A 35,000 gallon underground diesel storage tank is located beneath the northwest corner of the parking lot. In addition, several empty 55 gallon drums are present in the northwest corner of the parking lot, and outside the northwest corner of the fence.

A rail spur runs along the west edge of the building and ends at the "chlorine area," a metal shed at the northwest corner of the building, where chlorine gas was handled from rail cars. A release of chlorine gas in 1981 killed several trees about 100 ft north of the chlorine area. Due to this release, liquid chlorine entered a holding pond for storm water runoff from the parking lot located to the northwest of the Maralco building. Following the release, chlorine handling was switched from rail cars to 1 ton containers of liquid chlorine. Chlorine gas was used to extract magnesium from the metal by formation of magnesium chloride. The magnesium chloride was discharged to the dross pile. According to Mr. Stansfeld of IAI, pipes from the chlorine area are still filled with chlorine gas.

2.4 SITE GEOLOGY

This discussion of site geology is based on soil borings for installation of monitor wells, hand auger borings for collection of shallow soil samples, and review of data from nearby sites.

The soils immediately underlying the site are composed of fluvial fine to medium grained sands, interbedded with discontinuous clayey sands and clays. A thick clay unit was encountered in boring MW-1, between 6.5 to 13 feet below grade. The clay unit appears to thin, or pinch out, towards the borings to the north and northwest. Borings MW-2, 3, and 4 contain multiple thin, 0.2 to 2 feet, clay intervals. The continuity of the clays below the dross pile is unknown.

Borings and cross sections from the HYTEK site, 1,000 feet northeast of the Maralco site, indicate generally sandy sediments with discontinuous lenses of silt and clay to depths of 80-100 ft (Sweet Edwards, January 1988). A continuous silty clay layer was encountered at this depth in all deep borings at the HYTEK site. This clay may be continuous beneath the Maralco site as well.

SECTION 3

PHASE I FEASIBILITY STUDY/PILOT PLANT PROGRAM

The Phase I Feasibility Study (FS) and Pilot Plant Program (PPP) are described in this section. The Phase I FS/PPP specifically addresses the black dross interim expedited response action at the Maralco site. Phase II of the FS will address all other remediation requirements, including soil, surface water, groundwater, and site demolition and clean up.

The need for the black dross interim expedited response and Phase I FS/PPP was determined after several investigations took place at the Maralco site and significant volumes of contaminated material were identified. The findings of the preliminary assessment work performed by E&E and other investigations by Ecology indicated that there were four waste materials of primary interest at the Maralco site. Included in the assessment were an estimated 50,000 tons of black dross, 10 tons of Kawecki-Berylco, Inc. (KBI) dross, 5,000 tons of aluminum oxide, and 500 pounds of baghouse dusts. The black dross is a dangerous waste under Chapter 173-303 WAC, "Dangerous Waste Regulations". The baghouse dust is an extremely hazardous waste.

Limited sampling and analyses performed by E&E in 1987 showed that concentrations of priority pollutant metals in soils exceeded applicable background soil concentrations by up to three orders of magnitude. Sediment samples collected by E&E in 1987 from the seasonal creek which trisects the Maralco site indicated a contamination of the creek by the black dross and/or aluminum oxide piles located immediately adjacent to the creek. In addition, the off-site migration of the compounds via the creek was analytically substantiated. The primary source of the soil and surface water contamination was determined to be the 50,000 ton black dross pile. It was also suspected as a source of groundwater contamination.

In 1988, IAI, a local process technology company, proposed a remediation process that if proven, would be applicable as an interim expedited response action to treat the black dross pile. IAI is a new company comprised of employees that worked at the Maralco site when it operated as a secondary aluminum refinery. During the Maralco operation, a similar process was used to wash the black dross and recover the aluminum oxide. According to IAI, bench scale tests were completed in 1989, and the results indicated that the black dross material could be washed and recycled, and sold to cement manufacturers as an aluminum oxide. The process required IAI to comply with a wastewater discharge permit issued during the bench scale tests.

Based on the foregoing, a Phase I FS/PPP was planned to:

- Characterize the nature and extent of contamination caused by the black dross pile.

- Develop a preliminary list of and define the potential applicable and relevant or appropriate requirements (ARARs) and to-be-considered information that; 1) may impact or dictate the nature and extent of the interim expedited response action; 2) will be useful in discussions with the various agencies approving the interim response; and 3) allow for improved planning of field and operating practices.

- Evaluate the feasibility of the IAI process to treat the black dross waste pile as an Expedited Response Action. This involved flow sheet analysis with fatal flaw review to establish whether the process has been sufficiently designed; evaluation of construction, operating and discharge permits and limitations associated with those permits; determination of whether the process is feasible by operating a pilot program; review of the estimated capital expenditure and operating costs associated with the process.

- Determine the market potential for the aluminum oxide.

- Assess the viability and costs of alternate technologies.

The preliminary characterization of the black dross pile and the Phase I FS/PPP are described in the following subsections. The ARARs are discussed in Section 5, alternate interim response technologies are presented in Section 6 and the market potential is discussed in Section 7.0.

3.1 PRELIMINARY CHARACTERIZATION OF THE BLACK DROSS PILE

During the Phase I RI/FS, a preliminary chemical and volumetric characterization of the black dross pile was completed. This work involved performing an aerial survey of the pile and obtaining 23 samples from five transects established across the black dross waste pile.

3.1.1 Black Dross Analytical Results

A total of 23 samples were taken from the five transects, including one transect across the washed oxides; an additional three samples were taken from the smaller pile immediately south of the baghouse. Thirteen of these samples were selected for

analysis.

Sample and transect locations are shown in Figure 3-1. The black dross samples were collected at varying vertical depths from 0.5 feet to 4 feet. The sample material was described at 0.5 foot intervals to the base of each sample hole. The black dross is visually described, in general, as a black to dark grey friable, fine-grained to clayey material with 1 to 15 percent disseminated salt crystals. The salts ranged in color from white to blue-green to pink. Thick crusts of salt, presumably from vertical migration of salts by downward percolating rainwater, were encountered at different depths from 1 to 5 feet below the pile surface. Deeper salt crust layers were also observed in cuts or collapsed areas of the dross pile. Ammonia vapors were encountered in many of the boreholes.

Following the collection of all discrete samples, separate composite samples were amalgamated for each of the five transects for toxicity characteristic leaching procedure (TCLP) and hexavalent chromium analyses. The black dross samples were analyzed for the indicator metals (see Table 3.1 for indicator list), Target Analyte List (TAL) metals, moisture, and selected geochemical parameters, including cyanide, ammonia, Total Kjeldahl Nitrogen (TKN), and chloride. The analytical results have been compiled in Table 3.1 and are graphically presented in Figures 3.2 through 3.14. These figures are located at the end of this section.

Total metal results (Table 3.1) for the indicator and TAL metals show a wide variation in the dross material. One group contains very high potassium and sodium concentrations: potassium contents range from 70,700 mg/Kg (BD-9) to 115,000 mg/Kg (BD-8) and sodium contents range from 33,000 mg/Kg (BD-9) to 93,100 mg/Kg (BH-1).

The two samples from the washed oxides area of the waste pile, BD-17 and BD-18, do not have notably lower potassium and sodium contents than the samples of the unwashed oxides; the chloride concentrations are much lower, however. These samples are interpreted to represent insoluble sodium and potassium oxide and not soluble sodium and potassium chloride.

Table 3.1
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Total Metal Analysis
Target Analyte Metals and Indicator Metals
Maralco Site, Kent, Washington

SAMPLE LOCATION:	BH-1	BH-2	BD-5	BD-6	BD-8	BD-9
DEPTH INTERVAL (ft., BGS):	2.3-2.8	2.1-2.7	2.4-2.5	3.5-4.0	1.0-1.5	1.5-2.0
SAMPLE ID:	368501	368502	368507	368509	368511	368512
DESCRIPTION:	baghouse dust	baghouse dust	black dross	black dross	black dross	black dross
SAMPLE DATE:	9/6/90	9/6/90	9/6/90	9/7/90	9/7/90	9/7/90
UNITS:	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
Aluminum*	172000 B,N	130000 B,N	211000 B,N	155000 B,N	130000 B,N	140000 B,N
Antimony	<3.15		<2.88	<2.89		<2.78
Arsenic	<0.633		0.722	2.75		1.94
Barium*	65.2 N	81.2 N	91.5 N	66.1 N	91.5 N	76.4 N
Beryllium	1.26		2.8	1.88		1.94
Cadmium	2.05		5.19	2.31		2.36
Calcium*	2840	4200	6800	4340	5120	5000
Chromium*	153 B,N	189 B,N	198 B,N	119 B,N	412 B,N	120 B,N
Cobalt	4.1		7.38	3.47		11
Copper*	1200	1420	2860	1660	1200	748
Iron	3630 B		8100 B	3040 B		6700 B
Lead*	110	108	144	115	93.1	97.2
Magnesium*	19200 N	15000 N	21600 N	20500 N	24800 N	22800 N
Manganese*	1510 B	1100 B	1960 B	1070 B	1000 B	986 B
Mercury	0.26		0.351	0.064		0.059
Nickel	31.5 B,N		67.9 B,N	39.1 B,N		36.1 B,N
Potassium*	109000 N	86600 N	17300 N	43400 N	115000 N	70700 N
Selenium	<0.633		<0.577	<0.578		<0.555
Silver	<1.57		<1.44	<1.45		<1.39
Sodium*	93100	65000	15900	27500	45000	33000
Thallium	<0.633		<0.577	<0.578		<0.555
Vanadium	84.7		137	84.8		197
Zinc*	773 B	871 B	2000 B	1060 B	952 B	643 B

Table 3.1 (continued)
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Total Metal Analysis
Target Analyte Metals and Indicator Metals
Maralco Site, Kent, Washington

SAMPLE LOCATION:	BD-10	BD-11	BD-12	BD-13	BD-113	BD-14	BD-15
DEPTH INTERVAL (ft., BGS):	3.5-4.0	2-2.5	0-1.0	1.5-2.5	1.5-2.5	3.5-4.0	2.5-3.5
SAMPLE ID:	368513	368514	368515	368516	368517	368518	368519
DESCRIPTION:	black dross	black dross	black dross	black dross	black dross	black dross	black dross
SAMPLE DATE:	9/7/90	9/7/90	9/7/90	9/7/90	9/7/90	9/7/90	9/7/90
UNITS:	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
Aluminum*	194000 B,N	147000 B,N	185000 B,N	153000 B,N	191000 B,N	166000 B,N	175000 B,N
Antimony	4.65		3.9				3.5
Arsenic	8.61		4.87				5.25
Barium*	120 N	128 N	152 N	66.8 N	96.6 N	86.6 N	105 N
Beryllium	8.377		5.65				2.8
Cadmium	6.98		7.8				5.07
Calcium*	23000	7600	12500	4700	6300	6700	7350
Chromium*	349 B,N	140 B,N	1860 B,N	1200 B,N	176 B,N	324 B,N	146 B,N
Cobalt	6.28		8.38				7.52
Copper*	4600	2100	2180	1600	2850	5400	1290
Iron	6500 B		6000 B				7200 B
Lead*	116	129	214	103	149	81.1	70
Magnesium*	30000 N	27500 N	39600 N	19700 N	29000 N	24300 N	33200 N
Manganese*	893 B	827 B	1060 B	1200 B	1400 B	841 B	1220 B
Mercury	0.238		0.155				0.076
Nickel	116 B,N		56.5 B,N				57.7 B,N
Potassium*	27900 N	57000 N	29000 N	22400 N	29800 N	33600 N	17500 N
Selenium	<0.931		<0.780				<0.700
Silver	<2.33		<1.95				<1.75
Sodium*	25600	21000	18900	16200	21500	32400	16500
Thallium	<0.931		<0.780				<0.700
Vanadium	98.4		280				124
Zinc*	6100 B	1730 B	2000 B	780 B	1200 B	2820 B	1320 B

Table 3.1 (continued)
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Total Metal Analysis
Target Analyte Metals and Indicator Metals
Maralco Site, Kent, Washington

SAMPLE LOCATION:	BD-16	BD-17	BD-18	BB-1	BB-2	BB-3
DEPTH INTERVAL (ft., BGS):	3.0-4.0	3.5-4.0	3.0-4.0			
SAMPLE ID:	378522	378525	378527	368508	368520	368534
DESCRIPTION:	black dross	black dross	black dross	water	water	water
SAMPLE DATE:	9/10/90	9/10/90	9/10/90	9/7/90	9/7/90	9/10/90
UNITS:	ug/g	ug/g	ug/g	ug/ml	ug/ml	ug/ml
Aluminum*	145000 B,N	18600 B,N	181000 B,N	0.36 B	0.25 B	0.18 B
Antimony						
Arsenic						
Barium*	167 N	236 N	289 N	<0.003	<0.003	<0.003
Beryllium						
Cadmium						
Calcium*	13900	10100	10000	1.8 B	1.7 B	0.59 B
Chromium*	322 B,N	207 B,N	172 B,N	<0.006	<0.006	<0.006
Cobalt						
Copper*	2100	1300	1100	0.027 B	0.016 B	0.01 B
Iron						
Lead*	172	176	168	0.01 B	0.002 B	0.004 B
Magnesium*	38200 N	61700 N	45000 N	0.24	<0.10	<0.10
Manganese*	879 B	1270 B	1100 B	0.005 B	0.004 B	0.002 B
Mercury						
Nickel						
Potassium*	42000 N	22000 N	21700 N	<1.0	<1.0	<1.0
Selenium						
Silver						
Sodium*	30600	26000	20100	0.72 B	0.69 B	0.6 B
Thallium						
Vanadium						
Zinc*	1870 B	960 B	864 B	0.043 B	0.024 B	0.032 B

NOTES:

(1) Analyses performed and reviewed by AM Test, Inc. in Redmond, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. The following USEPA Analytical Methods were employed: Arsenic: 7060; Lead: 7421, 239.2; Mercury: 7470; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7. Dates of analyses were: Mercury: 9/21/90; Lead: 9/25 and 10/2/90; Selenium, Thallium, Arsenic: 10/3/90; Antimony: 10/4/90; all others (ICP): 9/29/90.

(2) Data qualifiers:
< = less than detection limit noted.
B = compound detected in blank. For the black dross and baghouse dust matrix, the blank values are not significant in comparison to the sample values.
N = recovery not within control limits.

(3) * = indicator metals

(4) BD-113 is a duplicate of BD-13.
BB-1, BB-2, and BB-3 are equipment blanks.

Concentrations of the other indicator metals are relatively high. Aluminum concentrations range from 130,000 mg/Kg (BH-2, BD-8) to 211,000 mg/Kg (BD-5), barium ranges from 65.2 mg/Kg (BH-1) to 289 mg/Kg (BD-18), calcium concentrations vary from 2840 mg/Kg (BH-1) to 23,000 mg/Kg (BD-10), chromium ranges from 119 mg/Kg (BD-6) to 1860 mg/Kg (BD-12), copper ranges from 746 mg/Kg (BD-9) to 5400 mg/Kg (BD-14), lead varies from 70 mg/Kg (BD-15) to 214 mg/Kg (BD-12), magnesium varies from 15,000 mg/Kg (BH-2) to 45,000 mg/Kg (BD-18), manganese ranges from 827 mg/Kg (BD-11) to 1960 mg/Kg (BD-5), and zinc concentrations range from 643 mg/Kg (BD-9) to 6100 mg/Kg (BD-10).

The results from the Toxicity Characteristic Leaching Procedure (TCLP) metals and hexavalent chromium analyses for the composite black dross samples are compiled in Table 3.2. All TCLP metal concentrations were below detectable levels, except for TC-1, which contained 0.2 mg/Kg lead. Hexavalent chromium ranged from less than detectable quantities to 0.092 mg/Kg in four composite samples.

The geochemical parameter analytical results for the black dross samples are shown in Table 3.3. Chloride concentrations are high in most samples, with concentrations as high as 150,755 mg/Kg (BH-2) in the high potassium and sodium group and ranging from 80 mg/Kg (BD-16) to 59,427 mg/Kg (BD-6) in the lower potassium and sodium group. Ammonia and TKN concentrations ranged from 26 mg/Kg (BD-10) to 686 mg/Kg (BD-6) and 398 mg/Kg (BD-10) and 4089 mg/Kg (BD-5), respectively. Cyanide content was less than 2 mg/Kg in all dross samples.

Table 3.2
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Samples
Selected Parameters
Maralco Site, Kent, Washington

SAMPLE LOCATION	DEPTH INTERVAL (ft., BGS)	SAMPLE ID	DESCRIPTION	SAMPLE DATE	AMMONIA (mg/Kg)	TOTAL KJELDAHL NITROGEN (mg/Kg)	CHLORIDE (mg/Kg)	CYANIDE (mg/Kg)
BH-1	2.3-2.6	368501	black dross	9/6/90	292	884	140,642	0.67
BH-2	2.1-2.7	368502	black dross	9/6/90	188	677	150,755	0.42
BD-5	2.4-2.5	368507	black dross	9/6/90	153	4089	15,752	1.30
BD-6	3.5-4.0	368509	black dross	9/7/90	686	3006	59,427	1.50
BD-8	1.0-1.5	368511	black dross	9/7/90	149	554	131,988	0.66
BD-9	1.5-2.0	368512	black dross	9/7/90	95	664	95,593	0.56
BD-10	3.5-4.0	368513	black dross	9/7/90	26	398	2,025	1.04
BD-11	2.0-2.5	368514	black dross	9/7/90	109	824	41,901	1.07
BD-12	0.0-1.0	368515	black dross	9/7/90	46	684	20,541	1.53
BD-13	1.5-2.5	368516	black dross	9/7/90	101	856	30,614	1.08
BD-113	1.5-2.5	368517	black dross	9/7/90	84	3768	30,265	0.96
BD-14	3.5-4.0	368518	black dross	9/7/90	197	879	5,728	1.51
BD-15	2.5-3.5	368519	black dross	9/7/90	145	777	1,655	0.70
BD-16	3.0-4.0	368522	black dross	9/10/90	61	646	80	0.74
BD-17	2.0-3.0	368525	black dross	9/10/90	109	795	108	1.49
BD-18	3.0-4.0	368527	black dross	9/10/90	64	658	81	1.43
HB-4	0.0-1.0	378552	soil	9/11/90	57	760	4	0.25
HB-4	2.0-3.0	378553	soil	9/11/90	13	102	3	<0.21
HB-5	0.0-0.2	378548	soil	9/11/90	109	1098	17	0.65
HB-5	1.0-2.0	378549	soil	9/11/90	28	331	3	0.29
HB-6	0.0-1.0	378550	soil	9/11/90	108	1110	6	0.22
HB-6	2.0-3.0	378551	soil	9/11/90	13	6	4	<0.22
HB-7	0.5-1.3	378533	soil	9/10/90	347	1479	30	1.32
HB-8	0.0-1.0	378544	soil	9/11/90	341	631	65743	0.33
HB-8	2.5-3.0	378545	soil	9/11/90	222	316	42001	0.29
HB-9	0.0-1.0	378542	soil	9/11/90	53	1754	21092	0.51
HB-9	3.0-4.0	378543	soil	9/11/90	206	690	41498	<0.25
HB-11	0.0-0.75	378529	soil	9/10/90	164	1171	58535	0.55
HB-11	1.5-2.5	378530	soil	9/10/90	97	237	17874	<0.22
HB-11	2.5-4.0	378531	soil	9/10/90	64	173	12726	0.33
HB-12	1.0-1.5	378532	soil	9/10/90	201	2373	45153	0.71
HB-13	1.5-2.5	378528	soil	9/10/90	38	593	4175	1.04
HB-14	0.0-1.0	378555	soil	9/12/90	120	1753	5	0.22
HB-14	2.0-3.3	378556	soil	9/12/90	23	298	2	<0.21
HB-114	2.0-3.3	378557	soil	9/12/90	22	279	3	<0.21
HB-15	0.0-0.5	378546	soil	9/11/90	93	885	6	0.30
HB-15	2.0-3.0	378547	soil	9/11/90	27	255	7	<0.18
HB-16	0.0-1.0	378558	soil	9/12/90	128	1807	10	0.21
HB-16	2.0-3.0	378559	soil	9/12/90	21	241	5	<0.18

Table 3.2 (continued)
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Samples
Selected Parameters
Maralco Site, Kent, Washington

SAMPLE LOCATION	DEPTH INTERVAL (ft., BGS)	SAMPLE ID	DESCRIPTION	SAMPLE DATE	AMMONIA (mg/Kg)	TOTAL KJELDAHL NITROGEN (mg/Kg)	CHLORIDE (mg/Kg)	CYANIDE (mg/Kg)
MW-1	3.0-4.0	398576	soil	9/25/90	12	154	3	<0.21
MW-1	6.0-7.5	398577	soil	9/25/90	33	343	4	<0.27
MW-1	12.0-13.5	398578	soil	9/25/90	55	193	3	<0.25
MW-1	15.0-16.5	398579	soil	9/25/90	46	137	<3	<0.25
MW-2	2.0-3.0	398571	soil	9/25/90	15	169	3	<0.21
MW-2	6.0-7.5	398572	soil	9/25/90	7	72	3	<0.22
MW-2	10.5-12.0	398573	soil	9/25/90	10	90	4	<0.25
MW-2	15.5-16.5	398574	soil	9/25/90	148	693	8	<0.25
MW-3	3.0-4.5	398565	soil	9/24/90	10	81	1936	<0.25
MW-3 dup	3.0-4.5	398567	soil	9/24/90	13	154	1932	<0.25
MW-3	6.5-7.5	398568	soil	9/24/90	47	258	3608	<0.24
MW-3	12.5-13.5	398569	soil	9/24/90	62	155	2517	<0.24
MW-3	15.0-16.5	398570	soil	9/24/90	72	281	2860	<0.23
MW-4	1.5-3.0	398561	soil	9/24/90	34	266	120	<0.27
MW-4	4.5-6.0	398562	soil	9/24/90	12	67	83	<0.23
MW-4	9.0-10.5	398563	soil	9/24/90	97	415	3974	0.73
MW-4	12.0-13.5	398564	soil	9/24/90	13	43	765	<0.22

NOTES:

(1) Analyses performed and reviewed by Analytical Resources, Inc. in Seattle, WA and EPA/Ecology Manchester Laboratory, in Port Orchard, WA, respectively. The following USEPA Analytical Methods were employed: Cyanide: 335.2; Ammonia: 350.1; TKN: 351.1; Chloride: 325.3

(2) Dates of analyses are as follows: Ammonia: 10/7 – 10/23/90, Total Kjeldahl Nitrogen: 10/8 – 11/15/90, Chloride: 10/7 – 17/90, Cyanide: 9/27 – 11/2/90.

(3) BD-113 and HB-114 are duplicates of BD-13 and HB-14 (2.0-3.3).

Table 3.3
Results of Stage 2 Laboratory Analyses of Black Dross/Baghouse Waste Samples
Composite Samples From Waste Pile Transects
TCLP Metals and Hexavalent Chromium Analysis (Target Analyte Metals)
Maralco Site, Kent, Washington

SAMPLE LOCATION:	TC-1 Composite	TC-3 Composite	TC-5 Composite	TC-1 Composite	TC-3 Composite	TC-4 Composite	TC-5 Composite
SAMPLE ID:	378535	378539	378538	378536	378540	378541	378537
DESCRIPTION:	black dross	black dross	black dross	black dross	black dross	black dross	black dross
SAMPLE DATE:	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90	9/11/90
ANALYSIS DATE:	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90	10/4/90
UNITS:	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Arsenic	<0.02	<0.02	<0.02				
Barium	<1.0	<1.0	<1.0				
Cadmium	<0.05	<0.05	<0.05				
Chromium	<0.10	<0.10	<0.10				
Lead	0.2	<0.10	<0.10				
Mercury	<0.001	<0.001	<0.001				
Selenium	<0.05	<0.05	<0.05				
Silver	0.07	<0.05	<0.05				
Hexavalent Chromium				<0.062	<0.056	0.087	0.092

NOTES:

(1) Analyses performed and reviewed by AM Test, Inc. in Redmond, WA and EPA/Ecology Manchester Laboratory in Port Orchard, WA, respectively. The following USEPA Analytical Methods were employed: Toxicity Characteristic Leaching Procedure: 1311: Arsenic: 7060; Lead: 7421, 239.2; Mercury: 7470; Selenium: 7740; Thallium: 7841, all other metals: 6010, 200.7.

(2) Data qualifiers:
< = less than detection limit noted.

3.1.2 Volumetric Survey Results

Original estimates of the black dross quantity at the Maralco site were determined to be 50,000 tons and the washed oxide pile, located immediately to the north of the black dross pile, was estimated to be 5,000 tons. These estimates were prepared as part of the Preliminary Assessment. After performing an aerial survey and using the results to estimate the volumes and tons, revised estimates are as follows:

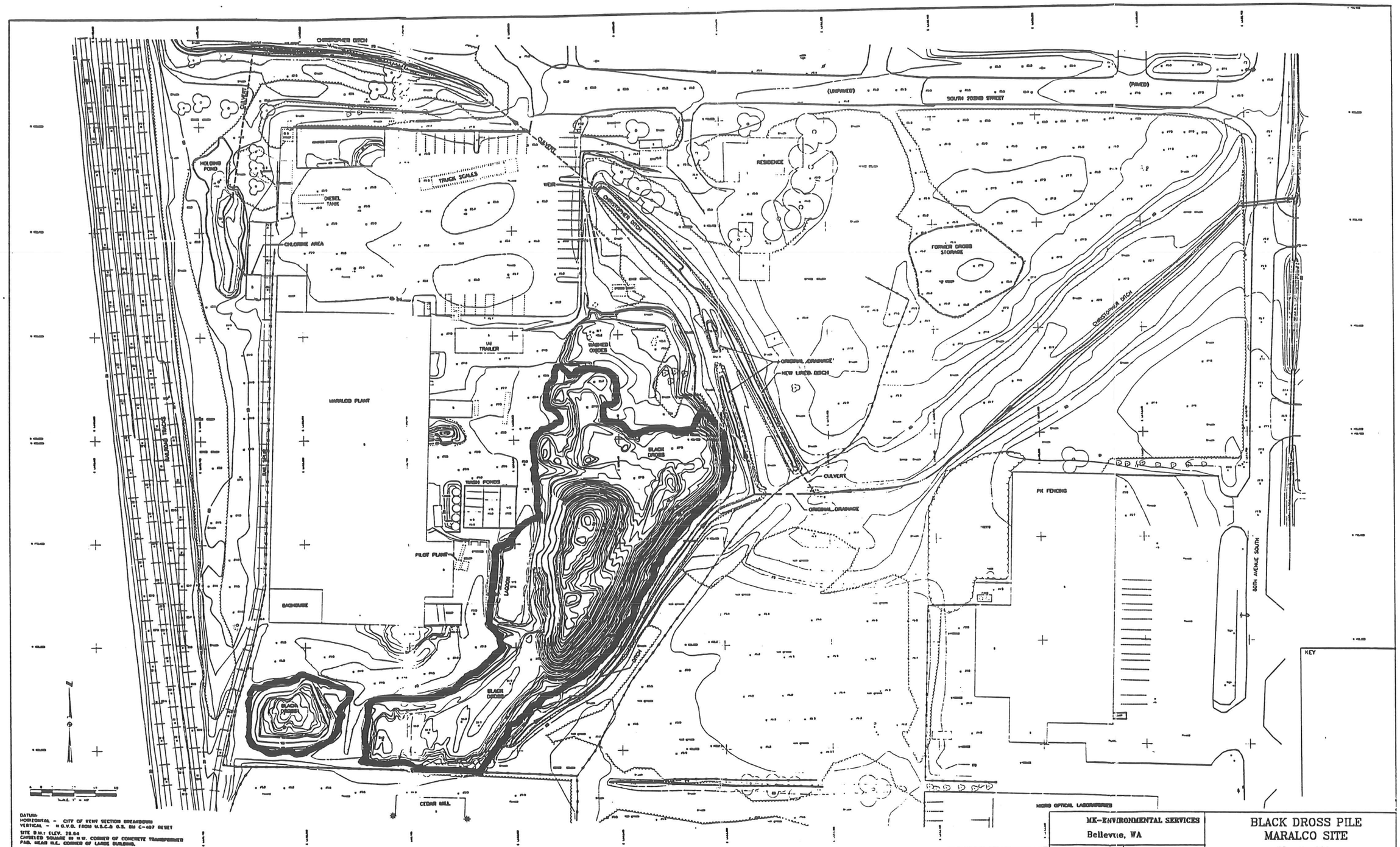
Table 3.4
Volumetric Survey Results

Volume of Black Dross:	19,325 cubic yards
Volume of Washed Oxide:	1,074 cubic yards
Tons of Black Dross (20% Moisture):	26,089 tons
Tons of Washed Oxide (20% Moisture):	1,450 tons
Tons of Black Dross (Dry Basis):	20,871 tons
Tons of Washed Oxide (Dry Basis):	1,160 tons

The volume of black dross material was determined using topographic data generated from an aerial survey. Using this data, the black dross pile was outlined, as shown in Figure 3-15, and contoured on 1 foot intervals. The data points from the survey were input into a computer program which was used to calculate the waste pile volume. The 26 foot contour at the east side and the 28 foot contour at the west side of the pile were used as the baseline boundary of the black dross pile.

The total volume of the black dross pile was calculated to be 19,325 cubic yards with an accuracy of ± 10%. Using a density factor for the dross of 2,700 pounds per cubic yard, the total tonnage of black dross is 26,089 tons. This figure includes an estimated moisture content of 20% which is equivalent to 5,218 tons of water. On a dry basis, the weight of the black dross pile is 20,870 tons.

The washed oxide pile, located at the north end of the black dross pile, was also surveyed (see Figure 3-16). Using the same factors, the tonnage of washed oxide is estimated to be 1,450 tons. On a dry basis the weight is 1,160 tons.



HORTON DENNIS & ASSOC. INC.		MARALCO ALUMINUM SITE	

MK-ENVIRONMENTAL SERVICES Bellevue, WA		BLACK DROSS PILE MARALCO SITE Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 3/01/91	Drafter: LMH	Figure No: 3-15	File Name:

HORTON DENNIS & ASSOC. INC. 320 SECOND AVENUE SOUTH KIRKLAND, WASH 98033-6007		MARALCO ALUMINUM SITE 1" CONTOURS	MK-ENVIRONMENTAL SERVICES Bellevue, WA Job No: 2121 / Scale: Not to scale Date: 3/01/91 / Drafter: LMH

WASHED OXIDE PILE
MARALCO SITE
Kent, WA

Figure No: 3-16

File Name:

3.2 INTERIM EXPEDITED RESPONSE ACTION

The primary purpose of the Phase I FS/PPP was to investigate the feasibility of washing the black dross material to remove soluble sodium and potassium salts, discharging the wastewater, and recycling the washed aluminum oxide product.

IAI was selected to design, construct, and operate a pilot plant to wash the black dross material. The pilot plant production objectives were defined as shown in Table 3.5.

Table 3.5
Production Objectives

Production Objectives	Month 1	Month 2	Month 3	Month 4	Month 5	Total
Tons Black Dross Processed	0	204	408	408	408	1,428
Tons Washed Oxide Produced	0	143	285	285	285	998
Pounds of Salt Removed	0	81,600	163,200	163,200	163,200	571,200
Gallons of Process Water	0	98,077	196,154	196,154	196,154	686,538

The pilot plant was operated at the Maralco site from July 18, 1990 to December 18, 1990. The pilot plant process recovered aluminum oxides from black dross by mixing the dross with water, screening the slurry, and then washing the undersize material to reduce the salt content to an acceptable level for commercial sale.

The products for recycle and wastewater discharge from the IAI process are washed aluminum sands, (at or below -16 mesh size), and sodium chloride and potassium chloride brine. Two cement manufacturers have expressed an interest in purchasing the washed oxides, providing they meet certain specifications.

The Metro sewer system of Seattle accepts the brine generated providing it meets conditions of Permit No. 7570 issued to IAI on January 26, 1989. IAI maintained on-site analytical equipment to monitor process conditions and discharges to the sewer for permit compliance.

3.2.1 Pilot Plant Operations

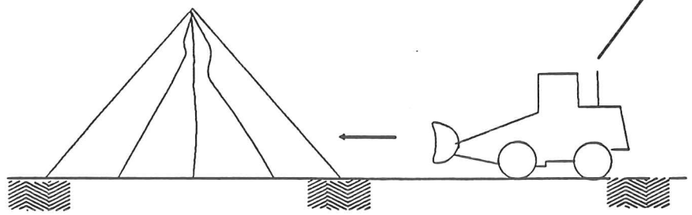
The Pilot Plant was constructed between July 18, 1990 and August 25, 1990. On August 26th, the process operations commenced. The IAI process is a countercurrent decantation system wherein the potassium and sodium salts are dissolved from the insoluble alumina solids with water in a system which increases the salinity in the liquid fraction and decreases it in the solids by successive washing steps. Equipment used in the pilot plant/countercurrent decantation process include:

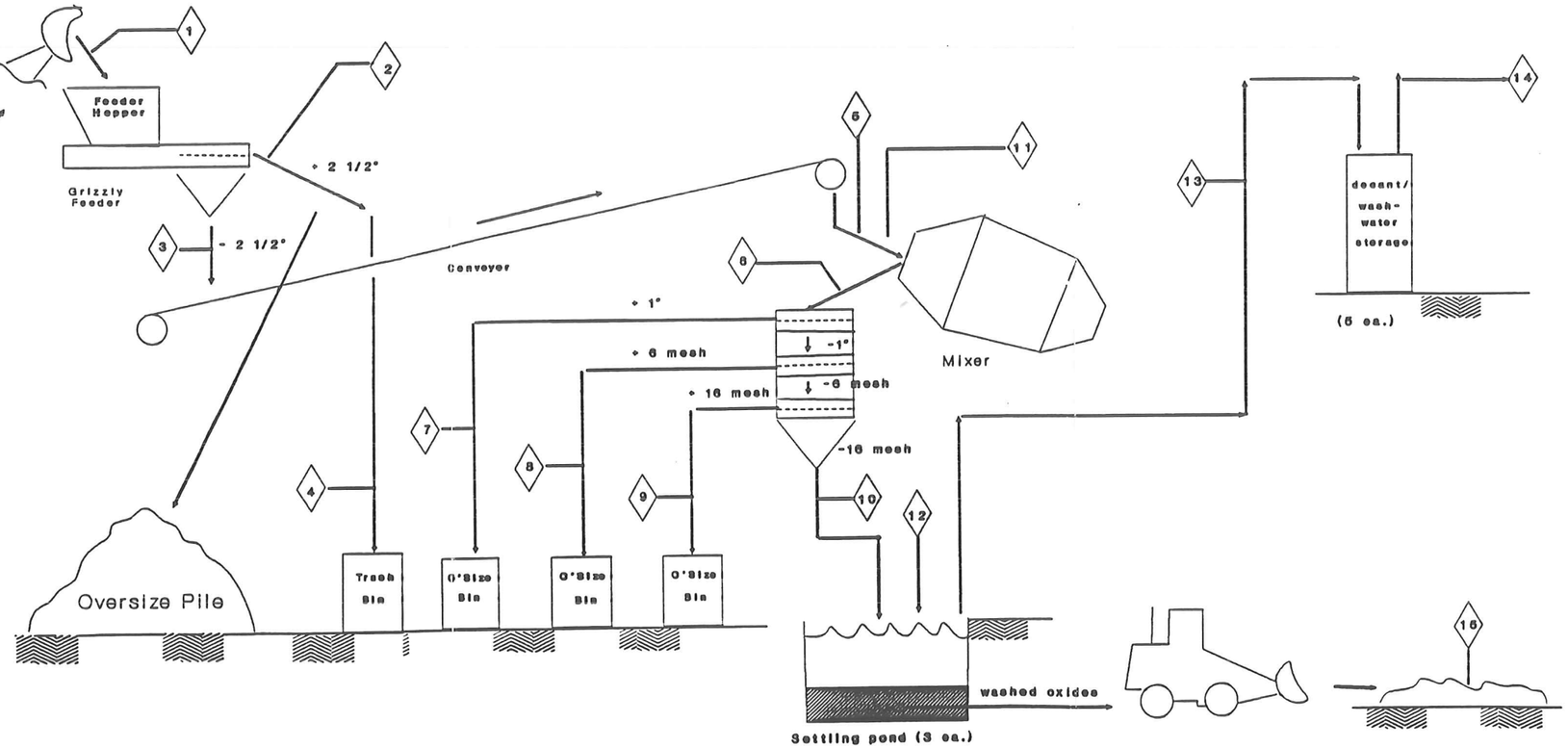
- 1 cubic yard front end loader
- A 2 1/2" vibrating screen
- Elevated conveyor, 60 tons per hour capacity
- 10 cubic yard conditioning drum, modified from a 10 cubic yard cement mixer
- 5 ton per hour Sweco screen equipped with 3 sizing screens; +1", + 6 mesh, +16 mesh
- 3,000 gallon process water storage tank
- Five 2,000-gallon waste water holding tanks
- Three - 1/2 hp. decantation pumps
- Interconnecting process water pump and piping
- Interconnecting waste water pump and piping

A flowsheet depicting the process is shown in Figure 3-17. The mechanics of the IAI process are described as follows:

- The chemical components of the black dross are described in section 3.1; generally, however, the dross is composed of alumina, silica, and salt (a mixture of sodium chloride and potassium chloride). The alumina, silica, and salt represent approximately 95% of the weight. The remaining 5% consists primarily of a mixture of plastics, aluminum metal splatter and chunks, used beverage containers, stones and scrap iron.

- The size of the dross feed varies from fine dust to particles 8"-10" in diameter. At present, particles larger than 2 1/2" are removed from the process feed. Additionally, the size fraction -2 1/2" to +16 mesh is removed from the recovered washed oxide. This material is separated into three piles for later treatment. The first pile is material ranging in size from +1" to 2 1/2" material. The second pile is material ranging in size from -1" to +6 mesh. The third pile is material ranging in size from -6 mesh to +16 mesh.





1 Feed	2 Feeder O'Size	3 Feeder U'Size	4 Trash	5 Mixer Feed	6 Screened Feed	7 Feeder O'Size	8 Feed O'Size	9 Feeder O'Size	10 Screen U'Size	11 Process Water Feed	12 Makeup Water Feed	13 Decant Water	14 Discharge to Metro	15 Washed Oxides dry

MK-ENVIRONMENTAL SERVICES Bellevue, WA		PILOT PLANT PROCESS FLOW SHEET Kent, WA	
Job No: 2121	Scale: Not to scale		
Date: 3/01/91	Drafter: LMH	Figure No: 3-17	File Name:

- A Case 580 front end loader with a 1 cubic yard bucket is used to haul black dross from the on-site waste piles to the vibrating screen. The vibrating screen was constructed of 2 1/2 x 2 1/2" grating. The dross is deposited onto the screen: the oversize material (+2 1/2") is vibrated off the screen onto the ground at the base of the screen, while the undersize material (-2 1/2") passes through the screen onto the elevated conveyor, which carries the dross to a hopper which feeds the black dross into the conditioning drum. During the pilot plant program, approximately 1,614 cubic yards of dross were processed.

- Once the desired amount of black dross has been fed into the conditioning drum, process water is added, and the drum is rotated for approximately one hour. During the first two months of the PPP, an average of 4 cubic yards of black dross was placed in the conditioning drum. In the final two months, an average of 8 cubic yards was added.

- Process water is stored in a 4,000 gallon horizontal tank located near the conditioning drum. Sources of the water are from an on-site City of Kent hydrant and from rain water collected from standing ponds and the roof of the refinery building. An estimated 1,118,000 gallons of water were used during the pilot program. After an hour of rotating, a flocculent is then added to the mixer, and the material is allowed to mix for an additional 5 minutes.

- The slurry is then dumped and screened on a SWECO screen equipped with three screen fractions, which removes all +1", +6 mesh and +16 mesh material. This material is stockpiled for future washing or disposal. A sample of the slurry is collected for pH and salinity analyses before it is discharged to the Sweco screens.

- The -16 mesh material is transferred to a sloped-bottom, concrete-lined settling pond, where the solids separate from the brine. There are three ponds, each with a 11.250 gallon slurry capacity.

- A proprietary flocculent is added to the ponds to enhance settling, and the slurry is allowed to settle for approximately 16 hours. The brine is decanted with a submersible pump to one of five vertical holding tanks to await discharge to Metro's sewer system. As much brine as possible is pumped from the ponds, taking care not to pump any of the solids. The vertical tanks are discharged to Metro when they are full and only after they have settled at least 8 hours. Water was pumped from the top of the tanks to the Metro sewer line.

- Once the brine has been pumped from the pond, the -16 mesh product is washed with fresh water to remove additional soluble salts. Washings are repeated until the salt content of the oxides is less than .5%. They are then removed with the front end loader into the refinery building and placed within a bermed area to dry.

- The oxides initially contain approximately 30-40% water. The washed oxide material is eventually removed from the bermed area and spread out on the floor of the refinery building in thin layers. A tractor equipped with a spring tooth rake then passes through the washed oxides to further enhance drying. Successive passes by the tractor produce a product with approximately 15 - 20% moisture.

- The front end loader is decontaminated into whichever settling pond it is working from. Decontamination of the front end loader is practiced to prevent cross-contamination of the 3 ponds and of each batch of processed dross.

- Process control monitoring is performed on-site by IAI personnel. The primary analyses are for salinity and metals which are required for solution discharges to Metro. These analyses are recorded and reported according to permit requirements (see Section 3.4). These requirements are being complied with, and no violations have been reported.

3.3 PILOT PLANT SUPPORT FACILITIES

The PPP support facilities included maintenance and storage/small repairs shop, a 24 X 60 office/changeroom/laboratory complex, and a small warehouse/storage area. The maintenance support shop and warehouse buildings were modular type while the office/laboratory was an ATCO trailer type structure. The pilot plant also used the existing refinery building to dry and store the washed oxides. This building is a 150 by 300 ft. concrete structure.

Support facilities included fresh water systems, sanitary sewer, wastewater sewer discharge, storm water collection and drain system, site security, and electrical power distribution. Site utility requirements were based upon the location and type of the operations and number of personnel.

3.3.1 Site Preparation

Site preparation consisted of providing space for the office trailer, maintenance, warehouse, process facility equipment, access road, parking, and electrical distribution system.

3.3.2 Office/Laboratory Complex

During pilot plant operations, a one-story, pre-fabricated office complex consisting of 1,440 square feet of office space was provided for management and operating personnel. The building also contained a lunchroom, change area, showers and restroom facilities, warehouse, and laboratory area. The laboratory contained countertop and cabinet space, a large work bench and a sink. During pilot plant operations, the laboratory housed a pH meter, drying oven, spectrophotometer, balance, and assorted laboratory equipment and reagents.

The change area could accommodate approximately six employees, although there were no separate facilities for male and female employees within this area. A separate restroom/changeroom was located on the south side of the office complex and could accommodate one person.

The complex interior was designed for handicap access, although no access ramps have been installed on the building's exterior. There were telephone jacks throughout the complex to service all offices.

A parking area is located north of and adjacent to the office building at the point of entry of the access road into the facility and plant site. The paved parking area accommodates automobiles for employees, vendors, and visitors.

3.3.3 Maintenance Shop/Warehouse Facility

Facilities were provided in these 8 ft. by 30 ft. steel buildings for routine maintenance of mobile equipment and for the storage of repair parts and consumable supplies. Personal protective equipment and first aid supplies were stored in a separate area within the building.

3.3.4 Water and Sanitary Systems

Potable and process water were provided by the City of Kent at the site. A water storage tank was provided within the process plant. Water was collected from the roof of the refinery building and used as process makeup water. Fire water was supplied by an on-site hydrant. Fire lines (4-inch diameter) are located in two areas within the site.

Sanitary sewer service at the process/office facility consists of a side sewer line connected to the main sewer line. As specified in the existing waste discharge permit issued by Metro, maximum industrial wastewater discharge from the process was 40,000 gallons per day.

The storm drain system consists of two drains in the front parking lot which drain west through a culvert to an area adjacent to the northwest edge of the property. This area in turn drains to the Christopher Ditch. Runoff from the roof of the old process building was collected in a horizontal tank for use in the dross recycling process. A sump at the south end of the main building collects runoff from the black dross storage area. This water was then pumped to one of vertical tanks for discharge to the sanitary sewer.

3.3.5 Fuel and Lubricants

Fuel and lubricants were stored off-site.

3.3.6 Electrical Power

Electrical power is provided from an existing transmission line. A 200 amp, 480 volt, 3 phase transformer was installed to service the process line, and a 50 KVA, 480 volt, single phase transformer was installed for the off-site trailer.

3.3.7 Road and Access

Site access is via South 202nd Street, which dead ends at the facility's main gate. Existing roads to the site are considered adequate for their proposed usage.

3.3.8 Site Security

Site security during pilot plant operations was provided by a chainlink fence around the perimeter of the process area and a padlocked gate at the front parking area. The remainder of the property perimeter is secured by fencing as well as dense stands of blackberry bushes, along the eastern and southern boundaries of the site. A portion of

the northern site boundary from the corner of 80th Ave. and 202nd St. to the farmhouse is unsecured.

3.4 WASTE DISCHARGE PERMIT

The Pilot Plant operated using an IAI waste discharge permit from the Municipality of Metropolitan Seattle (Metro) for the discharge of its industrial wastewater into the Metro sewer system. The permit was effective on January 26, 1989 and expires in five years, on January 26, 1994. Details relating to the waste discharge permit are as follows.

3.4.1 Site-Specific Permit Conditions

The waste discharge permit contains both site-specific and general conditions which IAI must comply with in order to discharge wastewater. Metro established these conditions based upon the specific operating parameters of the pilot plant, the discharge criteria established for upstream dischargers, and Metro's ability to accept discharge within the limits of its (Metro's) own NPDES permit. Site-specific permit conditions include volume and effluent limitations, self-monitoring and reporting requirements, and operation and maintenance practices.

3.4.1.1 Volume and Effluent Limitations

Table 3.6 lists the permit volume and effluent limitations set by Metro for the pilot plant operations. The effluent limitations must be met prior to dilution with other wastewaters unless a fixed alternative discharge limit is approved by Metro.

3.4.1.2 Self-Monitoring and Report Requirements

The waste discharge permit required IAI to monitor its discharges to ensure compliance with the permit effluent limitations and to report the results to Metro. The sampling parameters, types and frequencies are presented in Table 3.7, while the required reports are summarized in Table 3.8. Monitoring commenced upon receipt of the signed permit, and all reports are to be submitted to Metro by the 15th day of the month following sample collection.

3.4.1.3 Operations and Maintenance Requirements

The permit requires IAI to use waste preventative practices to reduce or eliminate contaminant loading to the municipal sewer system. The following requirements are specific to IAI's operations.

Table 3.6
Volume and Effluent Limitations

Metro Parameter	Daily Max Limit (mg/l) [a]	Max Limit lbs/day [b]
Industrial Wastewater (Volume)	40,000 gallons per day	40,000 gallons per day
Arsenic	1.0	0.33
Cadmium	3.0	1.00
Chromium	6.0	2.00
Copper	3.0	1.00
Lead	3.0	1.00
Mercury	0.1	0.03
Nickel	6.0	2.00
Silver	1.0	0.33
Zinc	5.0	1.67
Cyanide [c]	2.0	0.67
Polar Fats Oils & Grease (FOG) [d]	100	NA
Non Polar FOG [e]	100	NA
pH minimum [f]	5.5	NA
Temperature	150 F	NA
Settleable Solids	7ml/L	
Max. allowable brine concentration	22%	
Maximum salt poundage	33,000 lbs. per day	

NOTES:
(a) Units = mg/l unless otherwise specified
(b) Units = lbs/day unless otherwise specified
(c) Cyanide = Total Cyanide
(d) Polar FOG = FOG of animal vegetable origin
(e) Non Polar FOG = FOG of mineral petroleum origin
(f) pH is in standard units

Table 3.7
Self-Monitoring Requirements

Phase	Sample Parameter	Sample Type	Min. Sampling Frequency
One [a]	Metals, pH volume [b]	Any batch discharged; composite representative of tank's discharge	1/batch
	Total Toxic Organics [c]	Representative of tank's discharge	1/month
Two [a]	Cd, Cr, Cu Pb, Ni, Zn	Daily sample collected [d]; mixed into composite	1/week
	pH	Grab/recording pH meter/ litmus paper	1/batch
	Settleable Solids		1/batch
	Flow	Total daily flow (24 hr) [e]	1/day
	FOG	Not required	

NOTES:

(a) Phases One and Two are discussed in Section 3.4.2.

(b) Volume from all batch discharges shall be recorded on the self-monitoring form.

(c) Total Toxic Organics (TTO) requirements are due 90 days after permit issuance.

(d) Each daily sample shall consist of at least four grab samples of equal volume taken throughout the processing day from a well-mixed final effluent chamber.

(e) Total water use for that sampling day (24 hr) shall be calculated by reading the volume of water passing through the water meter that serves the site. If there is no such meter, or if this meter is used to feed other processes, then a separate meter for this process will be installed.

Table 3.8
Reporting Requirements

Report	Frequency	Comments
Baseline Monitoring	Upon application	Submit with completed application
Self-monitoring	15th day of each month following sample collection	Monitoring to commence upon receipt of signed permit
Spill/Upset Conditions	Within 14 days of spill notification	Include reason for and characteristics of spill and corrective action taken
Discharge Violations	14 days after violation discovered or with self-monitoring report	Include reason for violation, corrective action taken, and proposed plan of action and schedule to prevent recurrence of violation
Installation/Upgrade of Pretreatment System	Prior to installation or upgrade	Approval required prior to installation or upgrade. Submittal of engineering report and operations and maintenance manual. Installation of or upgrade to 10,000 gallons per day or more system requires design by registered engineer.
Dangerous Waste (filed with WDOE)	As requested by Metro	As requested by WDOE
Feasibility	Within 30 days of completion of 90 day study	Required by Metro to insure that the reclaiming process functions as proposed

Chemical Storage

Chemical solutions, solid chemicals, waste materials, oils and solvents shall be stored in a manner that will prevent the inadvertent entry of these materials into the municipal sewer system. All chemicals shall be stored in a no-outlet area approved by Metro.

Spill Prevention/Notification

IAI shall notify Metro immediately in the event of a spill to the sanitary sewer. IAI shall insure that process solutions are used and stored in such a manner as to minimize spills of concentrated solutions to the sanitary sewer. All process tanks shall be located in a no-outlet area approved by Metro.

Pretreatment Equipment Maintenance and Operations

All pretreatment systems used to bring IAI's discharge into compliance with Metro's discharge limitations shall be maintained continuously in satisfactory and effective operations by IAI at its expense, and shall be subject to periodic inspections by authorized Metro personnel. These systems shall be attended at all times during discharge to the municipal sewer system. In the event that such equipment fails, IAI must notify Metro immediately and take spill prevention precautions.

1. Under this permit, IAI has the flexibility to determine the number of rinsings that each batch of rinse water is capable of. IAI may not exceed the maximum discharge volume of 40,000 gallons per day nor shall they dilute heavy metals to meet Metro's limits.

2. The oxide transport and mixing system and the settling ponds will receive maintenance on a regular basis to prevent work stoppage due to equipment failure.

Sample Site

IAI shall maintain sample Site No. A8102, which is connected to the existing sanitary side sewer line, to monitor and collect representative samples of their effluent. Metro will also use this site for effluent monitoring. The site will be secured to prevent unauthorized individuals from discharging materials to the Metro system.

3.4.2 Special Conditions

For purposes of tracking IAI's operations and its effect on Metro's treatment facilities, Metro divided IAI's pilot plant operations into two phases. During Phase One, a 90-day feasibility study, Metro was to determine if the recycling operations caused operational or corrosion problems at the Metro facilities. IAI would be held liable for the cost of any damages directly resulting from their operations, and Metro reserved the right to require IAI to cease discharge prior to the scheduled end of the study. If no damage or operational problems were observed, operation was allowed to continue under Phase One for an additional 90 days, while the regulatory agencies commented on the results of the feasibility study.

Specific Phase One conditions include the following:

1. IAI would maintain an active letter of intent with the purchaser of the reclaimed aluminum oxides. Metro was to be notified immediately if this letter was canceled.

2. IAI would test each batch of rinse water prior to discharge. If the rinse water did not meet Metro limits, it was to be placed in a storage tank or pond for treatment, or collected by a treatment, storage, or disposal (TSD) company. Dilution of the rinse water to meet Metro standards was not allowed.

3. IAI would coordinate discharge flow rates with Mr. Dick Finger of the Renton Treatment Plant at 684-2412.

4. No later than 30 days after the completion of Phase One, IAI would submit a feasibility report approved by a professional engineer licensed by the State of Washington. The report would detail operational problems and proposed changes and summarize operational data.

5. Metro would perform inspections before, during and after the 90 day feasibility study. IAI would provide sections of test pipe made of the same material found in the local and Metro sewer lines. This pipe would be capped on one end and used as a test pipe. A portion of each batch discharge would be put into the test pipe and allowed to sit for 24 hours prior to discharge. These test pipes were to be available for inspection during the normal work hours of this site.

At the end of the second 90-day period, Metro would review the feasibility report and their own inspection records, and meet with WDOE, City of Kent, and IAI personnel. If their review of all relevant data indicated that no damage or operational problems

resulted from the discharge, they would then issue a specific written authorization to begin Phase Two, the operational phase of the project. The specific conditions of this phase were to be determined after review of the data and the agency meetings. As in Phase One, IAI would be responsible for the cost of any damages directly resulting from their operations.

3.4.3 General Permit Conditions

General permit conditions are set forth in Sections 7 of IAI's waste discharge permit. These conditions are not specific to IAI's operations, but rather, they encompass a wide range of operational and maintenance issues that must be addressed as part of any operating facility. The general conditions include, but are not limited to, changes in character or volume of pollutants being discharged, diversion or bypass of any discharge from any pretreatment facility, equipment breakdown or accidents, Metro compliance inspections, discharges to state waters, and discharges of hazardous or toxic chemicals.

3.4.4 Future Permitting Considerations

In a meeting held December 14, 1990, Metro, WDOE and MK personnel discussed the status of IAI's current waste discharge permit and possible permit considerations in the event that IAI does not continue to operate the dross recycling facility.

Ray Carveth, Industrial Waste Investigator with Metro's Industrial Waste Section, stressed that the current permit is company- and process-specific. To date, IAI has complied with all conditions of their permit, as evidenced by Metro's compliance inspection reports (see Appendix A). If no significant changes (as determined by Metro) are made to the process, and if they continue to comply with their permit requirements, IAI's permit will remain in effect until 1994. However, Mr. Carveth pointed out that if there is no discharge activity on the site after December 18, 1990 for six months or longer, he may not be able to keep IAI's permit active.

The current discharge permit may be transferable to another operator using IAI as a subcontractor, depending upon the changes, if any, made in the process. For instance, a change or increase in the waste stream of 20% or more would require a new permit. Additionally, current operations are permitted under the dangerous waste permit-by-rule criteria at WAC 173-303-802-5. Any changes in the process that would change the facility's current status as a recycling/reclamation operation would render the current permit ineffective.

A new site operator would be required to obtain a new discharge permit, which in Mr. Carveth's opinion, would be a very difficult task. New discharge limits, including those for organic contaminants, have been promulgated and become effective in June of this year. These new limits will make it more difficult for some facilities to obtain permits, as well as increase the permittee's analytical costs.

IAI's maximum discharge limit is 40,000 gallons per day. Under new federal guidelines, a discharge of 25,000 gallons per day or more will constitute significant industrial use and have ramifications for obtaining a new permit and monitoring site discharges. Under their existing permit, IAI could continue to discharge their maximum limit without being subject to the significant user criteria. Additionally, an application for a waste discharge permit must now be accompanied by an engineering report for the process. This report must be approved by a WDOE engineer and a Metro engineer before the permit can be granted.

3.5 HEALTH AND SAFETY PLAN

A comprehensive Health and Safety Plan was implemented at the Maralco site with the primary purpose of controlling risk to the health and safety of all site personnel.

The health and safety program followed WAC 296-62-3010 Hazardous Waste Operations and Emergency Response regulations. All personnel were required to sign an acknowledgement that they had read the Health and Safety Plan and would comply with the plans and procedures contained therein.

3.5.1 Medical Surveillance

MK personnel and subcontractors engaged in the Maralco activities participated in a Medical Surveillance program, and were approved by the examining physician(s) to wear respiratory protection devices and protective clothing for protection from exposure to hazardous materials. The applicable requirements under Hazardous Waste Operations (WAC 296-62-3050) were observed.

3.5.2 Basic OSHA Training

All personnel engaged in the Pilot Plant Program received the health and safety training as described below before being allowed to participate in field activities that could expose them to hazardous substances, safety hazards, or health hazards. This training is required pursuant to (WAC 296-62-3040) and included:

- Forty-Hour Hazardous Waste Operations Health and Safety Training
  Forty hours of classroom instruction and simulated field exercises regarding the following topics: 1) biology, chemistry, and physics of hazardous materials; 2) toxicology; 3) industrial hygiene; 4) hazard evaluation and control; 5) personal protective equipment; 6) medical surveillance; 7) decontamination; 8) legal and regulatory aspects; 9) emergency response.

- Eight-Hour Manager/Supervisor Hazardous Waste Operations Health and Safety Training
  Eight hours of additional specialized instruction on managing/supervising employees engaged in hazardous waste operations. Required of on-site supervisors who are directly responsible for or who supervise employees engaged in hazardous waste activities.

- Eight-Hour Annual Hazardous Waste Operations Health and Safety Refresher Training
  Eight hours of refresher training annually, as necessary.

In addition, one worker was trained and had a current, valid certification in first aid and cardiopulmonary resuscitation (CPR) training from the American Red Cross (or the equivalent).

3.5.3 Hazard Analysis and Control

Historical information regarding the types of wastes that exist at the Maralco site were utilized in establishing requirements for the medical surveillance program and personnel protective equipment.

Engineering controls were implemented to control health and safety hazards whenever such controls were available and practical. Dust suppression techniques, equipment guards, and work procedures that minimize worker exposure to hazardous substances or situations were all implemented.

Personal protective equipment was utilized in conjunction with engineering and administrative controls. Personal protective equipment consisted of boots, clothing, gloves, head, eye, and hearing protection. Respirators were utilized when concentrations of airborne contaminants warranted. All respirators were NIOSH/MSHA approved.

3.5.4 Work Zones

Work zones were established in the areas of operations to prevent the spread of hazardous substances from contaminated or potentially contaminated sites to clean areas and to control the flow of personnel and equipment within these areas. The establishment of work zones helped ensure that personnel were properly protected against hazards present where they worked, that work activities and contamination were confined to the appropriate areas, and that personnel could be located and evacuated in an emergency.

Prior to the commencement of field activities within areas of concern, work zones were established where needed to meet operational and safety objectives.

Exclusion (Control) Zone

Entry to the exclusion zone, which included the process area, the entire black dross pile, and the old refinery building, was limited to those personnel wearing the specified personal protective equipment who completed the required health and safety training, and who participated in the medical surveillance program. The boundary of the exclusion zone was clearly delineated through the use of signs and barricade tape. Access control points were established to regulate the flow of personnel and equipment into and out of the zone and to help verify that proper procedures for entering and exiting were followed. The required level of personal protective equipment in the exclusion zone was dependant upon the job assignment and detailed information available regarding types, quantities and extent of hazardous substances. In most instances, level C PPE (see Section 3.5.6) was appropriate protection.

Contamination Reduction Zone

The contamination reduction zone, the transition area between the exclusion zone and the clean zone, was designed to reduce the probability that the support (clean) zone would become contaminated or affected by other site hazards. It consisted of a glove and boot wash and an equipment decontamination area.

Support (Clean) Zone

The support zone included all areas outside the exclusion and contamination reduction zones. A log was kept in the office at the access control point into the exclusion and contamination reduction zones. The names and the time of personnel entering/exiting the exclusion zone were recorded.

3.5.5 Monitoring

Initial site monitoring was performed to assess the potential exposure to hazardous substances and to ensure the selection of the proper level of personal protective equipment. It also helped delineate areas where protection was needed and determine the necessity for specific medical monitoring.

Prior to the preliminary washed oxide removal and shipment operations at Maralco, background air filter samples were collected to identify potential personnel exposure above Permissible Exposure Limits (PELs) and to determine the appropriate level of PPE (see Section 3.5.6). Six samples were collected from the following locations:

- Immediately south of the farmhouse
- Inside the storage shed west of the farmhouse
- At the southeast corner of the refinery building near the black dross pile
- Inside the refinery building
- At the northwest corner of the Maralco property near the fence line

A blank sample was also submitted for analyses.

All samples were analyzed for aluminum, antimony, chromium, copper, nickel and zinc. The sample from the storage shed and the blank sample were also analyzed for asbestos. All sample concentrations were below the PELs established by WISHA at WAC 296-62-075(H) (see Table 3.9).

On May 27, 1990, washed oxide removal operations commenced, and three air filter samples were collected to monitor airborne contaminant exposures from the operations. A personal air sample was collected from the driver of the front end loader and another was collected from the north inside wall of the refinery building. A blank air sample was also submitted for analyses. All sample concentrations were below the WISHA PELs.

Mark Sultow, a certified industrial hygienist from the Department of Labor and Industries, visited the Maralco site on June 5, 1990 at the request of MK. His visit included a tour of the site and a discussion of the planned cleanup and processing operations. He addressed general and specific safety and health issues and made recommendations for minimizing exposures and work place hazards. He concurred with MK that truck drivers loading the washed oxides inside the building would probably not be subject to the requirements of WAC 296-62-Part P "Hazardous Waste Operations and Emergency Response", provided that precautions were taken to prevent exposures. He emphasized the responsibility of the employer to continually review site

Table 3.9
WISHA Permissible Exposure Limits

Priority Pollutant Metals	PEL (mg/M^3)
Aluminum	
Metal and oxides	10
Soluble salts	2
Antimony	0.5
Chromium (total, VI)	0.5, 0.05
Copper	1.0
Nickel	1.0
Zinc (oxide, chromate)	10
Asbestos	0.2 f/cc*,[1] 1.0 f/cc[2]

NOTES:
* f/cc = fibers per cubic centimeter
[1] Taken as an 8-hour time weighted average as determined by the method prescribed in WAC 296-62-0775, or by an equivalent method.
[2] Averaged over a 15-minute sampling period.

conditions and to identify hazards through self-inspection.

3.5.6 Personal Protective Equipment (PPE)

The level of PPE required was dependent upon the work task, site hazards, and current level of hazard assessment within the area. Modifications (i.e. upgrading/downgrading) of the specified level of PPE were made at the discretion of the Project Manager as more information regarding site hazards became known.

Throughout the project, Level C PPE was implemented and included, (as appropriate):

- 1/2-face respirator with appropriate cartridges/canisters
- chemical-resistant coveralls (polyethylene-coated tyvek, or equivalent)
- gloves, outer, chemical-resistant (nitrile, or equivalent)
- gloves, inner, chemical-resistant (vinyl, or equivalent)
- boots, chemical-resistant, steel toe (PVC, or equivalent)
- cotton coveralls
- safety glasses with side shields

3.5.7 Decontamination

All personnel, clothing, and equipment that were contaminated or potentially contaminated during the site walkthrough were decontaminated as necessary to remove any harmful substances that may have adhered to them. Particular attention was given to bottoms of shoes or boots and gloves.

3.5.8 General Project Safety Requirements

The project operations were conducted with the following minimum safety requirements employed:

- Eating, drinking, and smoking will be restricted to a designated area.
- All personnel shall be required to wash hands and face before eating, drinking, or smoking.
- Gross decontamination and removal of all personal protective equipment shall be performed prior to exiting the facility. Contaminated clothing will be removed and collected for disposal.
- Shaking or blowing of potentially contaminated clothing or equipment to remove dust or other materials is not permitted.
- The Project Manger will be responsible to take necessary steps to ensure that employees are protected from physical hazards, which would include:

- falling objects such as tools or equipment
- falls from elevations
- tripping over hoses, pipes, tools, or equipment
- slipping on wet or oily surfaces
- insufficient or faulty protective equipment
- insufficient or faulty operation, equipment or tools
- Field operations personnel shall be cautioned to inform each other of non-visible effect of the presence of toxics, such as:
- headaches
- dizziness
- nausea
- blurred vision
- cramps
- irritation of eyes, skin, or respiratory tract
- changes in complexion or skin discoloration
- changes in apparent motor coordination
- changes in personality or demeanor
- excessive salivation or changes in papillary response
- changes in speech ability or pattern

3.6 PUBLIC PARTICIPATION PLAN

A public participation plan was implemented by Ecology during the RI/FS/PPP activities at the Maralco Site. This plan was designed to support the RI/FS/PPP technical activities, and included compiling a mailing list of interested parties to receive project-specific information, establishing information repositories for public review of documents and other site and investigation information, and publishing fact sheets to inform the public of site activities and developments, explain findings, and inform the public of scheduled opportunities for public input. Copies of the three fact sheets published for Maralco are included in Appendix B.

Figure 3–2

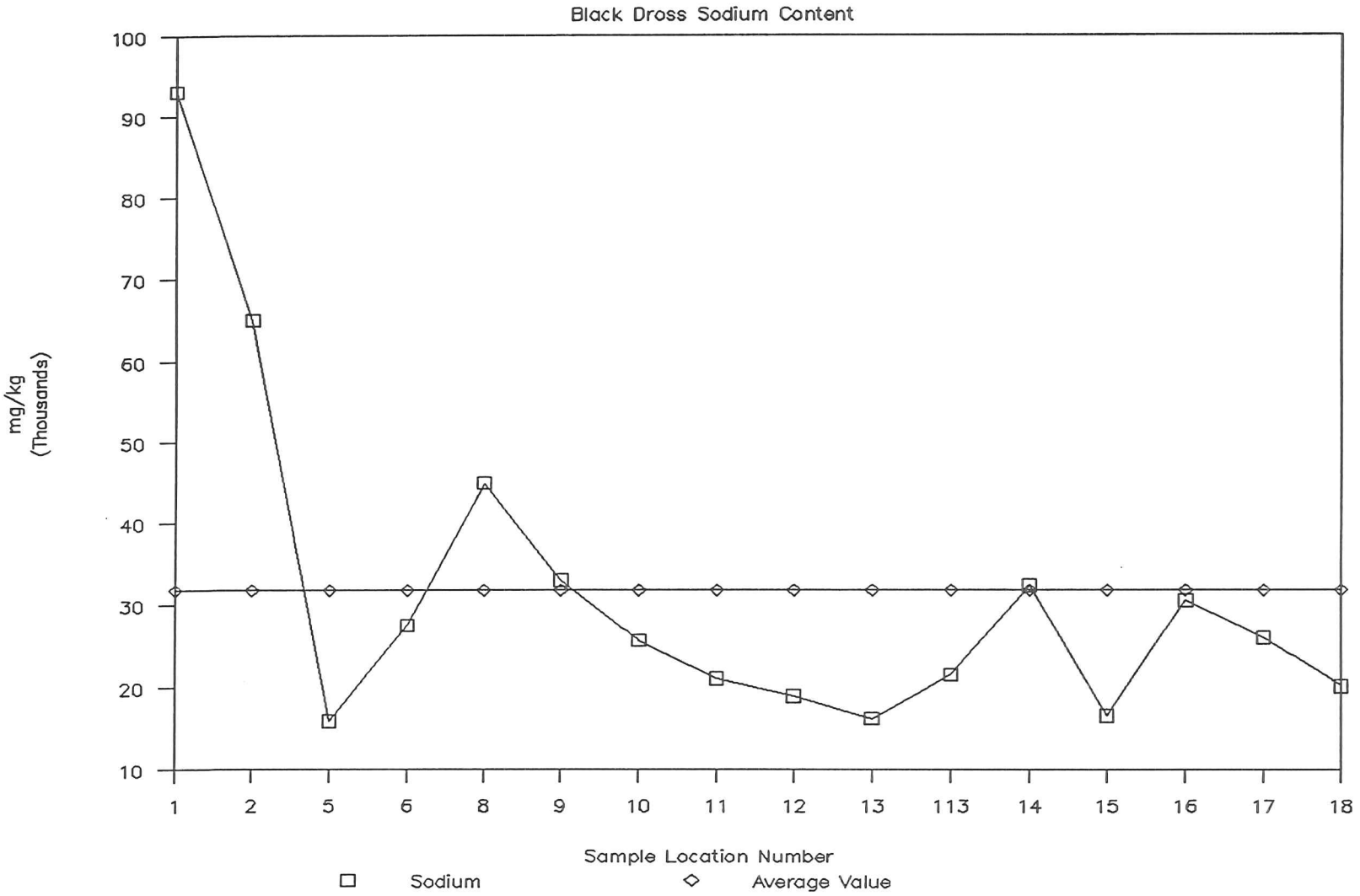

Black Dross Sodium Content
100
90
80
70
60
50
40
30
20
10
mg/kg
(Thousands)
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Sodium
Average Value

Figure 3–3

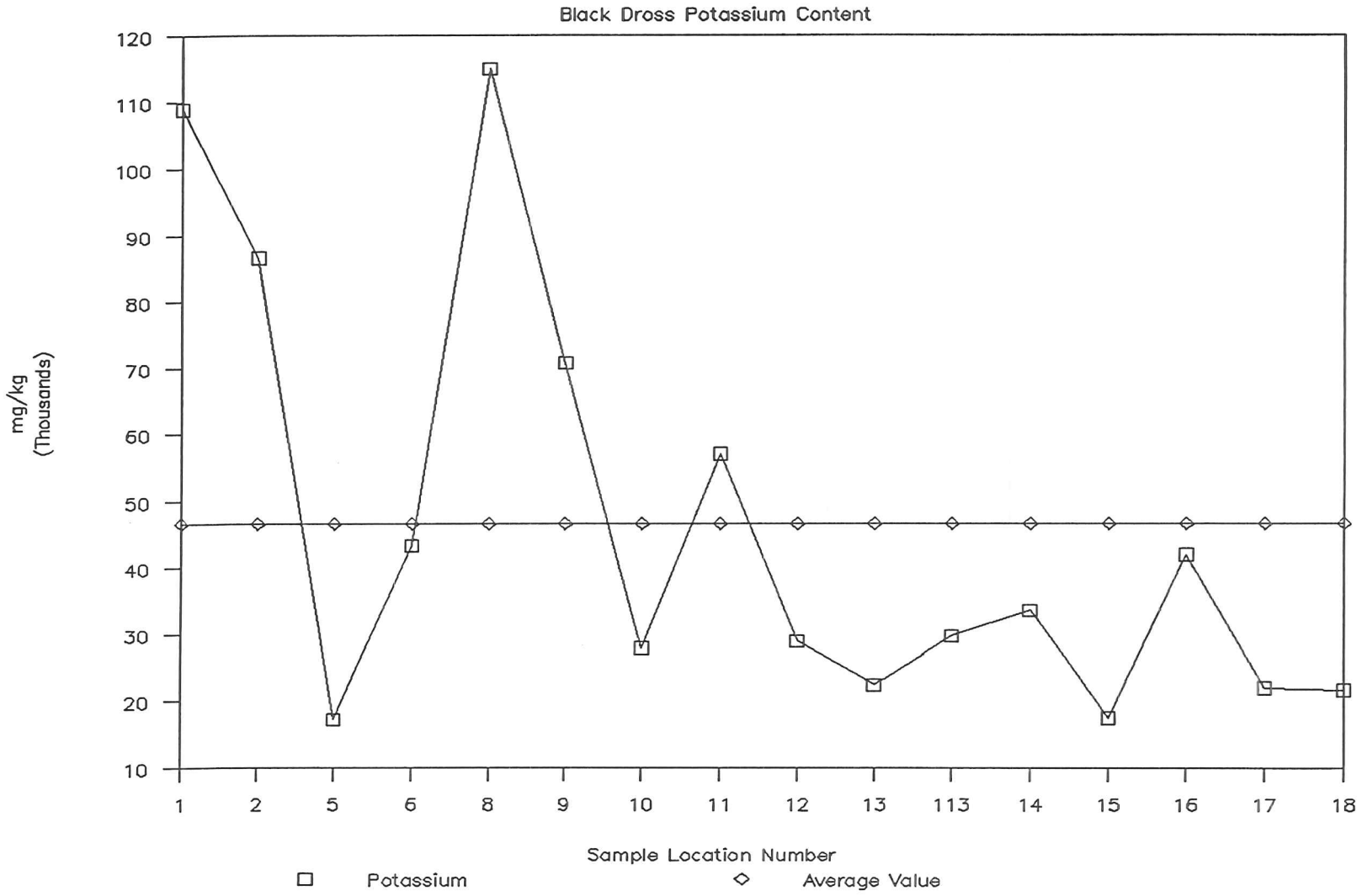

Black Dross Potassium Content
120
110
100
90
80
70
60
50
40
30
20
10
mg/kg
(Thousands)
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Potassium
Average Value

Figure 3–4

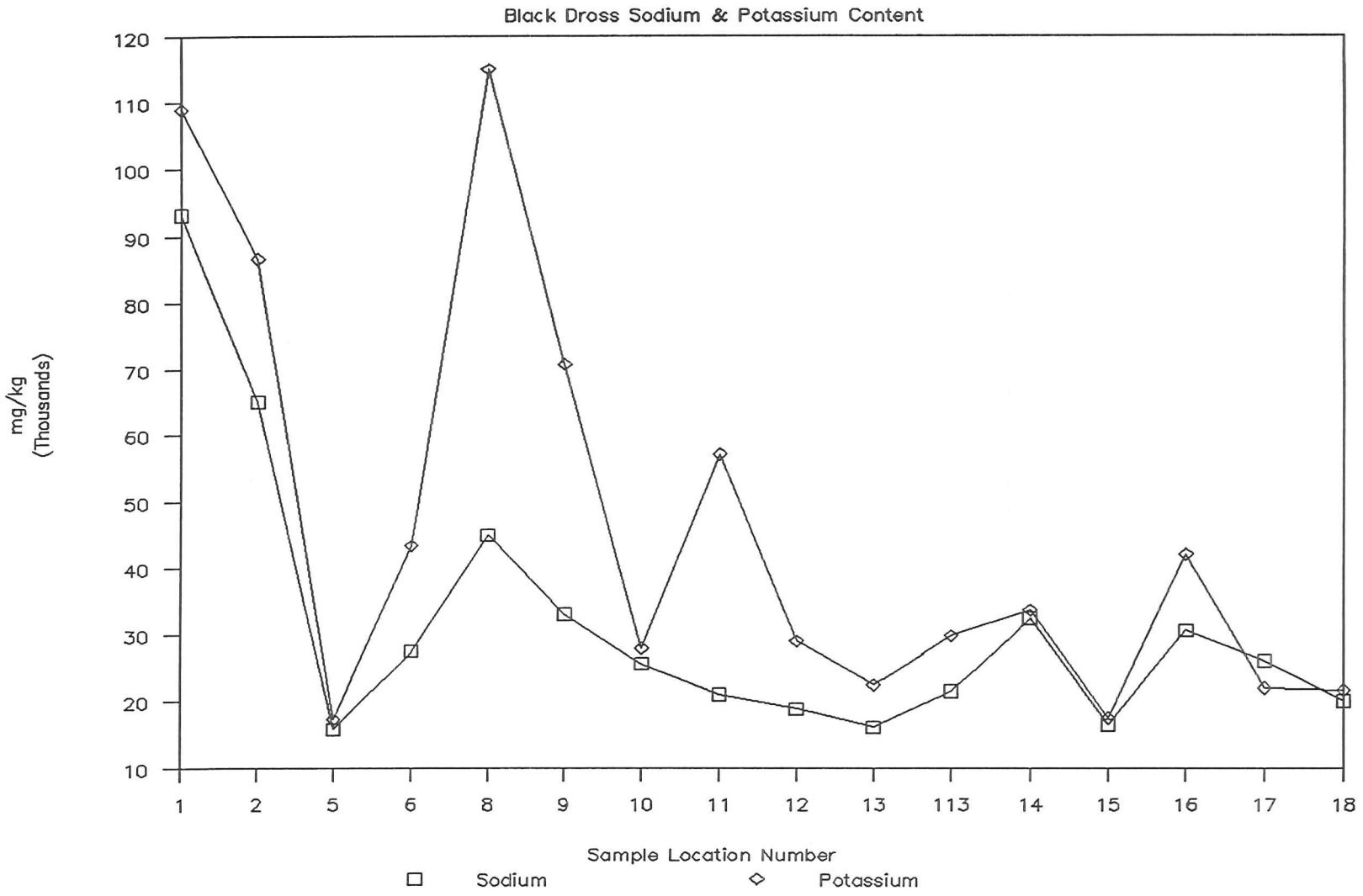

Black Dross Sodium & Potassium Content
120
110
100
90
80
70
60
50
40
30
20
10
mg/kg
(Thousands)
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Sodium
Potassium

Figure 3–5

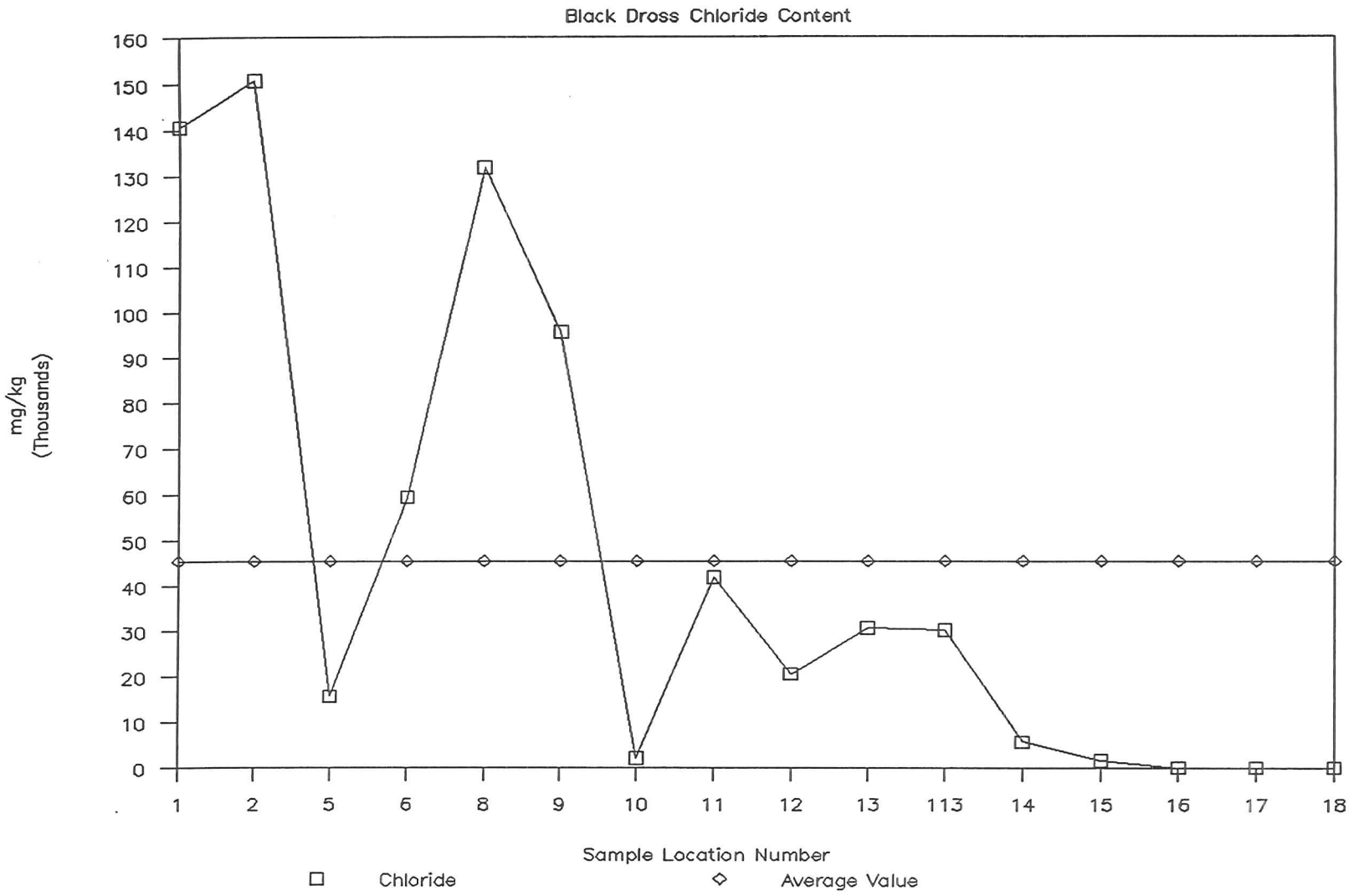

Black Dross Chloride Content
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
mg/kg
(Thousands)
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Chloride
Average Value

Figure 3–6

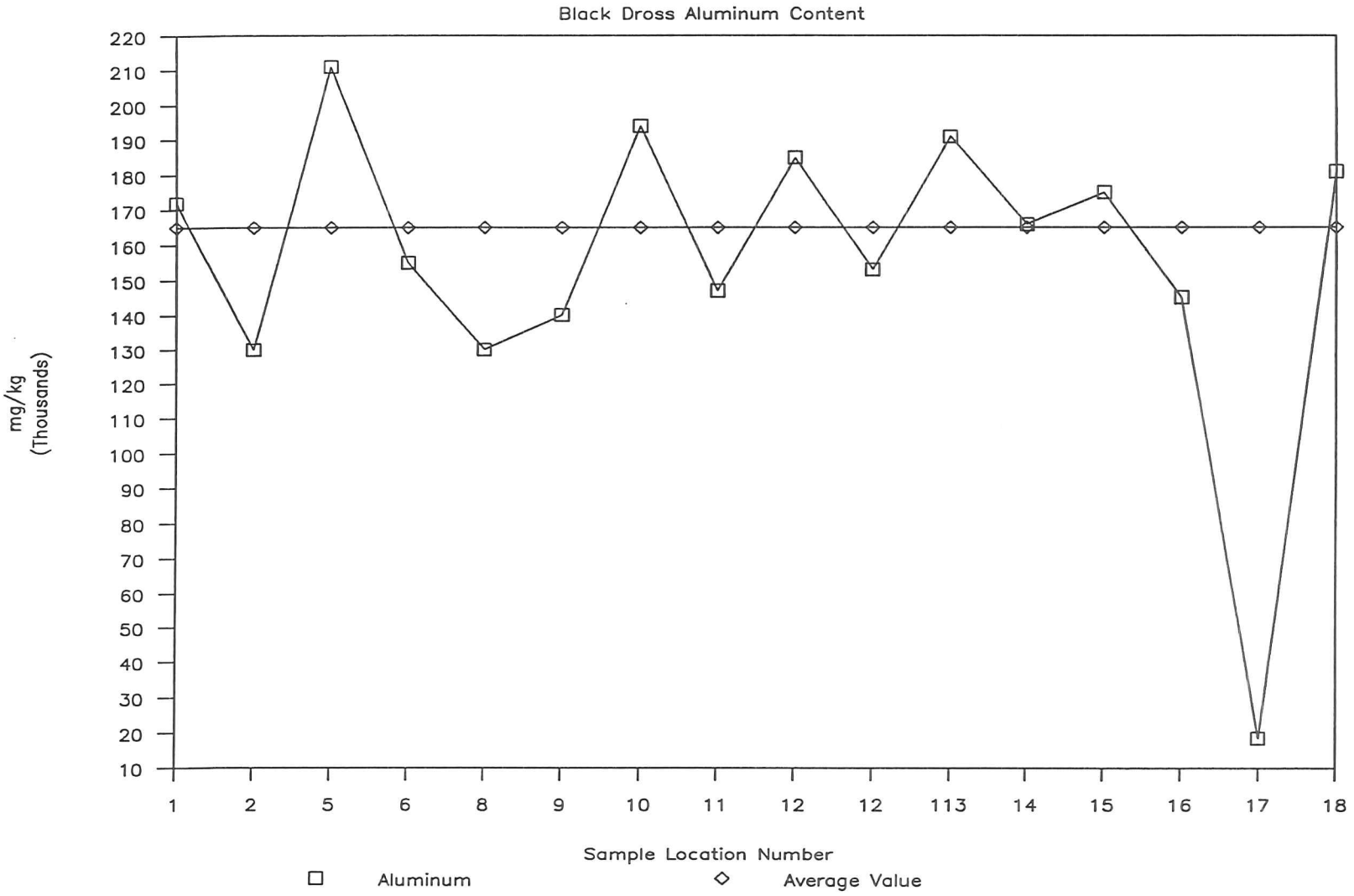

Black Dross Aluminum Content
mg/kg
(Thousands)
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1
2
5
6
8
9
10
11
12
12
113
14
15
16
17
18
Sample Location Number
Aluminum
Average Value

Figure 3–7

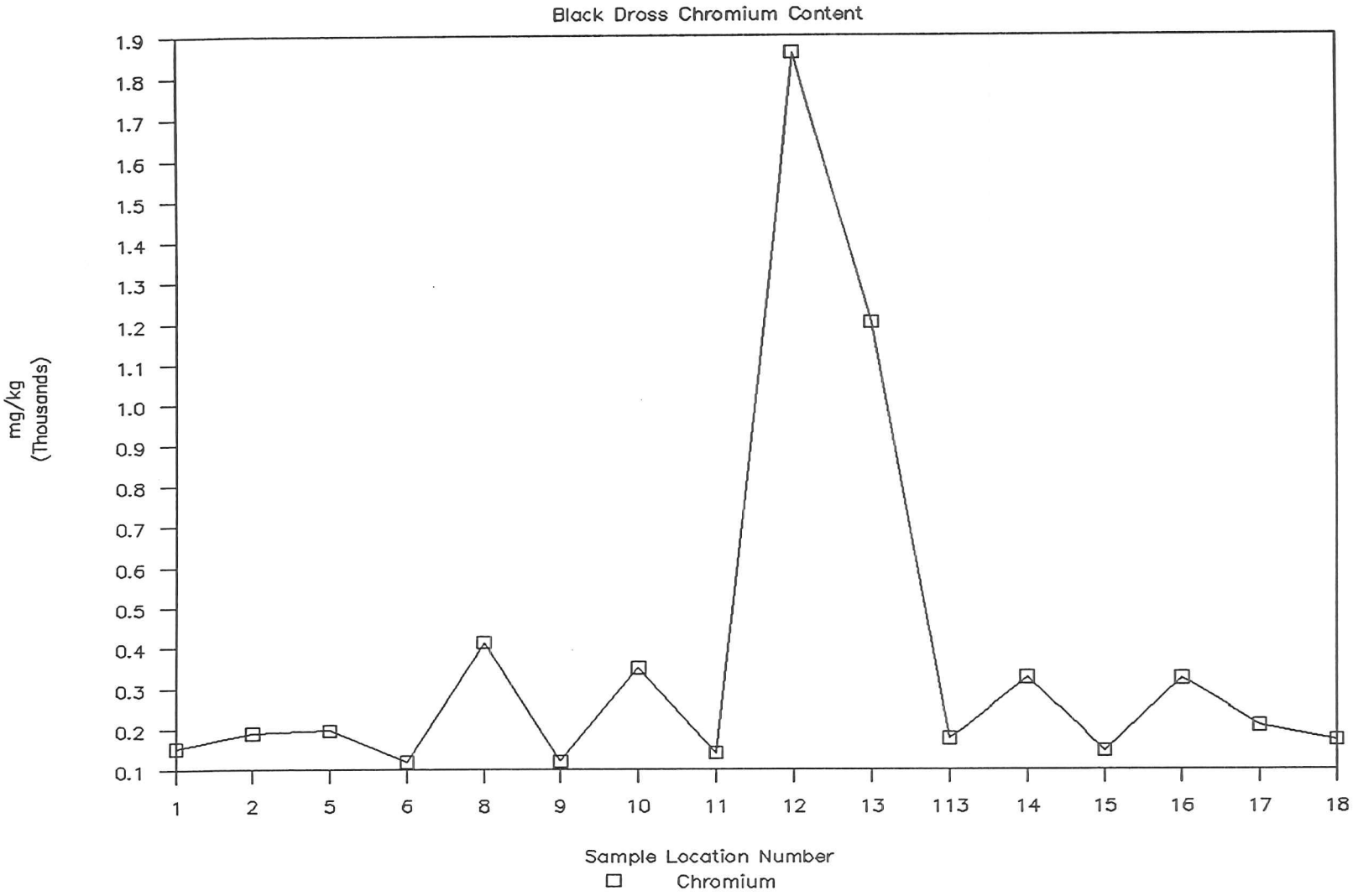

Black Dross Chromium Content
mg/kg
(Thousands)
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Chromium

Figure 3–8

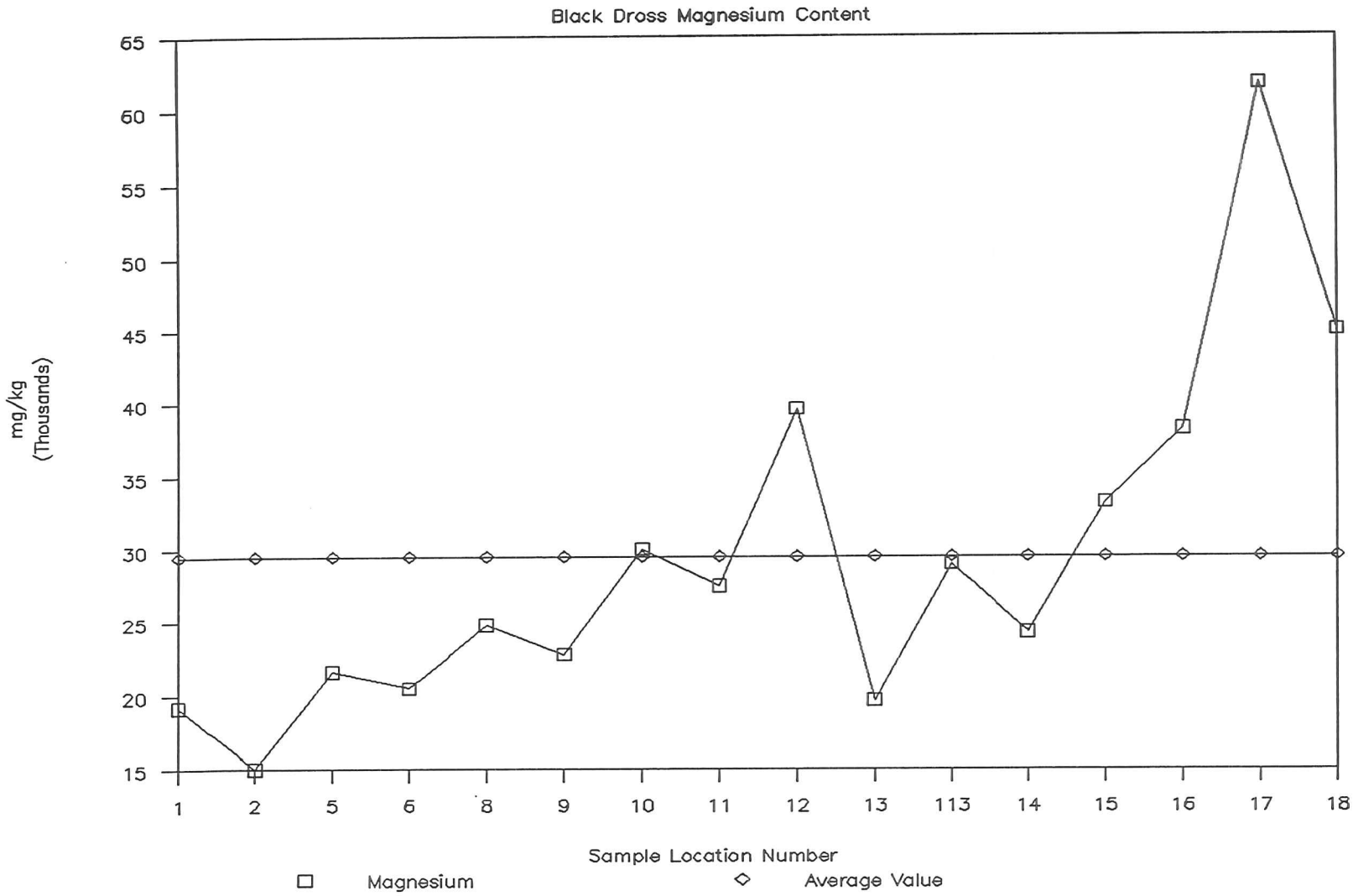

Black Dross Magnesium Content
mg/kg
(Thousands)
65
60
55
50
45
40
35
30
25
20
15
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Magnesium
Average Value

Figure 3–9

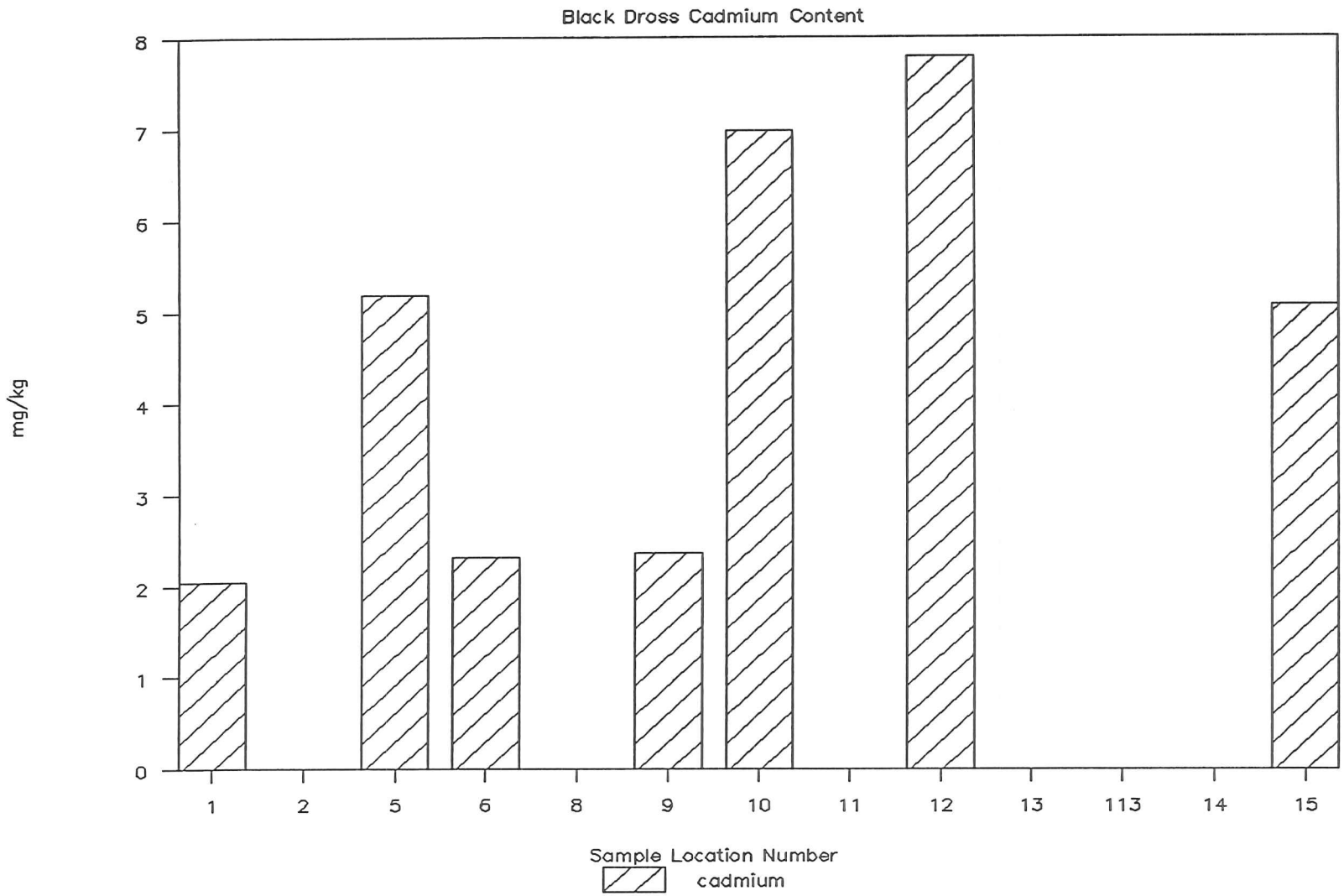

Black Dross Cadmium Content
mg/kg
0
1
2
3
4
5
6
7
8
1
2
5
6
8
9
10
11
12
13
113
14
15
Sample Location Number
cadmium

Figure 3—10

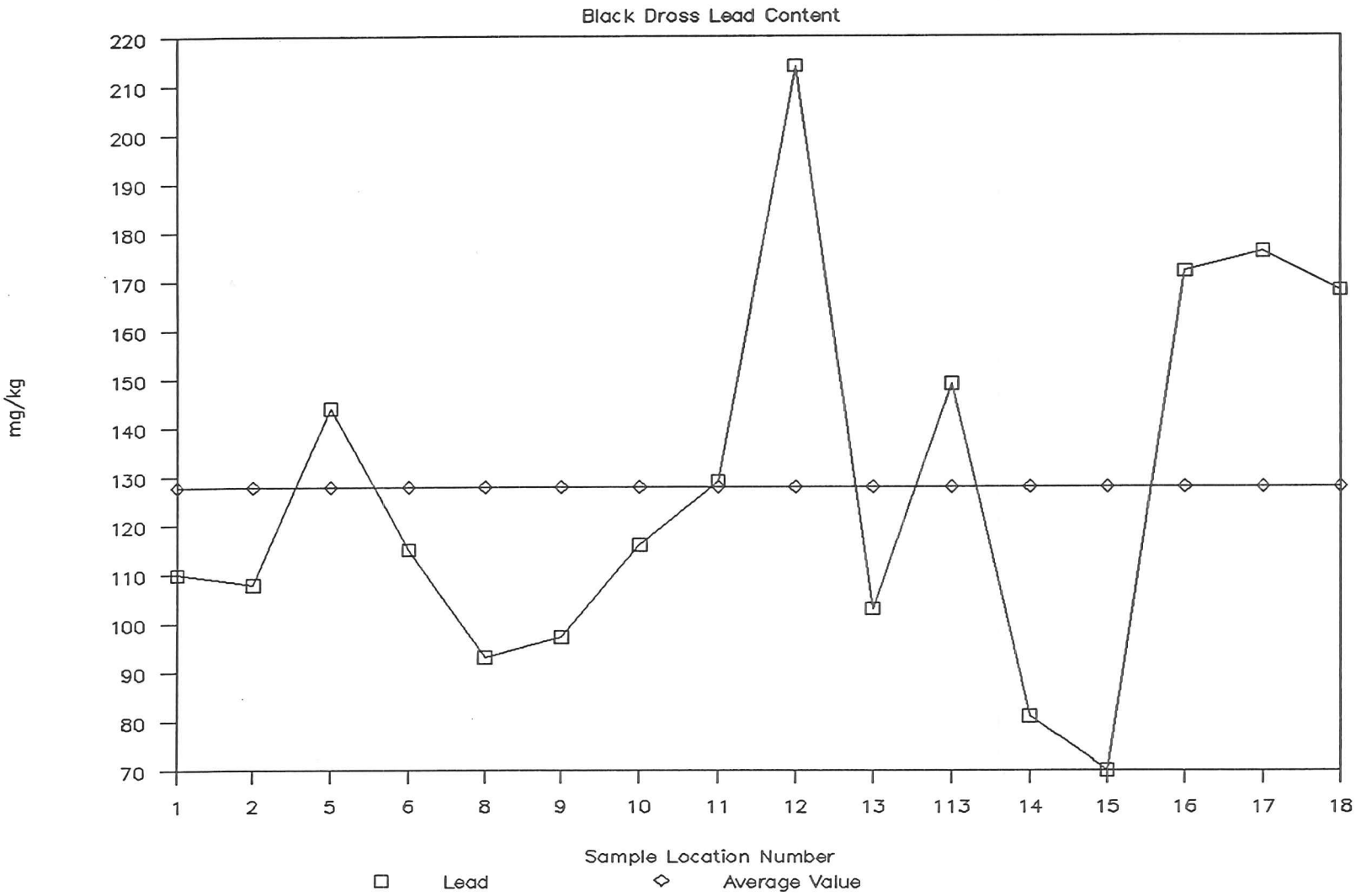

Black Dross Lead Content
mg/kg
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Lead
Average Value

Figure 3—11

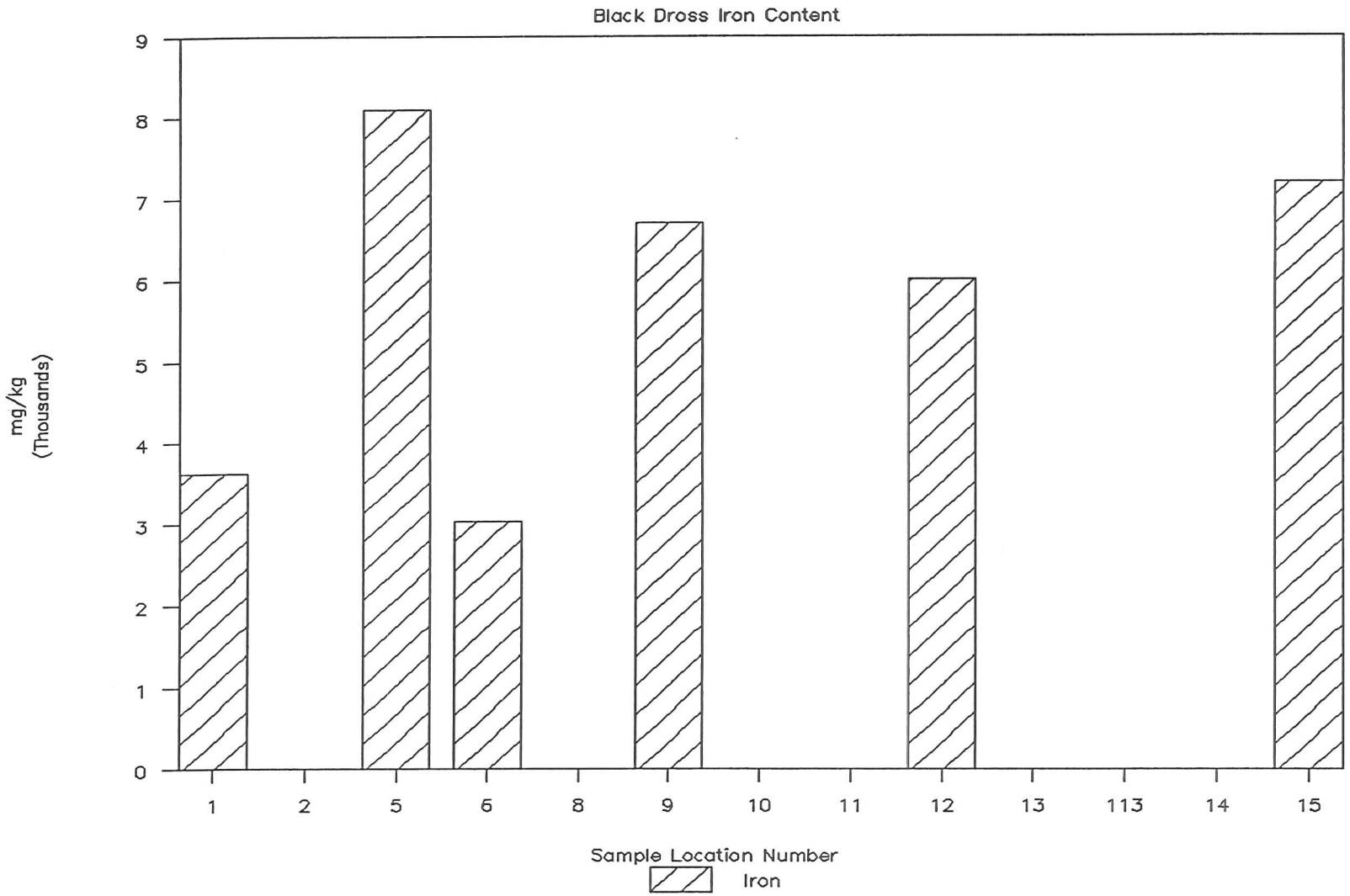

Black Dross Iron Content
mg/kg
(Thousands)
9
8
7
6
5
4
3
2
1
0
1
2
5
6
8
9
10
11
12
13
113
14
15
Sample Location Number
Iron

Figure 3—12

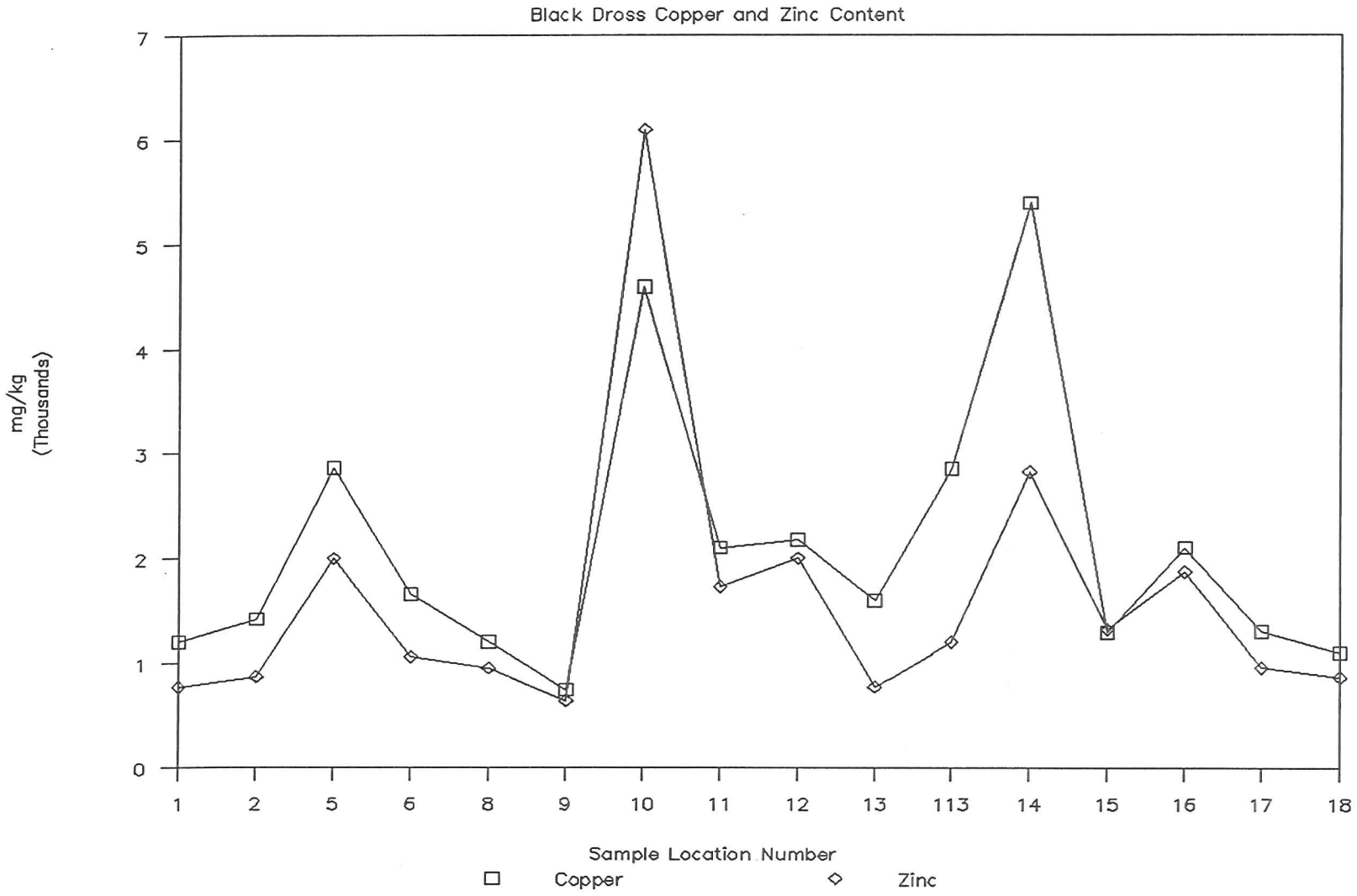

Black Dross Copper and Zinc Content
mg/kg
(Thousands)
0
1
2
3
4
5
6
7
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Copper
Zinc

Figure 3—13

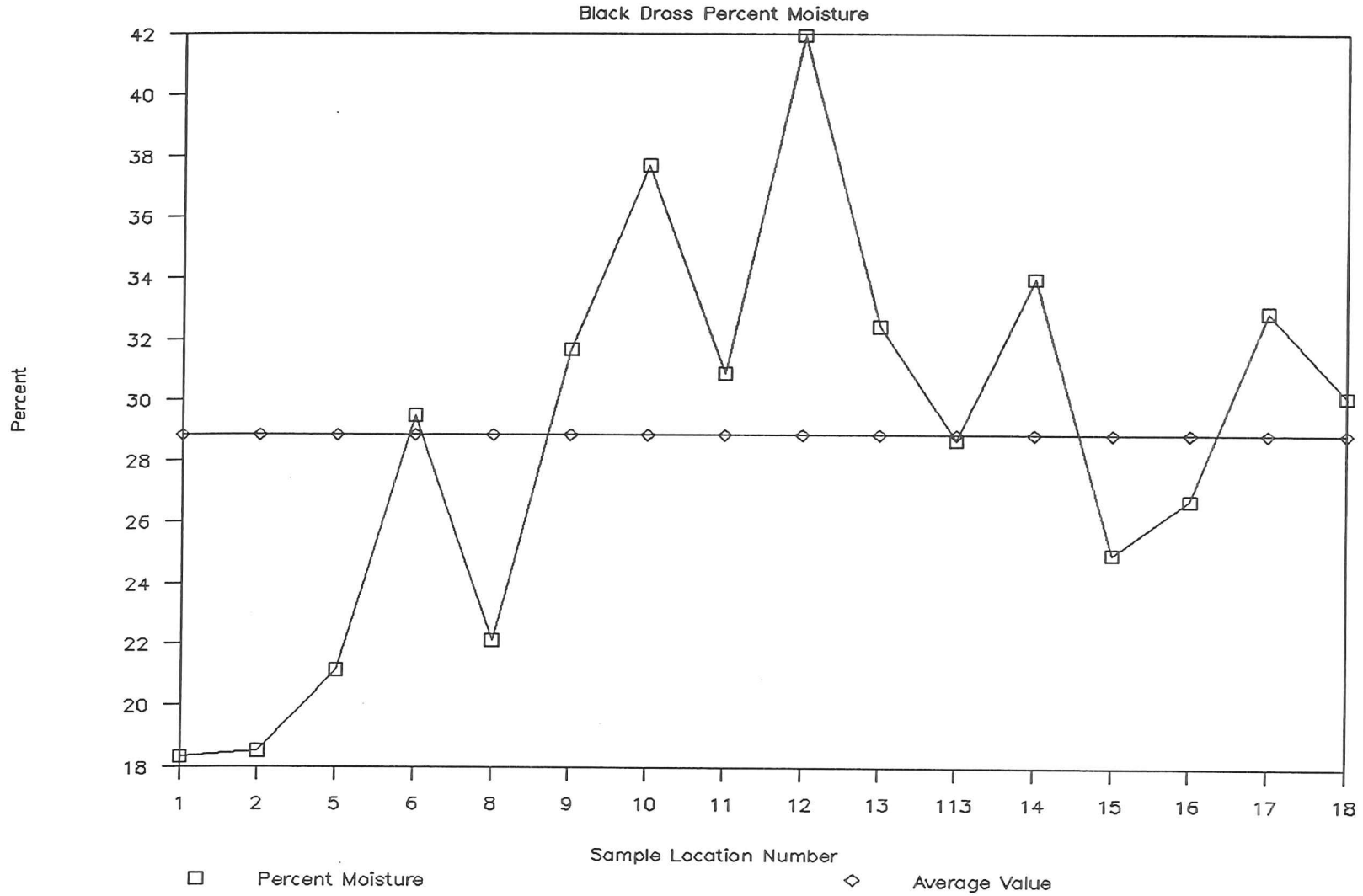
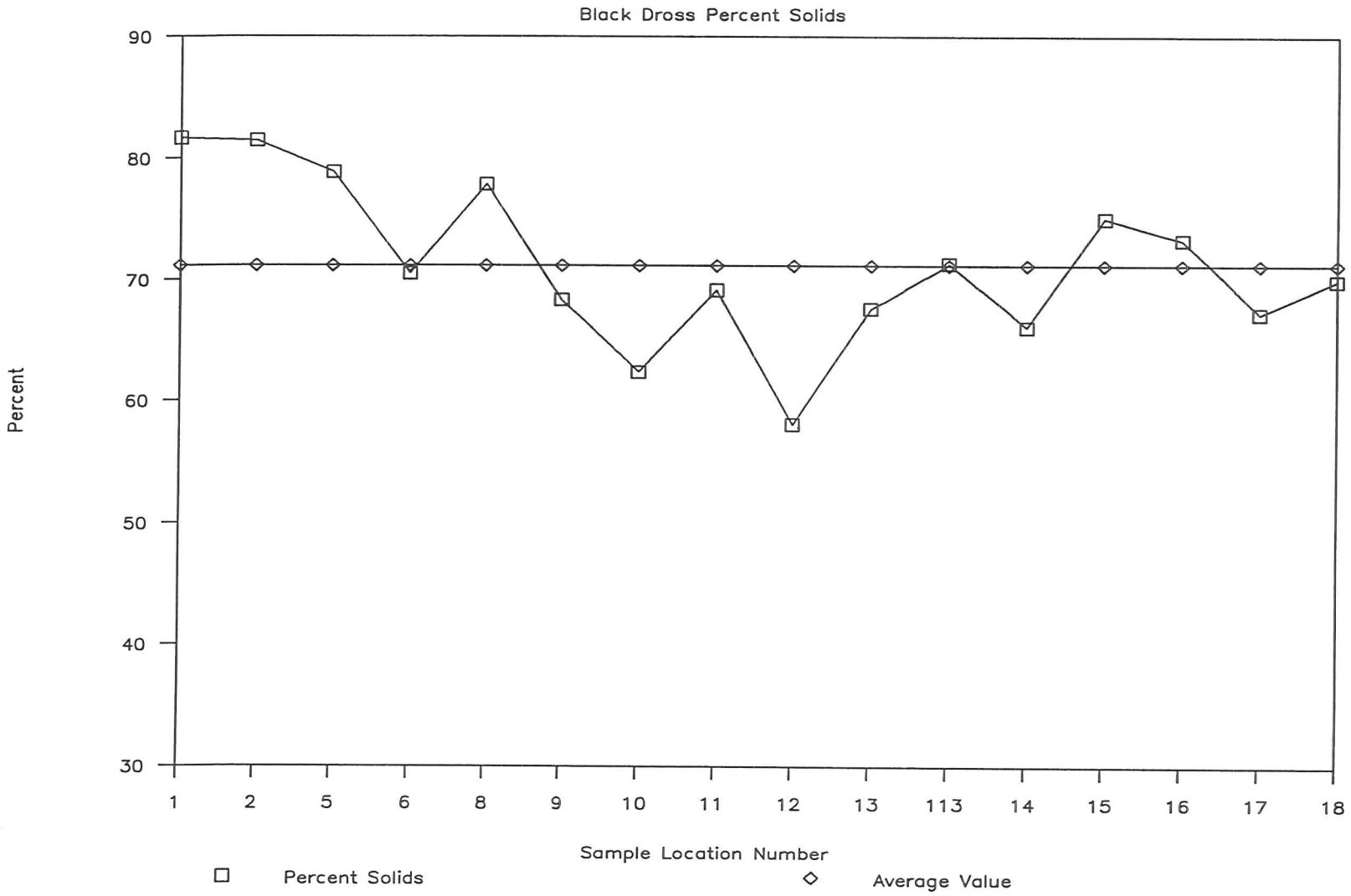

Black Dross Percent Moisture
Percent
42
40
38
36
34
32
30
28
26
24
22
20
18
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Percent Moisture
Average Value

Figure 3—14


Black Dross Percent Solids
90
80
70
60
50
40
30
Percent
1
2
5
6
8
9
10
11
12
13
113
14
15
16
17
18
Sample Location Number
Percent Solids
Average Value

SECTION 4

PILOT PLANT PROGRAM RESULTS/APPLICATION OF RESULTS

The results of the FS/PPP are presented in this section. They are discussed under the Subsection 4.1 Technical Results and Subsection 4.2 Cost Results, and are summarized as follows:

- Washing the black dross, recovering the washed oxide and discharging the wastewater is technically feasible.

- The black dross pile could be remediated in approximately 13 months using a single process line similar to the one demonstrated during the PPP. In order to achieve the 13 month time period some improvements to the PPP process would be required. These improvements are discussed in Section 4.3.

- The production capability of operating two process lines at a maximum production rate would exceed the allowable salinity discharge limits of the waste discharge permit.

- Operating three process lines at a maximum production rate would exceed the limits of the wastewater discharge permit.

- The unit cost of remediating the black dross pile is in the range of per ton of black dross. This cost does not include any allowance for one time construction costs, third party oversight, or contractor profit. It also does not reflect any credits for the sale of aluminum oxide or aluminum metal.

- There is a potential market for the recycled of aluminum oxide product, however, final contract terms and prices have not been determined.

Additional information regarding the Phase I FS/PPP results are as follows:

4.1 TECHNICAL RESULTS

Process Line 1, as described in Section 3.2, was operated on a single shift basis for two months and on a double shift basis for two months. During each successive month of operation, the single process line was increased in shift production capability (measured in tons of black dross processed) until a maximum of 22.9 tons per shift was achieved in the fifth month.

Prior to initiating the PPP, the maximum production from a single production line was estimated to be 10.2 tons of black dross per shift. This estimate of maximum production was achieved by month 3 and was improved upon until achieving the rate of 22.9 tons per shift. Production objectives and results are summarized in Table 4.1.

Based on the overview of the Line 1 operations, the operating procedures, and by further optimization of material handling and decanting procedures, an estimated maximum production of 47 tons per shift is achievable. The proposed optimizations are presented in Section 4.3 and the optimized production capability is described in Table 4.2

Operating a single process line at a rate of 47 tons per shift on a 2 shift basis, salt discharge is estimated to be 30,240 pounds per day and the black dross pile could be remediated in 13.1 months. Further details regarding the optimized production capability are presented in Table 4.2.

4.2 PILOT PLANT COST RESULTS

During the operation of the PPP, detailed records of costs were maintained and the costs are summarized in Table 4.3. The total cost of the PPP, excluding one time construction costs, contractor fee, and third party oversight was Using the month 5 production rate, the overall remediation cost was calculated to be per ton of black dross.

The projected cost of remediation is per ton and details are shown in Table 4.4. Operating costs were calculated using the optimized production capability of 47 tons per shift for the single process line as, determined in Table 4.2. Other assumptions were made in determining the unit costs shown in Table 4.4. These include:

- Additional capital expenditures of would be required. Capital cost items were based on list price for equipment. Typically, discounts of up to 10% are available at the time orders are placed for equipment.

Table 4.1
Summary of Production Objectives and Results

Production Objectives	Month 1	Month 2	Month 3	Month 4	Month 5	TOTAL
Tons Black Dross Processed	0	204	408	408	408	1,428
Tons Washed Oxide Produced	0	143	285	285	285	998
Pounds of Salt Removed	0	81,600	163,200	163,200	163,200	571,200
Gallons of Process Water	0	98,077	196,154	196,154	196,154	686,538

Production Results	Month 1	Month 2	Month 3	Month 4	Month 5	TOTAL
Tons Black Dross Processed	0	246	556	460	917	2,179
Tons Washed Oxide Produced						
Washed Oxide Less than 16 mesh	0.0	86.1	194.6	161.0	321.0	763
Washed Oxide +16/-6 mesh	0.0	54.1	122.3	92.0	183.4	452
Total Washed Oxides	0.0	140.2	316.9	253.0	504.4	1,214
Tons of Other Waste Streams						
+2 1/2" black dross material	0	29.4	61.8	46.8	86.8	225
-2 1/2" to + 6 mesh material	0	2.5	12.0	9.2	18.1	42
Moisture Reduction	0	24.6	55.6	46.0	91.7	218
Total Other Waste Material	0.0	56.4	129.4	102.0	196.6	484
Pounds of Salt Removed	0	109,554	189,964	219,655	440,998	960,171
Gallons of Process Water (metered)	0	72,816	164,576	133,873	271,802	643,067
Gallons of Process Water (unmetered)	0	25,000	50,000	67,000	133,000	275,000
Gallons of Process Water (unmetered)	0	0	0	67,000	133,000	200,000
Total Gallons Process Water	0	97,816	214,576	267,873	537,802	1,118,067
Management Staff	4	4	4	4	4	
Hourly Staff	3	4	5	5	5	
WISHA Violations/Accidents	0	0	0	0	0	0
Wastewater Permit Violations	0	0	0	0	0	0

Table 4.2

OPTIMIZED PRODUCTION CAPABILITY

OPTIMIZED SHIFT AND DAILY PRODUCTION CAPABILITY	
Tons of Black Dross Processed Per Wash Cycle	9.45
Number of Wash Cycles Per Hour	1.25
Number of Wash Cycles Per Shift	5.00
TOTAL TONS PER SHIFT	47.25
TOTAL TONS PER DAY (2 shift basis)	94.50
OPTIMIZED MONTHLY PRODUCTION CAPABILITY	
Average Number of Shifts per Month	21.0
Total Tons Per Day (2 shift basis)	94.5
TOTAL TONS PER MONTH	1984.5
ESTIMATED WATER/SALT DISCHARGE RATES	
Gallons per Ton	390.0
Total Tons per Day	94.5
Total Gallons per Day	36855.0
Total Salt Discharge per Day	30240.0
ESTIMATED REMEDIATION TIME PERIOD	
Total Tons of Black Dross	26,088.0
Single Process Line Optimized Production Capability (tons/month)	1,984.5
ESTIMATED TIME PERIOD TO REMEDIATE BLACK DROSS PILE (months)	13.1

Note:

Process water is calculated on the basis of 10% salt content.
Salt is calculated on the basis of the black dross containing a 20% salt content, on a dry weight basis.

Table 4.3

PILOT PLANT COST SUMMARY

CONFIDENTIAL

Table 4.3 (Continued)

CONFIDENTIAL

Table 4.4

PROJECTED COST OF BLACK DROSS REMEDIATION

CONFIDENTIAL

Table 4.4 (continued)

CONFIDENTIAL

- 75% of the capital expenditures were depreciated over the life of the project.
- One time construction costs were not included in the estimate.
- Labor rates would remain the same as those experienced during the PPP.
- The cost estimate does not reflect all sales tax.
- All mobile equipment would be leased.
- No credit has been shown for the sale of the recycled aluminum oxide or aluminum metal.

4.3 APPLICATION OF TEST RESULTS

One purpose of the PPP was to provide information needed to perform a detailed analysis of the black dross washing/recycle process and to suggest improvements that may be implemented if the washing is selected as the remedial option for the site. Operation of the PPP suggests several changes that will improve the overall process. These changes are as follows:

- Addition of a 30 ton per hour hammer mill at the front end of the process. Approximately 10% of the pile is material that is larger than 2-1/2 inches in size and cannot be added directly to the washing/conditioning drum. During pilot plant operation, this material was collected in a pile and not processed. Estimated cost
- Addition of a picking belt at the front end of the production line. This would allow for recovery of aluminum metal and removal of trash material. Estimated cost
- Use of concrete lined ponds for settling washed oxides should be discontinued. The circuit needs to be redesigned to allow settling to take place in steel tanks equipped with turbine-type agitators and two pumping systems. One pumping system would be submersible type to handle brine/decant water removal. The other pumping system would be a centrifugal slurry pump to remove washed oxides from the bottom of the tank. Estimated cost
- Addition of a horizontal, belt-type filter after the settling tanks to aid in the drying of the washed oxides. The filter belt would be equipped with filtrate receiver, filtrate pump, vacuum pump, and controls. The filter could produce 65

tons per shift at 15% moisture. Estimated cost

- Tanks located on-site and used for wastewater collection during the pilot program showed signs of corrosion by the end of the 5 month test period. All tanks would need to be replaced. Estimated cost

- Use the concrete-lined ponds to decontaminate equipment and for emergency storage of process or discharge water.

- The addition of a drainage/collection system for stormwater runoff and process water overflow. Currently, these waters collect in an area immediately south of the refinery building, making access to the black dross pile with the front end loader difficult, and at times, impossible. This, in turn, slows the recycling operations. Overflow is also collected in the "lagoon" east of the concrete ponds. Because the base of the "lagoon" is unlined and is floored with black dross, it is uncertain how the hydraulic head affects contaminant transport. Estimated cost

- Addition of steel chutes, feeder hoppers, slurry pipe, and belts to improve material handling. Estimated cost

Equipment costs were based on telephone quotes from various vendors. Costs do not include installation and sales tax.

SECTION 5

ARARs

The black dross recycling operations at the Maralco site must be conducted in compliance with federal and state environmental laws and regulations, requirements, criteria and limitations that are legally applicable or relevant and appropriate for the release or threatened release of hazardous substances, pollutants or contaminants to the environment (WAC 173-340-710). This is known as compliance with applicable or relevant and appropriate requirements (ARARs).

The following discussion includes identification of potential ARARs and any related permits, as well as guidance and criteria to be considered when evaluating environmental effects of the recycling operations.

5.1 FEDERAL REQUIREMENTS

The following is a discussion of the federal ARARs.

5.1.1 Clean Water Act (PL 92-500)

Section 173-340-710 of the Model Toxics Control Act (MTCA) states that remedial actions shall attain federal water quality criteria where relevant and appropriate under circumstances of the release or threatened release of hazardous substances. The federal water quality criteria, established under Section 301 of the Clean Water Act, are potential ARARs due to the potential for releases from the recycling operations to reach Christopher Ditch, which ultimately flows into the Green River.

Section 404 of the Clean Water Act provides for the issuance of permits for the discharge of dredged or fill material into navigable waters, including wetlands. A Phase I Wetlands Inventory conducted in 1990 by Shapiro and Associates for the City of Kent identified portions of the Maralco property as wetlands. Any development of these areas will come under the purview of a Section 404 permit, administered by the Army Corps of Engineers.

5.1.2 Safe Drinking Water Act Regulations (40 CFR 141)

The Safe Drinking Water Act provides for the establishment of drinking water quality standards for public water systems. The standards include Maximum Contaminant Levels (MCLs) for metals, and organic and inorganic parameters. Because area surface and groundwaters are potential drinking water sources or have the potential to

affect drinking water sources, these regulations are potential ARARs.

5.2 STATE REQUIREMENTS

The following discussion summarizes the Washington State ARARs.

5.2.1 Washington Water Quality Standards (WAC 173-201)

The surface water quality standards conform to present and potential uses of the State's surface waters, and include chemical, biological and physical parameters. Because of the proximity of the recycling operations to Christopher Ditch, which flows into the Green River, and the potential for direct or indirect discharges to the ditch, the standards are potential ARARs.

5.2.2 Washington Groundwater Quality Standards (WAC 173-200)

Although these standards may be potential ARARs, WAC 173-200-010-3(c) states that these regulations do not apply to cleanup actions approved by WDOE under the MTCA or by the EPA under CERCLA. Instead, groundwater cleanup standards for such sites are to be developed under WAC 173-340-720, MTCA cleanup regulations, Groundwater Cleanup Standards.

5.2.3 Model Toxic Control Act (MTCA) Cleanup Regulations (WAC 173-340)

Pursuant to MTCA (70. 105D RCW), WDOE adopted regulations to clean up the state's hazardous waste sites. These regulations, found at WAC 173-340, include groundwater, surface water, soil and air parameters. A remedial investigation of the site under MTCA is ongoing, and therefore, these regulations are considered as ARARs.

5.2.4 Washington Drinking Water Regulations (State Board of Health, Chapter 248.54)

These regulations, promulgated to protect the health of consumers using state public drinking water supplies, are almost identical to the federal drinking water standards. Because area surface and groundwaters are potential drinking water sources or have the potential to affect drinking water sources, these regulations are potential ARARs.

5.2.5 Dangerous Waste Regulations (WAC 173-303)

Pursuant to 70.105 RCW, the dangerous waste regulations designate solid wastes as

dangerous or extremely hazardous and provide for their monitoring, tracking, manifesting and reporting, among other things. The black dross was designated as a dangerous waste on the basis of its salt content, and until such time as it is recycled, neutralized or disposed of, these regulations are considered ARARs.

5.2.6 Puget Sound Air Pollution Control Agency (PSAPCA) Regulations I, II, and III

Under the Washington State Clean Air Act, PSAPCA is responsible for controlling stationary air pollution sources in King, Kitsap, Pierce and Snohomish counties. Regulations I, II and III deal with source registration and criteria pollutants, volatile organic compounds, and toxic air contaminants, respectively. These regulations are ARARs for fugitive dust at the Maralco site (Regulation I), although no registration or permit is needed. The addition of any air contaminant sources at the site (e.g. rock crusher, baghouse), however, would require registration of the equipment and issuance of a Notice of Construction.

5.2.7. General Occupational Health Standards (WAC 296-62)

The Washington Department of Labor and Industries is responsible for administering the safety and health standards set forth at WAC 296-62. These standards provide minimum requirements for the prevention or control of conditions in industry hazardous to health, and include hazard communication, air contaminants, biological and physical agents, noise, confined spaces, and hazardous waste operations and emergency response, among others. These standards are ARARs for current and future plant operations.

5.3 OTHER REQUIREMENTS

The local (King County) section of the Shoreline Master Program and the King County wetlands/sensitive area ordinance may be potential ARARs for the site due to its wetlands designation. Shoreline means lakes, including reservoirs with 20 or more surface acres, streams with a mean annual flow of 20 cubic feet per second or greater, marine waters, areas landward for 200 feet measured on a horizontal plane from the ordinary, high water mark, and all associated marshes, bogs, swamps, and river deltas. Floodplains and floodways are also included. A shoreline permit is required for any development or construction activity in these areas. Contact with the King County planning department will clarify the applicability of these requirements to the site.

Permits to construct permanent buildings or additions to existing facilities are required by counties and cities, except under certain circumstances. The permit application requires detailed final plans for structures. The King County Building and Lands Division should be contacted for further information.

SECTION 6

ALTERNATE INTERIM RESPONSE TECHNOLOGY

During the Phase I RI/PPP, the feasibility of washing the black dross material was addressed. The purpose of this section is to present other interim expedited response technologies that may be applicable to treat the black dross at the Maralco site. These technologies are divided into two categories.

- Landfilling
- Recycling/Recovery

6.1 LANDFILLING

Three hazardous waste landfills were contacted during the FS/PPP. Names, addresses, and contacts are presented in Table 6.1, along with order of magnitude cost estimates for disposal. The cost estimates were based on discussions with landfill representatives and range from a low of $1,304,450 to a high of $4,409,000. Final landfill costs could be determined after samples of the black dross have been analyzed by the respective landfill laboratory agencies and stabilization/handling costs determined.

The McBride landfill, identified in Table 6.1, is a facility specifically designated to accept black dross from aluminum refineries. The location of the landfill was ideally suited to economically transport and dispose of the black dross, since the same units used to haul black dross to the landfill are with salt flux from Utah and shipped back to the plant. The IMSAMET secondary aluminum refinery in Rathdrum, Idaho, has been shipping their black dross to the landfill for several years.

In December of 1990, the McBride landfill was closed due to permit compliance problems. There are discussions that another similar landfill will be opened, but at this time nothing can be reported.

The Chem Security Systems and Envirosafe Services of Idaho facilities are state of the art hazardous waste landfills. Both report accepting black dross wastes from other aluminum refineries in the Pacific Northwest.

TABLE 6.1

LANDFILL OPTIONS FOR MARALCO BLACK DROSS

Company/Contact	Site Description	Disposal Cost	Shipping Cost	Project Cost
Chem Security Systems 9 Cedar Springs Road Arlington, Oregon 97812 Mr. Kieth Rieff (503) 659-0736	Hazardous waste landfill currently accepting waste from aluminum producers.	$134 per ton gate fee plus $20 per ton State tax. Possible stabilization cost depending on EP Tox analysis.	$15 per ton	$4,409,041
Envirosafe Services of Idaho, Inc. P.O. Box 417 Boise, ID 83701-0417 Mr. Dan Keitges (206) 778-5546	Hazardous waste landfill set up to accept waste from aluminum producers.	$70 per ton gate fee plus $20 per ton State tax. Possible stabilization cost depending on EP Tox analysis.	$30 per ton	$3,130,680
McBride Landfill P.O. Box 568 410 S. Center Grantsville, Utah 84029 Mr. Dennis McBride (801) 884-6183	State of Utah permitted landfill specifically set aside to accept black dross waste.	$10 per ton gate fee. Possible stabilization cost depending on EP Tox analysis.	$40 per ton	$1,304,450

NOTE: Project cost is the sum of disposal cost plus shipping cost multiplied by 26,088 (tons of black dross to be disposed of). Stabilization costs have not been included. Project cost for each landfilling option could be partially offset by metal recovery and drying prior to shipping, however, these cost reductions have not been determined.

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6.2 RECYCLING/RECOVERY

During the FS/PPP, numerous process technology companies were contacted to identify alternate interim response technologies. Three possible technologies were identified. A fourth technology was described in a technical paper, however, because the company is located in Germany, they were not contacted.

The results of the discussions are summarized in Table 6.2. Each of the companies listed have developed recycling systems that address recovery of:

- aluminum metal
- aluminum oxide
- salt prills

The aluminum oxide recovery method used by each company is similar to the process used during the pilot plant program. The aluminum metal recovery was not addressed in the pilot plant; however, each of the companies shown in Table 6.2 have developed a metal recovery process.

Salt recovery uses a variety of technologies, including evaporation ponds, flash evaporators, and flotation systems. Salt recovery was not addressed in the pilot plant program because of the ability to discharge the salt-containing wastewater per a waste discharge permit.

Order of magnitude cost estimates were developed from discussions with company representatives. Cost estimates are based on using the entire technology and range from a low of $3,130,680 to a high of $5,739,580. If the brine/salt recovery circuits were deleted from the process line, company representatives indicated that capital and operating costs would be significantly lower.

TABLE 6.2

RECYCLING/RECOVERY OPTIONS FOR MARALCO BLACK DROSS

Company/Contact	Process Description	Recovered Products/Value	Capital Cost	Operating Cost	Shipping Costs	Project Cost	Remarks
International Aluminum Inc. 7819 South 202nd Street Kent, Washington 98032 Mr. Phil K. Stansfeld, President (206) 875-5296	Screening, Agitation, Brine Separation, Aluminum oxide recovery, brine discharge.	Aluminum metal (620 tons) Aluminum oxide (18,000 tons) Aluminum metal: $313,056 Aluminum oxide: $540,000 Total: $853,056	Cost figures presented in Section 4.	Cost figures presented in Section 4.	Cost figures presented in Section 4.	Cost figures presented in Section 4.	Cost figures presented in Section 4.
American Recovery Tech. Sys., Inc. 4181 Bradley Road Cleveland, Ohio 44109 Mr. Dan Yerushalmi, President (216) 661-3500	Crushing and Screening, Metal Recovery, Salt Separation, Aluminum oxide recovery, evaporation ponds, salt crystal recovery. A 42,000 ton per year plant is operating in Cleveland recycling secondary aluminum waste.	Recycled products retained by American Recovery Technology	$ 0	$220 per ton. Includes $60 per ton shipping to plant.	$ 0	$5,739,580	Cost figures based on discussions with owners representative.
Lake Engineering, Inc. 6000 Lake Forest Drive Suite 350 Atlanta, Georgia 30328 Mr. Kent Hudson, Vice President (404) 257-9634	Crushing and screening, Metal Recovery, Salt Separation, Aluminum oxide recovery, evaporation ponds, salt crystal recovery. A 51,000 ton per year plant is operating in Carisio, Italy recycling secondary aluminum waste.						Not applicable to the Maralco project.

TABLE 6.2 (continued)

Company/Contact	Process Description	Recovered Products/Value	Capital Cost	Operating Cost	Shipping Costs	Project Cost	Remarks
Lake Engineering, Inc. 6000 Lake Forest Drive Suite 350 Atlanta, Georgia 30328 Mr. Kent Hudson, Vice President (404) 257-9634	Crushing and Screening, Metal Recovery, Salt Separation, Aluminum oxide recovery, flash evaporation, salt crystal recovery plant could be built in U.S. A 19,500 ton per year pilot plant is operating in Cacapava, Brazil recycling secondary aluminum waste	Aluminum metal (620 tons) Aluminum oxide (18,000 tons) Salt Prills (3,340 tons) Aluminum metal: $ 313,056 Aluminum oxide: $ 540,000 Salt Prills: $ 133,600 Total: $ 986,656	$3,500,000	$51 per ton of black dross	$30 per ton of washed oxide	$4,383,832	Costs taken from white paper on reprocessing of black dross.
Reilly Wendover 675 E 2100 S Suite 220 Salt Lake City, Utah 84106 Mr. Dennis Hullinger, Sales Mgr. (800)533-0341	Crushing and Screening, Metal Recovery, Salt Separation, Aluminum oxide recovery, evaporation ponds, salt crystal recovery. A plant is in the planning stages.	Recycled products retained by Reilly Wendover.	$ 0	$120 per ton Includes $40 per ton shipping to plant.	$ 0	$3,130,680	Cost figures based on discussions with owners representative.
UMWELTBUNDESAMT, Bismarck 1, 1000 Berlin 33 Mr. S. Scheff (030) 89 03-0	Crushing and Screening, Metal Recovery, Salt Separation, Aluminum oxide recovery, flash evaporation, salt crystal recovery plant could be built in U.S. A 63,000 ton per year commercial plant is operating near Berlin, Germany recycling secondary aluminum waste	Aluminum metal (620 tons) Aluminum oxide (13,044 tons) Salt Prills (3,340 tons) Aluminum metal: $ 310,000 Aluminum oxide: $ 391,320 Salt Prills: $ 133,600 Total: $ 834,920	unknown	unknown	NA	unkown	Company was not contacted, however, literature was reviewed

NOTE: Project cost is the sum of capital cost plus operating cost plus shipping cost less the value of the recovered products.
Total tons of black dross estimated to be 26,088. Black dross average moisture estimated to be 20%. Aluminum oxide recovery estimated to be 75%. Aluminum metal recovery estimated to be 2%. Aluminum metal price: $0.30 per pound. Aluminum oxide moisture content estimated to be 15%. Salt prill recovery estimated to be 16%. Recovered salt price: $0.02 per pound.

SECTION 7

ALUMINUM OXIDE MARKET SURVEY

This section is a summary of the preliminary aluminum oxide marketing survey conducted by MK.

7.1 CEMENT MARKET

Attention was focused on the cement industry as the most immediate opportunity to market the Maralco washed oxides. Cement is typically made up of 6% - 8% aluminum oxide along with silica and ferric material. The Maralco washed oxides contain all three of these ingredients and could be an excellent source of aluminum oxide product.

During the FS/PPP, two cement companies, LaFarge Cement Canada Ltd. and Ash Grove Cement, were contacted, and preliminary marketing meetings were held. Both companies expressed an interest in the Maralco washed oxides and would be willing to enter some type of contract negotiations.

Analytical test results for the Maralco washed oxides, found in Table 7.1, show the percentages of aluminum, silica, and washed oxides. The analytical test results also show a relatively high percentage of alkaline metals, sodium oxide (Na_2O), and potassium oxide (K_2O). These two alkaline products present a serious problem to the cement operations if they exceed a combined 2%. The sodium and potassium oxides become particulate matter in the cement manufacture and are collected as emission particulates. Emissions are highly regulated and controlled wherever possible. Sodium and potassium oxides would need to be removed to less than 2% prior to shipping the products.

Table 7.1
Analytical Test Results for Maralco Washed Oxides

LaFARGE CANADA ANALYSIS OF WASHED OXIDES

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Moisture	30.66	32.14	17.13	15.90	16.21
SiO_2	13.76	14.73	13.00	17.18	31.04
Al_2O_3	53.86	52.75	54.01	43.98	40.10
Fe_3O_3	1.62	1.75	1.59	3.11	20.6
CaO	1.77	20.80	1.80	2.30	2.08
MgO	7.93	8.37	8.32	6.54	11.55
Na_2O	1.99	2.78	2.29	1.85	1.53
K_2O	1.24	2.24	1.62	1.08	1.27
SO_3	--	--	--	--	0.37
TiO_2	0.91	0.81	0.91	--	6.26
P_2O_5	0.09	0.11	0.08	--	0.18
Cl	--	--	--	0.21	0.06

NOTES:
Analyses are recorded as percents (%)

Table 7.1 (continued)
Analytical Test Results for Maralco Washed Oxides

ASH GROVE CEMENT ANALYSIS OF WASHED OXIDES

	Sample 1	Sample 2
Moisture	--	--
SiO_2	32.60	38.80
Al_2O_3	43.31	43.37
Fe_3O_3	2.79	2.23
CaO	4.14	2.26
MgO	7.77	2.39
Na_2O	2.15	0.45
K_2O	1.47	0.25
SO_3	0.02	0.19
LOI*	10.76	13.24
-16 Mesh	100.00	100.00
+100 Mesh	43.70	26.50
-100 Mesh	56.30	73.50
-200	43.40	68.80

NOTES:
* = Loss on Ignition
Analyses are recorded as percents (%)

Two companies engaged in purchasing aluminum oxide-related materials were contacted. Each company provided the following information:

Table 7.2
Preliminary Marketing Results

Company Name:	LaFarge Canada Inc., Western Division
Address:	RR No. 2 Site 12 Comb. 1 Kamloops, British Columbia, Canada
Company Contact:	Mr. Dennis Price, General Manager Mr. John Wong, Chief Chemist
Telephone No:	(604) 573-3211
Corporate Profile:	Largest cement producer in Canada
Purchase Price:	$30/ton
Remarks:	The LaFarge Kamloops plant uses an estimated 7,000 tons of aluminum oxide per year in the manufacture of cement. The plant also uses silica and ferric products, also present in the Maralco washed oxides. The LaFarge plant has performed several tests of the Maralco washed oxides, and in July 1990, ran a 75 ton bulk sample through their facility. LaFarge reports that the washed oxide product was suitable to their operation and that they would be interested in a long term agreement to purchase the oxides.

Company Name:	Ashgrove Cement West, Inc.
Address:	3801 East Marginal Way South Seattle, WA 98134
Company Contact:	Mr. Nate Furnow, Quality Control Mr. Ken Rhone, Plant Manager
Telephone No:	(206)623-5596
Corporate Profile:	Cement Production
Purchase Price:	Not stated
Remarks:	Ashgrove operates two facilities that could potentially use the Maralco washed oxides: the Durke plant in Durke, Oregon, and a new plant, currently being constructed in Seattle. Ashgrove has taken samples of the washed oxide and from an analytical standpoint, they have stated that the Maralco washed oxide would blend well with their other products.

7.2 OTHER USES FOR ALUMINUM OXIDE

Aluminum oxide has many other uses besides the manufacture of cement. Aluminum oxide is produced commercially in hydrated phases (gibbsite, bayerite, boehmite), as well as "active" calcined and tabular forms ranging in purity from bauxite to much higher purity. Calcined and tabular aluminum oxide serve as a raw material for refractories and ceramics as well as abrasives and polishes. Special methods of water removal lead to the "active" aluminum oxide which are excellent desiccants and adsorbents. These special forms of aluminum oxide also find specific applications in catalyst applications and chemical processing. Table 7.3 lists other uses for aluminum oxide, many in highly specialized product forms.

Table 7.3
Commercial Aluminum Oxide Products

Generic Name	Al_2O_3 Content	General	Uses
Calcined bauxite Fused bauxite	80-90	Sintered low porosity product. Essentially zero porosity crushed product	Raw material for refractory products. For refractories and as an abrasive.
Activated bauxite	75-90	High surface area sized granular product	As a catalyst and a desiccant
Alumina hydrate (gibbsite)	65.4	Coarse to fine grades--5-100% <325 mesh and precipitated submicron grades	As a raw material for aluminum, various aluminum chemicals, and as fillers
Alumina hydrate (bayerite)	65.4	Usually fine crystals with low soda content. Both trihydrates decompose at low temperature	As a catalyst precursors As a filler and flame retardant, and as catalyst and desiccant precursors
Alumina monohydrate	82.6	Microcrystalline to coarse particle size. Thermally stable to above 500°C.	As a filler and as a catalyst precursor
Gel alumina	70-80	A mixture of amorphous, bayerite, and pseudoboehmite	As a catalyst substrate and as a pharmaceutical raw material
Amorphous alumina	~50	A near colloidal hydrated alumina	As a catalyst substrate and as a pharmaceutical material
Transition aluminas[a]	92-97	High surface area product of controlled calcination of hydrated aluminas, usually in granular, spherical or extrudate shape	For desiccant use in multi-cycle regenerating process, for impurities scavenger, and for catalyst substrate

Table 7.3 (continued)

Generic Name	Al_2O_3 Content	General	Uses
Calcined aluminas	99.5+	Mixtures of gamma and 0-100% alpha alumina. Na2O contents and crystallite size may be varied in processing. Crystallite size range is 1-10u	For aluminum production, for ceramics refractories, abrasives, polishes, and for fusion
Reactive aluminas	99.5+	Readily sinterable, generally very small particle size and usually high purity alpha alumina	For technical ceramics, including electronic components
Tabular alumina	99.5+	Alpha alumina of large tablet-shaped crystals	For refractories, ceramics and abrasives, as well as for catalyst or desiccant supports
Beta alumina	Varies[b]	A high temperature phase material	For technical ceramics and as a high-temperature electrical conductor
Fused alumina	99.5+	Melted and cast or crushed	For abrasives and for refractories

a Sometimes called gamma alumina.
b Composition can vary (one alkali or alkaline earth oxide per 1-11 Al_2O_3).

APPENDIX A

METRO
Municipality of Metropolitan Seattle
Exchange Building • 821 Second Ave. • Seattle, WA 98104-1598

October 5, 1990

Philip Stansfeld
International Aluminum
7819 S. 202nd
Kent, WA 98032

Dear Mr. Stansfeld:

The Industrial Waste Section of Metro has sampled the waste being discharged to the sanitary sewer from your operation; enclosed are the waste characterizations of that effluent.

Our analysis has determined that the average fats, oils and grease (FOG) concentration of your waste was:

Total FOG = < 5.0 milligrams/liter

This characterization indicates that your effluent is in compliance with Metro discharge limitations for fats, oils and grease (FOG).

Thank you for your efforts to maintain consistent compliance. If you have any questions, please call your Metro contact person: Bruce Burrow 684-2329;Ray Carveth 684-2326; Denise Healy 684-2328; Christie True 684-2327; Michelle Dewey 684-2368; Jim Sifford 684-2335; Jacqueline Eden 684-2378; or Doug Hilderbrand at 684-2341.

Very truly yours,

Ray Carveth
Industrial Waste Investigator
Comprehensive Planning Division

EPP:10/5
Enclosure

DESCRIPTION	STATION	SITE
INTERNATIONAL ALUMINUM	A8102	O/S Collection Tank

DATE	TIME	TYPE	ID
900924	0906	G	0

		CONC (mg/l)	LBS
TOTAL FOG	OG	< 5.0000	

KEY

PH is in standard units.

TYPE

G	Grab sample.
SH02	Series hourly sample representing 2 hours.
CH24	Composite sample representing 24 hours.
CH00	Composite sample based on flow.

VIOLATIONS

#	Exceeded limits but not legal violation.
*	Legal violation subject to enforcement action.

DESCRIPTION	STATION	SITE
INTERNATIONAL ALUMINUM	A8102	O/S Collection Tank

DATE	TIME	TYPE	ID
900924	0913	G	0

		CONC (mg/l)	LBS
TOTAL FOG	OG	< 5.0000	

KEY

PH is in standard units.

TYPE

G	Grab sample.
SH02	Series hourly sample representing 2 hours.
CH24	Composite sample representing 24 hours.
CH00	Composite sample based on flow.

VIOLATIONS

#	Exceeded limits but not legal violation.
*	Legal violation subject to enforcement action.

DESCRIPTION	STATION	SITE
INTERNATIONAL ALUMINUM	A8102	O/S Collection Tank

DATE	TIME	TYPE	ID
900924	0919	G	0

		CONC (mg/l)	LBS
TOTAL FOG	OG	< 5.0000	

KEY

PH is in standard units.

TYPE

G	Grab sample.
SH02	Series hourly sample representing 2 hours.
CH24	Composite sample representing 24 hours.
CH00	Composite sample based on flow.

VIOLATIONS

#	Exceeded limits but not legal violation.
*	Legal violation subject to enforcement action.

METRO
Municipality of Metropolitan Seattle
Exchange Building • 821 Second Ave. • Seattle, WA 98104-1598

October 8, 1990

Philip Stansfeld
INTERNATIONAL ALUMINUM
7819 S. 202nd
Kent, WA 98032

Dear Philip Stansfeld:

Enclosed are the analyses from Metro's most recent effluent sampling at your facility for our Heavy Metals Control Program. All values met Metro's discharge limits.

Metro appreciates your good compliance. If you have any questions, please call your Metro contact person: Christie True 684-2327; Bruce Burrow 684-2329; Ray Carveth 684-2336 Doug Hilderbrand 684-2341; Denise Healy 684-2328; Michelle Dewey 684-2368; Jim Sifford 684-2335; Jacqueline Eden 684-2378; or Louise Kulzer at 684-2373.

Very truly yours,

Ray Carveth

Industrial Waste Investigator
Comprehensive Planning Division

Enclosure

DESCRIPTION	STATION	SITE
INTERNATIONAL ALUMINUM	A8102	O/S Collection Tank

DATE	TIME	TYPE	ID
900921	915	G	6652

		CONC (mg/l)	LBS
SILVER	AG	< 0.0030	
ARSENIC	AS	< 0.0500	
CADMIUM	CD	< 0.0020	
CHROMIUM	CR	< 0.0050	
COPPER	CU	0.2300	
NICKEL	NI	< 0.0100	
LEAD	PB	< 0.0300	
ZINC	ZN	0.0840	
CYANIDE	CN	0.0130	
PH	PH	8.9000	

KEY

PH is in standard units.

TYPE

G	Grab sample.
SH02	Series hourly sample representing 2 hours.
CH24	Composite sample representing 24 hours.
CH00	Composite sample based on flow.

VIOLATIONS

#	Exceeded limits but not legal violation.
*	Legal violation subject to enforcement action.
$	Legal violation - Slug violation.
SLUG	Concentrated discharge exceeding discharge limits by a factor of 10. Legal violation.

METRO
Municipality of Metropolitan Seattle
Exchange Building • 821 Second Ave. • Seattle, WA 98104-1598

October 8, 1990

Philip Stansfeld
International Aluminum
7819 S. 202nd
Kent, WA 98032

Dear Mr. Stansfeld:

The Industrial Waste Section of Metro has collected sample(s) of the waste water from your discharge for Total Toxic Organic (TTO) analysis. The purpose of this letter is to notify you of these analytical results. Attached you will find the data with a determination of whether or not your discharge is in compliance with the TTO standard.

If you have any questions, please contact me at 684-2326.

Very truly yours,

Ray Carveth

Ray Carveth
Industrial Waste Investigator
Comprehensive Planning Division

EPP:10/8
Enclosure

METRO
Municipality of Metropolitan Seattle
Exchange Building • 821 Second Ave. • Seattle, WA 98104-1598

TOTAL TOXIC ORGANIC ANALYSIS

Company: International Aluminum

Address: 7819 S. 202nd
Kent, WA 98032

Station: A8102 Oil Separator Collection Tank

Date	Total Toxic Organic (ppm)	Comment
9/21/90	0.00	

NOTE: TTO is based on the sum of the concentrations of priority pollutants that exceed 10 ppb.

GCMS METHOD 624 VOLATILES ORGANIC ANALYSIS REPORT

SAMPLE NUMBER: 9006652

MATRIX: WASTEWATER AMOUNT ANALYZED: 5.0 ML

INSTRUMENT ID: 4500C DILN. FACTOR: 5.0

PRIORITY POLLUTANTS	Wet DL (ppb)	Wet Conc (ppb)
CHLOROMETHANE	10.00	ND
VINYLCHLORIDE	10.00	ND
BROMOMETHANE	10.00	ND
CHLOROETHANE	10.00	ND
TRICHLOROFLUOROMETHANE	10.00	ND
ACROLEIN	50.00	ND
1,1-DICHLOROETHYLENE	10.00	ND
METHYLENE CHLORIDE	50.00	ND
ACRYLONITRILE	50.00	ND
TRANS-1,2-DICHLOROETHYLENE	10.00	ND
1,1-DICHLOROETHANE	10.00	ND
CHLOROFORM	10.00	ND
1,1,1-TRICHLOROETHANE	10.00	ND
CARBON TETRACHLORIDE	10.00	ND
BENZENE	10.00	ND
1,2-DICHLOROETHANE	10.00	ND
1,1,2-TRICHLOROETHYLENE	10.00	ND
1,2-DICHLOROPROPANE	10.00	ND
BROMODICHLOROMETHANE	10.00	ND
2-CHLOROETHYLVINYLETHER	10.00	ND
TRANS-1,3-DICHLOROPROPENE	10.00	ND
TOLUENE	10.00	ND
CIS-1,3-DICHLOROPROPENE	10.00	ND
1,1,2-TRICHLOROETHANE	10.00	ND
TETRACHLOROETHYLENE	10.00	ND
CHLORODIBROMOMETHANE	10.00	ND
CHLOROBENZENE	10.00	ND
ETHYL BENZENE	10.00	ND
BROMOFORM	10.00	ND
1,1,2,2-TETRACHLOROETHANE	10.00	ND

SAMPLE NUMBER: 9006652

HAZARDOUS SUBSTANCES LIST	Wet DL (ppb)	Wet Conc (ppb)
ACETONE	50.00	110.00
CARBON DISULFIDE	10.00	ND
VINYL ACETATE	50.00	ND
2-BUTANONE (MEK)	50.00	ND
4-METHYL-2-PENTANONE (MIBK)	50.00	ND
2-HEXANONE	50.00	ND
TOTAL XYLENE	10.00	ND
STYRENE	10.00	ND

Note - DL means Sample Detection Limits (based on 100% recovery).
NA means Not Analyzed, ND means Not Detected.

GCMS METHOD 625 SEMI-VOLATILES ORGANIC ANALYSIS REPORT

SAMPLE NUMBER: 9006652

MATRIX: WASTEWATER AMOUNT ANALYZED: 500.0 ML

INSTRUMENT ID: 4500A DILN. FACTOR: 1.0

PRIORITY POLLUTANTS	Wet DL (ppb)	Wet Conc (ppb)
N-NITROSODIMETHYLAMINE	6.00	ND
PHENOL	6.00	ND
BIS(2-CHLOROETHYL)ETHER	1.00	ND
2-CHLOROPHENOL	4.00	ND
1,3-DICHLOROBENZENE	1.00	ND
1,4-DICHLOROBENZENE	1.00	ND
1,2-DICHLOROBENZENE	1.00	ND
BIS(2-CHLOROISOPROPYL)ETHER	4.00	ND
N-NITROSODI-N-PROPYLAMINE	2.00	ND
HEXACHLOROETHANE	2.00	ND
NITROBENZENE	2.00	ND
ISOPHORONE	2.00	ND
2-NITROPHENOL	2.00	ND
2,4-DIMETHYLPHENOL	2.00	ND
BIS(2-CHLOROETHOXY)METHANE	2.00	ND
2,4-DICHLOROPHENOL	2.00	ND
1,2,4-TRICHLOROBENZENE	1.00	ND
NAPHTHALENE	3.00	ND
HEXACHLOROBUTADIENE	2.00	ND
4-CHLORO-3-METHYLPHENOL	4.00	ND
HEXACHLOROCYCLOPENTADIENE	2.00	ND
2,4,6-TRICHLOROPHENOL	8.00	ND
2-CHLORONAPHTHALENE	1.00	ND
ACENAPHTHYLENE	1.00	ND
DIMETHYL PHTHALATE	0.60	ND
2,6-DINITROTOLUENE	0.80	ND
ACENAPHTHENE	0.80	ND
2,4-DINITROPHENOL	4.00	ND
4-NITROPHENOL	4.00	ND
2,4-DINITROTOLUENE	0.80	ND
FLUORENE	1.00	ND
DIETHYL PHTHALATE	2.00	ND
4-CHLOROPHENYL PHENYL ETHER	1.00	ND
4,6-DINITRO-O-CRESOL	4.00	ND
N-NITROSODIPHENYLAMINE *	2.00	ND
1,2-DIPHENYLHYDRAZINE **	4.00	ND
4-BROMOPHENYL PHENYL ETHER	0.60	ND
HEXACHLOROBENZENE	1.00	ND
PENTACHLOROPHENOL	2.00	ND
PHENANTHRENE	1.00	ND
ANTHRACENE	1.00	ND

VOLATILE TENTATIVELY IDENTIFIED COMPOUNDS

ile No.: 9006652 Sample: INTL ALUM
Method: EPA 624 Matrix: WASTE WATER
Init. Amt.: 5.0 ML Dilution: 5.0 % Solids: 0.0

No.	Compound Name	CAS#	Scan	Q	Est Conc

ONE FOUND

SAMPLE NUMBER: 9006652

PRIORITY POLLUTANTS	Wet DL (ppb)	Wet Conc (ppb)
DI-N-BUTYLPHTHALATE	2.00	ND
FLUORANTHENE	1.20	ND
BENZIDINE	48.00	ND
PYRENE	1.00	ND
BENZYL BUTYL PHTHALATE	1.00	ND
BENZO(A)ANTHRACENE	1.00	ND
CHRYSENE	1.00	ND
3,3'-DICHLOROBENZIDINE	2.00	ND
BIS(2-ETHYLHEXYL)PHTHALATE	1.00	ND
DI-N-OCTYL PHTHALATE	1.00	ND
BENZO(B)FLUORANTHENE	3.00	ND
BENZO(K)FLUORANTHENE	3.00	ND
BENZO(A)PYRENE	2.00	ND
INDENO(1,2,3-CD)PYRENE	2.00	ND
DIBENZO(A,H)ANTHRACENE	3.00	ND
BENZO(G,H,I)PERYLENE	2.00	ND

HAZARDOUS SUBSTANCES LIST	Wet DL (ppb)	Wet Conc (ppb)
ANILINE	4.00	ND
BENZYL ALCOHOL	2.00	ND
2-METHYLPHENOL	2.00	ND
4-METHYLPHENOL	2.00	ND
BENZOIC ACID	6.00	ND
4-CHLOROANILINE	4.00	ND
2-METHYLNAPHTHALENE	3.00	ND
2,4,5-TRICHLOROPHENOL	8.00	ND
2-NITROANILINE	6.00	ND
3-NITROANILINE	6.00	ND
DIBENZOFURAN	2.00	ND
4-NITROANILINE	6.00	ND

* - Compound detected as Diphenylamine
** - Compound detected as Azobenzene
Note - DL means Sample Detection Limits (based on 100% recovery).
NA means Not Analyzed, ND means Not Detected.

SEMIVOLATILE TENTATIVELY IDENTIFIED COMPOUNDS

File No.: 9006652 Sample: INTL ALUM (IW TTO)
Method: EPA 625 Matrix: WASTEWATER
Init. Amt.: 500.0 ML Dilution: 1.0 % Solids: 0.0

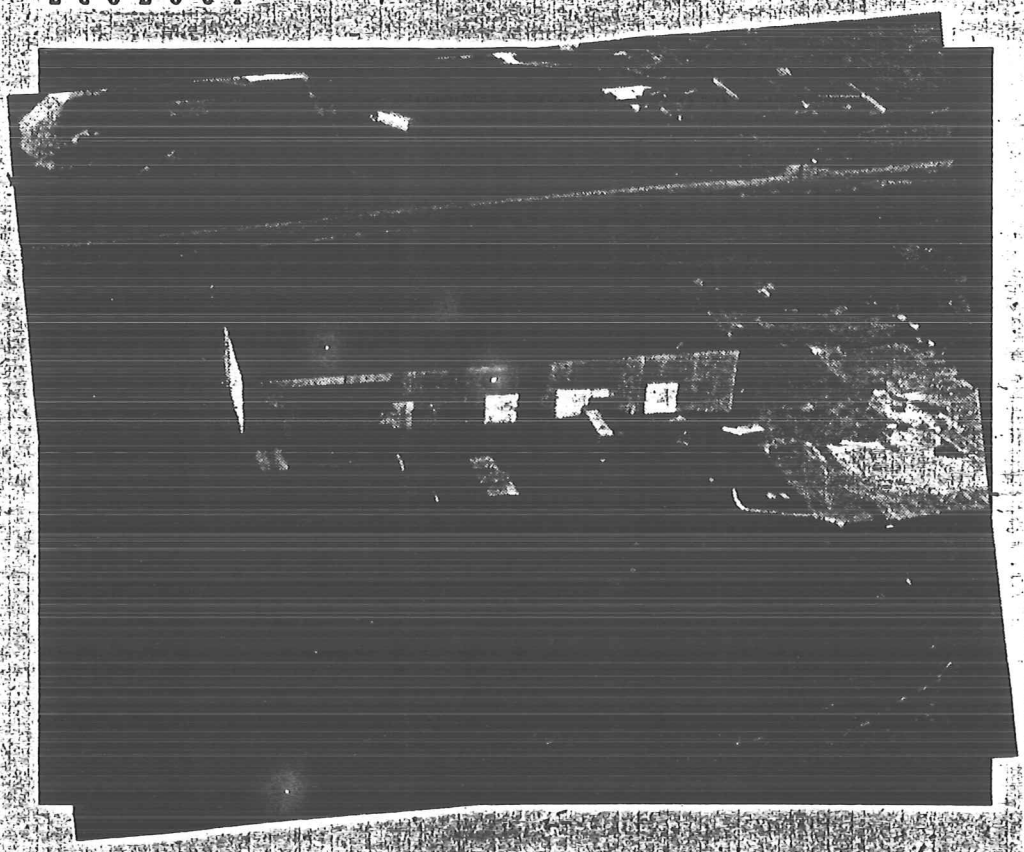
TIC No.	TIC Scan	Name	TIC Num	TIC Mass	TIC Conf	TIC Est Conc

NONE FOUND

APPENDIX B

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Maralco Aluminum



Maralco Aluminum. The Maralco Aluminum Company operated an aluminum recycling/refinery facility in Kent from 1980 through 1986. The recycling and refinery process used by Maralco involved melting and processing aluminum scrap in rotary-barrel salt-bath furnaces. This process created the hazardous wastes black dross (salt and impurities) and baghouse dusts (particulate matter). Black dross is considered dangerous waste because of salt contents of up to 50 percent. High acidity levels in baghouse dust make it extremely hazardous.

During the first year of operation, Maralco transported waste products off-site to a landfill. When the material was deemed a dangerous or hazardous waste, Maralco began storing the waste products on-site.

Maralco filed for bankruptcy in 1986, relinquishing its responsibility at the site. At that time, a lack of funds prevented Ecology from initiating cleanup. Cleanup efforts started in 1990 are a direct result of the Model Toxics Control Act which provides money to clean up sites with no potentially liable party, known as orphan sites.

In 1986, after bankruptcy was declared, Ecology spent about $65,000 to line a ditch which crosses the site, in an effort to prevent water from leaking through contaminated soil and surface water into the ground water.

It is currently anticipated that the total cost to clean up this site will be $5 million to $10 million.

1. Site Discovery

During a routine inspection to ensure that Maralco was complying with its waste water discharge permit, a Metro inspector noticed possible contamination on the site. The inspector notified Ecology of the problem, and staff from the Toxics Cleanup Program began a preliminary site assessment.

2. Hazard Assessment

Lead and chromium contamination was discovered during an Ecology-conducted site hazard assessment. In 1990, the site received a hazard ranking of 2, the second highest possible score in terms of the relative threat posed by a site to the public and the environment.

3. Remedial Investigation/Feasibility Study

During the summer of 1990, Ecology began the first phase of a remedial investigation/feasibility study of the contamination at the site. The Phase I study included a preliminary evaluation of both soil and ground water contamination, and the feasibility of alternative cleanup methods. Phase II of the study will define the types, sources, and extent of contamination on the site and evaluate alternative cleanup methods. When ready, the report on Phase I studies and the Phase II work-plan will be made available for public comment.

4. Cleanup Actions

A cleanup action plan will be drafted once the remedial investigation/feasibility studies are completed at the site. One of the most exciting cleanup proposals is an innovative process to recycle the black dross waste. The hazardous materials at the site would be converted to washed aluminum oxide using a washing process. Washed aluminum oxide may be used in the manufacture of cement. The recycling process is estimated to cost about $2 million, which is significantly cheaper than most alternatives.

Environmental Concerns: Short-term risks to human health associated with the site are low, since contamination is believed to be confined to the site. Because the site is fenced and is located in what is primarily an industrial area, it is not easily accessible to the public. Long-term health and environmental risks associated with the site, however, are not yet well defined. The City of Kent gets some of its drinking water from ground water, but the city wells are not near the site. Because contamination is believed to be localized, there is little chance that drinking water sources will be affected.

There is also concern about 10 tons of chromium-bearing dross brought on site by Maralco from the Kawecki-Berylco site in Wenatchee, and 5,000 tons of aluminum oxide (a by-product of the recycling/refinery process).

MARALCO ALUMINUM SITE

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Announcing the Start of a Phase I Remedial Investigation/Feasibility Study

The Washington State Department of Ecology (Ecology) is beginning a Phase I Remedial Investigation/Feasibility Study (RI/FS) of hazardous substance contamination at the Maralco Aluminum Site (7730 South 202nd Street, Kent, Washington 98032). Information developed by this study will be used to define a comprehensive Phase II RI/FS.

Ecology invites the public to review and comment on the public participation plan and the work-plan under which the investigation is being conducted. The box at right provides information on where to review documents and submit comments. The public comment period will extend from June 15, 1990 through July 15, 1990.

Site History

The Maralco Aluminum Site is a 13-acre industrial property located in Kent, Washington. Maralco Aluminum Company, Inc. (Maralco) operated an aluminum recycling/refinery facility at the site from 1980 to 1986. The recycling facility produced aluminum alloy ingots from aluminum cans and scrap. The facility was abandoned in November 1986.

Waste products produced from the operation included black dross (salt and impurities) and baghouse dusts (particulate matter). During the first year of operation, the waste products were transported off-site to a landfill. After 1981, the material was deemed a dangerous or hazardous waste and Maralco began storing the waste products on-site.

The recycling/refinery process used by Maralco involved melting and processing aluminum scrap in rotary barrel and reverberatory furnaces. The scrap used contained varying amounts of associated heavy metals. Black dross from the molten aluminum was stored in an outside pile. Baghouse dusts from the smelting operations were collected and discharged onto the black dross pile.

Maralco filed for bankruptcy in May of 1986, and the property is now being managed by a bankruptcy examiner. The site remediation activities are funded by the State of Washington's Model Toxics Control Account.

Environmental Concerns

Short-term risks to human health associated with the site are low, as contamination is believed to be localized on-site. Because the site is fenced and is located in what is primarily an industrial area, it is not easily accessible to the public. Long-term risks to human health and the environment associated with the site are not yet well defined.

Continued on Page 2

ECOLOGY ADDRESS

Department of Ecology
Toxics Cleanup Program
Attn: Richard Huey
4350 150th Avenue N.E.
Redmond, WA 98052
(206) 867-7256

FACT SHEET

Additional fact sheets may be obtained by writing to Richard Huey, Community Relations Specialist, at the above address.

PUBLIC COMMENT/QUESTIONS

Written comments should be directed to Richard Huey, Community Relations Specialist, at the above address. Call (206) 867-7256 if you have questions on this site.

REPOSITORIES

Documents providing additional information on this site can be found at the following locations:

Department of Ecology
4350 150th Avenue N.E.
Redmond, WA 98052

Kent Community Library
232 4th Avenue S.
Kent, WA 98032

MaralcoFS001
June 1990
Printed on Recycled Paper

MARALCO ALUMINUM SITE

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Public Comment Period Completed/ Responsiveness Summary Available

The Washington State Department of Ecology (Ecology) held a public comment period from June 15, 1990 to July 15, 1990 on the work-plan for Phase I of the Remedial Investigation/Feasibility Study (RI/FS) at the Maralco Aluminum Site, located at 7730 South 202nd Street, Kent, Washington 98032.

Ecology considered and responded to all written comments received during the public comment period. These comments are summarized in the Responsiveness Summary which is now available to the public. The box at right provides information on where to review this document.

Site History

The Maralco Aluminum Site is a 13-acre industrial property located in Kent, Washington. Maralco Aluminum Company, Inc. (Maralco) operated an aluminum recycling/refinery facility at the site from 1980 to 1986. The recycling facility produced aluminum alloy ingots from aluminum cans and scrap. The facility was abandoned in November 1986.

Waste products produced from the operation included black dross (salt and impurities) and baghouse dusts (particulate matter). During the first year of operation, the waste products were transported off-site to a landfill.

After 1981, the material was deemed a dangerous or hazardous waste and Maralco began storing the waste products on-site.

The recycling/refinery process used by Maralco involved melting and processing aluminum scrap in rotary barrel and reverberatory furnaces. The scrap used contained varying amounts of associated heavy metals. Black dross from the molten aluminum was stored in an outside pile. Baghouse dusts from the smelting operations were collected and discharged onto the black dross pile.

Maralco filed for bankruptcy in May of 1986, and the property is now being managed by a bankruptcy examiner. The site remediation activities are funded by the State of Washington's Model Toxics Control Account.

Environmental Concerns

Short-term risks to human health associated with the site are low, as contamination is believed to be localized on-site. Because the site is fenced and is located in what is primarily an industrial area, it is not easily accessible to the public. Long-term risks to human health and the environment associated with the site are not yet well defined.

Continued on Page 2

ECOLOGY ADDRESS

Department of Ecology
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FACT SHEET

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The Responsiveness Summary can be reviewed at the following locations:

Department of Ecology
4350 150th Avenue N.E.
Redmond, WA 98052

Kent Community Library
232 4th Avenue S.
Kent, WA 98032

MaralcoF9002
July 1990
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