Region 1
Geologist

SITE OPERATIONS PLAN

FORMER SITE OF
LIBERTY INDUSTRIAL FINISHING CORP.
FARMINGDALE, NEW YORK

LKB

GERAGHTY
& MILLER, INC.
Ground-Water Consultants

LOCKWOOD, KESSLER & BARTLETT, INC.
CONSULTING ENGINEERS
SYOSSET, NEW YORK

NOVEMBER 1986

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at the Former Site of
Liberty Industrial Finishing Corporation
Farmingdale, New York

1. INTRODUCTION

The history of this site, including industrial operations and contamination studies, has been previously summarized in the Remedial Investigation (RI) Report prepared by Lockwood, Kessler and Bartlett, Inc., dated November, 1985. Liberty Industrial Finishing Corp. and other prior occupants operated metal plating facilities that discharged treated, and at times untreated, plating effluent to on-site disposal basins where it leached into ground water. Metal sludge from their effluent treatment plant was discharged to an on-site sludge drying bed.

The RI report identified residual sludge and soil on site which has been deemed hazardous within the definition set forth in 40 CFR Part 261. Details of the site assessment are provided in Appendix A which is a section of the RI report. The recommended remedial action for the site provided in the RI report is the removal of existing hazardous sludge and soil. The Site Operations Plan (SOP) describes the procedure which will be employed to execute the recommended removal action, which includes the following activities:

Removal of hazardous waste
Protection of cleanup personnel
Validation of removal

This SOP has been developed from company experience in waste site cleanup, as well as published U.S. Environmental Protection Agency (USEPA) references, technical papers, bibliography, guidelines and texts.

2. REMOVAL ACTIVITIES

The plan developed for cleanup of this site calls for excavation and off-site disposal of residual hazardous waste materials. This process will proceed in a stepwise manner, as follows:

2.1 Mobilization, set-up, establishment of site security
2.2 Sampling, stockpiling of overlying soils
2.3 Removal of sludge and contaminated soils, sampling same
2.4 Validation of cleanup, site restoration

Inherent in this process are the elements of health and safety and quality assurance/quality control (QA/QC) which are described in the respective plans in this SOP.

2.1 Mobilization, set-up, establishment of site security

Equipment will be brought to the site over a 2 to 3 day period. The heavy equipment necessary such as backhoes and payloaders will be driven to the site, or brought in on flat-bed trailers. Two trailers will be set up on site; one trailer will serve as an office, and the other trailer will serve as storage area for equipment and a change area for personnel. The anticipated layout of the site for the cleanup program is shown on Figure 1. During this step, the following operations will take place:

- Roadways will be cleared as necessary to accommodate tractor-trailers.
- Turn-around and stockpiling areas will be cleared as necessary.
- Ramps within the basins will be renovated, as necessary.
- A source of potable water will be secured at the site.
- Permanent markers (stakes) will be put in at strategic locations around the areas to be excavated; these markers will serve as reference points for measuring excavation progress.
- Working zones and personal decontamination areas, as described in the Health and Safety Plan (HASP), will be established, as will equipment decontamination areas.

Site access will be limited to personnel authorized by Four J's, and designated representatives of USEPA, New York State Department of Environmental Conservation (NYSDEC) and Nassau County Department of Health. (NCDH). Existing fenc-

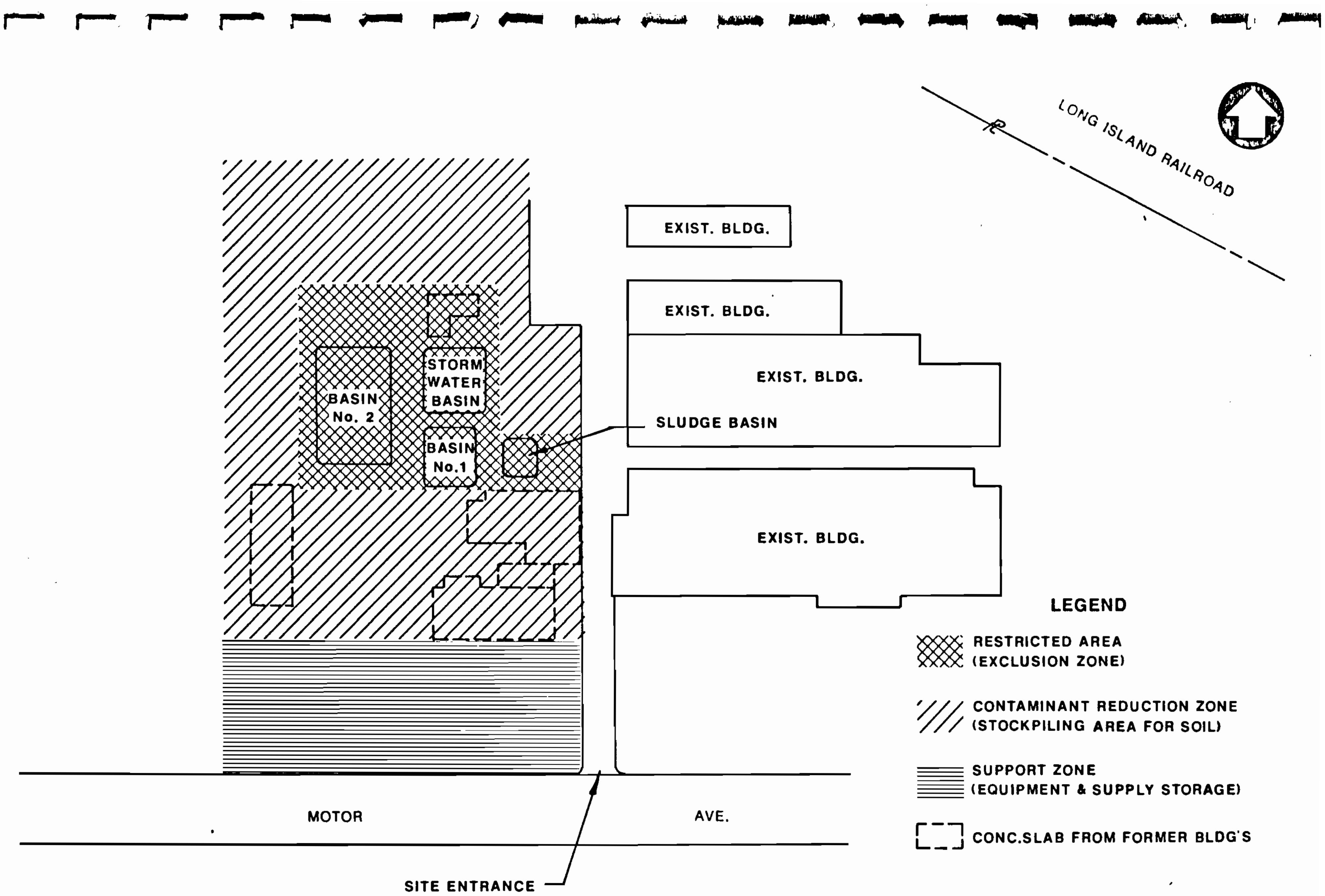


FIGURE 1

SITE PLAN FOR REMOVAL PROGRAM

ing will be repaired as necessary, and posted as "restricted."

2.2. Sampling, stockpiling of overlying soils

The RI report identified soil layers overlying sludge layers in two of the basins:

Stormwater Basin:	0-4 ft. below grade
Basin 2:	0-1 ft. below grade

Four samples will be taken from each of these soil layers before they are removed. The samples will be taken as individual point samples, composited over the depth of the layer. Samples will be taken according to the protocol given in Appendix B.

The overlying layer in Basin 2 will then be pushed to the north side of the basin, exposing the sludge layer; the areal extent of sludge is described and shown on figures in Appendix A. The overlying layer in the Stormwater Basin will be pushed through the southern berm and piled in Basin 1, without covering the ramp in Basin 1 (part of which will be removed. The soil will be piled on paved areas, or on top of plastic sheeting. While awaiting analytical results, these piles will also be covered with plastic sheeting. If the soils are determined to be non-hazardous, they will be uncovered and used in site restoration. If the soils are determined to be hazardous, they will be removed from the site as part of Step 3. Movement of soils will be done with conventional earth-moving equipment, such as a backhoe and front-end loader.

2.3. Removal of sludge and contaminated soils

Layers containing sludge or soil determined to be hazardous were identified in four areas (Appendix A):

- Stormwater basin: the entire basin area from a depth of 4 feet to approximately 12 feet below grade contains hazardous concentrations of cyanide.
- Sludge drying bed: a layer from the surface to 6 feet below grade contains hazardous concentrations of cyanide and cadmium.
- Basin no. 2: a layer from 1 foot to 6 feet below grade contains hazardous concentrations of cadmium.
- Ramp wall to Basin no. 1: a thin lens of contaminated sludge was exposed. Areal delineation of the lens by removal of overlying soil will be done in the field with excavation equipment.

Excavation will begin with Basin 2 and the ramp area of Basin 1, than the stormwater Basin, and finally the Sludge Drying Basin. The sludge layers are identifiable by a distinct blue-green-gray coloration. The identified sludge layers and soil layers determined to be hazardous as a result of previous testing will be removed and stockpiled on the side of the excavation or just outside the excavation (on pavement or plastic sheeting), depending on operational requirements. (As outlined in the RI Report, the oil-like sludge at the bottom of the storm water basin will also be removed.) The stockpiled materials will be loaded onto 20 yd^3, open body, dump trailers, in approximately 20-ton increments. The trailers will be lined with plastic sheeting and covered with a tarp. Loading operations will be conducted on paved areas, or areas where plastic sheeting has been laid. Before leaving the loading area, truck tires will be washed clean with potable water. This wash water will be directed into an adjacent basin within the restricted area (as described in the HASP). Resource Conservation and Recovery Act manifests will be completed and signed by the generator (property owner); a manifest will accompany each waste shipment. The waste will be disposed of by landfilling at a Resource Conservation and Recovery Act permitted facility (final selection of the disposal facility has not been made). Truck drivers will be provided with specific travel directions to the facility, as well as emergency phone numbers. Trucks will be placarded per Department of Transportation regulations.

The excavation will be initially terminated according to the following prioritized criteria:

1. Visibly clean soil is present in all areas of the excavation.
2. The pre-determined depth of excavation is reached

In order to make a preliminary evaluation of the success of the cleanup, one sample will be taken from the floor of each excavation, in an area which was overlain by the thickest accumulation of sludge, or contaminated soil, according to the protocol given in Appendix B. The sample will be a point sample, composited over a one foot depth. The sample will be analyzed (on an expedited basis) as in the RI, using the EP Toxicity Extraction. If the concentration in the sample exceeds the RCRA limits, another one-foot layer of soil will be removed from the floor of the excavation. This sampling and removal process will continue until the sample concentration is below the RCRA limits.

2.4. Validation of cleanup, site restoration

In order to validate the removal of hazardous wastes from the site, an additional three samples will be taken from each excavation. The samples will be collected and analyzed as previously described. If the concentration in a sample exceeds the RCRA limit, then further excavation will be conducted in the area of that sample, and another sample taken.

After completion of removal activities, the site will be restored consistent with intended land use. This may include bringing the excavations up to grade with clean fill and reseeding. Monitoring wells, which were installed in the RI, will be maintained and monitored. If any of these wells are destroyed, they will be replaced.

2.5 Community Relations

Mr. Ivan Pouschine of Lockwood, Kessler and Bartlett, Inc. is designated as community spokeperson. He will be available to respond to inquiries and provide information concerning the removal activities. The public will be made aware of the cleanup operations in newspaper advertisements in two local papers.

3. QUALITY ASSURANCE/QUALITY CONTROL PLAN

3.1 Laboratory

Volumetric Techniques Ltd. of Bayport will supply analytical services for samples taken during the excavation at the Four J's site. QA/QC procedures have been supplied by Volumetric Techniques and are given in Appendix C.

3.2 Field

Specific measures for assuring that the samples are representative and that the integrity has been maintained are described in the sampling plan and appended protocols. These measures include decontamination procedures and the use of replicate and blank samples. In order to eliminate transcription errors and promote uniform reporting of field data, a series of site investigation reporting forms have been developed. These forms replace the usual bound notebook. Data and information are collected directly on these forms and are submitted weekly to the project manager. Examples of the various forms are given in Appendix D.

In addition to the above logs, a photographic log of the sequence of events will also be kept. The log will be a record of the progress of the excavation.

The sampling team will also complete chain-of-custody records to establish the necessary documentation to track sample possession from time of collection to analysis. Chain-of-custody forms will be completed in the field before leaving the site.

3.3 Data Review and Management

In addition to the analytical methods and protocols for the collection of samples and data, there is a thorough review and management process for data. The two sources of data are the laboratory and the field. There is interaction between the lab and field personnel in the form of sample collection delivery and chain-of-custody. Data generated by either of these sources is reviewed prior to submission to the Project Manager. After submittal to the Project Manager, the data is reviewed a second time. At any one of these review points, data may be questioned or rejected. Some reasons for questioning data are given below:

- Inconsistent with data previously collected at the site
- Inconsistent with studies done at similar sites

- Inconsistent with previous studies on local or regional hydrogeologic conditions
- Inconsistent with reported site usage

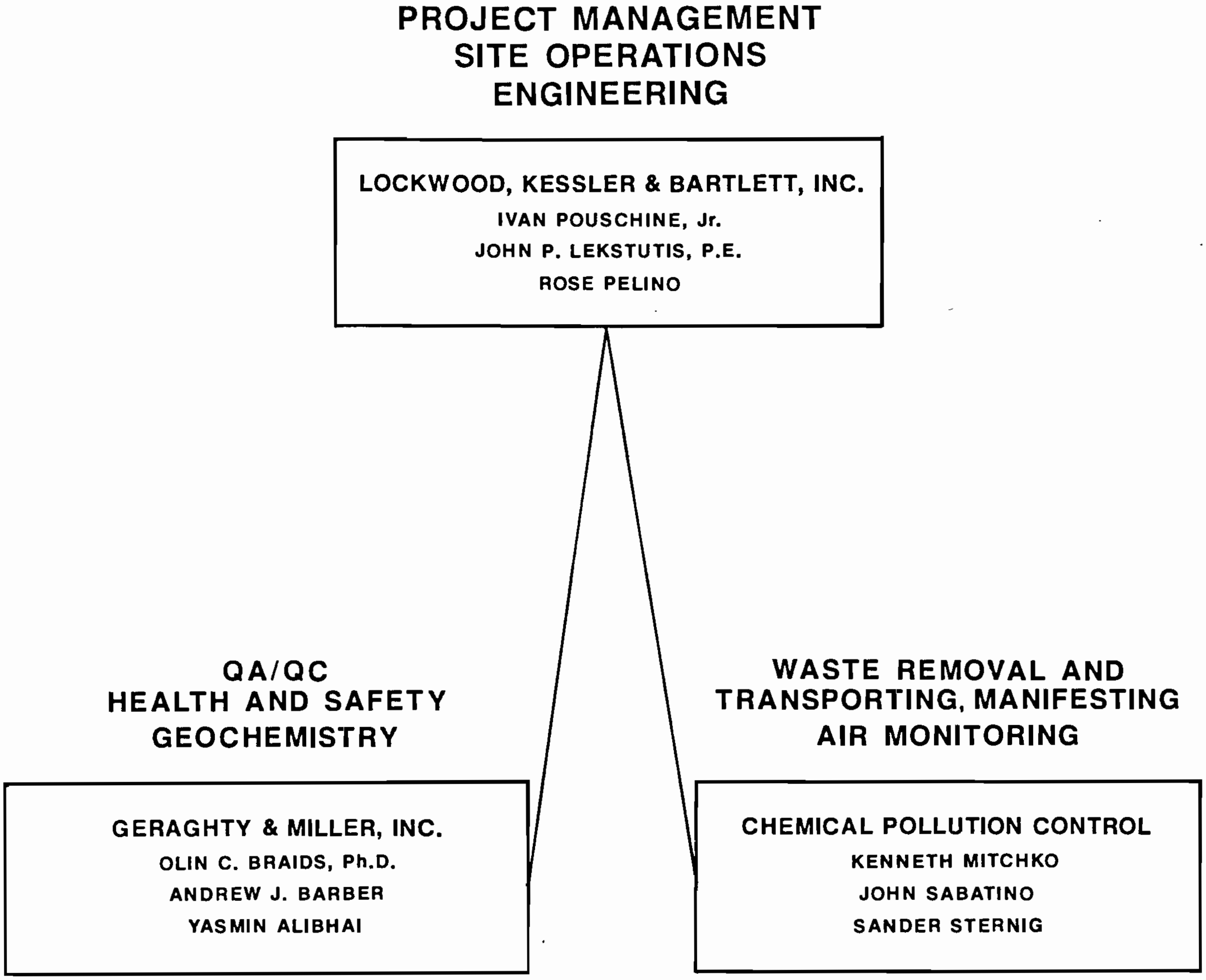
Some examples of reasons for rejecting data are given below:

- Physical impossibilities, e.g. - a water table elevation in a monitoring well exceeeding the elevation of the top or below the bottom of the well.
- Chemical impossibilities, e.g. - the concentration of an individual cation exceeding the total dissolved solids concentration.
- Strong likelihood of sample contamination, evidenced by trip and field blanks.
- Poor correlation between replicate samples.

The review process ensures that the data is examined by both the generators (field and lab) and also by objective technical management personnel. In the event that data is rejected, an attempt will be made to salvage the old data (e.g. - refer to raw lab data) or generate new data (e.g. - another round of samples), if possible. Any gaps or replacements in the data will be clearly noted on all appropriate tables.

3.4. Project Management

The project team is shown on Figure 2, along with a breakdown of responsibilities. Resumes of key project personnel are presented in Appendix E. The firm of Lockwood, Kessler and Bartlett, Inc. (LKB) will manage this project



PROJECT MANAGEMENT
SITE OPERATIONS
ENGINEERING

LOCKWOOD, KESSLER & BARTLETT, INC.
IVAN POUSCHINE, Jr.
JOHN P. LEKSTUTIS, P.E.
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HEALTH AND SAFETY
GEOCHEMISTRY

GERAGHTY & MILLER, INC.
OLIN C. BRAIDS, Ph.D.
ANDREW J. BARBER
YASMIN ALIBHAI

WASTE REMOVAL AND
TRANSPORTING, MANIFESTING
AIR MONITORING

CHEMICAL POLLUTION CONTROL
KENNETH MITCHKO
JOHN SABATINO
SANDER STERNIG

FIGURE 2

IDENTIFICATION OF KEY PERSONNEL AND DELINEATION OF RESPONSIBILITIES

and also supply engineering expertise. A representative of LKB will be onsite during all removal activities. The firm of Geraghty & Miller, Inc. will provide geochemical expertise, and oversee health and safety and QA/QC issues. The firm of Chemical Pollution Control will provide equipment and personnel for the excavation and shipment of waste, transportation manifesting, as well as sampling and other support activities.

4. HEALTH AND SAFETY PLAN

4.1. Introduction

This Health and Safety Plan (HASP) has been developed to protect the health of personnel during the course of the remedial investigation at the former site of Liberty Industrial Finishing Corporation. This HASP was prepared based on company experience and using current Federal regulations and published guidelines, texts and references.

4.2 Hazard Evaluation

The proposed excavation of contaminated soil has certain potential hazards:

- Presence of particulates containing heavy metals such as cadmium and chromium.
- Presence of volatile organic compounds.

Previous investigations at the site have determined the presence of heavy metals and volatile organic compounds (VOCs). Sampling results have indicated that VOCs (tetrachloroethylene and dichlorobenzene isomers) and inorganic compounds (chromium, cadmium and cyanide) were present in lenses of subsurface material. Toxicological information and physical properties for these compounds are presented in Appendix F. An inhalation hazard is present due to VOCs volatilizing during excavation. Contact with contaminated materials (and subsequent ingestion of contaminants by food) is also a possible hazard. An inhalation hazard is also present due to soils contaminated with cadmium or chromium; cyanides could pose an inhalation hazard if released from the soil matrix as hydrogen cyanide (e.g. if acid were spilled).

4.3 Personal Protection Equipment

Based on the hazard evaluation, the use of respiratory protective equipment is essential. Air purifying respirators will be used, equipped with organic vapor cartridges and/or particulate filters, depending on which area is being excavated. All respirators will be NIOSH (National Institute for Occupational Safety and Health) and MSHA (Mine Safety and Health Administration) approved.

The standard work uniform for personnel working in the restricted area or exclusion zone will be:

Half-Face Respirator with Safety Glasses (supervisory tasks or equipment operation)

Full-Face Respirator (manual labor)

Hard Hat

Tyvek Coveralls (with separate hood)

Gloves - inner (surgical), outer (rubber, PVC or equivalent; minimum 12" gauntlet)

Boots - rubber, minimum 10" height

If conditions become particularly sloppy due to weather or are substantially more hazardous than anticipated, more stringent protection will be employed, including but not limited to:

Taping boots and gloves to coveralls to eliminate possible leakage at the wrist and ankle

Face shields

Full-Face respirator

4.4. Site Access

The site will be secured with limited access as previously described. The site will be divided into three zones -- the exclusion zone, the contamination reduction zone, and the support zone, as shown on Figure 1. The exclusion zone will be limited to authorized personnel, wearing the required work uniform. Smoking, tobacco, chewing, eating and drinking will be prohibited in the restricted area, as will the wearing of contact lenses. Upon leaving the restricted area, personnel must pass through the contaminant reduction zone (CRZ). Uncontaminated soil will be held in the CRZ awaiting site restoration. New equipment and supplies will be kept in the support zone; equipment may not enter the support zone from the restricted area until it has been decontaminated in the CRZ.

4.5 Air Monitoring

Air monitoring with direct reading instruments will be conducted during excavation operations. The air close to the ground will be surveyed, as will the atmosphere at shoulder height (breathing zone) around the excavation. This survey will take place at hourly intervals during the operation.

The main survey instruments employed will be a Foxboro Organic Vapor Analyzer (OVA), an HNU Model PI-101 Photoionizer or a Photovac TIP. The OVA is a sensitive instrument designed to measure trace quantities of organics in air. The instrument employs a flame ionization detector which is an excellent detector for light hydrocarbons, with the sensitivity in the low parts per million (ppm) range (vol/vol). The HNU and the Photovac instruments employ a photoionization detector, which is particularly sensitive to halogenated organic compounds like tetrachloroethylene and dichlorobenzene. These instruments are also capable of measurements in the low ppm range (vol/vol). An upwind and downwind sample for particulates will be taken on a daily basis. These samples will be analyzed for cadmium and chromium.

4.6. Contaminant Reduction

In order to leave the restricted area, personnel will remove protective equipment within the CRZ. Plastic sheeting with be laid throughout the CRZ. Starting with the potentially most contaminated item, the boots, equipment will be removed in the following order: gloves, coveralls, hard hat, glasses, respirator, and hood. Potable water will be provided for rinsing of hands and face. Respirators will be sanitized daily and stored in individual plastic bags. Boots and gloves (if they are to be reused) will be rinsed off with potable water and stored overnight in plastic bags. Disposable equipment will be placed in bags or drums, and disposed of as normal trash. Water from decontamination will be routed into the excavation. Small equipment will be decontaminated by soaking and/or scrubbing with a surfactant solution, followed by a water rinse. Large equipment will be decontaminated by steam cleaning.

4.7. Health Monitoring

All site personnel will have had an examination within 12 months preceding the start of on-site work, and will receive exit physicals within one month of completion of the remedial program.

The examination consists of the following:

Laboratory testing:

A. Complete Blood Count:

1. Red blood count
2. White blood count
3. Differential screening
4. Hemoglobin
5. Hematocrit

B. Urinalysis:

1. Sugar
2. Albumin
3. Specific gravity
4. Microscopic

C. Laboratory Chemistries:

1. A/G Ratio
2. Albumin
3. Alkaline, Phosphatase
4. Bilirubin, Total
5. Calcium
6. Chloride
7. Cholesterol
8. Creatinine
9. GGT
10. Globulins
11. Glucose
12. Iron
13. Lactic Dehydrogenase (LDH)
14. Phosphorus
15. Potassium
16. Protein, Total
17. SGOT
18. SGPT
19. Sodium
20. Triglycerides
21. Urea Nitrogen (BUN)
22. Uric Acid

D. Special Testing

1. Cadmium and chromium in urine

4.8. Emergency Procedures

In the event of a serious injury, an ambulance can be summoned using the telephone located at Remington Building Products (681-9100) on Thermal Industries (293-3838). The nearest hospital is Mid-Island Hospital, located at 4295 Hempstead Turnpike, Bethpage (Tel. No. 579-6000). A map giving directions to the hospital will be kept on site.

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REFERENCES

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APPENDIX

APPENDIX A

SECTION 5 OF REMEDIAL INVESTIGATION REPORT

SECTION V

SITE ASSESSMENT

5.1 Soil Quality

The soil quality data collected have been reviewed and the results presented in this section. Results are discussed under the following subsections: Basin No. 2, Basin No. 1, Stormwater Basin and Sludge Drying Bed. The data on soils are included in Appendix B of this report.

The soil quality data were evaluated jointly with the formation data obtained during the boring program. In the field special attention was directed to identifing sludge-like material or sludge affected soils. Concurrent review of both soil quality and formation data provides the information necessary for delineation of areas of the site that contain hazardous levels of waste material.

5.1.1 Basin No. 2

Soil samples were collected from Boring No. 13 (Figure 3-1) and analyzed for total cadmium, chromium and cyanide. A sample was obtained from above the visible sludge layer (2 to 3 ft. below grade), from the sludge layer (3 to 5 ft. below grade), and from below the sludge layer (5 to 6 ft. below grade). The data indicated that cadmium and chromium were present in all three samples at concentrations exceeding the predefined action levels for performing EP toxicity testing, as discussed in Section IV.

The sludge sample (3 to 5 ft. below grade) also contained cyanide at concentrations exceeding the predefined action level for cyanide amenable testing. Based on these results, EP toxicity testing was conducted on all three samples for cadmium, and for total, hexavalent and trivalent chromium. Cyanide amenable to chlorination testing was performed on the sludge sample. Data from these tests indicate that only cadmium is present at levels high enough to classify it as a hazardous waste. That is, soil samples collected at 2 to 3 ft. and 3 to 5 ft. below grade contained cadmium at concentrations of 2.2 and 2.1 mg/L, exceeding the RCRA maximum concentrations of 1.0 mg/L.

The formation data, obtained in the field during drilling, indicate that a clay-like sludge layer is present between 2 and 6 ft. below grade, as indicated in Table 5-1. Sludge was observed in Boring Nos. 7, 10, 11, 13, 14 and 15, which cover an area of the basin of approximately 1600 sq. ft. This area is depicted in Figure 5-1.

The sludge layer and deposits one foot above the sludge layer, are classifiable as a hazardous waste material, as indicated by the soil quality data. Therefore, the total area of Basin No. 2 containing hazardous waste material is the portion that extends from 1 to 6 ft. below grade in the 1600 sq. ft. area designated in Figure 5-1.

5.1.2 Basin No. 1

A uniform thick layer of sludge was not present beneath Basin No. 1. Of the five borings drilled, only two contained evidence of sludge

TABLE 5-1

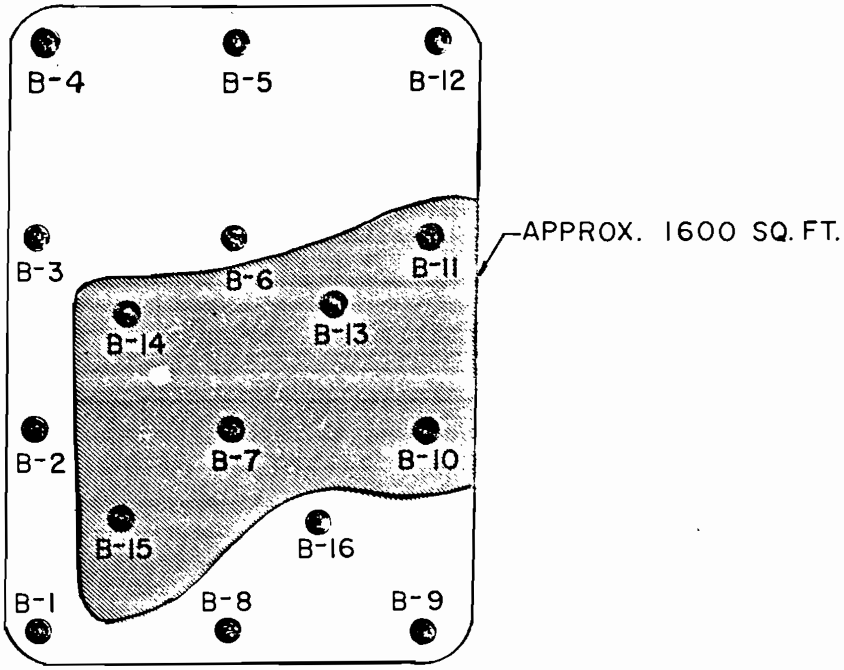
LOCATION OF UNIFORM SLUDGE LAYER

BASIN NO. 2

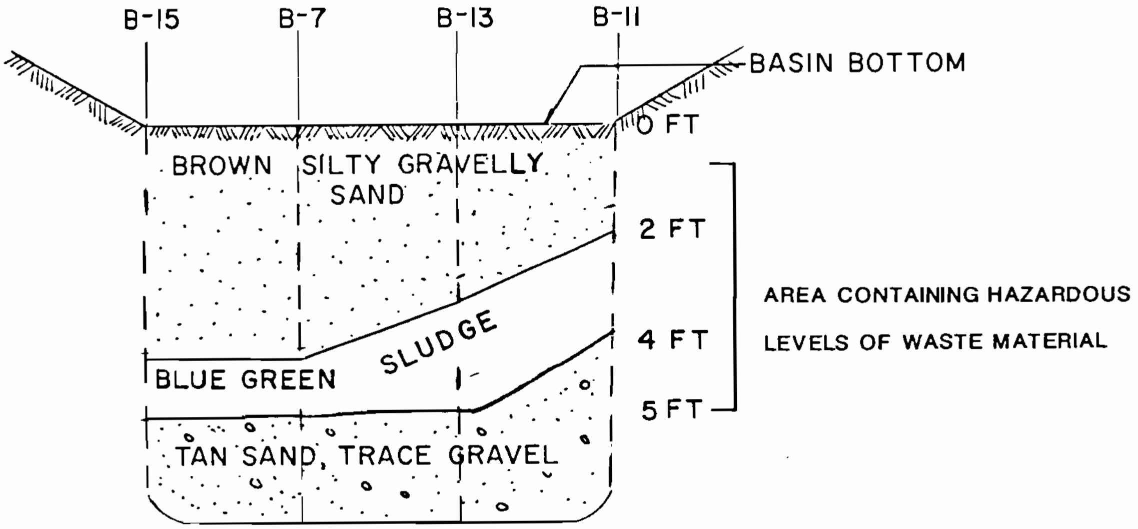
BORING NO.	GEOLOGIC UNIT DESCRIPTION	DEPTH BELOW LAND SURFACE from (ft)	to (ft)
B-7	Grayish blue sludge	4	5
B-10	Blue gray clayish sludge	2	3
B-11	Clayish sludge	2	4
B-13	Blue green clayish sludge mix	3	5
B-14	Blue green clayish sludge mix	1.5	6
B-15	Blue green clayish sludge mix	4	5

SLUDGE DRYING BED

BORING NO.	GEOLOGIC UNIT DESCRIPTION	DEPTH BELOW LAND SURFACE from (ft)	to (ft)
B-23	Very soft sludge-like material	4	5
B-24	Blue gray sludge mix	5	6
B-25	Brown silty sand, trace gravel, trace green sludge	4	5
B-26	Blue green sludge mix	4	5.6
B-27	Green sludge mix	4	5.5
B-28	Brown silty sand, trace gravel, trace sludge	4	6



PLAN VIEW



CROSS SECTIONAL VIEW

FIGURE 5-1

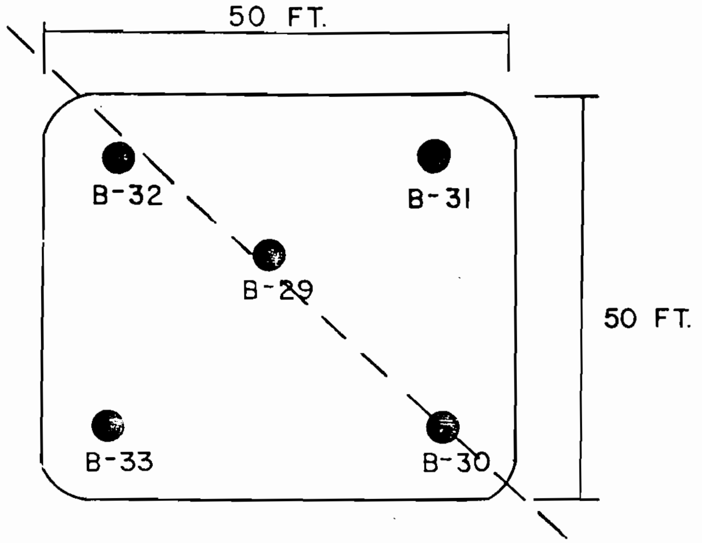
BASIN NO.2

material. Based on this, a composite sample was collected from boring No. 19, located in the center of the basin and from boring No. 21, where the half foot of sludge material was encountered. Results of the analyses for total cadmium, chromium and cyanide indicated that all three were present in the sample at levels exceeding the action levels for performing EP toxicity testing and cyanide amenable. Results of the EP toxicity and amenable testing indicates that no samples contain material classifiable as hazardous waste.

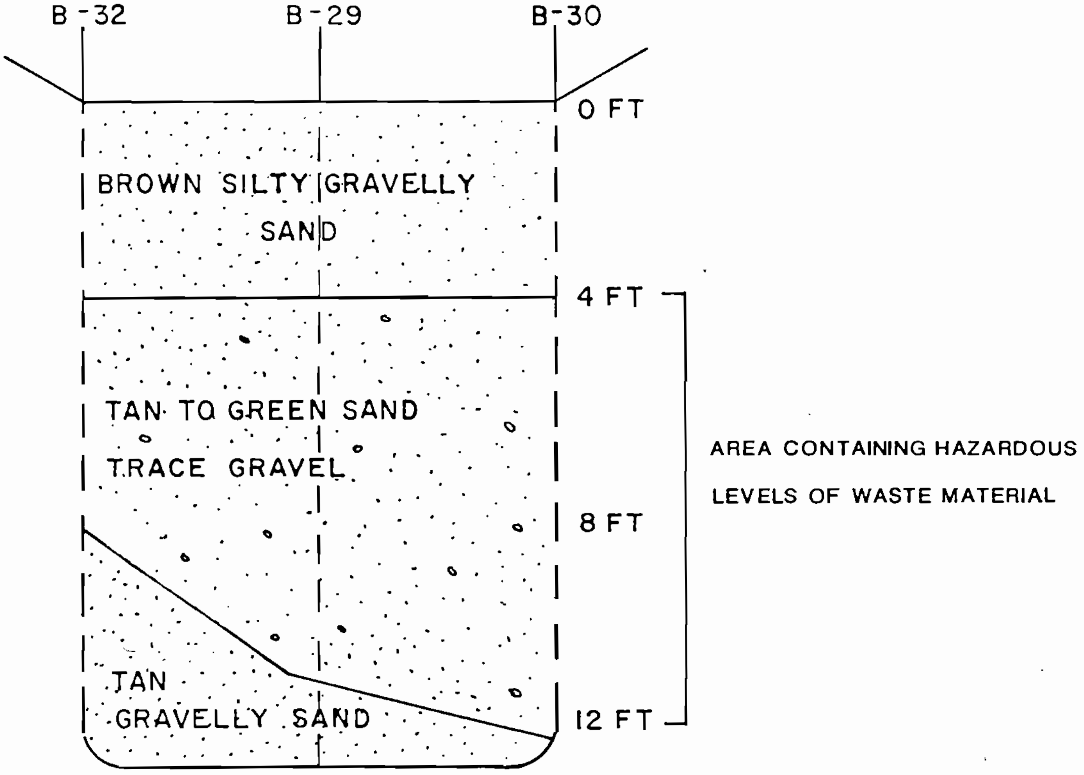
To provide the drill rig with access to the basins, ramps were constructed by excavation of adjacent earth materials. In one wall of the ramp constructed for Basin No. 1, a thin lense of green clayish sludge, and some dark petroleum tainted soil were detected. A composite sample of these materials was collected and sent to the laboratory for testing. NCDH requested that analyses be done for aromatic hydrocarbons, volatile halogenated organics and total chromium, cadmium and cyanide. Results indicate that organics, such as tetrachloroethylene and dichlorobenzene, and chromium, cadmium and cyanide, are present in high concentrations. As a result, a sample of the soil below the green lense was collected and analyzed. The results of EP toxicity and cyanide amenable testing indicated no hazardous levels of contaminants are present.

5.1.3 Stormwater Basin

The formation data, obtained in the field, indicate that a band of greenish tainted sand is present throughout the entire stormwater basin from approximately 4 ft. to approximately 12 ft. below grade (Figure 5-2).



PLAN VIEW



CROSS SECTIONAL VIEW

FIGURE 5-2

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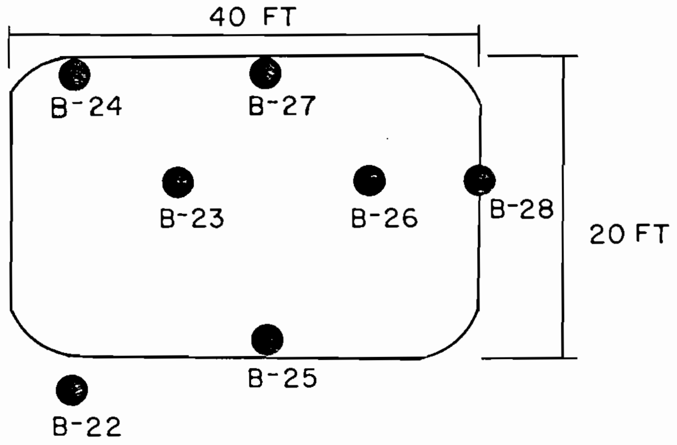
STORMWATER BASIN

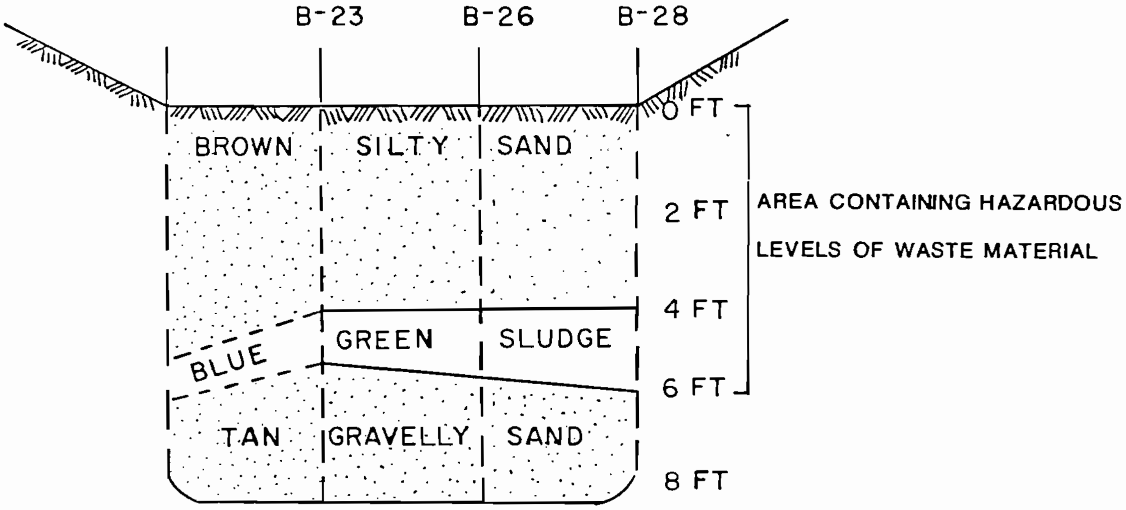
Results of EP toxicity and cyanide amenable testing on samples collected from 4 ft. to 14 ft. below grade indicate that cyanide is present in samples from 4 ft. to 12 ft., at concentrations to classify the soil as a hazardous waste. In addition, the oil sludge material, which was found at the bottom of the basin when the standing water was removed, was analyzed to determine whether it is a hazardous waste. Testing was performed for characteristics of ignitability, and for EP toxicity for all contaminants listed in 40 CFR 261, Table 1. Results indicated that the material did not contain any of the materials listed in Table 1 to render classification as a hazardous waste material. Analyses did indicate, however, that it contained a pesticide, dieldrin, at 4 ppm.

5.1.4 Sludge Drying Bed

Formation data indicated that a uniform layer of blue green sludge was present throughout the former location of the sludge drying bed. This layer occurred from approximately 4 to 6 ft. (Figure 5-3) below grade, as indicated in Table 5-1. Soil samples were collected for analysis from Boring No. 26 at 0 to 4 ft., 4 to 6 ft., and 6 to 8 ft. Resultant data indicated that total cadmium and chromium were present in the 4 to 6 and 6 to 8 ft. samples at levels exceeding the predefined action levels. Cyanide was present in the 0 to 4 ft. and 4 to 6 ft. samples at levels exceeding the predefined action level. Results of the EP toxicity testing and the cyanide amenable testing indicate that the visible sludge layer (4 to 6 ft. sample) contained concentrations of cadmium at levels sufficient to classify the sample as a hazardous waste. The 0 to 4 ft. and 4 to 6 ft. sample contained concentrations of cyanide at levels sufficient to classify



PLAN VIEW



CROSS SECTIONAL VIEW

FIGURE 5-3

SLUDGE DRYING BED

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the samples as a hazardous waste. Therefore, the area of the sludge drying bed containing material classified as hazardous, extends from 0 to 6 ft. below grade and encompasses the entire basin area.

5.2 Groundwater Quality

5.2.1 On-Site

The water quality data collected from the three on-site monitoring wells have been reviewed and the results are presented in this section. Monitoring wells were sampled in May and June following well construction, and in September. The data from the two downgradient southerly) wells have been compared to the background data representative of the upgradient well. This comparison, coupled with data on typical ambient groundwater quality conditions in this area of Nassau County, provided the basis for determining whether the groundwater beneath the site has been degraded from former on-site waste disposal activities. Water quality data is discussed under the following subsections: Inorganic Parameters and Organic Parameters.

Inorganic Parameters

The water quality from Well Nos. 1 and 2 (Figure 3-1), when compared with background quality (Well No. 3) for both samplings, indicates that the groundwater has been affected by former disposal activities. Cadmium in Well Nos. 1 and 2, cyanide in Well Nos. 1 (June only) and 2, and chromium in Well No. 2 (May only) were detected at concentrations exceeding background. These concentrations are also above maximum allowable levels specified by New York State for Drinking Water and Class GA Waters for cadmium and chromium as shown in Table 5-2. NYS does not specify a maximum allowable level for cyanide.

Comparison of September water quality data with results of the initial sampling of May and June indicates improvement in groundwater quality, which is normal with time. This reflects a seasonal fluctuation which is superimposed on the long-term trend. This is attributable to the varying conditions of groundwater recharge and water table elevations.

Organic Parameters

Water samples collected from the on-site wells in September were tested for volatile halogenated organics (VHO's), aromatic hydrocarbons and pesticides, as indicated in Table 5-2. The water samples were tested for these constituents due to the presence of VHO's and aromatic hydrocarbons in a soil sample collected from the ramp wall to Basin No. 1, and the occurence of dieldrin in the oil-like sludge at the bottom of the stormwater basin. Data indicate that dieldrin, as well as all other pesticides tested for, are not present in the groundwater beneath the site. Volatile organics, however, were detected in the water samples analyzed. Methylene chloride was found in Well Nos. 1 and 3 at concentrations of 115 and 2, ug/L respectively. Well No. 2 contained 1,2-dichloroethane, trichloethylene and benzene at 11, 32 and 2 ug/L, respectively. These compounds are commonly found in many industrial cleaning solvents and are frequently detected in the groundwater in industrial areas (Stover, 1982).

TABLE 5-2

ON-SITE WATER SAMPLING RESULTS AND QUALITY STANDARDS

	10 NYCRR Part 5.1 Drinking Water Regulations	6 NYCRR Part 703 Groundwater Quality	Background Well No. 3		Well No. 2		Well No. 1	
			May	Sept	May	Sept	June	Sept
Cadmium, mg/L	.01	.01	.004	.004	.53	.32	.058	.034
Chromium, mg/L total	.05	-	<.005	<.02	.11	.03	<.005	<.02
hexavalent		.05	<.02	<.02	<.02	<.02	<.02	<.02
trivalent		-	<.005	-	.11	-	<.005	-
Cyanide, mg/L	-	-	<.04	<.02	.07	.08	.04	<.02
Methylene Chloride, ug/L				2		<2		115
Dichloroethene, ug/L				<2		11		<2
Trichloroethene, ug/L				<1		32		<1
Benzene, ug/L				<1		2		<1

5.2.2 Off-Site

The water quality data collected from the off-site observation wells and Massapequa Creek have been reviewed and the data are provided in Table 5-3 and in the appendices of this report. Chromium concentrations were lower than cadmium concentrations and only the sample from Lambert Avenue (Figure 4-1) exceeded the 0.05 mg/L drinking water standard. Samples downgradient of that location showed reductions in chromium concentrations to below the detection limit, as shown in two samples near the creek (Figures 4-1 and 5-4).

The slight increase in chromium concentration a few hundred feet downgradient of the source, as shown in Figure 5-4, probably results from the intermittent and non-uniform inputs resulting from recharge events. The net result, however, is that chromium concentrations are reduced to below detectable limits by the time groundwater reaches the area where it discharges to Massapequa Creek.

Cadmium was an order of magnitude more concentrated in on-site Well No. 2 than was chromium. The concentration dropped downgradient, but remained above the 0.01 mg/L drinking water limit until the sample farthest downgradient in the Spielman Avenue well (Figure 4-1 and 5-4). These results are consistent with the general behavior of cadmium in the soil and groundwater environment. It remains more soluble and less strongly sorbed than several other of the transition series elements (i.e. chromium, copper and lead).

TABLE 5-3

Cadmium and Chromium Concentrations in Groundwater Samples Collected in Off-Site Observation Wells and Massapequa Creek

LOCATION	CADMIUM (mg/L)	CHROMIUM (mg/L)	CHROMIUM, HEXAVALENT (mg/L)
On-Site Well No. 2*	0.32	0.03	< 0.02
Lambert Avenue	0.20	0.065	< 0.02
Plitt Avenue	0.10	0.008	< 0.02
Spielman Avenue	< 0.001	< 0.005	< 0.02
Well at Massapequa Creek	0.004	< 0.02	< 0.02
Massapequa Creek Surface Water	0.001	< 0.02	< 0.02

* Repeated in this table for purposes of discussion.

Locating Well No 2
1
3 ?

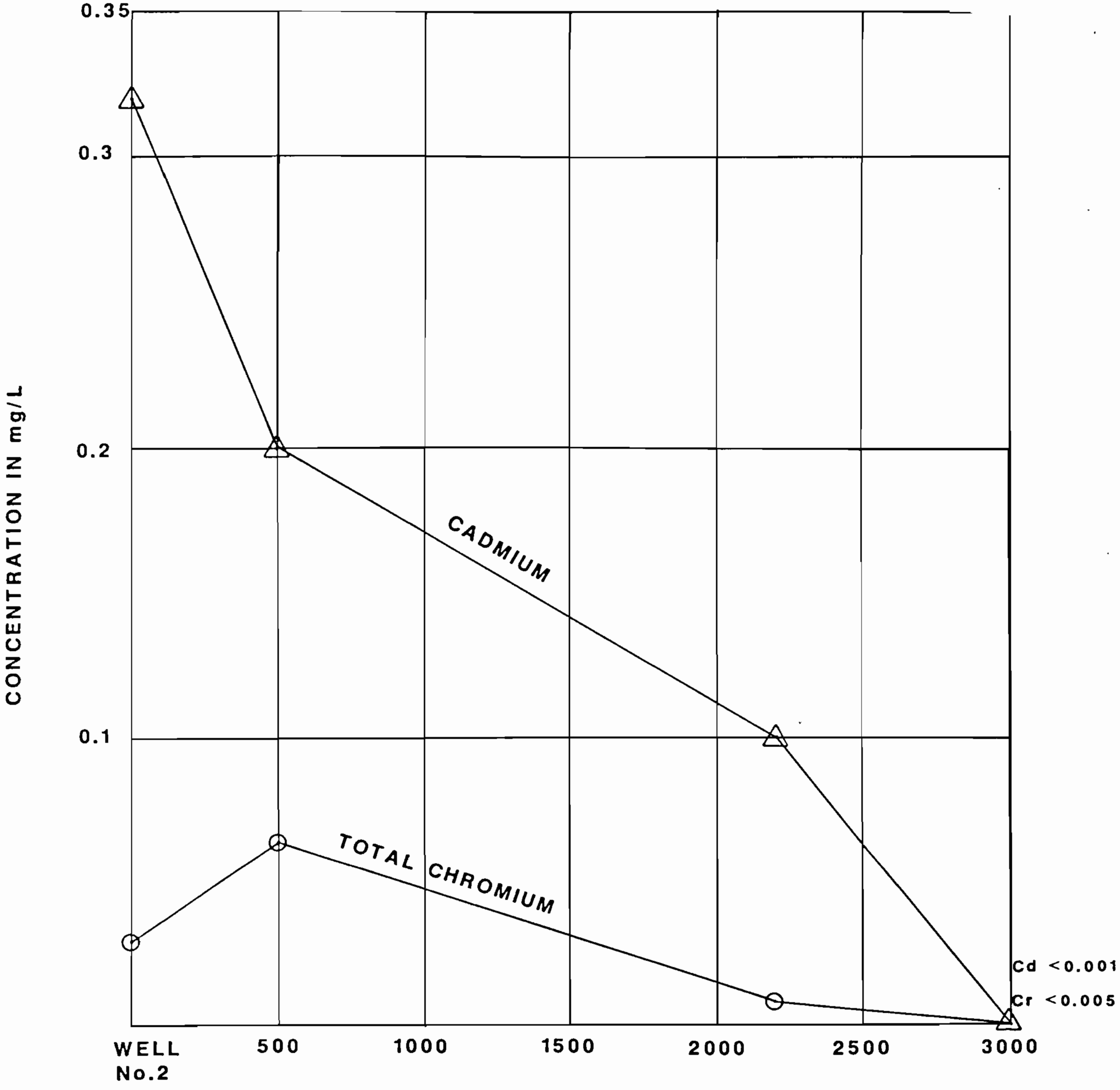

FIGURE 5-4

LKB

CONCENTRATIONS OF CADMIUM AND CHROMIUM AS A FUNCTION OF DISTANCE FROM DISPOSAL BASINS

Both of the metals reach non-detectable concentrations by the time they reach the vicinity of Massapequa Creek. Much of the time, groundwater discharges into Massapequa Creek along a reach west of the Woodward School property. At the time the samples were collected, a prolonged drought had lowered the water table to several feet below that of the creek bed. Thus, it appeared that the groundwater flowed beneath the creek at the time of sampling.

Because of the low water table, Massapequa Creek was not flowing at the location where the culvert opens on the southern end. A surface water sample was collected from a puddle in the stream channel. Chromium was below the detection limit and cadmium was at the detection limit. It is likely that this water was more indicative of stormwater runoff than of discharging groundwater because of the prevailing hydrologic relationship.

The results of on- and off-site sampling have confirmed the presence of a zone of groundwater contaminated with cadmium and chromium as has been historically noted. Both metals are reduced to below detection limits at the region where groundwater discharges to Massapequa Creek. No drinking water wells are used between the source area and the discharge area. Thus, the only direct impact of the contaminants is on the quality of the creek. Since the metals are no longer detectable there, the groundwater discharge does not adversely affect the creek's water quality.

Removal of contaminated soils is planned for the site, as discussed in Section VI, and this will remove the input of contaminants at the present source area. Natural groundwater flow will flush the present body of contaminated groundwater toward and into Massapequa Creek. With the source removed, the only changes in metal concentrations should be lower. As they are already below detection in the vicinity of the creek, no further impact is envisioned. The remaining detectable concentrations in the plume will decay with time as contaminants in the water disperse and are diluted.

5.3 Other On-Site Assessments

5.3.1 Wastewater Treatment Unit

The remains of a wastewater treatment plant on the site, as shown in Figure 1-1, include approximately three connecting 20-ft. high, open, concrete, octagonal shaped units. The treatment process had involved the removal of chromium from the plating waste effluent, the subsequent transfer of the liquid portion to the recharge basins, and the disposal of the precipitate to an adjacent sludge drying bed. The units were inspected by an LKB field engineer in September of 1985 to determine whether any material remained in the units that would be classified as a hazardous waste. The inspection disclosed that there was no evidence of any remaining material within the units other than some soil and vegetation that had accumulated in the bottom of the units. The walls of the facility were completely clean.

5.3.2 Air Sampling for Cyanide

Although cyanide ion was expected to be present in chemical residues at the former Liberty site, no air samples were collected for cyanide analysis for reasons discussed below.

The cyanide originated in the plating solutions containing the cadmium and chromium metal ions that, when treated, formed the sludge. Cyanide ion can be converted to gaseous hydrogen cyanide under strongly acidic conditions. There was nothing present at the site to indicate that such conditions existed. The sludge was formed under alkaline conditions which produced metal hydroxides. In soil, these would tend to buffer any acidity in rain toward neutral or alkaline conditions. The cyanide would not react to form hydrogen cyanide under such conditions. Since conditions do not and were not anticipated to favor hydrogen cyanide production, no air samples were collected.

APPENDIX B

PROTOCOL FOR SOIL SAMPLING

Protocol for Soil Sampling

Equipment:

Split Spoon Sampler(s), trowel or core sampler

MICRO™ Laboratory Cleaner

Brushes

Plastic Buckets

Spatula

Distilled Water (several gallons)

Plastic Sheeting

Table (optional)

Surgical Gloves (or equivalent)

Procedure:

1. Prepare a 2% solution of MICRO™ in distilled water in a bucket.

2. Disassemble sampling equipment and immerse all parts in the MICRO™ solution. Rinse parts with copious amounts of distilled water. Reassemble sampling equipment and place in plastic bag until ready for use.

3. Samples taken from the overyling soils in Basin 2 (0-2 feet below grade) and the stormwater basin (0-4 feet below grade) will be composited over the depth of the layer. Samples taken from the basins after removal of sludge layers will be one foot in depth.

4. Select the appropriate sampler for the condition.

5. Insert or drive the sampler to the required depth.

6. If more sample is obtained than will fit in the sample container (as with the core sampler), extrude the sample onto polyethylene sheeting. Split the core along its length to obtain a smaller, representative sample (using a spatula). Transfer this sample to the appropriate container.

7. Fill out the sample label (project, location, depth, date, etc.) and cover with transparent tape. Place the container in a cooler with ice.

8. Fill out Sample/Core Log and Chain of Custody Form (copies of these forms are given in Appendix).

9. Deliver sample to the lab as soon as possible; obtain signature of Chain of Custody Form.

APPENDIX C

LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PROCEDURE

VOLUMETRIC TECHNIQUES, Ltd.

SANDER R. STERNIG
Director of Laboratories

317 BERNICE DRIVE • BAYPORT, NEW YORK 11705 • (516) 472-4848

ANALYTICAL PLAN FOR QA/QC

Sample taking

Sample preparation methods

Chain of custody

Analytical Methods

Calibration and analytical procedures

Data handling, review and reporting

REPRESENTATIVE SAMPLING

- Appropiate location site & depth
- Statistical sufficient number of sampling sites
- Measuring all necessary ancillary data
- Determination of climatic flow or other conditions under which sampling should be conducted
- Selecting parameters to be measured
- Selecting sample containers
- Selecting frequency & length of sampling
- Selecting types of samples
- Sample preservation
- Chain of custody

CHAIN OF CUSTODY

- Sample number
- Signature of collector
- Date and time of collection
- Place and address of collection
- Waste type
- Signiture of persons involved in chain of possession
- Inclusive dates of possession

ANALYTICAL METHODS & ANALYTICAL PROCEDURES

Test Methods for Evaluating Solid Wastes SW 846 EPA 4/1984

Federal Register 10/26/84 sections 600 & 601

Standard Methods for the Examination of Water and Wastewater, 1st edition, 1985

CALIBRATION

Linearity of lab instruments within acceptable limits

Reference standards

Maintanance contracts and inspections by manufactures represenatives

Reference samples

Internal QC samples (X & R, lab blanks, duplicates, splits, % recoveries - spikes)

External samples - State & Federal proficiences

QC charts for monitoring precision & accuracy of data

Review of data, results & knowledge of wastestreams

Training of instrument operators

Data transmitted in prescribed format

VOLUMETRIC TECHNIQUES, LTD.
317 Bernice Drive
Bayport, New York 11705

CHAIN OF CUSTODY RECORD

ID #	SAMPLE NAME					NO. OF CONTAINERS							REMARKS
SAMPLERS: *(Signature)*													
LAB NO.	DATE	TIME	COMP.	GRAB	LOCATION								

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

APPENDIX D

FIELD REPORTING FORMS

GERAGHTY
& MILLER, INC.
Ground-Water Consultants

SAMPLE/CORE LOG

Boring/Well ________ Project/No. ____________________ Page ______ of ______

Site Location ____________________ Drilling Started ____________ Drilling Completed ____________

Total Depth Drilled ______ feet Hole Diameter ______ inches Type of Sample/ Coring Device ____________

Length and Diameter of Coring Device ____________________ Sampling Interval ____________ feet

Land-Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ____________

Drilling Fluid Used ____________________ Drilling Method ____________

Drilling Contractor ____________________ Driller ____________ Helper ____________

Prepared By ____________________ Hammer Weight ______ Hammer Drop ______ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description

GERAGHTY
& MILLER, INC.
Ground Water Consultants

DAILY LOG

Well(s) ________ Project/No. ________________________________ Page ______ of ______

Site Location ________________________________

Prepared By ________________________________

Date/Time	Description of Activities

& MILLER, INC.
Ground-Water Consultants

CHAIN-OF-CUSTODY RECORD

Page ____ of ____

Location: ____

Laboratory: ____

Project/Number ____

Shipping Container ID: ____

Sampler(s) ____

SAMPLE IDENTITY	Date Sampled	SAMPLE CONTAINER DESCRIPTION												Total	Remarks
												Total No. of Containers			

Relinquished by: ____ Organization: ____ Received by: ____ Organization: ____

Date: ____ Time: ____ Date: ____ Time: ____

Relinquished by: ____ Organization: ____ Received by: ____ Organization: ____

Date: ____ Time: ____ Date: ____ Time: ____

Relinquished by: ____ Organization: ____ Received by: ____ Organization: ____

Date: ____ Time: ____ Date: ____ Time: ____

Delivery Method: ____ (attach shipping bill, if any)

(Use extra sheets, if necessary)

IVAN POUSCHINE, JR.
Vice President of Technical Development

EDUCATION/REGISTRATION

B.A., Engineering, Harvard College, 1952

Graduate Studies, Political Science, Georgetown University, 1956

EXPERIENCE

Mr. Pouschine has 30 years of consulting engineering experience, and he has served as Project Manager or Director on numerous water supply and wastewater treatment projects world-wide, including hazardous waste remediation.

Among the projects he has directed or managed are:

- Hazardous waste management studies at several industrial sites including development of plans for investigation and remediation and performing the required investigations.

- Investigations and designs of waste pickle liquor collection and disposal systems at Bethlehem Steel's Sparrows Point Plant and US Steel's Gary Plant, including supervision of construction and start-up.

- Comprehensive investigations of industrial wastewater, and preparation of reports and recommended treatment facilities for US Steel Corporation's Gary Steel, Gary Tube, National and Elwood Works; Bethlehem Steel Corporation's Sparrows Point Plant including the shipyard, and Lebanon and Bethlehem plants; and Cities Service Lake Charles Refinery.

- Pilot plant testing and report on removal of organic contaminants in Glen Cove, NY, drinking water, funded by the USEPA, and arranging for continued testing to remove pesticides in Suffolk County, NY. The Glen Cove pilot plant operations included testing of several different aeration systems, carbon adsorption, proprietary resin absorption, regeneration by steam of both carbon and resin over a three year period.

- Evaluation of USEPA wastewater effluent guidelines for the coal and ore mining, synfuels, and ferrous metals industries. Technical assistance to EPA Region III concerning achieving of limitation guidelines at six steel plants. Treatability studies of filtering combined sewer overflows and polishing secondary treatment plant effluent.

- Comprehensive master plan, design and start-up of a regional combined industrial-municipal wastewater treatment plant for Como, Italy, handling 127 wet process industries including voluminous textile wastes.

- Comprehensive surveys and reports on wastewater treatment and reuse for FIAT S.p.A. Avigliana, Turin, Brescia and Milano plants and for AGIP S.p.A. petrochemical complex in Gela, Italy. Studies, designs, construction supervision and start-up of water systems for Italsider's Taranto complex and Montecatini chemical plant wastes.

JOHN P. LEKSTUTIS, P.E.
Manager of Engineering Development

EDUCATION/REGISTRATION

B.E. Civil Engineering, Manhattan College
M.E. Sanitary Engineering, Manhattan College

Registered Professional Engineer in NY, NJ, MA, RI, ME, WA

EXPERIENCE

Mr. Lekstutis has more than 19 years of experience in the fields of civil and sanitary engineering, environmental science, and hazardous waste management. During this time he has addressed and managed technical, economic, environmental and engineering programs from inception through implementation for major industrial and municipal projects. Mr. Lekstutis directs LKB's technical activities and serves as senior advisor on all environmental projects.

Before joining LKB, Mr. Lekstutis was Director of Environmental Engineering and Sciences for Envirosphere Company, a Division of Ebasco Services Incorporated. He was responsible for managing Envirosphere's eastern environmental operations on projects represented by a capital investment in excess of $10 billion. He also planned and directed that firm's entry into the hazardous waste field. His responsibilities included the development, design and implementation of remedial engineering measures such as: groundwater monitoring and management; excavation, removal and safe disposal of wastes; in-place encapsulation; lagoon and tank farm closure; and in situ chemical treatment. Mr. Lekstutis' other experience includes site investigations, engineering feasibility evaluations, EIS reports, and economic studies for major project undertakings throughout the U.S. Specific projects included: coal storage and shipment terminals; coal gasification and other alternate fuel production facilities; high voltage transmission lines; coal fired electric generating plants; and industrial chemical manufacture.

Mr. Lekstutis recently directed a remedial investigation, feasibility and engineering design program for a former coal gasification/disposal site in central New Jersey. The work scope for this program included: detailed site investigations of the air, soils and groundwater to establish the extent and character of buried coal tar residues; a risk assessment to establish the critical health and environmental pathways of contamination; an engineering feasibility study to select a remedial program; engineering design and construction oversight of the remedial measures; and interface and negotiation on behalf of the former owners with local communities, local governments and the New Jersey Department of Environmental Protection.

Prior to Ebasco, Mr. Lekstutis worked for NL Industries, Inc., a major industrial chemical manufacturer. In his position as Environmental Health Engineer he conducted in-plant environmental, health and safety audits for operating facilities including: lead chemical production; lead battery reclamation; titanium dioxide manufacturing; and paint manufacturing.

OLIN C. BRAIDS, Ph.D.

Associate & Senior Scientist
Member of the firm since 1975

CREDENTIALS/REGISTRATION

B.A. Chemistry, University of New Hampshire 1960
Ph.D. Soil Chemistry, The Ohio State University 1966
Certified Professional Soil Scientist, American Registry of Certified Professionals in Agronomy, Crops, and Soils, Ltd.

PROFESSIONAL AFFILIATIONS

American Association for the Advancement of Science
American Chemical Society
American Society of Agronomy/Soil Science Society of America
National Water Well Association
Sigma Xi (research honorary)
Alphi Chi Sigma (professional chemistry)

FIELDS OF SPECIALIZATION

- Evaluation of complex ground-water quality problems
- Formulates remedial ground-water cleanup programs
- Establishes protocols for field sampling and analysis
- Provides expert testimony and reports on hazardous waste compliance issues
- Establishes quality assurance protocols for outside labs and drilling contractors
- Prepares seminars on ground-water contamination for industrial clients and regulators
- Hazardous waste compliance research planning
- Special research on PCBs in the ground-water environment
- Investigation and research on biodegradation of complex organics in ground water

EXPERIENCE SUMMARY

Dr. Braids is responsible for the evaluation of complex ground-water quality problems relating to the chemical contamination of ground water and soil. He plays a major role in the firm's investigation of ground-water contamination incidents and is often required to provide detailed technical memoranda to Geraghty & Miller, Inc's staff, the firm's industrial clients, and their legal counsel relating to the probable source, extent, and ground-water quality implications of materials introduced into the ground-water regime through spills, storage, and disposal activities. Dr. Braids has prepared documents for litigation and appeal purposes and provides expert testimony on behalf of the firm's clients.

Dr. Braids has participated in every aspect of the firm's work relating to ground-water contamination. He has prepared monitoring programs for RCRA-related facilities tailored to the specific site characteristics. He has also developed monitoring programs and interpreted data from CERCLA-regulated sites on behalf of industrial clients. In 1983, Dr. Braids was part of a group that wrote a manual for the American Water Works Association Research Foundation. In this connection, he was invited to participate in meetings with the Netherlands Institute for Water Research (KIWA) and to tour water treatment plants in Dusseldorf, Mannheim, and Karlsruhe, West Germany

KEY PROJECTS

- Developed and implemented a system for biodegrading organic chemicals in ground water for a pharmaceutical manufacturer.
- Developed background research on hazardous waste management for USEPA.
- Assisted in the development of pathway analysis and hazardous chemiical inventory at the Love Canal site.
- Developed standards for land-use in northern New Jersey to limit groundwater contaminants.
- Developed training program for ground-water quality assessment/monitoring programs for chemical industry clients.
- Provided interpretation of geochemistry of contaminants at a major arsenal in the United States.
- Investigated agricultural utilization of municipal sludges while a member of the University of Illinois faculty.
- Provided testimony in regard to contaminant fate at a Superfund site in New England.

SELECTED PUBLICATIONS

Hinesly, T.D., O.C. Braids, and J.A.E. Molina, 1971, "Agricultural Benefits and Environmental Changes Resulting From the Use of Digested Sewage Sludge on Field Crops," an Interim Report on a Solid Waste Demonstration Project, EPA Publication No. WP-30, U.S. Govt. Printing Office.

Kimmel. G.E., and O.C. Braids. 1974, "Leachate Plumes in a Highly Permeable Aquifer," Ground Water, 12(6): 388-392.

Braids, O.C. and S.E. Ragone, 1975, "Nitrogen in Long Island Ground Water," Pages 64-91 in R.E. Burge, ed., Conference Proceedings of Nitrogen in Long Island Water Systems, Environmental Improvement Committee, Am. Chemical Society, Nassau-Suffolk Subsection.

Kimmel, G.E., and O.C. Braids, 1975, "Preliminary Findings of a Leachate Study on Two Landfills in Suffolk County, N.Y.," Journal Research, U.S. Geological Survey 3(3):273-280.

Braids, O.C.. G.R. Wilson, and D.W. Miller, 1977, "Effects of Industrial Waste Disposal on the Ground-Water Resources," Pages 179-207 in Robert P. Pojasek, ed., Drinking Water Quality Enhancement Through Source Protection, Ann Arbor Science. Ann Arbor, Michigan.

SELECTED PUBLICATIONS (Continued)

Fenn, D.. E. Cocozza, John Isbister. O.C. Braids, and Paul Roux, 1977, "Procedures Manual for Ground-Water Monitoring at Solid Waste Disposal Facilities," EPA Publication No. EPA/530/SW-611, Cincinnati, Ohio 269 pp.

Braids, O.C., 1981, "Developing a Ground-Water Monitoring Program", in Land Application of Sewage Sludge, Seminar Proceedings Virginia Water Pollution Control Assn., Richmond 23227, pp. 71-87.

Saar, R., and O.C. Braids, 1983, "Chemical Indicators of Leachate Contamination in Groundwater Near Municipal Landfill," Ann Arbor Science, Ann Arbor, Michigan.

Braids, O.C., 1983, "Volatile Organic Compounds and the Ground Water Environment." Pages 49-65 in J.F. Manwaring, Ed., Occurrence and Removal of Volatile Organic Chemicals from Drinking Water, American Water Works Association Research Foundation, Denver, Colorado.

ANDREW J. BARBER

Senior Scientist
Corporate Safety Manager
Member of the firm since 1980

CREDENTIALS/REGISTRATION

B.S. Chemistry, Union College, 1979

PROFESSIONAL AFFILIATIONS

American Chemical Society
American Industrial Hygiene Association
American Society of Safety Engineers
National Water Well Association

FIELD OF SPECIALIZATION

- Hazardous waste site remediation
- Field sampling and analysis
- Health and safety
- Analysis of water-quality and geochemical data

EXPERIENCE SUMMARY

Prior to joining Geraghty & Miller, Inc., Mr. Barber was employed by Peabody Coastal Services of Linden, New Jersey, as a member of its Hazardous Material Response Team. While at Peabody, he was directly involved with cleanup activities at several uncontrolled hazardous waste sites. His responsibilities included data and sample collection, supervision of heavy equipment operations, and classification and segregation of waste materials.

As a geochemist with the firm, Mr Barber has worked on numerous ground-water contamination projects characterizing the movement of contaminants in the subsurface environment and developing effective monitoring and remedial programs. He has extensive experience in establishing sampling protocols in the planning and implementing ground-water quality investigations, particularly for RCRA, CERCLA, and state compliance programs. His responsibilities include project management, data analysis, and the preparation of technical reports. As the Corporate Safety Manager., he has developed and managed a company-wide program of safety training and health monitoring, as well as many site-specifric health and safety program.

KEY PROJECTS

- Supervised remediation of disposal pit containing residual solvents and PCB oil.

- Developed field techniques to analyze volatile organic contaminants in soil and water samples using a portable gas chromatograph.

KEY PROJECTS (Cont'd.)

- Continually involved in analysis and presentation of water quality and geochemical data.

- Developed computer programs to store, retrieve and manipulate water quality data from hazardous waste landfills.

- Prime responsibility for geochemistry in the negotiation and implementation of extensive ground-water investigations at two major CERCLA sites on Long Island.

- Co-authored three volume technical report as part of on-going litigation support for a major environmental lawsuit.

- Field manager for the surficial cleanup and subsequent ground-water investigation for a CERCLA site in New Jersey.

- Continually involved in developing work plans for taking representative samples for contaminants in soil, air, and water under difficult or hazardous situations such as on lagoons or in sewer lines.

- Project manager for remedial action feasibility study for major CERCLA site on Long Island.

SELECTED PUBLICATIONS

Barber, A.J., and O.C. Braids, Application of a Portable Organic Vapor Analyzer in Ground-Water Contamination Investigations, "Proceedings of the Second National Symposium on Aquifer Restoration and Ground-Water Rehabilitation," National Water Well Association, Worthington, Ohio, 1982 (paper presented May 27, 1982).

Barber, A.J., Case Histories in Safety Programs for Hazardous Waste Site Investigations, Paper presented to the National Water Well Association, "Aquifer Restoration and Ground-Water Monitoring," Third National Symposium, Columbus, Ohio, May 25-27, 1983.

Lobasso, T. and A.J. Barber, A Monitoring and Removal Plan for Leaked Propane in the Vadose Zone, "Proceedings of Characterization and Monitoring of the Vadose (Unsaturated) Zone," National Well Water Association, Worthington, Ohio (Paper presented December 9, 1982, Las Vegas, Nevada).

YASMIN ALIBHAI

Scientist
Member of the firm since 1985

EDUCATION

M.S. Environmental Engineering (Specialized in Toxicology and Hazardous Wastes), New Jersey Institute of Technology, Newark, New Jersey, 1984

M.S. Computer Science, New Jersey Institute of Technology, Newark, New Jersey, Candidate

B.S. Chemical Engineering and Management (Combined Honors), Loughborough University, Loughborough, England, 1981

PROFESSIONAL AFFILIATIONS

American Institute of Chemical Engineers
Water Pollution Control Federation

FIELDS OF SPECIALIZATION

- Risk assessment
- Toxicology
- Computer programming and modeling
- Knowledge of RCRA regulations

EXPERIENCE SUMMARY

Since joining Geraghty & Miller, Inc., Ms. Alibhai has provided technical assistance on an EPA project involving the preparation of a guidance manual for RCRA permit writers dealing with the selection of effective monitoring parameters. This work involved the collection and analysis of chemical information related to priority pollutants and their behavior in the environment.

Prior to joining Geraghty & Miller, Inc., Ms. Alibhai was employed as an environmental engineer with JRB Associates, a firm of consulting environmental engineers, where she was involved in the preparation of Surface-Water Discharge Permits for New Jersey and Connecticut. Ms. Alibhai used her computer skills to provide technical assistance in the preparation of industrial effluent guidelines for the EPA. She was also involved in conducting site inspections and preparing reports for the preliminary assessment of Superfund sites. Ms. Alibhai was also employed as a staff environmental engineer by the Earth Technology Corporation where she reviewed RCRA Part B Applications and provided technical assistance on ECRA projects.

KENNETH MITCHKO, Secretary/Treasurer of Chemical Pollution Control, Inc., Bay Shore, NY
College Biology Major
College General Chemistry
College Organic Chemistry
Thirteen (13) years experience Hazardous Materials Handling
One (1) year demolition experience United States Army
On-site supervisor for S.T.O.P programs in Suffolk, Nassau & Westchester Counties.
On-site supervisor for New York DEP - monitored cleanups
Monitored PCB cleanups
New York State Certified Pesticide Applicator: Identification #C 1-005393

JOHN SABATINO, General Manager of Chemical Pollution Control, Inc.,
Bay Shore, NY
College Inorganic Chemistry Major
College Organic Chemistry Major
College Physics
College Mathematics
Six (6) years experience Hazardous Waste Management
Hazardous Waste Seminars: Has given Hazardous Waste Management Seminars at various industrial locations on Long Island.

SANDER STERNIG, Chemist
Wisconsin State University
Adelphi University 1969: Biology & Chemistry Major
State University at Stony Brook 1974: Environmental Biology Major
C. W. Post College: Finished Thesis to obtain degree

Electronic Engineer at Instrument System Corporation, Biochemist at Mallincrodt Chemical 1970-1971; Environmental Chemist at Suffolk County Department of Environmental Conservation 1971-1975; Director of Labs at Volumetric Techniques Ltd., 1976 to present; Director of Labs at Chromographic Testing Associates, Vice President for Technical Affairs at Chemical Pollution Control, Inc., standing member of Suffolk County Legislature's Committee On Toxic Waste and Technical Advisor for Suffolk County Police Department Emergency Services and Fire Safety.

APPENDIX F

TOXICOLOGICAL DATA

type 3/msds.merck

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1; Accession No. 1583

(MONO) Monograph: 1583

(MMAT) Monograph Title Name: Cadmium

(CAS) C.A.Registry Number: 7440-43-9

(TEXT) Monograph Text:

Cd; at. wt 112.41; at. no. 48; valence 2. Group 2b element. Abundance in earth's crust: 0.1 to 0.2 ppm. Natural isotopes: 114 (28.86%); 112 (24.07%); 111 (12.75%); 110 (12.39%); 113 (12.26%); 116 (7.58%); 106 (1.22%); 108 (0.88%); known isotopes range in mass number from 103 to 121. Found in zinc ores; also as CdS, greenockite; CdCO3, otavite. Obtained in vapor form when roasting zinc ores, as sludge from zinc sulfate purification. Lab prepns from CdSO4: Treadwell, Helv. Chim. Acta 4, 551 (1921). Review: Aylett "Group IIB" in Comprehensive Inorganic Chemistry, vol. 3, J. C. Bailar Jr. et al., Eds. (Pergamon Press, Oxford, 1973) pp 187-328; M. L. Hollander, S. C. Carapella in Kirk-Othmer Encyclopedia of Chemical Technology vol. 4 (Wiley-Interscience, New York, 3rd ed., 1978) pp 387-396. Review of carcinogenicity studies: IARC Monographs 11, 39-74 (1976).

Silver-white, blue-tinged, lustrous metal; distorted hexagonal close-packed structure; easily cut with a knife; available in the form of bars, sheets or wire or a gray, granular powder. mp 321 deg. bp 765 deg. d[25] 8.65. Specific heat at constant pressure (25 deg.) 6.22 cal/mole deg.

0.4025 V. Insol in water; reacts readily with dil HNO3; reacts slowly with hot HCl; does not react with alkalies. Other reactions similar to those of zinc. Solns of cadmium salts and H2S or Na2S yield a yellow ppt insol in excess Na2S. Cadmium and its salts are highly toxic.

Caution: Ingestion of metal and sol compounds causes increased salivation, choking, vomiting, abdominal pain, anemia, renal dysfunction, diarrhea, tenesmus. Inhalation (dust or fumes): throat dryness, cough, headache, vomiting, chest pain, extreme restlessness and irritability, pneumonitis, possibly bronchopneumonia. Implicated as causative agent in Itai-Itai disease in Japan. See E. Browning, Toxicity of Industrial Metals (Appleton-Century-Crofts, New York, 2nd ed., 1969) pp 98-108; Flick et al., Environ. Res. 4, 71-85 (1971); Fassett, Ann. Rev. Pharmacol. 15, 425-435 (1975). This substance and certain cadmium compounds have been listed as carcinogens by the EPA: Second Annual Report on Carcinogens (NTP 81-43, Dec. 1981) pp 68-72.

(USE) Use: A constituent of easily fusible alloys, e.g., Lichtenberg's, Abel's, Lipowitz', Newton's, and Wood's metal; soft solder and solder for aluminum; electroplating (major use), deoxidizer in Ni plating; process engraving, electrodes for cadmium vapor lamps, photoelectric cells; photometry of ultraviolet sun-rays; in Ni-Cd storage batteries. The powder is also used as an amalgam (1Cd:4Hg) in dentistry. To charge Jones reductors.

(THCVET) Therapeutic Category (Vet.): Many cadmium salts, especially the oxide and anthranilate, are used or have been suggested as anthelmintics in swine and poultry.

(DENS) Density: d[25] 8.65

(MP) Melting Point: mp 321 deg.

(BP) Boiling Point: bp 765 deg.

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type 4/msds.ohmtads


Conversion to local identifiers resulted in      1 unique occurrences.

          Conversion Entry     1: Accession No.      7216647

(CAS)  CAS Registry Number: 7440-47-3

(MAT)  Material Name: CHROMIUM

(FML)  Chemical Formula: CR

(USS)  Common Uses: ALLOYS

(BIN)  Binary Reactants: HYDROGEN PEROXIDE, NITRIC OXIDE, POTASSIUM
       CHLORATE, SULFUR DIOXIDE.

(ANT)  Antagonistic Materials: VALENCE OF CHROMIUM AFFECTS TOXICITY
       TOWARD BACTERIA AS WELL AS TYPE OF ORGANISM, AMOUNT OF ORGANIC
       MATTER PRESENT,  AND PRESENCE OR ABSENCE OF DISSOLVED OXYGEN..
       SOIL DECREASED THE TOXICITY OF CR2O7 TO EURASIAN WATER MILFOIL.

(FDL)  Detection Limit (Field: Techniques,Ref) (ppm): .005, CHROMIUM
       COLORIMETRIC, (BNW10* 0009)

(LDL)  Detection Limit (Lab; Techniques,Ref) (ppm): .005, CHROMIUM
       COLORIMETRIC, (BNW10* 0009)

(STD)  Standard Codes: NFPA-0,2,-.

(FLM)  Flammability: MODERATE. COMBUSTION WITH MODERATE HEATING

(MLT)  Melting Point (C.): 1900

(BLP)  Boiling Point (C.): 2642

(SPG)  Specific Gravity: 7.14

(PER)  Persistency: MAY LAST IN INSOLUBLE FORMS INDEFINITELY.

(PFA)  Potential for Accumulation: TROUT CAN ACCUMULATE HEXAVALENT
       CHROMIUM EVEN AT LEVELS OF .001 PPM. POSITIVE; BARLEY ABSORBS
       CHROMIUM. CONCENTRATION  FACTORS FOR CR - MARINE PLANTS 2000,
       FRESHWATER AND; BROWN ALGAE CONCENTRATES 100-500 TIMES. MARINE
       INVERTEBRATES - 2000,  MARINE FISH 400 AND FRESHWATER FISH 200
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(R170** 0001); HALF-LIFE IN TOTAL HUMAN BODY 616 DAYS (R172** 0001).

(EDF) Etiological Potential:

HEXAVALENT CHROME CAN CAUSE CHROME ULCERS.

(CAG) Carcinogenicity: HEXAVALENT CHROME DUST CAN CAUSE CANCER. POTENTIAL.

(TRT) Major Species Threatened: ALL LIFE IN HEXAVALENT FORM. AQUATIC LIFE AND PLANTS.

(INH) Inhalation Limit (Value): 500 (MG/M3; IDLH FOR CHROMIUM METAL AND INSOLUBLE SALTS)

(INT) Inhalation Limit (Text): REGULATIONS-- OSHA PEL (TWA) 1 MG/M3 (29CFR* 1910). RECOMMENDATIONS-- NIOSH CEILING .050 MG/M3/15 MIN (CRSOE* 76-129,76/NIOSH) NIOSH TWA .025 MG/M3 (CRSOE* 76-129,76/NIOSH) NIOSH IDLH 500 MG/M3 (PKTGD* 80/MAC) ACGIH TLV (TWA).5 MG/M3 (TLVADM 83/ACGIH) UPDATED 3/84

(DRC) Direct Contact: SALTS ARE CORROSIVE TO SKIN AND MUCOUS MEMBRANES

(JNS) General Sensation: SALTS ARE TOXIC AND CORROSIVE TO SKIN

(LTT) Taste Threshold, Lower (ppm): 1.4

(UTT) Taste Threshold, Upper (ppm): 25

(BCE) Body Contact Exp. (ppm): 1

(PHC) Prolonged Human Contact (ppm): .05

(SAF) Personal Safety Precautions: FULL RUBBERIZED SAFETY CLOTHING AND SELF-CONTAINED BREATHING APPARATUS SHOULD BE WORN.

(AHL) Acute Hazard Level: CHROMIUM IS TOXIC TO PLANTS AT ALL CONCENTRATION. .5-1 PPM LEVELS RECOMMENDED FOR FISHERIES. HEXAVALENT CHROME POSES EXTREME THREAT. CHROMIUM METAL POSES NO GREAT THREAT. THRESHOLD CONCENTRATION FOR FRESH AND SALT WATER FISH, .05 PPM CR(VI) (E188** 0001).

(CHL) Chronic Hazard Level: HEXAVALENT CHROMIUM IS A CHRONIC TOXICANT VIA INGESTION OR INHALATION. CHRONIC RAINBOW TROUT STUDIES SHOW

IMPAIRED REPRODUCTION OVER A 2 YEAR PERIOD; CHROMIUM METAL POSES NO GREAT THREAT. AT .4 PPM FOR +6 STATE. FRESHWATER SHOULD NOT EXCEED .03 PPM CR, MARINE WATERS; 1/100 96 HOUR LC50 (R184** 0001); APPLICATION FACTOR TO CONVERT 96 HOUR LC50 FOR CR+6 TO CHRONIC SAFE LIMIT .03 FOR FATHEAD MINNOW, .01 FOR BROOK TROUT AND .003 FOR RAINBOW TROUT (R131** 0001).

(HEL) Degree of Hazard to Public Health: NO REAL HAZARD AS METAL. EXTREMELY TOXIC IN HEXAVALENT STATE.

(AIR) Air Pollution: NO GREAT HAZARD, AVOID DUST-HEXAVALENT DUSTS. TOXIC LOW.

(ACT) Action Levels: NOTIFY AIR AUTHORITY. RESTRICT ACCESS TO AFFECTED WATER. PREVENT SUSPENSION OF DUSTS IN AIR.

(AML) In Situ Amelioration: ADD CO2 OR NAHCO3 TO PRECIPITATE CARBONATE. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

(AVL) Aval. of Countermeasure Material: CO2 - SOFT DRINK DISTRIBUTORS; NAHCO3-GROCERY STORES, LARGE BAKERIES.

(DIS) Disposal Method: DUMP INTO LANDFILL

(DSN) Disposal Notification: CONTACT LOCAL LANDFILL AUTHORITY

(WTP) Effects on Water Treatment Process: 5 PPM HEXAVALENT IS THRESHOLD FOR RETARDATION OF DIGESTION 2000 PPM TRIVALENT RETARDED DIGESTION 11% .

(WAT) Major Water Use Threatened: HEXAVALENT CHROMIUM THREATENS ALL USES.

(LOC) Probable Location and State of Material: HARD GRAY METAL. WILL SINK IN WATERWAY. MOST SALTS ARE SOLUBLE.

(DRT) Soil Chemistry: UP TO 300 PPM WERE REMOVED BY ALL TYPES OF SOIL IN COLUMN STUDIES (R17*** 0001); SOIL PH IS A MAJOR FACTOR FOR UPTAKE.(R175** 0001); PLANT DAMAGE TO CROPS MAY RESULT FROM

LEVELS ABOVE .5 PPM FREE CHROMATE IN SOLUTION. AN APPARENT THRESHOLD EFFECT HAS ALSO BEEN NOTED, BUT NOT QUANTIFIED (R175** 0001); TOXIC CROPS FROM UPTAKE CAN BE AVOIDED BY KEEPING THE CONCENTRATION OF CHROMIUM BELOW 164 PPM IN THE TOP 12 INCHES OF SOIL (WWAEA2 0001).

(HOH) Water Chemistry: GENERALLY SPEAKING HEXAVALENT CHROMIUM EXISTS IN TRUE SOLUTIONS, REGARDLESS OF THE PH OR PRESENCE OF OTHER IONS. DEPENDING ON PH AND CONCENTRATION OF CR IONIZATION, CR SALTS FORM CHROMATES, HYDROCHROMATES AND DICHROMATES. THE SOLUBILITY OF TRIVALENT CHROMIUM IS DEPENDENT ON WATER CHARACTERISTICS LIKE PH, HARDNESS, AND ALKALINITY. TRIVALENT CHROMIUM HAS A STRONG TENDENCY TO FORM COORDINATING COMPOUNDS, COMPLEXES, AND CHELATES. COMMON SALTS ARE SOLUBLE. HEXAVALENT CHROMIUM IS A STRONG OXIDIZING AGENT AND TENDS TO BE REDUCED TO THE TRIVALENT STATE.

(COL) Color in Water: ORANGE OR RED AS DISSOLVED SALT

(DAT) Adequacy of Data: FAIR

File 12; Entry 1; Accession No. 2245274

(NCD) Name Assessment Code: DBM

(MAT) Material Names: m-DICHLOROBENZENE; 1, 3-Dichlorobenzene; Metadichlorobenzene

(DES) Description: Liquid Colorless ( )

Sinks in water.

(ACT) Actions in Case of Emergency: Avoid contact with liquid. Keep people away. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.

FIRE

Combustible

POISONOUS GASES ARE PRODUCED IN FIRE.

Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.

EXPOSURE

CALL FOR MEDICAL AID.

LIQUID

Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

WATER POLLUTION

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.

May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

(RSD) Response to Discharge: Issue warning-water contaminant.

Should be removed.

Chemical and physical treatment.

(LCT) Label Category: None

(CGC) CG Compatibility Class: Halogenated hydrocarbon.

(FML) Formula: $C6H4Cl2$

(IMO) IMO/UN Designation: 6.1/1591

(DOT) DOT ID No.: 1591

(CAS) CAS Registry No.: 25321-22-6

(LOC) Physical State (as shipped): Liquid

(COL) Color: Colorless

(SAF) Personal Protective Equipment: Goggles, rubber gloves and self-contained breathing apparatus.

(DRC) Symptoms Following Exposure: INHALATION: Causes headache, drowsiness, unsteadiness. Irritating to mucous membranes. EYES: Severe irritation. SKIN: Severe irritation. INGESTION: Irritation of gastric mucosa, nausea, vomiting, diarrhea, abdominal cramps and cyanosis.

(TFE) Treatment of Exposure: Get medical aid. INHALATION: Remove from exposure. Keep quiet and warm. EYES: Rinse with running water for 15 to 20 minutes. SKIN: Wash with soap and water. INGESTION: Wash mouth, give emetic.

(OHI) Toxicity By Ingestion: Grade 2; LD50 = 500 to 5000 mg/kg.

(LTX) Late Toxicity: May cause some liver and kidney damage.

(VIC) Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

(LSI) Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.

(ODT) Odor Threshold: .02 (ppm in water)

(FLP) Flash Point: 165 (deg.F O.C., est.) 151 (deg.F C.C.)

(FLA) Flammable Limits in Air: 2.02 TO 9.2. (%, est.)

(EXT) Fire Extinguishing Agents: Water, foam, carbon dioxide or dry or dry chemical.

(TCP) Special Hazards of Combustion Products: Irritating vapors including hydrogen chloride are produced.

(IGT) Ignition Temperature: 1198 (est., deg.F.)

(EHZ) Electrical Hazard: None

(RWT) Reactivity With Water: No reaction

(RCM) Reactivity With Common Materials: No reaction

(SDT) Stability During Transport: Stable

(RGR) Reactivity Group: 36

(AQT) Aquatic Toxicity:

Concentration	Exposure	Species	Effect	Comment
10 ppm	48-hour	Zebrafish	LC50	

(HAC) Hazard Assessment Code: A-X-Y

(CFR) Code of Federal Regulations: Not listed

(PYS) Physical State at 1 deg. C and 1 atm.: Liquid

(MWT) Molecular Weight: 147.01.

(BLP) Boiling Point at 1 atm.: 173 (deg.C) (= 446.15 deg.K = 343.4 deg.F)

(TFP) Freezing Point: 24.7 (deg.C) (= 248.45 deg.K. = -12.5 deg.F)

(TC) Critical Temperature: 410.8 (deg.C) (= 683.95 deg.K. = 771.44

deg.F, est.)

(PC) Critical Pressure: 38.3 (atm) (= 3.88 NM/m2 = 562.9 psia)

(SPG) Specific Gravity: 1.2884 (at 20 deg.C.)

(LST) Liquid Surface Tension: 36.01 (dynes/cm) (=0.03601 N/m at 20 deg.C.)

(VSG) Vapor (Gas) Specific Gravity: 5.07.

(LHV) Latent Heat of Vaporization: 62.79 (cal/g) (= 2.63E+5 = 113.02 Btu/lb At boiling point.)

(HCO) Heat of Combustion: 4498 (cal/g) (= -1.88E+7 J/kg. = -8096 Btu/lb, net)

(HFS) Heat of Fusion: 20.55 (cal/g)

File 12; Entry 2; Accession No. 2245230

(NCD) Name Assessment Code: DBP

(MAT) Material Names: p-DICHLOROBENZENE; Paradichlorobenzene; Dichloricide; Paradi; Paradow; Paramoth; Santochlor

(DES) Description: Solid crystals White to clear Mothballs odor Sinks in water.

(ACT) Actions in Case of Emergency: Avoid contact with solid. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.

FIRE

Combustible.

POISONOUS GASES ARE PRODUCED IN FIRE.

Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.

EXPOSURE

CALL FOR MEDICAL AID.

SOLID

Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

WATER POLLUTION

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.

Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

(RSD) Response to Discharge: Issue warning-water contaminant
Should be removed
Chemical and physical treatment

(LCT) Label Category: None

(CGC) CG Compatibility Class: Halogenated hydrocarbon

(FML) Formula: p-C6H4Cl2

(IMO) IMO/UN Designation: 9.0/1592

(DOT) DOT ID No.: 1592

(CAS) CAS Registry No.: 106-46-7

(LOC) Physical State (as shipped): Solid

(COL) Color: White

(ODR) Odor: Aromatic

(SAF) Personal Protective Equipment: Full face mask fitted with organic vapor canister for concentrations over 75 ppm; clean protective clothing; eye protection.

(ORC) Symptoms Following Exposure: INHALATION: irritation of upper respiratory tract; over- exposure may cause depression and injury to liver and kidney. EYE CONTACT: pain and mild irritation.

(TFE) Treatment of Exposure: INHALATION: if any ill effects develop, remove patient to fresh air and get medical attention. If breathing stops, give artificial respiration. EYES: flush with plenty of water and get medical attention if ill effects develop. SKIN AND INGESTION: no problem likely.

(TLV) Threshold Limit Value: 75 (ppm)

(SIL) Short Term Inhalation Limit: 50 (ppm for 60 min.)

(DHI) Toxicity By Ingestion: Grade 2; LD50 = 0.5 to 5 g/kg

(VIC) Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

(LSI) Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

(ODT) Odor Threshold: 15 TO 30 (ppm) -

(IDL) IDLH Value: 1000 (ppm)

(FLP) Flash Point: 165 (deg.F O.C.) ; 150 (deg.F C.C.)

(EXT) Fire Extinguishing Agents: Water, foam, carbon dioxide or dry chemical.

(TCP) Special Hazards of Combustion Products: Vapors are irritating. Toxic chlorine, hydrogen chloride, and phosgene gases may be generated in fires.

(BRT) Burning Rate: 1.3 (mm/min., approx.)

(RWT) Reactivity With Water: No reaction

(RCM) Reactivity With Common Materials: No reaction

(SDT) Stability During Transport: Stable

(RGR) Reactivity Group: 36

(AQT) Aquatic Toxicity:

Concentration	Exposure	Species	Effect	Comment

50 ppm		fish	lethal	fresh water
380 mg/l	48 hr	rainbow trout	TLm	"

(GPU) Grades or Purity: Solid: 5 grades, chemical purity close to 100%

Liquid: 1-2% orthodichlorobenzene.

(HAC) Hazard Assessment Code: II

(CFR) Code of Federal Regulations: ORM-A

(NFP) NFPA Hazard Classification:

Category	Rating
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0
Other (White)	

(PYS) Physical State at 1 deg. C and 1 atm.: Solid

(MWT) Molecular Weight: 147.01

(BLP) Boiling Point at 1 atm.: 174.2 (deg.C) (= 447.4 deg.K = 345.6 deg.F)

(TFP) Freezing Point: 53 (deg.C) (= 326 deg.K = 130 deg.F)

(SPG) Specific Gravity: 1.458 (at 20 deg.C, solid)

(HFS) Heat of Fusion: 29.07 (cal/g)

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2 XXX

Option? type 2/msds.ohmtads


Conversion to local identifiers resulted in      1 unique occurrences.

          Conversion Entry     1: Accession No.      7216847
(CAS) CAS Registry Number: 127-18-4
(SIC) SIC Code: 2842; 2833; 2834
(MAT) Material Name: TETRACHLOROETHYLENE
(FML) Chemical Formula: C2CL4; CL2C:CCL2
(USS) Common Uses: DRY CLEANING SOLVENT, METAL CLEANING AND
      EXTRACTION, CHEMICAL SYNTHESIS, DRYING AGENT, DEGREASER, HEAT
      TRANSFER  MEDIUM, ANTHELMINTIC, AND VERMIFUGE. (CCDCDS 0001)
      (THIDD6 0001 0002) (IMEMDT 0019)
(CON) Containers: GLASS BOTTLES AND RECEPTACLES (120 ML, AND 5,10, OR;
      15 L); PLASTIC BOTTLES AND RECEPTACLES (120 ML, AND 5,10  OR 15
      L); EARTHENWARE RECEPTACLES (120 ML AND 5, 10, OR 15 L); CANS
      (20 L); METAL RECEPTACLES (120 ML, 5 OR 10 L) AND DRUMS  (40 OR
      450 L); TANK CARS AND TANK MOTOR VEHICLES. (85EZAO 0001) (RARADS
      0002) (FEREAC 0017) (49CFR* 0001) (NFICAM 0001)
(STO) General Storage Procedure: STORE IN A CLOSED CONTAINER IN A
      COOL, DRY PLACE. PROTECT AGAINST DIRECT SUNLIGHT. DO NOT STORE
      IN ILL-VENTILATED  CELLARS AND HOLLOW PLACES OWING TO HIGH VAPOR
      DENSITY. KEEP AWAY FROM FIRE HAZARDS. (RARADS 0002) (NFICAM 0001)
(HND) General Handling Procedure: HIGH TEMPERATURE DECOMPOSITION
      PRODUCTS CAN BE VERY TOXIC.
(BIN) Binary Reactants: OXIDIZED BY STRONG OXIDIZING AGENTS (SULFURIC
      AND NITRIC ACIDS, SULFUR TRIOXIDE) PRODUCT IS CO2 (35FFA3 0001);
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REACTION WITH EXCESS HYDROGEN IN THE PRESENCE OF REDUCED NICKEL CATALYST PRODUCES TOTAL DECOMPOSITION TO HYDROGEN CHLORIDE AND CARBON. (IMEMDT 0019) WILL REACT WITH A FORMALDEHYDE AND SULFURIC ACID MIXTURE TO FORM HOCH2CCL2COOH. REACTS EXPLOSIVELY WITH POWDERED BARIUM, BERYLLIUM OR WITH LITHIUM SHAVINGS. (85FFA3 0001) (NFICAM 0002) TETRACHLOROETHYLENE REACTS WITH LONG WAVELENGTH LIGHT IN THE PRESENCE OF NO OR NO2 TO FORM FREE RADICALS. (ESTHAG 0015)

(COR) Corrosiveness: NOT CORROSIVE UNDER NORMAL CONDITIONS.

(SGM) Synergistic Materials: SYNERGISTIC WITH TOLUENE (AWQCD* 0058)

(FDL) Detection Limit (Field: Techniques,Ref) (ppm): 75, POLY HALOGEN SPOT TEST, (8NW45* 0021)

(LDL) Detection Limit (Lab: Techniques,Ref) (ppm): CARBON DIOXIDE LASER ABSORPTION SPECTROMETRY CAN BE USED TO DETECT TETRACHLOROETHYLENE IN PREPARED SAMPLES OF AIR POLLUTANTS, WITH A LIMIT OF DETECTION OF 9.5 .MU.G/CU M (1.4 PPB). A FULL SUMMARY OF THE AVAILABLE METHODS OF DETECTION IS IN (IMEMDT 0019)

(STD) Standard Codes: NFPA-3,-,-: IATA-OTHER RESTRICTED ARTICLES, CLASS A, NO LABEL REQUIRED, 40 LITERS PASSENGER, 220 LITERS CARGO. SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES) LIST: UN NO. 1897; IMCO-CLASS 6.1 POISON, HARMFUL LABEL, PACKAGING GROUP III, STOW ON OR UNDER DECK. (85EZAO 0001) IATA-ARTICLE NO. 1740, CLASS ORA.A, NO LABEL, PACKING NOTES 690 AND 692, 40 L MAX. PACKAGE SIZE FOR PASSENGER AIRCRAFT; 220 L MAX. PACKAGE SIZE FOR CARGO AIRCRAFT. (RARADS 0002) CFR-ID NO. UN1897, CLASS ORM-A, NO LABEL, CFR REG. 173.605 EXCEPTION 173.505, 220 L, PACKAGE SIZE FOR CARGO AIRCRAFT. 40 L MAX. PACKAGE SIZE FOR PA PASSENGER AIRCRAFT OR RAILCAR. (FEREAC 0017). SWDA NO. U210, CLASS TOXIC WASTE. (FEREAC 0039)

(FLM) Flammability: HARD TO IGNITE (85EWAF 0001)

(TCP) Toxic Combustion Prod.: WHILE NONFLAMMABLE, HIGH TEMPERATURES MAY CAUSE DECOMPOSITION TO TOXIC PRODUCTS SUCH AS CL2, CO, COCL2 (PHOSGENE).

(EXT) Extinguishing Method: FIGHT FIRES WITH CARBON DIOXIDE WATER SPRAY, FOAM, AND DRY CHEMICAL. (85EWAF 0001) USE THE WATER SPRAY TO COOL HOT SUBSTANCES OR CONTAINERS. (NFC*** NFICAM 0001)

(MLT) Melting Point (C.): -22

(BLP) Boiling Point (C.): 121

(SOL) Solubility (ppm @ 25C): 150

(SPG) Specific Gravity: 1.631 (15/4) (THIDD6 0002)

(VPN) Vapor Pressure (mm Hg): 20

(VDN) Vapor Density: 5.72

(PER) Persistency: VERY STABLE TO HYDROLYSIS. UNSTABILIZED IN WATER SLOWLY DECOMPOSES TO TRICHLOROACETIC ACID AND HCL.; WITHOUT AIR RATE IS .1 MG/L/DAY. IN THE PRESENCE OF OZONE IT WILL GO TO PHOSGENE AND TRICHLOROACETYL CHLORIDE. HALF-LIFE IN WATER DUE TO EVAPORATION 24 MINUTES. HYDROLYSIS HALF-LIFE 9 MONTHS IN LIGHT (R92*** 0001).

(PFA) Potential for Accumulation: LOG OCTANOL/WATER PARTITION IS 2.88. LEVELS OF TETRACHLOROETHYLENE INDICATE A 100-FOLD ACCUMULATION IN FATTY TISSUES AND A 10-FOLD ACCUMULATION IN FLESHY TISSUES. THE ACCUMULATION IS NOT ACCOMPANIED B ILL EFFECTS. (USPEDU 0001) THE ESTIMATED BIOCONCENTRATION FACTOR FOR AMERICANS FROM INGESTING CONTAMINATED FRESH AND SALTWATER AQUATIC ORGANISMS IS 30.6. INHALATION STUDIES SHOW TETRACHLOROETHYLENE ATTAINS A STEADY STATE LEVEL IN BLOOD AFTER 2 H OF CONTINUOUS EXPOSURE. ONCE IN THE BODY IT ACCUMULATES IN BODY FAT. TETRACHLOROETHYLENE IS ELIMINATED AS VAPOR THROUGH THE LUNGS. THE HALF-LIFE FOR THE PROCESS IS 65 H. TETRACHLOROETHYLENE ALSO METABOLIZES IN THE BODY FORMING TETRACHLOROETHYLENE OXIDE WHICH

DECOMPOSES TO TRICHLOROACETYL CHLORIDE. THE FINAL PRODUCT OF METABOLISM IS TRICHLOROACETIC ACID. ELIMINATION OF TRICHLOROACETIC ACID IN THE URINE HAS A HALF-LIFE OF 144 H. MOST OF THIS TIME IS USED TO METABOLIZE TETRACHLOROETHYLENE TO TRICHLOROACETIC ACID. (AWQCD* 0058)

(EDF) Etiological Potential: TETRACHLOROETHYLENE IS A CENTRAL NERVOUS SYSTEM DEPRESSANT. HIGH CONCENTRATIONS MAY PRODUCE NARCOSIS, AND SNIFFING THE SOLVENT AS A DRUG MAY RESULT IN PHYSICAL DEPENDENCY. AWQCD** 0058 IT DEFATS SKIN TISSUE SO PROLONGED USE MAY LEAD TO DERMATITIS. (MMII** 0002) TETRACHLOROETHYLENE IS KNOWN TO CAUSE LIVER AND KIDNEY DAMAGE ALTHOUGH CIRRHOSIS, HEPATITIS, AND NEPHRITIS ARE RARE.THE LIVER SHOWS ERYTHEMIA AND FATTY DEGENERATION WHILE THE KIDNEY SHOW CONGESTION AND GRANULAR SWELLING. TETRACHLOROETHYLENE IS ALSO SUSPECT IN CAUSING RAYNARDS DISEASE. (AWQCD** 0058) (PKTGD* 0001) (IMEMDT 0019)

(CAG) Carcinogenicity: POTENTIAL. INTERMEDIATE METABOLITE EPOXIDES ARE CARCINOGENIC.(STEVA8 0002). ORAL ADMINISTRATION IN MICE PRODUCED HEPATOCELLULAR CARCINOMAS IN ANIMALS OF BOTH SEXES. (IMEMDT 0019) NCI IS TESTING FOR CARCINOGENESIS BY A STANDARD BIOASSAY PROTOCOL AS OF NOV. 1979. (RTECS* 0002)

(MUT) Mutagenicity: POTENTIAL. INTERMEDIATE METABOLITE CHLORAL IS MUTAGENIC (STEVA8 0002). ALTHOUGH TESTS WITH E.COLI GAVE NEGATIVE RESULTS, ONE STUDY USING SALMONELLA STRAINS FOUND INCREASED BASE SUBSTITUTION AND FRAME SHIFT MUTATION. IT WAS CONCLUDED THAT THERE IS INSUFFICIENT DATA TO DETERMINE TETRACHLOROETHYLENES MUTAGENICITY. (AWQCD** 0058)

(TER) Teratogenicity: NEGATIVE. EXPOSURE TO VAPORS AT TWICE MAC DID NOT CAUSE EMBRYO MORTALITY OR TERATOGENESIS IN MICE OR RATS ON DAYS 6-15 OF GESTATION (TXAPA9 0057). RATS AND MICE INHALED 2,000 MG/CU M (300 PPM) FOR 7 H DAILY DURING DAYS 6 THROUGH 15

OF GESTATION. RATS SHOWED A SMALL INCREASE IN FETAL RESORPTIONS. MICE SHOWED DECREASED FETAL BODY WEIGHT, DELAY IN OSSIFICATION OF THE SKULL AND STERNEBRAE, AND SUBCUTANEOUS EDEMA IN THE PUPS. WHILE THESE ABNORMALITIES ARE SMALL, THEY ARE STATISTICALLY SIGNIFICANT. MORE STUDY AT HIGHER DOSE LEVELS ARE NEEDED TO DETERMINE IF TETRACHLOROETHYLENE HAS A TERATOGENIC EFFECT. (AWQCD** 0058)

(TRT) Major Species Threatened: MAY SMOTHER BENTHIC LIFE.

(TIC) Taste Imparting Characteristics (ppm): 5

(INH) Inhalation Limit (Value): 500 (PPM; IDLH)

(INT) Inhalation Limit (Text): REGULATIONS-- OSHA PEL (TWA) 100 PPM (29CFR* 1910) OSHA PEAK 300 PPM/5 MIN IN ANY 3 HRS. (29CFR* 1910) OSHA CEILING 200 PPM (29CFR* 1910). RECOMMENDATIONS-- NIOSH CEILING 678 MG/M3/15 MIN 100 PPM/15 MIN (CRSOE* 76-185,76/NIOSH) NIOSH TWA 339 MG/M3 50 PPM (CRSOE* 76-185,76/NIOSH) NIOSH IDLH 500 PPM (PKTGD* 80/MAC) ACGIH TLV (TWA)335 MG/M3 50 PPM (TLVADM 83/ACGIH) UPDATED 3/84

(DRC) Direct Contact: VAPOR IS A NOSE, EYE, AND THROAT IRRITANT. 810 MG ON RABBIT SKIN FOR 24 HOURS PRODUCED SEVERE IRRITATION. 162 MG ON RABBIT EYE PRODUCED MILD IRRITATION. (RTECS* 0002)

(JNS) General Sensation: CHLOROFORM OR ETHER ODOR. LONG EXPOSURE LEADS TO EYE, NOSE, AND THROAT IRRITATION, NAUSEA, HEADACHES, SLEEPINESS, ABDOMINAL PAIN, CONSTIPATION, DIZZINESS, DISCOORDINATION, SENSORY CHANGES, MENTAL FOGGINESS, EXHILIRATION, SPEECH DIFFICULTY, LASSITUDE, VERTIGO, AND FLUSHING OF THE FACE AND NECK. (PKTGD* 0001) (IMEMDT 0019) (AWQCD* 0058)

(MOT) Odor Threshold, Medium (ppm): 5 TO 50

(SAF) Personal Safety Precautions: AIR SUPPLIED BREATHING EQUIPMENT OR APPROVED INDUSTRIAL GAS MASKS, ACID GOGGLES AND RUBBER GLOVES

AND APRONS ARE RECOMMENDED FOR AREAS WHERE VAPORS ARE HIGHLY CONCENTRATED OR WHERE THE THREAT OF SPLASHES EXISTS. (THIDD6 0002) (HMSMB* 0001)

(AHL) Acute Hazard Level: THE VAPOR AND LIQUID ARE BOTH TOXIC AND IRRITATING. THE EFFECTS OF LOW CONCENTRATIONS ON AQUATIC LIFE IS UNKNOWN. MAY BE DANGEROUS IF IT ENTERS WATER INTAKES. TETRACHLOROETHYLENE IS NONFLAMMABLE, BUT HEATING PRODUCES TOXIC GASES. (CGCH** 0001) HIGHLY TOXIC BY INGESTION. MODERATELY TOXIC BY INHALATION, ORAL, SUBCUTANEOUS, AND DERMAL ROUTES. (DPMADX 0001)

(CHL) Chronic Hazard Level: CONTACT DERMATITIS. .1-10 PPM ALLOWABLE LIMIT IN WATERS SAFE FOR FISH; MODERATELY TOXIC VIA ALL ROUTES. UNDISSOLVED PORTION MAY PROVIDE CONTINUING SOURCE FOR EXTENDED PERIODS OF TIME.

(HEL) Degree of Hazard to Public Health: IRRITANT. HIGHLY TOXIC WHEN INGESTED. MODERATELY TOXIC VIA ALL OTHER ROUTES WITH ACUTE OR CHRONIC EXPOSURE. EMITS HIGHLY TOXIC VAPORS WHEN HEATED TO DECOMPOSITION.

(AIR) Air Pollution: HIGH

(ACT) Action Levels: NOTIFY AIR AUTHORITY. ISOLATE FROM HEAT SOURCES. NOTIFY HEALTH AND POLLUTION AGENCIES; WILDLIFE OFFICIALS; AND OPERATORS OF NEARBY WATER INTAKES. (CGCH** 0001)

(AML) In Situ Amelioration: PUMP OR VACUUM UNDISSOLVED PORTION FROM BOTTOM. APPLY CARBON OR PEAT TO DISSOLVED PORTION. SEEK PROFESSIONAL ENVIRONMENTAL ENGINEERING ASSISTANCE THROUGH EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NO. 201-321-6660.

(SHR) Beach/Shore Restoration: DO NOT HEAT.

(AVL) Aval. of Countermeasure Material: PUMPS - FIRE DEPARTMENT; VACUUM - SWIMMING POOL SUPPLIERS; CARBON - WATER TREATMENT

PLANTS, SUGAR REFINERIES; PEAT - NURSERIES, FLORAL SHOPS.

(DIS) Disposal Method: MUCH OF THE PERCHLOROETHYLENE CAN BE RECOVERED FROM CONTAMINATED AREAS. THE REMAINDER CAN BE VENTED TO THE ATMOSPHERE IN ISOLATED LOCATIONS.

(DSN) Disposal Notification: CONTACT LOCAL AIR AUTHORITIES.

(WTP) Effects on Water Treatment Process: TETRACHLOROETHYLENE IS FOUND IN FINISHED DRINKING WATER. IT IS NOT THOUGHT TO ORIGINATE FROM THE CHLORINATION PROCESS DURING WATER TREATMENT BUT RATHER FROM INDUSTRIAL WASTE. (IAOPW* 77/KEI)

(WAT) Major Water Use Threatened: POTABLE SUPPLY; RECREATION

(LOC) Probable Location and State of Material: WILL LIE IN IMMISCIBLE LAYER AT BOTTOM OF WATER COURSE. WILL SINK; SHIPPED AS COLORLESS LIQUID.

(DRT) Soil Chemistry: SEDIMENTS RICH IN ORGANIC MATTER TEND TO ABSORB MORE TETRACHLOROETHYLENE. BUT THE CONCENTRATIONS IN THE SEDIMENTS WERE SIMILAR TO THOSE IN WATER. (USPEDU 0001)

(HOH) Water Chemistry: RELATIVELY STABLE. HYDROLYSIS IS SLOW. DECOMPOSES SLOWLY IN CONTACT WITH WATER TO YIELD TRICHLOROACETIC AND HYDROCHLORIC ACIDS. (IMEMDT 0019) THE HALF-LIFE OF THE ABOVE PROCESS IS 8.8 MONTHS. (USPEDU 0001) HYDROLYSIS IS ACCELERATED IN THE PRESENCE OF O2. (ESTHAG 0015)

(COL) Color in Water: COLORLESS

(DAT) Adequacy of Data: GOOD

type 5/msds.ohmtads

Conversion to local identifiers resulted in 1 unique occurrences.

Conversion Entry 1: Accession No. 8400313

(CAS) CAS Registry Number: 57-12-5

(MAT) Material Name: $$$ CYANIDES (SOLUBLE CYANIDE SALTS), NOT ELSEWHERE SPECIFIED $$$

(HND) General Handling Procedure: NIOSH/OSHA RECOMMENDATIONS FOR OCCUPATIONAL HANDLING OF CYANIDES (SEE ALSO FIELD SAF FOR RESPIRATORY PROTECTION). WEAR IMPERVIOUS CLOTHING, GLOVES, 8-INCH-MINIMUM FACE SHIELDS, AND OTHER PROTECTIVE CLOTHING AS NEEDED TO PREVENT SKIN CONTACT WITH CYANIDE OR CYANIDE IN SOLUTION. IF THERE IS ANY POSSIBILITY OF EYE CONTACT, WEAR DUST- AND SPLASH-PROOF GOGGLES. CHANGE INTO UNCONTAMINATED CLOTHING BEFORE LEAVING THE WORK PREMISES. PLACE CONTAMINATED OR POSSIBLY CONTAMINATED CLOTHING IN CLOSED CONTAINERS UNTIL DISPOSAL OR CLEANING. REMOVE CONTAMINATED NON-IMPERVIOUS CLOTHING IMMEDIATELY AND DO NOT WEAR AGAIN UNTIL THE CYANIDE HAS BEEN REMOVED. INFORM THE PERSON(S) PERFORMING THE LAUNDERING OR OTHER CLEANING OPERATION OF THE HAZARDS OF CYANIDE. AN EYE-WASH FOUNTAIN AND FACILITIES FOR QUICK DRENCHING SHOULD BE READILY AVAILABLE FOR EMERGENCY USE. (OHGHC* 81/MAC)

(BIN) Binary Reactants: UNDER CERTAIN CONDITIONS, MOST CYANIDE SALTS ARE VIOLENTLY OXIDIZABLE. FUSED MIXTURES OF METAL CYANIDES WITH METAL CHLORATES, PERCHLORATES, NITRATES, OR NITRITES ARE VIOLENTLY EXPLOSIVE. (BRETH* 79/BRE) REACTIONS WITH EVEN WEAK ACIDS RELEASE HCN GAS. (OHGCH* 81/MAC)

(ANT) Antagonistic Materials: THIOSULFATE IN WATER CONTAINING CYANIDE REDUCES THE TOXICITY OF CYANIDE TO AQUATIC ORGANISMS. (EEPCN*

78/TOW) ANTIDOTE FOR CYANIDE POISONING--GIVE AMYL NITRITE BY INHALATION AND SODIUM NITRITE INTRAVENOUSLY TO FORM METHEMOGLOBIN, WHICH FIRMLY BINDS THE FREE CYANIDE IONS. THEN GIVE SODIUM THIOSULFATE INTRAVENOUSLY TO SPEED UP THE CONVERSION OF CYANIDE TO THE LESS TOXIC THIOCYANATE. (OHGHC* 81/MAC) CYANIDE POISONING CAN BE ANTAGONIZED BY OTHER COMPOUNDS THAT CAN GENERATE METHEMOGLOBIN IN VIVO. SUCH COMPOUNDS INCLUDE HYDROXYLAMINE, AROMATIC AMINO COMPOUNDS, AND AROMATIC NITRO COMPOUNDS. COBALT COMPOUNDS ALSO ANTAGONIZE CYANIDE POISONING, PRESUMABLY BY COMPLEXING THE FREE CYANIDE. (AWQCD* PB81-117483,80/ECAO)

(LDL) Detection Limit (Lab: Techniques,Ref) (ppm): EPA TEST METHODS (ME014* 78/KOP): CYANIDES, AMENABLE TO CHLORINATION, METHOD 335.1 (TITRIMETRIC; SPECTROPHOTOMETRIC)--FOR DETERMINATION IN DRINKING WATER, SURFACE AND SALINE WATERS, AND DOMESTIC AND INDUSTRIAL WASTEWATERS. CYANIDE LEVELS >1 PPM ARE DETERMINED BY TITRATION AFTER REMOVAL OF THE CYANIDES AMENABLE TO CHLORINATION. AT LEVELS <1 PPM, COLORIMETRY IS USED. CHLORINATE A PORTION OF THE SAMPLE AT PH >11 TO DECOMPOSE CYANIDE. THEN DETERMINE CYANIDE LEVELS IN THE CHLORINATED SAMPLE BY THE METHOD FOR CYANIDE, TOTAL. CALCULATE CYANIDES AMENABLE TO CHLORINATION BY DIFFERENCE. (BASED ON ANNUAL BOOK OF ASTM STANDARDS, PART 31, STANDARD D 2036-75, METHOD B, PAGE 505, 1976, AND STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, 14TH EDITION, PP. 376 AND 370, METHOD 413F AND D, 1975.) CYANIDE, TOTAL, METHOD 335.2 (TITRIMETRIC; SPECTROPHOTOMETRIC)-- FOR DETERMINATION OF CYANIDE IN DRINKING WATER, SURFACE AND SALINE WATER, AND DOMESTIC AND INDUSTRIAL WASTE. DETERMINE CYANIDE LEVELS >1 PPM BY THE TITRATION PROCEDURE USING SILVER NITRATE WITH P-DIMETHYLAMINO- BENZAL-

RHODANINE INDICATOR. DETERMINE CYANIDE CONCENTRATIONS <1 PPM (SENSITIVITY, APPROXIMATELY 0.02 PPM) BY THE COLORIMETRIC PROCEDURE. RELEASE HCN BY REFLUX-DISTILLATION, ABSORB HCN IN A SCRUBBER CONTAINING A SOLUTION OF NAOH, AND DETERMINE CYANIDE BY VOLUMETRIC TITRATION OR COLORIMETRICALLY. FOR THE COLORIMETRIC MEASUREMENT, CONVERT CYANIDE TO CYANOGEN CHLORIDE BY TREATING WITH CHLORAMINE-T AT PH <8. WHEN THE REACTION IS COMPLETE, COLOR IS FORMED ON ADDITION OF PYRIDINE-PYRAZOLONE OR PYRIDINE-BARBITURIC ACID REAGENTS (READ ABSORBANCE AT 620 OR 578 NM, RESPECTIVELY). SULFIDES AND FATTY ACIDS INTERFERE AND MUST BE REMOVED. (BASED ON ASTM METHOD A, PAGE 503 [SEE FULL REFERENCE ABOVE]; STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER, METHOD 413B AND D, PP. 367 AND 370; AND OTHER REFERENCES.) CYANIDE, TOTAL, METHOD 335.3 (COLORIMETRIC, AUTOMATED UV)--FOR DETERMINATION OF CYANIDE IN DRINKING AND SURFACE WATERS AND DOMESTIC AND INDUSTRIAL WASTEWATERS. APPLICABLE FOR CONCENTRATIONS OF 0.005 TO 0.5 PPM. RELEASE HCN FROM CYANIDE COMPLEXES BY UV DIGESTION AND DISTILLATION; CONVERT TO CYANOGEN CHLORIDE BY TREATING WITH CHLOORAMINE-T, WHICH THEN REACTS WITH PYRIDINE AND BARBITURIC ACID TO GIVE A RED-COLORED COMPLEX. THIOCYANATES AND SULFIDE INTERFERE. CYANIDE IN AIR MAY BE SAMPLED BY USE OF IMPINGERS THAT CONTAIN 10 ML OF 0.1 M NAOH. SAMPLES ARE ANALYZED BY CYANIDE ION SELECTIVE ELECTRODE. SULFIDE ION POISONS THE CYANIDE ELECTRODE. (NIOSH* I,1,77/TAY) (NIOSH* II,3,77/TAY) TOTAL CYANIDE FROM RELATIVELY NON-DISSOCIABLE CYANIDES AND FROM RELATIVELY DISSOCIABLE COMPLEXES IS DETERMINED BY ACIDIFICATION OF AQUEOUS SAMPLES FOLLOWED BY DISTILLATION AND AIR PURGING. HCN GAS IS COLLECTED IN NAOH SCRUBBING SOLUTION AND CYANIDE CONCENTRATION CAN BE DETERMINED BY TITRIMETRIC, COLORIMETRIC OR POTENTIOMETRIC METHODS.

TITRIMETRY UTILIZES STANDARD AGNO3 AND AN INDICATOR. COLORIMETRY CONVERTS CYANIDE ION TO CYANOGEN CHLORIDE, WHICH IS ESTIMATED BY A COLOR-FORMING REAGENT. A CYANIDE-SELECTIVE ELECTRODE IN CONJUNCTION WITH AN EXPANDED-SCALE PH METER IS SATISFACTORY. (ME025* 81/APHA) OTHER METAL CYANIDE COMPLEXES OF INTERMEDIATE STABILITY ARE DESTROYED BY CHLORINATION (THAT IS AMENABLE TO CHLORINATION). CYANIDES AMENABLE TO CHLORINATION CAN BE DETERMINED BY (1) ESTIMATING TOTAL CYANIDE BY ACIDIFICATION AND (2) ESTIMATING RESIDUAL CYANIDE AFTER CHLORINATION STEP. THE OBSERVED DIFFERENCE IN CYANIDE VALUES IS QUANTITY OF CYANIDES AMENABLE TO CHLORINATION. (ME025* 81/APHA)

(STD) Standard Codes: SUPERFUND DESIGNATED (HAZARDOUS SUBSTANCES) LIST. HAZARDOUS (RCRA) WASTE NO. P030. REPORTABLE QUANTITY (RQ): 1 LB (NOT TO BE CONFUSED WITH 1 LB RQ UNDER CLEAN WATER ACT SECTION 311). (STATUTORY SOURCE UNDER CERCLA IS RCRA SECTION 3001.) PROPOSED RQ: 10 LB (4.54 KG) (CATEGORY A). (FEREAC 48FR23551, 5-25-83)

(EXT) Extinguishing Method: DOT RECOMMENDATIONS--SMALL FIRES: DRY CHEMICAL, CO2, WATER SPRAY, OR FOAM LARGE FIRES: WATER SPRAY, FOG, OR FOAM. IF YOU CAN DO SO WITHOUT RISK, MOVE THE CONTAINER FROM THE FIRE AREA. FIGHT FIRE FROM THE MAXIMUM DISTANCE. (85EWAF 80/DOT)

(EXP) Explosiveness: VIOLENT EXPLOSIONS OCCUR WHEN MIXTURES OF METAL CYANIDES AND METAL CHLORATES, PERCHLORATES, NITRATES, OR NITRITES ARE FUSED. (PRETH* 79/BRE)

(PER) Persistency: PHOTOLYSIS OF METAL CYANIDES MAY RELEASE CYANIDE ION. IN WATERS AT PH <8, MOST FREE CYANIDE WILL BE HCN. VOLATILIZATION OF HCN IS AN IMPORTANT ENVIRONMENTAL TRANSPORT PROCESS. HYDROLYSIS RATES (BOTH ACIDIC AND BASIC) ARE NOT COMPETITIVE WITH THOSE OF VOLATILIZATION OR BIODEGRADATION,

ANOTHER VERY IMPORTANT ENVIRONMENTAL PROCESS. CLAYS, BIOLOGICAL SOLIDS, ACTIVATED CARBON, AND SEDIMENTS SORB CYANIDES, BUT SORPTION IS NOT AN IMPORTANT ENVIRONMENTAL PROCESS. (USPEDU 1,79/CAL)

(PFA) Potential for Accumulation: LITTLE BIOACCUMULATION POTENTIAL FOR CYANIDE. EITHER THE ORGANISM QUICKLY METABOLIZES HCN OR IT DIES DUE TO INTERFERENCE WITH THE ENZYMES ASSOCIATED WITH CELLULAR OXIDATION. HOWEVER, BRODERIUS (1973) REPORTED THAT FISH BIOACCUMULATE METAL CYANIDE COMPLEXES. THE LIVER-GALL BLADDER AMONG BLUEGILL TISSUES SHOWED THE HIGHEST BIOACCUMULATION OF COPPER CYANIDE. (USPEDU 1,79/CAL) THE NATIONAL RESEARCH COUNCIL OF CANADA (LEDUC ET AL., 1982) CAUTIONED THAT IT CANNOT BE ASSUMED THAT "VARIOUS CYANIDE CONTAINING COMPOUNDS HAVE A SHORT RESIDENCE TIME IN NATURAL WATERS". (ECNAQ: NRCC19246,82/LED)

(EDF) Etiological Potential: PERSONS WHO WOULD BE EXPECTED TO BE AT INCREASED RISK FROM EXPOSURE: PERSONS WITH A HISTORY OF FAINTING SPELLS (POSSIBLE CARDIOVASCULAR OR NERVOUS DISORDERS). PERSONS UNUSUALLY SUSCEPTIBLE TO THE EFFECTS OF ANOXIA. PERSONS WITH ANEMIA. PERSONS WITH PRE-EXISTING SKIN DISORDERS. PERSONS WITH IMPAIRED LUNG FUNCTION. (OHGHC* 81/MAC)

(CAG) Carcinogenicity: NO CARCINOGENICITY DATA ON CYANIDE WERE FOUND FOR REVIEW IN THE 1980 EPA AMBIENT WATER QUALITY CRITERIA DOCUMENT. (AWQCD* PB81-117483/ECAO)

(MUT) Mutagenicity: NO MUTAGENICITY DATA ON CYANIDE WERE AVAILABLE FOR REVIEW FOR THE 1980 EPA AMBIENT WATER QUALITY CRITERIA DOCUMENT. (AWQCD* PB81-117483,80/ECAO)

(TER) Teratogenicity: NO TERATOGENICITY STUDIES ON CYANIDE WERE AVAILABLE FOR REVIEW IN THE 1980 EPA AMBIENT WATER QUALITY CRITERIA DOCUMENT. (AWQCD* PB81-117483,80/ECAO)

(INH) Inhalation Limit (Value): 50 (MG/M3; IDLH FOR CYANIDE KCN OR

NACN)

(INT) Inhalation Limit (Text): FOR CYANIDE: REGULATIONS-- OSHA PEL (FOR KCN OR NACN) 5 MG/M3 (29CFR* 1910). RECOMMENDATIONS-- NIOSH CEILING 5 MG/M3/10 MIN (CRSOE* 77-108,76/NIOSH) NIOSH IDLH 50 MG/M3 (PKTGD* 80/MAC) ACGIH TLV (TWA) AS CN--SKIN 5 MG/M3 (TLVADM 83/ACGIH)

(DRC) Direct Contact: CYANIDE CAN BE ABSORBED THROUGH THE SKIN. IF THERE ARE CUTS IN THE SKIN, A FATAL DOSE CAN BE ABSORBED. DUSTS IRRITATE THE EYES AND MAY CAUSE TEARING, WHICH CAN PROMOTE SYSTEMIC TOXICITY. DUSTS ALSO IRRITATE THE NOSE AND SKIN. STRONG CYANIDE SALT SOLUTIONS ARE SO CORROSIVE THEY MAY PRODUCE ULCERATION. CYANIDE ACTS AS A DEFATTING AGENT; PROLONGED EXPOSURE TO CYANIDE CAN CAUSE DERMATITIS. (OHGCH* 81/MAC)

(GNS) General Sensation: CYANIDE POISONING SYMPTOMS: LOSS OF CONSCIOUSNESS, CESSATION OF BREATHING, SOMETIMES CONVULSIONS, AND DEATH FOLLOW INHALATION OR INGESTION OF LARGE DOSES OF CYANIDE. AT LOWER EXPOSURE LEVELS, EARLY SYMPTOMS OF WEAKNESS, HEADACHE, CONFUSION, NAUSEA, AND VOMITING, AND SOMETIMES CONVULSIONS MAY BE FOLLOWED BY UNCONSCIOUSNESS AND DEATH. MILD INTOXICATION SYMPTOMS INCLUDE WEAKNESS, DIZZINESS, HEADACHE, AND NAUSEA. SYSTEMIC POISONING CAN ARISE FROM SKIN AND EYE CONTACT, ESPECIALLY TEARING EYES OR NONINTACT SKIN. (OHGCH* 81/MAC)

(SAF) Personal Safety Precautions: NIOSH/OSHA MINIMUM RESPIRATORY PROTECTION REQUIRED ABOVE 5 MG/M3--FOR PARTICULATE CONCENTRATION OF 50 MG/M3 OR LESS, USE ANY SUPPLIED AIR RESPIRATOR OR ANY SELF CONTAINED BREATHING APPARATUS. FOR GREATER THAN 50 MG/M3 OR ENTRY AND ESCAPE FROM UNKNOWN CONCENTRATIONS, USE SELF CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE, OR A

COMBINATION RESPIRATOR WHICH INCLUDES A TYPE C SUPPLIED AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE OR CONTINUOUS FLOW MODE AND AN AUXILIARY SELF CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE. FOR FIRE FIGHTING USE A SELF CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE. AND FOR ESCAPE, USE ANY GAS MASK PROVIDING PROTECTION AGAINST HYDROGEN CYANIDE AND PARTICULATES OR ANY ESCAPE SELF CONTAINED BREATHING APPARATUS. (OHGCH* 81/MAC)

(AHL) Acute Hazard Level: INGESTION OR INHALATION OF CYANIDE SALTS MAY BE RAPIDLY FATAL. CYANIDE CAN ALSO AFFECT THE BODY IF IT CONTACTS THE SKIN OR EYES. (OHGCH* 18/MAC)

(CHL) Chronic Hazard Level: NONSPECIFIC EFFECTS MAY OCCUR FROM LONG-TERM EXPOSURE TO CYANIDE. THESE ARE RARE. (OHGCH* 81/MAC) STUDIES DESIGNED TO SHOW CHRONIC OR CUMULATIVE ADVERSE EFFECTS FROM CYANIDE HAVE REPORTED ONLY NEGATIVE RESULTS. (AWQCD* PB81-117483,80/ECAO)

(ACT) Action Levels: ISOLATE HAZARD AND DENY ENTRY. KEEP UNNECESSARY PEOPLE AWAY. 8N CASE OF WATER POLLUTION, CALL LOCAL AUTHORITIES. (85EWAF 80/DOT)

(AML) In Situ Amelioration: THE ASSOCIATION OF AMERICAN RAILROADS BUREAU OF EXPLOSIVES DOES NOT RECOMMEND ANY IN SITU AMELIORATION STEPS FOR EVERY HEAVY METAL CYANIDE, BUT ITS RECOMMENDATIONS FOR ZINC CYANIDE APPEAR TO BE GENERALLY APPROPRIATE: FOR A LAND SPILL, DIG A PIT, POND, LAGOON, OR OTHER HOLDING AREA TO CONTAIN LIQUID OR SOLID MATERIAL. COVER SOLIDS WITH A PLASTIC SHEET TO PREVENT DISSOLVING IN RAIN OR FIRE-FIGHTING WATER. FOR A WATER SPILL THAT HAS BEEN CONTAINED, NEUTRALIZE WITH AGRICULTURAL LIME (SLAKED LIME), CRUSHED LIMESTONE, OR SODIUM BICARBONATE.

ADD CALCIUM HYPOCHLORITE. ADJUST PH TO NEUTRAL AFTER ALL OF THE CYANIDE HAS BEEN DESTROYED. USE MECHANICAL DREDGES TO REMOVE IMMOBILIZED MASSES OF POLLUTANTS AND PRECIPITATES. (BUXEH* 81/STU) MRI RECOMMENDATIONS FOR UNSPECIFIED CYANIDE SALTS: SEEK PROFESSIONAL ASSISTANCE FROM EPA'S ENVIRONMENTAL RESPONSE TEAM (ERT), EDISON, NJ, 24-HOUR NUMBER (201)321-6660. CONTAIN AND ISOLATE SPILL TO LIMIT SPREAD. CONSTRUCT CLAY OR BENTONITE SWALE TO DIVERT UNCONTAMINATED PORTION OF WATERSHED AROUND CONTAMINATED PORTION. ISOLATION PROCEDURES INCLUDE CONSTRUCTION OF LINED DAMS, INTERCEPTOR TRENCHES, OR IMPOUNDMENTS. SEEK PROFESSIONAL HELP TO EVALUATE PROBLEM AND IMPLEMENT CONTAINMENT PROCEDURES. CONDUCT BENCH-SCALE TESTS PRIOR TO IMPLEMENTATION OF FULL-SCALE DECONTAMINATION PROGRAM. FOR DENSITY STRATIFICATION AND IMPOUNDMENT, REMOVE PRODUCT FROM BOTTOM LAYER BY PUMPING THROUGH MANIFOLD OR BY POLYETHYLENE ROPE COLLECTION OR REMOVE CLARIFIED UPPER PORTION BY SKIMMERS OR SIPHONING. TREATMENT ALTERNATIVES FOR CONTAMINATED WATER INCLUDE SORPTION WITH POWDERED ACTIVATED CHARCOAL, BENTONITE, FILTRATION THROUGH A GRANULAR ACTIVATED CARBON BED (USPEDU 1,79/CAL); CHEMICAL OXIDATION WITH HYPOCHLORITE (PRHBK* 73/SIT) OR POTASSIUM PERMANGANATE; ULTRAVIOLET IRRADIATION WITH OZONE OXIDATION (PRHBK* 73/SIT); ACID HYDROLYSIS; ALKALINE CHLORINATION; CHEMICAL PRECIPITATION; AERATION; EVAPORATION; OR BIODEGRADATION. CONTAMINATED WATER MAY BE IMPOUNDED IN A LINED PIT WITH LEACHATE COLLECTION SYSTEM AND DOMED COVER. TREATMENT ALTERNATIVES FOR CONTAMINATED SOILS INCLUDE WELL POINT COLLECTION WITH TREATMENT OF LEACHATES AS FOR CONTAMINATED WATERS AND BENTONITE/CEMENT GROUND INJECTION TO IMMOBILIZE SPILL. PHYSICALLY REMOVE IMMOBILIZED RESIDUES. ADJUST PH OF RESIDUES TO 8.0 AND APPLY ON LAND AT A CONTROLLED AND MONITORED

WATERSHED TO DESTROY BY ULTRAVIOLET IRRADIATION AND ALKALINE HYDROLYSIS. DECOMPOSE BY ACID HYDROLYSIS. CONTAMINATED SOIL OR IMMOBILIZED RESIDUES MAY BE PACKAGED FOR DISPOSAL. CONFIRM ALL TREATMENT PROCEDURES WITH RESPONSIBLE ENVIRONMENTAL ENGINEER AND REGULATORY OFFICIALS.

(DIS) Disposal Method: PRODUCT RESIDUES AND SORBENT MEDIA MAY BE PACKAGED IN 17H EPOXY LINED DRUMS AND DISPOSED OF AT A RCRA-APPROVED SECURE LANDFILL. DESTROY CYANIDE BY PERMANGANATE OXIDATION, ALKALINE OR ACID HYDROLYSIS, TREATMENT WITH CALCIUM HYPOCHLORITE, CHEMICAL OXIDATION, OR MICROWAVE PLASMA TREATMENT. CONFIRM DISPOSAL PROCEDURES WITH RESPONSIBLE ENVIRONMENTAL ENGINEER AND REGULATORY OFFICIALS.

(WTP) Effects on Water Treatment Process: ACTIVATED SLUDGE TREATMENT CAN GIVE COMPLETE CYANIDE REMOVAL, BUT MOST OF THE LOSS IN SUCH TREATMENT IS FROM VOLATILIZATION. PRACTICALLY ALL ORGANISMS CAN METABOLIZE HCN. (USPEDU 1,79/CAL INHIBITION OF SEWAGE ORGANISMS HAS BEEN REPORTED AT CONCENTRATIONS OF 0.3 TO 5.0 PPM CYANIDE. HOWEVER, EVEN AT 6% CYANIDE, INCUBATION FOR UP TO 10 DAYS PURIFIED ALL WATERS STUDIED BY AT LEAST 50% OF THE CONTROL. (MOVIS* 77/FUL)

(DRT) Soil Chemistry: CYANIDE ION HAS FAIR MOBILITY IN SOILS. MOBILITY IS LOWEST IN SOILS OF LOW PH WITH HIGH CONCENTRATIONS OF IRON OXIDES AND POSITIVELY CHARGED PARTICLES SUCH AS KAOLIN, CHLORITE, AND GIBBSITE. HIGHEST MOBILITY OCCURS IN SOILS OF HIGH PH WITH HIGH CONCENTRATIONS OF FREE CALCIUM CARBONATE (HIGH NEGATIVE CHARGE) AND LOW CLAY CONCENTRATION. (USPEDU 1,79/CAL) DEPENDING ON THE OXIDATION OR REDUCTION CONDITIONS, UP TO 200 PPM CYANIDE ADDED TO SOIL IS READILY TRANSFORMED AND/OR DEGRADED. IN NONSTERILE SOILS CYANIDE (AS KCN) IS READILY CONVERTED TO CO2 AND NH3. (MOVIS* 77/FUL)

(HOH) Water Chemistry: AT PH <7, >99% OF TOTAL FREE CYANIDE EXISTS AS HCN; AT PH 8, 93.3%; AT PH 9, 58%; AND AT PH 10, 13%. STRONG OXIDIZING AGENTS CONVERT HCN TO HNCO, WHICH CAN BE HYDROLYZED VIA CARBAMIC ACID TO AMMONIA, WATER, AND CARBON DIOXIDE. AT PH <1, HCN ITSELF HYDROLYZES TO AMMONIUM FORMATE (HALF-LIFE 10 TO 1000 HOURS). ALKALINE HYDROLYSIS TO AMMONIA AND FORMATE IS ALSO SLOW.

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File  17 is being converted to CAS Registry Numbers.

Conversion complete.      1 related references

consisting of      1 unique CAS Registry Numbers were found.


Conversion to local identifiers resulted in      1 unique occurrences.


          Conversion Entry     1; Accession No.        8439


(MONO) Monograph:  8439

(MMAT) Monograph Title Name:  Sodium Cyanide

(AMAT) Alternate Name(s):  Cyanogran

(CAS)  C.A.Registry Number:  143-33-9

(TEXT) Monograph Text:

            This cyanide of commerce is 95-98% pure.  Mixtures of sodium

        cyanide with sodium chloride or carbonate for special uses are

        also marketed.



        NA*C££N




            White granules or fused pieces.  Violent poison!  Odorless

        when perfectly dry; somewhat deliquesc in damp air and emits

        slight odor of HCN.  mp 563 deg.  Freely sol in water, slightly

        in alcohol.  The aq soln is strongly alkaline and rapidly

        decomposes; the soln readily dissolves gold and silver in

        presence of air.  Keep we_l closed.  LD50 orally in rats: 15

        mg/kg, Smyth et al., Am. Ind. Hyg. Assoc. J. 30, 470 (1969).

(USE)   Use:  Extracting gold and silver from ores; electroplating

        baths; fumigating citrus and other fruit trees, ships, railway

        cars, warehouses, etc.; manuf hydrocyanic acid and many other

        cyanides; case hardening of steel.  Caution:  See Hydrogen
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Cyanide.

(MOL) Molecular Formula: CNNa

(COMP) Composition: C 24.50%, N 28.58%, Na 46.92%

(MWT) Molecular Weight: 49.02

(LFORM) Line Formula: NaCN

(MP) Melting Point: mp 563 deg.