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Harding Lawson Associates

Engineering and Environmental Services

BURIED DRUM AND ADDITIONAL FIELD INVESTIGATION, AND MONITORING PROGRAM GIBSON SITE NIAGARA FALLS, NEW YORK

HLA Job No. 17497,001.12

A Report Prepared for:

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I EXECUTIVE SUMMARY

Harding Lawson Associates (HLA) conducted a remedial investigation (Plan A) at the Gibson site in Niagara Falls, New York during the summer of 1985. The primary objective of the remedial investigation was to assess the type and degree of contamination from previous disposal at the site and, thereby, provide a data base that Olin could use for planning site remediation activities. Based on the results of the remedial investigation, the contaminants that were identified for further study included hexachlorocyclohexane (BHC) isomers, hexachlorobenzene (HCB), and mercury. The remedial investigation concluded that all deposition was on the northern portion of the site, north of the Niagara Mohawk Power Corporation right-of-way.

A feasibility study report for the northern portion of the Gibson site was completed in March 1987. The recommended alternative proposed rerouting Cayuga Creek around and away from the site, installing a fully circumscribing soil-bentonite slurry wall barrier, installing a double, flexible membrane cap with a perimeter collection drain system, and implementing an appropriate monitoring program.

The State of New York and Olin Corporation, et al., stipulated on April 13, 1987 that Olin would conduct additional investigatory activities at the site. These activities included the installation of

additional monitoring wells on- and off-site, reinstallation of a monitoring well removed during the installation of a pipeline on the site, and moni- toring the groundwater. Additionally, sampling of the buried drums at the site was to be performed to confirm that they contained hexachlorobenzene (HCB).

HLA conducted the additional field and buried-drum investigations, and subsequent quarterly groundwater monitoring at the Gibson site. The work included drilling and sampling soil borings, installing monitoring wells, and performing groundwater sampling and analyzing the samples to evaluate subsurface soil and groundwater conditions disclosed by the remedial investigation (Plan A). More specifically, the project objectives were:

- to confirm that the buried drums contain hexachlorobenzene (HCB)
- to attempt to determine the condition of the buried drums
- to install two additional monitoring wells (MW-A1 and MW-A2) upgradient from the site to determine if hexachlorocyclohexane (BHC) isomers levels previously detected in upgradient wells were due to isolated pockets of contamination, as contended by NYDEC, or the result of a background level of hexachlorocyclohexane (BHC) isomers in the area
- to install one off-site monitoring well (MW-A3) across Cayuga Creek from the site
- to replace one monitoring well (MW-1) that was removed during the installation of a pipeline in the Niagara Mohawk Power Corporation right-of-way

- to perform quarterly groundwater monitoring for one year that included collecting samples for chemical analyses for hexachlorocyclohexane (BHC) isomers, hexachlorobenzene (HCB), and mercury and obtaining groundwater and creek level data
- to analyze the additional data to determine if any remediation of the southern portion of the site would be necessary as a result of isolated pockets of hexachlorocyclohexane (BHC) isomers contributing to groundwater contamination

The chemical analyses performed on samples of the drum contents confirmed the drums contain hexachlorobenzene (HCB). The condition of the material in the drums is very dense (solidified). Metallographic and scanning electron microscopy analyses on samples of the drum metal revealed evidence of pitting corrosion on the outside surface of the drums.

Air monitoring was performed during the drilling phase of the investigation to observe exposure levels to contaminants during field operations. Results from the air monitoring indicate that employee exposure to hexachlorobenzene (HCB) and hexachlorocyclohexane (BHC) isomers was well below acceptable levels. Off-site air concentrations of hexachlorobenzene (HCB) and hexachlorocyclohexane (BHC) isomers generated during this investigation were detectable, but very low.

Quarterly groundwater monitoring was performed throughout 1988 to observe fluctuations in groundwater level and flow direction, and to collect groundwater samples for analysis of hexachlorobenzene (HCB), hexachlorocyclohexane (BHC) isomers, and mercury. The data collected indicate that the groundwater flow direction is consistently toward

the adjacent Cayuga Creek. The hydraulic gradient across the site averaged 0.026 foot/foot for 1988. Chemical analyses of the groundwater samples revealed low concentrations of the targeted contaminants hexachlorobenzene (HCB), hexachlorocyclohexane (BHC) isomers, and mercury in some of the monitoring wells.

Overall, the findings for the additional investigation reported herein are consistent with the geologic, hydrogeologic, and analytical findings from the earlier Remedial Investigation at the Gibson site. A statistical comparison of the analytical data from monitoring during 1985, 1986, and 1988 indicates that deterioration of the groundwater quality at the site has not occurred during the monitoring period. The low concentrations of hexachlorocyclohexane (BHC) isomers initially detected in monitoring wells upgradient from the site during the remedial investigation are concluded to be the result of the drilling operation, and not isolated pockets of hexachlorocyclohexane (BHC) isomers on the southern portion of the site. Remediation of the southern portion of the site is not necessary.

II INTRODUCTION

A. General

This report presents the findings of the buried-drum investigation and the subsequent groundwater monitoring program by Harding Lawson Associates (HLA) at the Gibson site performed for Olin Corporation (Olin). HLA has performed the work under Olin's Contract No. C5-NF-0000-02216, dated April 30, 1985.

A remedial investigation (Plan A) was conducted at the Gibson site during the summer of 1985. The overall objective of the remedial investigation was to assess the extent and character of previous disposal at the site and, thereby, provide a data base which Olin could use for planning site remediation activities. The results of the on-site investigation (Plan A) performed by HLA for Olin are contained in the remedial investigation report dated July 31, 1986. Based on the results of the remedial investigation, target compounds to be further investigated were hexachlorocyclohexane (benzene hexachloride or BHC) isomers, hexachlorobenzene (HCB), and mercury.

Olin has developed a feasibility study report for the northern portion of the Gibson site (March 1987). The recommended remedial alternative proposes the rerouting of Cayuga Creek around and away from the Gibson site, installing a fully circumscribing soil bentonite

slurry wall barrier, installing a double flexible membrane liner cap with a perimeter drainage collection system, and implementing an appropriate monitoring program.

B. Site Background

The Gibson site is located in a commercial/residential area of Niagara County, New York. A Vicinity Map for the site is presented on Plate 1. The site is bounded by Tuscarora Road on the west, Niagara Falls Boulevard on the south, and Cayuga Creek on the north and east. Small commercial businesses are located along Niagara Falls Boulevard, which is the more heavily traveled of the two streets. Single family residences border Tuscarora Road. The site consists of two adjacent parcels of land. An east to west, 80-foot-wide, right-of-way (ROW) owned by Niagara Mohawk Power Corporation (NMPC) divides the site approximately in half. Olin owns the land located north of the ROW. The landowners on the south side (Zito's property) operate a used car business. The study area to the north and east, across Cayuga Creek, is undeveloped.

In 1957, approximately 438 drums of HCB were buried at the Gibson site. The drums, which were not stacked, are contained within an approximate 2600-square-foot area on the north side of the NMPC ROW. Plate 2 is a Site Plan showing the location of the buried drums. The drums were covered with an estimated 1010 tons of hexachlorocyclohexane (BHC) isomers cake consisting primarily of the alpha and beta isomers. These waste materials were

subsequently covered with a soil layer. The tops of the drums were believed to be approximately three to five feet below the ground surface.

C. Project Objectives

The primary objective of the buried drum investigation was to confirm that the drums contain HCB by drilling into them and sampling their contents. A secondary goal was to attempt to evaluate the condition of the drums by analyzing any pieces of drum metal obtained through the sampling program. A third objective was to complete the installation of three additional groundwater monitoring wells and to relocate one of the earlier monitoring wells (MW-1), which had been destroyed. The guidelines by which the buried drum investigation was conducted and the guidelines by which the monitoring wells were installed are presented in the Work Plan dated March 13, 1987 (Revised July 7, 1987). A copy of the Work Plan is presented in Appendix A.

A groundwater and creek level monitoring program was implemented to further characterize and observe fluctuations in groundwater flow direction and gradients as a result of seasonal variations. In addition, quarterly groundwater sampling for chemical analysis was performed for one year to observe concentrations of the target compounds.

III FIELD ACTIVITIES

A. Buried Drum Investigation

Nine borings were drilled on October 21, 1987, within the boundaries of the drum disposal area shown on Plate 2. A Fischer M-Scope, Model TW-5, metal detector was used to reestablish the boundaries of the drum area which were previously delineated during the remedial investigation. The boring locations were selected jointly by HLA and Olin and were spaced approximately equidistant within the drum area.

An exclusion zone was established around the buried-drum area prior to drilling, as specified by the Job Safety Plan. A copy of the Job Safety Plan is included in Appendix B. Specific decontamination procedures and Health and Safety protocols were also implemented as described in the Job Safety Plan.

The borings were drilled with a truck-mounted drilling rig using an 8-inch O.D. hollow-stem auger. The borings were advanced to a depth of approximately 3 feet and then a sample was obtained using a 2-inch O.D. by 1.375-inch I.D., standard, split-spoon sampler. The split-spoon sampler was driven a maximum of 24 inches, or to refusal, to provide maximum sample recovery. The maximum boring depth sampled was 6.5 feet. The recovered samples were visually examined for the presence of the drum contents and for pieces of metal from the buried drums. Table 1 presents a summary of the drum area sampling.

Table 1

Drum Sampling Summary
Gibson Site

Boring	(1) Termination Depth (feet)	(1) Sample Interval (feet)	Description of Sample
D-1	7.0	3.0 - 5.0	HCB and Drum Metal
D-2	6.5	3.5	Drum Metal
		3.5 - 5.5	HCB
		5.5	Drum Metal
		5.5 - 6.5	Gray Clay
D-3	4.5	2.5 - 4.5	HCB
D-4	4.5	2.5 - 4.5	Fill Material
D-5	5.5	3.5 - 5.5	HCB
D-6	5.5	3.5 - 5.5	HCB
		5.5	Drum Metal
D-7	6.0	4.0 - 6.0	HCB
		6.0	Drum Metal
D-8	5.5	3.5 - 5.5	Gray Clay
D-9	5.5	3.5 - 5.5	HCB
		5.5	Drum Metal

Note: (1) Below existing grade.

Selected samples from the drum area sampling were placed in glass jars with Teflon(R)-lined lids. The sample jars were labeled with the time, date, location, boring number, and depth. The samples were stored at 4°C and shipped to the analytical laboratory in ice chests under chain-of-custody protocol. The results of the chemical analyses are discussed in Section IV-A of this report.

Upon completion of each boring in the drum area, a 1-foot-thick bentonite plug was placed at the bottom of the boreholes. Cuttings from the borings were then placed back into the borehole and sealed with a cement-bentonite grout to approximately six inches below the ground surface. The remaining six inches was backfilled with No. 3 quartzite sand.

At the completion of the buried drum investigation, and prior to leaving the site, the drill rig and tools were decontaminated by steam cleaning, following the procedures outlined in the Work Plan. Water from the decontamination process was placed in drums and stored in a secure area on site to be characterized and properly disposed of by Olin.

B. Monitoring Well Installation

Four monitoring wells (MW-1 replacement, MW-A1, MW-A2, and MW-A3) were installed on October 23, 1987, at the approximate locations shown on Plate 2. Monitoring Well MW-1 replacement was relocated about 40

feet south of MW-1, which was removed during installation of a pipeline in the Niagara Mohawk Power Corporation right-of-way. Wells MW-A1 and MW-A2 were located upgradient from the site to determine if hexachlorocyclohexane (BHC) isomers previously detected in upgradient wells was due to isolated pockets of contamination on the southern portion of the site. MW-A3 was located across Cayuga Creek from the site to serve as an off-site monitoring well.

Hollow-stem auger drilling methods were used to install the monitoring wells. The wells were installed 10 feet deep and constructed in the same manner as the other monitoring wells on-site. A 5-foot section of 2-inch diameter stainless steel well screen (0.010-inch openings) was attached to a 7-foot section of 2-inch diameter galvanized steel casing. The borehole diameter was 8 inches.

The annulus between the casing and borehole was backfilled with a filter pack of No. 3, quartz sand to an approximate depth of 2 feet above the screened interval. A 1.5-foot-thick bentonite seal was placed above the sand pack and cement-bentonite grout was placed above the seal to the ground surface. A 4-inch-diameter protective steel casing with a locking cap was grouted in place over the riser pipe. Details of each monitoring well are shown in Appendix C adjacent to each well log. Table 2 presents a completion summary for the monitoring wells.

Table 2

Monitoring Well Completion Summary
Gibson Site

Monitoring Well	(1) Borehole Depth (feet)	(2) TOC Elevation (feet)	(3) Formation Material Screened
MW-1 replacement	10.0	576.4	Brown Lean Clay (CL)
MW-A1	10.0	576.4	Brown Lean Clay (CL)
MW-A2	10.0	576.1	Brown Lean Clay (CL)
MW-A3	10.0	574.7	Brown Lean Clay (CL)

Notes: (1) Below existing grade.
(2) TOC = Top of Casing. Elevation referenced to MSL.
(3) Unified Soil Classification and Symbol.

The monitoring wells were developed in accordance with the work plan using compressed air the day after they were installed. MW-1 replacement and MW-A1 produced a minimal amount of groundwater, and MW-A2 and MW-A3 were dry. Groundwater elevations and sampling results are presented and discussed later in this section and the subsequent sections of this report.

After each well installation, augers and sampling tools were decontaminated by steam cleaning. At the completion of monitoring well installation, and prior to leaving the site, the drilling rig and tools were decontaminated by steam cleaning, following the procedures outlined in the work plan. Water from the decontamination process was placed in drums and stored in a secure area on site for later disposal by Olin.

C. Air Monitoring

Air monitoring was conducted by two methods during the buried drum investigation, in accordance with the Job Safety Plan. The first method consisted of collecting ambient air samples for analysis of airborne hexachlorocyclohexane (BHC) isomers and hexachlorobenzene (HCB) particulates. The second method consisted of using an HNu^{R} photoionization detector to measure the organic vapor level as an indicator of potential airborne contamination in the vicinity of the drilling operations.

Method 1 - Air samples were collected by drawing a measured volume of air through midget impingers (two in series) filled with isooctane media, using battery operated personal air sampling pumps. Personal and area samples were collected. For the personal samples, the pumps were attached to the workers' belts with the impingers attached to the outside of the workers' protective suits and the inlet base positioned in their breathing zone (directly below the chin). For the area samples, the pumps were placed at a fixed location approximately 200 feet upwind and approximately 50 to 100 feet downwind of the buried drum site. The sampling methodology was in accordance with NIOSH Method 5502. Analytical results from the air samples are presented in Section IV of this report.

Method 2 - An HNu^{R} photoionization detector with a 10.2 electron volt probe was used to screen boreholes, samples, and worker breathing zones during the drilling operations. The HNu^{R} was calibrated to 16

milligrams per cubic meter (mg/m^3) [5 parts per million (ppm)] benzene.

D. Groundwater Monitoring

1. Water Levels

The groundwater elevations at the monitoring wells and the water level at the two nearest upstream and downstream bridge crossings along Cayuga Creek were measured monthly during 1988. O'Brien & Gere Engineers, Inc. (OB&G) of Syracuse, New York, performed the field work. Water level measurements were taken using an electronic, battery operated, water level probe. The probe was rinsed between well measurements with distilled water followed by a methyl alcohol rinse to avoid possible cross contamination. The groundwater and creek elevation data for the monitoring program are presented in Table 3.

2. Groundwater Sampling

Groundwater samples from each monitoring well were collected quarterly during 1988 and submitted for chemical analysis. The sampling was performed by OB&G. Before sample collection, each monitoring well was pumped dry, or until three well volumes of water were removed, using a pump attached to a dedicated 1/4-inch stainless steel intake line in each monitoring well. The pump was rinsed between

Table 3

Monthly Groundwater and Cayuga Creek Water Level Elevations(1)
Gibson Site

Measurement Location	Date of Measurement											
	1-28-88	2-25-88	3-25-88	4-21-88	5-20-88	6-24-88	7-29-88	8-25-88	9-29-88	10-27-88	11-23-88	12-29-88
MW-1 replacement	571.77	572.51	572.41	571.91	572.34	570.48	571.25	569.18	569.19	572.51	572.69	572.79
MW-2	561.47	572.60	573.50	572.15	572.11	570.32	570.36	567.98	568.25	572.15	572.22	572.43
MW-3	568.34	569.28	568.63	568.67	568.63	568.08	568.17	567.53	567.50	568.87	569.13	568.80
MW-4	568.42	569.62	569.33	569.24	569.23	568.39	568.34	567.36	566.93	569.37	569.71	569.57
MW-5	567.19	568.08	568.46	569.48	569.29	568.49	567.92	567.09	565.48	567.28	568.53	567.95
MW-6	565.49	566.22	565.40	565.49	565.35	565.25	565.39	565.21	565.16	565.64	565.55	565.46
MW-7	564.42	569.23	568.33	568.33	567.76	567.10	566.03	——	——	——	——	——
MW-A1	569.66	570.76	570.85	569.95	570.80	569.27	569.55	568.31	568.54	570.76	570.88	571.54
MW-A2	569.17	570.75	570.72	569.20	570.42	569.12	569.65	568.56	568.89	571.27	571.04	571.35
MW-A3	566.38	569.44	569.41	569.27	569.13	566.26	564.56	563.39	——	——	——	——
NIAGARA FALLS BLVD.	563.39	563.68	563.05	564.20	563.75	563.50	563.48	563.72	563.31	563.35	562.85	563.15
PORTER RD.	- -	- -	- -	- -	567.67	567.35	567.41	567.34	567.29	567.55	567.55	567.86

Notes: (1) Elevation referenced to feet above MSL.

—— Indicates dry well.

- - Indicates no reading obtained.

wells with a soapy-water solution, followed by a methyl alcohol and distilled water rinse. The groundwater sample was collected using a Teflon bailer, which was rinsed between sampling with a soapy-water solution followed by a methyl alcohol and distilled-water rinse.

The groundwater sample from each well was collected and poured into volatile organic carbon vials with Teflon-lined lids until full for the hexachlorocyclohexane (BHC) isomers and hexachlorobenzene (HCB) analysis. For the mercury analysis the sample was poured into a plastic container that had been acidified with nitric acid to preserve the sample. The results of the chemical analyses performed on the water samples are discussed in Section IV.

IV ANALYSES AND DISCUSSION

A. Drum Area

Based on the observations made during drilling and sampling in the buried drum area, the drums appear to be intact and the contents are very dense (solidified). The samples were light in color (dirty white to beige) with amber streaking. The material was thinly layered and often had a slight crystalline structure.

Six samples of the drum contents were analyzed for HCB using EPA Method 612, which is the same methodology used for the remedial investigation. The results of the chemical analysis confirm the drums contain HCB. One sample was split and analyzed by Olin's laboratory. Based on historical reports of the drum contents and the analytical results (see June 7, 1988 Olin memo, Appendix D), it is believed that the higher reported concentration of 91.78 percent hexachlorobenzene (HCB) is more representative. The 3.9 to 5.3 percent reported by OB&G's laboratory are about 20-fold less than the expected hexachlorobenzene (HCB) concentrations and this is directly attributable to dilution error on the part of the laboratory.

Table 4 presents a summary of the analytical results, and the laboratory reports are included in Appendix D.

Table 4

Analytical Test Results
Drum Content Samples
Gibson Site

Boring	Sample Depth (feet)	HCB Concentration, Percent (1)	
		OB&G Lab	Olin Lab
D-1	3.0 - 5.0	4.80	91.78
D-3	2.5 - 4.5	5.30	N.A.
D-5	3.5 - 5.5	4.70	N.A.
D-6	3.3 - 5.5	4.80	N.A.
D-7	4.0 - 6.0	3.90	N.A.
D-9	3.5 - 4.5	4.50	N.A.

Notes: (1) Concentrations reported on percent wet weight basis.
N.A. Sample not analyzed.

The analysis of the drum metal interior and exterior revealed evidence of extensive localized corrosion on the surface of the drums, due to exterior pitting. Three samples of drum metal recovered during drilling were analyzed by Professional Services Industries, Inc. Pittsburgh Testing Laboratory Division by visual examination, cross-section microscopy, thickness measurements, scanning electron microscopy (SEM), and energy dispersive X-ray spectroscopy (EDS). A copy of the Professional Services Industries report is included in Appendix E.

B. Air Sampling

The personal and area air samples that were collected during the intrusive work in the buried drum area were analyzed for hexachlorobenzene (HCB) and hexachlorcyclohexane (BHC) isomers following NIOSH Method 5502 for organochlorine pesticides. The method of air sample collection is discussed in Section III-D - Air Monitoring.

There are no OSHA permissible exposure limits (PELs) for hexachlorobenzene (HCB) or hexachlorocyclohexane (BHC) isomers, except the gamma isomer (Lindane). Lindane is expected to be the most hazardous of the hexuchlorocyclohexance (BHC) isomers. The PEL for Lindane is specified in 29 CFR 1910 as 500 ug/m^3 of air. This level is based on an 8-hour time weighted average (8-hour TWA) representing a typical work shift. It is believed that at these working conditions and these concentration levels nearly all employees can be exposed daily, throughout their working lives, without adverse effects.

Results from the air monitoring are presented in Table 5 and indicate that employee exposure to hexachlorobenzene (HCB) and hexachlorocyclohexane (BHC) isomers was well below acceptable levels. Because all exposed employees wore Level C* protection and were closely monitored by the Site Safety Officer, actual exposures

* Level C personal protective equipment included: hooded, polyethylene, Tyvek suits, neoprene gloves over latex gloves, steel toed, neoprene boots, full face respirators with combined pesticide cartridges and high efficiency particulate air (HEPA) filters, hard hats and ear protection. All seams of the clothing material and parts of the suit that made contact with gloves and boots were sealed with duct tape.

Table 5

Analytical Test Results
Air Monitoring Program (1)
Gibson Site

Employee/Job Description, or Location	Principal Station of Work on Site	(2) Contaminant	Air Volume (Liters)	Total Contaminant (ug)	Total Time Exposure (Minutes)	8-Hour (3) TWA Conc. (ug/m^3)
Driller	Drill rig. Drilled 8 boreholes up to 10' deep. Direct contact with contaminant.	HCB	605.4	8.54	476	14.0
		Alpha BHC	605.4	1.60	476	2.62
		Beta BHC	605.4	0.60	476	0.98
		Gamma BHC	605.4	1.01	476	1.65
Driller's Helper	Drill rig. Greatest hands on usage of split-spoon samplers. Direct contact with contaminants. Equipment decontamination.	HCB	187.5	7.16	465	37.0
		Alpha BHC	187.5	1.70	465	8.78
		Beta BHC	187.5	0.40	465	2.07
		Gamma BHC	187.5	0.01	465	0.05
Engineer	Principally observed drum penetration investigation. Slight contact with sampling equipment.	HCB	214.0	1.56	428	6.50
		Alpha BHC	214.0	0.30	428	1.25
		Beta BHC	214.0	0.11	428	0.46
		Gamma BHC	214.0	0.10	428	0.42
Upwind sample NW corner of house. Approximately 200 to 300 feet from drum area.	Wind direction blowing NW to SE constant through day. Minimal wind velocity.	HCB	193.2	0.07	422	0.32
		Alpha BHC	193.2	0.01	422	0.05
		Beta BHC	193.2	0.01	422	0.05
		Gamma BHC	193.2	0.01	422	0.05
Downwind sample SE corner of property. Approximately 50 to 100 feet from drum area.	Wind direction blowing NW to SE constant through day. Minimal wind velocity.	HCB	240.0	2.80	480	11.7
		Alpha BHC	240.0	0.44	480	1.83
		Beta BHC	240.0	0.11	480	0.46
		Gamma BHC	240.0	0.10	480	0.42

Note: (1) Personal and Area Air Monitoring with SKC Air Sampling Pumps with Isooctane Liquid Impingers.
(2) The gamma BHC isomer is commercially called Lindane.
(3) The OSHA 8-hour TWA permissible exposure level for gamma BHC is 500 ug/m^3.

may be assumed to be much less than the measured airborne concentrations. Even without protective equipment, adverse health effects would not be expected, based on the measured exposure levels.

The downwind air sample which was 50 to 100 feet from the buried drum area did show very low, but detectable levels of target compounds. It is believed that these levels resulted from the generation of dust during the drum penetration/sampling activities and also from the decontamination of the equipment. The downwind concentration of gamma BHC was 1,190 times lower than the OSHA PEL.

C. Groundwater Monitoring

1. Water Levels

Groundwater elevations, recorded monthly during 1988, at the 10 monitoring wells indicated slightly higher water elevations during the fall and winter than in the spring and summer seasons. Maximum fluctuations in water levels were within 4.0 feet. Table 5, in Section III, presents the groundwater elevations for the monitoring program. Plots of groundwater elevation versus monitoring date for June and December 1988 are presented on Plates 4 and 5. Observed groundwater fluctuations throughout the monitoring period were similar for all of the wells, and the groundwater level remained above the surface water level in Cayuga Creek. These data indicate a consistent groundwater flow direction toward Cayuga Creek. Potentiometric contour maps developed from the June and December 1988 monitoring data

are presented on Plates 6 and 7, respectively. These dates were chosen as representing typical groundwater level conditions and appear to confirm the groundwater flow directions for seasonal extremes. Hydraulic gradients of 0.022 and 0.032 foot/foot in the area of MW-2 to MW-6 were calculated for June and December 1988, respectively. The hydrogeological findings of this investigation are similar to, and consistent with, the findings of the earlier Remedial Investigation.

2. Analytical Results

Quarterly, groundwater samples from the monitoring wells were analyzed for hexachlorobenzene (HCB), hexachlorocyclohexane (BHC) isomers, and mercury. At the direction of Olin, the groundwater samples from MW-1 replacement, MW-A1, MW-A2, and MW-A3 for the second quarter sampling (April 1988) were split in the field for independent analyses by OB&G's laboratory and Weston's Lionville laboratory. Weston's Lionville laboratory was selected by Olin to perform the remaining analysis (i.e., the third and fourth quarter sampling). The chemical analyses were performed in accordance with 787 CLP protocols for organochlorine pesticides for hexachlorobenzene (HCB) and hexachlorocyclohexane (BHC) isomers, and EPA Method 245.1 for mercury.

Table 6 presents the results of the quarterly groundwater sampling program at the site for 1988. The individual laboratory reports are presented in Appendix F. Concentrations of hexachlorobenzene (HCB) observed in the groundwater ranged from

Table 6

Analytical Test Results
1988 Groundwater Samples
Gibson Site

Monitoring Well	Sampling Date	Mercury (ug/l)	Alpha BHC (ug/l)	Beta BHC (ug/l)	Delta BHC (ug/l)	Gamma BHC (ug/l)	HCB (ug/l)
MW-1	1-28-88	1.70	69.	14.	5.0	5.0	13.
replacement	4-22-88	<0.50	12.	<5.0	5.0	5.0	18.
	4-22-88*	<.10	<.05	<.05	<.05	<.05	<.05
	7-29-88	<.20	<.05	<.05	<.05	<.05	<.05
	10-28-88	<.20	<.05	<.05	<.05	<.05	<.50
MW-2	1-28-88	<0.50	0.20	0.21	<.05	<.05	<.05
	4-22-88	0.60	<.05	<.05	<.05	<.05	<.05
	7-29-88	<.20	<.05	<.05	<.05	<.05	<.05
	10-28-88	<.20	<.05	<.05	<.05	<.05	<.05
MW-3	1-28-88	<0.50	0.62	0.34	<.05	<.05	<.05
	4-22-88	<0.50	0.23	0.17	<.05	<.05	<.05
	7-29-88	<.20	0.15	0.21	<.05	<.05	<.05
	10-28-88	<.20	N.A.	N.A.	N.A.	N.A.	N.A.
	11-23-88*	--	0.39	0.35	<.25	<.25	<.25
MW-4	1-28-88	<.50	0.14	<.05	<.05	<.05	<.05
	4-22-88	<.50	0.11	<.05	<.05	<.05	<.05
	7-29-88	<.20	0.10	<.05	<.10	<.10	<.10
	10-28-88	<.20	0.12	<.05	<.05	<.05	<.05
MW-5	1-28-88	<.50	0.07	<.05	<.05	<.05	<.05
	4-22-88	<.50	0.97	0.14	<.05	<.05	0.10
	7-29-88	<.20	<.05	<.05	<.05	<.05	<.05
	10-28-88	<.20	<.05	<.05	<.05	<.05	<.05
MW-6	1-28-88	<.50	<.50	3.6	<.50	<.50	1.2
	4-22-88	<.50	<.50	3.7	<.50	<.50	<.50
	7-29-88	<.20	0.10	1.2	<.10	<.10	<.10
	10-28-88	<.20	<.05	5.5	<.05	<.05	<.05
MW-7	1-28-88	<.50	0.5	0.87	0.2	<.05	<.05
	4-22-88	<.50	0.25	0.68	<.05	<.05	<.05
	7-29-88	<.20	0.32	0.50	<.062	<.062	<.06
	10-28-88	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Continued on next page.

Table 6
(continued)

Monitoring Well	Sampling Date	Mercury (ug/l)	Alpha BHC (ug/l)	Beta BHC (ug/l)	Delta BHC (ug/l)	Gamma BHC (ug/l)	HCB (ug/l)
MW-A1	1-28-88	<.50	0.70	<.50	<.50	<.50	2.1
	4-22-88	<.50	0.27	0.07	<.05	<.05	0.46
	4-22-88*	<.10	0.21	<.05	<.05	<.05	0.20
	7-29-88	<.20	0.07	<.05	<.05	<.05	<.05
	10-28-88	<.20	N.A.	N.A.	N.A.	N.A.	N.A.
	11-23-88**	--	<.25	<.25	<.25	<.25	0.31
MW-A2	1-28-88	<.50	2.9	1.3	<.50	<.50	8.3
	4-22-88	<.50	<.05	<.05	<.05	<.05	<.05
	4-22-88*	<.10	0.33	<.05	<.05	<.05	0.05
	7-29-88	<.20	<.05	<.05	<.05	<.05	0.05
	10-28-88	<.20	0.49	<.05	<.05	<.05	<.05
MW-A3	1-28-88	<.50	5.2	0.60	<.50	<.50	<.50
	4-22-88	<.15	0.82	<.10	<.05	<.05	0.20
	4-22-88*	<.10	0.33	<.05	<.05	<.05	0.05
	7-29-88	<.20	<.07	<.07	<.07	<.07	<.07
	10-28-88	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Notes: < Indicates compound not detected at indicated detection limit.
* Denotes analytical results for split sample by second laboratory (Weston Lionville Analytical Laboratory).
** Denotes repeat sampling after initial sample vials were received broken.
N.A. Indicates sample not analyzed; broken vial in ice chest.
N.S. Indicates no sample collected; dry well.

nondetectable to 18.0 ug/l, with the higher concentrations at Monitoring Well MW-1 replacement. The highest concentration of hexachlorobenzene (HCB) observed from the last quarterly sampling was 0.31 ug/l at Monitoring Well MW-A1. The concentration of hexachlorobenzene (HCB) observed at Monitoring Well MW-A3, which is located off-site across Cayuga Creek, ranged from nondetectable to

0.20 ug/l. The concentration of hexachlorobenzene (HCB) last observed at MW-A3 (July 29, 1988) was nondetectable; Monitoring Well MW-A3 was dry for the October 1988 sampling.

Monitoring Wells MW-Al and MW-A2 were installed in the southern portion of the site to investigate for possible pockets of hexachlorocyclohexane (BHC) isomers and hexachlorobenzene (HCB). The last quarterly sampling (11-23-88) indicated concentrations of the target compounds below detectable limits with the exception of 0.31 ug/l of hexachlorobenzene (HCB) at MW-Al and 0.49 ug/l of Alpha BHC isomer at MW-A2.

The concentrations of the four hexachlorocyclohexane (BHC) isomers detected in the groundwater ranged from nondetectable to 69 ug/l at Monitoring Well MW-1 replacement. The highest hexachlorocyclohexane (BHC) isomer concentration observed from the last quarterly sampling was 5.5 ug/l of Beta BHC at Monitoring Well MW-6. The concentration of hexachlorocyclohexane (BHC) isomers observed at Monitoring Well MW-A3 located off-site across Cayuga Creek ranged from nondetectable to 5.2 ug/l. No detectable concentrations of hexachlorocyclohexane (BHC) isomers were observed from the last sampling (July 29, 1988) of Monitoring well MW-A3; the monitoring well was dry for the October 1988 sampling.

Mercury was only detected at Monitoring Wells MW-1 and MW-2 during the 1988 monitoring. The concentrations of mercury detected in the groundwater ranged between nondetectable and 1.7 ug/l. Mercury

concentrations in the groundwater samples collected during the last quarterly sampling in October 1988 were all nondetectable.

Statistical analyses were performed on the analytical results of the quarterly groundwater sampling program at Monitoring Wells MW-3 through MW-7. The analyses involved a comparison for significant change for hexachlorocyclohexane (BHC) isomers, hexachlorobenzene (HCB), and mercury using Cochran's Approximation to the Behrens-Fisher Student's T-Test, as presented in Appendix IV of 40 CFR Part 264.

The well data subjected to the statistical analyses were chosen based on their downgradient location and because they were among the original monitoring wells installed in 1985 for the remedial investigation of the Gibson site. The statistical analyses involved a comparison of groundwater chemical data obtained during 1985 and 1986 to those obtained from the quarterly monitoring in 1988. Appendix G presents the results of the chemical analysis for the 1985 and 1986 monitoring. For a given compound, all the data was grouped from the monitoring wells (MW-3 through MW-7) and the mean and standard deviation was obtained for each compound respectively. Subsequently, t statistic (t*) and t critical (tc) values were calculated. Table 7 presents the results of the statistical analyses.

For all six compounds analyzed, no statistically significant concentration increases were indicated. The analyses indicated

Table 7

Statistical Results
Groundwater Chemical Analysis
Downgradient Wells (MW-3 Through MW-7)
Gibson Site

Compound	Sampling Period (year)	Number of Samples	Mean (ug/l)	Standard Deviation (ug/l)	t*	tc	Comments
HCB	85-86	30	0.214	0.305	-0.409	2.08	No Change
	88	19	0.177	0.286			
Alpha BHC	85-86	30	2.14	2.96	-3.43	2.05	Decrease
	88	19	0.272	0.251			
Beta BHC	85-86	30	2.91	4.29	-2.31	2.06	Decrease
	88	19	0.927	1.56			
Delta BHC	85-86	30	0.056	0.106	0.888	2.06	No Change
	88	19	0.122	0.144			
Gamma BHC	85-86	30	0.092	0.060	0.592	2.28	No Change
	88	19	0.113	0.145			
Mercury	85-86	31	1.12	1.41	-2.98	2.04	Decrease
	88	19	0.358	0.154			

If: $t^* > tc$ Indicates significant change has occurred. A positive t^* indicates an increase, while a negative t^* a decrease.

If: $t^* < tc$ Indicates that a significant change has not likely occurred.

Cochran's Approximation to the Behrens-Fisher Student's T - Test. Appendix IV, 40 CFR, part 264. Two - tail test at 0.05 level of significance.

statistically significant decreases for the alpha BHC, beta BHC, and mercury constituents at the 0.05 level of significance. The trend of decreasing concentrations indicates a possible well clean-up with time, thus, the later analytical results may be more representative of actual concentrations in the groundwater.

V CONCLUSIONS

- Overall, the geologic, hydrogeologic, and analytical findings from this phase of investigation (1987-1988) are similar and consistent with, the findings from the earlier Remedial Investigation (1985-1986).

- The buried drums are intact and their contents are very dense (solidified).

- The chemical analyses performed on samples of the drum contents confirmed the drums contain hexachlorobenzene (HCB).

- Based on the results of the air monitoring, worker exposure to hexachlorocyclohexane (BHC) isomers and hexachlorobenzene (HCB) was well below acceptable levels. Off-site air concentrations generated during this investigation were negligible.

- The quarterly groundwater monitoring indicates the groundwater flow direction to be toward the adjacent Cayuga Creek. The hydraulic gradient across the site averaged 0.026 foot/foot for 1988.

- The chemical analyses of the groundwater samples revealed low concentrations of the targeted compound, hexachlorobenzene (HCB), hexachlorocyclohexane (BHC) isomers, and mercury, in some of the monitoring wells. The last quarterly, groundwater sampling (October 1988) indicated concentrations ranging from nondetectable to 0.49 ug/l of alpha hexachlorocyclohexane (BHC).

- The low concentrations of hexachlorocyclohexane (BHC) isomers initially detected during the remedial investigation in monitoring wells upgradient from the site appear to be the result of the drilling operation. There are no isolated pockets of hexachlorocyclohexane (BHC) isomers on the southern portion of the site.

- An increase in groundwater contamination at the site has thus far not been observed to date.

- Remediation of the southern portion of the site (Zito's property) is not necessary.

DISTRIBUTION

15 copies to: Olin Corporation
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Charleston, Tennessee 37310

Attention Mr. Blaine Butaud

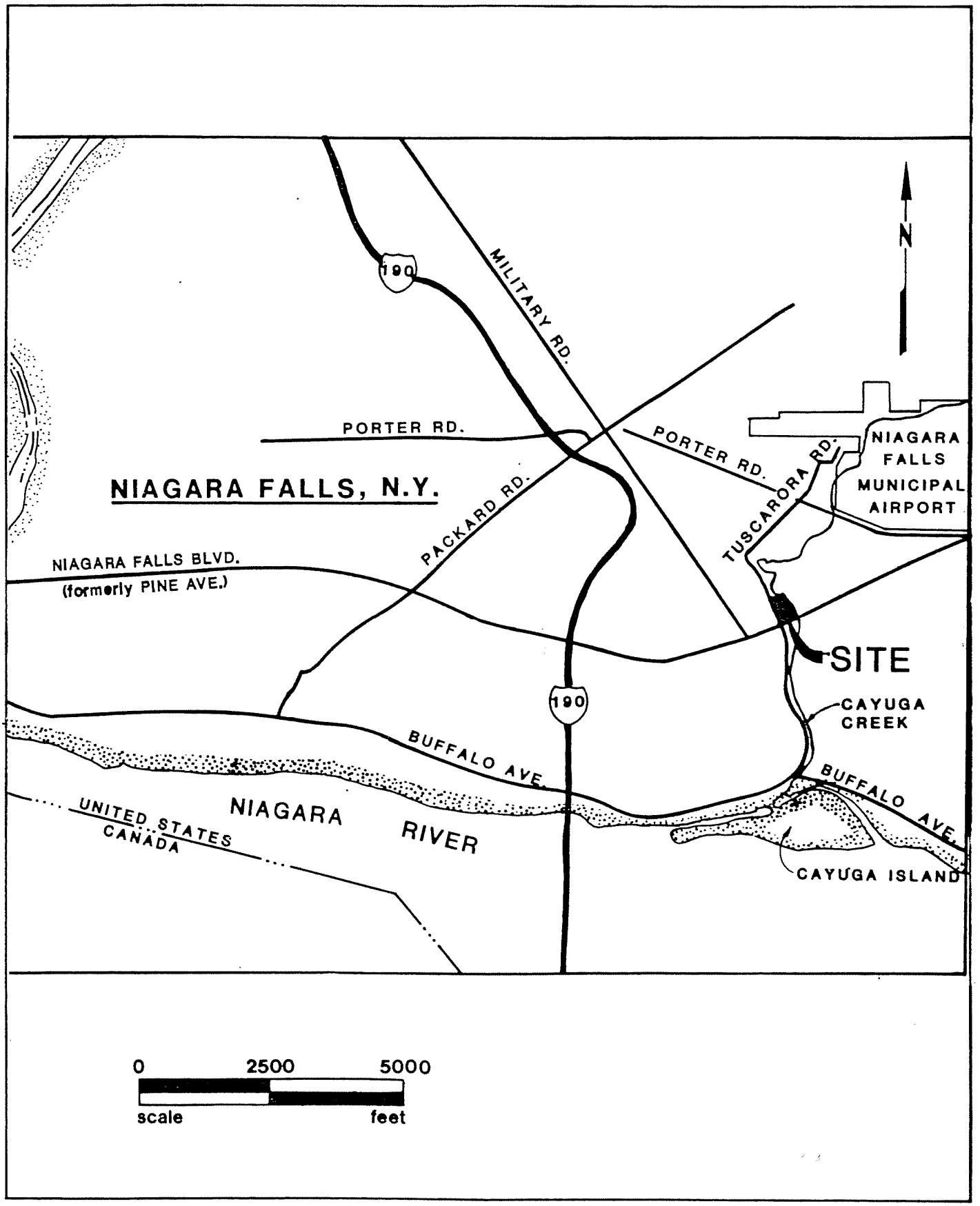
SRN/JWT:mlf
22580

QUALITY CONTROL REVIEWER:

Charles R. Glore, C.E.G.
Principal Hydrogeologist

ILLUSTRATIONS

ILLUSTRATIONS



Harding Lawson Associates
Engineers, Geologists & Geophysicists

VICINITY MAP

Gibson Site
Niagara Falls, New York

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES.	17497,001.12	RC	3/2/86	BH	7/31/86

LEGEND

- Creek Sediment Sample
- Creek Bank Soil Sample
- Water Sample
- Creek Bottom Probe
- Soil Boring/Monitoring Well (June/July, 1985)
- Soil Boring/Monitoring Well (Oct., 1987)
- Surface Debris
- Buried Metal (Drum Disposal Area)
- Flow Direction

NOTE: All locations are approximate.

N

B-1
B-2
PROPOSED CREEK REROUTING
B-3 (MW-A3)
City of Niagara Falls
Town of Niagara
NIAGARA MOHAWK POWER CORP. EASEMENT
BRINE PIPELINE EASEMENT
Pool
NIAGARA FALLS BLVD. (Formerly Pine Ave.)
C-6
W-3
S3
C-5
CAYUGA CREEK
C-4
S-2
P-4
C-3
WCC-3
B5
MW6
Y1
D5
Y2
W-2
A4
B4
C4
D4
Y3
P-3
APPROX. EDGE OF CREEK
B3
C3
D3
Y4
C-1
W-1
P-2
WCC-2
WCC-4
C2
D2
Y5
X2
X3
Y6
MW7
C1
D1
WCC-1
P-1
X1
C-2
S-1
Residence
TUSCARORA RD.
E6
MW5
F7
MW4
H7
MW3
F6
G6
E5
F5
G5
Garage
H5
MW-A2
E4
F4
G4
H4
F3
MW2
G3
H3
E2
F2
G2
MW-A1
MW1 (Destroyed)
E1
MW-1 (Replacement)
Motel
Abandoned

0 80 160
scale feet

REFERENCE: Topographic Map, McIntosh & McIntosh, P.C., June, 1987.

Harding Lawson Associates
Engineers, Geologists & Geophysicists

SITE PLAN

Gibson Site
Niagara Falls, New York

PLATE 2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
DJG	17497,001.12				

T.H. B-1 571.9

T.H. B-2 573.5

CONTROL POINT #2 (SET WOOD STAKE)

WCC3 571.9

0 5' 20' 30' 50' 75'

T.H. B-5 572.5

MW #1 572.3 GND 575.72 TOP

CAYUGA CREEK

559.6 559.8 560.6 560.9 561.1

SHRUBS & TREES

BOT. OF BANK

TOP OF BANK

T.H. A-4 570.0

T.H. B-4 570.9

T.H. B-5 570.7

MW #6 575.43 TOP 572.2 GND.

T.H. D-5 572.2

T.H. Y-1 572.0

T.H. Y-2 572.0

T.H. C-4 571.3

T.H. B-3 570.8

T.H. D-4 572.5

ELEC. TOWER

T.H. C-3 571.9

T.H. Y-3 572.08

T.H. D-3 572.5

T.H. B-2 571.0

T.H. C-2 572.2

T.H. D-2 572.1

T.H. Y-4 572.23

WCC4 572.4

T.H. C-1 571.8

T.H. X-2 572.44

T.H. X-1 572.78

T.H. Y-5A 573.0

T.H. D-1 573.5

WCC2 564.9

WCC5 571.9

MW #7 576.04 TOP 573.2 GND.

5" TREE

10" TREE

12" TREE

POST

10" SPRUCE

4" MAPLE

MARKER POST

BRK. FIREPLACE

BRK. GAR.

1 STY. BRK. HO. # 1505

BIT.

P

POR.

PLANTER

FLAGSTONE WALK

SVC. CRAIN

CONC. DR.

ROW OF SPRUCE 8' (AVG.)

ROW OF SPRUCE SEEDLINGS

SET I.P.

MSB

BIT. APRON

P.P. N.Y.T. 4

P.P. N.Y.T. 3

P.P. W/ TRANS. N.Y.T. 2

P.P. N.M. 2 N.Y.T. 11/2

130.0' D = 123.10' MS

111.82' MS

34.0' MS

58°-19' MS

617.1' D = 608.69' MS

392.88' D = 391.29' MS

10" D.C.P.

BATROUNY L-1583 P-950

HOA OF PINE SEEDLINGS

361.19' MS

S 38°-30'-0" E 369.0' MS

S 37°-30'-0" E 369.0' MS

10" ø BRINE LINE

MOHAWK POWER CORP.

NIAGARA FALLS BOULEVARD (REPUTED OWNER)

80.0'

25'-W

15.0'

10" ø NIAGARA FALLS WATER BOARD

CITY OF NIAGARA FALLS

J. ZITO L-1383 P-431

T.H. E-6 572.0

MW #5 575.14 TOP 572.1 GND.

MW #4 575.29 TOP 572.3 GND.

T.H. F-7 572.2

T.H. F-6 572.4

T.H. E-5 572.19

T.H. E-3 572.9

T.H. F-5 572.7

T.H. G-EA 573.2

T.H. G-5 573.2

T.H. F-4 573.2

T.H. E-2 574.1

T.H. F-3 573.6

T.H. G-4 573.5

T.H. H-5 573.5

T.H. H-4 574.0

T.H. E-2 577.1

MW #2 571.5 TOP 574.0 GND

T.H. G-3 573.9

T.H. F-2 574.2

T.H. E-1 574.0

T.H. H-3 574.0

T.H. G-2 574.2

MW #1 574.69 RIM 574.0 GND. (REMOVED)

MW #1 574.4 GND 576.40 TOP (REPLACEMENT)

VENT

SEPTIC TANK COVER

CONC. CURB

STONE & BROKEN-UP BIT. PARKING AREA

2 NO. STY. BALCONY

2 STY. CONC. BLOCK BLDG.

1 STY. CONC. BLOCK BLDG.

CONC. WALK

1 STY. CONC. BLOCK BLDG.

BIT.

CONC. WALK

LIGHT BRUSH & TALL GRASS

STONE PARKING

STONE & BROKEN UP BIT.

MW #3 573.58 TOP 573.2 GND.

MWA-2 573.7 GND 576.10 TOP

MWA-1 574.4 GND 576.42 TOP

GAS METER

GRASS

SIGN

T.S.C.B.

T.S.P.

M.H. COVERED

SIGN L.S.

BENCHMARK

P.P. N.M. 8762-2

P.P. N.M. 8762-1

P.P. N.Y.T. 8730

T.L.P.

SET I.P.

2.8.0 MP ± 4.60 MS

± 25.0 MP

± 24.64 MS

EX. STONE MON. O/S N.

EX. CONC. MON.

M.H. RIM 575.34

M.H. RIM 574.75

C.B. RIM 574.42 INV 569.87

C.B. RIM 573.40 INV. 570.59

M.H. RIM 573.76 E. INV. 563.66 W. INV. 561.51 S.E. INV. 561.53 N. INV. 562.56

M.H. RIM 573.59 INV. 561.4

M.H. RIM 573.59

M.H. RIM 573.40 N. INV. 568.30 S. INV. 568.15 E. INV. 568.15 W. INV. 568.20

C.B. RIM 573.30 INV. 569.69

PARCEL No. II PINE AVE. ARTERIAL ACQUIRED BY THE STATE OF NEW YORK

NIAGARA FALLS BLVD. (100')

12" ST.

18" ST.

UPFA

BIT. APRON

CONC. CURBING

GRANITE

260.25' MS

S 272.0 D

S 38°-34'-20" E 272.0 MS

S 38°-34'-20" E 272.0 MS

8" SAN

15" SAN

30" SAN

M.H. RIM 574.97 INV. 563.76

M.H. RIM 573.87 INV. 563.13

M.H. RIM 574.73 N.E. INV. 563.96 W. INV. 563.39 S. INV. 564.14

M.H. RIM 574.43 INV. 564.91

G.V.

HWY. BNDRY.

TUSCARORA ROAD (49.5')

HOMESTEAD AVE. (50')

LEGEND

T.H.	TEST HOLE
M.W.	MONITORING WELL
M.H.	MANHOLE
C.B.	CATCH BASIN
T.S.C.B.	TRAFFIC SIGNAL CONTROL BOX
T.S.P.	TRAFFIC SIGNAL POLE
P.P.	POWER POLE
G.V.	GAS VALVE
W.V.	WATER VALVE
—OE—	OVERHEAD ELECTRIC
—SAN—	SANITARY SEWER
—ST—	STORM SEWER
—UPFA—	UNDERGROUND POLICE & FIRE ALARM
—W—	WATER LINE
WWC	TEST HOLE

NOTE: ELEVATIONS GIVEN AT MONITORING WELLS ARE TOP OF 2" ø PVC PIPE AND NOT 4" ø METAL PROTECTION PIPE.

B.M. - NORTHWEST FLANGE BOLT OF HYDRANT AT NORTHEST CORNER OF TUSCARORA ROAD & NIAGARA FALLS BLVD. ELEV. 576.69

DWG NO.	REFERENCE DWG.	DWG NO.	REFERENCE DWG.

REV.	DESCRIPTION	DRAWN	DATE	CHKD.	APPR.
1	GENERAL UPDATE & ADDITIONAL LOCATION OF TEST HOLES & MONITORING WELL	M.J.B.	3-2-88		

DRAWN P. MAIORANA 11/4/85
DATE
CHECKED L. ENNESSER 11/4/85
DATE
APPROVED

PROJECT No. 2287 - 43

WENDEL ENGINEERS P.C.
consulting engineers/planners/surveyors
LOCKPORT N.Y. - BUFFALO N.Y.

STATE OF NEW YORK Peter J. White 16 No. 049418 LICENSED LAND SURVEYOR

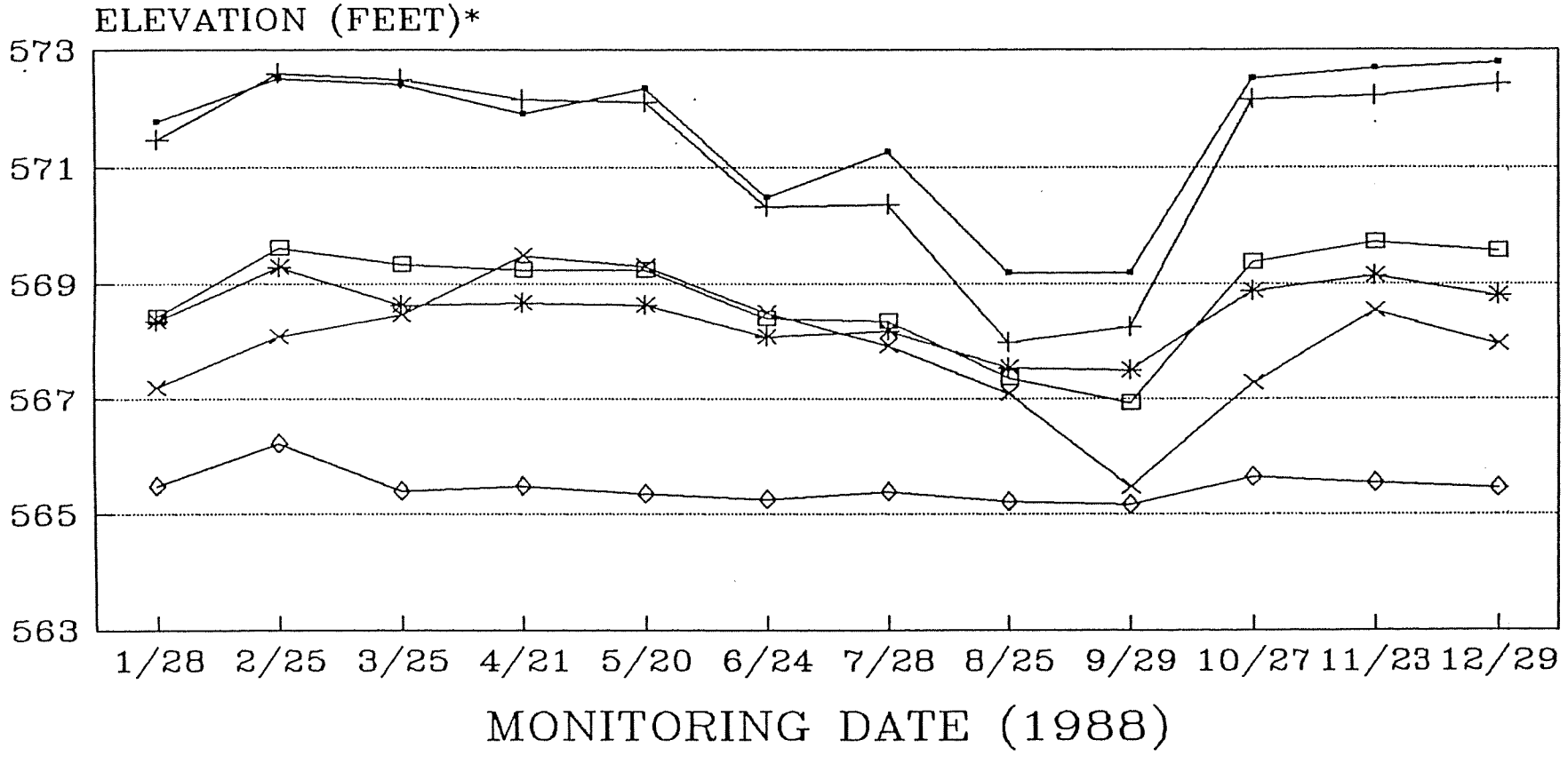
Olin

GIBSON SITE SURVEY
NIAGARA FALLS, NEW YORK

PROJECT NO.	C.A.R. NO.	SCALE	DRAWING NUMBER	PLATE	REV.
		1" = 20'		3	

GIBSON SITE, NIAGARA FALLS, N. Y.

GROUNDWATER ELEVATIONS



HARDING LAWSON ASSOCIATES

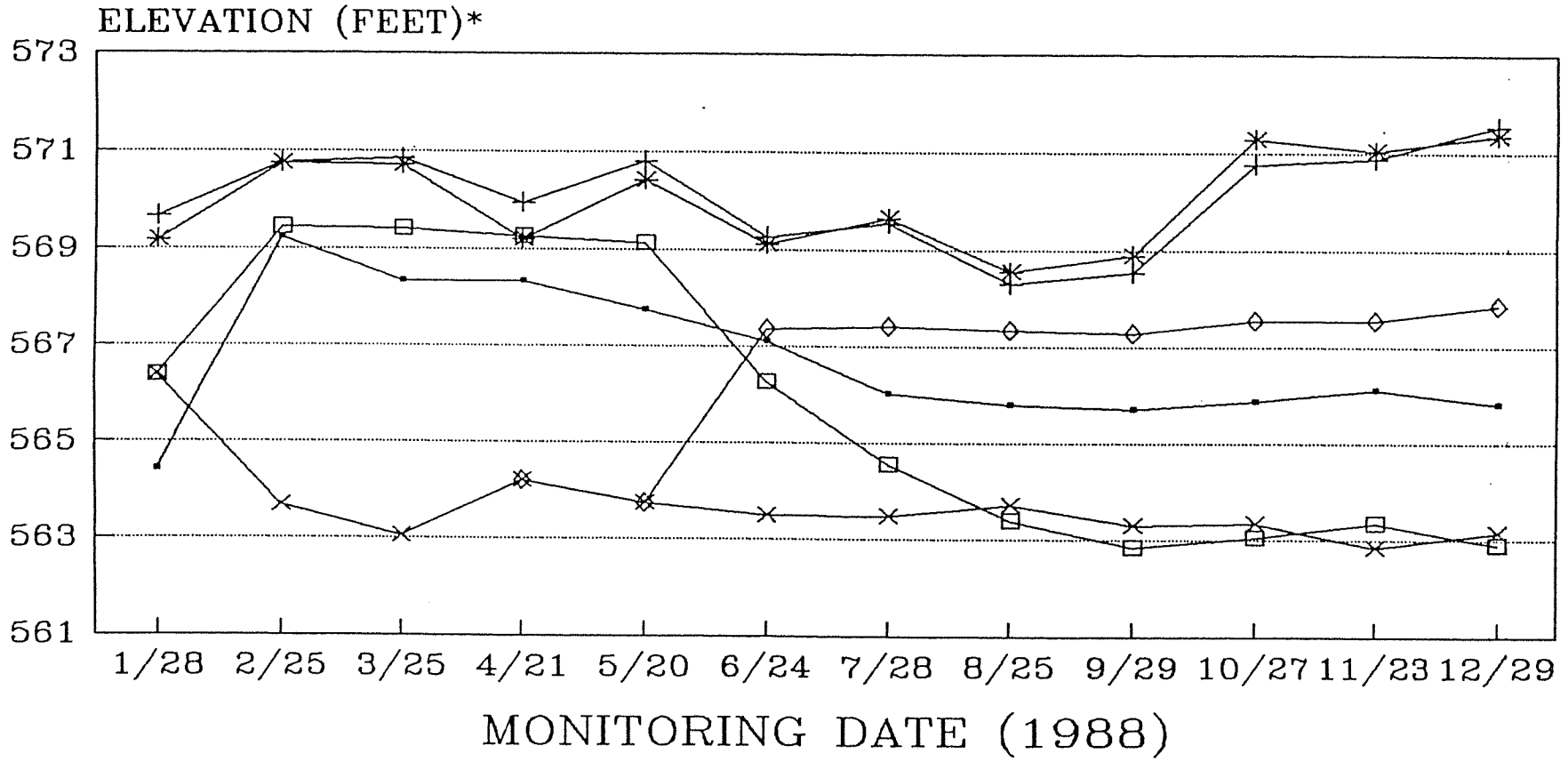
PLATE

4

*REFERENCED TO MEAN SEA LEVEL

GIBSON SITE, NIAGARA FALLS, N. Y.

GROUNDWATER ELEVATIONS



HARDING LAWSON ASSOCIATES

PLATE

5

*REFERENCED TO MEAN SEA LEVEL

LEGEND

- Creek Sediment Sample
- Creek Bank Soil Sample
- Water Sample
- Creek Bottom Probe
- Soil Boring/Monitoring Well (June/July, 1985)
- Soil Boring/Monitoring Well (Oct., 1987)
- Surface Debris
- Buried Metal (Drum Disposal Area)
- Flow Direction
- 566 Potentiometric Elevation Contour, Feet
- 567.1 Potentiometric Elevation, Feet

NOTE: All locations are approximate.

N

PROPOSED CREEK REROUTING

APPROX. EDGE OF CREEK

CAYUGA CREEK

City of Niagara Falls
Town of Niagara

NIAGARA MOHAWK POWER CORP. EASEMENT

BRINE PIPELINE EASEMENT

NIAGARA FALLS BLVD. (Formerly Pine Ave.)

TUSCARORA RD.

Pool

Garage

Residence

Motel

Abandoned

B-1, B-2, B-3 (MW-A3) 566.5, C-1, C-2, C-3, C-4, C-5, C-6 563.5, C1, C2, C3, D1, D2, D3, D4, D5, E2, E4, E5, E6, E7, F2, F3, F4, F5, F6, F7, G2, G3, G4, G5, G6, H3, H4, H5, H7, MW1 (Destroyed), MW-1 (Replacement) 570.5, MW2, MW4 568.4, MW5 568.5, MW6 565.3, MW7 567.1, MW-A1 569.3, MW-A2 569.1, S-1, S-2, S3, W-1, W-2, W-3, WCC-1, WCC-2, WCC-3, WCC-4, X1, X2, X3, Y1, Y2, Y3, Y4, Y5, A4, B3, B4, B5, P-1, P-2, P-3, P-4, 564, 566, 568, 570

0 80 160
scale feet

REFERENCE: Topographic Map, McIntosh & McIntosh, P.C., June, 1987.

Harding Lawson Associates
Engineers, Geologists & Geophysicists

POTENTIOMETRIC CONTOUR MAP JUNE 1988

Gibson Site
Niagara Falls, New York

PLATE 6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
DSG	17497,001.12				

LEGEND

- Creek Sediment Sample
- Creek Bank Soil Sample
- Water Sample
- Creek Bottom Probe
- Soil Boring/Monitoring Well (June/July, 1985)
- Soil Boring/Monitoring Well (Oct., 1987)
- Surface Debris
- Buried Metal (Drum Disposal Area)
- Flow Direction
- 566 Potentiometric Elevation Contour, Feet
- 567.1 Potentiometric Elevation, Feet

NOTE: All locations are approximate.

N

City of Niagara Falls
Town of Niagara

NIAGARA MOHAWK POWER CORP. EASEMENT

BRINE PIPELINE EASEMENT

Pool

PROPOSED CREEK REROUTING

B-1 B-2 B-3 (MW-A3) 562.90

S3 C-4 C-5 C-6 563.15 W-3

CAYUGA CREEK

S-2 P-4 C-3 WCC-3 W-2 P-3 A4 B5 B4 C4 MW6 Y1 D5 Y2 D4 Y3 C3 D3 Y4 Y5 Y6

APPROX. EDGE OF CREEK

B3 C-1 W-1 P-2 WCC-2 C2 WCC-4 D2 C1 X2 X3 D1 MW7 565.82 P-1 WCC-1 X1

E5 567.95 MW5 F7 MW4 569.57 H7 568.80 MW3 F6 G6 E5 F5 G5 Garage H5 571.35 MW-A2 E4 F4 G4 H4 F3 572.43 MW2 G3 H3 E2 F2 G2 MW1 (Destroyed) MW-A1 571.54 E1 MW-1 572.79 (Replacement)

564 566 568 570 572

HIAGARA FALLS BLVD. (Formerly Pine Ave.)

Motel

Abandoned

Residence

C-2 S-1

TUSCARORA RD.

REFERENCE: Topographic Map, McIntosh & McIntosh, P.C., June, 1987.

0 80 160
scale feet

Harding Lawson Associates
Engineers, Geologists & Geophysicists

POTENTIOMETRIC CONTOUR MAP DECEMBER 1988

Gibson Site
Niagara Falls, New York

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
DJG	17497,001.12				

APPENDIX A

APPENDIX A

Work Plan
Additional Field Exploration, Buried Drum Investigation

A Work Plan Prepared for:

Olin Corporation
Lower River Road
Charleston, Tennessee 37310

ADDITIONAL FIELD EXPLORATION
BURIED DRUM INVESTIGATION
GIBSON SITE
NIAGARA FALLS, NEW YORK

HLA Job No. 17497,001.12

by

Steven R. Neely, P.E.
Associate Engineer

James W. Tremblay, P.E.
Principal Engineer

Harding Lawson Associates
6220 Westpark Drive, Suite 100
Houston, Texas 77057
Telephone: (713) 789-8050

March 13, 1987

Revised July 7, 1987

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I INTRODUCTION

Olin Corporation has engaged Harding Lawson Associates (HLA) to perform a subsurface investigation in the drum disposal area at the Gibson Site in Niagara Falls, New York. A vicinity map for the site is presented on Plate 1. The investigation is intended to verify that the drums contain solidified hexachlorobenzene (HCB), and to attempt to determine the condition of the drums. The area where the drums are buried was determined at the time of the remedial investigation using geophysical techniques. The method used to locate the drums, along with the findings, are presented in the remedial investigation report dated July 31, 1986. This work plan provides the guideline by which the drum investigation will be conducted. The plan has been revised based on discussions with the New York Department of Law and the New York Department of Environmental Conservation at a meeting in New York City on July 6, 1987.

A. Project Description

In 1957, approximately 403 drums of hexachlorobenzene (HCB) were buried in the drum disposal area at the Gibson Site. The drums, which were not stacked, are contained within an approximate 2600-square-foot area on the north side of the Gibson Site. Plate 2 presents a Site Plan showing the location of the buried drums. A generalized subsurface profile for the drum disposal area is depicted on Plate 3.

The tops of the drums are believed to be approximately three to five feet below the ground surface. The drums were covered with an estimated 100 tons of hexachlorcyclohexane (benzenehexachloride - BHC) cake consisting primarily of the alpha and beta isomers. These waste materials were subsequently covered with a thin soil layer. The HCB in the drums is expected to be in a consolidated state, having a consistency similar to paraffin.

The Gibson Site is located in a commercial/residential area of Niagara County (see Plate 1). The site is bounded by Tuscarora Road on the west, Niagara Falls Boulevard on the south, and Cayuga Creek on the north and east. Small commercial businesses are located along Niagara Falls Boulevard, which is the more heavily traveled of the two streets. Single family residences border Tuscarora Road. The site itself consists of two adjacent parcels of land. An east to west 80-foot-wide right-of-way (ROW) owned by Niagara Mohawk Power Corporation divides the site roughly in half. A private home on approximately one acre of land is located north of the ROW. The landowners on the south side operate a used car business.

B. Project Objectives

The primary objective of the subsurface investigation in the drum disposal area is to confirm that the buried drums contain HCB. To

accomplish this objective, borings will be drilled to the top of the drums and the contents of the drums will be sampled and analyzed for the presence of HCB.

A secondary goal of the exploration program will be to attempt to determine the condition of the drums. Sampling may bring pieces of the punctured drums to the surface for visual inspection and laboratory analysis for the degree of corrosion.

A third objective of this plan is to complete the installation of three additional groundwater monitoring wells and to relocate one earlier monitoring well. The installation of these four monitoring wells will be accomplished in accordance with the draft stipulation transmitted on April 6, 1987 by the State of New York Attorney General's office to the presiding United States District Court (Appendix A). The techniques and procedures for installation and sampling of the four wells will be the same as outlined in Plan A of Consent Judgement and used during previous field efforts in 1985/1986. Monitoring wells will be installed prior to initiating intrusive work in the drum disposal area.

C. Project Safety

The drum investigation and any other associated field work at the site will be performed in accordance with the site-specific Job Safety

Plan presented in Appendix B. All field investigation personnel have received safety training and medical examinations in accordance with the requirements of 29 CFR 1910.120. Training also includes safety procedures appropriate to this investigation and also the proper use of personal protective equipment, and health hazards associated with this proposed study.

The primary Site Safety Officer (SSO) will be a Certified Industrial Hygienist (CIH). Prior to the first penetrative work in the drum disposal area, the CIH will hold a safety meeting with Olin representatives, HLA personnel, contract personnel, and site observers to explain safety procedures.

After the initial safety meeting, any new visitors to the site will be briefed by the CIH or his designated SSO on site safety procedures.

II. MONITORING WELL INSTALLATION

A. Drilling and Sampling Techniques (Monitoring Wells)

The installation and sampling/analyses of the four groundwater monitoring wells will be accomplished in the same manner as provided in the Consent Judgement and Plan A during the 1985/1986 field investigations. The wells will be located at the approximate locations as shown on Exhibit A to the previously referenced stipulation dated April 6, 1987 (Appendix A).

III DRUM INVESTIGATION

A. Drilling and Sampling Techniques (Drum Disposal Area)

Six soil borings will be drilled in the drum disposal area. The boundary of the drum disposal area will be marked on the ground based on the findings from the metal detection survey performed in March 1986 (see Plate 2). The precise boring locations will be determined in the field by Olin and HLA personnel and approved by on-site state representatives, if present.

The borings will be advanced using a hollow-stem auger to just above the expected top of the drums. A split-spoon sampler, 2-inch O.D. by 1.375-inch I.D., will then be driven 18 inches. The sampler will be retrieved and the recovered sample will be visually examined. It is expected that the sampler will pierce, or puncture, the top of the drum within the first sampling interval; however, if this is not the case, the borehole will be advanced and the sampler driven another 18 inches until recovering an adequate sample of the drum contents. Samples will be transferred to glass jars having teflon-lined lids. The sample jars will be sealed with evidence tape and labeled with the time, date, location, boring number, depth, and sample description. Samples will be stored at 4°C and will be shipped to the laboratory in ice chests with ice packs. Chain-of-custody procedures will be followed with all samples. Cuttings from the boreholes will be

drummed and stored in a secured area on-site for disposal within 90 days by Olin Corporation.

If the HCB in the buried drums is softer or more liquid than the paraffin consistency expected, the split-spoon sampler can be modified with a spring catcher or a Lad-type spring catcher to enhance sample recovery. If the HCB is harder than can be sampled by split-spoon, a core barrel may be substituted and used inside the hollow stem to collect samples.

Drum metal samples should be recovered from the drilling and/or sampling process. Representative metal samples that are recovered will be placed in glass jars with teflon-lined lids and labeled with the time, date, location and boring number. Metal samples will be subjected to laboratory analyses to assess the physical condition of the buried drums.

B. Grouting Boreholes

Since the sampling effort will be conducted in a drum disposal area, the boreholes and pierced drums will be sealed with a bentonite-cement grout from the bottom to approximately six inches below the ground surface. The remaining portion of the borehole will be filled with clean compacted soil after the grout hardens. Each boring location will be marked with a temporary stake and its location

surveyed with respect to an on-site landmark so it can be relocated in the future, if necessary.

C. Decontamination Procedures

The sampling equipment will be washed between samples to avoid cross-contamination of samples in the borings. Finally, the rig and tools will be steam cleaned prior to leaving the site at the end of the investigation. Wastewater from the equipment decontamination will be collected and stored in drums for disposal by Olin.

An exclusion zone will be established around the buried drum area to aid in controlling access, egress, decontamination procedures, etc. The designated exclusion zone and specific decontamination procedures are fully described in the appended Job Safety Plan.

D. Management of Auger Cuttings

Precautions will be employed to manage the auger cuttings from each borehole. Prior to drilling, heavy gauge plastic sheeting (approximately 6' x 10' in size) will be spread over the borehole location on top of which will be placed a 4' x 8' sheet of 3/4" plywood. The plywood will then be covered with another sheet of heavy gauge plastic. An auger access hole through the plywood and plastic will be provided. Cuttings from the borehole will be collected from the plywood sheet using a shovel, and placed in a sealable 55-gallon

drum along with the plastic sheeting, after completion of borehole installation and sampling. To further aid in the control of tracking contaminants, site personnel will decontaminate footwear at the perimeter of the buried drum area (zone 1) before moving from the buried drum area to the contamination reduction corridor. Washwater from footwear decontamination will be collected and stored in a sealable 55-gallon drum for disposal by Olin. Auger cuttings from the six borings are expected to amount to approximately fifteen to twenty-five cubic feet that should be contained in three to four 55-gallon drums. Other contaminated materials (plastic sheeting, washwater, disposable coveralls, gloves, etc.) should be containerized in five to six other 55-gallon drums.

All intrusive work should be completed within two to three days. The sealed drums will then be removed from the site and transported under manifests to a USEPA or State Approved Source for off-site disposal.

E. Field Supervision

The drum investigation will be performed under the supervision of HLA's field engineer, who will log the boreholes and collect samples. Olin and HLA personnel on site will determine the locations of the borings and advise the HLA field engineer during drilling and sampling. The CIH or his designated SSO will observe all work done at

the site, direct decontamination procedures, and advise the Olin representatives and the HLA field engineer.

F. Air Sampling

Ambient air samples will be collected for analysis of airborne BHC and HCB particulates during the boring program in accordance with the Job Safety Plan presented in Appendix A. One sample set (one upwind and one downwind sample) will be collected once during drilling and sampling operations. Additionally, personnel air samples will be collected in the breathing zone of the drillers and field engineer once during the drilling and sampling operations.

SKC aircheck (or similar) samplers attached to 0.45 micron glass fiber filters followed by a bubbler containing isooctane as a collection medium will be used to collect the samples. Ambient air will be drawn through the filter and bubbler at a rate of two to four liters/ minute. At the completion of each sampling, the glass fiber filter will be removed from the sampler, immediately capped, and labeled to include sample designation, location (upwind/downwind of personnel), time of sampling, and date. Chain-of-custody procedures will be followed for all samples. The bubbler collection medium will be handled in the same manner.

The glass fiber filters (air particulates samples) and isooctane collection medium from the air sampling program will be analyzed for BHC and HCB by gas chromatography with electron capture using NIOSH Method 5502. See Appendix C for details of this method.

An HNU photoionization detector will be used to measure organic vapor levels as an indicator of potential airborne contamination in the vicinity of the drilling operations. Specific procedures and action limits are described in Appendix B.

IV ANALYTICAL TESTING (DRUM DISPOSAL AREA)

A. Parameters

Samples obtained from the drums will be composited for each borehole and analyzed for the presence of HCB. If the sample is predominantly HCB, no further analysis will be performed. Concurrently with the initial confirmation analysis, a sufficient amount of the sample will be extracted for semi-volatile analysis. If the initial sample is not HCB, the sample extract will be subjected to semi-volatile analysis.

B. Procedures

The analytical procedures specified under USEPA-CLP manual (Modified Method 625) will be employed for analysis of all samples collected from the drums. Samples will be delivered to the analytical laboratory under chain-of-custody procedures. Results will be expected within approximately two weeks. Extracts will be held for the method limit of forty days.

C. Drum Metal Analyses

Samples of metal from the buried drums will be subjected to analyses to assess the condition of the drum containers. The composition of the interior and exterior sides of the drum samples will be investigated using scanning electron microscopy to estimate the extent and depth of corrosion. The thickness of the metal samples

will be established and compared to original drum thicknesses for similar drums.

V CHARACTERIZATION REPORT

The results of the drum investigation, including physical and chemical analyses and a description of field and laboratory procedures, will be presented in a report to Olin Corporation. The report will include a detailed description of the subsurface conditions encountered in the drum disposal area, and an assessment of the material contained inside the drums. The report will also present recommendations for further actions, should the findings so warrant. A preliminary draft report will be issued to Olin Corporation for review and comment prior to issuing the final report.

VI SCHEDULE

It is anticipated that the field work will begin in early summer to avoid complications in field procedures caused by snow and cold weather conditions. HLA can mobilize to the field within one week of receiving authorization to proceed. Preliminary site work to mark the boundary of the drum disposal area on the ground and to set-up decontamination facilities is expected to require one to two days. Installation of the four groundwater monitoring wells is expected to take four days. The drilling, sampling, and grouting of boreholes in the drum disposal area should be completed in two to three field days. A final report should be completed within thirteen weeks of notice to proceed. Plate 4 presents a bar chart showing the anticipated schedule from start to finish for the field investigation, including analytical testing and report preparation.

DISTRIBUTION

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Olin Corporation
P.O. Box 248
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Attention: Mr. J. B. Butaud

1 Copy To:
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P.O. Box 1355
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Stamford, CT 06904-1355
Attention: Mr. R. B. Hodgson

3 Copies To:
New York State Department of Law
The Capitol Building
Albany, NY 12224
Attention: Mr. Albert Bronson

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New York State Department of Environmental Conservation
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Albany, NY 12233
Attention: Mr. John Willson

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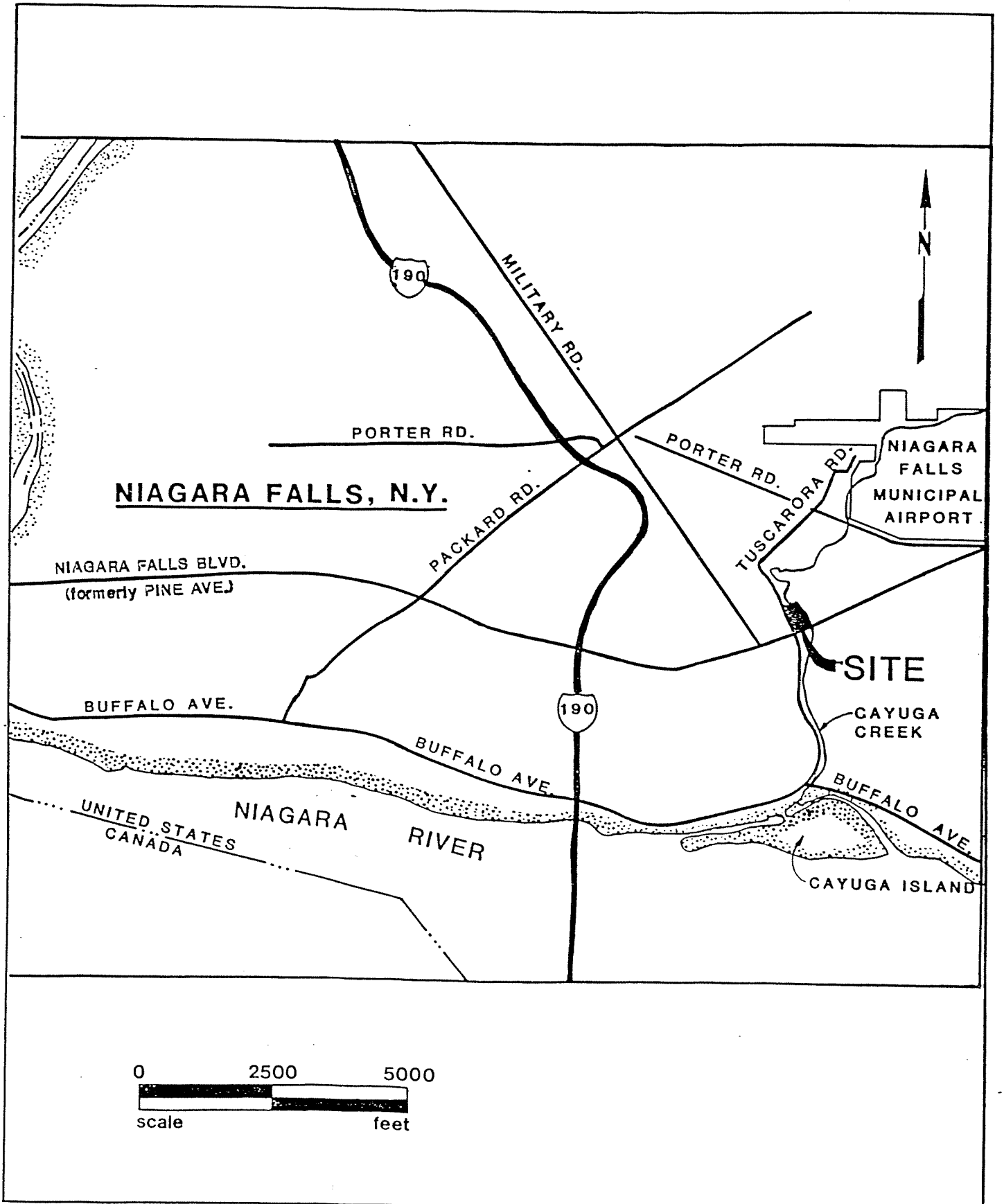
Buffalo, NY 14202
Attention: Mr. John Tygert

1 Copy To:
Mr. Stanley Grossman
331 Buffalo Avenue
Niagara Falls, NY 14303

Revised 9-18-87

ILLUSTRATIONS



Harding Lawson Associates
Engineers, Geologists
& Geophysicists

VICINITY MAP

Pine and Tuscarora Site
Niagara Falls, New York

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES.	17497,001.12	DRC	3/2/86	SH	7/22/86

LEGEND:

- Y5 — BORING
- MW4 — MONITORING WELL
- EXISTING STRUCTURE
- BURIED METAL
- NONMETALLIC DEBRIS
- SUBSURFACE PROFILE

CAYUGA CREEK

TOP OF BANK

BOTTOM OF BANK

RUBBLE AND DEBRIS

TIRES AND WOOD

CREEK

DRUM DISPOSAL AREA

ELEC. TOWER

NIAGARA MOHAWK POWER CORP. EASEMENT

EASEMENT ACQUIRED BY U.S.A.

10" BRINE LINE

UNDERGROUND PIPE AND CABLE AREA

UNDERGROUND TANK

UNDERGROUND PIPELINE

UNDERGROUND PIPELINE

UNDERGROUND PIPELINE

PINE AVE.

TUSCARORA ROAD

HOMESTEAD AVE.

0 50 100

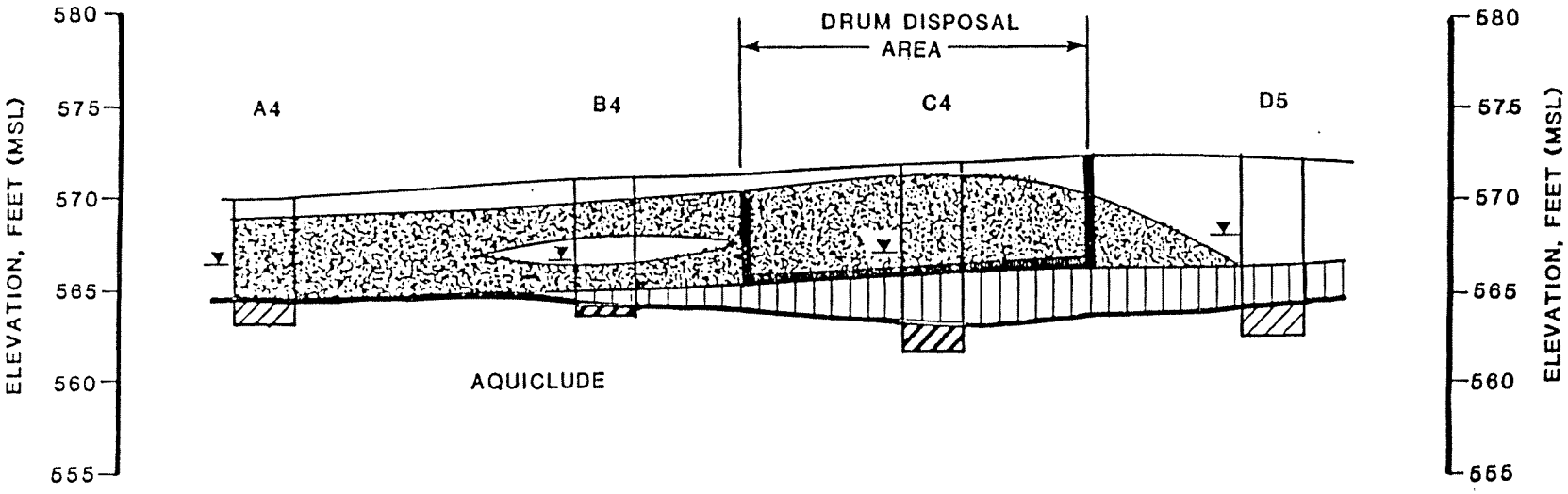
scale feet

Harding Lawson Associates
Engineers, Geologists & Geophysicists

SITE PLAN
Gibson Site
Niagara Falls, New York

PLATE 2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
C.E.	17497,001.12	RC	3/2/87	SRW	2/10/87



LEGEND:

- CAKE (suspected BHC-HCB)
- SILT (ML)
- CLAY (CL)
- CLAY (CH)
- NON-CAKE FILL MATERIAL (soil, const. debris)
- WATER LEVEL IN BORINGS

0 25 50
Horiz. Scale Feet

NOTE:

Refer to Plate 2 for Profile Location

SUBSURFACE PROFILE A - A'

Gibson Site
Niagara Falls, New York

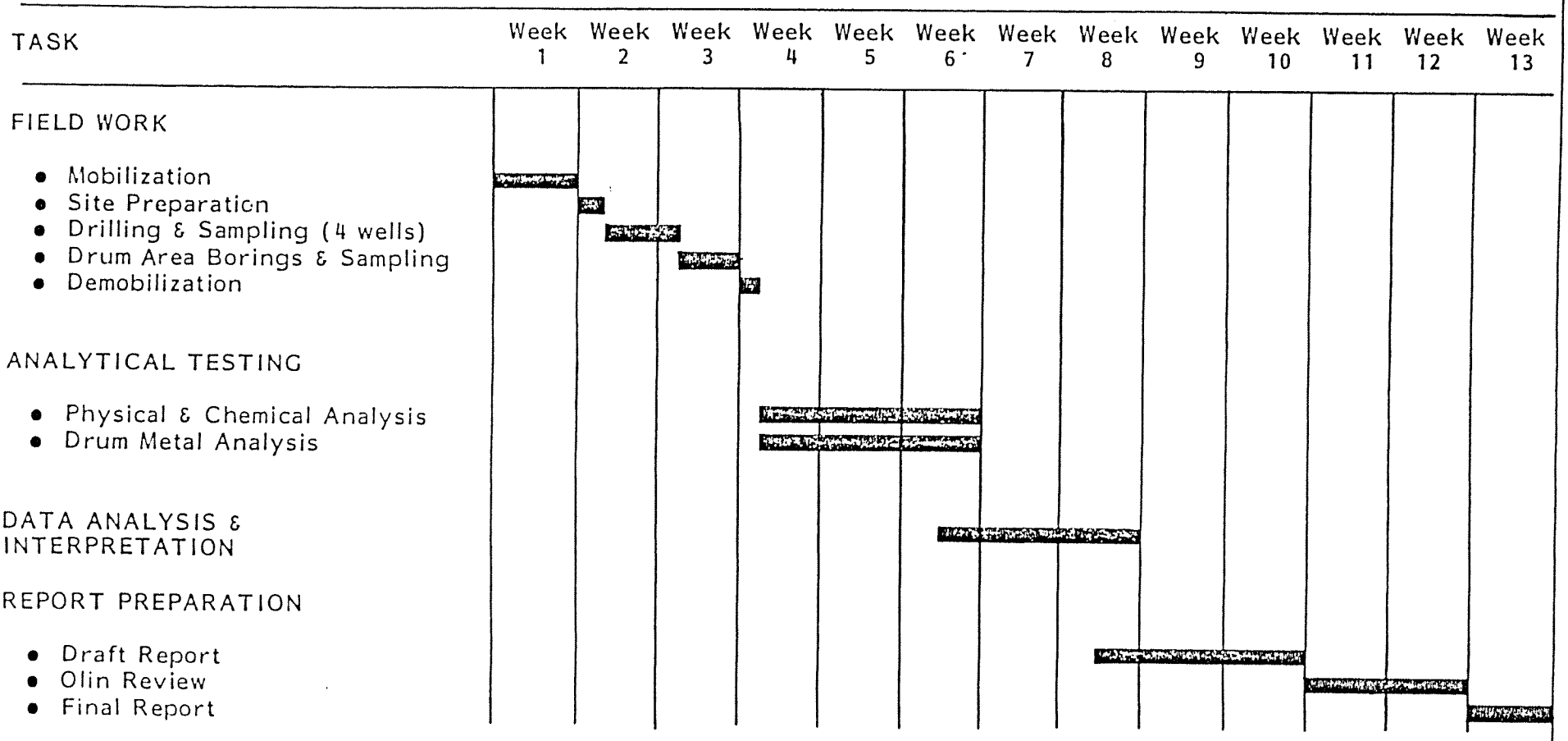
PLATE 3

Harding Lawson Associates
Engineers, Geologists & Geophysicists

17497,001.12

2/10/87

PROJECT SCHEDULE
Buried Drum Investigation
Gibson Site
Niagara Falls, New York



Harding Lawson Associates
Engineers Geologists
& Geophysicists

PROJECT SCHEDULE
Buried Drum Investigation
Gibson Site
Niagara Falls, New York

PLATE
4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	17497,001.12				

APPENDIX A

Stipulation

STATE OF NEW YORK
DEPARTMENT OF LAW
ALBANY, NY 12224

ROBERT ABRAMS
Attorney General

JAMES A. SEVINSKY
Assistant Attorney General in Charge
Environmental Protection Bureau

VAL E. WASHINGTON
Deputy Bureau Chief
Environmental Protection Bureau

Telephone: (518) 474-8480

April 6, 1987

Honorable John T. Curtin
United States District Judge
Western District of New York
68 Court Street
Buffalo, New York 14202

Re: State of New York v. Olin Corporation, et al.,
Civil Action No. 83-1400C

Dear Judge Curtin:

As previously reported to the Court in Olin's Draft Feasibility Study and in correspondence from the parties, Olin, with the State's concurrence, intends to undertake additional investigatory activities at the Gibson site. These investigations include the installation of additional wells on- and off-site, reinstallation of a well removed during the installation of a pipeline on the site, and monitoring of groundwater levels at all wells. Olin also intends to move forward with a sampling program for drums of buried waste detected during the initial site investigation.

A stipulation between the parties memorializing this agreement, along with matters relating to remediation of the site, is enclosed. The parties respectfully request the Court to approve this stipulation. If the Court needs additional

information from the parties prior to approving the Stipulation, we will be happy to provide such information by telephone or in person.

Very truly yours,

Albert M. Bronson

ALBERT M. BRONSON
Assistant Attorney General

Enclosure

cc: Rick Kennedy, Esq.
Joel E. Schweitzer, Esq.
Stanely Grossman, Esq.
Gordon J. Johnson, Esq.
Guy Boberski, P.E.

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF NEW YORK
----------X
STATE OF NEW YORK,

Plaintiff,

-against-

OLIN CORP., et al.,

Defendant.
----------X

STIPULATION

Civil Action No. 83-1400C

WHEREAS the initial field investigation conducted by defendant Olin Corporation ("Olin"), as described at paragraph 5(a) of the Stipulation and Consent Judgment Approving Settlement Agreement, entered May 2, 1985 ("Consent Judgment"), has generated data which the State believes is insufficient to adequately determine the full extent of chemical contamination of the Site which may have resulted from material deposited or caused to be deposited on-Site by Olin, or to design, in full, remedial plans which, to the extent achievable through requisite remedial technology, will result in the removal or isolation from people and the environment of such contamination, and

WHEREAS, this perceived partial failure of the initial field investigation was unanticipated by the parties, and

WHEREAS, although Olin does not share the State's belief that the initial field investigation was inadequate, it has agreed to perform additional investigative work which Olin believes was not originally contemplated by the Consent Judgment, and

WHEREAS, Olin's agreement to perform additional investigative work necessarily requires the modification of certain reporting requirements under the Consent Judgment, and

WHEREAS, Olin and the State have agreed to treat the northern portion of the site as a site distinct from the southern portion of the site for purposes of designing and implementing remedial measures, and

WHEREAS, Olin and the State have determined that it is necessary to memorialize the scope of Olin's commitment to perform additional investigative work, the attendant modification of reporting requirements, and the agreed bifurcation of the site, and

WHEREAS, the Court has jurisdiction pursuant to paragraph 19 of the Consent Judgment to modify the terms of the Consent Judgment to reflect the resolution of disputes arising under it,

IT IS HEREBY stipulated by and between the parties, by their undersigned attorneys, as follows:

1. Samples shall be taken and analyzed by Olin from wells MW-2 through MW-7 (the "old on-site wells") on a quarterly basis for one year. Groundwater level readings shall be taken by

Olin from wells MW-2 through MW-7 monthly for one year. Olin and the State shall assess the need for continued sampling and groundwater level readings from the old on-site wells when the one year sampling program required by this Stipulation is completed. Quarterly samples and monthly groundwater level readings from the wells on the northern portion of the site may be excused upon agreement of the parties if remedial work actually begun on site when sampling or measuring is scheduled to be done makes sampling or measuring impracticable.

2. Olin shall install an additional two groundwater monitoring wells on-site, and shall reinstall MW-1, which well was removed from the site during the construction of a trench for a pipeline (the "new on-site wells"). Samples shall be taken and analyzed by Olin from the new on-site wells on a quarterly basis for one year. Groundwater level readings shall be taken by Olin from the wells installed pursuant to this paragraph monthly for one year. Olin and the State shall assess the need for continued sampling and groundwater level readings from the new on-site wells when the one year sampling program required by this Stipulation is completed.

3. Olin shall install an off-site well across Cayuga Creek from the site (the "off-site well"). Installation of the off-site well shall be contingent upon Olin's obtaining authority

to install said well, in accordance with paragraph 11 of the Consent Judgment. Once the off-site well is installed, samples shall be taken and analyzed and groundwater level readings made from the well by Olin on the same schedule as provided in paragraphs 1 and 2 above for the old and new on-site wells. In the event that the off-site well cannot be installed at the same time as the wells called for in paragraph 2 above, Olin and the State shall agree on a supplemental sampling schedule to ensure that four representative groundwater samples and representative groundwater level readings are obtained and analyzed from the off-site well during the one year supplemental remedial investigation required by this Stipulation. Olin and the State shall assess the need for continued sampling and groundwater level readings from the off-site well when the one year sampling program required by this Stipulation is completed.

4. The wells installed pursuant to this Stipulation shall be constructed and sampled in the same manner as provided in the Consent Judgment and Plan A for the installation and sampling of wells. The wells shall be located at the approximate locations shown on the grid/boring plan attached hereto as Exhibit "A". MW-1 shall be reinstalled in an area not excavated during the pipeline installation. Final locations of reinstalled MW-1 and the three additional monitoring wells shall be determined by Olin and the State in accordance with field conditions.

5. The wells called for in paragraphs 2 and 3, above, shall be installed as soon as practicable after this Stipulation is executed by the parties and approved by the Court. A delay in obtaining authorization to install the off-site well shall not be deemed to waive Olin's obligation under this paragraph to promptly install the wells required by paragraph 2 of this Stipulation.

6. The groundwater samples collected pursuant to this Stipulation shall be collected and handled in the same manner as provided in the Consent Judgment and Plan A.

7. Samples from reinstalled MW-1, the two new on-site monitoring wells, and the off-site well shall be collected at the same times as the samples from MW-2 through MW-7, consistent with paragraph 3 above.

8. Olin shall analyze all groundwater samples collected from the old on-site wells (MW-2 through MW-7) for BHC, HCB, and mercury. Olin shall analyze the initial round of groundwater samples collected from the new on-site wells and the off-site well for the contaminants listed in paragraph 4(e) and Appendix 6 of the Consent Judgment. Olin shall analyze all subsequent groundwater samples collected from the new on-site wells and the off-site well for BHC, HCB, mercury and any paragraph 4(e)/Appendix 6 contaminants detected during the analysis of the

initial round of groundwater samples collected from the new on-site and off-site wells.

9. Olin shall sample the area in the northern portion of the site where the presence of buried drums was indicated by the metal detection program through the collection of six samples from buried drums through the use of an auger and a split-spoon sampler or any other method agreed upon by the parties. Collected samples shall be analyzed by Olin in the first instance for HCB. If the samples do not reflect essentially pure HCB, Olin shall analyze them for the contaminants listed in Appendix 6 and paragraph 4(e) of the Consent Judgment.

10. The drum sampling program specified in paragraph 9 shall be commenced as soon as practicable after this Stipulation is executed by the parties and approved by the Court.

11. The laboratories analyzing samples collected pursuant to this Stipulation shall both perform the sample analyses and adhere to the quality assurance/quality control measures as specified by the U.S. Environmental Protection Agency Contract Laboratory Program. All analytical results (from groundwater and buried drum sampling) and groundwater level readings shall be reported to the State within seven days of receipt by Olin.

12. Olin submitted a final report of the initial field investigation on July 31, 1986 and a draft feasibility study of remedial options regarding the northern portion of the site to the State on November 10, 1986. The State provided comments to Olin on the report and draft study on or about January 16, 1987. A meeting to discuss the State's comments with Olin has been held. Olin shall issue a final report no later than 45 days after the meeting between the parties referred to above. The final report shall expressly address the State's comments, discuss possible remedial alternatives and recommend a remediation plan for the northern portion of the site, specifying the reasons for the rejection of the alternatives.

13. Olin shall submit a supplemental final report consisting of a supplemental remedial investigation of the northern and southern portions of the site and a supplemental feasibility study addressed only to the southern portion of the site within 60 days after receipt of the final set of analytical results for the last groundwater samples taken in accordance with this Stipulation.

14. This stipulation shall modify those provisions of the Consent Judgment necessarily inconsistent with it.

15. The authorized representatives of the State and Olin, after having reviewed the terms and conditions of this Stipulation, hereby consent to its entry.

ROBERT ABRAMS
Attorney General of the
State of New York

By: Albert M. Bronson
Assistant Attorney General

By: _____
Assistant Attorney General

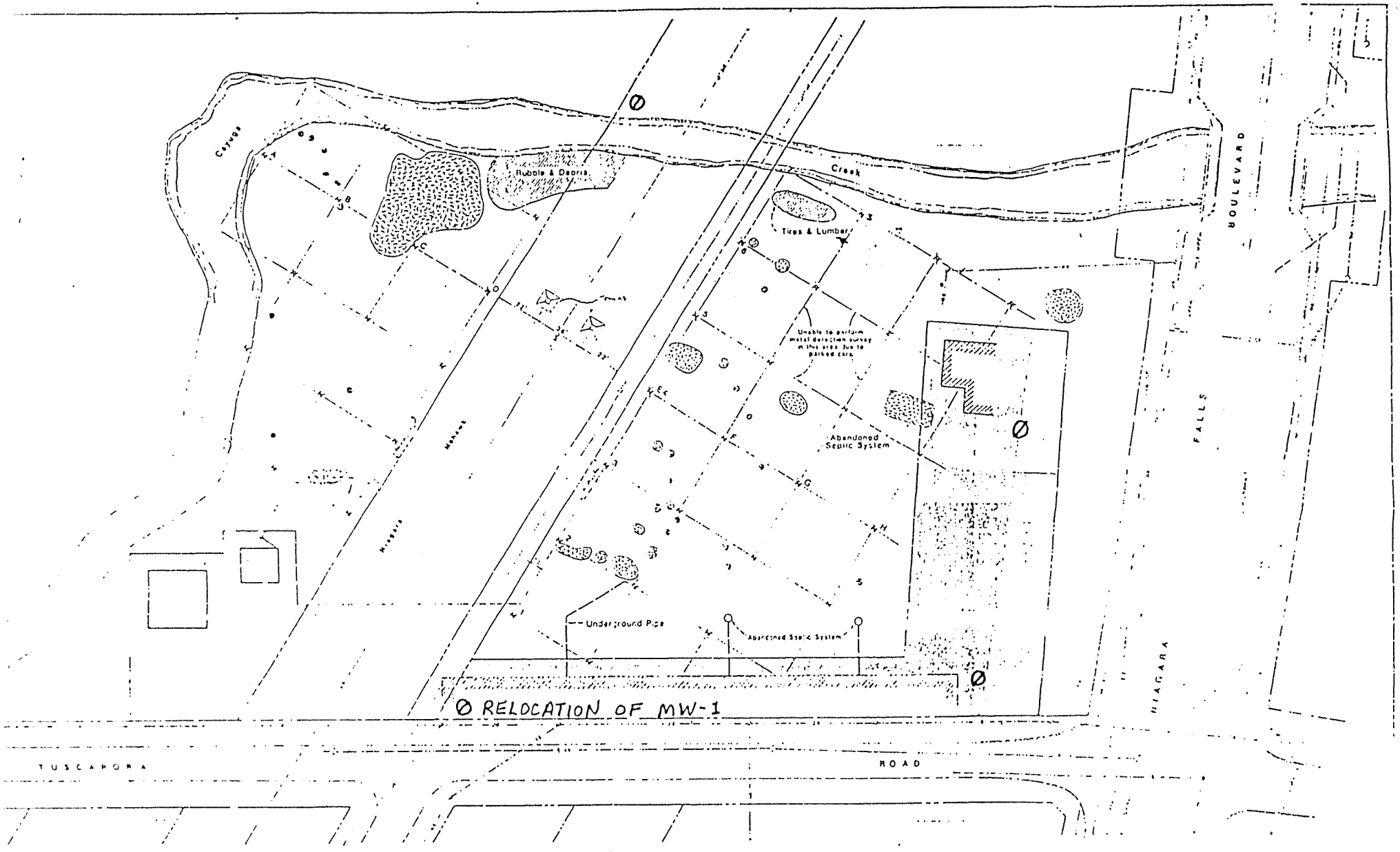
OLIN CORPORATION

By: _____
HODGSON, RUSS, ANDREWS,
WOODS & GOODYEAR
Attorneys for Defendant

SO ORDERED:

_____ UNITED STATES DISTRICT JUDGE

Dated:



SITE PLAN

Ø - ADDITIONAL WELLSTO BE INSTALLED (PROPOSED)

9-24-86

WENDEL ENGINEERING

Olin

APPENDIX B

APPENDIX B

Job Safety Plan
Additional Field Exploration, Buried Drum Investigation

Harding Lawson Associates

JOB SAFETY PLAN

Part 1 - Site Information

1. Site: Gibson Site
2. Job No.: 17497.001.12
3. Location: Niagara Falls Blvd. (Pine Ave.) & Tuscarora Rd., Niagara Falls, NY
4. Plan Prepared By: Steve Neely (P.M.) Date: February 10, 1987
5. Plan Approved By: Peter Rice (C.I.H.) Date: February 11, 1987
6. Plan Revised:
7. Approved:
8. Facility Description: The 4-acre site is relatively flat and was originally marsh lands that were filled in with waste materials.
9. Status (active, inactive, unknown): Inactive (residential and commercial property).
10. Unusual Features (dike integrity, powerlines, etc.): Niagara Mohawk powerline and parallel underground water and brine pipelines cross site (see Attachment 1).
11. History (injuries, exposures, complaints): 403 drums HCB plus 101 truckloads BHC reported by Olin to have been buried between 1955-1957. No known injuries, exposures, or complaints.
12. Surroundings (location with respect to residences, businesses, natural features): Residential and small business nearby (see Attachment 1).
13. Site Sketch (attach sketch showing salient features)
14. Climate: 60^{o} - 70^{o} expected daytime temperatures, April and May.

a) average wind speed and direction:

b)

	July	October	January	April
mean high temperature	70-80			60-70
mean low temperature	50-60			30-40

15. Hazardous Material Type: __Liquid X Solid __Sludge __Gas/Vapor __Other
16. Hazardous Material Characteristics: * __Corrosive 1 Ignitable 3 Toxic __Volatile 0 Reactive __Radioactive __Carcinogenic __Other Persistance 3

* CERCLA Hazard Rating

17. Chemical Information Summary

Material Name	BHC	HCB	BHC					
Chemical Constituent	C6H6C16	C6C16						
Information Reference/Page	Hazardline	Hazardline	Sax					

Likely Encounter

Source (1)	Soil & G. W.	Soil & G. W.						
Physical State (2)	Solid	Solid						

Concentrations

Measured or Estimated?	Unknown *	Unknown *						
Media	"	"						
Maximum Value	"	"						
Minimum Value	"	"						

Pure Chemical Characteristics

Water Solubility G/100 G H_2O @ 20°C	0.001 G	Insoluble						
Vapor Density Air = 1	N.A.	9.8						
Flash Point Closed cup	Nonflammable	468°F						
Vapor Pressure @ 20°C MMHG	< 0.001	1.0	0.0317					
LEL	-	Combustible						
UEL	-	Combustible						

Hazard Specifics of Pure Chemical

TLV (8 hrs. TWA)	0.5 Mg/m^3 *	N.A. *						
LD50/LC50	N.A. *	N.A. *	5-25 mg/kg	Cattle Oral				
IDLH Level	1000 Mg/m^3	None Specified						
Odor Threshold	Musty Odor	N.A.						
Hazard Property (3)	Toxic	Toxic						
Exposure Route (4)	* *	* *						
Toxic Effects (5)	(See Attachment 2)							

(1) Tank, drum, soil, ground water, surface impoundment, etc.
(2) Liquid, solid, gas, vapor, dust, fume, mist, sludge
(3) Corrosive, ignitable, toxic, volatile, reactive, radioactive, carcinogenic, infections, etc. Fill in all that apply.

* Monitor breathing zone with PID approximately every 10 minutes. (See Item 20 for PID action levels.)

* * Inhalation, Skin absorption, Ingestion, Skin or Eye contact

(4) Inhalation, Skin Absorption, etc.
(5) Exposure symptoms and effects

N.A. Specific information not available.

Task Description: _____

Task Name:

18. ANALYSIS OF KNOWN OR SUSPECTED UNMITIGATED HAZARDS		19. RISK ANALYSIS		
Hazard Type	How Does Hazard Exist?	Expos	Prob	Conseq
Mechanical	Drill rig and associated equipment	Cont.	Unu.	Mod.
Electrical	Overhead power lines	Occ.	Imp.	ser./ fatal
Chemical	Site wastes BHC and HCB	Cont.	Unu.	Min.
Temperature	Restricted body ventilation in personal protective clothing	Occ.	Like	Mod.
Acoustical	Drill rig noise.	Cont.	Unv.	Chron.
Radioactive	N/A			
O2 Deficiency	N/A			
Biohazard	N/A			

Expos: Frequency of exposure to the hazard event
- cont - many times per day
- freq - once or twice per day
- occ - once a week or month
- seld - once a month or year

Prob: Liklihood that an injury will occur upon exposure
- cert - certain
- like - 50/50 chance
- unu - unusual
- imp - improbable

Conseq: Degree of injury if one occurs
- fatal - fatality
- ser - serious, requires hospitalization
- mod - moderate, requires out-patient care
- min - requires on-site first aid
- chron - chronic, no acute affects

20. MITIGATION MEASURES	REQUIRED PERSONAL PROTECTIVE EQUIPMENT	
Usual drilling precautions. Shut off drill rig if vapor levels are above 500 ppm.	LEVEL _A _B X _C _D	
Keep safe distance from all electric lines.	Head: Hard hat	Eye/Face: Full face respirator
Chemical, see below	Hand: Neoprene Gloves	Body: Work Clothes Tyvek Suits or Slickers (1)
Use caution in personal protective clothing. Avoid heat stress.	Lung: ov Cartridge Respirator with filter (2)	Ear:
Have ear inserts available.	Foot: steel toe/ steel shank rubber boots	
	Special Equipment Required	

Special Procedures Required:

(1) Polyethylene Tyvek suits or slickers as deemed appropriate by site safety officer if liquid waste encountered (see Attachment 1).

(2) Up to 5 ppm* Total Hydrocarbons use OV respirator with filters. Greater than 5 ppm*: evacuate up wind and make determination on protective equipment before continuing (see Attachment 3).

Wind direction indicator to be attached to drill rig (i.e., small flags or ribbons, etc.)

No smoking or eating on-site before decon.

* measured in breathing zone approximately every 10 minutes.

23. Decontamination Procedures: Seal drill holes per work plan. Decon. of personnel and equipment per Attachment 4.

24. Investigation-Derived Material Disposal: Excess auger cuttings will be stored in 55-gallon disposal drums and placed in designated staging area for Olin to transport and dispose of in approved Hazardous Waste Facility.

25. Site Resources
Water Supply: available from vacant motel building west side of property.
Telephone: office west side of property.
Radio:
Other:

26.

Team Member	Responsibility	Date of Safety Training	Date of Physical Exam
Blaine Butaud (Olin)	Assistant Site Safety Officer (SSO)		
Mike Bellotti (Olin)	Assistant Site Safety Officer (SSO)		
Steve Neely (HLA)	Project Manager	10/85	8/86
Peter Rice (HLA)	Cert. Ind. Hyg. (CIH) and SSO	8/86	8/86
Hector Lopez (HLA)	Field Engineer/Geologist		7/86
Jim Tremblay (HLA)	Project Consultant	2/85	2/87
Tony Fischer	Lead Driller	12/86	10/86

Note: safety training satisfies requirements of 29 CFR 1910.120

27. Emergency Telephone Numbers

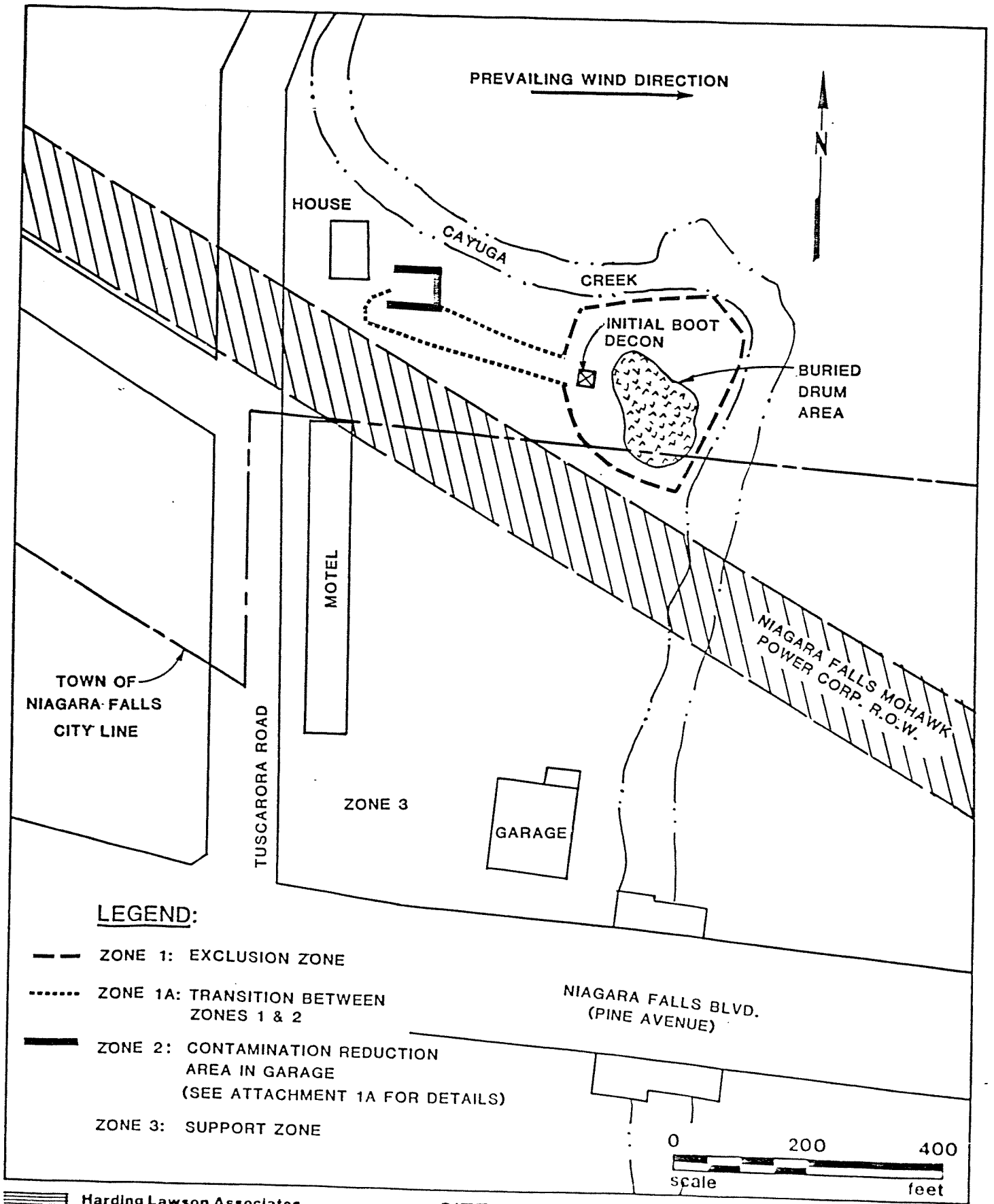
Phone/Radio Location:	Phone: office west side of property
Ambulance:	Niagara Ambulance (284-4228)
Hospital Emergency Room:	Mount St. Mary's Hospital (297-4800)
Poison Control Center:	278-4511
Police:	278-8111 or 911
Fire Department:	285-1233 or 911
Airport:	
Explosives Unit:	285-1233 or 911
EPA Contact:	
State Contact:	Guy Bobersky (518) 457-4343
Client:	Mike Bellotti/Blaine Butaud (615) 336-4576

28. Emergency Equipment Location

a. Safety Shower/Eyewash	Contamination Reduction Zone (see Attachment 1 & 1A).
b. First Aid Kit	Contamination Reduction Zone (see Attachment 1 & 1A).
c. Fire Extinguishers	Aboard drilling equipment.
d. Other	Emergency eyewash bottles on drilling equipment.

29. Emergency Routes (give road or other directions; attach map)
Hospital see Attachment 5

Other

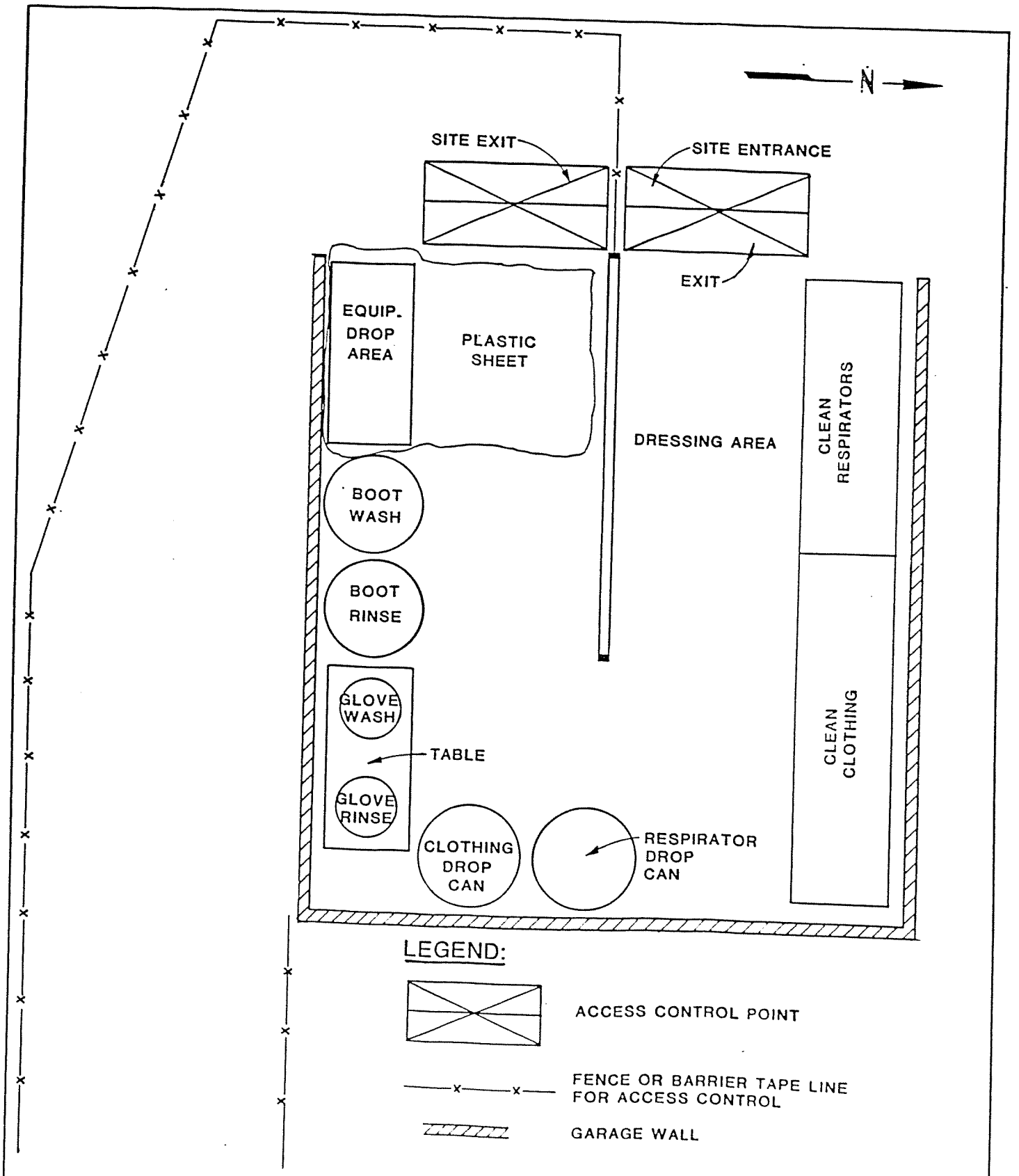


Harding Lawson Associates
Engineers, Geologists
& Geophysicists

SITE PLAN
Gibson Site
Niagara Falls, New York

Attachment
1

17497,001.12



Harding Lawson Associates
Engineers Geologists
& Geophysicists

DECONTAMINATION BUILDING (GARAGE)

Gibson Site
Niagara Falls, New York

Attachment
1A

17497, 001. 12

CHEMICAL NAME
LINDANE BHC

FORMULA

CHEMICAL NAME
LINDANE

FORMULA
C6H6CL6

SYNONYMS
BENZENE HEXACHLORIDE
DETOX 25
NCI-C00204
TAP 85
TRI-6
GAMMA-BHC
NA 2761
CYCLOHEXANE, 1,2,3,4,5,6-HEXACHLORO-, GAMMA-ISOMER
BENZENE HEXACHLORIDE-GAMMA-ISOMER
GAMMA-HEXACHLORAN
GAMMA-HEXCHLOROCYCLOHEXANE
GAMMA-1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE
GAMMA-HEXACHLOROBENZENE
HEXACHLOROCYCLOHEXANE, GAMMA-ISOMER
1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE, GAMMA-ISOMER
GAMMA-BENZENE HEXACHLORIDE
GAMMA-HCH
DBH
BHC
OHS12810

PERMISSIBLE EXPOSURE LIMIT
0.5 MG/M3 OSHA TWA (SKIN NOTATION)
0.5 MG/M3 ACGIH TWA (SKIN NOTATION)
ANIMAL CARCINOGEN (IARC)
SUSPECT HUMAN CARCINOGEN (NTP)
NEGATIVE CARCINOGEN IN RATS/MICE (NCI)
MUTAGENIC DATA (RTEC)
ACCEPTABLE DAILY INTAKE (FAO/WHO): 0.01 MG/KG
SURVEILLANCE INDEX CLASSIFICATION II: POTENTIAL HIGH HEALTH HAZARD
CERCLA HAZARD RATINGS - TOXICITY 3 - IGNITABILITY 1 REACTIVITY 0 -
PERSISTENCE 3

TOXICOLOGY: LINDANE IS A CONVULSANT POISON AND SUSPECT CARCINOGEN.
EXPOSURE TO LINDANE VAPORS WILL IRRITATE THE EYES, NOSE AND THROAT.
REPEATED OR PROLONGED CONTACT WILL LEAD TO DERMATITIS.
THE THRESHOLD LIMIT VALUE WAS SET AT A LEVEL TO PREVENT CONVULSIONS.
SEE DDT

NOTE: In order to be overlyconservative in developing the health and safety procedures presented herein, information on the most hazardous of all BHC isomers, lindane, was used to develop the procedures. Lindane, which is the gamma isomer of BHC, is not expected to be at the site. The only BHC isomers expected on site are the alpha, beta and delta isomers.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
1000 MG/M3
OSHA/NIOSH

PHYSICAL DESCRIPTION
COLORLESS SOLID WITH A MUSTY ODOR
PURE MATERIAL IS ODORLESS

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 290.82
BOILING POINT AT 1 ATM, F: DECOMPOSES
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.001 G
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): NONFLAMMABLE
VAPOR PRESSURE @ 20 C, MMHG: <0.001 MM HG
MELTING POINT, F: 334 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: %
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: %

INCOMPATIBILITIES
STRONG ACIDS
HEAT
THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PREVENT SKIN CONTACT, WHERE SKIN CONTACT MAY OCCUR
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

— — —

ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST INORGANIC BASES:

EXCELLENT/GOOD:
BUTYL RUBBER
NATURAL RUBBER
NEOPRENE
NITRILE RUBBER
POLYVINYL CHLORIDE

GOOD/FAIR:
NEOPRENE/STYRENE-BUTADIENE
NITRILE/POLYVINYL CHLORIDE
POLYETHYLENE
CHLORINATED POLYETHYLENE
POLYURETHANE
STYRENE-BUTADIENE RUBBER

FAIR/GOOD:
POLYVINYL ALCOHOL

A WIDE VARIATION IN RATINGS IS INDICATED FOR VITON

ATTACHMENT 2

40CFR261.24 CHARACTERISTIC OF EP TOXICITY
SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
45FR33084 05/19/80

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

PREREGULATORY ASSESSMENT COMPLETED/PUBLISHED FEDERAL INSECTICIDE FUNGICIDE, AND RODENTICIDE ACT (FIFRA) SECTION 6

REBUTTABLE PRESUMPTION AGAINST REGISTRATION (RPAR) OR ADVANCED NOTICE OF PROPOSED RULEMAKING (ANPR) COMPLETED/ PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA) SECTION 6

RISK DOCUMENTATION/ASSESSMENT COMPLETED/PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

TEST METHOD DEVELOPMENT COMPLETED/PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

MONITORING/LEVELS MEASUREMENT COMPLETED/PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

REGULATION PROMULGATED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA) SECTION 6

EPA HAS ANNOUNCED ITS INTENT TO CANCEL THE REGISTRATIONS OF LINDANE FOR TWO USES, TO CONTINUE THE REGISTRATION OF ALL OTHER USES SUBJECT TO CERTAIN LABEL REQUIREMENTS AND USE PRACTICE PROHIBITIONS, AND TO DENY APPLICATIONS FOR REGISTRATION OF LINDANE PRODUCTS NOT IN ACCORDANCE WITH THE TERMS OF THE NOTICE.
48FR48513 10/19/83

REGULATION PROMULGATED SAFE DRINKING WATER ACT (SDWA)

MONITORING/LEVELS MEASUREMENT IN DEVELOPMENT/PROGRESS SAFE DRINKING WATER ACT (SDWA)

ANALYTICAL METHODS DEVELOPMENT IN DEVELOPMENT/PROGRESS CLEAN WATER ACT (CWA)

TEST METHOD DEVELOPMENT COMPLETED/PUBLISHED TOXIC SUBSTANCES CONTROL ACT (TSCA)

SUBSTANCES LISTED APPENDIX A -- CONSENT DECREE LIST OF INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA. JUNE 7 1976. SITE 2CRC2120, DOC 1976. MODIFIED MARCH 9, 1979 SITE 12CRC1200 DOC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE LISTED COMMONWEALTH OF VIRGINIA STATE BOARD OF HEALTH HAZARDOUS WASTE MANAGEMENT REGULATIONS UNDER AUTHORITY OF THE CODE OF VIRGINIA, AS AMENDED. CHAPTER 6, TITLE 32.1. ARTICLE 3, SOLID WASTE MANAGEMENT

SUBSTANCE SUBJECT TO REQUIREMENTS OF GENERAL INDUSTRY SAFETY ORDER (GISO) 5194 OF TITLE 8 OF CALIFORNIA ADMINISTRATIVE CODE AND DIVISION 5 CHAPTER 2.5 OF CALIFORNIA LABOR CODE

ATTACHMENT 2

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, IMMEDIATELY GET MEDICAL ATTENTION. IF MEDICAL ATTENTION IS NOT IMMEDIATELY AVAILABLE, GET THE AFFECTED PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER OR BY GIVING HIM SYRUP OF IPECAC AS DIRECTED ON PACKAGE. THIS NON-PRESCRIPTION DRUG SHOULD BE KEPT WITH EMERGENCY MEDICAL SUPPLIES IN THE WORKPLACE AND IS AVAILABLE AT MOST DRUG COUNTERS. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT.

IF THIS HALOGENATED PESTICIDE IS SWALLOWED, INDUCE VOMITING WITH SYRUP OF IPECAC. ADMINISTER ACTIVATED CHARCOAL FOLLOWED BY GASTRIC LAVAGE WITH 2 TO 4 LITERS OF TAP WATER. FOLLOW WITH SALINE CATHARTIC. DO NOT GIVE FATS OR OILS. PERFORM LAVAGE WITH 200 ML OF 20% MANNITOL USING A STOMACH TUBE. ADMINISTER DIAZEPAM (10 ML) INTRAVENOUSLY AS AN ANTICONVULSANT. IF CONVULSIONS PERSIST, USE A NEUROMUSCULAR BLOCKING AGENT. FOR HYPERACTIVITY OR TREMORS, GIVE 100 MG OF PHENOBARBITAL SODIUM SUBCUTANEOUSLY HOURLY UNTIL CONVULSIONS ARE CONTROLLED OR UNTIL 0.5 G HAS BEEN GIVEN. DO NOT GIVE STIMULANTS.
(DREISBACH - HANDBOOK OF POISONING, 11TH ED.)

ORGANS
EYES
SKIN
CENTRAL NERVOUS SYSTEM
BLOOD
KIDNEYS
LIVER

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE.

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

ATTACHMENT 2

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT
OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38179 08/22/83

SUBSTANCE ESTABLISHED AS CONFIRMED OR SUSPECTED CARCINOGEN (POTENTIAL CARCINOGEN) BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

SUBSTANCE LISTED AS 'KNOWN TO BE CARCINOGENIC' OR 'MAY REASONABLY BE ANTICIPATED TO BE CARCINOGENIC' IN NATIONAL TOXICOLOGY PROGRAM (NTP) THIRD ANNUAL REPORT ON CARCINOGENS
40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR37333 08/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

REGULATION PROMULGATED CLEAN WATER ACT (CWA) SECTION 311
40CFR117

MONITORING/LEVELS MEASUREMENT IN DEVELOPMENT/PROGRESS CLEAN WATER ACT (CWA)

40CFR122, APPENDIX D - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATION TESTING REQUIREMENTS
TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GS/MS)
48FR14153 04/01/83

CLEAN WATER ACT (CWA) SECTION 304(A)
WATER QUALITY CRITERIA FOR LINDANE:
4.0 UG/L FOR DOMESTIC WATER SUPPLY (HEALTH).
0.01 UG/L FOR FRESHWATER AQUATIC LIFE.
0.004 UG/L FOR MARINE AQUATIC LIFE.

40CFR141.12 NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS
MAXIMUM CONTAMINANT LEVEL FOR LINDANE: 0.004 MG/L
40FR59570 12/24/75
44FR68641 11/29/79

ATTACHMENT 2

FOOD AND DRUG ADMINISTRATION (FDA) SURVEILLANCE INDEX
CLASSIFICATION (SIC) - CLASS II: HIGH HEALTH/TOXICITY HAZARD
HAS NOT BEEN DEMONSTRATED, BUT EVIDENCE EXISTS FOR POSSIBLE
HIGH RISK TOXICITY EFFECTS

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION,
PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER RE-
QUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATER-
IAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15976 04/15/76
45FR34560 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62030 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.31 EPA HAZARDOUS WASTE NO. F024. WASTES, INCLUDING BUT NOT
LIMITED TO, DISTILLATION RESIDUES, HEAVY ENDS, TARS, AND REACTOR
CLEANOUT WASTES FROM THE PRODUCTION OF CHLORINATED ALIPHATIC HYDRO-
CARBONS, HAVING CARBON CONTENT FROM ONE TO FIVE, UTILIZING FREE RADICAL
CATALYZED PROCESSES. (THIS LIST DOES NOT INCLUDE LIGHT ENDS, SPENT
FILTERS AND FILTER AIDS, SPENT DESICCANTS, WASTEWATER, WASTEWATER TREAT-
MENT SLUDGES, SPENT CATALYSTS, AND WASTES LISTED IN 40CFR261.32)
49FR5308 02/10/84

MEDICAL SURVEILLANCE REQUIRED
SKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES
CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES
MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES
TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR
30 YEARS
48FR38187 08/22/83
48FR39223 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICAL MEASUREMENTS
VISION TEST
CENTRAL NERVOUS SYSTEM TESTS, PERIPHERAL NEUROPATHY
COMPLETE BLOOD COUNT
BLOOD CHEMISTRY
RENAL AND LIVER FUNCTIONS
KIDNEY FUNCTION
SKIN EXAM
MORPHOLOGICAL BLOOD SLIDES
HEMATOLOGY
PRE-PLACEMENT AND ANNUAL EXAMS
14 BY 17 CHEST P.A. X-RAY
URINALYSIS
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY
ATTENTION TO SMOKING, ALCOHOL, MEDICATION, AND EXPOSURE TO CARCINOGENS

ATTACHMENT 2

FOOD AND DRUG ADMINISTRATION (FDA) SURVEILLANCE INDEX
CLASSIFICATION (SIC) - CLASS II: A HIGH HEALTH/TOXICITY HAZARD
HAS NOT BEEN DEMONSTRATED, BUT EVIDENCE EXISTS FOR POSSIBLE
HIGH RISK TOXICITY EFFECTS. HAZARD POTENTIAL IS SUFFICIENT TO
WARRANT A TEMPORARY INCLUSION OF THIS PESTICIDE IN MEDICAL
MONITORING PROGRAM UNTIL TOXICITY/EXPOSURE DATA IS MORE CLEARLY
DEFINED
FOOD AND AGRICULTURE ORGANIZATION/WORLD HEALTH ORGANIZATION (FAO/WHO)
ACCEPTABLE DAILY INTAKE ESTABLISHED

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL
SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT
ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES.
EPA (8001424-1404. 48FR33173 9/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED
BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
CONVULSIONS - BLOOD ANALYSIS FOR GLUCOSE, CALCIUM, UREA NITROGEN AND
CARBON DIOXIDE

LEAKS AND SPILL PROCEDURES

****

DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS IF
49CFR172.402)

NONE

ATTACHMENT 2

****

INTERGOVERNMENTAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

ORGANOCHLORINE PESTICIDES, SOLID, TOXIC, N.O.S.
CLASS 6.1-POISONOUS (TOXIC) SUBSTANCE
UN 2761

INTERGOVERNMENTAL MARITIME ORGANIZATION LABELLING SPECIFICATIONS FOR
DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

POISON

****

FOLLOWING INFORMATION FROM BUREAU OF EXPLOSIVES "EMERGENCY HANDLING OF
HAZARDOUS MATERIALS":

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* EXTINGUISH FIRE USING AGENT SUITABLE FOR TYPE OF SURROUNDING FIRE
(MATERIAL ITSELF DOES NOT BURN OR BURNS WITH DIFFICULTY)

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
* BUILD DIKES TO CONTAIN FLOW AS NECESSARY

PERSONNEL PROTECTION:
* KEEP UPWIND
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH
COPIOUS AMOUNTS OF WATER OR SOAP AND WATER

LAND SPILL:
* DIG A PIT, POND, LAGOON OR HOLDING AREA TO CONTAIN LIQUID OR SOLID
MATERIAL
* DIKE SURFACE FLOW USING SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED
CONCRETE
* ABSORB BULK LIQUID WITH FLY ASH OR CEMENT POWDER

WATER SPILL:
* USE NATURAL BARRIERS OR OIL SPILL CONTROL BOOMS TO LIMIT SPILL MOTION
* IF DISSOLVED, APPLY ACTIVATED CARBON AT 10 TIMES SPILLED
AMOUNT AT 10PPM OR GREATER CONCENTRATION
* USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES
OF POLLUTION AND PRECIPITATES
* THERMAL DECOMPOSITION TO INNOCUOUS CAN OCCUR

****

FOLLOWING INFORMATION FROM DEPARTMENT OF TRANSPORTATION/U.S. COAST GUARD
"CHEMICAL RESPONSE INFORMATION SYSTEM", REGARDING WATER SPILLS.

* SUBSTANCE SINKS IN WATER
* RESTRICT ACCESS OF GENERAL PUBLIC WHEN APPRECIABLE DANGER ARISES FROM
SPILL
* RESTRICT HUMAN USE WHEN SUBSTANCE INVOLVED
* RESTRICT [illegible] WITH SUBSTANCE SPILLED IN WATER USED FOR IRRIGATION

ATTACHMENT 2

CHEMICAL NAME
HEXACHLOROBENZENE

FORMULA
C6CL6

SYNONYMS
HCB
PENTACHLOROPHENYL CHLORIDE
PERCHLOROBENZENE
PHENYL PERCHLORYL
NO BUNT
ANTICARIE
SANOCIDE
UN 2729
BENZENE, HEXACHLORO-
AMATIN
BUNT-CURE
CO-OP HEXA
GRANOX NM
HEXA C.D.
JULIN'S CARBON CHLORIDE
NO BUNT 40
NO BUNT 80
NO BUNT LIQUID
SMUT-GO
SNIEBIOTOX
C.I.S10730

PERMISSIBLE EXPOSURE LIMIT
SUSPECT HUMAN CARCINOGEN (NTP)(IARC)
ANIMAL CARCINOGEN (IARC)
MUTAGENIC DATA (RTECS)
ACCEPTABLE DAILY INTAKE (FAO/WHO): 0.0006 MG/KG (CONDITIONAL)
CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 0 - REACTIVITY 0 -
PERSISTENCE 3

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
NONE SPECIFIED

PHYSICAL DESCRIPTION
SOLID NEEDLE CRYSTALS

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 284.78
BOILING POINT AT 1 ATM: F 612 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: INSOLUBLE
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF CL): 403 F
VAPOR PRESSURE @ 20 C, MMHG: 1 MM HG
MELTING POINT, F: 446 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: COMBUSTIBLE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: COMBUSTIBLE
SPECIFIC GRAVITY: 1.5691 AT 74 F
VAPOR DENSITY (AIR=1): 9.8

ATTACHMENT 2

DIMETHYL FORMAMIDE
HEAT
THERMAL DECOMPOSITION PRODUCTS ARE HAZARDOUS AND/OR TOXIC

PERSONAL PROTECTIVE EQUIPMENT
NO NIOSH/OSHA DATA; RECOMMEND
PREVENT ANY POSSIBILITY OF SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)
PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED
IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

— — —

ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST UNSUBSTITUTED AROMATIC HALOGEN COMPOUNDS:

EXCELLENT/GOOD:
NONE INDICATED

GOOD/FAIR:
POLYETHYLENE

FAIR/POOR:
NATURAL RUBBER
NEOPRENE
CHLORINATED POLYETHYLENE
POLYVINYL CHLORIDE

FAIR/GOOD:
BUTYL RUBBER

A WIDE VARIATION IN RATINGS IS INDICATED FOR THE FOLLOWING MATERIALS:
NITRILE RUBBER
POLYURETHANE

GOGGLES
NO OSHA STANDARD. NIOSH CRITERIA DOCUMENT ADVISES.
WEAR FACE SHIELD OR VENTED GOGGLES

WASHING CHEMICALS FROM THE SKIN
NO OSHA STANDARD. NIOSH CRITERIA DOCUMENT ADVISES:
PROMPTLY WHEN SKIN BECOMES CONTAMINATED

ROUTINE CHANGING OF WORK CLOTHING
NO OSHA STANDARD, NIOSH CRITERIA DOCUMENT ADVISES:
IF IT IS REASONABLY PROBABLE THAT CLOTHING IS CONTAMINATED
LEAVE CLOTHING & EQUIPMENT FOR DECONTAMINATION & DISPOSAL

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
NO OSHA STANDARD, NIOSH CRITERIA DOCUMENT ADVISES:
PROMPTLY IF IT IS NON-IMPERVIOUS AND CONTAMINATED
SPECIFIC EMERGENCY PROVISIONS
NO OSHA STANDARD. NIOSH CRITERIA DOCUMENT ADVISES:
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

ATTACHMENT 2

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

NO SPEC ADVISE
- CHEMICAL CARTRIDGE RESPIRATOR
  WITH AN ORGANIC VAPOR CARTRIDGE

HIGH LEVELS
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE, HELMENT. OR HOOD

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
- INHALATION
- SKIN ABSORPTION
- INGESTION
- SKIN OR EYE CONTACT

SYMPTOMS
- CHLORACNE
- LIVER DAMAGE
- THYROID ENLARGEMENT
- WEIGHT LOSS
- CONJUNCTIVITIS
- ERYTHEMA
- REPRODUCTIVE EFFECTS
- EYE IRRITATION
- SKIN IRRITATION
- RESPIRATORY IRRITATION
- RESPIRATORY EDEMA
- COUGHING
- DYSPNEA
- SKIN BURNS
- ABDOMINAL PAIN
- VOMITING
- DIARRHEA
- CIRRHOSIS
- ANXIETY
- ATAXIA
- CONVULSIONS
- COMATOSE
- TREMORS
- DIZZINESS
- HEADACHE
- CENTRAL NERVOUS SYSTEM DEPRESSION
- HEPATOCELLULAR TUMOR IN EXPERIMENTAL ANIMALS
- HEPATOMA IN EXPERIMENTAL ANIMALS
- HEMANGIOSARCOMA IN EXPERIMENTAL ANIMALS
- THYROID ADENOMA IN EXPERIMENTAL ANIMALS

ATTACHMENT 2

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHLORINATED HYDROCARBON GETS ON SKIN, IMMEDIATELY WASH SKIN WITH SOAP AND WATER, RUBBING ALCOHOL, OR TINCTURE OF GREEN SOAP.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, IMMEDIATELY GET MEDICAL ATTENTION. IF MEDICAL ATTENTION IS NOT IMMEDIATELY AVAILABLE, GET THE AFFECTED PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER OR BY GIVING HIM SYRUP OF IPECAC AS DIRECTED ON PACKAGE. THIS NON-PRESCRIPTION DRUG SHOULD BE KEPT WITH EMERGENCY MEDICAL SUPPLIES IN THE WORKPLACE AND IS AVAILABLE AT MOST DRUG COUNTERS. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT.

IF THIS HALOGENATED PESTICIDE IS SWALLOWED, INDUCE VOMITING WITH SYRUP OF IPECAC. ADMINISTER ACTIVATED CHARCOAL FOLLOWED BY GASTRIC LAVAGE WITH 2 TO 4 LITERS OF TAP WATER. FOLLOW WITH SALINE CATHARTIC. DO NOT GIVE FATS OR OILS. PERFORM LAVAGE WITH 200 ML OF 20% MANNITOL USING A STOMACH TUBE. ADMINISTER DIAZEPAM (10 ML) INTRAVENOUSLY AS AN ANTICONVULSANT. IF CONVULSIONS PERSIST, USE A NEUROMUSCULAR BLOCKING AGENT. FOR HYPERACTIVITY OR TREMORS, GIVE 100 MG OF PHENOBARBITAL SODIUM SUBCUTANEOUSLY HOURLY UNTIL CONVULSIONS ARE CONTROLLED OR UNTIL 0.5 G HAS BEEN GIVEN. DO NOT GIVE STIMULANTS.
(DREISBACH - HANDBOOK OF POISONING, 11TH ED.)

ORGANS

EYES
SKIN
LYMPHATIC SYSTEM
ENDOCRINE SYSTEM
REPRODUCTIVE SYSTEM
LIVER
LUNGS
RESPIRATORY SYSTEM
MUCOUS MEMBRANES
CENTRAL NERVOUS SYSTEM

STATUS OF REGULATORY ENFORCEMENT

OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION

REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS

[illegible]

ATTACHMENT 2

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910.
OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION
OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

SUBSTANCE ESTABLISHED AS CONFIRMED OR SUSPECTED CARCINOGEN (POTENTIAL CARCINOGEN) BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

SUBSTANCE LISTED AS 'KNOWN TO BE CARCINOGENIC' OR 'MAY REASONABLY BE ANTICIPATED TO BE CARCINOGENIC' IN NATIONAL TOXICOLOGY PROGRAM (NTP) THIRD ANNUAL REPORT ON CARCINOGENS

49CFR172.101 TABLES OF HAZARDOUS MATERIALS. THEIR DESCRIPTION. PROPER SHIPPING NAME. CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL (UNDER N.O.S CATEGORY) FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34503 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62020 09/13/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS. THEIR DESCRIPTION PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15976 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

RISK DOCUMENTATION/ASSESSMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

RISK DOCUMENTATION/ASSESSMENT COMPLETED/PUBLISHED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

ATTACHMENT 2

CONTROL TECHNOLOGY DEVELOPMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

CONTROL TECHNOLOGY DEVELOPMENT COMPLETED/PUBLISHED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR260
PREREGULATORY ASSESSMENT COMPLETED/PUBLISHED TOXIC SUBSTANCES CONTROL ACT (TSCA)

TOXIC SUBSTANCE CONTROL ACT (TSCA) SECTION 8(E) INITIAL EVALUATION OF SUBSTANTIAL RISK SUBMITTED TO EPA. 1982

SUBSTANCES LISTED APPENDIX A - CONSENT DECREE LIST OF INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN U.S.-EPA AND NATIONAL RESOURCES DEFENSE COUNCIL. ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7. 1976. SITE SERC2120. DOC 1976. MODIFIED MARCH 9, 1979. SITE IEERC1333, DOC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE SUBJECT TO REQUIREMENTS OF GENERAL INDUSTRY SAFETY ORDER (GISO) 5194 OF TITLE 8 OF CALIFORNIA ADMINSTRATIVE CODE AND DIVISION 5 CHAPTER 2.5 OF CALIFORNIA LABOR CODE

40CFR122, APPENDIX D - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATION TESTING REQUIREMENTS
TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GC/MS)
48FR14153 04/01/83
REGULATION IN DEVELOPMENT/PROGRESS COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 101

WATER QUALITY CRITERIA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 304(A) 45CFR231

WATER QUALITY CRITERIA DOCUMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 304(A)

MATERIALS BALANCE STUDY COMPLETED/PUBLISHED TOXIC SUBSTANCES CONTROL ACT (TSCA)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K042. HEAVY ENDS OR DISTILLATION RESIDUES FROM THE DISTILLATION OF TETRACHLOROBENZENE IN THE PRODUCTION OF 2,4,5-T. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K018. HEAVY ENDS FROM THE FRACTIONATION COLUMN IN ETHYL CHLORIDE PRODUCTION (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K016. HEAVY ENDS OR DISTILLATION RESIDUES FROM THE PRODUCTION OF CARBON TETRACHLORIDE. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K009. DISTILLATION OR FRACTIONATION COLUMN BOTTOMS FROM THE PRODUCTION OF CHLOROBENZENES (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
CFR261.32 EPA HAZARDOUS WASTE NO. K030: COLUMN BOTTOMS OR
HEAVY ENDS FROM THE COMBINED PRODUCTION OF TRICHLOROETHYLENE
AND PERCHLOROETHYLENE. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.31 EPA HAZARDOUS WASTE NO. F024: WASTES, INCLUDING CUT NOT
LIMITED TO, DISTILLATION RESIDUES, HEAVY ENDS, TARS, AND REACTOR
CLEANOUT WASTES FROM THE PRODUCTION OF CHLORINATED ALIPHATIC HYDRO-
CARBONS, HAVING CARBON CONTENT FROM ONE TO FIVE, UTILIZING FREE RADICAL
CATALYZED PROCESSES. (THIS LIST DOES NOT INCLUDE LIGHT ENDS, SPENT
FILTERS AND FILTER AIDS, SPENT DESSICANTS, WASTEWATER, WASTEWATER TREAT-
MENT SLUDGES, SPENT CATALYSTS, AND WASTES LISTED IN 40CFR261.32)
49FR5308 02/10/84
THIS SUBSTANCE TESTED FOR MUTAGENESIS/GENETIC TOXICITY
BY THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES
(NIEHS)

15CFR399.2, SUPPLEMENT 1 - COMMODITY INTERPRETATION 24: CHEMICALS
VALIDATED LICENSE REQUIRED FOR EXPORT TO LIBYA, NORTH KOREA, VIETNAM,
KAMPUCHEA, OR CUBA
45FR85942 12/30/80
46FR23942 04/29/81
47FR143 01/05/82
47FR41512 09/21/82
47FR51260 11/19/82
47FR58124 12/29/82

FOOD AND AGRICULTURE ORGANIZATION/WORLD HEALTH ORGANIZATION (FAO/WHO)
ACCEPTABLE DAILY INTAKE (ADI) ESTABLISHED

MEDICAL SURVEILLANCE REQUIRED
NO OSHA STANDARD, NIOSH CRITERIA DOCUMENT ADVISES
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES
CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES
MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES
TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR
30 YEARS
48FR38107 08/22/83
48FR39236 08/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION
INDUSTRIAL EXPOSURE HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
ATTENTION TO SMOKING, ALCOHOL, MEDICATION, AND EXPOSURE TO CARCINOGENS

PULMONARY FUNCTIONS
RESPIRATORY HISTORY
SPECIAL ATTENTION TO SKIN
RENAL AND LIVER FUNCTIONS
PERIODIC EXAM FOLLOWING EXPOSURE
FOOD & AGRICULTURE ORGANIZATION/WORLD HEALTH ORGANIZATION (FAO/WHO)
ACCEPTABLE DAILY INTAKE ESTABLISHED

ATTACHMENT 2

NO FEDERAL AGENCY REQUIREMENT, BUT DUE TO HAZARDOUS NATURE OF SUBSTANCE, ADVISE FOLLOWING:

HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL
SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT
ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,
EPA (800)424-1404. 40FR38178 8/22/80
MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED
BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
PULMONARY FUNCTION
URINARY METABOLITES

LEAKS AND SPILL PROCEDURES

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

HAZARDOUS SUBSTANCE, LIQUID OR SOLID, N.O.S.
ORM-E
UN 9188

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF
49CFR172.402)

POISON

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INTERGOVERNMENTAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 6 1-POISONOUS (TOXIC) SUBSTANCE

INTERGOVERNMENTAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR
DOMESTIC AND EXPORT SHIPMENTS
49CFR172.402

ST [illegible]

ATTACHMENT 2

FOLLOWING INFORMATION FROM BUREAU OF EXPLOSIVES "EMERGENCY HANDLING OF HAZARDOUS MATERIALS":

HAZARDOUS SUBSTANCE, LIQUID OR SOLID, N.O.S.
ORM-E
IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* EXTINGUISH USING SUITABLE MATERIAL TO SURROUND FIRE
IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
* BUILD DIKES TO CONTAIN FLOW AS NECESSARY
PERSONAL DANGER SITUATION PROTECTION:
* KEEP UPWIND
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* AVOID BREATHING VAPORS OR DUST
* WASH AWAY ANY MATERIAL WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
LAND SPILL
* DIG PIT, POND TO HOLD MATERIAL
* COVER SOLIDS WITH A PLASTIC SHEET TO PREVENT DISSOLVING IN RAIN OR FIREFIGHTING WATER
WATER SPILL
* IF DISSOLVED, APPLY ACTIVATED CARBON AT 10 TIMES SPILLED AMOUNT AT 10 PPM OR GREATER CONCENTRATION
* REMOVE TRAPPED MATERIAL WITH SUCTION HOSES
* USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES

WASTE
THIS MATERIAL LISTED AS HAZARDOUS SUBSTANCE, AS DEFINED IN SECTION 101(14) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) OF 1980, PURSUANT TO ONE OR MORE OF THE FOLLOWING:

* FEDERAL WATER POLLUTION CONTROL ACT (FWPCA) SECTION 311(B)(2)(A)
* SOLID WASTE DISPOSAL ACT SECTION 3001
* CLEAN WATER ACT (CWA) SECTION 307(A)
* CLEAN AIR ACT (CAA) SECTION 112
* TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 7
* COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 102

EPA HAZARDOUS WASTE NUMBER U127
HEXACHLOROBENZENE

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3001 AND 3002 OF RCRA

ATTACHMENT 2

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS. THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

CAS NUMBER
119-74-1

REGISTRY TOXIC CHEMICALS NUMBER
DA2775000

CLLLETINS

SPECIAL INFORMATION
PROGNOSIS WHEN TREATED. CLOSING HIGHLY TOXIC TYPES
TYPE WHAT INFORMATION YOU REQUIRE
/ALL/, SPECIFIC INFORMATION (BY LETTER COMMAND), /HELP/ OR /NONE/

ATTACHMENT 2

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATION UNDER SECTION 3006(B) OF RCRA

CAS NUMBER
58-89-9

REGISTRY TOXIC CHEMICALS NUMBER
GV4900000

BULLETINS

SPECIAL INFORMATION
TYPE WHAT INFORMATION YOU REQUIRE
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.

ATTACHMENT 2

A. Action Levels (See Item 20)

An HNU photoionization detector will be used to measure hydrocarbons (HC) as an indicator of potential airborne contamination in the vicinity of the drilling operations. The HNU Model PI 101 will be calibrated in accordance with the manufacturer's instruction manual, dated December 1985. Action limits are all expressed in terms of levels above ambient background.

- HC action limit for breathing zone samples is 5 ppm
- If breathing zone in drilling area has greater than 5 ppm HC, the team will move upwind and notify other site occupants to move upwind. Both upwind and downwind HNU readings will then be obtained.
- If downwind readings persist above 5 ppm HC for a period of more than 15 minutes, notify the Police Department to consider evacuating residents adjacent to the site. Assist police in defining safe downwind distance. Remediation could include covering the borehole, wetting down the contaminated area to suppress dust/air suspension, etc. A SCBA could be used for this activity as deemed necessary by the Site Safety Officer.
- If downwind readings are below 6 ppm HC, check borehole area for breathing zone levels. If the borehole area breathing zone level is less than 5 ppm boring activities may be resumed, using prescribed protective equipment.

B. Protective Equipment (See Items 20 and 21)

Personnel within the exclusion area (Zone 1, Attachment 1) will be required, at a minimum, to wear:

- Hardhat
- Full-face respirator with organic vapor (OV) cartridges and HEPA (high efficiency particulate air filters). Respirator cartridges or disposable respirators to be changed daily.

- Long sleeve cotton/polyester coveralls or tyvek polyethylene suits.
- Gauntlet length neoprene gloves.
- Steel toe/steel shank rubber boots.

The SSO may designate impermeable clothing (such as polyethylene coated tyvek suits or PVC rainsuits) be worn if liquid waste or precipitation are encountered.

If, in the judgement of the SSO (and in conjunction with the State DEC/DOL on-site representative) heat stress concerns or symptoms are encountered, alternative protective clothing such as breathable tyvek suits may be selected.

C. Ambient Air Sampling

To document the level of potential exposure to airborne BHC/HCB, upwind and downwind samples and personnel air samples will be collected for analysis during the boring program. One sample set (one upwind and one downwind sample) will be collected once during drilling and sampling operations. Additionally, personnel air samples will be collected in the breathing zones of the lead driller and field engineer once during the drilling and sampling operations.

SKC aircheck (or similar) samplers attached to 0.45 micron glass fiber filters followed by an isooctane bubbler will be used to collect the air samples. The samplers will be turned on in the morning at the start of work and turned off at the end of the work day. At the completion of each sampling, the glass fiber filter canister will be removed from the sampler, immediately capped, and labeled to include sample designation, location (upwind/downwind or personnel), time and duration of sampling, and date. Chain-of-custody procedures will be followed for all samples. The isooctane collection medium will be handled in the same manner.

The glass fibers (air particulate samples) and isooctane collection medium from the air sampling program will be analyzed for BHC and HCB by gas chromatography with electron capture using NIOSH Method 5502 (Appendix C).

An HNU photoionization detector will be used to measure organic vapor levels as an indicator of potential airborne contamination in the vicinity of the drilling operations. Specific procedures and action limits are described in Appendix B.

Table 1

Heat Stress Symptoms and Interventions

Disorder	Symptom	Treatment
Heat cramps	Painful muscle spasms	Rest Replace fluids and salt
Heat syncope	Fainting	Remove from heat
Heat exhaustion	Weakness Pale, cool skin Rapid pulse Decreased blood pressure	Remove from heat Replace fluids and salt Rest
Stroke	Fever, skin hot and dry Red complexion Elevated blood pressure Rapid pulse	Immediate removal from heat Bathe to reduce temperature Treat as an emergency

DECONTAMINATION PROCEDURES

Personnel

1. Details of the decontamination building (garage) are shown on Attachment 1A. Personnel will enter this building at the northwest corner of the garage when entering the site. All personnel must pass each garage suitup station and be equipped with the proper safety equipment prior to entering the investigation area (Zone 1). New or cleaned Personal Protective equipment will be on (under for boots) tables along the northern wall of the garage. Upon completion of suitup, individuals may cross the "hot line", pass the decontamination stations, and enter the site through the access control point at the southwest corner of the garage.

   At the end of each work period (before eating, drinking, smoking, or leaving the site) each person who has entered the investigation area (Zone 1) will decontaminate boots at the egress point of Zone 1, pass through the contamination reduction corridor (Zone 1A), and enter the decontamination building. Each of the following stations will be entered and used as appropriate.

   - Boot rinse at egress point of Zone 1 (gross decontamination only).

- Zone 1A walk to garage.
- Decontamination building.
- Equipment/Tool drop station.
- Boot Wash - soiled boots will be washed in a tub containing a detergent solution.
- Boot rinse - personnel will step into a tub containing rinse water after washing boots.
- Glove wash - Intact gloves will be wiped clean over a glove wash bucket containing detergent and water located on table.
- Glove rinse - washed gloves will be rinsed with water or wiped with a water wet towel located on table.
- Used work clothes will be dropped into a bag-lined garbage can.
- Spent disposable respirators or cartridges will be dropped into a bag-lined garbage can.
- Clean respirators and hardhats will be placed onto the work table along the north wall of the garage.
- Personnel may then exit the north access control point.

2. Before leaving the site, all personnel who have entered Zone 1 will change out of work clothes at the east end of the garage and into clean clothes along the northern corridor of the garage. Work clothes will be placed into plastic bags for delivery to an approved laundry. Work clothes will be laundered daily.

3. Soiled boots, hardhats, respirators, etc., will be inspected daily and, if necessary, washed and scrubbed in detergent and water. After cleaning, equipment shall be rinsed thoroughly in water and allowed to dry on a clean surface. Non-disposable respirators will be washed daily and bagged after drying.

4. All disposable work clothes, soiled gloves, and wash water will be collected and disposed of daily in 55-gallon drums. After inspection and cleaning, other items left at the site will be properly stored in a designated area.

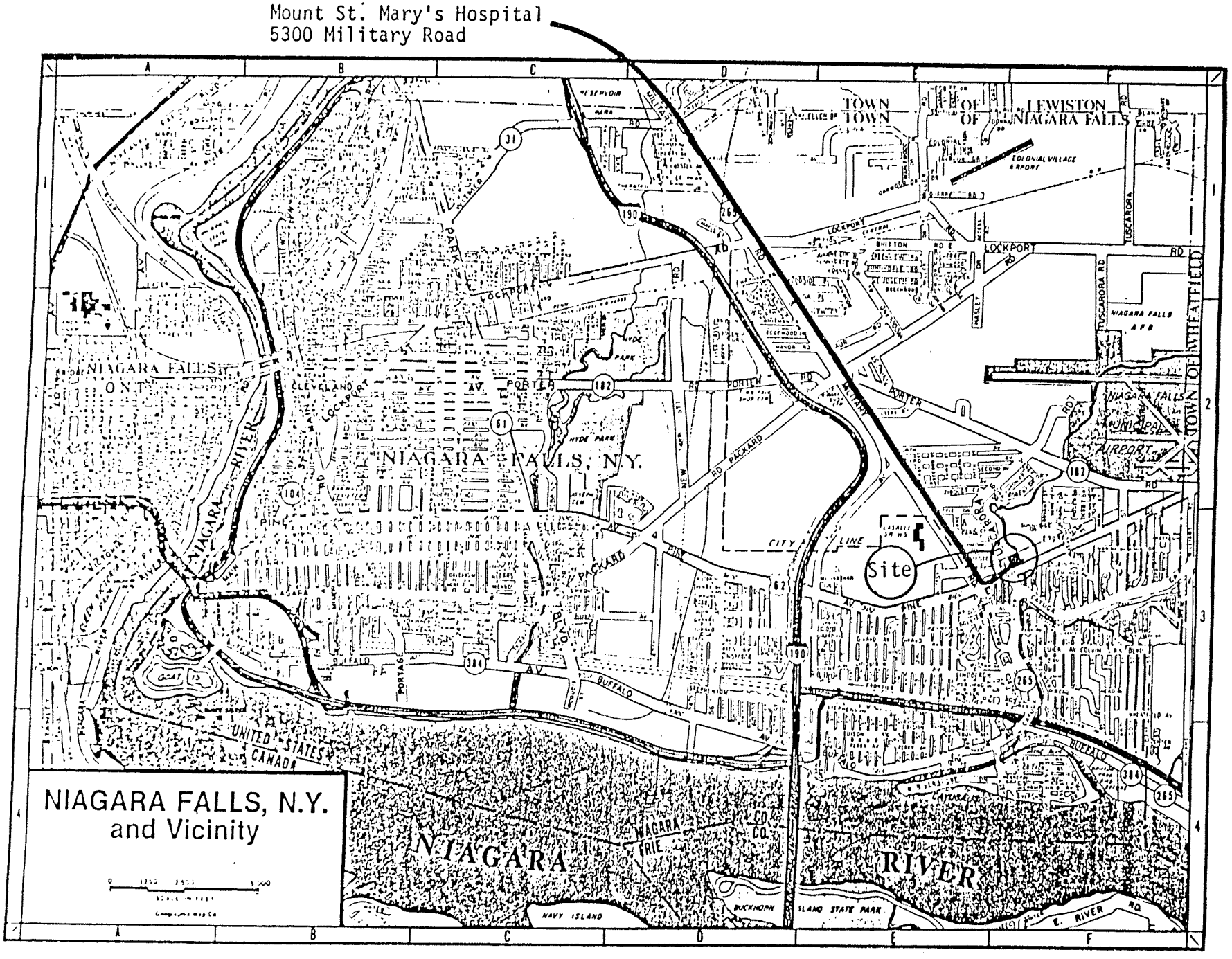
5. Personnel will shower as soon as possible at the end of the work day.

Equipment

1. Prior to drilling equipment demobilization, loose mud will be removed using brushes and scrapers and equipment will be steam cleaned over polyethylene sheets. The perimeter of the sheeting will be elevated using formwork.

2. Polyethylene sheeting, mud, and wash water will be placed in drums for subsequent disposal. Liquids may be pumped directly into drums or mixed with absorbent materials as deemed appropriate by the project manager.

3. After each well installation, augers and tools will be cleaned similarly to the process described above.



ATTACHMENT 5

For BHC/HCB in particulate matter.

(1) ALDRIN AND (2) LINDANE

FORMULA: (1) $C_{12}H_8Cl_6$ (Aldrin);
(2) $C_6H_6Cl_6$ (Lindane)
M.W.: (1) 364.93; (2) 290.85

METHOD: 5502
ISSUED: 2/15/84

	(1)	(2)
OSHA:	0.5 mg/m³ (skin)	0.25 mg/m³ (skin)
NIOSH:	Group I Pesticides [1]	
ACGIH:	0.5 mg/m³ (skin)	0.25 mg/m³ (skin)

PROPERTIES: (1): solid; MP 104 °C; VP 0.008 Pa (6×10^{-6} mm Hg; 0.12 mg/m³) @ 20 °C
(2): solid; MP 1125 °C; VP 0.0013 Pa (9.4×10^{-6} mm Hg; 0.15 mg/m³) @ 20 °C

SYNONYMS: (1) Aldrin: Octalene; CAS #309-00-2.
(2) Lindane: gamma-hexachlorocyclohexane; CAS #58-89-9.

SAMPLING

SAMPLER: FILTER AND BUBBLER
(glass fiber + 15 mL isooctane)

FLOW RATE: 0.2 to 1 L/min

VOL-MIN: 18 L @ 0.25 mg/m³ of (1) or (2)
-MAX: 240 L

SHIPMENT: transfer bubbler solutions and filters in scintillation vials; pack carefully

SAMPLE STABILITY: at least 1 week @ 25 °C

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: (1): 0.15 to 0.5 mg/m³ [2];
(2): 0.3 to 1.7 mg/m³ [2]

BIAS: not significant [2]

OVERALL PRECISION (s_r): (1): 0.092 [2];
(2): 0.086 [2]

MEASUREMENT

TECHNIQUE: GAS CHROMATOGRAPHY, ELECTROLYTIC CONDUCTIVITY DETECTOR

ANALYTE: Aldrin, Lindane

FILTER EXTRACTION: isooctane

INJECTION VOLUME: 15 µL

TEMPERATURE-FURNACE: 750 to 770 °C
-TRANSFER: 225 °C
-VENT: 205 to 260 °C
-COLUMN: 160 to 190 °C

GASES-H_2 (furnace): 150 to 160 mL/min
-N_2 (carrier): 140 mL/min

COLUMN: glass, 1.2 m x 3 mm OD; 5% SE-30 on 80/100 mesh acid-washed DMCS Chromosorb W or equivalent

CALIBRATION: solution of analyte in isooctane

RANGE: 5 to 135 µg per sample

ESTIMATED LOD: 3 µg (1) or (2) per sample

PRECISION (s_r): (1): 0.012 [2]; (2) 0.013 [2]

APPLICABILITY: The working range is 0.05 to 1.5 mg/m³ of either pesticide for a 90-L air sample. Evaporation of isooctane from the bubbler necessitates refilling the bubbler frequently.

INTERFERENCES: None identified.

OTHER METHODS: This method combines and replaces S275 [3] and S290 [3]. Lindane has also been sampled with a filter-solid sorbent train [4].

REAGENTS:

1. Aldrin, reagent grade.*
2. Lindane, reagent grade.*
3. Isooctane, chromatographic grade.
   NOTE: Needed for field use in sample collection.
4. Benzene, reagent grade.*
5. Calibration stock solution, 10 mg/mL. Dissolve 0.1 g accurately weighed Aldrin or Lindane in 1:5 (v:v) benzene:isooctane; dilute to 10 mL. Stable at least one week.
6. Hydrogen, prepurified.
7. Nitrogen, purified.

*See Special Precautions.

EQUIPMENT:

1. Sampler: glass fiber filter, organic binder-free (e.g., Gelman Type A/E), 37-mm, held without backup pad in a two-piece polystyrene cassette filter holder connected in series with a midget bubbler containing 15 mL of the collection medium.
   NOTE: a. Do not use filter holders made of Tenite.
   b. Place glass tube, 5 cm x 6 mm ID, plugged with glass wool between the exit cover of the bubbler and the inlet of the personal sampling pump to avoid splashover or solvent condensation.
2. Personal sampling pump, 0.2 to 1 L/min, with flexible connecting tubing.
3. Vial, scintillation, with PTFE-lined cap, graduated at 15 mL.
4. Gas chromatograph with electrolytic conductivity detector, quartz reduction furnace, in-line vent upstream of furnace, integrator and column (page 5502-1).
5. Syringes, 5-, 10- and 25-µL, for making standard solutions and GC injections.
6. Volumetric flasks.
7. Pipets, with pipet bulb.
8. Tweezers.

SPECIAL PRECAUTIONS: Benzene is a suspected human carcinogen; work with it only in a hood.

Aldrin and Lindane are toxic when absorbed through the skin [1].

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Add 15 mL isooctane to the bubbler.
3. Sample at 0.5 L/min for 1 to 6 hrs (30 to 180 L).
   NOTE: Check liquid level in the bubbler every 15 min. Maintain between 10 and 15 mL isooctane in the bubbler throughout the sampling period with a volume at the end of sampling of about 10 mL.
4. Remove the bubbler stem and tap it gently against the inside wall of the bubbler to transfer solvent from the stem to the bubbler.
5. Transfer contents of the bubbler to a vial. Rinse the bubbler with 2 mL isooctane. Add the rinse to the vial.
6. Transfer the glass fiber filter to the same vial using tweezers.
7. Cap the vial and pack carefully for shipment.

SAMPLE PREPARATION:

8. Adjust the volume of solution in the vial to 15 mL.

CALIBRATION AND QUALITY CONTROL:

9. Calibrate daily with at least five solutions covering the range 3 to 135 µg Aldrin or Lindane per sample.
   a. Add calibration stock solution with a microliter syringe to 15 mL isooctane in a vial.
   b. Analyze the working standards together with samples and blanks (steps 10 through 13).
   c. Prepare calibration graph (peak area vs. µg Aldrin or Lindane). Analyze three additional quality control blind spikes and three analyst spikes to ensure that the calibration graph is in control.

MEASUREMENT:

10. Set gas chromatograph to manufacturer's specifications and to conditions given on page 5502-1.
11. Mix the contents of the scintillation vial thoroughly.
12. Inject 15 µL sample aliquot using solvent flush technique or autosampler.
    NOTE: Open vent valve for 20 sec, beginning with time of injection, to prevent the solvent peak from entering the furnace.
13. Measure peak area.

CALCULATIONS:

14. Determine the mass, µg, of Aldrin or Lindane found on the sample (filter plus bubbler), W, and average media blank (filter plus bubbler), B, from the measured peak areas and the calibration graph.
15. Calculate the concentration, C (mg/m^3), of Aldrin or Lindane in the air volume sampled, V (L):

$$C = \frac{(W - B)}{V}, \ mg/m^3$$

EVALUATION OF METHOD:

Methods S275 (Aldrin) and S290 (Lindane) were issued on February 27, 1976, and March 26, 1976, respectively [3]. The substances used to generate test atmospheres at 25 °C and 760 mm Hg in dry air were Aldrite emulsifiable concentrate (64% Aldrin) and Ortho-Lindane Borer and Leaf Miner Spray [2]. Collection efficiencies and analytical method recoveries were 1.00 for both substances in the range 22 to 90 µg per sample. Sample filters extracted in isooctane immediately and stored one week at ambient conditions gave recoveries of 103% and 102%, respectively. Overall precision, s_r, was 0.092 for Aldrin and 0.086 for Lindane. No significant bias was found for either substante.

REFERENCES:

[1] Criteria for a Recommended Standard...Occupational Exposure During the Manufacture and Formulation of Pesticides, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 78-174 (1978).
[2] Documentation of the NIOSH Validation Tests, S275 and S290, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-185 (1977).
[3] NIOSH Manual of Analytical Methods, V. 3, S275 and S290, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-C (1977).
[4] Hill, R.H. and J.E. Arnold. Arch. Environ. Contam. Toxicol., 8, 621-628 (1979).

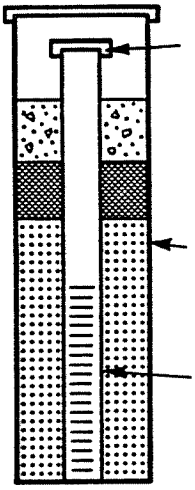
METHOD REVISED BY: Gangadhar Choudhary, Ph.D., NIOSH/DPSE; S275 and S290 originally validated under NIOSH Contract CDC-99-74-45.

APPENDIX C

APPENDIX C

Logs of Borings/Monitoring Wells

Monitoring Well Detail



LOG OF BORING MW-1 (Replacement)

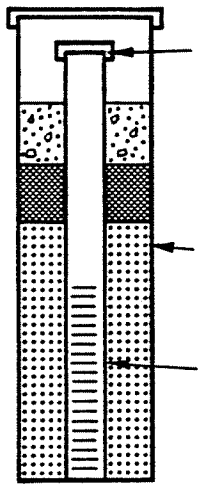
Equipment Hollow-Stem Auger

Elevation 574.4' Date 10/23/87

Depth (ft)	Sample	Blows/foot	Pocket Penetrometer (ksf)	
0		46	–	Subbase and Fill Material
	*	10	1.25	BROWN LEAN CLAY (CL) stiff, saturated, with sand
		9	2.25	clayey sand seam below 4 feet
5		19	4.5+	RED-BROWN LEAN CLAY (CL) very stiff, moist, with silt
		19	–	
10				End of Boring - 10 feet
15				

*Note: Boring was converted to a Monitoring Well on 10/23/87. G.W. elevation 571.77' on 1/28/88.

Monitoring Well Detail



LOG OF BORING MW-A1

Equipment Hollow-Stem Auger

Elevation 574.4' Date 10/23/87

Depth (ft)	Sample	Blows/foot	Pocket Penetrometer (ksf)	
0		15		Subbase and Fill Material
		12	2.75	BROWN LEAN CLAY (CL) stiff, moist, with sand
	*	12	–	saturated clayey sand seam below 4 feet
5		29	4.5+	RED-BROWN LEAN CLAY (CL) hard, moist
		26	4.5+	
10				End of Boring - 10 feet
15				

*Note: Boring was converted to a Monitoring Well on 10/23/87. G.W. elevation 569.66' on 1/28/88.

Harding Lawson Associates
Engineers, Geologists & Geophysicists

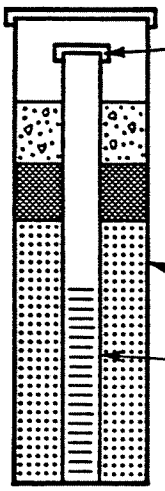
LOGS OF BORINGS/MONITOR WELLS MW-1 AND MW-A1

Gibson Site
Niagara Falls, New York

PLATE **C-1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
S.K.	17497,001.12		2/2/88		

Monitoring Well Detail



Blows/foot	Pocket Penetrometer (ksf)
12	
9	1.25
23	4.0
28	4.5+
24	2.75

LOG OF BORING MW-A2

Equipment Hollow-Stem Auger

Elevation 573.7' Date 10/23/87

Depth (ft) / Sample

0

Subbase Fill Material
BROWN LEAN CLAY (CL)
stiff, moist, with sand

*▽ 5

saturated clayey sand seams below 4 feet
RED-BROWN LEAN CLAY (CL)
hard, moist, with silt

very stiff below 8 feet

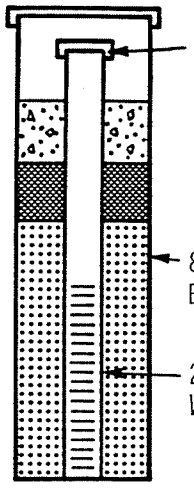
10

End of Boring - 10 feet

15

*Note: Boring was converted to a Monitoring Well on 10/23/87. G.W. elevation 569.17' on 1/28/88.

Monitoring Well Detail



LOG OF BORING MW-A3

Equipment Hollow-Stem Auger

Elevation 572.3' Date 10/23/87

Depth (ft) / Sample

0

BROWN TO YELLOW-BROWN SILTY LEAN CLAY (CL)
very stiff, dry, with organic material at ground surface
silt seam at 2 feet
RED-BROWN CLAY (CL)
hard, dry, with silt
moist below 6 feet

*▽ 5

medium stiff below 8 feet

10

End of Boring - 10 feet

15

*Note: Boring was converted to a Monitoring Well on 10/23/87. G.W. elevation 566.38' on 1/28/88.
No samples were taken due to close proximity of Boring B-3; approximately 10' offset south

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LOGS OF BORINGS/MONITOR WELLS MW-A2 AND MW-A3

Gibson Site
Niagara Falls, New York

PLATE **C-2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
S.K.	17497.001.12	[illegible]	2/24/88		

MAJOR DIVISIONS					TYPICAL NAMES
COARSE–GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE–GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION – ASTM D2487-85

Perm — Permeability
Consol — Consolidation
LL — Liquid Limit (%)
PI — Plastic Index (%)
G_s — Specific Gravity
MA — Particle Size Analysis
■ — "Undisturbed" Sample
☒ — Bulk or Classification Sample

Shear Strength (psi)		Confining Pressure	
TxUU (FM) or (S)	3200	(2600)	— Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxCU (P)	3200	(2600)	— Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
TxCD	3200	(2600)	— Consolidated Drained Triaxial Shear
SSCU (P)	3200	(2600)	— Simple Shear Consolidated Undrained (with or without pore pressure measurement)
SSCD	3200	(2600)	— Simple Shear Consolidated Drained
DSCD	2700	(2000)	— Consolidated Drained Direct Shear
UC	470		— Unconfined Compression
LVS	700		— Laboratory Vane Shear

KEY TO TEST DATA

Harding Lawson Associates
Engineers and Geoscientists

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

Gibson Site
Niagara Falls, New York

PLATE **C-3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED
RE	17497,001.12	SKN	8/14/89	

APPENDIX D

APPENDIX D

Analytical Laboratory Reports
Drum Contents

OBG LABORATORIES, INC.

Laboratory Report

CLIENT HARDING LAWSON ASSOCIATES JOB NO. 3238.001.517

DESCRIPTION Olin/Gibson Site

DATE COLLECTED 10-21-87 DATE REC'D. 10-23-87 DATE ANALYZED

Description	Sample #	PERCENT TOTAL SOLIDS	HCB (ppm)		
Drum Areas:					
D-1, 3'-5'	G2206	93.	48000.		
D-2, 3.5'-5.5'	G2207	-	-		
D-2, 5.5'-6.5'	G2208	-	-		
D-3, 2.5'-4.5'	G2209	93.	53000.		
D-4, 2.5'-4.5'	G2210	-	-		
D-5, 3.5'-5.5'	G2211	96.	47000.		
D-6, 3.5'-5.5'	G2212	92.	48000.		
D-7, 4'-6'	G2213	82.	39000.		
D-9, 3.5'-4.5'	G2214	94.	45000.		

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/ℓ (ppm) unless otherwise noted

Comments:

Authorized: [signature]

Date: April 8, 1988

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY / 13221 / (315) 457-1494

Telephone 615/336-4000
Telecopier 615/336-4183

Olin CHEMICALS

P. O. Box 248, Charleston, TN 37310

LETTER OF TRANSMITTAL

TO Steve Neely - HLA
6220 Westpark Drive, Ste. 100
Houston, TX 77057

DATE 5-12-89

RE: HCB Drum Analysis

GENTLEMEN:

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

☐ Prel. drawings ☐ Prints ☐ Draft report _____

☑ Analytical data ☐ Specifications ☐ Final report

Copies	Prepared by	Description
1		

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Revise and resubmit

☐ For your information ☐ Approved as corrected ☐ Copies for distribution

☑ As requested ☐ Returned for corrections ☐ Corrected prints

☐ For review and comment ☐ _____

REMARKS _____

COPY TO file

SIGNED Blaine Burtard

OLIN CORPORATION
ENVIRONMENTAL AFFAIRS DEPARTMENT

OC-10000A REV 5/86

RECEIVED
JUN 10 1988
B. BUTAUD

INTER OFFICE MEMO Olin

FILE COPY

TO B. Butaud AT Charleston DATE 7/7/88 6/7/88

FROM T. Groom/D.F. Giordano AT Cheshire COPY TO R. N. Scott
R. J. Fenn
D. Cummings

SUBJECT Hexcachlorobenzene Sample
Olin - Gibson Site

Pursuant to your request we have assayed the sample of waste hexachlorobenzene received in our lab on 5/31/88. This sample was labelled Niagara Olin/Gibson Site; Sample dated 10/21/87; Location D-1; 3'-5'; OBG Sample # G2206. The sample was dissolved in chloroform and analyzed by capillary flame ionization gas chromatography. Two standards of authentic hexachlorobenzene (assay 99.8%) were prepared and used as a two point calibration curve. Two separate samples of the waste specimen were prepared and each was run in duplicate vs. the standards. Areas for the unknowns fell between the standard values. Results are shown below:

Sample #1 %	Sample #2 %
91.92, 95.36	89.39, 90.36

Average Assay - 91.78% HCB

The sample was also analyzed by Electron Impact GC/MS using capillary column chromatography. Three components were identified; hexachlorobenzene, pentachlorobenzene, and a trace of pentachloronitrobenzene. Pentachlorobenzene is present at the percent level.

T. Groom

D. F. Giordano

```
CHRO: TSQ14526 ver 1 on UIC 1 103      1-JUN-88 Elapse: 00:00:01      1
Samp: 2406-CE GIBSON SITE HCB 10/21/87 D1 3-5  Start : 10:12:32   2991
Comm: GC-ACIDBASE 1.5UL IN CH2CL2 EI+
Mode: EI +Q1MS LMR  UP LR
Oper: TG                                       Inlet : GC
Peak: 1000.00 mmu     Label wndw: 1000 > 3000  Masses: 45 > 650
Area: 0, 4.00         Baseline  : 0, 3         Label : 0, 40.00
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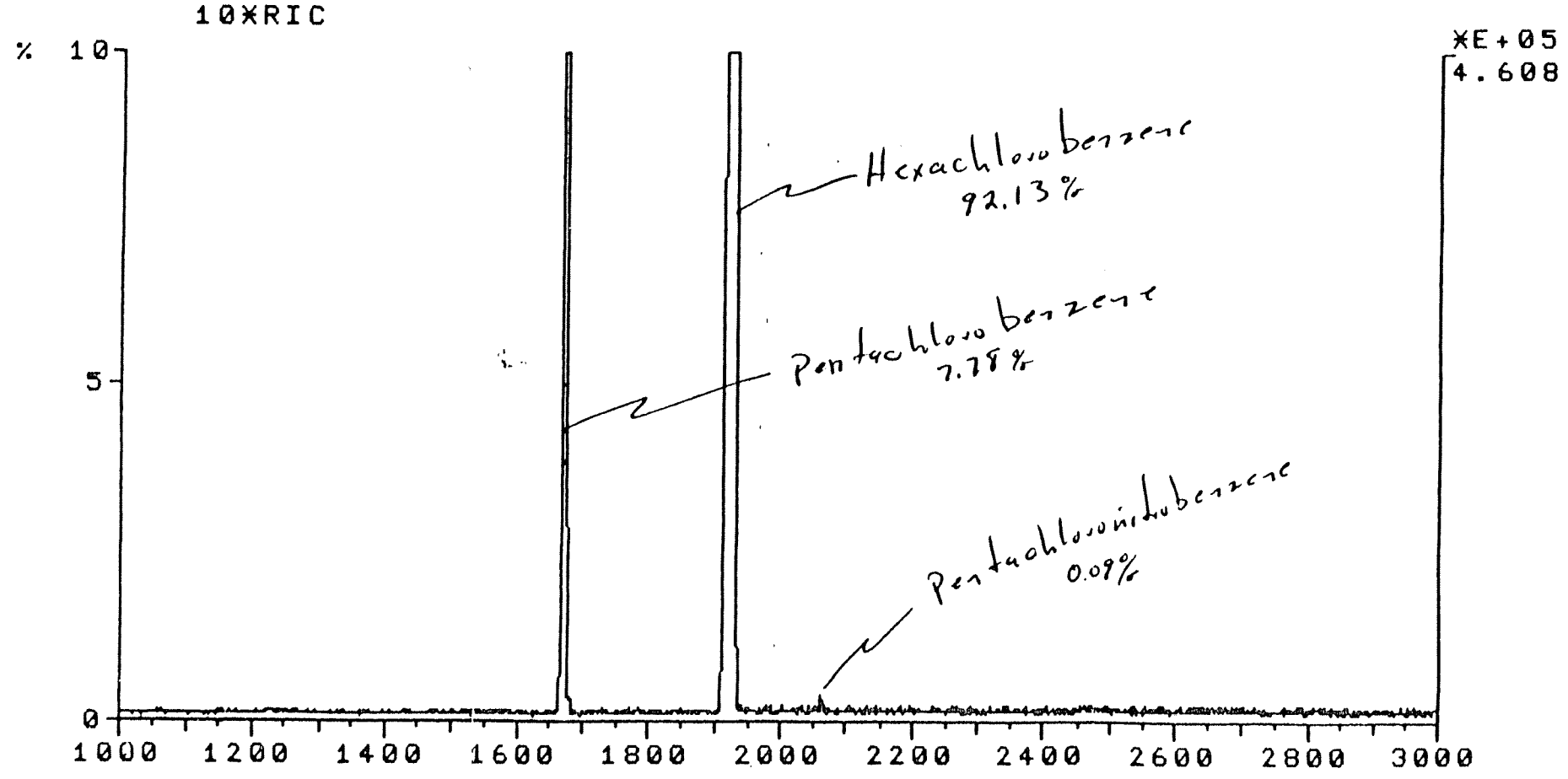
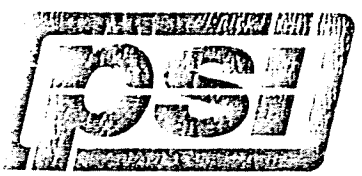


CHRO1: _

APPENDIX E

APPENDIX E

Drum Metal Analysis Results



Professional Service Industries, Inc.
Pittsburgh Testing Laboratory Division

Professional Service Industries, Inc.
Pittsburgh Testing Laboratory Division

850 Poplar Street
Pittsburgh, Pennsylvania 15220
412/922-4000

REPORT

Project #825-82409
Laboratory #894028
February 4, 1988

Report Of: Failure Analysis Of Buried Drums

Report To: Harding Lawson Associates
6220 Westpark Drive
Suite 100
Houston, TX 77057

Attention: Mr. James W. Tremblay

Introduction

Drums that had been in service in upstate New York developed corrosion which led to deterioration of the drum material. These drums had been buried for 30 years and contained hexachlorobenzene. Professional Service Industries-PTL Division received three samples collected from buried drums. It was reported that the samples had been exposed to the ambient air for approximately three months prior to testing.

Harding Lawson Associates required testing to determine the extent of corrosion, thickness, and integrity of drum's material.

Visual Examination

The submitted samples were identified as "D-2, large sample", "D-2, small sample", and "D-6". Photographs of the as-received samples and the metallographic cross-sections prepared from them are shown in Figures 1 through 4. Visual examination of the samples showed several features of interest:

1. Examination of the surfaces of all the samples showed a white deposit which consisted of several distinct layers. The top layer was covered with a loose, non-uniform whitish compound which broke away readily from the other layers beneath. The middle and innermost layers adhered firmly to one another. Cavities, cracks, and pores (both closed and open) were observed in the whitish deposit.

2. The corrosion was observed to be localized and appeared to have proceeded non-uniformly along the surface. There was also evidence of pitting. Both of these features are characteristic of the appearance of corrosion failures.

3. One of the corroded pieces was tested by attempting to bend it. The piece broke after being bent only once over on itself.

Cross Section Microscopy

Cross sections of the submitted samples were cut and examined using metallographic techniques. Figures 5 through 7 show cross section photomicrographs of the submitted samples in the unetched condition. The microstructure exhibits severe corrosion and pitting, but no evidence of any other deleterious action.

Thickness Measurements

Representative sections of submitted samples containing localized and uniform corrosion were cut, polished and examined microscopically to determine the thicknesses.

Thickness measurements were performed using a microscope and calibrated eyepiece. The results of the sample thickness survey (in inch) are listed below:

Reading	Sample D-2 (small)	Sample D-2 (large)	Sample D-6
1	0.042	0.039	0.039
2	0.040	0.039	0.037
3	0.017	0.025	0.008
4	0.042	0.029	0.035

Note: Pit depths have more significance than uniform corrosion.

Scanning Electron Microscopy (SEM)

SEM (Scanning Electron Microscopy) is used for the observation of specimens at very high magnifications. An important advantage of SEM over optical microscopy is that the depth of field in SEM is much higher; thus the SEM can focus on all sections of a three-dimensional object.

A detailed Scanning Electron Microscopy analysis of the submitted samples was performed in order to characterize the morphology and surface structure of the corroded samples.

SEM photomicrographs of specimens at low and high magnifications are shown in Figures 8 through 12. They illustrate various features of the surface morphology as well as showing some of the areas where EDS analysis was conducted.

Energy-Dispersive X-Ray Spectroscopy (EDS)

EDS is a method of x-ray analysis which discriminates among the energy levels of the characteristic x-ray produced during electron beam irradiation of a sample. Limitations of EDS analysis include the inability to analyze light elements (e.g. C, N, O), and that it is at best a semiquantitative method.

EDS microanalysis of the corrosion product on the external surface of the submitted sample indicated that the sample contained iron together with chlorine, calcium, magnesium and silicon. The information on elemental analysis is presented in Exhibits A through M.

DISCUSSION

Detailed visual, metallurgical and scanning electron microscopy as well as EDS microanalysis revealed the following evidence:

1. Presence of corrosion and pitting on the sample surfaces. Cross sections through portions of the drums showed evidence of severe damage. Figures 5 through 7 show micrographs of submitted samples. The external surfaces show extensive corrosion and pitting, which indicates a high rate of attack.

2. Presence of a distinctly layered deposit on the outer surface. The corrosion deposits did not appear to be homogeneous, but rather consisted of a series of layers differing in appearance, adherence, porosity and chemical makeup. The corrosion products were shown to contain many volume defects (see SEM micrographs, Figures 8 - 12). Open pores, closed pores, cracks and both loose and tight deposits were all observed in the scale. Cross section microscopy confirmed the presence of distinct layers and EDS analysis confirmed the presence of chloride.

Figures 5 through 7 show micrographs of the cross sections of the submitted samples. Cross sections through the samples showed pitting corrosion with high rate of attack and some holes which went all the way through.

Based on this evidence, the most likely explanation for the failure of the submitted samples is that they underwent severe pitting corrosion. The surface shows extensive pitting, which indicates a high rate of attack. It should be noted that individual pit depths have more significance than uniform corrosion rate.

Pitting is a type of localized corrosion of surfaces which is confined to a small area and which takes the form of cavities. This type of attack results from the formation of local electrolytic cells due to differences in electrochemical potential at adjacent areas of the surface. As a result the metallic constituents in the pit become anodic to the surrounding material, and are corroded away. Pitting corrosion is the type of corrosion which occurs when a material comes into contact with a corrosive environment, usually one containing chloride, and it is a phenomenon that can cause extremely severe deterioration in metals. When the corrosion product was removed, the surface beneath showed well-defined localized corrosion in agreement with the mechanism proposed above.

It was reported that the samples had been exposed to ambient air for a period of three months. Atmospheric corrosion rates are determined by relative humidity and pollution. The corrosion rate of these type of systems in even the heaviest-polluted air is unlikely to exceed 5 mil/year (127 micrometer/year). However, the degree of corrosion observed in the submitted samples was far more severe than this. The corrosion rate exceeded 50 mil/year in certain areas which is an indication that the corrosion process started long before the exposure of samples to ambient air.

The failure of the samples submitted by Harding Lawson Associates exhibits all of the characteristics of a pitting corrosion failure. The presence of elements that are common in water deposits (Ca, Si) indicate that the environment was also aqueous. Exposure to an environment such as this would result in corrosion via the mechanism described above, and would lead to severe deterioration such as was observed in the submitted samples.

Conclusion

This investigation revealed that there was evidence of extensive localized corrosion on the surface of the submitted samples, and that the deterioration of the submitted samples was most likely due to pitting corrosion. Metallographic and SEM analysis confirmed the severity of the pitting corrosion and the presence of holes and corrosion products. EDS confirmed the presence of chlorine and water deposits. In conclusion, the observed corrosion may lead to severe deterioration and eventual failure of the drums.

Prepared By:

Mehrooz Zamanzadeh, Ph.D.
Senior Corrosion Specialist

Reviewed And Approved By:

Kenneth M. O'Connor, Manager
Metallurgical Division

MZ/dla
Attachments
Distribution: 1 - Client

Exhibit A

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 27-JAN-87 00:00

ID:D-2 LARGE SAMPLE SIDE 1

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	13.58	18.72	1091.42
FE KA	75.16	65.79	1029.95
SI KA	0.00	0.00	-17.20
CA KA	9.04	11.03	550.48
MG KA	2.22	4.46	90.46
AL KA	0.00	0.00	-87.25

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 3.94 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

SI KA = 0.6971
MG KA = 0.4561
AL KA = 0.5848

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.03 TO 2.05 MICRONS ***

Exhibit B

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 27-JAN-87 00:00

ID:D-2 LARGE SAMPLE

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	20.03	27.81	771.19
FE KA	75.05	66.14	491.23
SI KA	0.00	0.00	-9.19
CA KA	4.92	6.04	142.05
MG KA	0.00	0.00	-59.94
AL KA	0.00	0.00	-41.24

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 3.91 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

MG KA = 0.4577
AL KA = 0.5940

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.03 TO 2.07 MICRONS ***

Exhibit C

EG&G ORTEC
ZAP MICROANALYSIS REPORT
V02.12 27-JAN-87 00:28

ID:D-2 LARGE SAMPLE SIDE 2 - outside

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	25.35	32.30	2698.01
CA KA	7.12	8.02	560.77
SI KA	2.16	3.47	241.69
FE KA	62.22	50.33	1115.59
MG KA	3.17	5.88	184.57
AL KA	0.00	0.00	-151.40

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 3.17 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

MG KA = 0.4960
AL KA = 0.6166

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.27 TO 2.55 MICRONS ***

Exhibit D

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 27-JAN-87 00:28

ID:D-2 LARGE SAMPLE SIDE 2

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	12.77	13.73	1391.44
CA KA	15.54	14.78	1280.47
SI KA	10.58	14.35	1232.53
FE KA	43.48	29.67	804.14
MG KA	16.70	26.17	1159.16
AL KA	0.93	1.31	83.26

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 2.62 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

MG KA = 0.5683
AL KA = 0.6223

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.55 TO 3.09 MICRONS ***

Exhibit E

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 27-JAN-87 01:29

ID:D-2 SMALL SIDE 1

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	6.31	7.66	340.74
FE KA	62.02	47.79	580.80
MG KA	4.84	8.57	149.24
CA KA	10.73	11.52	448.00
SI KA	10.41	15.96	597.19
AL KA	3.47	5.54	154.97
S KA	2.21	2.96	131.29

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 3.51 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

MG KA = 0.5019
AL KA = 0.6154

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.15 TO 2.30 MICRONS ***

Exhibit F

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 27-JAN-87 01:29

ID:D-2 SMALL SIDE 1

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	4.20	4.84	215.63
FE KA	52.86	38.64	466.64
MG KA	6.81	11.43	209.52
CA KA	17.53	17.86	693.45
SI KA	13.70	19.91	752.06
AL KA	4.48	6.77	193.89
S KA	0.43	0.54	23.89

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 3.09 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

MG KA = 0.5297
AL KA = 0.6309

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.31 TO 2.62 MICRONS ***

Exhibit G

EG&G ORTEC
ZAP MICROANALYSIS REPORT
V02.12 27-JAN-87 01:50

ID:D-2 SMALL SIDE 2

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	0.82	0.86	26.10
FE KA	27.51	18.37	146.22
SI KA	15.21	20.20	534.17
S KA	0.00	0.00	-26.11
MG KA	11.07	16.98	236.65
AL KA	3.04	4.20	85.17
CA KA	42.35	39.40	1023.26

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 2.20 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

MG KA = 0.6048
AL KA = 0.6712

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.84 TO 3.67 MICRONS ***

Exhibit H

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 27-JAN-87 01:50

ID:D-2 SMALL SIDE 2

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
CL KA	1.25	1.27	52.52
FE KA	30.83	19.77	221.36
SI KA	23.85	30.41	1119.42
S KA	0.00	0.00	-22.07
MG KA	11.60	17.08	340.47
AL KA	5.71	7.58	217.94
CA KA	26.75	23.90	865.02

ACCELERATING VOLTAGE: 11.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 2.44 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

MG KA = 0.6154
AL KA = 0.6765

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.66 TO 3.31 MICRONS ***

Exhibit I

EG&G ORTEC
ZAP MICROANALYSIS REPORT
V02.12 26-JAN-88 00:01

ID:D-6 SIDE = 1

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
FE KA	94.20	92.07	1013.78
SI KA	0.00	0.00	-26.23
CA KA	5.60	7.63	222.89
CL KA	0.20	0.30	9.39

ACCELERATING VOLTAGE: 12.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 6.36 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

SI KA = 0.6284

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 0.82 TO 1.42 MICRONS ***

Exhibit J

EG&G ORTEC
ZAP MICROANALYSIS REPORT
V02.12 26-JAN-88 00:01

ID:D-6 SIDE 1

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
FE KA	99.98	99.98	1183.25
SI KA	0.00	0.00	-64.41
CA KA	0.00	0.00	-6.31
CL KA	0.02	0.02	0.81

ACCELERATING VOLTAGE: 12.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 7.86 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

SI KA = 0.6196

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 0.66 TO 1.15 MICRONS ***

Exhibit K

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 26-JAN-87 00:00

ID:D-6 SIDE 2

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
FE KA	71.94	61.94	1197.47
CL KA	28.06	38.06	2155.15

ACCELERATING VOLTAGE: 12.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 3.68 G/CC

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.42 TO 2.31 MICRONS ***

Exhibit L

EG&G ORTEC
ZAF MICROANALYSIS REPORT
V02.12 26-JAN-87 00:11

ID:D-6 SIDE 2

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
FE KA	92.34	88.43	2165.86
CL KA	7.62	11.49	799.64
SI KA	0.04	0.08	4.05

ACCELERATING VOLTAGE: 12.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 6.01 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

SI KA = 0.6350

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 11.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 0.87 TO 1.50 MICRONS ***

Exhibit M

EG&G ORTEC
ZAP MICROANALYSIS REPORT
V02.12 26-JAN-87 00:11

ID:D-6 SIDE 2

ELEMENT	WEIGHT PERCENT	ATOMIC PERCENT	INTENSITY (CPS)
FE KA	75.92	66.68	1913.55
CL KA	24.08	33.32	2783.84
SI KA	0.00	0.00	-15.05

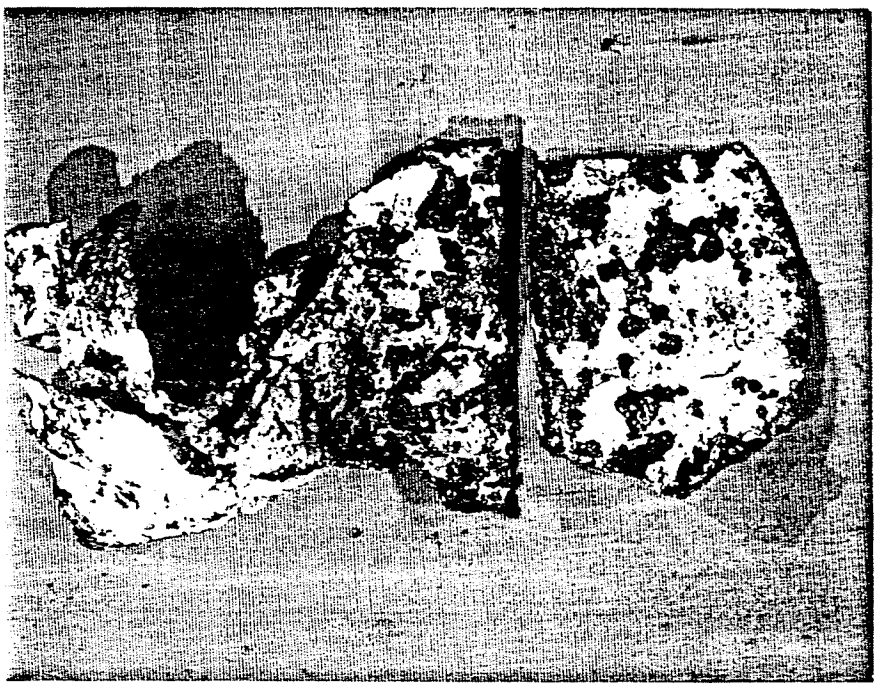
ACCELERATING VOLTAGE: 12.0 KV
SPECIMEN TILT X-AXIS: 0.0 DEGREES
Y-AXIS: 0.0 DEGREES
INCIDENCE ANGLE : 90.00 DEGREES
TAKEOFF ANGLE : 40.00 DEGREES
SAMPLE DENSITY : 3.98 G/CC

***** W A R N I N G *****
ABSORPTION CORRECTION FOR
THE FOLLOWING ELEMENTS IS
LESS THAN 0.7!

SI KA = 0.6700

TO MINIMIZE ABSORPTION CORRECTIONS
FOR THESE X-RAY LINES LOWER VOLTAGE
TO 12.0 KV

*** SPATIAL RESOLUTION OF ANALYSIS ***
*** 1.31 TO 2.27 MICRONS ***



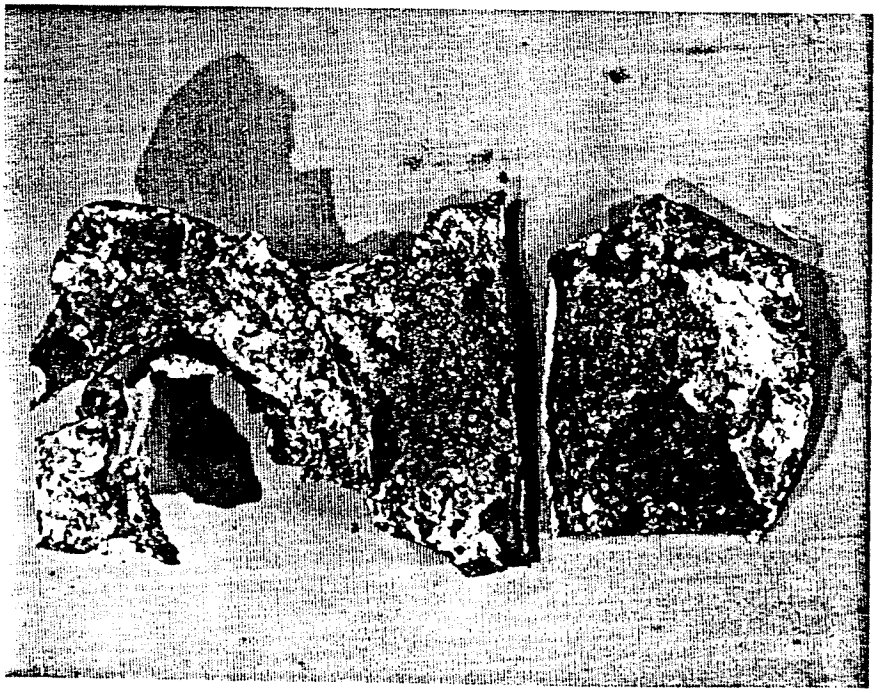


Figure 1: The as-received sample identified as "D-2, Large Sample". Note the precence of corrosion product, pores, and cavities on the outer surface.

Project #825-82409, Laboratory #894028

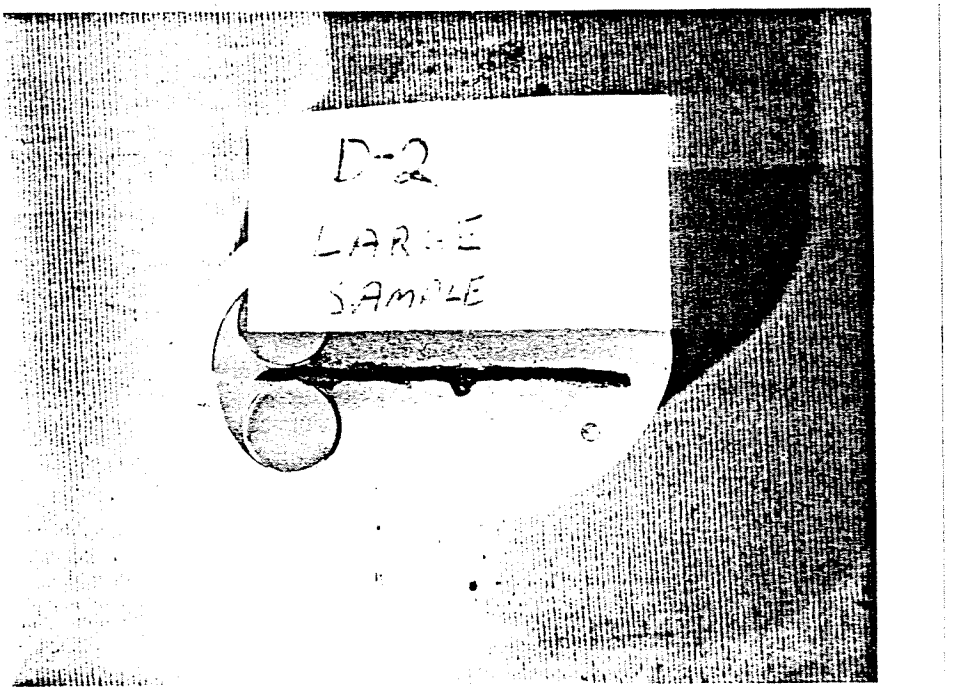
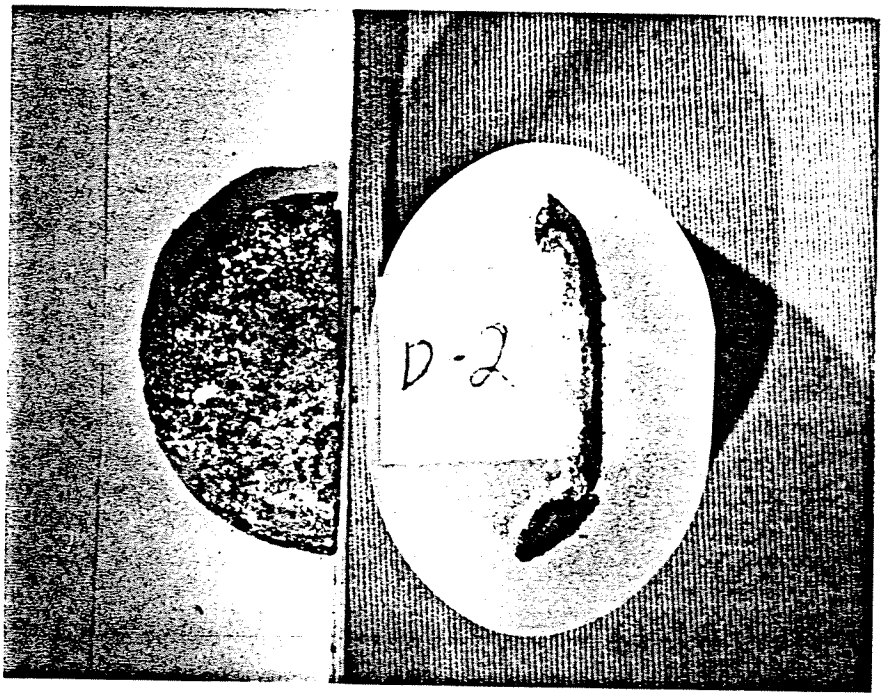


Figure 2: The cross section of the as-received sample "D-2, Large Sample".

Project #825-82409, Laboratory #894028



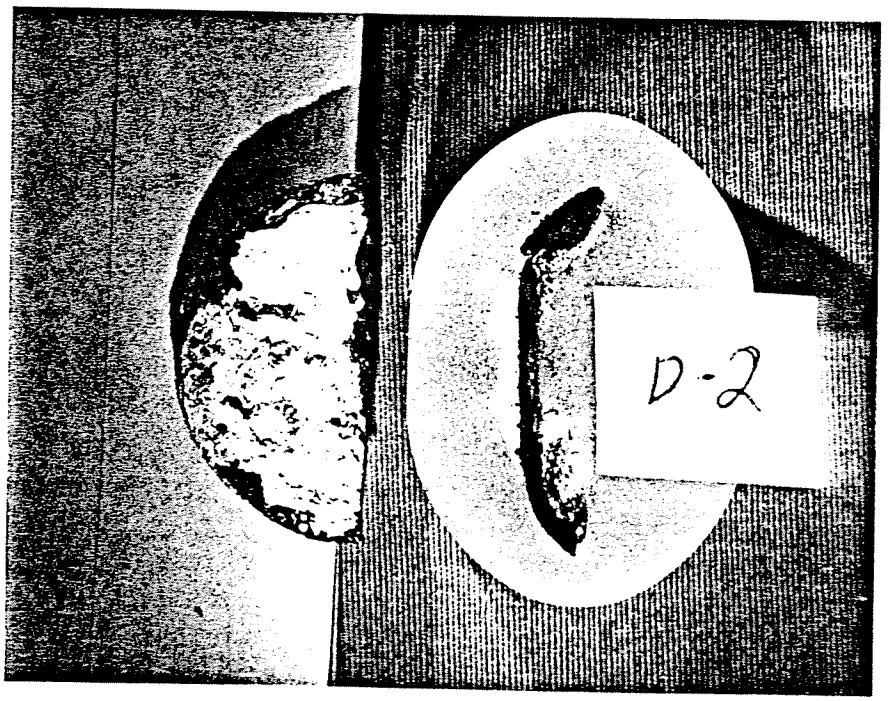


Figure 3: The as-received sample and cross section of the sample identified as "D-2, Small Sample" showing the presence of distinct layers on the outer surface.

Project #825-82409, Laboratory #894028

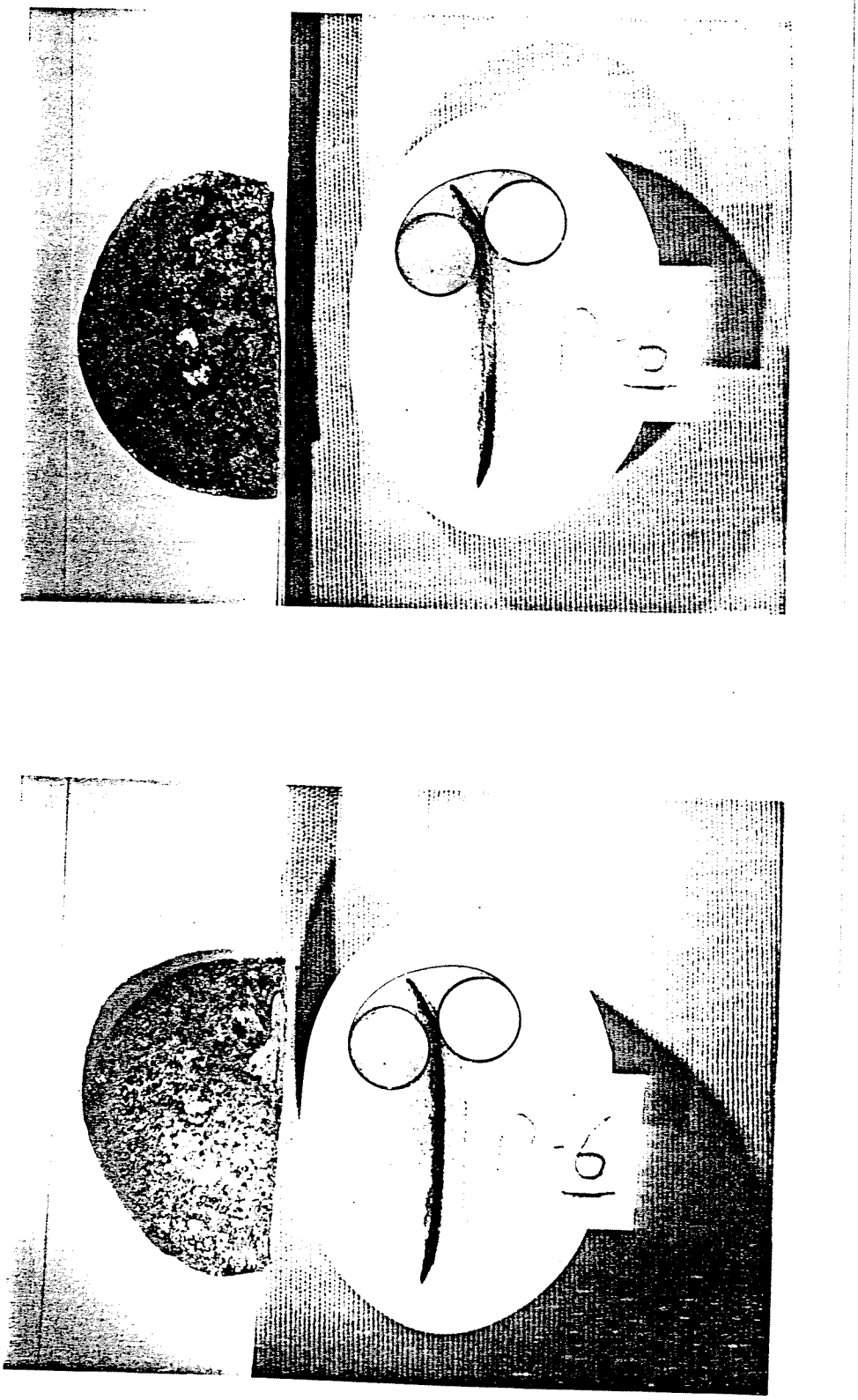


Figure 4: The as-received sample and cross section of the submitted sample identified as "D-6".

Project #825-82409, Laboratory #894028

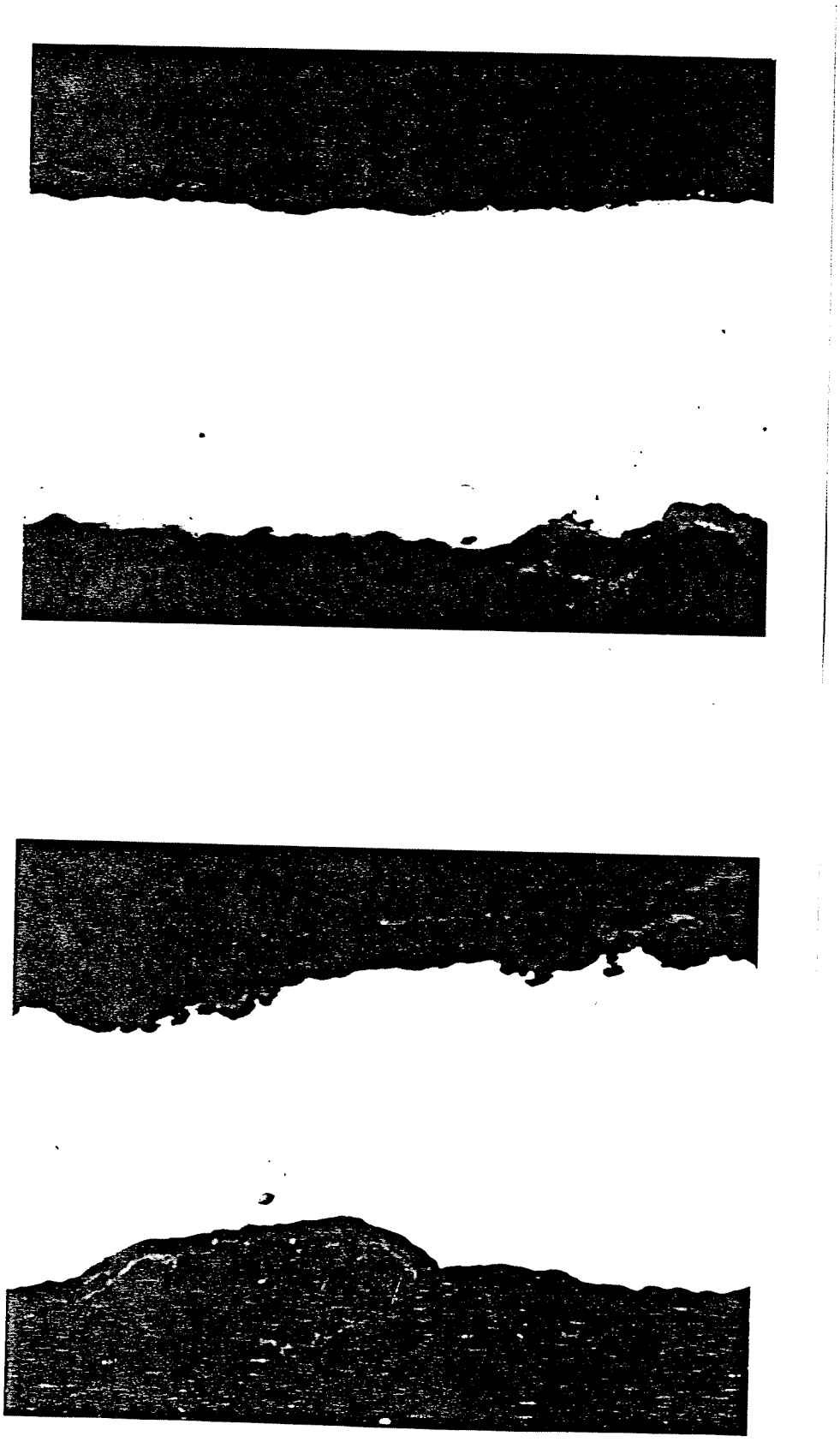


Figure 5: Cross section micrographs of the sample "D-2, Large Sample" at 50X showing the extent of damage; note the evidence of pitting.

Project #825-82409, Laboratory #894028

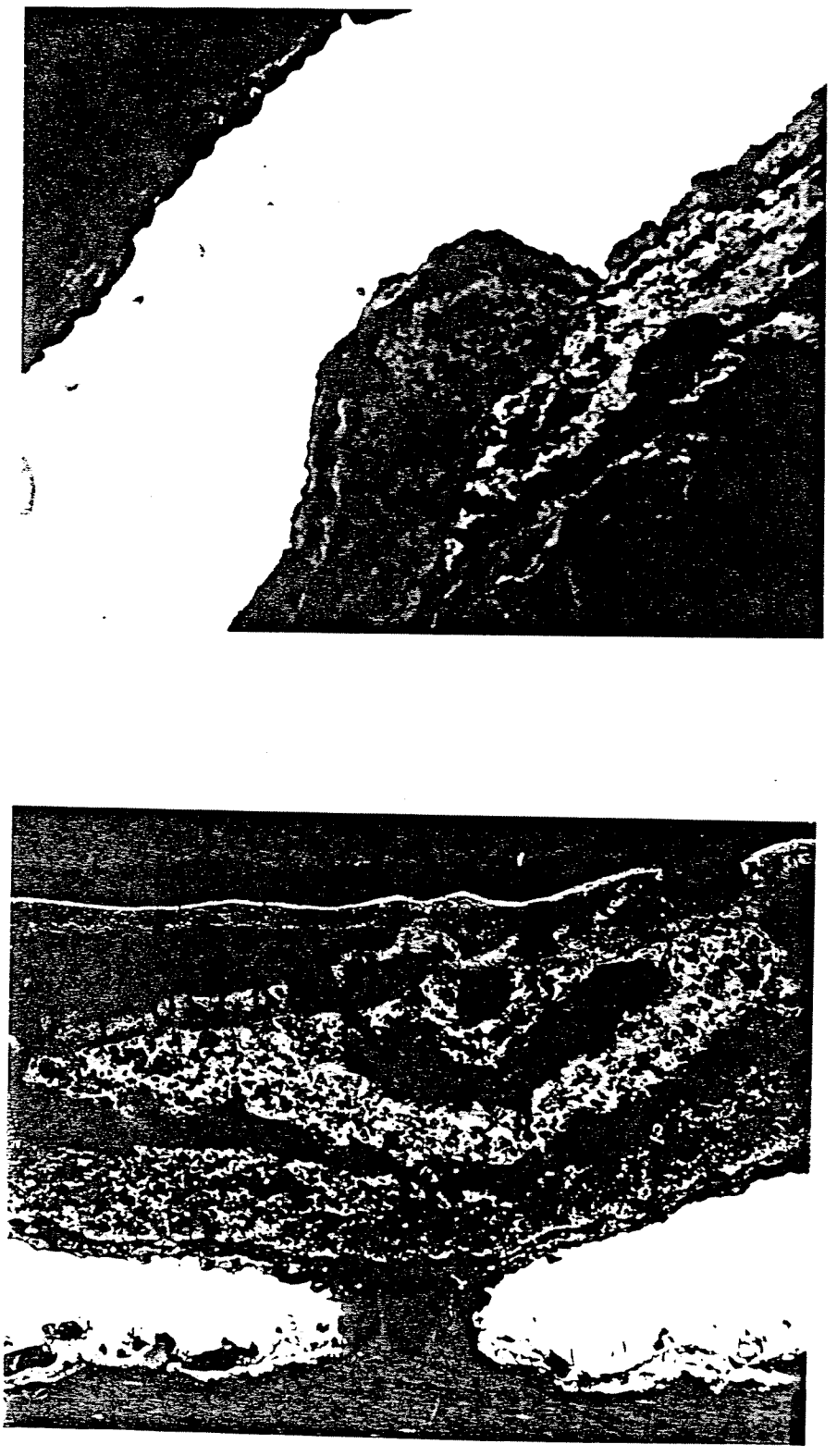


Figure 6: Cross section micrographs of the sample "D-2, Small Sample" in the unetched condition at 50X and 100X showing the extent of corrosion and the corrosion product; note the evidence of pitting and at one point, a hole going completely through the sample.

Project #825-82409, Laboratory #C94028

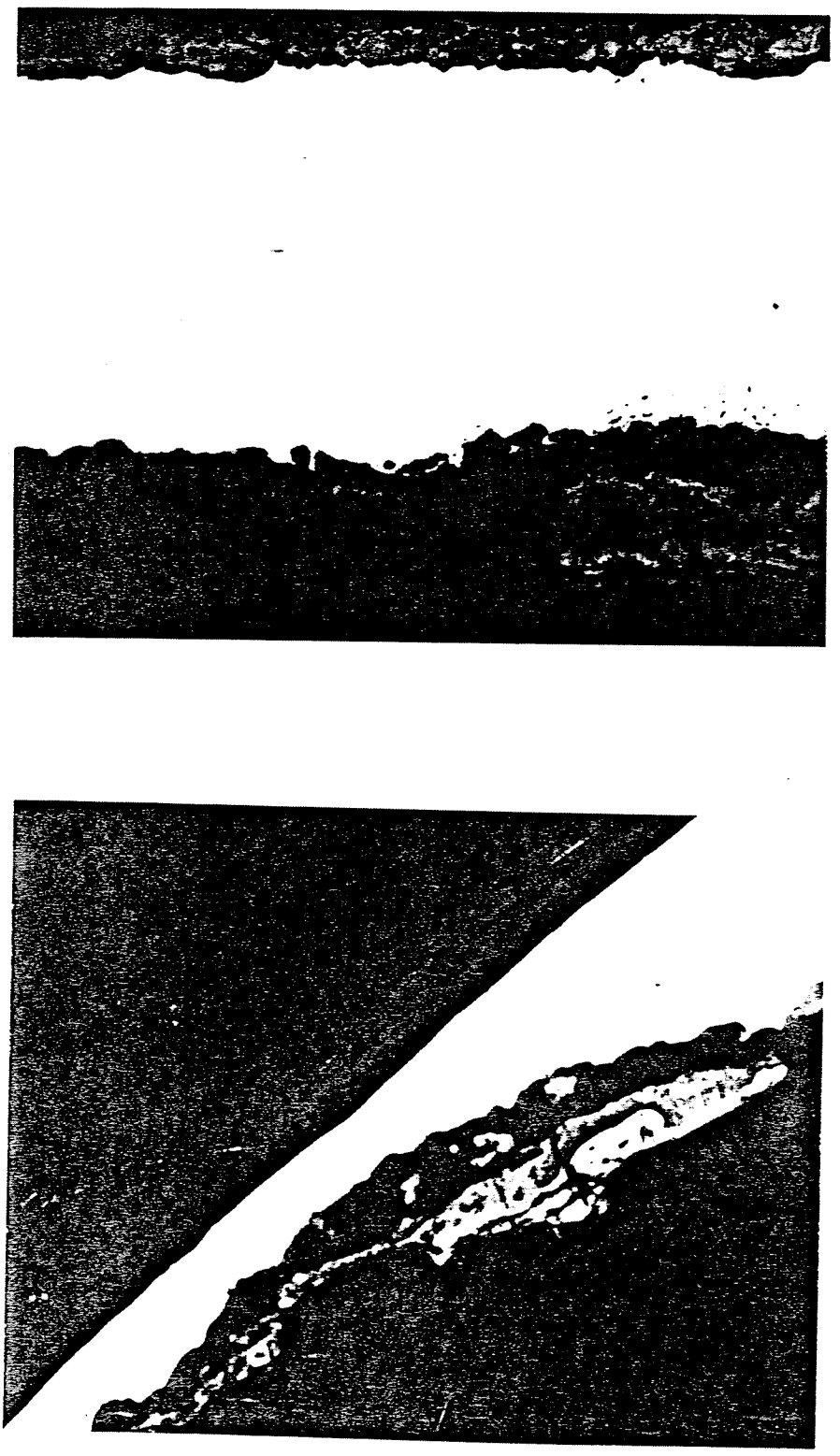


Figure 7: Cross section micrographs of the submitted sample "D-6" in the unetched condition at 50X showing the extent of corrosion and pitting. Note the high degree of attack.

Project #825-82409, Laboratory #894028

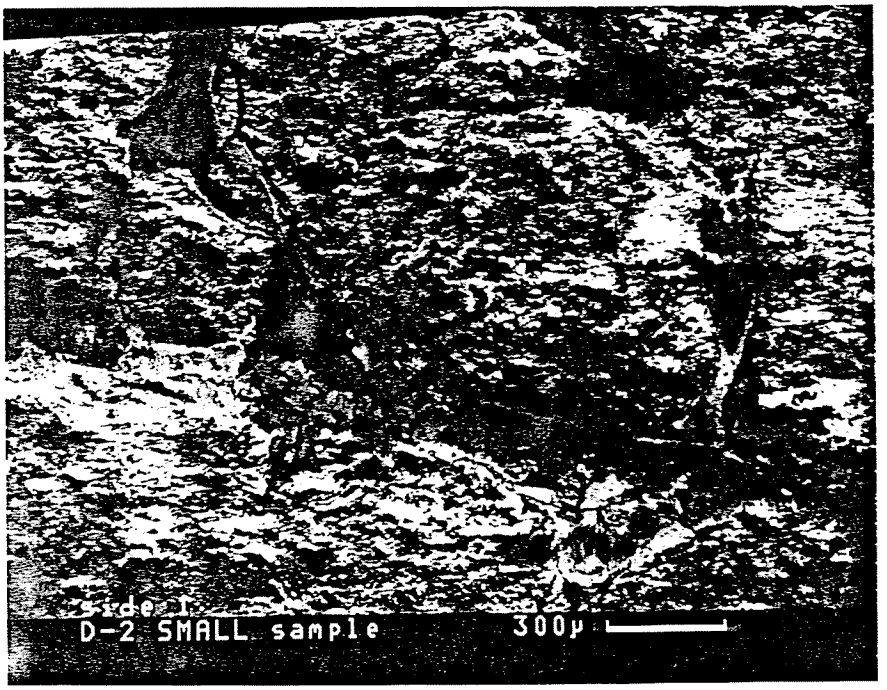
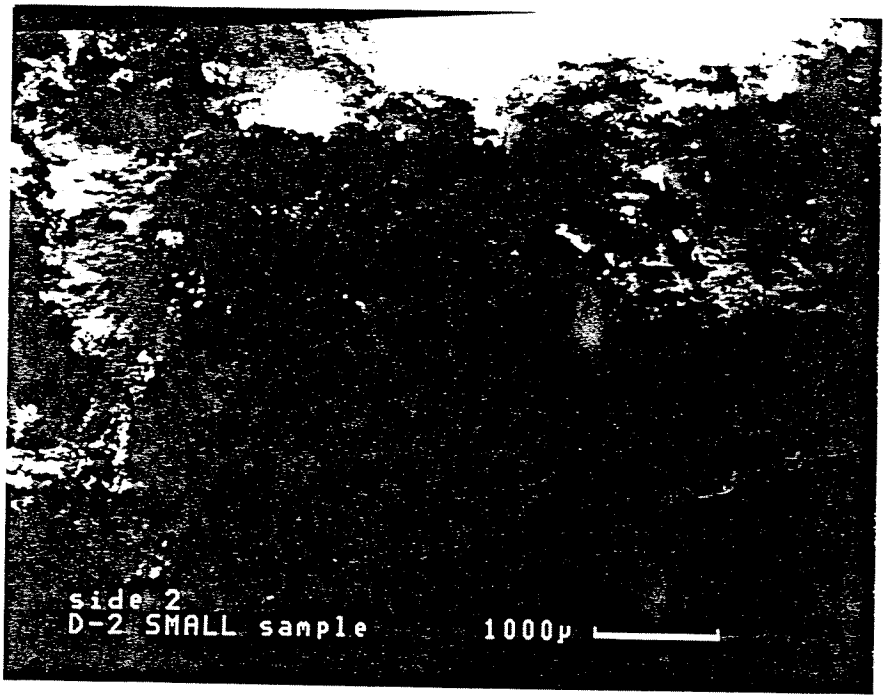


Figure 8: SEM photomicrograph of an area on the corroded surface of sample "D-2, Small" showing the surface morphology characteristics of the corrosion product.

Project #825-82409, Laboratory #894028



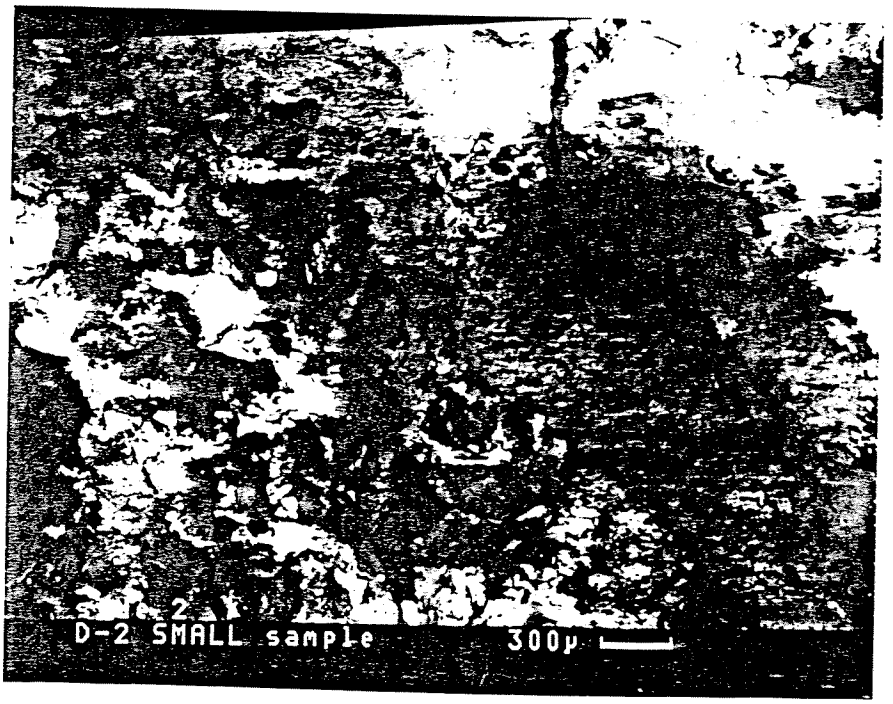
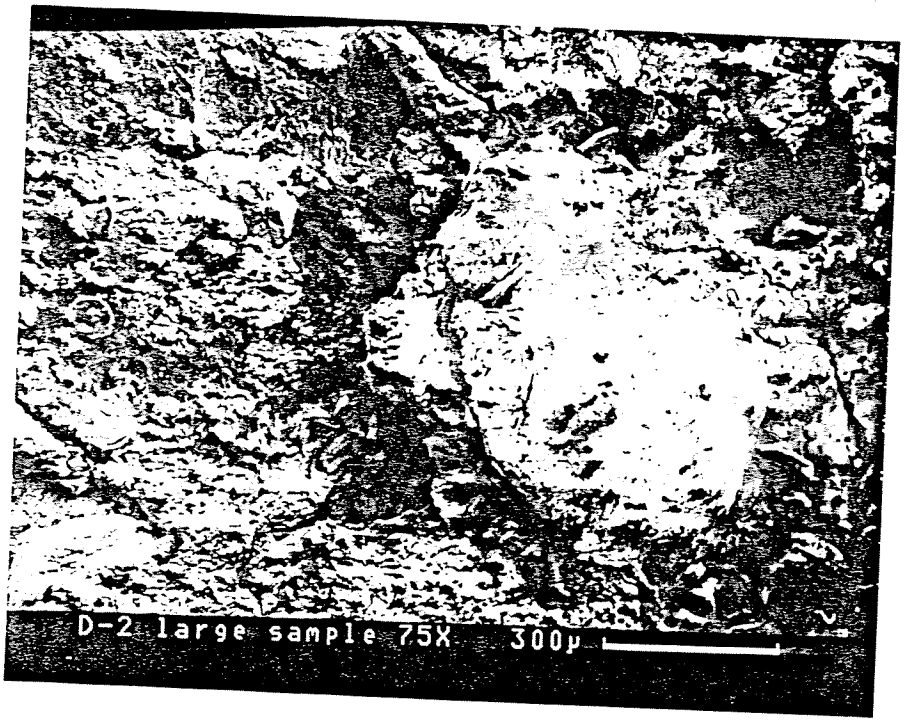


Figure 9: SEM photomicrographs of two areas on the opposite side of sample "D-2, Small" showing the surface morphology characteristics of the corrosion product.

Project #825-82409, Laboratory #894028



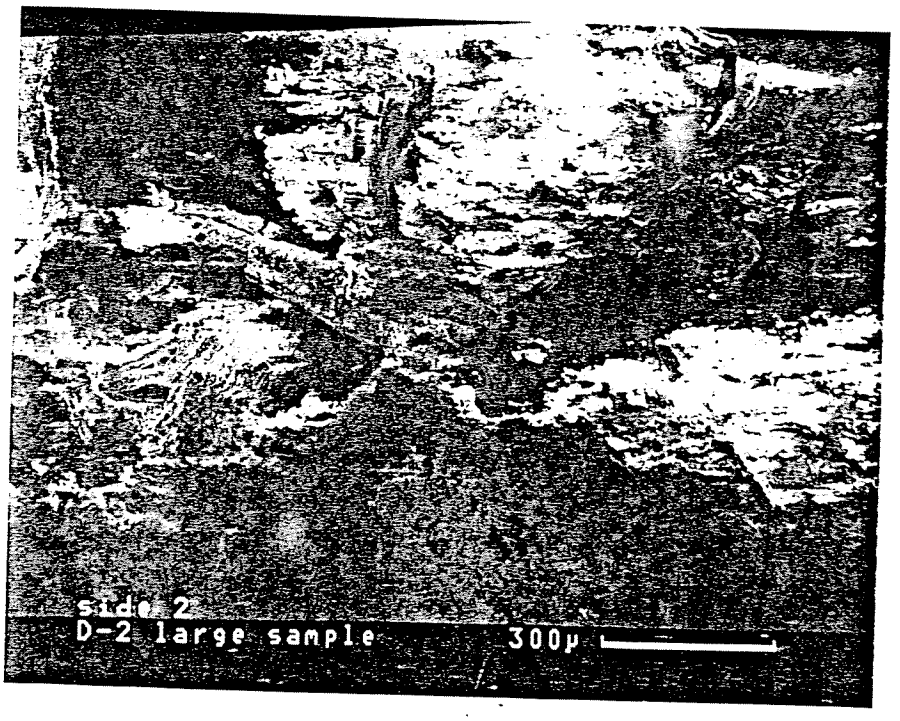
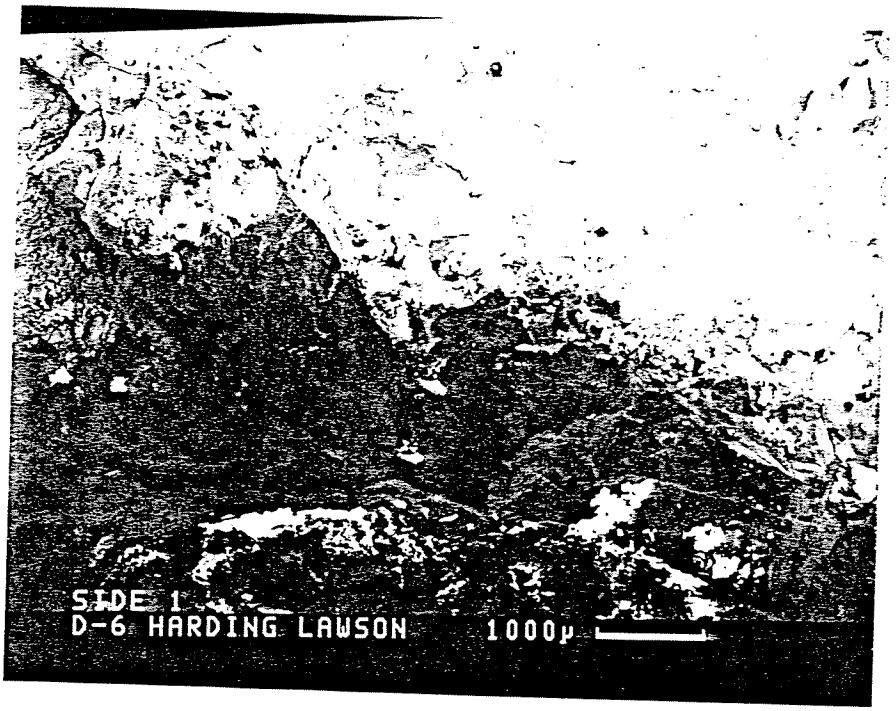


Figure 10: SEM photomicrographs of two areas (one on each side) of the corroded surface of sample "D-2, Large" showing the surface morphology characteristics of the corrosion product.

Project #825-82409, Laboratory #894028



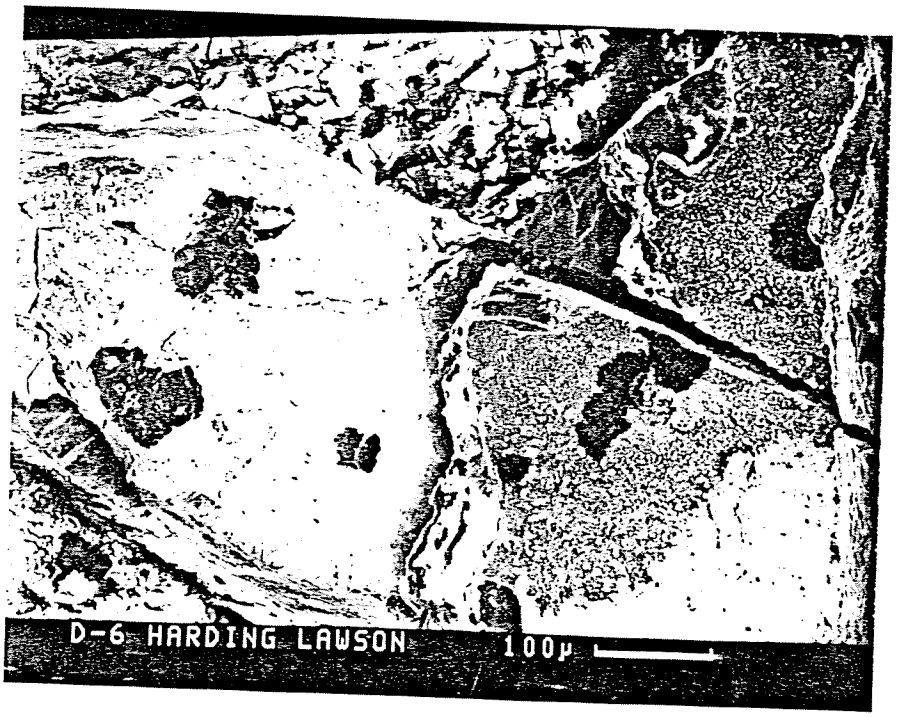
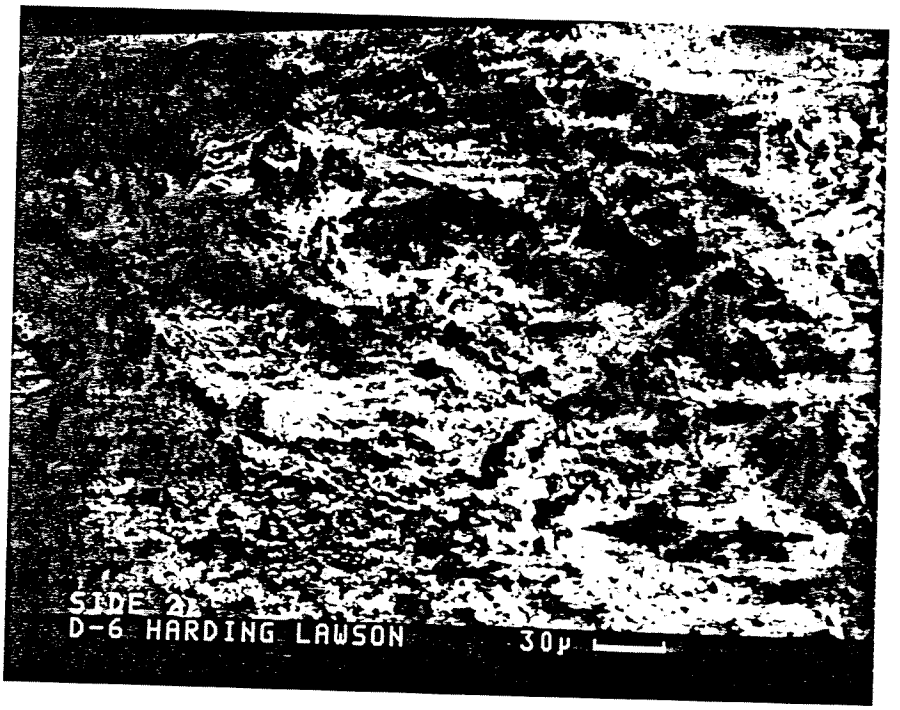


Figure 11: SEM photomicrographs of two areas (on the same side) of the corroded surface of sample "D"-6" showing the surface morphology characteristics of the corrosion product.

Project #825-82409, Laboratory #894028



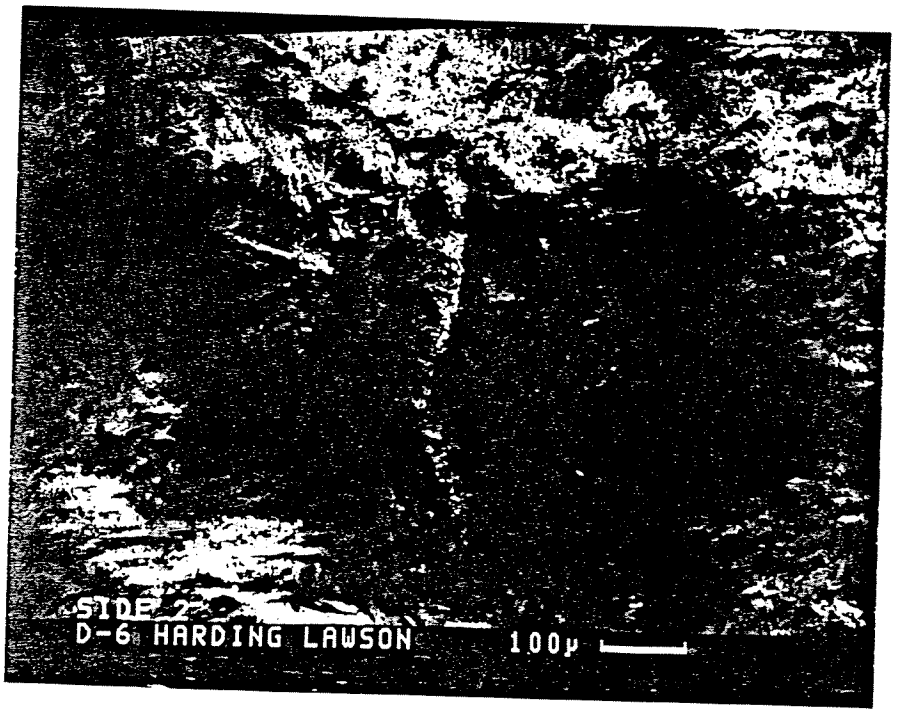


Figure 12: SEM photomicrographs of two areas on the opposite side of sample "D-6" showing the surface morphology characteristics of the corrosion product.

Project #825-82409, Laboratory #894028

APPENDIX F

APPENDIX F

Analytical Laboratory Reports
Groundwater Sampling: 1988

OBG Laboratory Report

January 28, 1988

OBG LABORATORIES, INC.

Laboratory Report

CLIENT HARDING LAWSON ASSOCIATES JOB NO. 3238.001.517

DESCRIPTION Groundwater Samples

Results reported as ppb

DATE COLLECTED 1-28-88 DATE REC'D. 2-1-88 DATE ANALYZED 2-2-88

Description	MW#1	MW#2	MW#3	MW#4	MW#5	MW#6	MW#7	MW#A1	MW#A2	MW#A3
Sample #	G5136	G5137	G5138	G5139	G5140	G5141	G5142	G5143	G5144	G5145
LINDANE	<5.0	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.5	<0.5	<0.5
HEPTACHLOR	<5.0	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.5	<0.5	<0.5
A-BHC	69.	0.20	0.62	0.14	0.07	<0.5	0.5	0.7	2.9	5.2
B-BHC	14.	0.21	0.34	<0.05	<0.05	3.6	0.87	<0.5	1.3	0.6
D-BHC	<5.0	<0.05	<0.05	<0.05	<0.05	<0.5	0.2	<0.5	<0.5	<0.5
HCB	13.	<0.05	<0.05	<0.05	<0.05	1.2	<0.05	2.1	8.3	<0.5
MERCURY	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
FORMALDEHYDE	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/l (ppm) unless otherwise noted

Comments:

Authorized: [signature]

Date: March 29, 1988

OBG Laboratories, Inc
Box 942 / 1304 Buckley Rd. / Syracuse, NY / 13221 / (315) 457-1494

OBG Laboratory Report

April 22, 1988

OBG LABORATORIES, INC.

Laboratory Report

CLIENT HARDING-LAWSON JOB NO. 3238.001.517

DESCRIPTION Gibson Site - Groundwater Samples

Results reported as ppb

DATE COLLECTED 4-22-88 DATE REC'D. 4-25-88 DATE ANALYZED 4-27-88

Description	MW#1	MW#2	MW#3	MW#4	MW#5	MW#6	MW#7	MW A-1	MW A-2	MW A-3
Sample #	G7971	G7972	G7973	G7974	G7975	G7976	G7977	G7978	G7981	G7982
LINDANE (Gamma BHC)	<5.0	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05
ALPHA BHC	12.	<0.05	0.23	0.11	0.97	<0.5	0.25	0.27	<0.05	0.82
BETA BHC	<5.0	<0.05	0.17	<0.05	0.14	3.7	0.68	0.07	<0.05	0.10
DELTA BHC	<5.0	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05
HCB	18.	<0.05	<0.05	<0.05	0.10	<0.5	<0.05	0.46	<0.05	0.20

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/l (ppm) unless otherwise noted

Comments:

OBG Laboratories, Inc.
Box 4942 • 4104 Buckley Rd. / Syracuse, NY / 13221 / (315) 457-1494

Authorized: DR Neel

Date: June 1, 1988

OBG LABORATORIES, INC.

Laboratory Report

CLIENT HARDING-LAWSON JOB NO. 3238.001.517

DESCRIPTION Gibson Site

DATE COLLECTED 4-22-88 DATE REC'D. 4-25-88 DATE ANALYZED

	Sample #	MERCURY	MERCURY, FILTERED		
MW#1	G7971	<0.0005	<0.0005		
MW#2	G7972	0.0006	<0.0005		
MW#3	G7973	<0.0005	<0.0005		
MW#4	G7974	<0.0005	<0.0005		
MW#5	G7975	<0.0005	<0.0005		
MW#6	G7976	<0.0005	<0.0005		
MW#7	G7977	<0.0005	<0.0005		
MW A-1	G7978	<0.0005	<0.0005		
MW A-1 M.S.	G7979	0.00193	0.00115		
MW A-1 M.S.D.	G7980	0.00091	<0.0005		
MW A-2	G7981	<0.0005	<0.0005		
Mw A-3	G7982	<0.0005	<0.0005		

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg / (ppm) unless otherwise noted

Comments:

Authorized: DRidell

Date: June 1, 1988

OBG Laboratories, Inc.
Box 4942 / 1304 Buckley Rd. / Syracuse, NY / 13221 / (315) 457-1494

CBG LABORATORIES, INC.

Laboratory Report

CLIENT HARDING-LAWSON JOB NO. 3238.001.517

DESCRIPTION Quality Control Associated with Sample Numbers: G7971 - G7982

DATE COLLECTED 4-22-88 DATE REC'D. 4-25-88 DATE ANALYZED See Below

PARAMETER	DATE ANALYZED	LABORATORY NUMBER OF SPIKED SAMPLE	SPIKED SAMPLE RESULT (SSR)	SAMPLE RESULT (SR)	SPIKE ADDED (SA)	SPIKE (%R)	LABORATORY NUMBER OF DUPLICATE SAMPLE	SAMPLE RESULT (S)	DUPLICATE RESULT (D)	DUPLICATE RPD	METHOD BLANK
MERCURY	5-17-88	G7978	0.00193	<0.0005	0.001	193.*	G7978	<0.0005	0.00091	*	<0.0005
MERCURY, FILTERED	5-17-88	G7978	0.00115	<0.0005	0.001	115.	G7978	<0.0005	<0.0005	-	<0.0005

NOTES: 1) Spike % Recovery = $\frac{(SSR - SR)}{SA} \times 100$

2) Duplicate RPD = $\frac{S - D}{(S+D)/2} \times 100\%$

*Site MW A-1 was split into three separate containers in the field to enable the laboratory to perform a matrix spike and duplicate analysis in addition to the sample analysis. The three separate containers were observed to contain varying amounts of solids. We believe that this situation resulted in the high spike recovery and poor duplicate results for the unfiltered sample.

Methodology: Federal Register — 40 CFR, Part 136, October 26, 1984

Units: mg/l (ppm) unless otherwise noted

Comments:

Authorized: DPH

Date: June 1, 1988

CBG Laboratories Inc
Box 4942 / 1304 Buckley Rd Syracuse NY / 13221 / (315) 457-1494

Weston Analytical Laboratory Reports

April 22, 1988

ROY F. WESTON, INC.
Client: Hardening Lawson
RFW Sample No: 8804-201-001 thru 004, 006 thru 009
Client Sample Identification: MW1, MWA-1, MWA-2, MWA-3,
filtered - MW1, MWA-1, MWA-2, MWA-3

CASE NARRATIVE

1. Samples were received 4-26-88. Samples for mercury analysis were digested and analyzed on 5-11-88. All required holding times were met.

2. ICVS, CCVS and LCS stock standards were purchased from Inorganic Ventures Laboratory.

3. All initial and continuing calibration verification standards and blanks are within the control limits.

4. All preparation blank values are within control limits.

5. Samples were analyzed and reported by the 787 CLP protocol.

Debra K. White
Inorganic Section Manager
WESTON Analytical Laboratories

Date 5/23/88

WESTON ANALYTICS
PEST/PCB ANALYTICAL DATA PACKAGE FOR
HARDING LAWSON

DATE RECEIVED: 04/26/88

RFW LOT # :8804-201

CLIENT ID	RFW #	MTX	PREP #	COLLECTION	EXTR/PREP	ANALYSIS
MWXXX1 (MW-1)	001	W	480	04/22/88	04/27/88	05/27/88
MWXXX2 (MW-A1)	002	W	480	04/22/88	04/27/88	05/27/88
MWXXX2	002 MS	W	480	04/22/88	04/27/88	05/27/88
MWXXX2	002 MSD	W	480	04/22/88	04/27/88	05/27/88
MWXXX3 (MW-A2)	003	W	480	04/22/88	04/27/88	05/27/88
MWXXX4 (MW-A3)	004	W	480	04/22/88	04/27/88	05/27/88
LAB QC:						
PBLK	MB1	W	88E480	NA	04/27/88	05/27/88

WESTON ANALYTICS
PESTICIDE
CLP LIST

RFW Batch Number: 8804-201 Client: HARDING LAWSON Page: 1

Sample Information	Cust ID:	MWXXX1	MWXXX2	MWXXX2	MWXXX2	MWXXX3	MWXXX4
	RFW#:	001	002	002 MS	002 MSD	003	004
	Matrix:	Water	Water	Water	Water	Water	Water
	D.F.:	1	1	1	1	1	1
	Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surrogate: Di-n-butylchlorendate:		53 %	71 %	90 %	58 %	97 %	91 %
Analyte:		fl	fl	fl	fl	fl	fl
Alpha-BHC		0.05 U	0.21	0.24	0.24	0.33	0.33
Beta-BHC		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Delta-BHC		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Gamma-BHC (Lindane)		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Hexachlorobenzene		0.05 U	0.20	0.20	0.20	0.05	0.05

WESTON ANALYTICS
PESTICIDE
CLP LIST

RFW Batch Number: 8804-201 Client: HARDING LAWSON

Sample Information	
Cust ID:	BLANK
RFW#:	BLANK
Matrix:	Water
D.F.:	1
Units:	ug/L

Surrogate: Di-n-butylchlorendate: 113 %

Analyte:	
Alpha-BHC	0.05 U
Beta-BHC	0.05 U
Delta-BHC	0.05 U
Gamma-BHC (Lindane)	0.05 U
Hexachlorobenzene	0.05 U

U=Analyzed,not detected. J=Present below detection limit. B=Present in blank. NR=Not requested.
%=Percent recovery. NS=Not spiked.

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX1
MW#1

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-001

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX2
MW#A1

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-002

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX3
MW#A-2

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-003

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

olor Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX4
MW#A-3

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-004

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX6
MW#1 filtered

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-006

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

olor Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX7
MW#A-1 F4

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-007

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX8
MwA-2 Filt.

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-00

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MWXXX9
MW#A-3 Filt

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: HARD SAS No.: SDG No.: CLP201

Matrix (soil/water): WATER Lab Sample ID: 8804-201-009

Level (low/med): LOW Date Received: 04/26/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

olor Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

omments:

THE INORGANICS SUMMARY REPORT FOR 05/16/88 13:04:22 *** REQUESTED FROM ACCT#: 010 *** PAGE: 1

RFW SAMPLE #	TEST	MAT RIX	CLIENT SAMPLE ID	FINAL RESULTS	LIMITS	INITIAL RESULTS	%DIFF %REC	C/D FACTOR	DILU TION	DETEC LIMIT	DATE ANALYZED	INSTR UMENT	ST CD
8804-201-001	MHGTO	WAT	MW#1	[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
8804-201-002	MHGTO	WAT	MW#A1	[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
8804-201-002	MHGTOR	WAT	MW#A1	[illegible]	[illegible]	[illegible]	[illegible]	1.0000	1	0.2	05/11/88	HG1	00
8804-201-002	MHGTOS	WAT	MW#A1	[illegible]	[illegible]	[illegible]	[illegible]	1.0000	1		05/11/88	HG1	00
8804-201-003	MHGTO	WAT	MW#A-2	[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
8804-201-004	MHGTO	WAT	MW#A-3	[illegible]	[illegible]	-0.17		1.0000	1	0.2	05/11/88	HG1	00
8804-201-006	MHGSO	WAT	MW#1 FILTERED	[illegible]	[illegible]	[illegible]		1.0000	1	0.2	05/11/88	HG1	00
8804-201-007	MHGSO	WAT	MW#A-1 FILTERE	[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
8804-201-007	MHGSOR	WAT	MW#A-1 FILTERE	[illegible]	[illegible]	[illegible]	[illegible]	1.0000	1	0.2	05/11/88	HG1	00
8804-201-007	MHGSOS	WAT	MW#A-1 FILTERE	[illegible]	[illegible]	[illegible]	[illegible]	1.0000	1		05/11/88	HG1	00
8804-201-008	MHGSO	WAT	MWA-2 FILTERED	[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
8804-201-009	MHGSO	WAT	MW#A-3 FILTERE	[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
88C056A-CCB1	MHGTO	WAT		[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
88C056A-CCB2	MHGTO	WAT		[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
88C056A-CCB4	MHGTO	WAT		[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
88C056A-CCB5	MHGTO	WAT		[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
88C056A-CCB6	MHGTO	WAT		[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
88C056A-CCB7	MHGTO	WAT		[illegible]	[illegible]	-0.144		1.0000	1	0.2	05/11/88	HG1	00
88C056A-CCB8	MHGTO	WAT		[illegible]	[illegible]	-0.144		[illegible]	1	0.2	05/11/88	HG1	00
88C056A-CCB9	MHGTO	WAT		[illegible]	[illegible]	-0.144		[illegible]	1	0.2	05/11/88	HG1	00
88C056A-CCV1	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-CCV2	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-CCV4	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-CCV5	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-CCV6	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-CCV7	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-CCV8	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-CCV9	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			05/11/88	HG1	00
88C056A-ICB1	MHGTO	WAT		[illegible]	[illegible]	[illegible]		[illegible]			[illegible]	HG1	00
88C056A-ICV1	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	HG1	00
88C056A-LC1	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	HG1	00
88C056A-LC2	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	HG1	00
88C056A-LC3	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	HG1	00
88C056A-LC4	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	HG1	00
88C056A-LC5	MHGLCS	WAT		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	HG1	00
88C056A-MB1	MHGTO	WAT		[illegible]	[illegible]	[illegible]		[illegible]			[illegible]	HG1	00
88C056A-MB2	MHGTO	WAT		[illegible]	[illegible]	[illegible]		[illegible]			[illegible]	HG1	00
88C056A-MB3	MHGTO	WAT		[illegible]	[illegible]	[illegible]		[illegible]			[illegible]	HG1	00
88C056A-MB4	MHGTO	WAT		[illegible]	[illegible]	[illegible]		[illegible]			[illegible]	HG1	00
88C056A-MB5	MHGTO	WAT		[illegible]	[illegible]	[illegible]		[illegible]			[illegible]	HG1	00

Weston Analytical Laboratory Reports

July 29, 1988

WESTON ANALYTICS
PEST/PCB ANALYTICAL DATA PACKAGE FOR
HARDING-LAWSON

DATE RECEIVED: 07/30/88

RFW LOT # :8807-152

CLIENT ID	RFW #	MTX	PREP #	COLLECTION	EXTR/PREP	ANALYSIS
A-2	001	W	88E866	07/29/88	08/02/88	08/22/88
MW-A-1	002	W	88E866	07/29/88	08/02/88	08/22/88
MW-A-3	003	W	88E866	07/29/88	08/02/88	08/22/88
MW 1	004	W	88E866	07/29/88	08/02/88	08/22/88
MW 2	005	W	88E866	07/29/88	08/02/88	08/22/88
MW 3	006	W	88E866	07/29/88	08/02/88	08/22/88
MW 4	007	W	88E866	07/29/88	08/02/88	08/22/88
MW 4	007 MS	W	88E866	07/29/88	08/02/88	
MW 5	008	W	88E866	07/29/88	08/02/88	08/22/88
MW 6	009	W	88E866	07/29/88	08/02/88	08/22/88
MW 6	009 REP	W	88E866	07/29/88	08/02/88	08/22/88
MW 7	010	W	88E866	07/29/88	08/02/88	08/22/88
LAB QC:						
PBLK	MB1	W	88E866	N/A	08/02/88	08/21/88
PBLK	MB1 BS	W	88E866	N/A	08/02/88	08/21/88
PBLK	MB1	W	88E866	N/A	08/02/88	08/21/88
PBLK	MB1 BS	W	88E866	N/A	08/02/88	08/21/88

WESTON ANALYTICS

Pesticide/PCBs by GC, Special List — Report Date: 08/26/88 13:54

RFW Batch Number: 8807-152 — Client: HARDING-LAWSON — Work Order: 3848-01-01-0000 — Page: 1

	Cust ID:	A-2	MW-A-1	MW-A-3	MW 1	MW 2	MW 3
Sample Information	RFW#:	001	002	003	004	005	006
	Matrix:	WATER	WATER	WATER	WATER	WATER	WATER
	D.F.:	1.00	1.00	1.00	1.00	1.00	1.00
	Units:	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Surrogate: Di-n-butylchlorendate		103 %	83 %	103 %	87 %	113 %	102 %
Alpha-BHC		0.050 U	0.070	0.071 U	0.050 U	0.010 J	0.15
Beta-BHC		0.050 U	0.050 U	0.071 U	0.050 U	0.050 U	0.21
Delta-BHC		0.050 U	0.050 U	0.071 U	0.050 U	0.050 U	0.050 U
gamma-BHC (Lindane)		0.050 U	0.050 U	0.071 U	0.050 U	0.050 U	0.050 U
Hexachlorobenzene		0.050 U	0.050 U	0.071 U	0.050 U	0.050 U	0.050 U

	Cust ID:	MW 4	MW 5	MW 6	MW 6	MW 7	PBLK
Sample Information	RFW#:	007	008	009	009 REP	010	88E866-MB1
	Matrix:	WATER	WATER	WATER	WATER	WATER	WATER
	D.F.:	1.00	1.00	1.00	1.00	1.00	1.00
	Units:	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Surrogate: Di-n-butylchlorendate		96 %	90 %	79 %	90 %	68 %	111 %
Alpha-BHC		0.10	0.020 J	0.10 U	0.10 U	0.32	0.050 U
Beta-BHC		0.080 J	0.050 U	1.2	1.2	0.50	0.050 U
Delta-BHC		0.10 U	0.050 U	0.10 U	0.10 U	0.062 U	0.050 U
gamma-BHC (Lindane)		0.10 U	0.030 J	0.10 U	0.10 U	0.062 U	0.050 U
Hexachlorobenzene		0.10 U	0.050 U	0.10 U	0.10 U	0.062 U	0.050 U

U= Analyzed, not detected. J= Present below detection limit. B= Present in blank. NR= Not requested.
%= Percent recovery. NS= Not spiked. D= Diluted out. I= Interference. NA= Not Applicable.

RFW Batch Number: 8807-152 Client: HARDING-LAWSON Work Order: 3848-01-01-0000

	Cust ID:	PBLK BS	MW 4
Sample Information	RFW#:	88E866-MB1	007 MS
	Matrix:	WATER	WATER
	D.F.:	1.00	1.00
	Units:	UG/L	UG/L
Surrogate: Di-n-butylchlorendate		115 %	109 %
Alpha-BHC		0.050 U	0.080 J
Beta-BHC		0.050 U	0.10 U
Delta-BHC		0.050 U	0.10 U
gamma-BHC (Lindane)		135 * %	120 %
Hexachlorobenzene		0.050 U	0.10 U

U= Analyzed, not detected. J= Present below detection limit. B= Present in blank. NR= Not requested.
%= Percent recovery. NS= Not spiked. D= Diluted out. I= Interference. NA= Not Applicable.

WESTON ANALYTICS

INORGANICS DATA SUMMARY REPORT 08/05/88

CLIENT: HARDING-LAWSON
WORK ORDER: 3848-01-01-0000

WESTON BATCH #: 8807-152

SAMPLE	SITE ID	ANALYTE	RESULT	UNITS	REPORTING LIMIT
-001	A-2	MERCURY, TOTAL	0.20 u	UG/L	0.20
-002	MW-A-1	MERCURY, TOTAL	0.20 u	UG/L	0.20
-003	MW-A-3	MERCURY, TOTAL	0.20 u	UG/L	0.20
-004	MW 1	MERCURY, TOTAL	0.20 u	UG/L	0.20
-005	MW 2	MERCURY, TOTAL	0.20 u	UG/L	0.20
-006	MW 3	MERCURY, TOTAL	0.20 u	UG/L	0.20
-007	MW 4	MERCURY, TOTAL	0.20 u	UG/L	0.20
-008	MW 5	MERCURY, TOTAL	0.20 u	UG/L	0.20
-009	MW 6	MERCURY, TOTAL	0.20 u	UG/L	0.20
-010	MW 7	MERCURY, TOTAL	0.20 u	UG/L	0.20

Weston Analytical Laboratory Report

October 28, 1988

WESTON ANALYTICS
PEST/PCB ANALYTICAL DATA PACKAGE FOR
HARDING & LAWSON

DATE RECEIVED: 10/31/88

RFW LOT # :8810-230

CLIENT ID	RFW #	MTX	PREP #	COLLECTION	EXTR/PREP	ANALYSIS
MW #1	001	W	88E1368	10/28/88	11/03/88	11/30/88
MW #1	001	W	88E1368	10/28/88	11/03/88	12/10/88
MW #2	002	W	88E1368	10/28/88	11/03/88	11/30/88
MW #4	004	W	88E1368	10/28/88	11/03/88	11/30/88
MW #5	005	W	88E1368	10/28/88	11/03/88	11/30/88
MW #6	006	W	88E1368	10/28/88	11/03/88	11/30/88
MW #6	006	W	88E1368	10/28/88	11/03/88	12/12/88
MW #2A	008	W	88E1368	10/28/88	11/03/88	11/30/88
MW #2A	008	W	88E1368	10/28/88	11/03/88	12/12/88
LAB QC:						
PBLK	MB1	W	88E1368	N/A	11/03/88	11/30/88
PBLK	MB1 BS	W	88E1368	N/A	11/03/88	11/30/88
PBLK	MB1 BSD	W	88E1368	N/A	11/03/88	11/30/88

10-20-88 - pk

WESTON ANALYTICS

Pesticide/PCBs by GC, Special List

RFW Batch Number: 8810-230 Client: **HARDING & LAWSON** Work Order: 3848-01-01-0000 Report Date: 12/28/88 10:08 Page: 1

	Cust ID:	MW #1	MW #1	MW #2	MW #4	MW #5	MW #6
Sample Information	RFW#:	001	001 DL	002	004	005	006
	Matrix:	WATER	WATER	WATER	WATER	WATER	WATER
	D.F.:	1.00	100	1.00	1.00	1.00	1.00
	Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surrogate: Di-n-butylchlorendate		72 %	126 %	57 %	64 %	54 %	51 %
Alpha-BHC		0.050 U	2.6 J	0.050 U	0.12	0.030 J	0.050 U
Beta-BHC		0.050 U	NA	0.050 U	0.050 U	0.030 J	E
Delta-BHC		0.050 U	NA	0.050 U	0.050 U	0.050 U	0.050 U
gamma-BHC (Lindane)		0.050 U	NA	0.050 U	0.050 U	0.050 U	0.050 U
Hexachlorobenzene		E	0.49 J	0.050 U	0.050 U	0.050 U	0.50 J

	Cust ID:	MW #6	MW #2A	MW #2A	PBLK	PBLK BS	PBLK BSD
Sample Information	RFW#:	006 DL	008	008 DL	88E1368-MB1	88E1368-MB1	88E1368-MB1
	Matrix:	WATER	WATER	WATER	WATER	WATER	WATER
	D.F.:	10.0	1.00	10.0	1.00	1.00	1.00
	Units:	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Surrogate: Di-n-butylchlorendate		56 %	69 %	71 %	93 %	89 %	96 %
Alpha-BHC		NA	E	0.49	0.050 U	0.050 U	0.050 U
Beta-BHC		5.5	0.050 U	NA	0.050 U	0.050 U	0.050 U
Delta-BHC		NA	0.050 U	NA	0.050 U	0.050 U	0.050 U
gamma-BHC (Lindane)		NA	0.050 U	NA	0.050 U	125 * %	140 * %
Hexachlorobenzene		NA	0.040 J	NA	0.050 U	0.050 U	0.050 U

U= Analyzed, not detected. J= Present below detection limit. B= Present in blank. NR= Not requested. NS= Not spiked.
%= Percent recovery. D= Diluted out. I= Interference. NA= Not Applicable. *= Outside of QC limits.

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

~~HAL001~~ MW #1

JW 11/24/88

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-001

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

~~HAL002~~ NW #2

JW 11/24/88

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-002

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

~~HAL003~~ MW#3 JW 11/24/88

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-003

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

095

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

~~HAL004~~ MW #4 JW 11/24/08

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-004

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

~~HAL005~~ MW#5 JW 11/24/88

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-005

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: BROWN Clarity Before: CLOUDY Texture:

Color After: BROWN Clarity After: CLOUDY Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

~~HAL006~~ MW #6

JW 11/24/88

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-006

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: BROWN Clarity Before: CLOUDY Texture:

Color After: BROWN Clarity After: CLOUDY Artifacts:

Comments:

U.S. EPA - CLP

EPA SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

~~HAL007~~ MW#1A JW 11/24/88

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-007

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: BROWN Clarity Before: CLOUDY Texture:

Color After: BROWN Clarity After: CLOUDY Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

~~HAL008~~ MW #2A

DW. 11/24/88

Lab Name: WESTON - LIONVILLE Contract:

Lab Code: WESTON Case No.: SAS No.: SDG No.: HAL230

Matrix (soil/water): WATER Lab Sample ID: 8810-230-008

Level (low/med): LOW Date Received: 10/29/88

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

Weston Analytical Laboratory Report

November 23, 1988

Roy F. Weston, Inc. - Lionville Laboratory
PEST/PCB ANALYTICAL DATA PACKAGE FOR
HARDING & LAWSON

DATE RECEIVED: 11/28/88

RFW LOT # :8811L609

CLIENT ID	RFW #	MTX	PREP #	COLLECTION	EXTR/PREP	ANALYSIS
MW #3	001	W	88LE1512	11/23/88	12/02/88	01/13/89
MW1-A	002	W	88LE1512	11/23/88	12/02/88	01/13/89
MW1-A	002 MS	W	88LE1512	11/23/88	12/02/88	01/13/89
MW1-A	002 MSD	W	88LE1512	11/23/88	12/02/88	01/13/89
LAB QC:						
PBLK	MB1	W	88LE1512	N/A	12/02/88	01/13/89

Roy F. Weston, Inc. - Lionville Laboratory
Pesticide/PCBs by GC, Special List

RFW Batch Number: 8811L609 Client: HARDING & LAWSON Report Date: 01/16/89 09:56
Work Order: 3848-02-01-0000 Page: 1

	Cust ID:	MW #3	MW1-A	MW1-A	MW1-A	PBLK
Sample Information	RFW#:	001	002	002 MS	002 MSD	88LE1512-MB1
	Matrix:	WATER	WATER	WATER	WATER	WATER
	D.F.:	5.00	5.00	5.00	5.00	1.00
	Units:	ug/L	ug/L	ug/L	ug/L	ug/L
Surrogate: Di-n-butylchlorendate		90 %	110 %	123 %	121 %	117 %
Alpha-BHC		0.39	0.25 U	0.25 U	0.25 U	0.050 U
Beta-BHC		0.35	0.25 U	0.25 U	0.25 U	0.050 U
Delta-BHC		0.25 U	0.25 U	0.25 U	0.25 U	0.050 U
gamma-BHC (Lindane)		0.25 U	0.25 U	125 * %	130 * %	0.050 U
Hexachlorobenzene		0.25 U	0.31	0.080 J	0.12 J	0.050 U

U= Analyzed, not detected. J= Present below detection limit. B= Present in blank. NR= Not requested. NS= Not spiked.
%= Percent recovery. D= Diluted out. I= Interference. NA= Not Applicable. *= Outside of EPA CLP QC

APPENDIX G

APPENDIX G

Analytical Laboratory Reports
Groundwater Sampling: 1985-1986

TABLE 7. ANALYTICAL TEST RESULTS - WATER SAMPLES

Contaminant	Date	MONITORING WELL(1) MW1 (Upgradient)	MW2 (Upgradient)	MW3 (Downgradient)	MW4 (Downgradient)	MW5 (Downgradient)	MW6 (Downgradient)	MW7 (Downgradient)
HCB	8/22/85	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
	9/27/85	<0.01	-	<0.01	<0.01	<0.01	<0.01	-
	10/25/85	<0.1	<0.5	<1.0	<1.0	<1.0	<1.0	-
	11/22/85	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	-
	2/20/86	<0.1	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
	5/22/86	<0.1	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
	6/6/86	<0.1	<0.1	<0.1	<0.01	<0.1	<0.1	-
αBHC	8/22/85	2.3	16.0	9.5	1.2	2.2	2.1	-
	9/27/85	0.99	-	3.3	0.55	0.70	6.5	-
	10/25/85	0.7	0.1	8.7	1.1	4.0	2.5	-
	11/22/85	1.2	2.5	1.9	0.7	0.5	<0.1	-
	2/20/86	0.28	<0.1	0.98	0.23	0.13	<0.1	10.3
	5/22/86	1.3	1.8	<0.1	0.3	0.3	<0.1	5.1
	6/6/86	0.5	<0.1	0.5	0.3	0.1	<0.1	-
βBHC	8/22/85	10.0	140.0	8.8	1.3	1.4	18.0	-
	9/27/85	1.8	-	1.1	0.23	0.2	6.1	-
	10/25/85	1.3	<0.1	2.1	0.2	0.6	5.2	-
	11/22/85	1.5	<0.1	0.9	0.1	0.1	7.5	-
	2/20/86	2.3	<0.1	2.4	0.38	0.30	1.3	12.6
	5/22/86	1.5	0.8	<0.1	0.1	0.1	4.4	3.2
	6/6/86	2.1	<0.1	0.8	0.2	<0.1	7.6	-

Notes:

(1) Concentrations reported in parts per billion (ppb) except for Formaldehyde which is reported in parts per million (ppm).
"-" Denotes riser pipe broken in the case of MW2 and the well was dry, or insufficient sample, in the case of MW7.
"*" Denotes that no data is available for this date.

TABLE 7. ANALYTICAL TEST RESULTS - WATER SAMPLES (CONT)

Contaminant	Date	MONITORING WELL[1] MW1 (Upgradient)	MW2 (Upgradient)	MW3 (Downgradient)	MW4 (Downgradient)	MW5 (Downgradient)	MW6 (Downgradient)	MW7 (Downgradient)
δBHC	8/22/85	0.75	0.62	0.02	0.12	0.02	<0.01	-
	9/27/85	0.21	-	0.03	0.02	0.3	<0.01	-
	10/25/85	<0.01	<0.01	<0.5	<0.1	<0.1	<0.01	-
	11/25/85	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	-
	2/20/86	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	0.18
	5/22/86	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	0.1
	6/6/86	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	-
γBHC	8/22/85	1.5	0.20	0.12	0.01	0.04	0.02	-
	9/27/85	0.40	-	0.02	<0.01	<0.01	<0.01	-
	10/25/85	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
	11/22/85	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
	2/20/86	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.32
	5/22/86	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
	6/6/86	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
Hg	8/22/85	0.6	0.5	1.4	0.6	2.4	2.9	-
	9/27/85	2.1	-	0.9	2.4	3.5	1.2	-
	10/25/85	<0.5	1.1	<0.5	<0.5	<0.05	<0.05	-
	11/22/85	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	-
	2/20/86	<0.5	<0.5	4.3	<0.5	<0.05	<0.05	0.5
	5/22/86	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<0.5
	6/6/86	<0.5	<0.5	<0.5	6.2	<0.5	<0.5	<0.5
Formaldehyde[1]	8/22/85	*	*	*	*	*	*	-
	9/27/85	*	-	*	*	*	*	-
	10/25/85	<0.5	0.1	0.18	0.24	<0.24	<0.25	-
	11/22/85	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
	2/20/86	0.47	0.47	0.40	1.1	2.2	3.5	0.6
	5/22/86	<0.2	<0.1	<0.1	0.3	0.2	<0.01	0.2
	6/6/86	0.4	<0.1	0.3	<0.1	0.2	<0.1	0.1

Notes:

(1) Concentrations reported in parts per billion (ppb) except for Formaldehyde which is reported in parts per million (ppm).
"-" Denotes riser pipe broken in the case of MW2 and the well was dry, or insufficient sample, in the case of MW7.
"*" Denotes that no data is available for this date.