earth tech for the planet.
engineering and technology

Remedial Investigation/ Feasibility Study Work Plan

C&D Facility
Site No. 3-36-001

Prepared for:
C&D Technologies, Inc.
1400 Union Meeting Road
Blue Bell, PA 19422-3058

Prepared by:
Earth Tech
12 Metro Park Road
Albany, NY 12205

April 1999

TABLE OF CONTENTS

Chapter **Page**

LIST OF FIGURES

LIST OF TABLES

ATTACHMENTS

APPENDICES

1.0 INTRODUCTION

1.1 Purpose

The New York State Department of Environmental Conservation (NYSDEC) has requested C&D Technologies, Inc. (C&D) to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the inactive lagoon site (Site) at the C&D facility located in the Village of Huguenot, Orange County, New York (Figure 1). This Work Plan serves as an outline of the activities to be performed during the RI/FS. This Work Plan is intended to provide some flexibility. As additional information is obtained, it may be necessary and/or appropriate to modify both the scope and schedule of the proposed activities.

The Remedial Investigation (RI) will be implemented to determine the nature and extent of hazardous waste contamination at the Site as necessary to evaluate potential remedies during the Feasibility Study (FS). The RI will focus on the potential soil and groundwater contamination resulting from the disposal of spent hydrofluoric acid at the Site by a past owner/operator, Empire Tube Corporation (ETC). In addition, at the request of the NYSDEC, the RI will address lead and barium contamination of soil, groundwater, and creek sediments. Both lead and barium were present in wastes disposed of on the Site by ETC. This approach focuses on the collection of additional data in the former lagoon and surrounding area to satisfy NYSDEC concerns with the adequacy of existing information pertaining to fluoride in the groundwater and fluoride and lead in Site soils.

During the FS, potential remedial alternatives will be identified, screened, and evaluated in accordance with EPA and NYSDEC guidance.

A Sampling and Analysis Plan (SAP) and a Field Health and Safety Plan (FHSP) have been developed for use with this Work Plan and are presented in Appendices A and B, respectively. The SAP contains both a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). It outlines data quality objectives and details the specific sampling procedures and the sampling and analytical protocols to ensure the data collected during the RI are of sufficient quality to support remedial decisions. The site-specific FHSP has been prepared to ensure the health and safety of workers and the immediate community during performance of the RI.

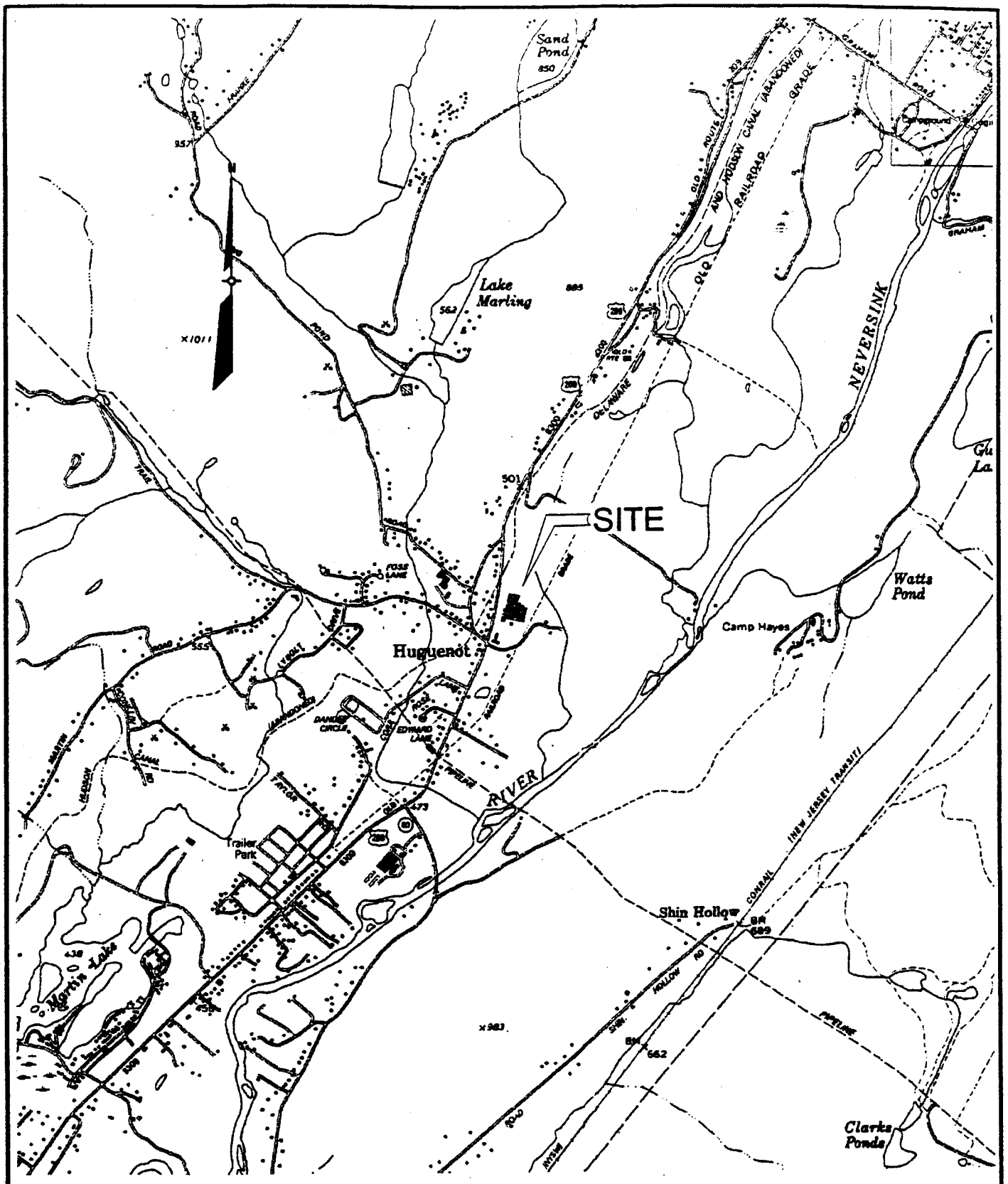
All activities to be performed pursuant to this Work Plan will be consistent with the National Contingency Plan (NCP), 40 CFR 300.

1.2 Site History

1.2.1 The C&D Facility

The facility is approximately ten acres in size and is situated immediately east of Route 209 and approximately four miles northeast of the City of Port Jervis. The facility is located in the Neversink River Valley and is bordered on the west by Route 209 and on the north and east by a tributary to

the Neversink River. The facility is currently operated by C&D. C&D has operated the facility since the mid 1970's.



SOURCE:
NYSDOT 7.5 MIN. QUAD., PORT JERVIS NORTH AND OTISVILLE 1992 EDITION

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

FIGURE 1
SITE LOCATION MAP
C & D TECHNOLOGIES, INC.

ORANGE COUNTY, NEW YORK

SEPTEMBER 1998

201476.10700

1.2.2 The Site

Available information indicates that from 1959 to approximately 1970, the facility was used by ETC to process black and white picture tubes. Hydrofluoric acid was used in the process to remove carbon, potassium silicate, phosphorus and barium from the picture tubes. Historically, industrial process wastewater consisting of rinse waters, wash waters, and floor drainage was directed by ETC to a lagoon adjacent to the northeastern corner of the plant building. This lagoon was approximately 150 feet in diameter and between 15 to 16 feet deep. As reported in the Phase II Investigation Report conducted on behalf of the NYSDEC by Gibbs & Hill (G&H), the process wastewater contained wash water, rinse water and floor drainage.

1.3 Previous Investigations

Dating back to 1981 and 1982, C&D has conducted investigations into the possible nature and extent of soil and groundwater contamination on the Site. The most recent investigative activity, conducted by NYSDEC personnel in July 1990, consisted of monitoring groundwater at the Site for fluoride. Results indicated that the on-Site fluoride levels were ten times greater than background values and exceeded New York State's groundwater standard.

Although the Phase II Investigation, prepared by G&H, reported that there was no evidence of contamination or the migration of contamination from the Site, the NYSDEC reclassified the Site to Class 2 based on excessive fluoride levels in groundwater.

Although fluoride has been detected in groundwater, due to significant attenuation rates, fluoride has not been detected in either the sediment or surface water samples taken from the tributary of the Neversink River located approximately 350 feet from the plant building.

Presented below is a chronological list of previous investigations performed at the Site. A brief summary of activities performed and recommendations provided, based upon review of results and conclusions from each investigation, is also included.

May, 1964: New York State Department of Health (NYSDOH) inspected ETC's waste disposal system. Surface water and groundwater samples were collected on a monthly basis. Samples collected from the spring emanating from a bank of the lagoon contained, on average, approximately 100 mg/l of fluoride. Samples from the nearby production well and tributary of the Neversink River exhibited fluoride levels of 0.0 to 5.5 mg/l and 8.0 mg/l, respectively. However, no action was taken by ETC.

September, 1966: A complaint was filed by NYSDOH regarding discharge of various wastes into the waters of the State of New York. Complaint centered around the discharge of industrial wastes containing approximately 2,500 ppm of fluorides and unidentified concentrations of barium and silicates. These discharges exceeded water quality standards since February 1, 1963.

December 1981/January 1982: In connection with C&D's interest in expanding the plant building over the former lagoon, C&D retained Environmental Resources Management, Inc. (ERM) to

perform a hydrogeologic assessment of the former lagoon and surrounding area. The objective behind the voluntary investigation was to gather data necessary to determine if the filling of the former lagoon would pose an adverse environmental effect on the Site and surrounding area.

Soil samples collected at the Site reported levels of lead, cadmium and zinc, possibly attributable to paint waste disposed by ETC, which exceeded the common range of inorganics in soil. Soil samples collected from the bottom of the former lagoon indicated fluoride concentrations ranging from 28 to 358 mg/kg. Groundwater samples collected demonstrated that water in the vicinity of the former lagoon were of "acceptable quality" except for fluoride concentrations (13 to 30 mg/l) which exceeded New York State's sanitary code for fluoride (2.2 mg/l).

These investigations identified the presence of fluoride in both the groundwater downgradient of the former lagoon and in soils at the bottom of the former lagoon. Lead was found in one well only. It is important to note that ERM concluded that fluoride and barium levels in subsurface soil and groundwater attenuated significantly with distance from the former lagoon.

The Site was classified as 2a in the New York State Registry of Inactive Hazardous Waste Sites on November 14, 1983.

July 21, 1988 to March 1990: A Phase II investigation was completed by G&H in January 1989 to collect the necessary information to determine if any imminent and/or significant environmental or human health hazard existed as a result of the presence of hazardous wastes. In addition to a historical records search, additional sampling and analysis of groundwater, surface water and sediment was conducted. The G&H Phase II investigation reported that there was no evidence of contamination or the migration of contamination from the Site. It did, however, acknowledge the presence of lead in one groundwater well at levels above the Federal Primary Drinking Water Standards. As noted above, the G&H Phase II Investigation did not include analysis of fluoride in the groundwater and subsurface soil in the former lagoon.

July 16, 1990: NYSDEC conducted additional groundwater monitoring and found fluoride levels more than ten times above background levels and exceeding the New York Class GA groundwater standard for fluoride of 1.5 mg/l. Subsequently, the Site was reclassified to Class 2.

1.4 Hydrogeologic Setting

The C&D facility is located in the Valley and Ridge physiographic province. This province is characterized by the presence of folded Paleozoic sedimentary rocks that include sandstone, shale and limestone. The long axis of the folds generally trend northeast-southwest, resulting in a marked parallelism of ridges oriented in this direction. The Neversink Valley is part of a large trough developed over soluble limestone of Devonian Age.

The facility and surrounding area is underlain by glacially-derived, coarsening downward sand and gravel outwash with an estimated average hydraulic conductivity of 6×10^{-3} cm/sec. The irregular thickness of the deposit ranges from less than 10 feet to approximately 150 feet. This unit is an unconsolidated principal aquifer yielding from 10 to 100 gallons per minute.

During post-glacial time, the Neversink River has eroded the older glacial deposits forming the existing floodplain. Remnants of the older glacial deposits remain along the sides of the valley as flat-topped benches or terraces, elevated above the present Neversink floodplain. It is these older, coarser-grained terrace deposits which underlie the Site. Thirteen monitoring wells were installed in this overburden hydrogeologic unit during the 1981 study.

During the supplemental drilling by ERM in 1982, coarse deposits of sand, gravel, and small cobbles were encountered at MW-6 and were similar to the material found in MW-2 to MW-5, near the former lagoon. The other four wells, MW-7 through MW-10, were located on a flat-topped bench that is about 10 feet below the terrace on which the other wells are located. The material underlying the bench becomes finer grained in a southwesterly direction as can be seen by comparing the logs of MW-7 through MW-10. The sands and gravels that constitute the stratigraphic column at MW-7 change horizontally into well-sorted, fine sand and silt containing thin clay horizons.

Groundwater flow at the Site is to the east or southeast toward the tributary to the Neversink River with a gradient of less than one percent.

1.5 Nature and Extent of Contamination

Based upon the results from the ERM investigations, Phase II Investigation and other Site inspections/investigations, no elevated concentrations of volatile organic compounds, semi-volatile organic compounds, pesticides or PCBs were reported in subsurface soil, sediment and surface water from a tributary to the Neversink River, or groundwater.

Fluoride has been detected in elevated concentrations in soils and in groundwater beneath and downgradient of the former lagoon, based upon analytical results obtained to date. Lead has been detected in elevated concentrations in soil and in groundwater at one monitoring well location. The lateral migration of fluoride appears to be limited. Based upon the existing data, off-site migration does not appear to have occurred within the overburden soil or shallow overburden groundwater. However, NYSDEC has requested that fluoride and metals (lead and barium) concentrations in soil at the former lagoon, on-Site groundwater, sediment and surface water be further characterized.

2.0 REMEDIAL INVESTIGATION

Previous investigative results were reviewed to aid in scoping this Remedial Investigation (RI). The RI tasks presented below will provide the additional data necessary to characterize the nature and extent of hazardous waste at the Site as necessary for the development and evaluation of remedial alternatives in the Feasibility Study (FS). The following items are the primary components of the RI activities:

- Review of existing data and inspection of the existing monitoring network;
- Site mapping and topographic survey;
- Water level monitoring, development of existing monitoring wells and hydraulic conductivity testing;
- Groundwater sampling and analysis;
- Shallow soil sampling and analysis;
- Subsurface soil sampling and analysis;
- Sediment sampling and analysis;
- Review of all new analytical data; and
- Report preparation.

2.1 Existing Data Review and Monitoring Well Inspection

In order to gain a more complete understanding of the site geology, hydrology and physical characteristics, Earth Tech will perform a review of correspondence and data generated during the G&H Phase II Investigation and the hydrogeologic investigation performed by ERM. This will include the review of boring logs, well construction details, analytical data forms, field notes, and historical aerial photographs.

The existing monitoring network will be inspected to assess the current condition of all monitoring wells. Any wells which are damaged or destroyed will be noted. Wells will be replaced if necessary to accurately delineate contamination. Total depth measurements will be obtained from all accessible wells during this inspection. Any obstructions in the wells will also be noted during this activity. A monitoring well inspection form is located in Attachment A of the Sampling and Analysis Plan.

2.2 Site Mapping and Topographic Survey

The site maps included in the Phase II Investigation appear to be approximate and therefore inadequate for the data quality objectives of this RI/FS. For this reason, Earth Tech will prepare an accurate base map of the Site by performing a topographic survey. The Site will be mapped at a scale of approximately one inch equals 50 feet with a two foot contour interval. The map will adequately represent topography and identify property lines, fence lines, roadways, buildings, monitoring wells, sampling points and other significant on-Site features. Monitoring well elevations will be surveyed to the nearest 0.01 foot at the top of well casing and top of protective steel casing. Ground surface at each location will be surveyed to the nearest 0.1 foot.

2.3 Water Level Measurements

Groundwater level measurements have been taken during previous investigative phases. However, the most recent round of water levels is from 1989. During the monitoring network inspection, water-level measurements will be obtained in all accessible wells. To minimize the amount of change in water levels which could occur, the measurements will be obtained during a single day, and to the extent possible, each round of water level measurements will be scheduled so as not to occur during or immediately after (i.e., two days) a significant precipitation event (i.e., greater than 0.25 to 0.50 inches).

To develop a reliable data set, water level measurements will be made in all accessible wells during each field sampling event.

The procedure for obtaining the water-level measurements is presented in Attachment B of the Sampling and Analysis Plan. A field recording form is presented in Attachment A.

2.4 Monitoring Well Development

Since it has been several years since their installation, the nine existing monitoring wells will be developed prior to sampling in order to remove residual silts, sands and clays, increase the hydraulic conductivity immediately around the well and reduce the turbidity of groundwater samples. This will help ensure that the groundwater samples, and other hydraulic information obtained from these wells, are representative of subsurface conditions.

All groundwater and sediments resulting from well development will be managed as described in Section 2.11. The wells will be developed using procedures presented in Attachment B of the Sampling and Analysis Plan. A well development reporting form is presented in Attachment A.

Well development will continue until a turbidity goal of less than or equal to 50 Nephelometric Turbidity Units (NTUs) is obtained. If this goal cannot be obtained, well development will continue until an amount of groundwater equivalent to 10 well volumes has been removed.

2.5 In-situ Hydraulic Conductivity Testing

After sufficient time for groundwater stabilization has occurred, the existing monitoring wells will be tested to obtain additional hydraulic conductivity estimates of the formation adjacent to the well screen, and to confirm the results of the G&H Phase II Investigation. These estimates will be necessary for estimating groundwater flow rates and travel times within a hydrogeologic unit and for the screening and selection of potential remedial options. The hydraulic conductivity testing will be performed in-situ by performing slug and/or bail tests. Test procedures are described in Attachment B of the Sampling and Analysis Plan.

2.6 Groundwater Sampling and Analysis

Groundwater samples will be obtained from existing wells and analyzed for comparison with analytical results obtained during previous investigative activities. This sampling will be performed no less than 20 days after the wells are developed. Both the wells to be sampled and the analyses to be performed are discussed below. Groundwater resulting from the sampling activity will be managed as discussed in Section 2.11.

Table 1 provides a summary of the groundwater samples to be collected. The groundwater sampling procedures and associated field reporting forms are presented in the SAP.

Fluoride and Metals Analysis

To assess the impact of the presence of solids in groundwater and how it affects the levels of fluoride and metals, filtered and unfiltered samples will be collected. One round of filtered and unfiltered groundwater samples will be obtained from nine (9) existing monitoring wells to define and confirm the chemistry within the shallow hydrogeologic unit. The wells which will be sampled are: MW-1, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12 and MW-13. Sample filtering will be performed in the field using a 5 micron filter. All filtered and unfiltered groundwater samples will be analyzed for fluoride, lead, and barium following the NYSDEC ASP/CLP.

Target Compound List/Target Analyte List (TCL/TAL) Analysis

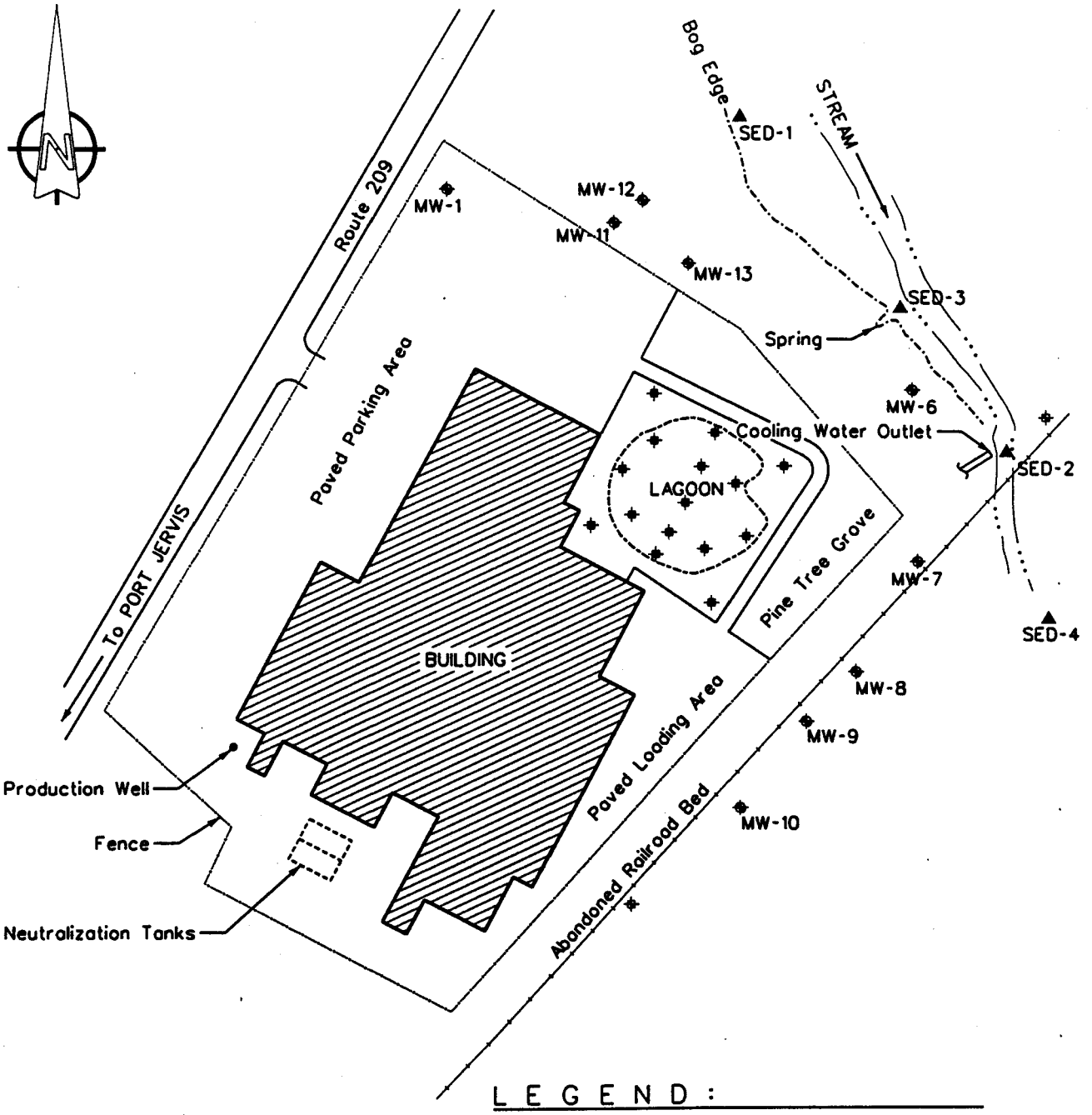
At the request of the NYSDEC, groundwater samples will be collected and analyzed for the full TCL/TAL following the NYSDEC ASP/CLP. Samples will be collected from one upgradient well (MW-1) and two downgradient wells (MW-6 and MW-7).

2.7 Shallow Soil Sampling and Analysis

Additional shallow soil samples will be obtained during the RI to further evaluate the vertical and horizontal extent of hazardous waste and hazardous waste constituents at the Site and collect information to enable comparison with background conditions. Shallow soil samples will be collected in the areas of the former lagoon, railroad bed, and upgradient portions of the Site.

TABLE 1
Sample and Analysis Summary
C&D Facility
Remedial Investigation

Media	Area	Number of Samples	Analysis
Groundwater			
	Existing Wells	9	Fluoride, Barium, Lead (unfiltered)
		9	Fluoride, Barium, Lead (filtered)
		3	TCL/TAL
Field Duplicate		1	Fluoride, Barium, Lead
Matrix Spike (MS)		1	Fluoride, Barium, Lead
MS Duplicate		1	Fluoride, Barium, Lead
Trip Blank		1	TCL-VOA
Soil			
	Former Lagoon	up to 125	Fluoride, Barium, Lead
		2	TCL/TAL
	Railroad Bed	2	Fluoride, Barium, Lead
	Upgradient	2	TCL/TAL
Field Duplicate		6	Fluoride, Barium, Lead
Matrix Spike (MS)		6	Fluoride, Barium, Lead
MS Duplicate		6	Fluoride, Barium, Lead
Trip Blank		1 per day	TCL-VOA
Sediment			
	Creek Bottom	4	Fluoride, Barium, Lead
Field Duplicate		1	Fluoride, Barium, Lead
Matrix Spike (MS)		1	Fluoride, Barium, Lead
MS Duplicate		1	Fluoride, Barium, Lead



LEGEND:

MW-10	Existing Monitoring Wells
	Proposed Shallow Soil Samples - Railroad Bed
	Proposed Shallow Soil Samples - Lagoon
SED-4	Proposed Sediment Samples

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

FIGURE No. 2
PROPOSED SAMPLING LOCATIONS
C&D FACILITY
Huguenot, New York

PROJECT No. 32049.100	DATE 4/5/99	DWG. No. 38934fg2	SCALE N.T.S.	FIGURE No. 2

DRAWING No. 38934fg2.dgn

The shallow soil samples will be collected to identify and define the extent of fluoride, barium, and lead in shallow soils. Additionally, railroad bed samples are expected to provide data confirming that lead below the railroad bed is not a Site-related contaminant but is attributable to off-Site sources.

Table 1 provides a summary of the shallow soil sample analyses. The soil boring log form and procedure for obtaining soil samples is presented in Attachments B of the Sampling and Analysis Plan.

Former Lagoon Area

An estimated 15 shallow soil borings will be taken in the former lagoon using hand auguring, direct push, or rotary / split-spoon methods as appropriate. The borings will be established in a grid with an approximately 50 foot spacing between locations. The borings will be advanced to a depth of 10 feet below grade or to the watertable, whichever is deeper. Samples will be collected at depths of 0, 2, 4, 6, and 10 feet or at the watertable. All samples will be analyzed for fluoride, lead, and barium following the NYSDEC ASP/CLP. In addition, at the request of the NYSDEC, two samples will be collected and analyzed for the full TCL/TAL following the NYSDEC ASP/CLP.

Railroad Bed Area

Two shallow soil samples will also be collected from off-Site locations in the abandoned railroad bed. Both samples will be analyzed for fluoride, lead, and barium following the NYSDEC ASP/CLP.

Upgradient Areas

Two shallow borings will also be installed in upgradient areas of the site to more accurately define site-specific background levels of naturally occurring constituents. These samples will be analyzed for the full TCL/TAL following the NYSDEC ASP/CLP.

2.8 Subsurface Soil Sampling and Analysis

If the results of shallow soil sampling indicate the shallow soil in the former lagoon contains hazardous constituents, it may be necessary to perform additional subsurface soil sampling and analysis in an effort to define the extent of contamination.

If this additional subsurface soil investigation is necessary, it would entail the collection of additional soil samples radially outward from the lagoon for the purpose of determining if contaminated soils exist outside the limits of the former lagoon.

This investigation would entail collecting samples from several locations in a grid pattern with approximately 100 foot spacing between sampling points. An estimated 10 shallow soil borings would be installed using hand auguring, direct push, or rotary / split-spoon methods as appropriate. The borings would be advanced to a depth of 10 feet below grade or to the watertable, whichever

is deeper. Samples would be collected at appropriate depths depending on the zones of contamination identified in the former lagoon area. It is estimated that this would result in approximately 50 samples. All samples would be analyzed for fluoride, lead, and barium following the NYSDEC ASP/CLP.

Table 1 provides a summary of the subsurface soil sample analyses. The procedure for obtaining split-spoon soil samples is presented in Attachment B of the SAP.

2.9 Sediment Sampling and Analysis

One round of sediment samples will be collected from the tributary to the Neversink River and will consist of four grab samples. Samples will be collected at the following locations: one at previous sample location Sd-1; one at previous sample location Sd-2; one at the spring (Sd-3); and a fourth sample (Sd-4) approximately 100 feet downstream of Sd-2. Proposed sediment sample locations are depicted in Figure 2. These sample locations were selected to evaluate potential impacts to the Neversink River from the Site for comparison with analytical results from previous sampling events.

All samples will be analyzed for fluoride, lead, and barium following the NYSDEC ASP/CLP.

Table 1 provides a summary of the sediment samples to be collected. The procedure for obtaining the sediment samples is presented in Attachment B of the SAP.

2.10 Decontamination Procedures

All re-usable equipment used during the RI will be decontaminated prior to, during and after the field activities as appropriate. Disposable sampling equipment will be disposed of properly. The purpose of equipment decontamination is to minimize the potential for compromising data validity by reducing the possibility of cross-contamination. Detailed equipment decontamination procedures are included in Attachment B of the SAP.

The drilling and sampling program will include decontamination procedures to ensure that possible contaminants are not introduced to or transferred across the Site. A temporary decontamination pad will be constructed near the east side of the Site. Prior to drilling the first boring, the equipment used in drilling will be cleaned to remove possible contaminants. All equipment which will come in contact with the soil, including but not limited to drilling tools, sampling augers, iron casings, pumps and hoses, water tanks, hand tools, mixing bowls, will undergo the initial cleaning procedure. While working at the Site, the drilling equipment and reusable sampling equipment will be decontaminated between boring locations to prevent cross-contamination. The drill rig and all drilling tools will be decontaminated after samples are collected and before leaving the Site. The cleaning process will involve the use of a high-pressure steam cleaner. Clean, potable water will be used for both the decontamination of the drilling equipment and the drilling procedures.

2.11 Handling of Investigation-derived Waste

The RI activities will produce investigation-derived waste (IDW) which will require appropriate management. This IDW includes the following:

- Groundwater resulting from the drilling and development of existing wells;
- Groundwater resulting from the purging and sampling of wells;
- Decontamination fluids and sediments which may settle out of such fluids; and
- Personnel protective equipment (PPE) and associated debris resulting from the execution of field activities.

The management of these materials is discussed below.

2.11.1 Groundwater

Water generated during the development, purging and sampling of groundwater monitoring wells will be held in appropriate secure storage until laboratory analytical results are received. After receiving the analytical results and notifying the NYSDEC, this water will be discharged onto the ground surface or transported off-Site for treatment and/or disposal at a permitted facility, as appropriate.

2.11.2 Sediments, PPE and Associated Debris

Used PPE and other associated debris (e.g., disposable sampling equipment) will be containerized in appropriate 55 gallon drums and stored temporarily on-Site. At the conclusion of field activities, these materials will be appropriately characterized and after receiving the necessary approvals, will be transported off-Site for disposal at a permitted facility.

2.11.3 Decontamination Fluids

Decontamination fluids associated with drilling activities will be held in appropriate secure storage until laboratory analytical results are received. After receiving the analytical results and notifying the NYSDEC, this water will be discharged onto the ground surface or transported off-Site for treatment and/or disposal at a permitted facility, as appropriate.

2.12 Laboratory Analysis

All laboratory analyses will be performed by a laboratory with a valid New York State Department of Health ELAP CLP Certification for the specific analytical methods specified in this work plan. The proposed laboratory selected to perform the work is Severn Trent/Envirotest, of Newburgh, New York.

2.13 Data Package Review

The data package review will follow the NYSDEC's Division of Environmental Remediation (DER) Guidance for the Development of Data Usability Summary Reports, revised September 1997. The DUSR will be prepared by an independent third party, Earth Tech's Quality Assurance Officer (QAO). The proposed QAO is Brett Mongillo who has prepared numerous DUSRs for NYSDEC. His resume is included in Appendix C.

2.14 Remedial Investigation Report

The methodologies used, sample location maps, and data generated during the RI will be presented in the Remedial Investigation Report. The RI Report will also include the results of previous investigative activities. To indicate the types of information to be presented, the preliminary report format is shown in Attachment A of this Work Plan.

3.0 FEASIBILITY STUDY

A Feasibility Study (FS) will be performed utilizing the stepwise approach outlined in EPA guidance. The first step involves the development of remedial action alternatives. These alternatives are screened out or retained, as necessary or appropriate, during the second step. The third and final step involves the detailed analysis of the remaining remedial alternatives according to the selection criteria specified in the National Contingency Plan (NCP). This process culminates in the recommendation of one or more remedial alternatives in the FS Report. This stepwise approach can be phased to maximize the value of data gathering and evaluation efforts performed in the RI, keeping the RI focused on collecting information pertinent to the selection of remedial alternatives.

3.1 Development of Remedial Alternatives

The development of remedial alternatives will involve the following six-step process:

- Development of remedial action objectives specifying the contaminants and media of interest, exposure pathways, receptors and acceptable contaminant levels for each exposure route that permit a range of treatment and containment alternatives to be developed;
- Development of general response actions for each medium of interest, defining containment, treatment, excavation, pumping, or other general actions which might satisfy the remedial action objectives;
- Identification of the volume of material or area(s) of contamination to which the general response actions might be applied;
- Identification and screening of technology types applicable to each general response action to eliminate those that are not implementable;
- Identification and screening of process options in terms of effectiveness, implementability and cost to select a representative process for each technology type; and
- Assembly of the technologies and process options into remedial alternatives, preserving a range of treatment and containment choices.

In the above process, data gathered during the RI is used to identify and screen technology types and process options. Technologies that could prove difficult to implement, might not achieve the remedial action objectives within a reasonable time frame, or might not be applicable or feasible based on site-specific conditions, are eliminated from further consideration. Moreover, results can be used to guide additional site characterization work, if necessary.

3.2 Screening of Remedial Alternatives

The remedial alternatives developed in the previous task may undergo an initial screening to reduce the number of remedial alternatives for detailed analysis. This screening will be accomplished by evaluating alternatives on the basis of effectiveness, implementability (both technical and administrative) and cost. The range of remedial alternatives will, however, be preserved during the screening. Innovative technologies will be considered throughout the screening process to determine if they provide a potential for better performance, easier implementation or cost savings relative to demonstrated technologies.

3.3 Detailed Evaluation of Remedial Alternatives

A detailed evaluation of the remedial alternatives which remain following the preliminary screening will be conducted. This detailed evaluation will follow the process specified in the EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (Interim Final, October 1988) and "Guidance on Superfund Selection of Remedy" (July 1987) as well as NYSDEC Technical and Administrative Guidance Memorandum No. 4030 entitled "Selection of Remedial Actions at Inactive Hazardous Waste Sites", dated September 13, 1989 and revised May 15, 1990. The seven criteria against which the remedial alternatives will be evaluated are:

- Overall protection of human health and the environment.
- Compliance with applicable New York State Standards, Criteria and Guidelines (SCGs);
- Short-term impacts and effectiveness;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility or volume;
- Implementability (i.e., technical and administrative); and
- Cost (i.e., capital, annual operation and maintenance and present worth).

Two additional evaluation criteria, state and community acceptance, must be addressed by the NYSDEC in the Record of Decision.

Evaluation of these alternatives will be performed using a relative weighting system. Each evaluation criterion will be assigned a relative weighting factor. Each of the alternatives will be compared to each evaluation criterion and will be assigned a relative score representative of the alternatives' achievement of the goals of the evaluation criteria. Following completion of this evaluation, the results of the comparison of alternatives will be tested using a sensitivity analysis. Various design aspects of each alternative will be altered to reflect uncertainties in the design.

Following the evaluation of each remedial alternative, a comparative analysis will be performed to determine the relative performance of each remedial alternative against the seven criteria. The remedial alternative(s) or combination of alternatives which receives the highest evaluation will be recommended as the preferred alternative(s).

3.4 Feasibility Study Report

The results of the evaluation of remedial alternative will be documented in an FS Report. The preliminary format for this report is provided in Attachment A.

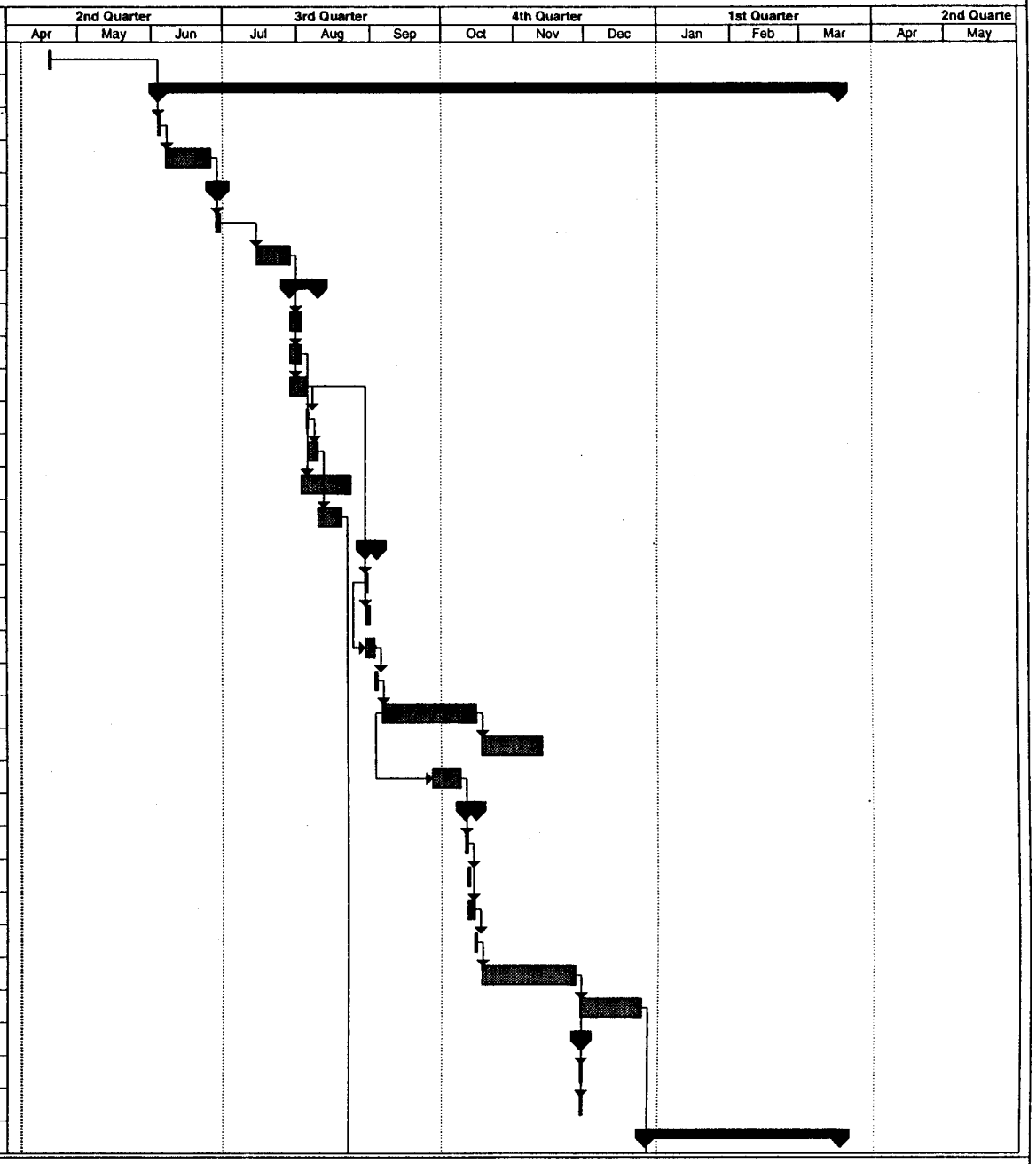
4.0 PROJECT SCHEDULE

A Project Schedule that depicts the duration of the individual tasks which comprise the project is presented in Figure 3. The estimated duration of the Remedial Investigation is 42 weeks, with work to start within 45 days of signing of the Consent Order. The estimated duration of the Feasibility Study is 36 weeks. The overall estimated project duration is 52 weeks.

This schedule assumes a Consent Order signing date and certain review time periods for the regulatory agencies, and may need to be modified to reflect actual review time periods. Actual dates will need to be modified if the signing date is different.

Figure 3

ID	Task Name	Duration	Start	Finish	Predecessors
1	CONSENT ORDER (assumed date)	1d	4/19/99	4/19/99	
2	**REMEDIAL INVESTIGATION**	**206d**	**6/4/99**	**3/17/00**	
3	Authorization to Proceed	1d	6/4/99	6/4/99	1FS+45ed
4	Existing Data Review	15d	6/7/99	6/25/99	3
5	**Field Visit #1**	**2d**	**6/28/99**	**6/29/99**	
6	Monitoring Well Inspection	2d	6/28/99	6/29/99	4
7	Well Evaluation & Contracting	10d	7/15/99	7/28/99	6FS+11d
8	**Field Visit #2**	**8d**	**7/29/99**	**8/9/99**	
9	Well Replacement (if nec.)	3d	7/29/99	8/2/99	7
10	Site Mapping and Topo Survey	3d	7/29/99	8/2/99	7
11	Monitoring Well Development	5d	7/29/99	8/4/99	7
12	Water Level Measurements	1d	8/5/99	8/5/99	11
13	In-Situ Hydraulic Conductivity Testing	2d	8/6/99	8/9/99	12
14	Map Development	15d	8/3/99	8/23/99	10
15	Data Analysis	8d	8/10/99	8/19/99	13
16	**Field Visit #3**	**5d**	**8/30/99**	**9/3/99**	
17	Water Level Measurements	1d	8/30/99	8/30/99	11FS+23ed
18	Groundwater Sampling	2d	8/30/99	8/31/99	11FS+23ed
19	Shallow Soil Sampling	4d	8/30/99	9/2/99	17SS
20	Sediment Sampling	1d	9/3/99	9/3/99	19
21	Ph I Laboratory Analysis	30d	9/6/99	10/15/99	20
22	Ph I Data Validation (DUSR)	20d	10/18/99	11/12/99	21
23	Data Evaluation and Contracting	10d	9/27/99	10/8/99	21SS+15d
24	**Field Visit #4 (if nec.)**	**5d**	**10/11/99**	**10/15/99**	
25	Site Work	1d	10/11/99	10/11/99	23
26	Water Level Measurements	1d	10/12/99	10/12/99	25
27	Subsurface Soil Sampling	3d	10/12/99	10/14/99	25
28	IDW Sampling/Restoration	1d	10/15/99	10/15/99	27
29	Ph II Lab Analysis	30d	10/18/99	11/26/99	28
30	Ph II Data Validation	20d	11/29/99	12/24/99	29
31	**Field Visit #5**	**1d**	**11/29/99**	**11/29/99**	
32	Water Level Measurements	1d	11/29/99	11/29/99	29
33	IDW Management	1d	11/29/99	11/29/99	29
34	**RI Report**	**60d**	**12/27/99**	**3/17/00**	

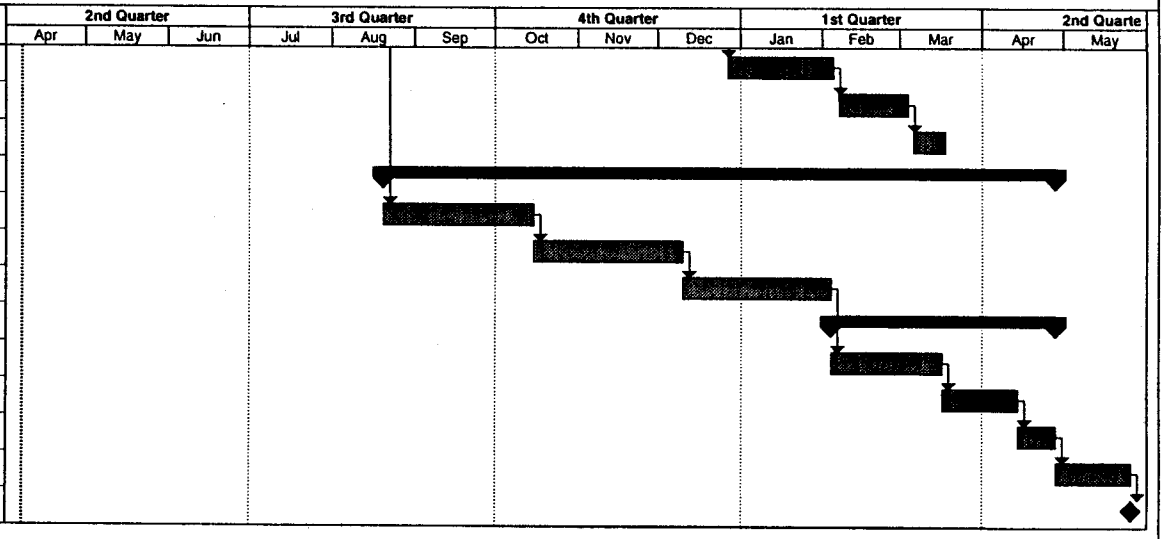


Project: C & D Technologies, Inc. Huguenot Site
Date: 4/7/99

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

Figure 3

ID	Task Name	Duration	Start	Finish	Predecessors
35	Prepare & Submit to NYSDEC	30d	12/27/99	2/4/00	30
36	NYSDEC Review	4w	2/7/00	3/3/00	35
37	Revise and Resubmit	10d	3/6/00	3/17/00	36
38	**FEASIBILITY STUDY**	**180d**	**8/20/99**	**4/27/00**	
39	Development of Alternatives	40d	8/20/99	10/14/99	15
40	Screening of Alternatives	40d	10/15/99	12/9/99	39
41	Detailed Evaluation of Alternatives	40d	12/10/99	2/3/00	40
42	**FS Report**	**60d**	**2/4/00**	**4/27/00**	
43	Prepare & Submit to NYSDEC	30d	2/4/00	3/16/00	41
44	NYSDEC Review	4w	3/17/00	4/13/00	43
45	Revise and Resubmit	10d	4/14/00	4/27/00	44
46	CONCEPTUAL DESIGN	20d	4/28/00	5/25/00	45
47	PROJECT COMPLETION	0d	5/25/00	5/25/00	46



Project: C & D Technologies, Inc. Huguenot Site
Date: 4/7/99

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

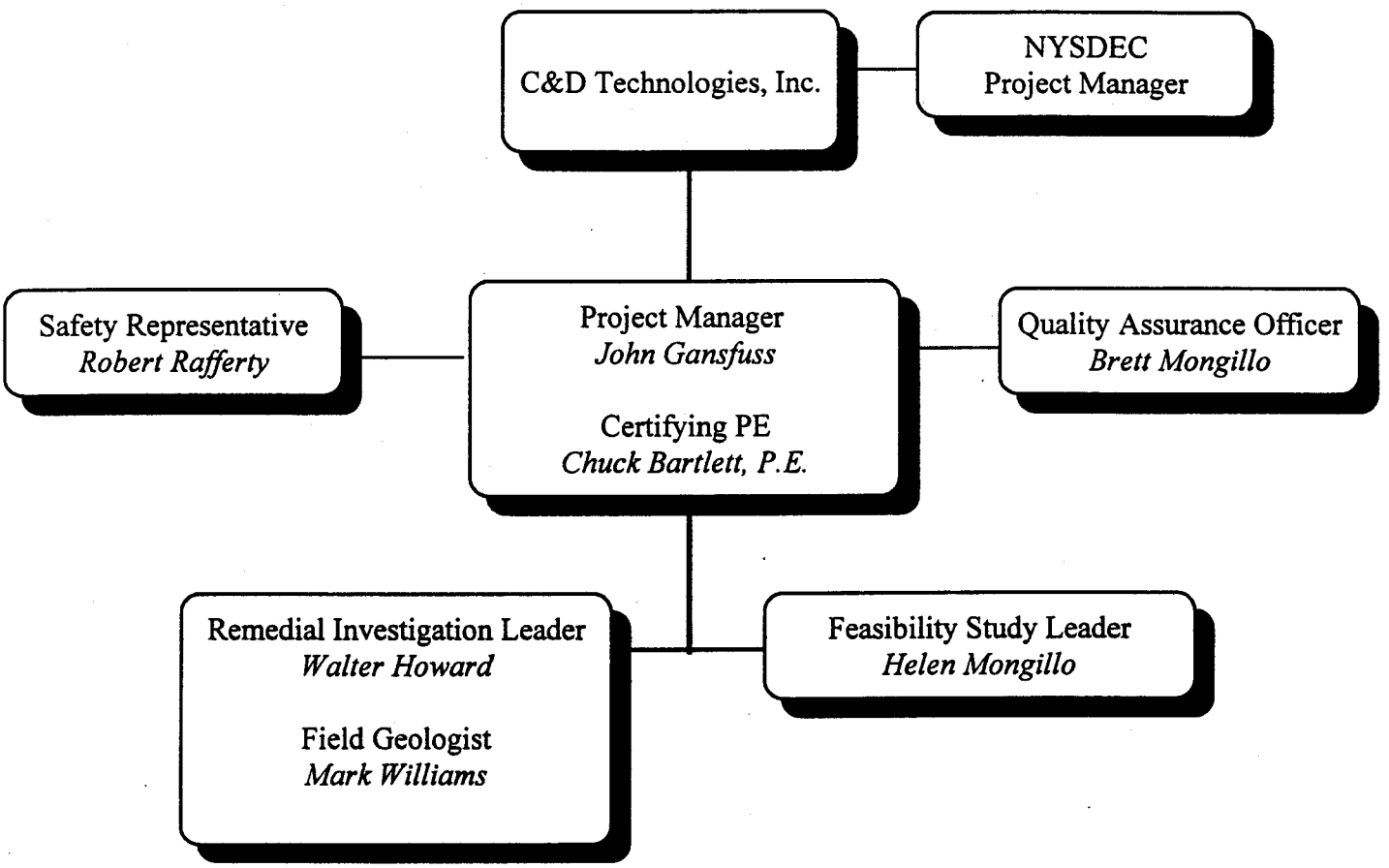
5.0 STAFFING PLAN

An Organizational Chart is presented in Figure 4. Earth Tech will be performing the RI/FS under the direction of C&D Technologies, Inc. Mr. Charles Bartlett, P.E. will serve as Earth Tech's certifying Professional Engineer. Mr. John Gansfuss will serve as Project Manager. Mr. Brett Mongillo will serve as the Quality Assurance Officer and Mr. Robert Rafferty as the Safety Representative. The RI will be lead by Mr. Walter Howard and the FS by Ms. Helen Mongillo.

The entire proposed staff has extensive experience in conducting RI/FS under the New York State Inactive Hazardous Waste Site Remedial Program. The resumes for these personnel are included in Appendix C.

FIGURE 4: PROJECT ORGANIZATION

C&D TECHNOLOGIES SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY



6.0 CITIZEN PARTICIPATION PLAN

In accordance with 6NYCRR Part 375, Citizen Participation (CP) activities will be conducted for the remedial program at the Site. The full text of the Citizen Participation Plan is included in Appendix E.

ATTACHMENT A

Preliminary Table of Contents
for the
Remedial Investigation (RI) Report
and
for the
Feasibility Study (FS) Report

REMEDIAL INVESTIGATION REPORT

PRELIMINARY
TABLE OF CONTENTS

FEASIBILITY STUDY REPORT

PRELIMINARY
TABLE OF CONTENTS

APPENDIX A

Sampling and Analysis Plan

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ATTACHMENTS

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) was developed for C&D Technologies, Inc. (C&D) by Earth Tech, Inc. (formerly Rust Environment and Infrastructure, Inc.), for use in conjunction with the Remedial Investigation (RI) / Feasibility Study (FS) Work Plan (Work Plan) for the inactive lagoon site (Site) at the C&D facility located in the Village of Huguenot, New York (Figure 1). It has been prepared to address aspects of the collection and analysis of environmental samples proposed in the Work Plan.

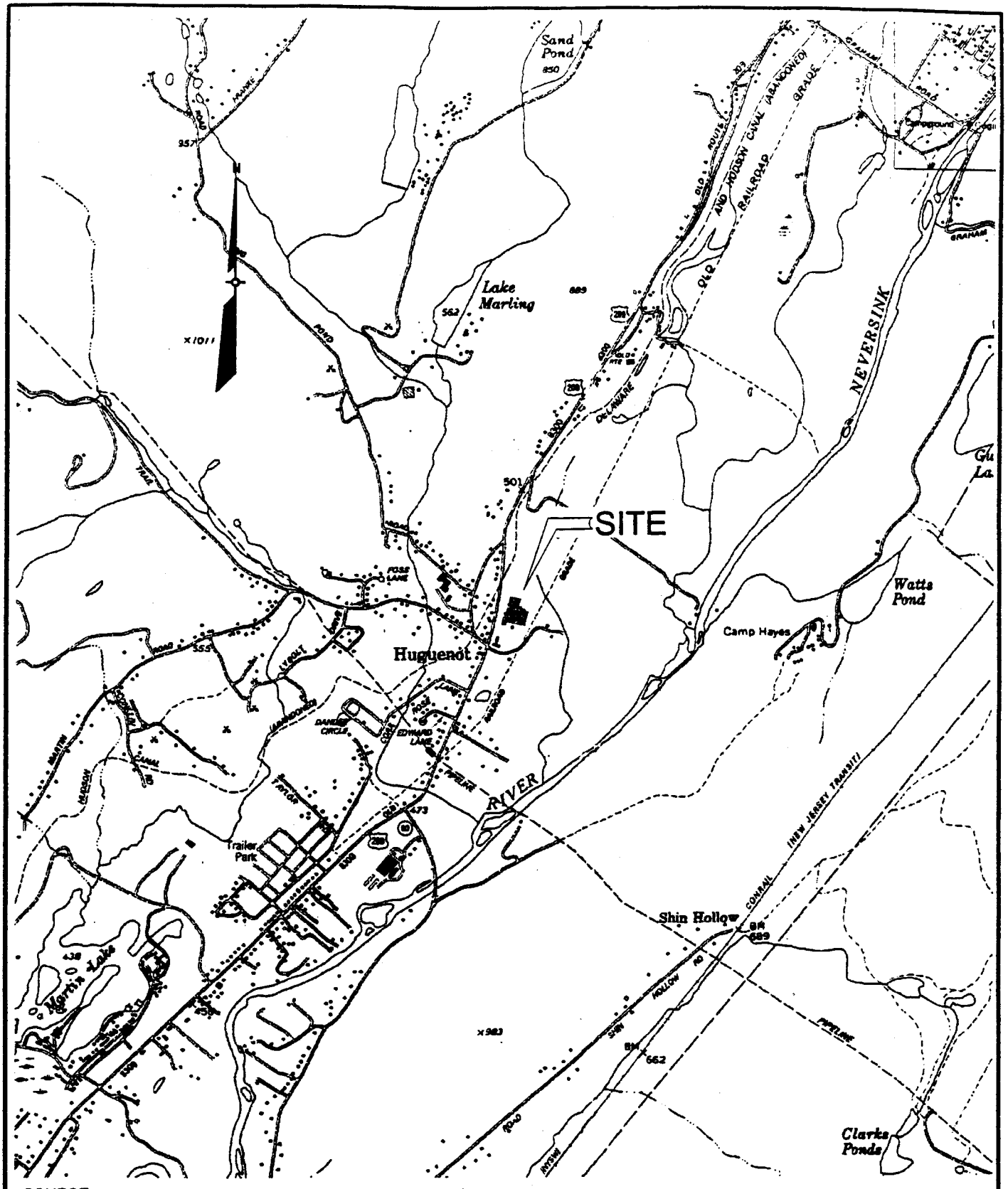
The two major components of this SAP are the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP). The FSP provides the detailed procedures for the collection of environmental samples including the following: equipment and personnel requirements; sampling techniques; sample volumes, preservatives; shipping requirements and holding times; and equipment decontamination. The FSP has been prepared in accordance with the United States Environmental Protection Agency's (EPA's) "Compendium of Superfund Field Operation Methods."

The QAPP indicates prime responsibilities and prescribes requirements for assuring that the Remedial Investigation (RI) is planned and executed in a manner consistent with quality assurance objectives. The objective of the QAPP is to ensure that the technical data generated during the RI are of sufficient quality for selection of a remedial alternative. The QAPP provides guidance and specifications to assure that:

- Field determination and analytical results are valid through preventative maintenance and calibration of equipment, and adherence to proper analytical protocols;
- Samples are identified and controlled through sample tracking systems and chain-of-custody protocols;
- Records are retained as evidence of the quality of samples, applied processes, equipment and results;
- Generated data are reviewed in accordance with New York State Department of Environmental Conservation (NYSDEC) Data Usability Summary Report guidelines and their use in calculations is documented; and,
- Evaluations of the data are accurate, appropriate, and consistent throughout the project.

The content and format of the QAPP are based on the EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Project Management Plans." Whenever possible, any deviations from this SAP will receive prior approval from the NYSDEC's Project Manager and the NYSDEC's QA/QC Officer.

The Work Plan was prepared at the request of C&D to detail activities necessary to implement the RI at the Site. The RI tasks are discussed in detail in the Work Plan. The following items are the primary components of the RI:



SOURCE:
NYSDOT 7.5 MIN. QUAD., PORT JERVIS NORTH AND OTISVILLE 1992 EDITION

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

FIGURE 1
SITE LOCATION MAP
C & D TECHNOLOGIES, INC.

ORANGE COUNTY, NEW YORK

SEPTEMBER 1998

201476.10700

- A groundwater investigation involving the collection and analysis of samples from existing monitoring wells or new wells as necessary. The existing monitoring wells will be redeveloped and water level measurements and hydraulic conductivity tests will be performed.

- A soil investigation involving the collection and analysis of soil samples from the industrial waste lagoon and, if necessary, from surrounding areas, as well as samples from the abandoned railroad bed.

- A sediment investigation involving the collection and analysis of sediment in a tributary to the Neversink River.

- A topographic survey and preparation of a Site map.

2.0 FIELD SAMPLING PLAN (FSP)

The following sections augment the Work Plan in describing the RI activities to be completed. Specific procedures and requirements are described for these activities including sample types, required analyses and rationale. Where appropriate, references are made to Standard Operating Procedures (SOPs) which are presented as part of this document and, in some cases, the Work Plan. Field forms for routine activities such as daily field activities, monitoring well inspections, soil boring logs, water level measurements, well development, well sampling, and chain of custody are included in Attachment A. Field procedures for water level measurements, well development, in-situ hydraulic conductivity testing, and the sampling and decontamination activities described in detail herein are included in Attachment B. Certain information such as the proposed number of samples, and sample locations, and monitoring well locations are provided in the Work Plan.

2.1 Environmental Media Sampling

Table 1 presents a list of environmental samples, including quality assurance/quality control (QA/QC) samples that will be submitted to the laboratory for analysis. Table 2 shows the analytical methods to be used for analysis of the samples. The following sections present sample collection procedures, analytical methods and rationale.

2.1.1 Groundwater Sampling and Analysis

Description: One round of groundwater samples will be obtained from nine (9) selected wells to confirm the nature and extent of chemical constituents within the unconfined overburden system. The wells which will be sampled are MW-1, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12 and MW-13 (Figure 2). To assess the impact of the contribution of fluoride and metals contained in solids or sediment in groundwater samples, both filtered and total matrix (unfiltered) samples will be collected and analyzed.

Sample Analysis: Filtered and unfiltered groundwater samples from all wells will be analyzed for fluoride, barium and lead. At the request of the NYSDEC, samples will also be collected from three wells and analyzed for the full TCL/TAL. All analyses will follow the NYSDEC's Analytical Services Protocol (ASP) (1995), with complete deliverables in accordance with NYSDEC Category B deliverables.

Methodology: All wells will be purged prior to collecting samples. Samples will be collected using dedicated or disposable PVC bailers or directly from the polyethylene or high-density polyethylene discharge tubing used for purging. Filtered samples will be field filtered, using a 5 micron filter. All samples will be analyzed in the field for pH, specific conductance, temperature and turbidity. Sampling information will be recorded on the Well Sampling Record Form (Attachment A). Purging and sampling procedures are outlined in Attachment B.

Rationale: Monitoring wells selected to confirm previous results and determine current groundwater conditions within the overburden. Analytical results will also provide a means of

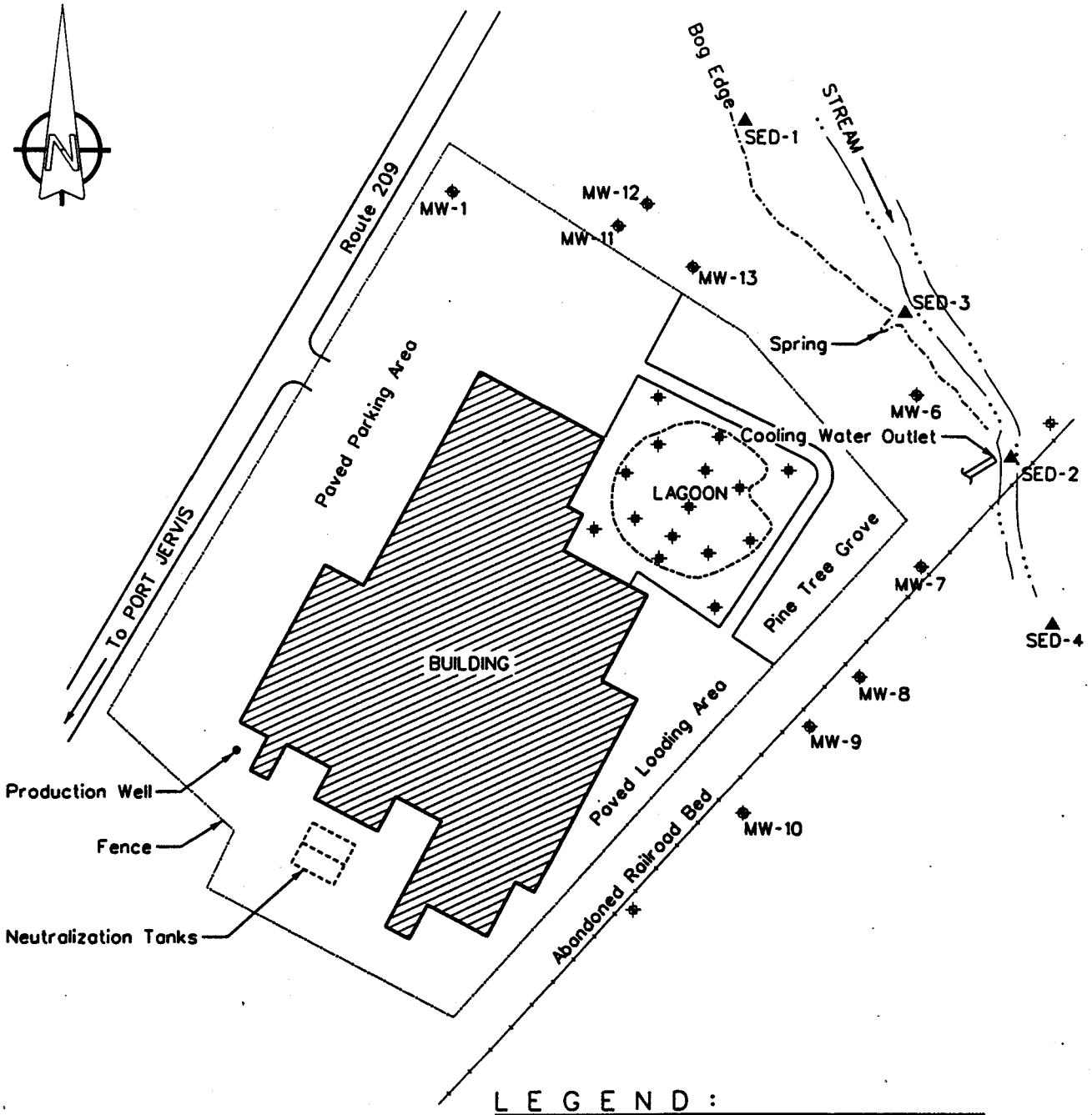
TABLE 1
Sample and Analysis Summary
C&D Facility
Remedial Investigation

Media	Area	Number of Samples	Analysis
Groundwater			
	Existing Wells	9	Fluoride, Barium, Lead (unfiltered)
		9	Fluoride, Barium, Lead (filtered)
		3	TCL/TAL
Field Duplicate		1	Fluoride, Barium, Lead
Matrix Spike (MS)		1	Fluoride, Barium, Lead
MS Duplicate		1	Fluoride, Barium, Lead
Trip Blank		1	TCL-VOA
Soil			
	Former Lagoon	up to 125	Fluoride, Barium, Lead
		2	TCL/TAL
	Railroad Bed	2	Fluoride, Barium, Lead
	Upgradient	2	TCL/TAL
Field Duplicate		6	Fluoride, Barium, Lead
Matrix Spike (MS)		6	Fluoride, Barium, Lead
MS Duplicate		6	Fluoride, Barium, Lead
Trip Blank		1 per day	TCL-VOA
Sediment			
	Creek Bottom	4	Fluoride, Barium, Lead
Field Duplicate		1	Fluoride, Barium, Lead
Matrix Spike (MS)		1	Fluoride, Barium, Lead
MS Duplicate		1	Fluoride, Barium, Lead

Table 2 Analytical Parameters and Methods

	Parameters	Analytical Method
A.	Fluoride	EPA Method 340.2*
B.	TCL/TAL	NYSDEC ASP/CLP

* Fluoride in soil will be analyzed as a distilled/deionized water leach of the soil, followed by analysis of the leachate for fluoride.



LEGEND:

- MW-10 — Existing Monitoring Wells
- Proposed Shallow Soil Samples - Railroad Bed
- Proposed Shallow Soil Samples - Lagoon
- SED-4 — Proposed Sediment Samples

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

FIGURE No. 2
PROPOSED SAMPLING LOCATIONS
C&D FACILITY
Huguenot, New York

PROJECT No. 32049.100	DATE 4/5/99	DWG. No. 38934fg2	SCALE N.T.S.	FIGURE No. 2

DRAWING No. 38934fg2.dgn

2.1.2 Soil Sampling and Analysis

Description: Subsurface soil samples will be obtained at several boring locations within the former lagoon, along the abandoned railroad bed, and upgradient of the Site. Each lagoon boring will be advanced to a depth of 10 feet below grade or to the watertable, whichever is deeper. Soil samples will be collected from each boring at depths of 0, 2, 4, 6, and 10 feet or at the watertable, whichever is deeper. Boring locations within the former lagoon will be established at 50 foot intervals for a total estimate of 15 locations and 75 samples. Depending on the results from the borings within the former lagoon, additional borings may be collected at 10 locations radially outward from the former lagoon for an additional estimated 50 samples.

The two samples collected from the abandoned railroad bed and the two upgradient samples will be collected within the top 6 to 12 inches (Figure 2).

Sample Analysis: All shallow soil samples from the former lagoon and abandoned railroad bed will be analyzed for fluoride, barium and lead. Two lagoon samples (per NYSDEC) and the two upgradient samples will also be analyzed for the full TCL/TAL. All analyses will follow the NYSDEC's Analytical Services Protocol (ASP) (1995), with Category B deliverables.

Methodology: All shallow soil samples will be collected by using a hand auger, direct-push or split-spoon methods and a stainless steel (or disposable plastic) scoop, spoon or spatula to retrieve the soil from the sampling device. Detailed shallow soil sampling and split-spoon sampling procedures are presented in Attachment B. Decontamination procedures for non-disposable sampling equipment are also outlined in Attachment B.

Rationale: Determine if the concentration of fluoride, barium and lead are a concern in areas sampled and identify the source of the fluoride and lead contamination in groundwater.

2.1.3 Sediment Sampling and Analysis

Description: One round of sediment samples will be collected from the tributary to the Neversink River and will consist of four grab samples. Samples will be collected at the following locations: one at previous location Sd-1 (SED-1); one at previous location Sd-2 (SED-2); one at the spring (SED-3) and a fourth sample approximately 100 feet downstream of Sd-2 (SED-4) (Figure 2).

Sample Analysis: Sediment samples from SED-1 through SED-4 will be analyzed for fluoride, lead and barium as defined in the NYSDEC's ASP with Category B deliverables.

Methodology: All sediment samples will be composite samples collected by one of the following methods:

Lexan tubing;
Hand auger;
Standard split-spoon sampler; or
Stainless steel sediment corer

Detailed sediment sampling procedures are presented in Attachment B.

Rationale: Sediment sampling will be performed to evaluate potential loadings or impacts to the tributary to the Neversink River from the Site and to confirm analytical results from previous sampling events.

2.2 Sample Handling

2.2.1 Sample Identification and Labeling

All samples collected during the RI will be assigned a unique sample identification code consisting of two to four parts. These parts will generally consist of the site code, location code and additional codes as needed. The following section indicates the code that will be used for each sample type.

a. Groundwater Samples (designated with the location prefixes of "MW")

Example:	C&D	MW-9
	Project	Location

b. Subsurface Soil Samples(designated with the type prefixes of "S")

Example:	C&D	B-1	S-1	0-2'
	Project	Location	Type	Depth

c. Sediment Samples (designated with the location prefixes of "SED")

Example:	C&D	SED-1	0-2'
	Project	Location	Depth

d. Quality Assurance/Quality Control Samples

Example:	C&D	DUP1	GW
	Project	Field Duplicate	Matrix

The actual sample identification will be marked in the field notebook and on the chain-of-custody form maintained by the sampling personnel.

All samples will be labeled in the field prior to the collection of the sample. Affixed to each sample container will be a non-removable label on which the following information will be recorded with a permanent water-proof marker:

- Project name, location and/or job number;
- Sample identification code;

- Date and time of sample collection;
- Name of sampling personnel;
- Preservatives, if any;
- Type of sample (i.e., soil, surface water, groundwater); and
- Analyses requested.

2.2.2 Bottles, Preservatives and Holding Times

The selection of containers used to collect aqueous samples for this project are based on the following criteria:

- Sample matrix;
- Analytical methods;
- Potential contaminants of concern;
- Reactivity of container and sample materials;
- QA/QC requirements; and
- NYSDEC's ASP and EPA's CLP requirements.

Table 3 presents the required sample container type and size and required container cap specified for each chemical analysis or group of analyses. Container caps will be leak-proof and constructed of, or lined with, a material which is inert to the sampled material. All sample containers and container caps will be supplied by the laboratory and pre-cleaned in accordance with the laboratory's Quality Assurance Plan (QAP).

All samples will be preserved on-site as soon as possible after collection prior to transport back to the laboratory. Required preservatives are listed on Table 3.

Holding times will be in accordance with the NYSDEC's ASP. These holding times are summarized in Table 4.

Table 3 Sample Bottle Requirements

Parameters	No. of Containers	Size	Type *	Cap**	Preservative (a)
Aqueous Samples (Groundwater)					
Fluoride, ASP/CLP	1	250 ml	1	1 or 2	None
TCL-VOC	3	40 ml	2	2	None
TCL-SVOC	2	1L	3	2	None
TCL-Pesticides/PCBs	2	1L	3	2	None
TAL Inorganics	1	1L	1	3	HNO3, pH<2
Cyanide	1	1L	1	3	NaOH, pH>12
Soil and Sediment Samples					
Fluoride, ASP/CLP	1	4 oz.	2	2	None
TCL-VOC	1	4 oz.	2	2	None
TCL-SVOC	1	100 g	2	2	None
TCL-Pesticides/PCBs	1	100 g	2	2	None
TAL Inorganics	1	100 g	1 or 2	1 or 2	None
Cyanide	1	100g	1 or 2	1 or 2	None

* Bottle Type: 1 = Polyethylene
2 = Glass
3 = Glass Amber

** Cap Liner: 1 = Polyethylene
2 = Teflon
3 = Plastic

(a) All samples will be cooled to 4 degrees C.

Table 4 Holding Times for Analytical Parameters

PARAMETER	HOLDING TIMES * (days)	
	Soil	**Water**
Fluoride, ASP/CLP	26	26
TCL-VOC	10	7
TCL-SVOC	5 extraction, 40 analysis	5 extraction, 40 analysis
TCL-Pesticides/PCBs	5 extraction, 40 analysis	5 extraction, 40 analysis
TAL Inorganics		
-Metals except Hg	180	180
-Hg	26	26
-CN	12	12

* All holding times are expressed in days after validated time of sample receipt (VTSR) unless otherwise noted.

2.2.3 Chain-of-Custody Protocol and Shipping Requirements

A chain-of-custody form (Attachment A) will trace the path of sample containers from collection and preservation to the laboratory. The Project Manager or field sampling personnel will notify the laboratory of upcoming field sampling activities and the subsequent shipment of samples. This notification will include information concerning the number and type of samples, as well as the anticipated date of shipment. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for storing and shipping samples. All sample bottles within each shipping container will be individually labeled with an adhesive identification tag provided by the laboratory. In the event the laboratory does not supply tags, other sample identification tags will be obtained and affixed. Shipping coolers will be numbered, or otherwise uniquely identified, and this identification will be entered onto the chain-of-custody form.

Each sample shipping cooler will be sealed with two adhesive tags assigned with unique identification numbers by the laboratory. The seal number will be recorded on the chain-of-custody form. Separate numbered seal tags will be provided for return shipment.

Field sampling personnel receiving the sample containers will check each cooler for the integrity of the seals. Coolers with both broken seals will be returned to the laboratory with the containers unused. Field sampling personnel will break the seals and inspect the contents for breakage and to ensure that proper sample containers and preservatives have been supplied.

Once the sample containers are filled, they will be immediately placed in the cooler with sealed bags of wet ice or ice packs to maintain the samples at 4 degrees Centigrade. The field sampling personnel will indicate the sample identification in the space provided on the appropriate chain-of-custody form for each sample of soil, surface water or groundwater. The chain-of-custody form will be completed by sampling personnel. The "Remarks" column of the chain-of-custody form will be used to record specific considerations such as the analyses to be performed. Prior to shipment, the chain-of-custody form(s) will be signed and placed in a sealed plastic Ziploc bag in the cooler. The shipping container(s) will be closed. Two adhesive paper seals will be affixed to the latch and lid of each shipping container. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label will be affixed identifying the cooler as containing "Environmental Samples", and the cooler will be shipped via overnight courier or hand delivered to the laboratory so that samples are received by the laboratory within 48 hours of sampling. The laboratory will check the custody seals and will sign the chain-of-custody form when it receives the sample coolers.

3.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

3.1 Analytical Methods

The analytical methods used will be those presented in the NYSDEC's ASP (1995), EPA's "SW-846 Test Methods for Evaluating Solid Waste" (November 1986), "Methods for Chemical Analysis of Water and Waste" (EPA 600/4-79-020) .

3.2 Data Quality Objectives

Data quality objectives (DQOs) are established in terms of precision, accuracy, representativeness and comparability (PARC) to ensure that the analytical and other data which are collected during the RI are of sufficient quality for remedial decisions. DQOs are also established in terms of completeness and instrument sensitivity. Data collected and analyzed relative to the DQOs described in this QAPP will be factored into assessing any uncertainty associated with remedial decisions.

3.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is generally much easier to control and quantify than sampling precision.

Overall system precision will be determined by collecting field duplicate samples. Analytical results from laboratory duplicate samples will provide data on analytical precision. Comparing the analytical precision to the overall precision will provide an assessment of the sampling precision.

Precision will be determined from duplicate samples; it will be expressed as the relative percent difference (RPD) between the original sample and a duplicate:

$$RPD = 100 \times 2(X_1 - X_2)/(X_1 + X_2)$$

where X_1 and X_2 are the larger and smaller reported concentrations for the original and duplicate samples, respectively. The equation is taken from the EPA's "Data Quality Objectives for Remedial Response Activities" (March 1987).

The laboratory objective for precision will be equal or exceed the precision demonstrated for the applied analytical methods on similar samples. The precision is evaluated by the analyses of laboratory duplicates. Laboratory spike duplicate and duplicate analyses will be performed once for every 20 samples as specified in the NYSDEC's ASP.

Criteria for the relative percent difference (RPD) prescribed by the NYSDEC's ASP and those determined from laboratory performance data are used to evaluate precision between duplicates. A

matrix spike duplicate will be performed once for every 20 samples as specified in the NYSDEC's ASP.

3.2.2 Accuracy

Accuracy measures the bias in the measurement system. It is difficult to measure for the entire data collection system, including sampling. Accuracy will be assessed through use of matrix spike (MS) and matrix spike duplicate (MSD) samples.

Accuracy can be evaluated in several ways. The average error is one way of presenting this information. However, more commonly, accuracy is presented as either percent bias or percent recovery. Percent bias is a standardized average error; for spikes, that is the average error divided by the spiked concentration expressed as a percentage. Percent bias is unitless which allows the accuracy of analytical procedures to be easily compared.

Percent recovery provides the same information as percent bias. Percent recovery (%R) will be defined as:

$$\%R = (R/S) \times 100$$

where S is the spike concentration and R is the reported concentration. Percent bias (%B) will be defined as:

$$\%B = \%R-100$$

These equations are taken from the EPA's "Data Quality Objectives for Remedial Response Activities" (March 1987).

Accuracy will be determined by matrix spike samples. The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical methods on similar samples. Criteria for percent recovery published by the NYSDEC as part of its ASP and those determined from laboratory performance data are used to evaluate accuracy in matrix spike and blank spike samples. A matrix spike and blank spike will be performed once for every 20 samples as specified in the NYSDEC's ASP.

3.2.3 Representativeness

The representativeness of the analytical data depends on sampling procedures. The sampling and sample handling procedures described in Section 2.0, and the attachments, have been designed with the goal of obtaining representative samples for each of the different matrices (i.e., sediment, groundwater and soil).

The representativeness of the analytical data is also a function of the procedures used in processing the samples. The objective of representativeness is to provide data of the same quality as other

analyses of similar samples, using the same methods during the same time period, within the laboratory.

3.2.4 Comparability

Analytical results from the laboratory can be comparable to results from other laboratories through the following: use of standard methodologies; use of standards traceable to the National Institute of Standards and Technology or the NYSDEC; use of consistent units in reporting results from similar matrices; application of appropriate levels of QC within the context of the laboratory Quality Assurance Program; and participation in inter-laboratory studies. By using standard methodologies and traceable standards, the analytical results from one laboratory can be compared to other laboratories operating similarly. The laboratory's Quality Assurance Program documents internal performance, while the inter-laboratory studies documents the relative performance of various laboratories. Periodic laboratory proficiency studies are instituted as a means of monitoring laboratory performance.

3.2.5 Completeness

Completeness refers to the amount of usable data generated relative to the total amount of data generated. The goal for completeness will be to generate the maximum amount of usable data possible. In the data evaluation, four general levels of data completeness will be considered. The first and highest degree of completeness will be the finding of all deliverables to be usable. The second level will be the presence of one or more flaws which are not sufficient to require the total rejection of the sample results. An example might be the failure of one or two non-primary m/z ratios to meet the ion abundance criteria during GC/MS calibration and tuning. The third level of completeness will be for presence of one or more flaws which bring the validity of a measurement into question (e.g., surrogate recoveries which are out of acceptable ranges). Data in the second and third levels of completeness are typically qualified as estimated (i.e., flagged by a "J" code) and are usable with the knowledge that such data lack the precision or accuracy of unqualified data. The fourth and lowest level of completeness is excessive failures to meet established acceptance criteria and subsequent rejection of data. Rejected data are unusable for any purpose.

3.2.6 Sensitivity

The instrument sensitivity is expressed as the detection and quantification limits. The detection and quantification limits that are desired for the TCL analyses are those equal to or less than specified by Exhibit C of the NYSDEC's ASP (1995). Detection limits for other analyses will be the published detection limits for each analytical method. It is understood that such limits may vary due to interference. Additionally, sample detection limits may vary due to required dilutions or cleanup procedures.

3.3 Field Quality Assurance Samples

3.3.1 Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling and analytical methods. Duplicate samples are defined as a second sample collected from the same location at the same time and in exactly the same manner as the first sample, but placed into a separate container with no prior mixing. Field duplicates will be collected at a frequency of one per every 20 samples for each matrix. Each duplicate sample will be analyzed for the same parameters as the original sample collected that day. Thus, both total and component (field vs. lab) variability can be determined. Acceptance limits for field duplicates will be RPDs of 50 and 100 percent (%) for aqueous and soil matrices, respectively.

3.3.2 Split Samples

Split samples are used for performance audits or inter-laboratory comparisons. No split samples are currently scheduled for the RI. However, the NYSDEC may request split samples in performing its oversight function. A split sample will be defined as at least two separate subsamples taken from a single original sample which has been thoroughly mixed or homogenized prior to obtaining the split samples.

3.3.3 Trip Blanks

The purpose of a trip blank is to place a mechanism of control on sample container preparation, blank water quality and sample handling. Trip blanks travel to the site with the empty sample containers and return from the site with the collected samples. Trip blanks will be utilized for samples undergoing analysis for VOCs and will be obtained at a frequency of one for each day that VOC samples are sent to the laboratory.

3.3.4 Equipment Blanks

Equipment blanks are used to monitor the potential for cross-contamination between samples, when non-dedicated sampling equipment is used for sample collection. Generally, all sampling at the site will be performed using dedicated equipment. However, if any non-dedicated sampling equipment is used, one equipment blank per day will be collected over and/or through a sample collection device which has been previously decontaminated and submitted for analysis.

3.4 Laboratory Quality Assurance Samples

3.4.1 Method Blanks

Laboratory method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instrument as the samples are prepared and analyzed in the laboratory. A method blank is defined as an aliquot of

laboratory water on which every step of the method is performed and analyzed along with the samples. Method blanks will be analyzed at a frequency of one for every 20 samples analyzed.

3.4.2 Duplicate Samples

Laboratory duplicates are used to assess the precision or reproducibility of the analytical method on a sample of a particular matrix. Laboratory duplicates are defined as second samples taken from a single aliquot of sample after the sample has been thoroughly mixed or homogenized. Laboratory duplicates will be analyzed at a frequency of one for every 20 aqueous samples collected.

3.4.3 Spiked Samples

Two types of spiked samples will be analyzed as part of the analytical program: matrix spike (MS) and matrix spike duplicate (MSD) samples. Matrix spikes are analyzed to evaluate instrument and method performance on samples of various matrices. Matrix spike duplicates are analyzed to determine the precision of the method and instrument. These samples are analyzed and the percent recovery is calculated and used to assess matrix interference effect. Site-specific MS and MSD samples will be analyzed at a frequency of one per 20 samples for analyses by NYSDEC's ASP/CLP.

3.5 Field Documentation

Data will be generated during the various field activities of the RI. Daily activity report forms which will be used to document these activities are illustrated in Appendix A. These forms, when completed, will become part of the permanent project file.

Field notebooks will be initiated at the start of Site work. One notebook will be dedicated to the supervising geologist overseeing intrusive activities. Another notebook shall be dedicated to sampling team(s) and will be maintained by sampling personnel. The field notebooks will include the following common information recorded on a daily basis: date; meteorological conditions; name(s) of field personnel; brief description of proposed activities; location(s) of activities; description of any problems and corrective actions; records of all field measurements (unless recorded on a field reporting form); and notice of any deviations from the Work Plan or associated documents and the reasons for such deviations. During drilling operations, the supervising geologist will record the following additional information: type of drill rig; quality and description of materials used; amount of time that work is performed (i.e., contractor hours), duration of downtime and the amount of the work is performed at an elevated level of respiratory protection; description of soil or rock materials; and monitoring well or piezometer construction details. During sampling activities, field personnel will record the following: sampling locations and associated test results (e.g., pH, specific conductivity, dissolved oxygen); information regarding sample collection (e.g., volumes of purged groundwater); and chain-of-custody information; and calibration of field equipment. All notebooks during field activities will become part of the permanent project file.

3.6 Equipment Calibration and Maintenance

3.6.1 Field Equipment and Associated Measurements

Field equipment which will be utilized during the collection of environmental samples, includes a turbidity meter, pH meter, conductivity meter, and portable photoionization detector (PID). Measurements will be made in the field for temperature, pH, turbidity, and specific conductivity of groundwater samples. Field determination of pH, turbidity and specific conductivity will be obtained in duplicate for every five groundwater samples collected.

Table 5 summarizes the calibration procedures for each instrument and any special maintenance procedures which will be used. Calibration and standardization for pH, turbidity and specific conductivity will be performed in accordance with EPA Methods 150.1, 180.1 and 120.1, respectively. The pH meter will be fully re-calibrated (i.e., two points) at least two times daily and it will be checked with a pH 7.0 buffer every ten samples, two hours, or every time it has been turned on after being off for more than two hours, whichever occurs first. If a routine QC sample (pH 10.0 buffer after initial calibration with pH 4.0 and 7.0 buffers) exceeds $\pm$0.5 pH units from the true value, the source of the error will be determined and the instrument re-calibrated. If a continuing calibration check with pH 7.0 buffer is off by $\pm$0.5 pH units, the instrument will be re-calibrated. Temperature will be measured with a thermometer or a factory-calibrated platinum electrode coupled to the pH meter.

The turbidity meter will be calibrated at least twice daily following the manufacturer's operating instructions over a linear, non-drifting range of interest. Routine QC samples for turbidity must be within $\pm$10% of the true values. The turbidity QC sample will be a commercially-prepared polymer standard (Advanced Polymer System, Inc.).

The specific conductivity meter will be checked against a standard buffer solution at the beginning and in the middle of the work day. Check samples (buffer solution) for specific conductivity must be within $\pm$10% of the true values. The check samples will consist of 0.01 or 0.1 molar solutions of potassium chloride.

The portable PID (e.g., HNU PI-101) used for health and safety monitoring and field screening of soil boring samples will be calibrated following the manufacturer's instructions at the beginning of the day, whenever the instrument is turned on after being off for more than two hours and at the field technician's discretion.

3.6.2 Laboratory Equipment

All laboratory equipment will be calibrated according to the requirements of the NYSDEC's ASP and maintained following professional judgement and the manufacturers' specifications.

Table 5 Calibration and Maintenance of Field Equipment

Instrument	Calibration	Maintenance
Turbidity Meter	Twice daily, the meter will be calibrated to a standard between 5 and 80 NTU. EPA Method 180.1.	Do not shake (bubbles give erroneous readings). Clean cells between samples with deionized water and soft paper towels. Recharge overnight after use.
Photoionization Detector	Daily, the meter will be calibrated to a standard non-toxic gas (i.e., isobutylene).	Clean ultraviolet lamp with soap and water if calibration is difficult. Keep meter dry. Recharge overnight after use.
pH Meter	Twice daily, the meter will be calibrated to pH buffers of 7.00 and 4.00 to adjust slope. Prior to each group of measurements, the meter will be standardized to a buffer of 7.00. EPA Method 150.0.	The electrodes should be kept moist with buffer solution when stored for prolonged periods. Change batteries when needed (after approximately 2 to 60 hours of use).
Conductivity Meter	Daily, the meter will be calibrated to a standard of 1140 umhos (or 11,400 umhos in the unlikely event samples have high specific conductivity values). EPA Method 120.1.	Keep conductivity probe in beaker of deionized water while not in use. Change batteries when needed (approximately every 100 hours).

3.7 Corrective Actions

Throughout all steps, instrument, method performance and data validity will be monitored. Laboratory instruments will be calibrated according to the requirements of the NYSDEC's ASP or EPA's CLP and calibration data will be documented.

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include one or more of the following:

- Re-calibration or standardization of instruments;
- Acquisition of new standards;
- Repair of equipment;
- Replacement of equipment; and
- Reanalysis of samples.

3.8 Data Reduction, Review and Reporting

3.8.1 Laboratory Data

All analytical services will be provided by a laboratory certified under New York State Department of Health (NYSDOH), Environmental Laboratory Accreditation Program (ELAP), Contract Laboratory Program (CLP). The proposed laboratory for the work is Severn Trent/Envirotest, of Newburgh, New York.

The laboratory will be required to meet all applicable documentation, data reduction, and reporting protocols as specified in the NYSDEC's ASP for Category B deliverables. A copy of the laboratory's QAP will be submitted once a lab has been selected. The laboratory's QAP will indicate its personnel qualifications, as well as the standard methods and practices for the obtainment and assessment of data. A copy of the Work Plan and SAP will be submitted to the laboratory to allow the laboratory to become familiar with the requirements of the project.

3.8.2 Data Review

In addition to the laboratory's in-house data review, data will also be reviewed by an independent third party, Rust's Quality Assurance Officer, following NYSDEC's guidelines for a Data Useability Summary Report (DUSR).

Sample clean-ups will be performed when necessary and lab reporting limits will be the most realistically achievable. The laboratory will submit complete NYSDEC ASP Category B deliverables.

The appropriate data and reporting forms outlined below will be reviewed, where appropriate. Once the entire data package has been reviewed, a DUSR will be prepared describing data reduction, review and reporting procedures. This report will indicate the quality of the data and identify any specific problem areas.

3.8.3 Field/Engineering Data

The reporting of field data and measurements will be kept in the project field book. Review of this data will be carried out by the Project Manager. The review will consist of checking the field notebook for consistency with the Work Plan and QAPP data collection procedures contained in the Work Plan and this SAP. The final reporting of the data will be reviewed by the project scientists and engineers who will also participate in data reduction and evaluation.

3.9 Quality Assurance Reports to Management

Periodic meetings will be held to discuss the project and will be attended by the Project Advisor, Project Manager and QA/QC Officer. These meetings will review QA/QC procedures, field work, laboratory performance and data documentation and review. Any potential problems discovered during these reviews will be noted and appropriately addressed.

The Project Manager will be responsible for ensuring that QA/QC records are stored in a proper and easily retrievable manner. All quality assurance reports to management at the laboratories will be maintained by the QA Officer at each laboratory. These QA Officers will be responsible for identifying the documents to be designated as quality assurance records.

ATTACHMENT A

Field Reporting Forms

Daily Field Report

Owner: _____ Report No.: _____

Page _____ of _____

Project: _____ Date: _____

Project No.: _____ Weather: A.M. _____ P.M. _____

Temp. (°F): High: _____ Low _____ Rain _____

Contractor(s): _____

Contractor Super(s): _____

Number and Function of Contractors' Personnel, Hours Worked (Identify Subcontractors Separately)

Contractor	No. of People

Major Constr. Equip. Description	Size/Capacity	No.	No. in Use

Visitors _____ Representing _____

_____ _____

Daily Notations: _____

Signature: _____

White Copy - Library File Yellow Copy - Owner Pink Copy - Employee's Field File

Monitoring Well Inspection Form
C&D Technologies, Inc.
C&D Site
Huguenot, New York

Date(s): _____

Well ID	Damaged/ Destroyed (Circle)		Obstruction (Circle)		Total Depth (Feet)	Measuring Point (Circle)		Remarks
MW-1	yes	no	yes	no	_____	inner	outer	_____
MW-6	yes	no	yes	no	_____	inner	outer	_____
MW-7	yes	no	yes	no	_____	inner	outer	_____
MW-8	yes	no	yes	no	_____	inner	outer	_____
MW-9	yes	no	yes	no	_____	inner	outer	_____
MW-10	yes	no	yes	no	_____	inner	outer	_____
MW-11	yes	no	yes	no	_____	inner	outer	_____
MW-12	yes	no	yes	no	_____	inner	outer	_____
MW-13	yes	no	yes	no	_____	inner	outer	_____

A:\MWINSPEC.FRM

Earth Tech, Inc. Albany, NY (518) 458-1313	**Test Boring Log**				**Boring No.**
PROJECT:					Sheet 1 of
CLIENT:					Job No.
DRILLING CONTRACTOR:					Meas. Pt. Elev.:
PURPOSE:					Ground Elev.:
DRILLING METHOD:		SAMPLE	CORE	CASING	Datum:
DRILL RIG TYPE:	TYPE				Date Started:
GROUNDWATER DEPTH:	DIAM.				Date Finished:
MEAS. PT.:	WEIGHT				Driller:
DATE OF MEAS.:	FALL				Inspector:

Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	Graphic Log	GEOLOGIC DESCRIPTION	REMARKS
5						
10						

Earth Tech, Inc. Albany, NY (518) 458-1313	**Test Boring Log**	Boring No.
PROJECT:		Sheet 2 of
CLIENT:		Job No.

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Graphic Log	Geologic Description	Remarks

Water Level Measurement Form
C&D Technologies, Inc.
C&D Site
Huguenot, New York

Date: _____

	Measuring Point Identification				Water Level		
Well ID	**STEEL**	**PVC**	**GROUND**	**MP**	**Depth**	**Elev.**	**Time**
MW-1	_____	_____	_____	1	_____	_____	_____
MW-6	_____	_____	_____	1	_____	_____	_____
MW-7	_____	_____	_____	1	_____	_____	_____
MW-8	_____	_____	_____	1	_____	_____	_____
MW-9	_____	_____	_____	1	_____	_____	_____
MW-10	_____	_____	_____	1	_____	_____	_____
MW-11	_____	_____	_____	1	_____	_____	_____
MW-12	_____	_____	_____	1	_____	_____	_____
MW-13	_____	_____	_____	1	_____	_____	_____

EARTH TECH

WELL DEVELOPMENT LOG

PROJECT INFORMATION

Project Name: _____

Project No.: _____

Date: _____

Personnel: _____

WELL INFORMATION

Well I.D.: _____

Screen diameter (inches): _____

Screen length (feet) _____

Riser diameter (inches) _____

Depth to Water (ft) : _____

Well Depth (initial): _____

Well Volume: (gals) _____

DEVELOPMENT INFORMATION

Time Start: _____ Time Finish: _____

Method: _____

Volume Removed (gals.): _____

Well Depth (final): _____

Sand/Silt Accumulation: _____

GW QUALITY PARAMETERS

Gallons	Time	DTW	Color	Odor	pH	Conductivity	Turbidity	Temp (C)	Observations

Notes:

EARTH TECH

WELL SAMPLING LOG

PROJECT INFORMATION

Project Name: _____
Project No.: _____
Date: _____
Personnel: _____

WELL INFORMATION

Well I.D.: _____
Well Condition: _____
Depth to Water (ft BMP): _____
Well Depth (initial) (ft BMP): _____
Well Volume: _____

SAMPLING INFORMATION

Time Start: _____ Time Finish: _____
Method: _____
Volume Purged (gals.): _____

FIELD PARAMETERS

Time	pH	Conductivity	Turbidity	Temp (C)	Odor	Color	Dissolved Oxygen	Observations

Notes:

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

Chain of Custody Record

Project Number	Project Name/Client	Custody Seal #	Rust E&I Cooler #
Sample Custodian: (Signature)			

Item No.	Sample Description (Field ID Number)	Date	Time	Grab	Comp.	PID Reading (ppm)	Label Number	Analysis Required	Matrix: Sample Type	Matrix: Sample Container
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Disposed of by: (Signature)	Items: / Date / Time
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Disposed of by: (Signature)	Items: / Date / Time

Send Lab Results To:

Remarks:

Federal Express Airbill No.:
Lab:

Check Delivery Method:

- ☐ Samples delivered in person
- ☐ Common carrier

Laboratory Receiving Notes:

Custody Seal Intact?

Temp. of Shipping Container:

Sample Condition:

Rev. 10/98

White Copy - Lab Yellow Copy - File Pink Copy - Client

1514/Earth.Sci

ATTACHMENT B

Field Procedures

WATER LEVEL MEASUREMENT PROCEDURES

Summary

Measurements of water levels in on-site monitoring wells will be performed using an electronic water level detector.

Procedures

1. Clean water level probe and lower portion of cable following standard decontamination procedures and test water level meter to ensure that the batteries are charged.

2. Lower probe slowly into the monitoring well until audible or visual alarm indicates that the water surface has been contacted.

3. Read the depth to water to the nearest 0.01 feet from the graduated cable using, wherever present, the innermost casing of the well as a reference.

4. Repeat the measurement for confirmation and record the depth to water on the field reporting form. Compare the measurement with the previous measurements to determine if current measurement is anomalously different. If it is, repeat measurement, and document this second confirmation.

5. Remove the probe from the well slowly, drying the cable and probe with a clean paper towel.

6. As applicable, replace the well cap and lock the cover of the protective casing in place.

WELL DEVELOPMENT PROCEDURES

Summary

Monitoring wells/piezometers are generally developed following installation to improve the hydraulic properties of the sand pack and to remove any sediment within the well and adjacent to the screen/sand pack. Well development should continue until the water is relatively sediment free.

Procedure

1. An appropriate well development method should be selected depending on water level depth, well productivity and sediment content of water. Well development options include:

   - Bailing;
   - Manual Pumping;
   - Inertial Pumping;
   - Powered Suction-Life Pumping; and
   - Air-Lift Development.

2. All equipment should be decontaminated, assembled, and installed in the monitoring well. Care should be taken not to introduce contaminants on the equipment during installation.

3. Well development should proceed by repeated removal of water from the well until the discharged water is relatively sediment free. Development effectiveness should be monitored at regular intervals (after each well volume is removed) using a portable turbidity meter. In addition, pH, temperature, and conductivity measurements should be obtained during development. All measurements versus volume removed should be recorded.

4. Well development may be discontinued either when the turbidity of the discharged water reaches a predetermined value (e.g., 50 NTU) or when the turbidity level stabilizes indicating that additional development will be ineffective.

5. Removed waters will be handled in a site specific manner and may include containerizing for later off-site disposal; containerizing for disposal elsewhere on-site; or disposing of water onto the ground near the well.

IN-SITU HYDRAULIC CONDUCTIVITY TEST PROCEDURES

Summary

Hydraulic conductivity (K) tests will be performed on each newly installed monitoring well and several existing monitoring wells to determine the in-situ hydraulic conductivity of the hydrostratigraphic unit screened. Both tests involve observing the recovery of water levels toward an equilibrium level after an initial perturbation. Procedures and equipment requirements are expected to vary depending on the rapidness of the water level response.

Procedure - For use with In-Situ, Inc. Hermit Model SE 1000C Data Logger and Pressure Transducer

- Record appropriate initial data in field notebook, including date of test, well identification, well construction details (i.e., screen length, screen diameter, riser diameter and screen depth), type of test and field personnel.

- Clean pressure transducer and cable, and the slug and line following standard decontamination procedures before initiating tests at each well.

- Measure and record the static water level in the monitoring well (only monitoring wells which have fully recovered to static level conditions should be tested). Depth to water should be recorded as a depth below the measuring point (bmp).

If using a Hermit data logger, connect the pressure transducer to the data logger and lower the transducer into the well four to ten feet below the water surface. If using a solid slug or a bailer to introduce the slug or bail, then the transducer should be set ten feet below the water table. If using a distilled water slug, the transducer should be set four to five feet below the water table. It is important that the pressure transducer not be subjected to pressures greater than the pressure transducer rating. Secure the position of the transducer by clamping the transducer cable to the well casing using a rubber covered clamp. If the edges of the well casing are sharp, cover them with cloth or duct tape to protect the transducer cable.

During the slug test, either a 5-foot aluminum rod or a known volume of deionized water will be quickly introduced into the well casing to cause the water level to rise in the well. During the bail tests, the same 5-foot aluminum rod or a dedicated precleaned PVC bailer will be rapidly removed from the well to lower the water.

- Set up the data logger. Check battery and enter coefficients for the transducer to be used (scale, offset, linearity, coefficient, delay, dsp and number of transducer).

- Enter test data (select test number, check clock, set reference level (stable water level).

- To initiate test, depress START key and press ENTER. To view data from the ongoing test, depress DATA key.

- Watch the data logger to determine if well recovery is reasonable. If so, allow the test to run until well recovery returns to baseline and then stop the test.

- If another test is to be performed, replace the bailer or solid object and let the well re-equilibrate or allow the well to re-equilibrate prior to introducing the next slug. Change settings as necessary and repeat the test.

Procedure - Manual Collection of Test Data

Hydraulic conductivity test data can be collected manually with the use of a water level measuring device. This method is less desirable than using a data logger because initial test data is usually missed and it is difficult to collect closely spaced measurements in a formation which recovers rapidly. However, manual data collection may be the preferred method for very slowly recovering formations, where hour measurement intervals are appropriate. The following methods shall be used when performing manual collection of K-test data:

- Establish a schedule according to which water level measurement will be measured. Measurement intervals should be close during the initial potion of the test and increase over time. Create a table in the field notebook to record times and water level measurements.

- Prepare water level meter or steel tape and chalk so that you will be ready to take a measurement immediately after the slug or bail is initiated.

- Perform the slug or bail as described above.

- Collect water level measurements according to the schedule in your field notebook. Continue taking measurements until the well has fully recovered or measurements do not appear to be changing significantly over time.

GROUNDWATER PURGING AND SAMPLING PROCEDURES

Summary

To collect representative groundwater samples, wells must be adequately purged prior to sampling. Purging will require the removal of the equivalent of two to three volumes in rapidly recharging wells and at least one well volume from wells with slow recharge rates. Sampling should commence as soon as adequate recharge has occurred following purging.

Prior to the collection of water level measurements, the well cover will be unlocked and carefully removed to avoid having any foreign material enter the well. For health and safety purposes, the interior of the riser pipe will be monitored with a photoionization detector for the presence of volatile organic compounds.

The following includes procedures summarizing 1) Purging of monitoring wells prior to sampling, and 3) Sampling.

Monitoring Well Purging Procedures

To collect representative groundwater samples, monitoring wells must be adequately purged prior to sampling. Purging will require the removal of two to three volumes of standing water in rapidly recharging monitoring wells and at least one volume from monitoring wells with slow recharge rates. Shallow monitoring wells in which the screen straddles the water table should require a minimum amount of purging since the groundwater would flow through the screen and not be entrapped in the casing. Deeper monitoring wells should be purged more thoroughly since they may be located in confined aquifers and water may rise up into the casing. A thorough purging would require the removal of several volumes of this trapped water to ensure that representative groundwater is brought into the casing for sampling. Sampling should commence as soon as adequate recharge has occurred.

1. Using an electronic water level detector, the water level from below the top of casing, the total depth and the diameter of the monitoring well, will be collected and used to determine the volume of water in the monitoring well. A well volume is defined as the volume of water standing inside the casing measured prior to purging. The cable and end of the probe will be soap-and-water washed and destilled water-rinsed between wells.

2. Purging of the well will be accomplished by one of four procedures. If the water level does not drop below approximately 20 feet, a suction-lift pump using dedicated, pre-cleaned 1/2 inch I.D. polyethylene tubing and a bottom check valve may be used. If the water level is below 20 feet or drops below suction-lift depth during purging, then a dedicated pre-cleaned bailer, submersible pump with dedicated high-density polyethylene tubing or WaTerra inertial pump with dedicated high-density polyethylene tubing will be used. The line for the bailer will be dedicated new 1/8 inch nylon line. All purging will be slow and gentle, with minimal disturbance to the filter pack, and will be performed from the top of the water column.

3. Approximately two to three well volumes will be purged from each monitoring well, measured in a five gallon bucket, starting with removal of the water from the top of the monitoring well. If the monitoring well purges to dryness and recharges rapidly (within 15 minutes), water will continue to be removed as it recharges until the required volumes are attained. If the monitoring well purges to dryness and is slow to recharge (greater than 30 minutes), purging will be terminated.

4. During the initial groundwater sampling task, the purging of existing wells which are to be sampled will be augmented to accomplish additional development. These wells will be purged for up to five well volumes. The turbidity will be monitored during purging and purging may be discontinued if the goal of 50 NTU is achieved before five well volumes are purged. A minimum of two to three well volumes will be purged regardless of the turbidity values. Measurements for pH, turbidity, temperatures and specific conductivity will be recorded during purging. The stability of these measurements with time may be utilized as a guide in the decision to discontinue purging.

5. Determination as to the appropriate handling of purge water will be made on a site-specific basis.

Sampling Procedures

1. After monitoring well purging is completed and the monitoring well has sufficiently recharged, samples will be collected into the appropriate sample bottles using a dedicated pre-cleaned bottom fill bailer to minimize sample disturbance. If a pre-cleaned, dedicated bailer constructed of the same material as the well casing was used for purging, then this same bailer may be used for sampling if there is no indication that the "stagnant" water purged from the well prior to sampling would have contributed anything to the characteristic of the actual samples (e.g., a slow forming sheen on the water column surface may not be present after purging but would have contaminated the purge bailer to the point where it could not be used for sampling). Purging will begin at the top of the water column and, as necessary, "chase" the water level downward.

2. Monitoring well sampling should be performed on the same day as purging, at anytime after the monitoring well has recovered sufficiently to sample, or within 24 hours after purging, if the monitoring well recharges slowly. If a well does not contain or yield sufficient volume for all required laboratory analytical testing (including quality control), then a decision will be made to prioritize analyses.

3. For monitoring wells with rapid recovery, groundwater sampling will be performed within three hours of purging. For slowly recharging monitoring wells, sampling should be performed within 24 hours after purging. If a monitoring well does not yield a sufficient volume of groundwater to fill all required containers, including those associated with quality control, then a decision will be made as to the prioritization of container collection.

SHALLOW SOIL SAMPLING PROCEDURES

Summary

Shallow soil samples may be collected by use of a hand auger, trowel, spade, spatula, spoon, etc. which is constructed of pre-cleaned stainless steel. Augers, or otherwise required for the Project, may be used to collect samples at a significant depth depending on soil conditions.

Procedure

1. Use a pre-cleaned stainless steel scoop or chisel to remove the grass, overlying soil, asphalt or concrete layer over the soil, as appropriate.

2. Advance the pre-cleaned stainless steel hand auger or alternate device into the soil until the sampler is full (approximately 6 inches for bucket auger).

3. Remove the sample from the bucket auger with a disposable plastic and/or pre-cleaned stainless steel spatula or lab spoon and place into a pre-cleaned stainless steel bowl or onto clean plastic sheeting.

4. Screen each sample with a photoionization detection (PID) meter and collect the VOA sample at a discrete interval.

5. Return the bucket auger to the hole to a depth of 12 inches as required and place the sample into the stainless steel bowl, or clean plastic sheet. Repeat the process until a depth of 24 inches, or as otherwise required, has been attained.

6. Grab Sampling: All VOC samples will be collected as discrete grab samples without mixing in the field.

   Compositing: See Method of Cone and Quarter.

7. Secure a Teflon lined cap onto the jar(s) and carefully/clearly label the sample container(s).

8. Place the sample container(s) on ice in a cooler for transport to the laboratory. Complete all chain-of-custody documents and record in the field log book.

9. Decontaminate sampling equipment after use and between sample locations.

10. All recovered sample material, excluding that reserved for laboratory analyses, will be handled as per other investigation-derived waste.

11. Decontaminate all non-dedicated sampling equipment after use and/or between sample locations.

Method of Cone and Quarter

Scope and Purpose

This procedure describes the requirements for compositing individual, non-aqueous grab samples to form one composite sample using the method of cone and quarter. Cone and quarter can also be used to ensure that a grab sample, not destined for VOC analysis, has been adequately homogenized.

NOTE: Samples destined for VOC analysis should be collected as discrete grab samples without compositing or mixing in the field.

Equipment

- Stainless steel mixing bowl/Plastic sheeting
- Stainless steel hand auger/trowel/spade/spoon/etc.
- Disposable plastic or pre-cleaned stainless steel spatula/lab spoon
- Buckets/Containers
- Gloves
- Sample Containers

Procedure

Equal volumes/quantities of individual grab samples which will comprise the composite are placed on a clean plastic sheet or stainless steel mixing bowl. The final amount of composite sample to be collected is dependent on the laboratory analyses to be performed.

The grab samples are thoroughly mixed together into a single pile (i.e., cone) using a shovel, hand trowel or gloved hand by continually mixing the material and shaping it into a cone. Material at the cone base is then repeatedly placed at the top of the cone while maintaining the cone shape. Large non-analyzable materials (stones, twigs, debris, etc.) which fall to the base of the cone by gravity are removed from the sample. The process is continued until the grab samples have been completely incorporated into one sample and non-analyzable materials removed.

Following "coning", the sample is divided into four approximately equal smaller piles. The "coning" mixing process is then briefly repeated in each of these four new piles. Equal aliquots from each of these new smaller piles are collected and mixed to form the preliminary composite sample. Coning is again repeated briefly and aliquots of this final composite are transferred to the respective sample containers.

Responsibilities

It shall be the field team leader's responsibility to ensure that all composite samples specified in the site work plan are adequately prepared by following the procedures presented in this SAP.

SPLIT-SPOON SOIL SAMPLING PROCEDURES

Summary

A standard method of subsurface soil sampling per ASTM Designation D-1586 "Standard Method for Penetration Test and Subsurface Soil Sampling" will be utilized to obtain representative samples for characterization, laboratory testing and as a measure of the resistance of soil to sampler penetration.

Procedure

1. Ensure that all down-hole drilling tools (i.e., subsurface soil, drilling rods, augers) have been properly decontaminated prior to advancement of borehole.

2. Measure the sampling equipment lengths and openings to ensure that they conform to specifications. Confirm the weight of the hammer (140 lbs.) by verbal confirmation or visual means.

3. Lower the sampler to the desired depth at the bottom of the auger column/drill casing and check the depth against length of the rods and the sampler.

4. Attach the drive head sub and hammer to the drill rods without the weight resting on the rods.

5. Lower the weight and allow the sampler to settle up to 6 inches. If it settles more, consider use of another sampler.

6. Mark three 6-inch intervals on the drill rods relative to a drive reference point on the rig. With the sampler resting on the bottom of the hole, drive the sampler with the 140 lb. hammer falling freely over its 30 inch fall until 18 inches have been penetrated or 100 blows applied.

7. Record the number of blows per 6 inches. Determine the "N" value by adding the blows for the last 12 inches.

8. Upon retrieval the subsurface soil should be opened, its contents logged, and then a sub-sample should be placed into a clean glass jar and its lid sealed with aluminum foil for subsequent screening with a photoionization detection (PID) meter. Document all properties and sample depths and locations on the boring log form.

   Grab Sampling: If the sample is to be chemically analyzed in the laboratory all samples destined for VOC analysis should be immediately transferred into the proper container using a disposable plastic and/or pre-cleaned stainless steel spatula or spoon.

Compositing: See Method of Cone and Quarter.

9. Secure a Teflon lined cap onto the jar(s) and carefully/clearly label the sample container(s).

10. Place the sample container(s) on ice in a cooler for transport to the laboratory. Complete all chain-of-custody documents and record in the field log book.

11. All recovered sample material, excluding that reserved for laboratory analyses, will be handled as per other investigation-derived waste.

9. Decontaminate sampling equipment after use and between sample locations.

Method of Cone and Quarter

Scope and Purpose

This procedure describes the requirements for compositing individual, non-aqueous grab samples to form one composite sample using the method of cone and quarter. Cone and quarter can also be used to ensure that a grab sample, not destined for VOC analysis, has been adequately homogenized.

NOTE: Samples destined for VOC analysis should be collected as discrete grab samples without compositing or mixing in the field.

Equipment

- Stainless steel mixing bowl/Plastic sheeting
- Disposable plastic or pre-cleaned stainless steel spatula/ spoon
- Buckets/Containers
- Gloves
- Sample Containers

Procedure

Equal volumes/quantities of individual grab samples which will comprise the composite are placed on a clean plastic sheet or stainless steel mixing bowl. The final amount of composite sample to be collected is dependent on the laboratory analyses to be performed.

The grab samples are thoroughly mixed together into a single pile (i.e., cone) using a shovel, hand trowel or gloved hand by continually mixing the material and shaping it into a cone. Material at the cone base is then repeatedly placed at the top of the cone while maintaining the cone shape. Large non-analyzable materials (stones, twigs, debris, etc.) which fall to the base of the cone by gravity are

removed from the sample. The process is continued until the grab samples have been completely incorporated into one sample and non-analyzable materials removed.

Following "coning", the sample is divided into four approximately equal smaller piles. The "coning" mixing process is then briefly repeated in each of these four new piles. Equal aliquots from each of these new smaller piles are collected and mixed to form the preliminary composite sample. Coning is again repeated briefly and aliquots of this final composite are transferred to the respective sample containers.

Responsibilities

It shall be the field team leader's responsibility to ensure that all composite samples specified in the site work plan are adequately prepared by following the procedures presented in this SAP.

SEDIMENT SAMPLING PROCEDURES

Summary

A simple way in which to collect a sediment sample is with a disposable plastic and/or stainless steel scoop, trowel, coring device or otherwise required for the Project. This method is most appropriate for shallow sediment samples to a depth of 0-6 inches. Disposable plastic and/or pre-cleaned stainless steel is preferred over the more common chrome-plated, which should be avoided if chromium is of concern. The procedure detailed below is for visibly stained soil, but applies to non-stained soil as well.

Procedure

1. Samples will be collected using disposable plastic or dedicated stainless steel trowels, spatulas, coring devices (i.e., auger or sediment tube) or otherwise required for the Project. Any non-dedicated equipment will be decontaminated between samples and/or sample locations.

2. Prior to sample collection, the area in question will be inspected to determine the extent of staining by inserting the blade of a shovel or pick axe to the maximum depth possible, and if conditions permit, removing and inspecting a vertical cross section.

3. If staining is limited to the top few inches, the sample will be defined by collecting the top few inches of stained material over a horizontal area large enough to provide a sufficient quantity of soil for subsequent laboratory analysis. The surface area and depth of the collected sample will be recorded.

4. Screen each sample with a photoionization detection (PID) meter and collect the VOA sample at a discrete interval.

5. If the stained area is six inches or more in depth, the top inch or two of material will be removed and a sufficient quantity of subsurface material, from a depth of 2 inches down, will be collected for analysis. The areal and depth dimensions of the collected sample will be recorded, as well as the depth of any visible, remaining stained soil. Repeat the process until the required depth has been attained.

6. Samples (by either above procedure) will be collected, in such a manner, to ensure that the sample (stained soil) is not diluted by the incorporation of unstained soil. In the event that this is not possible, the proportions of each soil type (i.e., stained vs. non-stained) will be recorded.

7. Approximately 24 ounces of material will be collected at each location.

   Grab Sampling: All VOC samples will be collected as discrete grab samples without compositing or mixing in the field.

Compositing: See Method of Cone and Quarter.

8. Secure a Teflon lined cap onto the container(s), and carefully/clearly label the sample container(s).

9. Place the sample container(s) on ice in a cooler for transport to the laboratory. Complete all chain-of-custody documents and record in the field log book.

10. All sample locations will be delineated with a wooden stake with the sample location identification clearly labeled on the stake.

11. All recovered sample material, excluding that reserved for laboratory analyses, will be handled as per other investigation-derived waste.

12. Decontaminate equipment after use and between sample locations.

Method of Cone and Quarter

Scope and Purpose

This procedure describes the requirements for compositing individual, non-aqueous grab samples to form one composite sample using the method of cone and quarter. Cone and quarter can also be used to ensure that a grab sample, not destined for VOC analysis, has been adequately homogenized.

NOTE: Samples destined for VOC analysis should be collected as discrete grab samples without compositing or mixing in the field.

Equipment

- Stainless steel mixing bowl/Plastic sheeting
- Stainless steel hand trowel(s)/shovel(s)
- Disposable plastic and/or pre-cleaned stainless steel scoop/trowel/coring device/etc.
- Buckets/Containers
- Gloves
- Sample Containers

Procedure

Equal volumes/quantities of individual grab samples which will comprise the composite are placed on a clean plastic sheet or stainless steel mixing bowl. The final amount of composite sample to be collected is dependent on the laboratory analyses to be performed.

The grab samples are thoroughly mixed together into a single pile (i.e., cone) using a shovel, hand trowel or gloved hand by continually mixing the material and shaping it into a cone. Material at the cone base is then repeatedly placed at the top of the cone while maintaining the cone shape. Large non-analyzable materials (stones, twigs, debris, etc.) which fall to the base of the cone by gravity are removed from the sample. The process is continued until the grab samples have been completely incorporated into one sample and non-analyzable materials removed.

Following "coning", the sample is divided into four approximately equal smaller piles. The "coning" mixing process is then briefly repeated in each of these four new piles. Equal aliquots from each of these new smaller piles are collected and mixed to form the preliminary composite sample. Coning is again repeated briefly and aliquots of this final composite are transferred to the respective sample containers.

Responsibilities

It shall be the field team leader's responsibility to ensure that all composite samples specified in the site work plan are adequately prepared by following the procedures presented in this SAP.

EQUIPMENT DECONTAMINATION PROCEDURES

Drilling Equipment Decontamination

Prior to drilling the first boring, the equipment to be used in drilling and well installation will be cleaned to remove possible contaminants. All equipment which is to come in contact with the soil, as well as water tanks, iron casings, drill tools, pumps and hoses will undergo the initial cleaning procedure. While working at the site, drilling equipment will be decontaminated between boring and monitoring well locations to prevent cross-contamination. The cleaning process will involve the use of a steam cleaner or high-pressure hot-water device. Potable water from the public water supply will be used for all decontamination procedures.

A decontamination pad will be built to collect the water used during steam cleaning of equipment. The location of the decontamination pad will be near the garage at the northeast corner of the plant. Decontamination of equipment used during overburden drilling (i.e., augers, split-spoons) will take place at the drilling location of the just completed soil boring and/or well. Equipment used during bedrock drilling (i.e., drill bits, rods) will be decontaminated at the decontamination pad. The decontamination fluids and any settled solids will be containerized and managed on a site-specific basis.

Heavy Equipment Decontamination

All equipment and material associated with sampling episodes are required to be cleaned prior to usage. Items such as drill rigs, well casing, auger flights, and backhoes all present potential sources of interference to environmental samples. Therefore, all heavy equipment utilized at the site will undergo the following decontamination procedures:

- Equipment will first be steam-cleaned with potable water; and
- Finally, the equipment will be rinsed thoroughly with potable water.

Cleaning of Field Sampling and Measurement Equipment

All equipment and tools used to collect samples for chemical analyses including spatulas, spoons, scoops, split-spoons or others, will be decontaminated using the following procedures:

- Non-phosphate detergent wash;
- Tap water rinse;
- Laboratory-grade methanol or isopropanol rinse;
- Distilled/Deionized water rinse; and
- If equipment is to be stored for future use, allow to air dry and then wrap in

aluminum foil (shiny-side out) or seal in plastic bags.

Cleaning of Pumps and Pumping Equipment

In general, all suction-lift pumps and pumping equipment which have come in contact with liquids used for well purging will use dedicated pre-cleaned tubing. If submersible pumps are used, then the following cleaning procedure will be used:

- Exterior wash of pump, wiring, and cables with non-phosphate detergent;
- Potable water rinse; and
- Pump a minimum of 25 gallons of potable water through the pump housing (a dedicated, pre-cleaned discharge hose will be used for each well).

A:\EQUIPDEC.PRO

APPENDIX B

Health & Safety Plan

TABLE OF CONTENTS

REMEDIAL INVESTIGATION

HEALTH AND SAFETY PLAN
C&D TECHNOLOGIES, INC.
C&D SITE
HUGUENOT, NEW YORK

Prepared by: _____ Date: _____
Robert L. Rafferty

Safety Representative
Earth Tech

Reviewed by: _____ Date: _____
John E. Gansfuss

Project Manager
Earth Tech

List of Figures

Figure

TABLE OF CONTENTS
(CONTINUED)

List of Tables

Table

Attachments

Attachment

1.0 GENERAL

This site-specific Health and Safety Plan (HASP) has been prepared by Earth Tech, Inc. (formerly Rust Environment & Infrastructure, Inc.) for C&D Technologies, Inc. (C&D) for use in performing a Remedial Site Evaluation of the inactive lagoon site (Site) on the southern portion of the C&D facility located on Route 209 in Huguenot, New York (Figure 1-1). It has been prepared in accordance with the regulatory requirements of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response."

The purpose of this HASP is to summarize the project organization and responsibilities; establish Standard Operating Procedures (SOPS) for preventing accidents, injuries, and illnesses; identify hazards; discuss the personal protective equipment that may be used at the Site; identify personnel health and safety training requirements; summarize the monitoring techniques to be used; establish emergency procedures; describe the medical surveillance program; identify that appropriate first aid equipment is available; provide for accident record keeping; and establish a schedule for safety inspections.

The HASP will be implemented by the Earth Tech Regional Health and Safety Specialist (RHSS), Safety Representative (SR) and the Site Safety Officer (SSO) during Site work. Compliance with this HASP is required of all personnel who enter this Site. Assistance in implementing this plan can be obtained from the Earth Tech Corporate Health and Safety Manager (CHSM).

Using the HASP Modification Form presented in Attachment BC, the content of this HASP may change or undergo revision based upon additional information made available to health and safety personnel, monitoring results, or changes in the technical scope of work. Any changes proposed must be approved by the RHSS or CHSM.

The Remedial Site Evaluation scope of work to be addressed by this HASP includes:

Groundwater Investigation

- Evaluation of existing wells;
- Water level measurement;
- Well development;
- Groundwater sampling;
- Hydraulic conductivity testing;

Soil Investigation

- Shallow and subsurface soil investigation(Industrial waste lagoon);
- Surface soil investigation (abandoned railroad bed);

Sediment Investigation

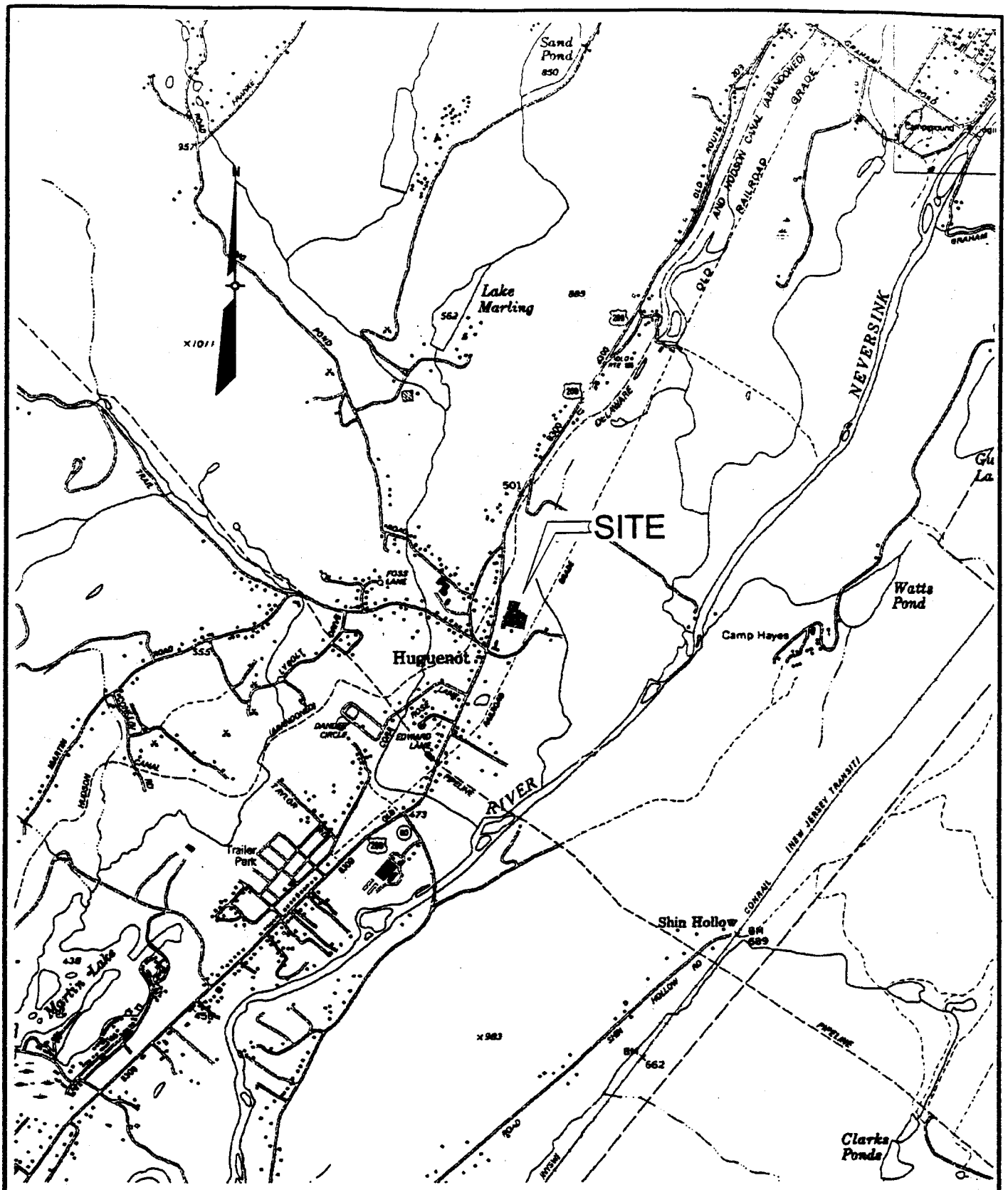
- Sediment sampling from a tributary to the Neversink River.

Topographic Survey

- Surveying for Site features to determine coordinates and elevation.

Project personnel responsible for site inspection activities include:

Name/Firm	**Title**	**Work Phone**	**Home Phone**
John Gansfuss Earth Tech	Project Manager	518-458-1313	518-382-7516
Robert L. Rafferty Earth Tech	Safety Representative	518-458-1313	518-399-3859
Sherman Woodson Earth Tech	Regional Health & Safety Specialist	803-234-2297	803-232-6873
Pam Markelz WSO-CSS, CET Earth Tech	Corporate Health and Safety Manager	414-458-8711	414-457-4570
Field Geologist Earth Tech	Site Safety Officer	(To be determined before field activities are initiated.)	



SOURCE:
NYSDOT 7.5 MIN. QUAD., PORT JERVIS NORTH AND OTISVILLE 1992 EDITION

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

FIGURE 1
SITE LOCATION MAP
C & D TECHNOLOGIES, INC.

ORANGE COUNTY, NEW YORK

SEPTEMBER 1998

201476.10700

2.0 ASSIGNMENT OF HASP RESPONSIBILITY

The following describes the health and safety designations and general responsibilities which will be assigned for Remedial Site Evaluation activities at the Site.

2.1 CORPORATE HEALTH AND SAFETY MANAGER (CHSM)

The CHSM is responsible for the development of company safety protocols and procedures necessary for field operations and is also responsible for the resolution of any outstanding safety issues which arise during the Site work.

2.2 REGIONAL HEALTH AND SAFETY SPECIALIST (RHSS)

The RHSS has overall responsibility for review and approval of this HASP. The RHSS or designee shall approve any changes to this plan due to modification of procedures or newly proposed Site activities.

Health and safety-related duties and responsibilities will be assigned only to qualified individuals by the RHSS. Before personnel may work on-Site, a current medical examination and acceptable health and safety training must be approved by the RHSS.

2.3 SAFETY REPRESENTATIVE (SR)

The Safety Representative for each Earth Tech office has responsibility for development and implementation of the HASP. The SR works in cooperation with the Project Manager and RHSS to assure that adequate health and safety precautions are taken for each of the defined tasks.

2.4 SITE SAFETY OFFICER (SSO)

The RHSS shall direct the site health and safety efforts through a Site Safety Officer (SSO) as needed. The SSO will be responsible for implementing the HASP. The SSO may direct or participate in on-Site activities as appropriate when this does not interfere with primary SSO responsibilities. The SSO has stop-work authorization which he/she will execute upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situations, such as detrimental weather conditions. Authorization to proceed with work will be issued by the RHSS in conjunction with the Project Manager.

2.5 SUBCONTRACTORS

Subcontracts will be issued for various tasks at the Site. Subcontractors shall comply with the requirements outlined in this HASP and in accordance with OSHA 29 CFR 1910 and 29 CFR 1926; but, in all cases, subcontractors shall be responsible for Site safety related to or affected by their own field operations (i.e. heavy equipment operations).

3.0 SITE HISTORY AND BACKGROUND

3.1 SITE HISTORY

3.1.1 The C&D Facility

The facility is approximately ten acres in size and is situated immediately east of Route 209 and approximately four miles northeast of the City of Port Jervis. The facility is located in the Neversink River Valley and is bordered on the west by Route 209 and on the north and east by a tributary to the Neversink River. The facility is currently operated by C&D. C&D has operated the facility since the mid 1970's.

3.1.2 The Site

Available information indicates that from 1959 to approximately 1970, the facility was used by ETC to process black and white picture tubes. Hydrofluoric acid was used in the process to remove carbon, potassium silicate, phosphorus and barium from the picture tubes. Historically, industrial process wastewater consisting of rinse waters, wash waters, and floor drainage was directed by ETC to a lagoon adjacent to the northeastern corner of the plant building. This lagoon was approximately 150 feet in diameter and between 15 to 16 feet deep. As reported in the Phase II Investigation Report, conducted on behalf of the NYSDEC by Gibbs & Hill (G&H), the process wastewater contained wash water, rinse water and floor drainage.

3.2 PREVIOUS INVESTIGATIONS

Dating back to 1981 and 1982, C&D has conducted investigations into the possible nature and extent of soil and groundwater contamination on the Site. The most recent investigative activity, conducted by NYSDEC personnel in July 1990, consisted of fluoride groundwater monitoring at the Site. Results indicated that the on-Site fluoride levels were ten times greater than background values and also exceeded New York State's groundwater standard.

Although the Phase II Investigation, prepared by G&H, reported that there was no evidence of contamination or the migration of contamination from the Site, the NYSDEC reclassified the Site to Class 2 based on excessive fluoride levels in groundwater.

Although fluoride has been detected in groundwater, due to significant attenuation rates, fluoride has not been detected in either the sediment or surface water samples taken from the tributary to the Neversink River located approximately 350 feet from the plant building.

Presented below is a chronological list of previous investigations performed at the Site. A brief summary of activities performed and recommendations provided, based upon review of results and conclusions, from each investigation is also included.

May, 1964: New York State Department of Health (NYSDOH) inspected ETC's waste disposal system. Surface water and groundwater samples were collected on a monthly basis. Samples

collected from the spring emanating from a bank of the lagoon contained, on average, approximately 100 mg/l of fluoride. Samples from the nearby production well and tributary of the Neversink River exhibited fluoride levels of 0.0 to 5.5 mg/l and 8.0 mg/l, respectively. However, no action was taken by ETC.

September, 1966: Complaint filed by NYSDOH regarding discharge of various wastes into the waters of the State of New York. Complaint centered around the discharge of industrial wastes containing approximately 2,500 ppm of fluorides and unidentified concentrations of barium and silicates. These discharges exceeded water quality standards since February 1, 1963.

December 1981/January 1982: In connection with C&D's interest in expanding the plant building over the former lagoon, C&D retained Environmental Resources Management, Inc. (ERM) to perform a hydrogeologic assessment of the former lagoon and surrounding area. The objective behind voluntary investigation was to gather data necessary to determine if the filling of the former lagoon would pose an adverse environmental effect on the Site and surrounding area.

Soil samples collected at the Site reported levels of lead, cadmium and zinc, possibly attributable to paint waste disposed by ETC, which exceeded the common range of inorganics in soil. Soil samples collected from the bottom of the former lagoon indicated fluoride concentrations ranging from 28 to 358 mg/kg. Groundwater samples collected demonstrated that water in the vicinity of the former lagoon were of "acceptable quality" except for fluoride concentrations (13 to 30 mg/l) which exceeded New York State's sanitary code for fluoride (2.2 mg/l).

These investigations identified the presence of fluoride in both the groundwater downgradient of the former lagoon and in soils at the bottom of the former lagoon. Lead was found in one well only. It is important to note that ERM concluded that fluoride and barium levels in subsurface soil and groundwater attenuated significantly with distance from the former lagoon.

The Site was classified as 2a in the New York State Registry of Inactive Hazardous Waste Sites on November 14, 1983.

July 21, 1988 to March 1990: A Phase II investigation was completed by G&H in January 1989 to collect the necessary information to determine if any imminent and/or significant environmental or human health hazard existed as a result of the presence of hazardous wastes. In addition to a historical records search, additional sampling and analysis of groundwater, surface water and sediment was conducted. The G&H Phase II investigation reported that there was no evidence of contamination or the migration of contamination from the Site. It did, however, acknowledge the presence of lead in one groundwater well at levels above the Federal Primary Drinking Water standards. As noted above, the G&H Phase II Investigation did not include analysis of fluoride in the groundwater and subsurface soil in the former lagoon.

July 16, 1990: NYSDEC conducted additional groundwater monitoring and found fluoride levels at more than ten times background levels and exceeding the New York Class GA groundwater standard for fluoride of 1.5 mg/l. Subsequently, the Site was reclassified to Class 2.

3.3 NATURE AND EXTENT OF CONTAMINATION

Based upon the results from the ERM investigations, Phase II Investigation and other Site inspections/investigations, no elevated concentrations of volatile organic compounds, semi-volatile organic compounds, pesticides or PCBs were reported in subsurface soil, sediment, surface water from a tributary to the Neversink River or groundwater.

Fluoride has been detected in elevated concentrations in soils and in groundwater beneath and downgradient of the former lagoon, based upon analytical results obtained to date. Lead has been detected in elevated concentrations in soil and in groundwater at one monitoring well location. The lateral migration of fluoride appears to be limited. Based upon the existing data, off-site migration does not appear to have occurred within the overburden soil or shallow overburden groundwater. However, NYSDEC has requested that fluoride and metals (lead and barium) concentrations in soil at the former lagoon and in on-Site groundwater, sediment and surface water be further characterized.

4.0 HAZARD ASSESSMENT

4.1 WASTE DESCRIPTION/CHARACTERIZATION

The following chemical information is presented in order to identify the types of materials that may be encountered at the Site. The detailed information on these materials was obtained from:

- ACGIH, Threshold Limit Values and Biological Exposure Indices for 1993-94.
- Material Safety Data Sheets, Genium Publishing.
- NIOSH Pocket Guide to Chemical Hazards - 1990.

The following is a list of chemicals and compounds that are potentially found on-Site. Chemical Data Sheets and/or Hazardlines for each compound listed below, providing information such as the chemical's characteristics, health hazards, protection, exposure limits, and first aid procedures, are presented in Attachment BA. These chemicals include:

- Lead
- Fluoride
- Barium

Waste Types:	Liquid	X	Solid	X	Gas		
	Sludge	X	Semi-Solid	X	Other	X	
Characteristics:	Corrosive	X	Flammable	X			
	Explosive	X	Volatile				
	Radioactive	X	Inert				
	Other	Toxic					

Exposure limits for the materials of concern are presented in Table 4-1.

4.2 DEGREE OF HAZARD

On-Site hazards include physical and chemical hazards. No radiological, biological, or laboratory wastes are suspected on-Site.

The contaminants of concern at the Site can affect the body if they are inhaled, come in contact with the eyes or skin, or are ingested. These materials may be released during soil intrusive or groundwater sampling activities. The primary concern is for skin exposure and inhalation exposure to contaminated soils, sediment and/or groundwater. Exposure to these substances by inhalation (in the breathing zone (BZ)) is not anticipated due to the levels found during past studies. Atmospheric monitoring, however, will be conducted during sampling.

Subsurface soil sampling and drilling, if necessary, activities may provide the potential for encountering buried hazards. It will be the owner's or drilling contractor's responsibility to "clear" utilities before soil intrusive activities begin. This includes location of overhead utilities. If encountered, soil sampling activities will be stopped, and the RHSS must be notified.

Physical hazards which may be encountered at the Site during field activities include overhead and tripping hazards associated with drill rig operations.

Noise related to soil boring operations is expected to be minimal; however, as a precaution, hearing protection will be available to be worn when working around the drill rig or as deemed necessary.

Depending on seasonal weather conditions, there is some potential for workers on-Site to be affected by heat stress if Site activities are scheduled for the summer months or cold exposure if activities are conducted during winter months. The SSO will monitor for heat stress or cold exposure in accordance with Section 12.7 of this HASP.

A summary of task-specific hazards and control measures is presented in Table 4-2.

4.2.1 Confined Space Entry

Confined space entry is not anticipated for these activities, therefore, not addressed in this HASP.

4.2.2 Spill Containment

Soil boring and groundwater sampling are unlikely to require spill containment and are, therefore, not addressed in this plan.

TABLE 4-1

EXPOSURE LIMITS
C&D TECHNOLOGIES, INC.
C&D FACILITY
JANUARY 1998

Compounds	PEL PPM	TLV PPM	STEL PPM	IP	Odor Thresholds
Fluoride	2.5 mg/m^3	2.5 mg/m^3	--	--	--
Barium	0.5 mg/m^3	0.5 mg/m^3	--	--	--
Lead	0.05 mg/m^3	0.15 mg/m^3	--	--	--

References:

Genium Publishing Company. Material Safety Data Sheets
American Conference of Governmental Hygienists (ACGIH). Guide to Occupational Exposure Values 1993.

Notes:

PEL - Permissible Exposure Limit.
TLV - Threshold Limit Value.
STEL - Short-Term Exposure Limit.
IP - Ionization Potential
PPM - Parts Per Million
-- - None Established/Not Available.

TABLE 4-2

TASK-SPECIFIC HAZARD ASSESSMENT TABLE
C&D TECHNOLOGIES, INC.
C&D FACILITY
JANUARY 1998

Task	Hazard	Control Measures
Evaluation of Existing Wells, Site Mapping and Topographic Survey	Dermal contact Inhalation contact Thermal stress	Use of PPE Respiratory protection Flagging, marking of hazards Work/rest cycles: Liquids
Water Level Measurements, Well Development, Groundwater Sampling, In-Situ Hydraulic Conductivity Testing	Dermal contact Inhalation contact Thermal stress Toxic atmospheres	Use of PPE Respiratory protection Work/rest cycles: Liquid
Shallow and Subsurface Soil and Sediment Sampling	Dermal contact Inhalation contact Thermal stress Toxic atmospheres	Use of PPE Respiratory protection Work/rest cycles: Liquids
Equipment Decontamination	Dermal contact Thermal stress Inhalation contact	Use of PPE Work/rest cycles: Liquids Respiratory protection

5.0 TRAINING REQUIREMENTS

5.1 BASIC TRAINING REQUIRED

Personnel who are required to work in areas where the potential for toxic exposure exists shall complete training or have Site experience conforming to the requirements of 29 CFR 1910.120(e). All personnel shall also be trained in the contents of Attachment BB, "Respiratory Protection Program."

The 40-hour course describes procedures for working at hazardous waste sites. These procedures include a health and safety program, medical surveillance, decontamination, Site control work documentation, emergency response, engineering and administrative control to reduce exposure, and Site safety evacuation procedures

5.2 SITE-SPECIFIC TRAINING

Site-specific training of employees to minimize on-site hazards will be provided to address the activities, procedures, monitoring and equipment for the field operations. This training will include identifying the names of personnel and alternate personnel responsible for Site safety, and facility layout.

In addition, to this training, at a minimum, the Earth Tech SSO will provide site-specific training that will include the following:

1. Site description and history.
2. Project activities, including coordination with other contractors.
3. Hazard evaluation.
4. On-Site safety responsibilities.
5. Site Control and work zones (WZ).
6. Personnel training.
7. Medical monitoring.
8. Atmospheric monitoring.
9. Personal protection, clothing, and equipment.
10. Decontamination procedures.
11. Emergency procedures.
12. Review of site-specific material safety data sheets (MSDS's).
13. Safe work practices.
14. Other elements covered in this site-specific HASP.

This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safe operations. Training must include emergency preparedness, location of assembly areas, proper entry and exit procedures for exclusion zone (EZ), warning systems, location of emergency equipment, and route to hospital. Site safety meetings shall be documented using the Site Safety Meeting Form presented in Attachment BC.

5.3 SAFETY BRIEFINGS

Project personnel will be given briefings by the SSO on a daily or as-needed basis to further assist Site personnel in conducting their activities safely. Briefings will be provided when new operations are to be conducted, changes in work practices must be implemented due to new information made available, or if Site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safety practices when performance deficiencies are identified during routine daily activities or as a result of safety audits.

5.4 SAFETY AUDITS

The CHSM, RHSS or SR, may conduct regular safety audits of field operations and subcontractor performance to review for compliance with health and safety policies and procedures. Daily operations will adhere to the protocols outlined in this HASP and will be enforced by the SSO.

5.5 FIRST AID AND CPR

At least one on-Site Earth Tech employee shall be trained and qualified to administer first aid and CPR. These courses will be consistent with requirements of the American Red Cross and/or American Heart Association.

6.0 MEDICAL SURVEILLANCE PROGRAM

All Earth Tech personnel and subcontractors performing field work at the Site will be required to have passed a pre-assignment and/or periodic medical examination that is consistent with 29 CFR 1910.120(f). A release for work will be confirmed by the RHSS before an employee can begin hazardous Site activities.

Additional medical testing may be required in consultation with the company physician if an overt exposure or accident occurs, or if other site conditions warrant further medical surveillance.

Subcontractors will maintain the medical records for their own employees but shall also provide written documentation certifying that each employee at the Site has met the requirements of the Medical Surveillance Program. This documentation will be provided before the first day of work for each employee assigned to the Site. The preassignment and annual examinations are essentially the same in content and will include:

- An updated medical and occupational history
- A screening physical examination
- Blood and urine laboratory tests
- Chest x-ray
- Electrocardiogram
- Pulmonary function tests
- Audiometry
- Visual acuity test

The physician has the authority to include other tests.

6.1 EMERGENCY MEDICAL TREATMENT

Provisions for emergency medical treatment shall be integrated with the overall Site Emergency Plan (see Section 12) and shall include:

- At least one Earth Tech employee will be qualified to render first aid and CPR.
- First aid kits in compliance with OSHA requirements and emergency first aid stations in the immediate work vicinity. Universal precautions shall be used for all first aid operations.
- Conspicuously posted phone numbers and procedures for contacting ambulance services, fire department, police, and medical facilities.
- Maps and directions to medical facilities.

7.0 SITE CONTROL MEASURES

The purposes of the Site control measures discussed in this section are to maintain order at the Site and to minimize chemical and physical hazards to on-site personnel, visitors, and the public. Site control zones (CZ) will include an exclusion zone (EZ), a contamination reduction zone (CRZ), and a support zone (SZ). In addition, temporary activity-specific work zones (WZs) will be established at specific locations.

7.1 EXCLUSION ZONE

The EZ is the area containing or suspected of containing contaminated materials. Since investigation activities will be conducted at several different areas, each area will be delineated as the EZ.

7.2 SUPPORT ZONE

The SZ is considered the uncontaminated area and will be identified by the SSO when field activities begin. It will contain the provisions for team communications and emergency response. A mobile telephone will be located in this area. Appropriate sanitary facilities, safety, medical, and support equipment will be identified.

7.3 SITE VISITORS

Visitors are required to report to the SSO prior to accessing the Site, although none are anticipated. The SSO will determine the purpose of individual visits, and will document decisions regarding their access to the Site. If granted limited access, visitors must sign in and out daily under the SSO's direction for the duration of their approved visit. Under no circumstances will visitors be allowed to interfere with or participate in operations within the scope of the field investigation.

As needed, the SSO will establish a designated Level D area as an observation point for visitors during intrusive activities. This designated area will be located to offer proximate viewing of Site operations, and positioned such that visitors in no way may inhibit Site access, logistics, or general operations. Further, the SSO will locate the viewing areas such that visitors present are at minimal risk of exposure to Site hazards.

Prior to gaining access to designated viewing areas described above, visitors must provide the SSO with documented compliance with Section 5 of the HASP, comply with other applicable sections, and satisfy additional conditions placed on them as deemed appropriate by the SSO to assure visitor safety. Site visitors will be escorted throughout the Site by the SSO.

8.0 PERSONAL PROTECTIVE EQUIPMENT

8.1 GENERAL

Personal protective equipment (PPE) for general operations will be consistent with the requirements of 29 CFR 1910 Subpart I, "Personal Protective Equipment." Basic levels of protection for hazardous waste operations will be selected in accordance with the provisions of 29 CFR 1910.120(g)(3), "Personal Protective Equipment Selection," and 1910.120 Appendix D, "General Description and Discussion of the Levels of Protection and Protective Gear." Modification to basic PPE ensembles may be necessary for specific operations. In these cases, further definition will be provided by review of specific hazards, conditions, and proposed operational requirements and by conducting monitoring at the particular operation. Protection may be upgraded or downgraded, as deemed appropriate by the SSO and verified by the RHSS.

8.2 ANTICIPATED LEVELS OF PROTECTION FOR SITE OPERATIONS

• Evaluation of existing wells	D
• Water level measurement	D
• Well development	D
• Hydraulic conductivity testing	D
• Subsurface soil, sediment and groundwater sampling	D
• Equipment Decontamination	D
• Site Mapping and Topographic Survey	D

Level D personal protective clothing and equipment includes:

- Tyvek disposable coveralls.
- Polycoated disposable Tyvek coveralls - required in sampling areas when splashing by contaminated soils or water is a possibility.
- Hard hat (when overhead hazards exist).
- Safety glasses or goggles - required.
- Steel toe, boots - required.
- Disposable latex gloves - required when handling and collecting soil and water samples.
- Disposable outer boots - required.
- Noise protection - as warranted.

Level C protective clothing and equipment includes:

- Air-purifying respirator (NIOSH/Mine Safety Health Administration (MSHA) approved) fitted with High Efficiency Particulate Air (filter) (HEPA) cartridges.
- Hard hat (when overhead hazards exist).
- Disposable Tyvek coveralls
- Disposable latex inner gloves.
- Steel toe, boots.
- Disposable outer boots.

Level B PPE, although not anticipated, includes the above Level C clothing with the addition of a self-contained breathing apparatus (SCBA) or supplied air-line respirator in place of an air-purifying respirator. If action levels are exceeded, and based on evaluation of the conditions, if Levels C or B respiratory protection is deemed necessary, work activities will be halted and the RHSS contacted immediately before upgrading the levels of protection.

The use and care of respiratory protection will be in accordance with the protocols described in Attachment BB.

Action levels used to determine the need to upgrade or downgrade the levels of protection are described in Section 8.2 of this HASP.

9.0 AIR MONITORING

9.1 GENERAL

Air quality in the BZ shall be monitored with instrument readings documented using the field data sheet presented in Attachment BC.

Field activities shall be initiated in Level D protection with the contingency to upgrade the level of protection based on the action levels. Monitoring shall be performed continuously. A Flame Ionization Detector (FID) or Photoionization Detector (PID) shall be used.

The action levels in this HASP will apply to all site work during the duration of activities at the site. Action levels for direct-reading instruments in the BZ are as follows:

Instrument	Action Levels	Level of Respiratory Protection/Action
PID (10.2 eV)/OVA	Continuous readings of background to 5 ppm	Level D
PID (10.2 eV)/OVA	Continuous readings of 5 ppm above background in BZ	Level C (based on identification of contaminant)
PID (10.2 eV)/OVA	Continuous readings of 5 to 250 ppm above background in BZ dependent upon specific substance encountered	Level B (if Level C is not appropriate for contaminant identified)
Colorimetric Detector tube	Measurements of 1 ppm or more for benzene	Level C (must be within max. use concentration of respirator)

9.2 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

It is not anticipated that personal exposure or migration of contaminants off-Site will be of concern due to the low concentrations of contaminants found on-Site; therefore, personal and perimeter monitoring is not anticipated.

10.0 DECONTAMINATION PROCEDURES

The SSO shall determine the level of decontamination necessary based on the evaluation of specific work activities and the potential degree of contamination encountered.

10.1 EQUIPMENT

Drill rigs, if necessary, and associated equipment and vehicles will be decontaminated at a decontamination area within the EZ. Drilling equipment (augers, rods, etc.), if necessary, will be steam cleaned between well locations. Decontamination rinse waters will be disposed of in accordance with Section 10.4.

Nondisposable sampling equipment will be decontaminated before use, between samples, and before leaving the sampling location.

Equipment that cannot be immersed in soap solution and water will be wiped clean and rinsed with distilled water.

10.2 PERSONNEL

Personnel will perform decontamination in the personal decontamination area upon entering the SZ and leaving the Site. Decontamination of personnel in Level D will consist of removal and disposal of coveralls (when worn), disposable boots, and gloves. Decontamination of personnel using Level C protective equipment will consist of:

- Removal and disposal of boot covers.
- Removal and disposal of coveralls.
- Removal and disposal of outer gloves.
- Removal, cleaning, and storage of respiratory equipment.
- Washing boots or other nondisposable protective equipment (i.e., hard hat, safety glasses/goggles, etc.) suspected of being contaminated using soap solution followed by potable or distilled water rinse.
- Removal and disposal of inner gloves.

10.3 CONTAMINATION PREVENTION

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

Personnel

- Know the limitations of all PPE being used.
- Do not walk through areas of obvious or known contamination.
- Do not handle or touch contaminated materials directly. Do not sit or lean on potentially contaminated surfaces.
- Make sure all PPE has no cuts or tears prior to donning.
- Fasten all closures on suits, covering with tape, if necessary.
- Take particular care to protect any skin injuries.
- Stay upwind of airborne contaminants.
- Do not carry cigarettes, gum, food, or candy into contaminated areas.
- Do not smoke, eat, or drink in contaminated areas.
- Shower at the hotel or home at the end of the work day.

Sampling/Monitoring

- Cover instruments with clear plastic, leaving openings for sampling ports, sensor points.
- Bag sample containers prior to placement of sample material into containers.

Heavy Equipment

- Limit the surface area of equipment that comes into contact with contamination.

General

- If contaminated tools are to be placed on noncontaminated equipment for transport to the decontamination pad, use plastic to keep the noncontaminated equipment clean.
- Place spoils from excavation work so as not to be in the expected paths of individuals.
- Keep drill cuttings shoveled out of the way of workers. Direct liquids generated during drilling out of the way to limit the amount of mud created around the rig.

10.4 DISPOSAL PROCEDURES

Discarded materials, waste materials, or other field equipment and supplies shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on site. Potentially contaminated materials, e.g.. clothing, gloves, etc., will be bagged or drummed with appropriate labeling affixed as regulated, and segregated for disposal by C&D. Noncontaminated materials shall be collected, bagged, and disposed of as normal domestic waste.

11.0 GENERAL SAFE WORK PRACTICES AND COMMUNICATIONS

11.1 SAFETY EQUIPMENT

Basic emergency and first aid equipment will be available at the SZ and/or the CRZ as appropriate. This shall include communications equipment, first aid kit, emergency eye wash, fire extinguishers, and other safety-related equipment.

11.2 COMMUNICATIONS

Telephones - A telephone will be available at the Site.

Hand Signals - Hand signals will be used in conjunction with the buddy system. These signals are very important when working with heavy equipment. They shall be known by the entire field team before operations commence and reviewed during site-specific training.

Signal	Meaning
Hand gripping throat	Out of air; can't breathe
Grip partner's wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; negative

11.3 SAFE WORK PRACTICES

The following safe work practices will be implemented during Site operations:

- Only properly trained and equipped personnel will be allowed to work in potentially contaminated areas.
- The number of personnel and equipment in the sampling areas will be kept to a minimum, consistent with safe site operations.
- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer, ingestion, and inhalation of potentially contaminated materials is prohibited.
- As necessary, personnel will thoroughly wash their hands and faces upon leaving the investigation areas.

- Contact with potentially contaminated materials and surfaces shall be avoided. Personnel shall comply with contamination control measures.

- Personnel with facial hair or other face piece seal obstructions will not be permitted to work where respirators are required.

- Work shall only be conducted if adequate illumination is provided, i.e., visual observation is not impaired due to loss of daylight conditions.

- Drillers shall inform personnel working with drill rig activities (i.e., soil boring operations) as to the location and operation of the emergency stop device.

- Sampling personnel shall not work near rotating augers.

12.0 EMERGENCY PREPAREDNESS

12.1 EMERGENCY COORDINATOR

The Site Emergency Coordinator shall be the SSO with responsibility to implement the emergency action plan as outlined (29 CFR 1910.38). Although the following six items are typically more applicable to operating facilities, they will be implemented to the extent possible when applicable. (These shall be determined prior to site work and presented during the site initiation meeting.]

- Emergency escape procedures and routes.
- Procedures for those remaining for critical operations.
- Procedures to account for employees after evacuation.
- Rescue and medical duties.
- Preferred means of reporting fires and emergencies.
- Names, job titles, or departments to contact for additional information of duties.

These items will be discussed during each site orientation meeting conducted on-Site by the SSO.

12.2 EMERGENCY SERVICES CONTACTS

The Emergency Coordinator shall verify appropriate emergency contacts and make contact with these before beginning work on-Site. The Emergency Coordinator will inform the emergency contacts about the nature and duration of work expected on the Site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. Also at this time, the Emergency Coordinator and the emergency response contacts shall make arrangements to handle any emergencies that might be anticipated.

EMERGENCY PHONE NUMBERS:

Police Department	(914) 856-6500
Fire Department	(914) 856-6500
Hospital - Mercy Community Hospital (emergency room) 160 East Main St., Port Jervis, N.Y. 12771	(914) 858-5640
National Response Center	(800) 424-8802
Poison Control Center	(800) 336-6997
CHSM - Pam Markelz, Sheboygan	(414) 458-8711
SSO - Senior Earth Tech Employee	(518) 458-1313
RHSS - Sherman Woodson, Greenville	(803) 234-3000
SR - Robert Rafferty, Albany	(518) 458-1313
PROJECT MANAGER - John Gansfuss, Albany	(518) 458-1313

HOSPITAL ROUTE:

A hospital route map and written description depicting the route to the hospital from the investigation area is presented on Figure 2.

Once the SZ is established, and before field activity start-up, the Site Emergency Coordinator shall drive the route to the hospital post directions and/or a map to the hospital and set up the first aid station, 10-pound Type A/B/C fire extinguisher, and other emergency equipment.

12.3 IMPLEMENTATION

The Site Emergency Coordinator shall implement the emergency action procedures whenever conditions at the Site warrant such action. The Site Emergency Coordinator will be responsible for coordinating the evacuation, emergency treatment, and emergency transport of site personnel as necessary, and for notification of emergency response units and the appropriate management staff. The following conditions may require implementation of emergency action procedures:

- Fire or explosion on-Site.
- Serious personal injury.
- Release of hazardous materials, including gases or vapors at levels greater than the maximum use concentrations of respirators.
- Unsafe working conditions, such as inclement weather.

The following alarm system(s) will be used to alert employees to evacuate the danger area:

( ) Air horn
( ) Radio/Telephone
(X) Direct Verbal Communications (10 Employees or less)
( ) Other

12.4 FIRE OR EXPLOSION

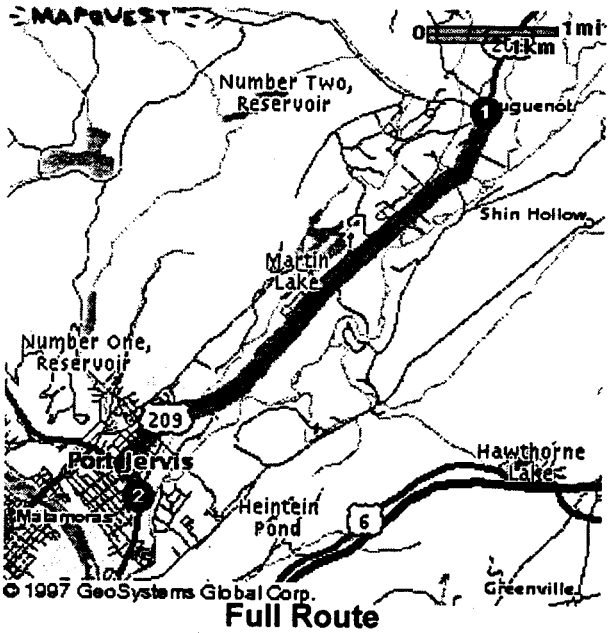
If an actual fire or explosion has taken place, emergency steps will include 1) evacuation of work area and venting, and 2) notification of the fire department and other appropriate emergency response groups if necessary.

12.5 PERSONAL INJURY

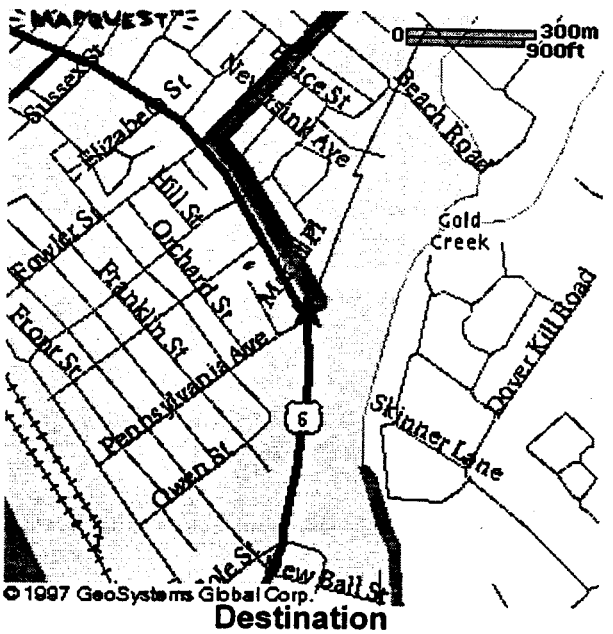
Emergency first aid will be administered on-Site as appropriate. Then, the individual will be decontaminated if possible, depending on the severity of the injury, and transported to the nearest medical facility if needed.

Starting From:	Arriving At:	Distance:	Approximate Travel Time:
Route 209 & Peenpack Trail Huguenot, NY 12771	160 East Main Street Port Jervis, NY 12771	4.4 miles	8 mins

Directions	miles
1. Start out going Southwest on US-209 towards NEVERSINK DR.	4.1
2. Turn LEFT onto US-6.	0.3



Full Route



Destination

1) Enter a starting address :

Route 209 & Peenpack Trail
Street Address, Intersection or Airport Code

Huguenot, NY 12771
City, State Zip or a ZIP

2) and a destination address:

160 East Main Street
Street Address, Intersection or Airport Code

Port Jervis, NY 12771
City, State Zip or a ZIP

EARTH TECH

KASJ

FIGURE 2
HOSPITAL ROUTE MAP
C&D TECHNOLOGIES, INC.
VILLAGE OF HUGUENOT
ORANGE COUNTY, NEW YORK

APRIL 1999

32049

12.6 OVERT CHEMICAL EXPOSURE

Typical response procedures include:

SKIN CONTACT: Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eye wash will be provided on-site at the CRZ and/or support zone as appropriate. Eyes should be rinsed for 15 minutes upon chemical contamination.

INHALATION: Move to fresh air and/or, if necessary, decontaminate/transport to hospital.

INGESTION: Decontaminate and transport to emergency medical facility.

PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility. The SSO will provide medical data sheets to medical personnel as requested.

12.7 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SSO will determine if work can continue without endangering the health and safety of field workers. Some items to be considered before determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions.
- Limited visibility.
- Potential for electrical storms.

12.7.1 Heat Stress

The SSO shall continuously visually monitor personnel to note for signs of heat stress. In addition, field personnel will be instructed to observe for symptoms of heat stress and methods on how to control it. One or more of the following control measures can be used to help control heat stress:

- Provision of adequate liquids to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

- Replacement fluids can be commercial mixes such as Gatorade.
- Establishment of a work regime that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.
- All breaks are to be taken in a cool rest area (77°F is best).
- Employees shall remove impermeable protective garments during rest periods.
- Employees shall not be assigned other tasks during rest periods.
- Employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

The heat stress of employees on-site may be monitored by the Wet Bulb Globe Temperature Index (WBGT) technique when workers are not wearing protective coveralls (i.e. Tyvek). This method will require the use of a heat stress monitoring device.

12.7.2 Cold Exposure

If the field activities occur during a period when temperatures average below freezing, the following guidelines will be followed.

Persons working outdoors in temperatures at or below freezing may be subject to frostbite. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling of the body core, resulting in coma and death. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, ears, are the most susceptible.

Two factors influence the development of a cold injury; ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration-soaked.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: Characterized by suddenly blanching or whitening of skin.

- Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

- Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Prevention of frostbite is vital. Keep the extremities warm. Wear insulated clothing as part of one's protective gear during extremely cold conditions. Check for symptoms of frostbite at every break. The onset is painless and gradual--you may never know you have been injured until it is too late.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water between 39°C and 41°C (102°F to 105°F). Give a warm drink-not coffee, tea, or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws. Then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

After thawing, the victim should try to move the injured areas a little, but no more than can be done alone (without help).

- Do not rub the frostbitten part (this may cause gangrene).

- Do not use ice, snow, gasoline, or anything cold on frostbite.

- Do not use heat lamps or hot water bottles to rewarm the part.

- Do not place the body part near a hot stove.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and, finally, 5) death.

Effects arising from cold exposure will be minimized by providing workers with insulated clothing when the equivalent chill temperature as defined in Table 5 and presented in the ACGIH booklet is less than 30°F. Furthermore, field activities will generally be curtailed or halted if the equivalent chill temperature is below -20°F. The ultimate responsibility for delaying work at a site due to inclement weather rests with the SSO.

12.8 POISON IVY

If someone should come in contact with poison ivy, the individual should immediately wash the affected area with the Ivy Cleaner provided in the first aid kit. If a rash develops, it should be treated at a medical facility as soon as possible.

12.9 SNAKES AND TICKS

12.9.1 Snake Bite Prevention and First Aid

On project sites, precautions against the possible presence of snakes should be taken when walking through overgrown vegetation and when moving debris (i.e. lumber, scrap metals, etc.). If someone is bitten by a snake, and the snake bite occurs in a location that is within a 1-hour drive of a medical facility, a conservative approach is safest. Keeping the victim quiet, lying or sitting and reassuring him/her is all that is required. He/she should be transported safely (no speeding) to the nearest medical facility. For the reassurance of both the victim and the first aider, a snakebite is not nearly as dangerous as popular mythology would suggest. In North America, death from snakebite to healthy adults is very rare. Many bites, even from known poisonous snakes, do not result in a significant amount of venom being injected. Even when significant envenomation occurs, symptoms develop slowly over many hours and can be controlled with appropriate treatment. Field treatments advised against include ice, cutting, and suction around the wound, and tourniquets. Studies indicate that ice leads to increased tissue destruction. It is best to transport the person immediately to a medical facility.

12.9.2 Tick Bite Prevention and First Aid

Routinely check for ticks after being outdoors. Remove ticks as soon as possible before they embed. To minimize exposure, wear light-colored clothing so ticks can be detected. Tuck pants into boots or socks and wear long sleeved shirts. Apply tick/insect repellent to clothing.

When a tick is found embedded, remove it by grasping it with a tweezers as close to the skin as possible and gently pull it straight out. Do not twist or jerk the tick because the head may remain embedded. Once the tick is removed, wash the bite area and your hands with soap and water and apply an antiseptic to the bite. Save the tick in a jar labeled with the date and the place where the tick was acquired. A physician may find this information and the tick specimen helpful in diagnosis if an infection results.

13.0 AUTHORIZATIONS AND FIELD TEAM REVIEW

13.1 AUTHORIZED PERSONNEL

Personnel authorized to enter the work area while field activities are being conducted must be authorized by the RHSS. Authorization will involve completion of appropriate training courses and medical examination requirements as required by OSHA 29 CFR 1910.120, current fit-testing, and review and signing of this HASP. All personnel must be escorted by appropriately trained personnel, and check in with the Field Team Leader.

PERSONNEL AUTHORIZED TO PERFORM WORK ON-SITE:

1. MARK WILLIAMS
2. RICHARD HISERT
3. IRA BICKOFF
4. RICHARD TOTINO
5. KEVIN McGRATH
6. KEITH MEISTER

OTHER PERSONNEL AUTHORIZED TO ENTER SITE:

1. ROBERT RAFFERTY
2. CHARLES BARTLETT
3. JOHN GANSFUSS
4. HELEN MONGILLO
5. BRETT MONGILLO
6. C&D PERSONNEL
7. NYSDEC PERSONNEL

13.2 FIELD TEAM REVIEW

Each field team member shall receive site-specific training by the SSO before being permitted to work on-Site.

14.0 RECORD KEEPING

The following records and reports will be established and kept as appropriate for the Site Remedial Evaluation:

- Accident/Incident Reports
- Daily Sign In/Sign Out Log
- Air Monitoring Records
- Sample Manifest/Transmittal (Chain of Custody Form)
- Employee Training Certificates
- Employee Exposure Record
- Site-Safety Orientation Log
- Health and Safety Audit Reports
- Instrumentation Calibration Logs
- Material Safety Data Sheets/Chem Data Sheets or Hazardlines
- Medical Data Sheets (to be sent with injured personnel to hospital)
- Medical Examination Reports (Physician's Written Opinion)
- Respirator Fit Test Records
- Respirator Inspection Records

A blank Medical Data Sheet is included in the Attachment BC. A Medical Data Sheet will be available for each person working at the Site.

ATTACHMENT BA

Material Safety Data Sheets

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 297
Barium and Compounds

Issued: 4/90

Section 1. Material Identification 31

Barium and Compounds Description: Produced by reducing barium oxide with aluminum or silicon in a vacuum at high temperature. The minerals barite ($BaSO_4$) and witherite ($BaCO_3$) are the primary sources of barium. Used as lubricant for anode rotors in X-ray tubes; a deoxidizer for copper; an extender in paints; a loader for paper, soap, rubber, and linoleum; a carrier for radium; a fire extinguisher for uranium or plutonium fires; a rodenticide; a stabilizer and mold lubricant in the rubber and plastics industries; a flux for magnesium alloys; getter alloys in vacuum tubes; and in spark-plug alloys and Frary's metal. Important barium compounds include carbonate (ceramics, rodenticide), sulfate (pigment and filler), hydroxide (water treatment, ceramics), nitrate (pyrotechnics), chloride (chemicals), chromate (pigments), oxide (lubricants), and peroxide (bleach).

Other Designations: CAS No. 7440-39-3; Ba.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[73] for a suppliers list.

R 2
I 3
S 2
K 4

Genium

HMIS
H 2
F 2
R 4
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Barium, ca 100%

OSHA PEL
8-hr TWA: 0.5 mg/m³ (Barium, soluble compounds, as Ba)

NIOSH REL, 1987
None established

Toxicity Data*
None listed

ACGIH TLV, 1989-90
TLV-TWA: 0.5 mg/m³ (Barium, soluble compounds, as Ba)

* Monitor *RTECS* (CQ8370000) for additional future data.

Section 3. Physical Data*

Boiling Point: 2984 °F/1640 °C
Melting Point: 1337 °F/725 °C
Vapor Pressure: 10 mm Hg at 1920 °F/1049 °C

Molecular Weight: 137.33 g/mol
Specific Gravity (H_2O = 1 at 39 °F/4 °C): 3.51 at 68 °F/20 °C
Water Solubility: Insoluble

Appearance and Odor: A silver white metal that is slightly lustrous and somewhat malleable.
Comment: Barium has a distinctive property of absorbing gases.

* Physical data are for barium only.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: *Do not* use water or foam. For small fires, use dry chemical, soda ash, lime, or sand. For large fires, withdraw from area and let fire burn.

Unusual Fire or Explosion Hazards: In the powder form, barium is flammable at room temperature. It is also explosive in the form of dust when exposed to heat, flame, or by chemical reaction. The chlorate, peroxide, and nitrate compounds are reactive and may present fire hazards in storage and use.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and fully encapsulating suit. Barium may ignite itself if exposed to air. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Barium is stable at room temperature under special storage and handling conditions (Sec. 9). If the free metal is exposed to air, an explosion hazard exists because hydrogen is liberated. Barium compounds are more stable than elemental barium. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Barium reacts violently with water, carbon tetrachloride, trichloroethylene, fluorotrichloromethane, and tetrachloroethylene. This material is incompatible with acids, trichloroethylene and water, trichlorotrifluoroethane, 1,1,2-trichloro trifluoro ethane, and flurotrichloroethane. Barium is extremely reactive and reacts readily with halogens and ammonia. Barium compounds are not as reactive as elemental barium. See MSDSs 40, 119, 132, 173, 181, and 251 for specific chemical incompatibilities.

Conditions to Avoid: Avoid heating barium in hydrogen to about 392 °F/200 °C since it reacts violently and forms barium hydride (BaH_2). An explosion hazard exists if the free metal is exposed to moist air or cold water because hydrogen is liberated.

Section 6. Health Hazard Data

Carcinogenicity: Although the NTP, IARC, and OSHA do not list barium as a carcinogen, the IARC lists barium chromate (VI) as a carcinogen.
Summary of Risks: Barium presents mainly an explosion hazard. However, soluble compounds of barium by the oral route are highly toxic and the fatal dose of the chloride has been stated to be 0.8 to 0.9 g. Death may occur from a few hours to a few days. The soluble barium compounds exert a profound effect on skeletal, arterial, intestinal, bronchial, and particularly cardiac muscle. Effects on the hematopoietic system (responsible for the formation of blood or blood cells in the living body) and the cerebral cortex are also noted. Poisoning may also occur if the dust of soluble compounds is inhaled. Certain compounds of barium are irritants of the skin, eyes, and mucous membranes. Barium oxide and barium hydroxide, strongly alkaline in aqueous solution, cause severe skin irritation and burns of the eye. Inhalation of insoluble barium produces a benign pneumoconiosis (baritosis). The half-life of barium in bone has been estimated at 50 days.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eyes, mucous membranes, lung, heart.
Primary Entry Routes: Inhalation of dust or fume, ingestion, skin or eye contact.
Acute Effects: Systemic absorption from ingestion causes gastroenteritis (inflammation of the stomach lining and the intestines), slow pulse rate (heart may stop while contracting), muscle spasm, and hypokalemia (potassium deficiency in the blood). Inhalation causes coughing, bronchial irritation, and pneumoconiosis. Contact with soluble salts causes dermatitis, irritation of the eyes and mucous membranes, and burns. During radiological examination, intraperitoneal (in the abdomen) or intrathoracic (in the chest) barium sulfate contamination resulting from a complication rupture may cause a significant inflammatory response.
Chronic Effects: Although baritosis (caused by inhaling barium sulfate) produces nodular opacities on chest X-rays, there is no evidence of clinical illness or bodily dysfunction.
FIRST AID
Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.
Skin: *Quickly* remove contaminated clothing. After rinsing affected skin with flooding amounts of water, wash it with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have a *conscious* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: Consider using calcium gluconate for muscular spasms. Consider gastic lavage followed by saline catharsis if soluble barium compounds are ingested. Institute cardiac monitoring for all significant ingestions of soluble barium salts.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel of spill. Immediately shut off all heat and ignition sources and evacuate hazard area. Cleanup personnel should protect against dust inhalation and contact with skin, eyes, and mucous membranes. For small dry spills, use a clean shovel to place material into a clean, dry container with a cover. For a large dry spill, cover with a plastic sheet to minimize spreading. For liquid spills, cover with sand or other noncombustible material and place in disposal containers. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations*
RCRA Hazardous Waste (40 CFR 261.33): Not listed
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations*
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1)
*Designations for barium only.

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.
Warning: Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres.
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below OSHA PEL and ACGIH TLV (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store under inert gas, petroleum, or oxygen-free liquid in a cool, dry, well-ventilated area away from all incompatibles (Sec. 5).
Engineering Controls: Barium metal itself presents mainly an explosion hazard. All engineering systems should be of maximum explosion-proof design and electrically grounded and bonded. Use nonsparking tools. Proper storage is essential. Avoid dust inhalation and skin, eye, and mucous membrane contact. All processes should be enclosed and/or exhaust ventilation installed to keep the dust concentrations below the recommended levels. Practice good personal hygiene and housekeeping procedures. Preemployment and periodic medical examinations should be given to workers exposed to barite dust. Prevent exposing individuals with respiratory disorders.

Transportation Data (49 CFR 172.102)
IMO Shipping Name: Barium alloys, pyrophoric
IMO Hazard Class: 4.2
IMO Label: Spontaneously combustible
IMDG Packaging Group: II
ID No.: UN1854

***MSDS Collection* References:** 7, 26, 38, 73, 85, 87, 89, 100, 103, 109, 123, 124, 126, 127, 133, 136, 138, 139
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 6A
Hydrofluoric Acid, Aqueous

Issued: 5/81 Revision: D, 6/92

Section 1. Material Identification

38

Hydrofluoric Acid Aqueous (HF) Description: A solution of hydrogen fluoride gas in water. Manufactured in varying aqueous concentrations from calcium fluoride and sulfuric acid. Grades include CP (chemically pure), technical, 38%, 47%, 53%, 70%. Used to manufacture semiconductor devices, etch glass, polish crystal glass, pickle stainless steel, clean metals, stone and brick; in removing rust or sand particles from metal castings, increase the porosity of ceramics and to determine silicon dioxide in analytical work.

Other Designations: CAS No. 7664-39-3, fluohydric acid, fluoric acid, hydrofluoric acid solution.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Handle hydrofluoric acid with *extreme* caution and take all preventive measures to avoid direct contact. HF liquid or vapor can cause severe burns that may result in permanent injury or systemic effects which may, in some cases, be fatal.

R	1
I	4
S	4
K	1

Genium

HMIS
H 4
F 0
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Hydrofluoric acid, aqueous ca 100%*

1991 OSHA PELs
(Hydrogen Fluoride, as F)
8-hr TWA: 3 ppm
15-min STEL: 6 ppm

1990 IDLH Level
30 ppm

1991-92 ACGIH TLV
(Hydrogen Fluoride, as F)
Ceiling: 3 ppm (2.6 mg/m^3)

1990 NIOSH RELs
(Hydrogen Fluoride, as F)
TWA: 3 ppm (2.5 mg/m^3)
STEL: 6 ppm (5 mg/m^3)

1990 DFG (Germany) MAKs
(Hydrogen Fluoride, as F)
TWA: 3 ppm (2 mg/m^3)
Peak Exposure (Short-term Level): 6 ppm, 5 min, momentary value, maximum of 8 peaks per shift

1985-86 Toxicity Data†
Human inhalation, LC_{Lo}: 50 ppm/30 min; toxic effects not yet reviewed
Rat, inhalation, LC_{50}: 1276 ppm/1 hr; toxic effects not yet reviewed
Rat, inhalation, TC_{Lo}: 470 µg/m^3/4 hr administered during 1-22 days of pregnancy produced effects on fertility (pre- and post-implantation mortality)

*An aqueous solution whose physical properties vary with HF concentration. Impurities include 0.015% hydrogen hexafluorosilicate, 0.003% sulfur dioxide, 0.005% sulfuric acid, and 0.02% water.
†See NIOSH, *RTECS* (MW7875000), for additional toxicity data.

Section 3. Physical Data

Boiling Point : 38.2% wt/wt HF: 234.0 °F (112.2 °C); 70% HF: 151 °F (66 °C) at 759.5 mm Hg
Freezing Point: 70% HF: -95.8 °F (-71.0 °C)
Vapor Pressure: 70% HF: 110 mm Hg at 20 °C
Refraction Index: 1.1574 at 25 °C

Saturated Vapor Density (air = 1.2 kg/m^3): 1.15 kg/m^3
pH: <2
Molecular Weight: 20.01
Specific Gravity: 70% HF: 1.258
Water Solubility: Soluble

Appearance and Odor: A clear, colorless, corrosive, fuming liquid at ordinary pressures below 66.2 °F (19 °C). It has a strong irritating odor detectable at a low 0.0333 mg/m^3 and is irritating at 4.17 mg/m^3.

Section 4. Fire and Explosion Data

Flash Point: Noncombustible	**Autoignition Temperature:** Noncombustible	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: Because hydrofluoric acid is noncombustible, use extinguishing media appropriate to the surrounding fire. Use water spray to absorb HF fumes and keep fire-exposed containers cool. **Unusual Fire or Explosion Hazards:** Flammable and explosive hydrogen gas evolves when HF reacts with certain metals. HF is difficult to contain because it corrodes most substances except wax, polyethylene, lead, and platinum. **Special Fire-fighting Procedures:** Keep upwind of fire. Because fire produces toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Wear chemically protective clothing which is specifically recommended by the shipper or producer. Unless stated by the clothing manufacturer, this chemically protective clothing does not provide thermal protection. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Hydrofluoric acid is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Reacts explosively with glycerol and nitric acid, sodium (with aqueous acid), cyanogen fluoride, methanesulfonic acid (evolves explosive oxygen difluoride). It reacts violently with acetic anhydride, ammonium hydroxide, 2-amino ethanol, arsenic trioxide, phosphorus pentoxide, chlorosulfonic acid, potassium permanganate, ethylene diamine, fluorine, ethylene imine, *n*-phenyl azo piperidine, calcium oxide, oleum, β-propiolactone, propylene oxide, vinyl acetate, sulfuric acid, sodium hydroxide, sodium, mercury oxide, sodium tetrafluorosilicate, potassium tetrafluorosilicate (2-) (evolves silicon tetrafluoride gas), nitric and lactic acid, mercury (II) oxide, organic materials (above 0 °C), and bismuthic acid (which evolves oxygen). HF reacts incandescently with oxides. HF attacks glass, concrete, certain metals, silica-containing materials, natural rubber, leather, and many organics. **Conditions to Avoid:** Contact with silica produces tetrafluorosilicate (SiF_4), a hazardous colorless gas. Reaction with cyanides or sulfide may release poisonous cyanide or hydrogen sulfide gas. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of HF can produce highly corrosive fluoride (F-) fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(142) and OSHA(164) do not list hydrofluoric acid as a carcinogen.
Summary of Risks: Although chemically a weak acid, HF is extremely toxic and corrosive to skin, eyes, and mucous membranes due to the fluoride component. Most frequent injuries are to the digits (fingers). The extent of injury depends on concentration, total amount of skin surface exposed, route and duration of exposure, and the presence of other chemical agents or physical factors. While initial contact with dilute solutions may not produce immediate pain, hours later, when HF penetrates to deeper tissues, the fluoride ion will bind with tissue calcium and cause severe tissue destruction (liquefactive necrosis) and excruciating pain, often out of proportion to the physical appearance of the skin. In some cases, bone may be eroded. With dilute solutions (up to 20%), the onset of pain and erythema (redness) may be delayed up to 24 hrs. 20-50% solutions may produce symptoms in 1-8 hrs; >50% solutions generally cause rapid or immediate pain. Unlike acids which act primarily on the skin's surface, HF causes deep penetrating burns which may take months to heal. Even minor exposure can cause a serious burn. Systemic absorption of fluoride can cause serious alterations of blood chemistry, cardiac rhythm and in some cases may result in death. Prompt and efficient first aid dramatically affects the outcome and is critical to prevent serious injury. **Medical Conditions Aggravated by Long-term Exposure:** Lung disease may be aggravated by inhalation of HF. **Target Organs:** Skin, eyes, respiratory (severe exposures may affect cardiac, hepatic, and renal function.
Primary Entry Routes: Inhalation, dermal, ocular.

Continue on the next page

Section 6. Health Hazard Data, continued

Acute Effects: Severe irritation, burns, and tissue damage to exposed eyes, skin, and mucous membranes. Skin appearance may range from blanched to red to necrotic (tissue destroyed). Inhalation may cause choking, cough and severe irritation with burns to the nose, throat, air passages and lungs. Severe respiratory distress and pulmonary edema may occur. Ingestion may cause severe abdominal pain, vomiting, and death. Systemic effects on the heart, liver and kidney may result from deficiencies of calcium (hypocalcemia) and magnesium (hypomagnesemia) or elevations of potassium (hyperkalemia) in blood. **Chronic Effects:** Chronic exposure to low vapor concentrations may cause nasal irritation or bronchitis. Repeated exposure to excessive fluoride concentrations over years may cause crippling osteofluorosis (fluoride deposition in the bone) which produces increased bone density. **FIRST AID** *Make topical fluoride-neutralizing agents readily available in the workplace. Consider designating an appropriately trained and equipped emergency response team. Personnel administering first aid should use extreme caution to avoid exposure to HF.* **Skin:** *Immediately* remove contaminated clothing, thoroughly lavage exposed area with water, and apply topical fluoride-neutralizing agents such as calcium gluconate (2.5% gel), or iced Zephiran (0.13%), or Hyamine (0.2%) solutions. Although calcium gluconate is not commercially available due to lack of FDA approval, it may be formulated by adding 3.5 g of USP calcium gluconate powder to a 5-oz (140-g) tube of water-soluble surgical lubricant. A recommended injection is 0.5 mL of solution per cm^2 exposed skin surface, with a maximum of 0.5 mL per digit. Calcium gluconate is preferred for head and neck burns because Zephiran (0.13%) and Hyamine (0.2%) are irritating to the face and mucosal surfaces. **Eyes:** Gently lift eyelids and flush immediately and continuously with flooding amounts of water, followed with a cold pack application. Once the patient is brought to medical attention, irrigate with at least 2 L of water or normal saline solution. **Inhalation:** Remove exposed person to fresh air and administer 100% humidified oxygen. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 or 2 glasses of milk as a diluent. *Do not induce vomiting!* **NOTE TO PHYSICIANS:** *Obtain specialist consultation if not familiar with HF medical management.* **For cutaneous burns**, if pain persists for 45 min despite topical first aid treatment and systemic analgesia, consider SQ infiltration with 5-10% calcium gluconate (NEVER calcium chloride) solution or intra-arterial infusion technique (consult medical toxicologist). Infiltration must not exceed 0.5 mL solution per cm^2 of loose skin surface, or 0.5 mL per digit. For subungual exposure, intra-arterial infusion is preferred over fingernail removal. Avoid local or regional anesthesia (pain is an important endpoint of therapy). Debride bullae. After neutralization treatment, follow closely and manage with standard burn treatment methods. **For ocular exposure**, irrigate copiously (>2 L) with water saline and consult an opthalmologist. **For inhalation**, provide 2.5% calcium gluconate nebulization and manage respiratory distress and pulmonary edema supportively. Intubate or perform tracheostomy as indicated. Consider a steroid burst (less than one week) to prevent inflammatory sequelae. **For ingestion**, manage supportively and consult with a gastroenterologist with consideration of NG suction, lavage with calcium gluconate solutions and endoscopy as clinically appropriate. **Systemic effects** resulting from ingestion, inhalation and severe cutaneous exposure should be treated aggressively. Early calcium replacement may be life-saving. Monitor and manage fluids/electrolytes (especially Ca, Mg, K) cardiac (especially QT int; rhythm), renal and hepatic function.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Design and practice a HF spill control and countermeasure plan (SCCP). Notify safety personnel, evacuate nonessential personnel, provide maximum ventilation, and remove all heat and ignition sources. Cleanup personnel should wear fully protective equipment for vapor inhalation and skin and eye contact. Allow aqueous hydrofluoric acid to vaporize and disperse as hydrogen fluoride gas. Cover and slowly neutralize spills with a sodium carbonate/slaked lime mixture and add large quantities of water. Never flush to sewers or waterways. Beware of heat generation, release of hydrogen fluoride, and spattering during the neutralization process. Commercial cleanup kits are also available. Thoroughly wash all porous surfaces (concrete, wood, plastic) with ammonia or lye solution, since they absorb HF and become a hazard for an indefinite time. Report any release equal to or greater than 100 lb to the National Response Center (NRC). Follow applicable OSHA regulations (29 CFR 1910.120). **Disposal:** Place neutralized slurry in appropriate disposal containers. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations Listed as a RCRA Hazardous Waste: (40 CFR 261.33): No. U134. Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 100 lb (45.4 kg) [* per RCRA, Sec. 3001 and Clean Water Act, Sec. 311 (b)(4)]. Listed as a SARA Extremely Hazardous Substance (40 CFR 355, hydrogen fluoride): Threshold Planning Quantity: 100 lb. Listed as a SARA Toxic Chemical (40 CFR 372.65, hydrogen fluoride)

OSHA Designations Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A, Z-2).

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses and/or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA and /or a protective suit may be required. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent all skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Thoroughly decontaminate or properly dispose of any contaminated clothing, personal protective or other equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a well-ventilated, cool, dry area separate from incompatible materials (Sec. 5). Do not store near nitric acid + lactic acid or nitric acid + propylene glycol since the gas these mixtures evolve may rupture a sealed container. Protect containers from physical damage. Store hydrofluoric acid in lead carboys and wax or polyethylene bottles. Do not put even dilute solutions in glass containers. Flammable hydrogen gas can be generated if HF is stored in metal containers. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. If feasible, totally enclose processes utilizing HF. Use nonsparking tools around tanks and pipes where hydrogen gas may collect. To prevent static sparks, electrically ground and bond all containers used in shipping, receiving, transferring, producing, and sampling operations. **Administrative Controls:** Educate workers about hazards of HF and train in work practices which minimize exposure, in appropriate first aid, and in evacuation procedures. For medical surveillance programs, consider baseline spirometry and biochemistry profile. Other examinations as clinically indicated.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Hydrofluoric acid solution
DOT Hazard Class: Corrosive material
ID No.: UN1790
DOT Label: Corrosive
DOT Packaging Exceptions: 173.244
DOT Packaging Requirements: 173.264

IMO Shipping Name: Hydrofluoric acid, solution
IMO Hazard Class: 8
ID No.: UN1790
IMO Label: Corrosive, Poison
IMDG Packaging Group: I/II
Other Requirements: Keep cool

MSDS Collection **References:** 1, 26, 73, 100, 103, 127, 132, 133, 136, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 170

Prepared by: MJ Wurth, BS; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** MJ Upfal, MD; **Edited by:** JR Stuart, MS

Genium Publishing Corp.
One Genium Plaza
Schenectady, NY 12304-4690
(518) 377-8854

Material Safety Data Sheet Collection

Hydrogen Fluoride **MSDS No. 6**

Date of Preparation: 5/81 Revision: B, 4/96

Section 1 - Chemical Product and Company Identification 48

Product/Chemical Name: Hydrogen Fluoride
Chemical Formula: HF
CAS Number: 7664-39-3
Other Designations: anhydrous hydrofluoric acid, hydrofluoric acid gas
Derivation: By distillation from the reaction product of fluorspar (calcium fluoride) and sulfuric acid or from fluosilicic acid.
General Use: As a catalyst in numerous reactions of chemical synthesis, especially in the petroleum industry (paraffin alkylation); as a fluorinating agent and additive in liquid rocket propellants; in the production of fluorine and aluminum fluoride; in making fluorine-containing plastics; in semiconductor manufacturing; in dye chemistry; to etch glass; and in refining uranium.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Hydrogen Fluoride, ca 100% vol

OSHA PELs
8-hr TWA: 3 ppm
1989 Vacated Final Rule Limit
STEL: 6 ppm

ACGIH TLV
Ceiling: 3 ppm (2.3 mg/m^3)

NIOSH REL
10-hr TWA: 3 ppm (2.5 mg/m^3)
STEL: 6 ppm (5 mg/m^3)

IDLH Level
30 ppm

DFG (Germany) MAK
TWA: 3 ppm (2 mg/m^3)
Category I: Local Irritants

Peak Exposure Limit:
4 ppm (2 mg/m^3), 5 min, momentary value, 8 per shift

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Hydrogen fluoride is an extremely corrosive, colorless gas with a strong, irritating odor. It is a severe respiratory, skin, and eye irritant which can cause chemical burns and may be fatal if inhaled. Considerable heat is released on contact with water.

Wilson Risk Scale
R 2
I 4
S 4
K 1

HMIS
H 4*
F 0
R 1

*Chronic Effects
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, skin and eye contact.
Target Organs: Respiratory tract, eyes, skin, bones, heart (as a result of hypocalcemia and hypomagnesemia).
Acute Effects
Inhalation: HF initially produces transient coughing and choking and, after an asymptomatic period of several hours or up to 1 to 2 days, fever, cough, difficulty breathing, cyanosis (blue discoloration of the skin and mucous membranes due to deficient oxygenation of the blood), and pulmonary edema (fluid in the lung) may develop. Massive exposures can result in persistent hoarseness, coughing, and nosebleeds. Significant systemic absorption by inhalation exposure may result in hypocalcemia (abnormal low levels of calcium in the blood) and hypomagnesemia (abnormal low level of magnesium in the blood) with subsequent cardiac arrhythmias. Systemic effects on the liver and kidneys may also develop from these deficiencies of calcium and magnesium or elevations of potassium (hyperkalemia) in the blood.
Eye: Severe irritation and burns.
Skin: Severe irritation and burns which may not be immediately painful or visible. HF will penetrate skin and attack tissue and bone.
Ingestion: Unlikely route of exposure as a gas.
Carcinogenicity: IARC, NTP, and OSHA do not list hydrogen fluoride as a carcinogen.
Medical Conditions Aggravated by Long-Term Exposure: Respiratory, cardiovascular, kidney, and bone disease.
Chronic Effects: Nasal congestion, bronchitis, and fluorosis characterized by bone pain and osteosclerosis (abnormal hardening of bone substance) of long bones.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air, monitor for respiratory distress, and administer 100% humidified supplemental oxygen with assisted ventilation as required. Transport to an emergency medical facility to observe for pulmonary edema which may be delayed for up to 24 to 48 hr.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water, followed with a cold pack application. Once the patient is brought to medical attention, irrigate with at least 2 L of water or normal saline solution. Consult an ophthalmologist immediately.

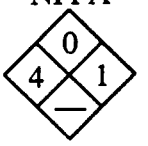
Skin Contact: *Immediately* remove contaminated clothing, thoroughly wash exposed area with water, and apply topical fluoride-neutralizing agents such as calcium gluconate (2.5% gel), iced Zephiran (0.13%), or Hyamine (0.2%) solutions. Consult a physician.

Ingestion: Unlikely route of exposure as a gas.

Note to Physicians: *Obtain specialist consultation if not familiar with HF medical management.* Obtain arterial blood gases, chest x-ray, and pulmonary function tests in symptomatic patients. Consider early administration of corticosteroids (methyl prednisolone 1 g intravenous as a single dose) to prevent the later development of pulmonary edema. Administration of nebulized calcium gluconate 2.5 % has also been recommended. Obtain serial plasma calcium, magnesium, and potassium levels hourly during therapy. Monitor EKG continuously for signs of hypocalcemia (prolonged QT interval). Correct hypocalcemia with IV calcium gluconate (10%) 0.1 to 0.2 mL/kg up to 10 mL/dose. Repeat dose if necessary. Correct hypomagnesemia with IV magnesium sulfate, 2 g in adults and 25 to 50 mg/kg in children diluted to < 10 mg/mL. Repeat dose if necessary.

Special Precautions/Procedures: Make topical fluoride-neutralizing agents readily available in the workplace. Consider designating an appropriately trained and equipped emergency response team. Personnel administering first aid should use extreme caution to avoid exposure to HF.

Section 5 - Fire-Fighting Measures



Flash Point: Nonflammable gas

Autoignition Temperature: None reported.

LEL: None reported.

UEL: None reported.

Extinguishing Media: Use extinguishing media appropriate to the surrounding fire since HF is nonflammable.

Unusual Fire or Explosion Hazards: HF in contact with metals produces flammable hydrogen gas. Cylinders may explode in the heat of fire.

Hazardous Combustion Products: Highly corrosive fumes of fluorides.

Fire-Fighting Instructions: Use water spray to absorb HF escaping from cylinders. Do not use solid streams of water. Cool fire-exposed containers with water spray. Keep water out of inside of containers because HF evolves heat when in contact with water. Do not release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is *not* effective. Use chemical protective clothing specifically recommended by the manufacturer. It may not provide thermal protection.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Immediately notify safety personnel, isolate hazard area (in all directions at least 500 ft), and evacuate all unnecessary personnel. If feasible and without undue risk, stop flow of gas. Otherwise, remove leaking cylinder to safe location, such as a fume hood, and allow to empty. Use nonsparking tools. Use water fog or spray to knock down and absorb vapors. Evacuate area and let remaining vapors disperse.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Take every precaution to prevent exposure to HF. Use only with adequate ventilation to reduce vapors to nonhazardous concentrations. Wear chemically protective clothing to adequately cover all exposed areas. Avoid water contamination of containers or piping systems because highly flammable, explosive hydrogen gas may be generated by the attack of HF on metals. Use nonsparking tools around tanks and pipes where hydrogen gas may collect.

Storage Requirements: Store in steel cylinders and tank barges in a cool, well-ventilated area away from other storage areas, heat, direct rays of the sun, and incompatibles (Sec. 10). Protect cylinders against physical damage. Periodically inspect storage containers for signs of corrosion. The recommended maximum storage period for HF cylinders is four months.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Enclose all processes to prevent the escape of HF into the workplace. To prevent static sparks, electrically ground and bond all containers and equipment. **Ventilation:** Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source. Fume hoods should have HF resistant glass to prevent etching. **Administrative Controls:** Consider preplacement and periodic medical exams with emphasis on the respiratory tract. Consider biological monitoring of urinary fluoride to determine total fluoride intake in an effort to prevent osteosclerosis. Human bone fluoride concentrations of 4000 to 5000 ppm have an approximate preshift urinary correlate of 5 ppm and represent the threshold for radiographic Grade 1(simple increase in bone density). Early signs of increased bone density may be detected by lumbar spine and pelvis x-ray. Educate workers about HF hazards and train in first aid, evacuation procedures, and safe work practices. **Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For concentrations ≤ 30 ppm, wear any chemical cartridge respirator with cartridge(s) providing protection against HF and eye protection; or any powered, air-purifying respirator with cartridge(s) and eye protection; or any air-purifying, full facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister; or any supplied-air respirator with eye protection; or any SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. Constantly check respirator equipment since HF attacks glass and most metal. **Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Teflon® and Responder® are recommended PPE materials. The following materials are *not* recommended: neoprene/styrene-butadiene rubber, polyurethane, nitrile + PVC, neoprene, natural rubber, polyvinylidene chloride/polyethylene, polyethylene, PVC, nitrile rubber, butyl rubber, and PVA. Wear a wide plastic face shield and protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder before reuse. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using HF, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Gas
Appearance and Odor: Colorless, strong irritating odor.
Odor Threshold: 0.04 ppm
Vapor Pressure: 760 mm Hg at 68 °F (20 °C)
Vapor Density (Air=1): 2.21 at 70 °F (21 °C); 1.97 at 75 °F (24 °C); 1.76 at 80 °F (27 °C)
Formula Weight: 20.01
Density: 0.901 g/L
Bulk Density: 8.2 lb/gal
Specific Volume: 17 ft^3/lb at 70.0 °F (21.1 °C) at 1 atm
Water Solubility: Soluble (releases heat)
Other Solubilities: Very soluble in alcohol; soluble in many organic solvents including (wt% at 41 °F/5 °C): benzene 2.54, toluene 1.80, tetralin 0.27, *m*-xylene 1.28; and slightly soluble in ether.
Boiling Point: 67.1 °F (19.5 °C)
Freezing Point: -117 °F (-83 °C)
Ionization Potential: 15.98 eV
Critical Temperature: 447 °F (230.6 °C)
Critical Pressure: 1100 psia (74.8 atm)

Section 10 - Stability and Reactivity

Stability: Hydrogen fluoride is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization cannot occur.
Chemical Incompatibilities: Most metals (produces hydrogen), metals containing silica (cast iron), strong bases, water or steam, glass, concrete, rubber, leather, ceramic, and many organic materials. Contact with carbonates, sulfides, and cyanides yields the following toxic gases: carbon dioxide, hydrogen sulfide, and hydrogen cyanide, respectively.
Hydrogen fluoride (48.7%) in a closed container causes an increase in temperature and pressure with: acetic anhydride, 2-aminoethanol, ammonia (28%), chlorosulfonic acid, ethyleneimine, oleum, propiolactone (beta-), propylene oxide, sodium hydroxide, sulfuric acid (96%), vinyl acetate. An incandescent reaction occurs with oxides such as arsenic trioxide and calcium oxide. **Conditions to Avoid:** Avoid contact with incompatibles.
Hazardous Decomposition Products: Thermal oxidative decomposition of hydrogen fluoride can produce highly corrosive fumes of fluorides.

Section 11- Toxicological Information

Toxicity Data:*

Acute Inhalation Effects:
Human, inhalation, $LC_{\_}$: 50 ppm /30 min
Human, inhalation, TC_{Lo}: 100 mg/m^3/1 min caused conjunctive irritation and cough.

Acute Effects:
Human, eye: 50 mg caused severe irritation.
Rat, oral, LC_{50}: 1276 ppm/1 hr caused lacrimation, motor activity change, change in structure or function of salivary glands.

Reproductive Effects:
Rat, inhalation: 4980 µg/m^3/4 hr administered to a female from 1-22 day of pregnancy caused fetal death.

Multiple Dose Toxicity:
Rat, inhalation: 252 µg/m^3/6 hr/17 weeks/intermittently produced changes in erythrocyte (RBC) cell count and biochemical changes in monoamine oxidase and dehydrogenases.

* See NIOSH, *RTECS* (MW7875000), for additional toxicity data.

Section 12 - Ecological Information

Aquatic Toxicity: Fish, freshwater: 60 ppm, lethal. Lobster, saltwater: 0.9 - 0.4 ppm, not toxic.

Section 13 - Disposal Considerations

Disposal: Contact supplier or licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Hydrogen fluoride, anhydrous
Shipping Symbols: -
Hazard Class: 8
ID No.: UN1052
Packing Group: I
Label: Corrosive, Poison
Special Provisions (172.102): 3, B7, B12, B46, B71, B77, T24, T27

Packaging Authorizations
a) **Exceptions:** None
b) **Non-bulk Packaging:** 173.163
c) **Bulk Packaging:** 173.243

Quantity Limitations
a) **Passenger, Aircraft, or Railcar:** Forbidden
b) **Cargo Aircraft Only:** Forbidden

Vessel Stowage Requirements
a) **Vessel Stowage:** D
b) **Other:** 40, 95

Section 15 - Regulatory Information

EPA Regulations:
Listed as a Toxic Substance Subject to Accidental Release Prevention (40 CFR 68.130), TQ: 1000
Listed as a RCRA Hazardous Waste (40 CFR 261.33)
RCRA Hazardous Waste Number: U134 (C, T)
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001; CWA, Sec. 311 (b)(4);CAA, Sec. 112
CERCLA Final Reportable Quantity (RQ), 100 lb (45.4 kg)
Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Threshold Planning Quantity (TPQ): 100 lb

OSHA Regulations:
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)
OSHA Process Safety TQ: 1000 lb

Section 16 - Other Information

References: 1, 73, 103, 124, 136, 167, 176, 190, 197, 200, 210
Prepared By MJ Wurth, BS **Industrial Hygiene Review** PA Roy, MPH, CIH **Medical Review** J Brent, MD, PhD
Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 713
Lead (Inorganic)

Issued: 8/90

Section 1. Material Identification

32

Lead (Inorganic) (Pb) Description: Exists widely throughout the world in a number of ores. Its main commercial source is galena (lead sulphide). Lead mineral is separated from crude ores by blast-furnace smelting, drossing, or electrolytic refining. Lead is used mostly in manufacturing storage batteries. Other uses are in manufacturing tetraethyllead and both organic and inorganic lead compounds in ceramics, plastics, and electronic devices; in producing ammunition, solder, cable covering, sheet lead, and other metal products (brass, pipes, caulking); in metallurgy; in weights and as ballast; as a chemical intermediate for lead alkyls and pigments; as a constuction material for the tank linings, piping, and equipment used to handle the corrosive gases and liquids used in sulfuric acid manufacturing, petroleum refining, halogenation, sulfonation, extraction, and condensation; and for x-ray and atomic radiation protection.
Other Designations: CAS No. 7439-92-1, lead oxide; lead salts, inorganic; metallic lead; plumbum.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(73) for a suppliers list.

R	0
I	4
S	-
K	0

Genium

HMIS
H 3
F 1
R 0
PPG*

* Sec. 8

Cautions: *Inorganic lead is a potent systemic poison.* Organic lead (for example, tetraethyl lead) has severe, but different, health effects. Occupational lead poisoning is due to inhalation of dust and fumes. Major affected organ systems are the nervous, blood, and reproductive systems, and kidneys. Health impairment or disease may result from a severe acute short- or long-term exposure.

Section 2. Ingredients and Occupational Exposure Limits

Lead (inorganic) fumes and dusts, as Pb, ca 100%

1989 OSHA PELs (Lead, inorganic compounds)
8-hr TWA: 50 µg/m³
Action Level TWA*: 30 µg/m³

1989-90 ACGIH TLV (Lead, inorganic, fumes and dusts)
TLV-TWA: 150 µg/m³

1985-86 Toxicity Data†
Human, inhalation, TC_{Lo}: 10 µg/m³ affects gastrointestinal tract and liver
Human, oral, TD_{Lo}: 450 mg/kg ingested over 6 yr affects peripheral and central nervous systems
Rat, oral, TD_{Lo}: 790 mg/kg affects multigeneration reproduction

29 CFR 1910.1025 Lead Standard
Blood Lead Level: 40 µg/100 g

1988 NIOSH REL
10-hr TWA: <100 µg/m³

* Action level applies to employee exposure without regard to respirator use.
† See NIOSH, *RTECS* (OF7525000), for additional mutative, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 3164 °F (1740 °C)
Melting Point: 621.3 °F (327.4 °C)
Vapor Pressure: 1.77 mm Hg at 1832 °F (1000 °C)
Viscosity: 3.2 cp at 621.3 °F (327.4 °C)
Molecular Weight: 207.20
Specific Gravity (20 °C/4 °C): 11.34
Water Solubility: Relatively insoluble in hot or cold water*

Appearance and Odor: Bluish-white, silvery, gray, very soft metal.

* Lead dissolves more easily at a low pH.

Section 4. Fire and Explosion Data

Flash Point: None reported	**Autoignition Temperature:** None reported	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, or foam to extinguish fire.
Unusual Fire or Explosion Hazards: Flammable and moderately explosive in the form of dust when exposed to heat or flame.
Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Lead is stable at room temperature in closed containers under normal storage and handling conditions. It tarnishes on exposure to air. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Mixtures of hydrogen peroxide + trioxane explode on contact with lead. Lead is incompatible with sodium azide, zirconium, disodium acetylide, and oxidants. A violent reaction on ignition may occur with concentrated hydrogen peroxide, chlorine trifluoride, sodium acetylide (with powdered lead), ammonium nitrate (below 200 °C with powdered lead). Lead is attacked by pure water and weak organic acids in the presence of oxygen. Lead is resistant to tap water, hydrofluoric acid, brine, and solvents.
Conditions to Avoid: Rubber gloves containing lead may ignite in nitric acid.
Hazardous Products of Decomposition: Thermal oxidative decomposition of lead can produce highly toxic fumes of lead.

Section 6. Health Hazard Data

Carcinogenicity: Although the NTP and OSHA do not list lead as a carcinogen, the IARC lists it as probably carcinogenic to humans, but having (usually) no human evidence. However, the literature reports instances of lead-induced neoplasms, both benign and malignant, of the kidney and other organs in laboratory rodents. Excessive exposure to lead has resulted in neurologic disorders in infants. Experimental studies show lead has reproductive and teratogenic effects in laboratory animals. Human male and female reproductive effects are also documented.
Summary of Risks: Lead is a potent, systemic poison that affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal (GI) system. The most important way lead enters the body is through inhalation, but it can also be ingested when lead dust or unwashed hands contaminate food, drink, or cigarettes. Much of ingested lead passes through feces without absorption into the body. Adults may absorb only 5 to 15% of ingested lead; children may absorb a much larger fraction. Once in the body, lead enters the bloodstream and circulates to various organs. Lead concentrates and remains in bone for many years. The amount of lead the body stores increases as exposure continues, with possibly cumulative effects. Depending on the dose entering the body, lead can be deadly within several days or affect health after many years. Very high doses can cause brain damage (encephalopathy).
Medical Conditions Aggravated by Exposure: Lead may aggravate nervous system disorders (e.g., epilepsy, neuropathies), kidney diseases, high blood pressure (hypertension), infertility, and anemia. Lead-induced anemia and its effect on blood presssure can aggravate cardiovascular disease.

Continue on next page

Section 6. Health Hazard Data, *continued*

Target Organs: Blood, central and peripheral nervous systems, kidneys, and gastrointestinal (GI) tract.
Primary Entry Routes: Inhalation, ingestion.
Acute Effects: An acute, short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are rare. Reversible kidney damage can occur from acute exposure, as well as anemia.
Chronic Effects: Symptoms of chronic long-term overexposure include appetite loss, nausea, metallic taste in the mouth, lead line on gingival (gum) tissue, constipation, anxiety, anemia, pallor of the face and the eye grounds, excessive tiredness, weakness, insomnia, headache, nervous irritability, fine tremors, numbness, muscle and joint pain, and colic accompanied by severe abdominal pain. Paralysis of wrist and, less often, ankle extensor muscles may occur after years of increased lead absorption. Kidney disease may also result from chronic overexposure, but few, if any, symptoms appear until severe kidney damage has occurred. Reproductive damage is characterized by decreased sex drive, impotence, and sterility in men; and decreased fertility, abnormal menstrual cycles, and miscarriages in women. Unborn children may suffer neurologic damage or developmental problems due to excessive lead exposure in pregnant women. Lead poisoning's severest result is encephalopathy manifested by severe headache, convulsions, coma, delirium, and possibly death.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Consult a physician if any health complaints develop.
Inhalation: Remove exposed person to fresh air and support breathing as needed. Consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If large amounts of lead were ingested, induce vomiting with Ipecac syrup. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: For diagnosis, obtain blood pressure, blood lead level (PbB), zinc protoporphyrin (ZPP), complete blood count for microcytic anemia and basophilic stippling, urinalysis, and blood urea nitrogen (BUN) of creatinine. Examine peripheral motor neuropathy, pallor, and gingival lead line. Use Ca-EDTA to treat poison, but *never* chelate prophylactically. Consult an occupational physician or toxicologist.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel and evacuate all unnecessary personnel immediately. Cleanup personnel should protect against inhalation of dusts or fume and contact with skin or eyes. Avoid creating dusty conditions. Water sprays may be used in large quantities to prevent the formation of dust. Cleanup methods such as vacuuming (with an appropriate filter) or wet mopping minimizes dust dispersion. Scoop the spilled material into closed containers for disposal or reclamation. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33, Appendix II—EP Toxicity Test Procedures)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [* per Clean Water Act, Sec. 307(a)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact. Protective clothing made of man-made fibers and lacking turn-ups, pleats, or pockets retain less dust from lead.
Ventilation: Provide general and local ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially washing hands before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all incompatible materials, direct sunlight, and heat and ignition sources.
Engineering Controls: Educate worker about lead's hazards. Follow and inform employees of the lead standard (29 CFR 1910.1025). Avoid inhalation of lead dust and fumes and ingestion of lead. Use only with appropriate personal protective gear and adequate ventilation. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Avoid creating dusty conditions. Segregate and launder contaminated clothing. Take precautions to protect laundry personnel. Practice good personal hygiene and housekeeping procedures.
For a variety of reasons, the lead concentration in workroom air may not correlate with the blood lead levels in individuals.
Other Precautions: Provide preplacement and periodic medical examinations which emphasize blood, nervous system, gastrointestinal tract, and kidneys, including a complete blood count and urinalysis. Receive a complete history including previous surgeries and hospitalization, allergies, smoking history, alcohol consumption, proprietary drug intake, and occupational and nonoccupational lead exposure. Maintain records for medical surveillance, airborne exposure monitoring, employee complaints, and physician's written opinions for at least 40 years or duration of employment plus 20 years. Measurement of blood lead level (PbB) and zinc protoporphyrin (ZPP) are useful indicators of your body's lead absorption level. Maintain worker PbBs at or below 40 µg/100 g of whole blood. To minimize adverse reproductive health effects to parents and developing fetus, maintain the PbBs of workers intending to have children below 30 µg/100 g. Elevated PbBs increase your risk of disease, and the longer you have elevated PbBs, the greater your chance of substantial permanent damage.

Transportation Data (49 CFR 172.102)
IMO Shipping Name: Lead compounds, soluble, n.o.s.
IMO Hazard Class: 6.1
ID No.: UN2291
IMO Label: St. Andrews Cross (X, Stow away from foodstuffs)
IMDG Packaging Group: III

MSDS Collection **References:** 26, 38, 73, 84, 85, 88, 89, 90, 100, 101, 103, 109, 124, 126, 132, 133, 134, 136, 138, 139, 142, 143
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Upfal, MD, MPH; **Edited by:** JR Stuart, MS

IDENTIFIER INFORMATION----------

Chemical Name	: **LEAD**
Synonym(s)	: C.I. PIGMENT METAL 4; C.I. 77575; KS-4; LEAD FLAKE; LEAD S2; OLOW (Polish); SI; SO
CAS Registry Number	: 7439-92-1
RTECS Number	: OF7525000
Molecular Formula	: Pb
Molecular Weight	: 207.19
Chemical Class	: METAL
Wisswesser Line Notation	: PB
Record Last Updated	: 06/06/97

PHYSICAL PROPERTY INFORMATION----------

Physical Description	: BLUISH-GREY, SOFT METAL; HEAVY DUCTILE, SOFT, GRAY SOLID
Boiling Point in C	: 1739.8 C
Boiling Point in F	: 3163.7 F
Boiling Point in K	: 2013 K
Melting Point in C	: 327.4 C
Melting Point in F	: 621.4 F
Melting Point in K	: 600.6 K
Auto Ignition in C	: -
Auto Ignition in F	: -
Auto Ignition in K	: ~
Flash Point in C	: ~
Flash Point in F	: ~
Flash Point in K	: ~
Vapor Pressure (atm)	: .0013 atm 973 C
Vapor Pressure (psi)	: No data
Vapor Pressure Data	: 1mm @ 973 C
Vapor Specific Gravity	: No data
Evaporation Rate	: Not given
Upper Explosive Limit	: ~
Lower Explosive Limit	: ~
Specific Gravity	: 11.34
Density (g/cc)	: 11.34 g/mL @ 20 C
Water Solubility (mg/L)	: INSOLUBLE; DISSOLVES SLOWLY IN WATER CONTAINING A WEAK ACID
Absorbance Units	: No data
Incompatibilities	: STRONG OX, HYDROGEN PEROXIDE, ACTIVE METALS, SODIUM, POTASSIUM, CHLORINE TRIFLUORIDE, HYDROGEN PEROXIDE, ZIRCONIUM, DISDIUM ACETYLIDE, OXIDANTS, ACIDS
Reactivity w/ Water	: No data on water reactivity
Reactivity w/ Common Mtl	: RELATIVELY IMPENETRABLE TO RADIATION
Stability During Transport	: No Data
Polymerization Possibile	: No data
Toxic Fire Gases	: WHEN HEATED EMITS HIGHLY TOXIC FUMES; CAN REACT VIGOROUSLY WITH OXIDIZING MATERIALS
Odor Description	: No desc given
Odor (100% Pop. Detection)	: No data
Odor Detection Lower Limit	: No data
Uses	: Storage batteries; tetraethyllead (gasoline additive); radiation shielding; cable covering; ammunition; chemical reaction equipment (piping, tank linings, etc.); solder and fusible alloys; type metal; vibration damping in heavy construction; foil; babbit and other bearing alloys. Condensed Chemical Dictionary, 10th ed.

REGULATORY INFORMATION----------

DOT - Department of Transportation

DOT Shipping Name	: LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT Identification Num.	: UN2291
DOT Hazard Class	: 6.1 POISON
DOT Guide Number	: 151
DOT Label(s) Required	: KEEP AWAY FROM FOOD

EPA Water - Environmental Protection Agency
  Clean Water Act (CWA) : Sec 307
  CWA Priority Pollutant : Yes
  CWA Hazardous Sub Listed: No
  MCL (Max Contam Level) : Treatment technique (12/07/92)
  MCLG (Max Contam Goal) : 0 mg/L (12/07/92)
  Marine Pollutant List : Not listed
EPA AIR - Environmental Protection Agency
  Clean Air Act : CAA '90 Listed CAA '77 Sect 109
  Air Sampling Agency : NIOSH; NIOSH
  Air Sampling Method : 7082; 7300
  NIOSH/OSHA Analytical Method: AA; ICP-AES
EPA SUPERFUND - Environmental Protection Agency
  SARA 312 Categories
    Chronic toxicity: carcinogen
    Chronic toxicity: adverse effect to target organ after long period of exposure.
    Chronic toxicity: mutagen.
    Chronic toxicity: reproductive toxin.
  SARA 313 Reporting Reqs : 0.1
  SARA Date : 6941
  CERCLA RQ Symbol : A CERCLA
  CERCLA RQ (Rep. Qty) : 10 pounds (4.54 kg) CERCLA
  TPQ (Threshold Pl. Qty.): Not listed
USPS - US Postal Service
  Hazard class: ORM-B
  Mailability: Domestic service and air transportation; shipper's declaration required
  Max per parcel: 25 LBS; 5 LBS
NFPA - National Fire Protection Association Code Information
  Health Hazard (BLUE) : Unspecified
  Flammability (RED) : Unspecified
  Reactivity (YELLOW) : Unspecified
  Special : Unspecified
OSHA - Occupational Safety & Health Administration
  STEL : Not in Table Z-1-A
  Exposure Limit Comment : AS LEAD
  8 Hour Air Contam Limit : Final Rule Limits: TWA = See 29 CFR 1910.1025 and 1926.62 50 ug/M3
  HS System ID : Not given
  Air Contam Ceiling Limit: Not in Table Z-1-A
  Duration at Max Conc : 50 ug/M3
  Max Allowable Conc : See 29 CFR 1910.1025 and 1926.62
EPA - Environmental Protection Agency
  Waste Number : D008
  Toxic Characteristics ID: D008
  Pesticide Rereg Ingred : Not listed
  TSCA Status
    EPA TSCA Chemical Inventory List 1986
    EPA TSCA Test Submission (TSCATS) Database - September 1989
    EPA TSCA Test Submission (TSCATS) Database - April 1990
    EPA TSCA Chemical Inventory List 1989
    EPA TSCA Chemical Inventory List 1990
    EPA TSCA Chemical Inventory List 1992
    TSCA Rulemaking
    Name :LIST OF HAZARDOUS SUBSTANCES UNDER 104(I) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA OR SUPERFUND) AS AMENDED BY SARA SECTION 110.
    40 CFR:
    Final cite :52 FR 12866
    Published :04/17/87
    Notes :FIRST list of 100 hazardous substances.
    Name :LIST OF TOXIC CHEMICALS UNDER 313 OF THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA OR SARA TITLE III)
    40 CFR:

Date :02/04/87
Prop. cite :52 FR 3479
Notes :STATEMENT of policy and guidance regarding petitions.

State Regulatory Information

CA List of Lists
(B) EPA List of Priority Pollutants.
(D) SARA Section 313 Toxic Chemicals.
(G) AB 2588 Air Toxics "Hot Spots" Chemicals.
(I) AB 1807 Toxic Air Contaminants.
(K) Prop. 65 Chemicals List.

MA List of Lists
ACGIH
See MSL
TIARC
FEPA
FNCI

MD/NJ List of Chemicals ("X" = Yes)
X

NJ List of Lists
List number 1096
Teratogen

NJ "Right To Know" Num. : 1096
NJ "Right To Know" Codes: TE

PA List of Lists
Environmental Hazard

WA Hazard Designation : NA

Canadian Ingredients Disclosure List

Listed ? : Y
Chemical French Spelling: PLOMB ELEMENTAIRE
Concentration : 0.1 %

OTHER

Threshhold Quantity (TQ): Not listed
Toxic Character Reg Lvl : 5.0

Summary of Regulatory Lists That This Substance Appears On

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Developmental Toxin List
California Proposition 65 Female Reproductive Toxin List
California Proposition 65 Male Reproductive Toxin List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 109 National Ambient Air Quality Standards List
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
LEAD [7439-92-1]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a teratogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Specifically regulated substance. See 29 CFR 1910.1025
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List

TOXICITY INFORMATION----------

Short Term Toxicity
LASSITUDE, INSOMNIA, PALLOR, EYE GROUNDS, ANOREXIA, LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE; TREMBLING PARALYSIS WRIST. ** Source: 2

Long Term Toxicity
Unknown

Target Organs : GI,CNS,KIDNEYS,BLOOD,GINGIVAL TISSUE,EYES

Symptoms : INHALATION, INGESTION, CONTACT:
ENCEPHALOPATHY; KIDNEY DISEASE; IRRIT EYES; HYPOTENSION, WEAKNESS, FACIAL PALLOR, LASSITUDE, INSOMNIA, PAL, EYE GROUNDS, ANOREXIA, WEIGHT LOSS, MALNUTRITION, CONSTIPATION, ABDOM PAIN, COLIC; HYPOTENSION, ANEMIA, GINGIVAL LEAD LINE; TREMORS, PARALYSIS WRIST, ANKLES. METALLIC TASTE, INCREASED SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR: NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY DISTRUBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. NIOSHP, THIC

NIOSH Immed. Danger Conc : 100 mg/m3 (AS Pb)

NIOSH REL
<0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH Threshold Limit Value : TLV = 0.05mg/M3 as LEAD A3

ACGIH Short Term Exposure Limit : Not listed

OSHA PEL
Final Rule Limits:
TWA = See 29 CFR 1910.1025 and 1926.62
50 ug/M3

Carcinogen : N

RTECS Carcinogen Determ. : ANIMAL INDEFINITE IARC** 23,325,80

Carcinogen Lists
IARC : 2B 7009
MAK : No
NIOSH : Y
NTP : No
ACGIH : A3
OSHA : No

Carcinogen List Summary
2B 7009
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
A3
OSHA: Not listed

EPA CAGS Hazard Ranking : ##

LD50 Value : No LD50 in RTECS 1992 LD50 Species : MG/KG/6Y,

LD50 Value (albino rabbit): Not given

LC50 Value
No data in RTECS 1992 LC50 Species : LDLO, IPR-RAT.

Human Toxic Effects
orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

Human Toxicity Data
3C08F08F18orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
2K05L30 ihl-hmn TCLo:10 ug/m3 VRDEA5 (5),107,81

Other Species Toxicity
* ipr-rat LDLo:1 gm/kg EQSSDX 1,1,75
* orl-pgn LDLo:160 mg/kg HBAMAK 4,1289,35

Reproductive Toxicity
orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU 23,102,71

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

EFFECTS ON EMBRYO OR FETUS
Fetal death
orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA 20,201,78

EFFECTS ON NEWBORN
Behavioral
orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7 37,394,78

EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77

EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU 23,102,71

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

EFFECTS ON EMBRYO OR FETUS
Fetal death
orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75

EFFECTS ON FERTILITY
Female fertility index

EFFECTS ON FERTILITY
Pre-implantation mortility
orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76

EFFECTS ON FERTILITY
Other measures of fertility
orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77

EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73

EFFECTS ON NEWBORN
Behavioral
Toxicity Data (RTECS)
orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL

Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness
ihl-hmn TCLo:10 ug/m3 VRDEA5 (5),107,81
GASTROINTESTINAL
Gastritis
LIVER
Other changes
* ipr-rat LDLo:1 gm/kg EQSSDX 1,1,75

Irritation Data (RTECS)
No data

Reproductive Toxicology
orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU 23,102,71
REPRODUCTIVE EFFECTS CODES
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
REPRODUCTIVE EFFECTS CODES
EFFECTS ON EMBRYO OR FETUS
Fetal death
orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA 20,201,78
REPRODUCTIVE EFFECTS CODES
EFFECTS ON NEWBORN
Behavioral
orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7 37,394,78
REPRODUCTIVE EFFECTS CODES
EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78
REPRODUCTIVE EFFECTS CODES
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
REPRODUCTIVE EFFECTS CODES
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
REPRODUCTIVE EFFECTS CODES
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
REPRODUCTIVE EFFECTS CODES
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
REPRODUCTIVE EFFECTS CODES
EFFECTS ON NEWBORN
orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU 23,102,71
REPRODUCTIVE EFFECTS CODES
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
REPRODUCTIVE EFFECTS CODES
EFFECTS ON EMBRYO OR FETUS
Fetal death
orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75
REPRODUCTIVE EFFECTS CODES
EFFECTS ON FERTILITY
Female fertility index
REPRODUCTIVE EFFECTS CODES
EFFECTS ON FERTILITY
Pre-implantation mortility
orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76
REPRODUCTIVE EFFECTS CODES
EFFECTS ON FERTILITY
Other measures of fertility
orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77
REPRODUCTIVE EFFECTS CODES
EFFECTS ON EMBRYO OR FETUS

Cytological changes(including somatic cell genetic material)
orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73
REPRODUCTIVE EFFECTS CODES
EFFECTS ON NEWBORN
Behavioral
Mutagenic Data : human rat mky
Teratogenic Data : EXPERIMENTALLY DETERMINED TER. Ref:SAX
Routes of Entry : Unknown
From Deutsche Forschungsgemeinshaft Reports
MAK Information
MAK workplace concentration data:
0.1 calculated as total dust mG/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.
Risk of damage to the developing embryo or fetus must be considered probable. Damage cannot be excluded even when the MAK values are adhered to.
Teratogenic Data Group : MAK workplace concentration data Risk of damage to the developing embryo or fetus must be considered probable. Damage cannot be excluded even when the MAK values are adhered to.
Carcinogenic Data Group : MAK workplace concentration data Not listed
Abnormal Sensitivity : MAK data Not listed
Max Workplace Conc. : 0.1 calculated as total dust
Exposure Peak Limits : MAK data Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

FIRST AID AND PERSONAL PROTECTION INFO----------
First Aid
CHEMICAL: LEAD
SOURCE: NIOSH
EYE: irr immed
SKIN: soap flush promptly
INHALATION: art resp
INGESTION: water, vomit
SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air. Call emergency medical care. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. For minor skin contact, avoid spreading material on unaffected skin. Keep victim warm and quiet. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.
Protection Suggested
ACGIH Protect Guidelines: LEAD ********** Butyl CPE Nat. rubber Neoprene Nitrile Nitrile/PVC PE Polyurethane PVA PVC SBR VITON
ACGIH Exposure Comments : AS LEAD
Med Conditions Aggrav. : PERSONS WHOSE LEVELS FOR LEAD IN BLOOD ARE ALREADY ABOVE ACCEPTABLE. ** Source: THIC
NIOSH Respirator Selection Info
OSHA (LEAD)
Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator equipped with high efficiency filters.
Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.
Not in excess of 100 mg/M3: Supplied air respirator with full

facepiece hood, or helmet or suit and operated in positive pressure mode.
Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in postive-pressure mode.

SPILL, STORAGE, AND INITIAL INCIDENT RESPONSE INFORMATION----------
DOT Shipping Name : LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT ID Number : UN2291
DOT Hazard Class : 6.1 POISON
DOT Guide Information
DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT ID NUMBER: UN2291

GUIDE 151 - SUBSTANCES - TOXIC (NON-COMBUSTIBLE)
*POTENTIAL HAZARDS
*HEALTH
Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin.
Avoid any skin contact.
Effects of contact or inhalation may be delayed.
Fire may produce irritating, corrosive and/or toxic gases.
Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.
*FIRE OR EXPLOSION
Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
Containers may explode when heated.
Runoff may pollute waterways.
*PUBLIC SAFETY
CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
Keep unauthorized personnel away.
Stay upwind.
Keep out of low areas.
*PROTECTIVE CLOTHING
Wear positive pressure self-contained breathing apparatus (SCBA).
Wear chemical protective clothing which is specifically recommended by the manufacturer.
Structural firefighters' protective clothing is recommended for fire situations ONLY; it is not effective in spill situations.
*EVACUATION
Spill
See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".
Fire
If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.
*EMERGENCY RESPONSE
*FIRE
Small Fires
Dry chemical, CO2 or water spray.
Large Fires
Water spray, fog or regular foam.
Move containers from fire area if you can do it without risk.
Dike fire control water for later disposal; do not scatter the material.
Do not use straight streams.
Fire involving Tanks or Car/Trailer Loads
Fight fire from maximum distance or use unmanned hose holders or

monitor nozzles.
Do not get water inside containers.
Cool containers with flooding quantities of water until well after fire is out.
Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
ALWAYS stay away from the ends of tanks.
For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
*SPILL OR LEAK
Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Stop leak if you can do it without risk.
Prevent entry into waterways, sewers, basements or confined areas.
Cover with plastic sheet to prevent spreading.
Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
DO NOT GET WATER INSIDE CONTAINERS.
*FIRST AID
Move victim to fresh air.
Call emergency medical care.
Apply artificial respiration if victim is not breathing.
Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Administer oxygen if breathing is difficult.
Remove and isolate contaminated clothing and shoes.
In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
For minor skin contact, avoid spreading material on unaffected skin.
Keep victim warm and quiet.
Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Initial Isolation Distance: Not given
Extinguishing Media : Not given

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 51
Carbon Black Powder

Issued: 6/79 Revision: B, 11/91

Section 1. Material Identification

Carbon Black (C)* Description: Produced by thermal decomposition of natural gas, oil, or a mixture of both. Some sources refer to "blacks" derived from animal, vegetable, and resin sources as "carbon black"; in this publication we refer to carbon black obtained from gas or oil. Its composition depends on three manufacturing processes: channel, furnace and thermal. Typical composition is 88 to 99% carbon, 0.3 to 11% oxygen, 0.1 to 1% hydrogen, up to 1% organic material [mostly polycyclic aromatic hydrocarbons (PAHs) of benzene origin], minute amounts of tarry material, and traces of ash and sulphur. Carbon black's most important use is as a resistance and reinforcing agent in the rubber industry; also used as an electric conductor, a filler, a reinforcing agent, a pigment, and a chemical reducing agent in production of antioxidants, batteries, belt covers, carbon paper, electrical insulating apparatus, ink, leather, phonograph records, protective coating, UV light absorbers, and varnish.

Other Designations: CAS No. 1333-86-4, amorphous carbon, channel black, furnace black, gas black, impingement carbons, Mogul, Monarch 700, Niteron, oil black, Philblack, Printer 60, Raven 8000, thermal black.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

R 1
I 2
S 1
K 1

Genium

HMIS
H 1
F 1
R 0
PPG†
† Sec. 8

Cautions: Combustible carbon black is mildly toxic by inhalation, skin, and eye contact. Carcinogenicity is disputed.

* The molecular formula for pure carbon is "C", but carbon black's molecular formula varies with impurities.

Section 2. Ingredients and Occupational Exposure Limits

Carbon black, ca 88 to 99%*

1990 OSHA PEL
8-hr TWA: 3.5 mg/m³

1990 DFG (Germany) MAK
None established

1985-86 Toxicity Data‡
S. typhimurium: 1 mg/plate produced microbial mutation without S9

1991-92 ACGIH TLV
TWA: 3.5 mg/m³

1990 NIOSH REL†
3.5 mg/m³

* Impurities consist of 0.3 to 11% oxygen, 0.1 to 1% hydrogen, up to 1% organic material (mostly polycyclic aromatic hydrocarbons of benzene origin), minute amounts of tarry material, and trace amounts of ash and sulfur.
† 0.1 mg/m³ in the presence of polycyclic aromatic hydrocarbons.
‡ See NIOSH, *RTECS* (FF5800000), for additional mutation data.

Section 3. Physical Data

Boiling Point: 7592 °F (4200 °C) *under pressure*. Sublimes at *standard pressure* [6690 °F (3700 °C)].
Vapor Pressure: 0 mm Hg at 68 °F (20 °C)
Molecular Weight: Varies with impurities present (pure carbon = 12)
% Volatile by Volume: <14% (channel black), <9.6% (furnace black)
Density: 1.8 to 2.1 at 77 °F (25 °C)
Water Solubility: Insoluble
Other Solubilities: Insoluble in all solvents
Appearance and Odor: Fine, black, odorless material found commercially as powder, pellets, or pastes. Particle size varies from 5 to 500 nm.*

* The smaller the particle size, the greater the potential for becoming airborne and thus posing an inhalation hazard.

Section 4. Fire and Explosion Data

Flash Point: None reported	**Autoignition Temperature:** 500 to 700 °F (260 to 371 °C) *in air*	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: Combustible carbon black can be ignited by heat, sparks or flames. For small fires, use dry chemical, sand, earth, water spray, or regular foam. For small fires, use water spray, fog, or regular foam.
Unusual Fire or Explosion Hazards: When containing >8% volatiles, carbon black is considered an explosion hazard that can burn rapidly with flare-like effect.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also wear fully protective clothing. If possible without risk, remove containers from fire area. Apply cooling water to fire-exposed container sides until fire is well out. Stay away from ends of tanks. For large fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Carbon black is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Chlorinated paraffins, lead (IV) oxide, manganese (IV) oxide, iron (II) oxide, liquid oxygen, strong oxidizers such as chlorates, bromates and nitrates. Carbon black ignites spontaneously when in contact with fatty oils or sodium sulfate and reacts violently with nitric acid.
Conditions to Avoid: Avoid contact with heat, the incompatibles mentioned above, and excessive dust generation.
Hazardous Products of Decomposition: Thermal oxidative decomposition of carbon black can produce carbon dioxide (CO_2), carbon monoxide (CO), and toxic sulphur oxides (SO_x).

Section 6. Health Hazard Data

Carcinogenicity: Carbon black carcinogenicity is controversial. The NTP and OSHA do not list carbon black as a carcinogen in their 1990 reports, but the IARC lists it as Class 3 (not classifiable as to human carcinogenicity). It is now generally accepted that impurities present in carbon black (such as 3,4 benzpyrene) can cause cancer, but that carbon black tightly binds and renders these compounds ineffective. Animal studies show that prolonged inhalation and ingestion produces no significant changes, but that skin contact produces harmful effects by allowing absorption of the carcinogenic impurities in carbon black. More studies are currently underway to determine the significance of these findings.
Summary of Risks: Inhalation and skin contact produce local irritation and mild pain which usually disappear rapidly after removal from exposure.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Respiratory tract, skin, and eyes.
Primary Entry Routes: Inhalation, skin and eye contact.
Acute Effects: Carbon black dust inhalation can cause irritation, sneezing, coughing, chest pain, and headache. Skin contact has produced irritation, follicular blackheads, and keratosis (area of skin marked by overgrowth of horny tissue).
Chronic Effects: Evidence shows decreased pulmonary (lung) function due to long-term deposition of carbon black dusts. Several studies found deterioration of pulmonary function in tests conducted in heavily exposed industrial populations, while other studies failed to show any impact. Attempts to limit pulmonary exposure are probably warranted.
FIRST AID
Eyes: Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* let victim rub eyes or keep them tightly closed. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing *after* wetting down if possible. *Do not* shake or blow dust off clothing or body. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treatment is symptomatic and supportive.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources—no flares, smoking or flames in hazard area. Cleanup personnel should protect against contamination. Use water spray to reduce dust and vapors. For small dry spills, carefully scoop material into clean, dry, suitable container and cover loosely for later disposal. Damp mopping or vacuuming (with an appropriate filter) can minimize dust generation. For large spills, use water to wet down material and dike for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.33): Not listed
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets with elastic cuffs at the wrists and ankles to prevent all skin contact.
Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103] Do not release removed carbon black dust directly to the outside air where it can cause contamination.
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in cool, dry, well-ventilated area away from heat, flames, oxidizers, and incompatibles (Sec. 5).
Engineering Controls: If respirators are used, OSHA requires a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Because 80% of carbon black particles are less than 0.5 μm in diameter, use high-performance collection systems with a low-velocity airstream. Before entering confined areas where carbon black is stored, check carbon monoxide and oxygen levels.
Other Precautions: Consider preplacement and periodic medical examinations of exposed workers emphasizing heart, skin, respiratory system, and mucous membranes of the oral cavity. Also determine previous occupational exposure to pulmonary carcinogens as well as respiratory tract skin irritants.
Transportation Data (49 CFR 172.101, .102): Not listed (*only carbons from plant and animal origin are listed*)

***MSDS Collection* References:** 38, 73, 89, 100, 103, 124, 126, 127, 132, 136, 139, 140, 143, 148, 149, 153, 159, 162, 163, 164
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

ATTACHMENT BB

Respirator Program for C&D Facility

ATTACHMENT BB

RESPIRATOR PROGRAM FOR REMEDIAL INVESTIGATION

The following respirator program is in accordance with OSHA 29 CFR 1910.134 Respiratory Protection Program requirements. This program governs the selection and use of respirators on-Site.

Respirators for the Earth Tech field sampling team will be provided by Earth Tech. The respirator protection program will be administered by, and is the responsibility of the RHSS and/or SSO for the Site. Subcontractors (i.e., drillers) will furnish their own respirators and medical surveillance for their employees. The RHSS and/or SSO will be responsible for ensuring that they are in compliance with this respirator program.

The respirators will be selected according to the hazard and level of protection determined by monitoring action levels and the decision of the RHSS and/or the SSO. The respirators and levels are:

Level	Respirator
B	Positive Pressure-Pressure Demand SCBA or Supplied Air Respirator with 5-minute escape bottle. Level B is 5 to 250 ppm above background in (BZ).
C	Air purifying respirator with combination dust (HEPA) and organic vapor cartridge. Level C is 5 ppm above background in BZ based on identification of contaminant present. An air purifying respirator with combination dust and organic vapor cartridge will be appropriate for the dust conditions and organics that may be encountered.
D	No respirator required. Continuous reading of background (0.2 ppm) to 5 ppm in the worker's BZ.

The respirator users will be fit tested with the size, style, and make of the respirator they will be using on-Site. The fit test will be recorded and these Fit Test Records win be maintained in the Command Post.

Employee respirator training is provided on an annual basis and at site-specific training sessions. This training includes:

- A discussion of the nature of the respiratory hazards and the dangers if the respirator is not used properly.
- The reasons that respirators are required for protection, along with any engineering controls that may be used.

- Instruction in the selection, use, sanitary care, maintenance, proper storage, and limitation of the full face piece respirator with combination cartridge, and the SCBA.

- Practice in proper fitting, wearing, adjusting, and checking face seal of the respirator.

- An opportunity to handle the respirator.

- Instruction on how to recognize and cope with emergency situations requiring respiratory protection.

- Explanation of the requirements for a self-contained breathing device for work in unknown concentrations and Immediately Dangerous to Life or Health (IDLH) atmosphere and for fire fighting.

- Explanation of the medical surveillance program and how it relates to respirator use.

- Explanation of the requirements for maintaining a tight seal, why beard and facial hair is prohibited, and why use of contact lenses while wearing respirators is prohibited.

Respirators will be assigned to individual workers. Each individual shall be responsible for cleaning and maintaining their assigned respirator and documenting this using the Respirator Service Log presented in Attachment BC. They will be cleaned and disinfected before being reassigned. Respirators will be cleaned after each day of work according to manufacturer's instructions. The cleaning will be done at the Command Post. Used cartridges will be disposed of and replaced with new ones.

After cleaning, the respirators will be inspected and checked for defects such as excessive dirt, cracks or other distortions, scratches, incorrectly mounted lens, broken or worn cartridge holders on the face piece, breaks, loss of elasticity, broken buckles, and excessively worn serrations on head harness that may cause slippage on the head straps or head harness. Further checks include:

- A check of the tightness of the connections.

- A check of the face piece, valves, connecting tube, and canisters.

- A check of the regulator and warning devices on SCBA for proper functioning.

- For air purifying:

  Check the exhalation valve after removing its cover for:

Foreign material, such as detergent residue, dust particles, or human hair under the valve seat.

Cracks, tears, or distortion in the valve material.

Improper insertion of the valve body in the face piece.

Cracks, breaks, or chips in the valve body, particularly in the sealing surface.

Missing or defective valve cover.

Improper installation of the valve in the valve body.

Check the air purifying elements for:

Incorrect cartridges, canister, or filter for the hazard.

Incorrect installation, loose connections, missing or worn gaskets, or cross threading in holder.

Expired shelf life of cartridge or canister.

Cracks, dents, or breaks in the cartridge or canisters case.

Evidence of prior use of cartridge or canister, such as broken seal tape foil or other sealing material.

- For air supplied respirators, check the air supply system for:

  Integrity and condition of air supply lines and hoses, including attachments and end fitting.

  Correct operation and condition of all regulators, valves, or other air-flow regulators.

  If SCBA, that the cylinder is sufficiently charged for the intended use, preferably fully charged (mandatory on an emergency device). The emergency SCBA will have a tag for logging in the monthly inspections.

Monitoring of the work area will be performed and the results will be used to select the appropriate level of protection. Refer to air monitoring section of the HASP (Section 9.0).

This Respirator Program will be re-evaluated and revisions and updates added regularly.

Persons will not be assigned to tasks requiring the use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The Earth Tech-contracted physician will determine what health and physical conditions are pertinent.

Only those respirators jointly approved by NIOSH/MSHA shall be used. All component parts (i.e., canister, replacement straps, etc.) will be of the same make.

All Earth Tech employees shall document their respirator use time on the Record of Respiratory Wear Log presented in Attachment BC. This record shall be submitted to the RHSS on a weekly basis.

ATTACHMENT BC

Health and Safety Field Forms

MEDICAL DATA SHEET

Project Name/Location:

Employee Name: Home Telephone:

Address:

Birthdate: Height: Weight:

Drug and Other Allergies:

Notable Medical Conditions/Medical Restrictions:

Do You Wear Contact Lenses? Yes No

Are you using any medications? Yes No Please list:

Emergency Contact: Relationship:
Address: Phone: ( )

Personal Physician: Phone: ( )
Address:

APPENDIX C

Staff Resumes

JOHN E. GANSFUSS

SENIOR ENGINEERING GEOLOGIST

EDUCATION

MS Engineering Geology, Purdue University, 1977
BA Geology, University of Rochester, 1973

REGISTRATIONS AND CERTIFICATIONS

Certified Professional Geologist, State of Indiana
Certifed Hazardous Waste Site Worker, OSHA 1920.120(e)(2)
Certifed Hazardous Waste Site Supervisor, OSHA 1920.120(e)(3)

PROFESSIONAL EXPERIENCE

Mr. Gansfuss is a senior engineering geologist with 20 years of professional experience, primarily in the areas of environmental or geotechnical site assessment and investigation, civil construction and remediation. He is a technically-oriented generalist, with a predisposition toward analytical problem solving. He has extensive experience in subsurface investigations, Remedial Investigations, Feasibility Studies, Conceptual Remedial Design, and regulatory permitting activities, mostly in the northeastern U.S., for industrial and state agency clients. He is typically responsible for project advising, managing, planning, or trouble-shooting, and is frequently involved in developing focused, solution-oriented approaches and strategies. Areas of particular technical experience include hydrogeological investigations, evaluation of remedial technologies, assessment and remediation of contaminated sediments and DNAPLs, applications of geophysics and rock mechanics, and document review. Previously a manager of Rust's former Hydrogeologic Services Department, he currently serves as a group leader for geologists and hydrogeologists in Earth Tech's Environment Waste and Remediation Department in Albany, New York. Following is a listing and brief description of relevant project experience.

Special Project Experience

Remedial Investigations/Feasibility Studies

Preliminary Hydrogeological Investigation, Wilsonart, Congers, New York. Served as Project Advisor for a preliminary site investigation involving installation of passive soil gas samplers and monitoring wells to evaluate groundwater flow directions and the potential for offsite sources to impact onsite groundwater quality.

Focused Feasibility Study for PCB-Contaminated Sediment in Stream and Pond, Hayton Area Remediation Project, Tecumseh Products, Wisconsin. Provided technical assistance in developing strategies related to the remediation of contaminated sediment in a shallow man-made 30-acre mill pond.

Cumberland Bay Wilcox Dock PCB-Sludge Bed, NYSDEC, Plattsburg, New York. Helped develop pre-design investigation sampling strategies. Served as a technical reviewer regarding alternative methodologies and pre-design studies for removal of PCB-contaminated sludges from a 35-acre near-shore area of Lake Champlain.

Gaess Site Remedial Investigation/Feasibility Study, Waste Management Inc., Harriman, New York. Provided technical assistance and review for the remedial investigation and feasibility study for the Gaess Inactive Hazardous Waste Site. Project involves recovery and stripping of very low concentrations of VOCs from an existing water supply well.

Remedial Investigation of Powerex Site, General Electric Company, Auburn, New York. Provided technical assistance and review for Interim RI report. Project involved presence of dissolved VOCs in carbonate bedrock groundwater.

Remedial Investigation of Hudson Falls Plant, General Electric Company, Auburn, New York. Provided technical assistance and review for remedial activities at the GE Hudson Falls Plant. Project involved sewer cleaning and the presence of DNAPLs in soil overburden and shale bedrock.

Remedial Investigation, Durez Inlet Site, Whiteman, Osterman and Hanna, North Tonawanda, New York. Project Manager for the initial site assessment and remedial investigations for the submerged Inlet cove and the contiguous land and river areas at the Durez Inlet Site. Activities included diver and remotely-operated-vehicle inspections of the interior of a large diameter municipal water main; drilling and sampling the narrow bedding of the deeply buried active water main; offshore and onshore geophysical surveys and drilling; sediment characterization; definition of DNAPL-contaminated areas; monitoring well installation; media sampling and analyses; bench-scale treatability study; and preparation of RI report which also included extensive historical research into the original construction of the on-site 100-year old buried structures that could have affected chemical migration. Principal contaminants of concern were chlorobenzenes.

Remedial Investigation, Creekside Site, Whiteman, Osterman, and Hanna, North Tonawanda, New York. Project Manager from initial site assessment through remedial alternatives assessment for the remediation of soil, sediment, groundwater and NAPL-containing drums at the Creekside inactive hazardous waste site situated on a golf course along a 1000 foot reach of Tonawanda Creek (New York State Barge Canal). Remedial investigation activities included geophysics, trenching, monitoring well installation, creek bottom sediment sampling, diver surveys of creek bottom and preparation of RI report. Principal contaminants of concern were tars and dibenzofurans.

Feasibility Study, General Electric Company, Malta, New York. Assistant Project Manager for development of a Feasibility Study for remediation of the Malta Rocket Fuel Area Test Site, a

federal Superfund site under EPA jurisdiction. Project included numerical groundwater modeling to conceptualize and justify reasonableness of proposed groundwater remedy and clean-up time. Evaluation addressed VOCs in groundwater, mercury and PCBs in soil and presumptive remedies for septic tanks, dry wells and buried crushed drums. Cost-effective alternative proposed in FS was accepted by EPA and implemented.

Remedial Alternatives Assessment, Durez Inlet Site, Whiteman, Osterman and Hanna, North Tonawanda, New York. Project Manager for the remedial alternatives assessment for the remediation of DNAPL, sediment and soil remediation at the Durez Inlet inactive hazardous waste site. Responsibilities included technical negotiations with NYSDEC. RAA report included a human health evaluation and habitat-based assessment. Selected remedy included a combination of source removal, dredging, containment and wetland restoration.

Remedial Alternatives Assessment, Creekside Site, Whiteman, Osterman, and Hanna, North Tonawanda, New York. Project Manager for remedial alternatives assessment for the drummed phenolic tars, soil, creek-bottom sediment and groundwater at the Creekside inactive hazardous waste site along the New York State Barge Canal. Selected remedial activities in the RAA report included drum and soil removal, cofferdamming and dewatering a portion of the canal, sediment removal and underwater drum removal. Activities included transport of drum-filled trailers to a permitted TSDF away from the site.

Feasibility Study, Confidential Client, Baltimore, Maryland. Project Manager for preparation of a feasibility study for the removal of PCB-contaminated soil from an active industrial apparatus service facility in downtown Baltimore.

<u>Remedial Design/Construction Oversight/Permitting</u>

Remedial Design for Lake Capri and Willetts Creek Sediment Remediation, NYSDEC, West Islip, New York. Assistant Project Manager for remediation of cadmium-contamination sediments in an eight-acre man-made lake in an urbanized area of Long Island. Project included a pre-design investigation to characterize the nature and depth of contaminated sediment, develop bathymetric maps, core sampling and anaysis, treatability study, wetland delineation, and pre-construction documentation. Prepared drawings and specifications for dredging sediment. Prepared long-term monitoring plan.

Remedial Design for Cumberland Bay Sludge Bed, NYSDEC, Plattsburgh, New York. Developed technical requirements (specifications) for remoival of PCB-contaminated sludges, including dredging and onshore excavation in dewatered areas. Provided technical reviews of procurement documents, work plans and permit applications.

Remedial Design and Construction Oversight for Passaic River Sediment and Soil Removal Project, Confidential Client, Hawthorne, New Jersey. Project Manager for a voluntary cleanup of two areas of mercury contaminated sediments in the Passaic River and an area of mercury- and lead-contaminated soil in the vicinity of an active municipal sanitary sewer, both off-site of a former

chemical manufacturing facility. Work included preparation of work plans for State approval, wetland delineation, preparation of federal and State permit applications, development of construction specifications, construction oversight, mercury vapor and particulate perimeter air monitoring and preparation of the final remedial action report. Major project elements included isolation and dewatering of river bottom utilizing portable cofferdams, temporary diversion of stormwater and sewage flows, temporary relocation of utility poles and an active municipal sewer, and wetland and site restoration.

Remedial Design for DNAPL Extraction Wells, Chemical Waste Management, Model City, New York. Project Manager for design of two DNAPL extraction wells to improve efficiency of an existing groundwater extraction system at a TSD Facility. Project included design of wells, automated pumping using pneumatic pumps, storage tank and instrumentation and controls; and preparation of design report.

Remedial Design for Groundwater Extraction Wells, Chemical Waste Management, Model City, New York. Project Manager for design of a groundwater extraction system to remove VOCs at an existing TSD Facility as part of a RCRA Corrective Measures Implementation. Project included review of hydrogeological information; design of extraction well system, storage tank, instrumentation and controls; and preparation of design report.

Remedial Design and Construction Oversight, Gladding Cordage Site, NYSDEC, South Otselic, New York. Project Manager under the State Superfund Standby Program for the predesign study for remediation of residually contaminated groundwater (VOCs) at an active manufacturing facility. Activities include preparation of work plans, plans and specifications; direction of a predesign hydrogeologic investigation including an aquifer pumping test and groundwater modeling to optimize the treatment system; and coordination of design and construction oversight for the installation of groundwater recovery and monitoring wells, and temporary GAC and permanent air stripping water treatment systems.

Permitting Activities, Industrial Welding Site (Gill Creek) Rehabilitation, Olin Corporation, Niagara Falls, New York. Task Manager for federal and State permitting activities related to the Gill Creek/Industrial Welding Site remediation project which involves sediment characterization, stream diversion, sediment dredging, wastewater discharge, ACOE nationwide permit, and determination of consistency with federal Coastal Management Zone policy. Constituents of concern were mercury, PAHs and BHC.

Predesign Investigations and Permitting, Durez Plant Site, Occidental Chemical Corporation, North Tonawanda, New York. Project Manager for technical negotiations with NYSDEC regarding predesign investigations for soil, groundwater, storm sewers, and sediment remediation. Assisted with development of remedial alternatives and conceptual remedial design for active, 70-year old, 60 acre Durez chemical manufacturing plant. Task Manager for several phases of predesign investigations. Activities included soil, sediment, and groundwater investigations; evaluation of groundwater-storm sewer relationships; and a video/diver inspection of a arterial municipal storm sewer to evaluate its condition and quantify sediment accumulation. Also prepared

technical portion of SPDES permit application for the effluent collected in the proposed groundwater interceptor. Chlorobenzenes were the compounds of concern.

Permitting Activities, Durez Inlet Site, Occidental Chemical Corporation, North Tonawanda, New York. Task Manager for obtaining Army Corps of Engineers nationwide permit, and federal consistency determination, for cleanup of DNAPL, soil and sediment at the Durez Inlet inactive hazardous waste site. Predischarge Notification included wetland restoration Plan. Permit obtained on schedule and without significant added conditions or design changes.

Permitting Activities, Creekside Site, Occidental Chemical Corporation, Amherst, New York. Task Manager for obtaining Army Corps of Engineers nationwide permit for cleanup of sediment, soils and drums at an inactive hazardous waste site. Cultural Resources Survey completed because of site proximity to historically significant Erie Canal and associated structures. Permit granted on schedule without significant added conditions or restrictions.

Remedial Design and Construction Oversight, Durez Plant Site, Occidental Chemical Corporation, North Tonawanda, New York. Project Manager during final design and construction phases for an 8300-foot long Plant perimeter groundwater interceptor trench and plant groundwater monitoring system. Remediation designed and implemented to minimize disruption to Plant operations. Served as Client's technical liaison with NYSDEC. Also, Task Manager for grouting of abandoned bedrock water supply wells and developing a management plan for excavated soils.

Remedial Design and Construction Oversight, Durez Inlet Site, Occidental Chemical Corporation, North Tonawanda, New York. Project Manager for remediation of the complex Durez Inlet inactive hazardous waste site along the Little Niagara River. Served as Client's technical liaison with NYSDEC, provided technical review of consent decree, and helped balance Client's concerns regarding other nearby sites. Predesign studies included a cultural resources survey; wetland restoration plan; offshore seismic subbottom profiling, side-scan sonar and bathymetry surveys; offshore coring and drilling program; sediment sampling and analysis program; and onshore and offshore DNAPL investigations. Negotiated the use of visual criteria for certain sediment cleanup activities. Elements of the remediation included temporary storm sewer diversion; two temporary Sprung structures for solids and water treatment and staging; double-wall sheet pile cofferdams; dredging DNAPL-contaminated sediments from cove and river bottom; 25-foot deep braced excavations; installation and operation of DNAPL extraction wells; innovative cutoff walls; wetland restoration; sediment dewatering, stabilization and containerization; water pretreatment prior to discharge to POTW; and rigorous air monitoring. Construction continued through the winter season.

Remedial Design and Construction Oversight, Creekside Site, Occidental Chemical Corporation, Amherst, New York. Project Manager for remedial design and construction for the Creekside NYSDEC inactive hazardous waste site. Served as Client liaison with NYSDEC and helped negotiate a practical list of sediment and soil cleanup criteria. Remedial elements included temporary sheet pile cofferdam, creek bank excavation, removal of 600 drums from creek-bank and

creek bottom, creek bottom dewatering, sediment removal and dewatering, water treatment and preparation of final engineering report. Remediation included archeological oversight and was initiated as golf course remained operable.

Professional Affiliations

Hudson-Mohawk Professional Geologists
Association of Engineering Geologists

Publications/Lectures

"Book Review, Strategies for Accelerating Cleanup at Toxic Waste Sites", *Northeast Environmental Science*, December, 1998.

"A Variety of Approaches to Contaminated Sediment Removal", presentation to Society of American Military Engineers, Watervliet Arsenal, 1996.

"DNAPL Technology and Removal", presentation at a regional internal Dunn seminar organized by Mr. Gansfuss, Albany, 1994.

"Remediation of the Durez Inlet Site" New York-Philadelphia Chapter of the Association of Engineering Geologists, co-presented with NYSDEC, Tuxedo, New York, 1993.

"Rock-Slope Investigations at Selected Hudson Valley Sites", 42nd Annual Highway Geology Symposium, co-author, Albany, 1991.

"Geophysical Methods in Landfill Investigations", Capital District Chapter of the New York State Society of Professional Engineers, presentation, Albany, 1989.

"Practical Applications of Surface Geophysical Methods at Abandoned Hazardous Waste Sites", Northeast Section AIPG Symposium on Ground Water, presentation, also with co-author published in Northeastern Environmental Science, V. 4, No. 2, 1985.

Selected Special Training/Conferences

27th Dredging Engineering Short Course, Texas A & M, January 12-16, 1998.

U.S. Army Corps of Engineers Dredged Material Assessment and Management Seminar, Savannah, GA, May 1997.

DNAPLs: Site Characterization and Remediation, short course, Syracuse, 1994.

International Symposium on Environmental Dredging, Buffalo, 1992.

Dense, Immiscible Phase Liquids (DNAPLs) Contaminants in Porous and Fractured Media, University of Waterloo Short Course, 1990.

International Symposium on Toxics in the Niagara, Toronto, 1987.

Employment History

1998-present	Earth Tech (acquired Rust)
1993-1998	RUST Environment & Infrastructure
1983-1993	Dunn Corporation (merged into RUST)
1978-1982	Sargent & Lundy Engineers, Chicago

CHARLES K. BARTLETT, P.E.

SENIOR ENGINEER

EDUCATION

BS 1981 Civil Engineering, SUNY at Buffalo, 1981
MBA 1995 Business Adm., SUNY at Albany,

REGISTRATION & CERTIFICATIONS

Professional Engineer: New York 1992

PROFESSIONAL SUMMARY

For the past four years Mr. Bartlett has served as the Environmental Services Manager for the Earth Tech Albany office. In addition to this role, he also serves as the Program Manager for Earth Tech's Term Agreements with the New York State Office of General Services and New York State Department of Environmental Conservation. Mr. Bartlett provides his environmental experience to projects related to Environmental Site Assessments, Remedial Investigations and Feasibility Studies, Environmental Impact Statements, Spill Prevention Programs, Remedial System Design, Above and Below ground Tankage Design, Construction Oversight, Litigation Support, Wastewater Treatment and Pump and Piping Design. Mr. Bartlett is particularly experienced in formulating cost effective remedial approaches to environmental concerns stemming from leaking above and below ground storage tanks.

New York State Office of General Services, Term Agreement For Water Quality Engineering. As Project Manager for this Term Agreement, Mr. Bartlett has managed project types ranging from water supply and distribution to wastewater treatment to groundwater quality. Projects include septic tank rehabilitations at six community residence facilities.

Blue Circle Cement, Wastewater Treatment Plant, Ravena, New York. Mr. Bartlett serves as Project Manager for this project which involves the upgrade of an existing wastewater treatment plant to comply with the current Blue Circle Cement State Pollutants Discharge Elimination System (SPDES) limits, including BOD, fecal coliform, and chlorine discharge. Earth Tech's efforts to meet this need consist of the identification and evaluation of options to upgrade or replace the existing system, the development of design plans, and upon approval of plans, the preparation of construction drawings and bid documents.

Project Manager for a groundwater investigation at an industrial facility in Albany, New York. Served as project manager for an extensive site assessment that followed removal of 4,000 cu.yds. of contaminated material from an industrial site in Albany, New York. The investigation focused on an attempt to determine the origins of a number of leaking abandoned tanks which had been unexpectedly encountered at the site and determine what, if any, groundwater impact had occurred. The investigation involved historical research, a geophysical survey, a soil gas survey and installation of monitoring wells. This investigation ultimately demonstrated that the activities conducted had resulted in satisfactory remediation of the site.

Corrections Corporation of America, New Institutional Facility, Upstate New York Earth Tech, as a subconsultant to Dana Larson Roubal and Associates (DLR Group), provided civil engineering services required to support the design and construction of a new 1,500 bed institutional facility in central New York. Mr. Bartlett served as Project Manager and under his direction the following elements of work were accomplished:

Topographic Survey: An aerial topographic survey of the 110 acre was conducted with photography captured during the Spring of 1997. Due to the need for a new water line to the site, the aerial survey also depicted the proposed centerline, existing utilities, inverts, cover elevations, right-of-way limits, pavements, walks, culverts, mail boxes, signage and topography along the 3700 LF route for the new line. The development of a demolition plan was also included in this task, involving the identification of specific items and structures recommended for removal.

Geotechnical Investigation and Soils Report: Earth Tech conducted a geotechnical investigation consisting of soil borings and test pitting as well as sampling and analysis to evaluate the subsurface condition in the vicinity of the proposed facility. The work was advanced in two phases, the first of which was to broadly characterize soil and subsurface conditions across the site to aid in finalizing the location of the facility on the site. The second phase involved a refined investigation in the final facility location which resulted in data required for the foundation design. The investigation was prepared in two phases due to the steep slopes and possible shallow bedrock in the area. The first phase allowed for the final siting to be located in an area so as to minimize construction costs associated with retaining walls, blasting and the like.

Civil and Sanitary Engineering: The civil and sanitary engineering work involved in the project included the development of a grading and drainage plans based upon final design grades and facility location provided by DLR. A site utility plan for water and wastewater was also prepared. As part of this task, Earth Tech determined the need for design of storm water detention basins for the site. Utility plans were provided for electrical service, sanitary sewer coordination for hookups and design of holding tanks and exterior lines to handle peak flow, and designs to accommodate water usage as well as permitting and regulation coordination for the site engineering.

Excavation of Contaminated Soils, Albany, New York. Project Manager for the excavation of some 4,000 cu.yds. of contaminated soils associated with leaking underground storage tanks. The tanks were unexpectedly encountered during an expansion project at an industrial facility in Albany, New York. Close coordination was required with both the general contractor and the New York State Department of Environmental Conservation (NYSDEC) in order to satisfy the department and maintains an aggressive construction schedule. An initial remedial alternative evaluation was performed which indicated that excavation and removal of the contaminated material was the preferred approach. An aggressive test pitting program was then undertaken in conjunction with soil sample collection with rapid turnaround of analytical results in order to delineate the zone of contamination. Following delineation, the soils were removed to a staging area and placed in piles on the basis of observed contaminant level. The soils were segregated in an effort to avoid intermixing of relatively clean soils with more highly contaminated soils such that treatment and disposal costs could be minimized. Ultimately, it was possible to utilize the excavated material for landscaping purposes following a subsequent sampling effort which demonstrated that the contaminated soils were impacted at levels below regulatory concern.

Tank Removal/Tank System Design/ Construction Oversight. Served as project manager for a project in Wallkill, New York. The project involved removal of underground storage tanks, bioremediation of soils, design of aboveground tankage system and pumps/piping associated with an in-plant secondary containment system and construction oversight.

Bioremediation of contaminated soils, Honolulu, Hawaii. Served as project manager for the bioremediation of 300 yards of contaminated soils associated with leaking underground storage tanks at an industrial site in Honolulu, Hawaii. Project involved use of a soil shredder and treatment of the soils with a nutrient-bacterial solution. Full remediation was achieved.

Project manager for a project involving the evaluation of an existing groundwater pump and treat/soil venting system. Results of Mr. Bartlett's evaluation suggested that the existing remedial system was ineffective and expensive. A new system consisting of a shallow tray air-stripper and recovery wells was selected and designed.

Remedial Design Prepared construction specifications and plans for the excavation and removal of buried drums and contaminated soils at an industrial site in Western New York.

Litigation Support

Expert Testimony:

Provided expert testimony in a case involving the interpretation of a "sudden and accidental" clause in an insurance policy relating to leaking underground storage tanks.

Severed as project manager and fact witness in a case involving a dispute between two major oil companies over responsibility for environmental restoration at some 300 properties sold in the early 1980's. Managed a team of up to 18 engineers, hydrogeologists and scientists in the review of several hundred thousand pages of documents. The effort was focused on maintenance history, hydrogeology, leak mechanism, chronology and other pertinent facts and information relating to each site.

PROFESSIONAL AFFILIATIONS

New York State Society of Professional Engineers

EMPLOYMENT HISTORY

1998-Present	Earth Tech, Inc. (formerly Rust Environment & Infrastructure)
1993-1998	Rust Environment & Infrastructure (formerly Dunn Corporation)
1990-1993	Dunn Corporation (merged into Rust)
1981-1990	Exxon Company, USA

WALTER O. HOWARD

SENIOR HYDROGEOLOGIST

Education

BA Geology, State University of New York at Plattsburgh, 1982

Registrations & Certifications

Certified Hazardous Waste Site Worker, OSHA 1910.120(e)(2)
Certified Hazardous Waste Site Supervisor, OSHA 1910.120(e)(3)

Professional Summary

Mr. Howard has 16 years of experience as a professional geologist, thirteen of which have been focussed in hydrogeology and environmental consulting. He specializes in subsurface investigations, including the research and analysis of suspected or confirmed contaminated sites and proposed landfill sites. He is experienced with a wide variety of subsurface investigative techniques including all types of drilling and sampling procedures, aquifer testing and analysis, hydrogeologic and geochemical data interpretation, sampling protocols and QA/QC procedures. He has designed ground water monitoring systems, characterized ground water and contaminant movement, designed and implemented soil and ground water remedial plans, assessed public health and environmental risks, and designed and implemented post-closure monitoring programs.

Project Experience

Phase I Environmental Site Assessment and Limited Phase II/III Site Investigation Program, DaimlerChrysler Realty Corporation, Eastern U.S. Mr. Howard serves as Project Manager in a comprehensive program to assess environmental conditions at multiple automobile dealerships in the eastern U.S.. His responsibilities include conducting site visits to identify potential environmental concerns, designing and overseeing Phase II site investigations, preparation of Phase I and Phase II reports for DaimlerChrysler and State regulatory agencies.

Groundwater Monitoring and Remediation, Confidential Client, western New York. Project manager for this manufacturing facility site where previous underground storage tanks and volatile organic contaminated soil had been remediated but residual levels of contamination persisted in groundwater. Mr. Howard negotiated with the NYSDEC to approve the site be investigated under the state's Voluntary Cleanup Program (VCP) . Future phases will include performance of a subsurface investigation and reporting.

Remedial Investigation/Feasibility Study (RI/FS), Confidential Site, Harriman, New York. Mr. Howard served as Project Manager for an RIFS at this site where soil and groundwater were contaminated by volatile organic compounds. Sampling of the downgradient public water supply well indicated that these compounds were detectable. The RI included the characterization of residual soil contamination in a previously remediated disposal area, the characterization of site hydrogeologic conditions, and the assessment of potential human health and environmental risks posed by the site. The FS included a detailed evaluation of alternatives, which resulted in the recommendation that continued pumping of the existing water supply well and groundwater treatment with the existing air stripper system would be protective of human health and provide for the long-term control of low concentrations of the volatile organic compounds in groundwater.

Solid Waste Permitting, International Paper Co., Ticonderoga, New York. Project Hydrogeologist for a landfill permit renewal project for International Paper Company's Ticonderoga, New York mill. Managed the completion of a detailed hydrogeologic investigation. Fieldwork consisted of: a seismic refraction survey for depth to bedrock determination; the installation and sampling of twenty five monitoring wells and piezometers, many of which were double-cased bedrock wells; and, the performance of downhole packer and in-situ hydraulic conductivity aquifer tests. The significant amount of geologic, hydrogeologic and geochemical data was generated was compiled into a comprehensive hydrogeologic report, in accordance with 6 NYCRR Part 360 regulations.

Solid Waste Permitting, Confidential Client., western New York. Project Hydrogeologist for a landfill expansion permit project. Managed the completion of a hydrogeologic investigation. Fieldwork consisted of: downhole natural gamma logging to correlate site stratigraphy, the installation and sampling of multiple zone monitoring wells and piezometers; and, the performance of downhole packer and in-situ hydraulic conductivity aquifer testing. Comprehensive Part 360 Hydrogeologic Report is on-going.

Environmental Restoration, American National Can Company, Oakland, California. Mr. Howard was Project Hydrogeologist for the site-wide environmental restoration of a large industrial manufacturing facility in northern California. While the facility had been decommissioned and redeveloped as a major retail center, the site contained six areas where leaking USTs, pipelines and hazardous waste storage facilities contributed to subsurface contamination of soils and groundwater by volatile and semi-volatile organic, PCBs, and heavy metals. Site characterization was further complicated by the encroachment of waste oil from an adjacent abandoned property. Mr. Howard prepared and implemented work plans to characterize the site's hydrogeology and the nature and extent of soil and ground water impact. He and his team then prepared a final subsurface investigation report for the facility. He also prepared and directed the implementation of soil and ground water remedial work plans, and the Final Closure Plan for two RCRA Hazardous Waste Storage Facilities.

Environmental Restoration, American National Can Company, Danbury, Connecticut. Task manager for the investigation and remediation of PCB contaminated

(TSCA hazardous) soil and groundwater. Prepared subcontractor specifications and work plans. Directed the excavation of approximately 1500 cubic yards of contaminated soil from isolated areas around the facility and the collection and removal of free product and contaminated groundwater.

Hydrogeologic Investigation/Environmental Restoration, American National Can Company, Sparrows Point, Maryland. Project Hydrogeologist for a subsurface investigation at this industrial facility. Designed a program to characterize baseline groundwater quality and to assess potential soil contamination resulting from a network of LUSTs. He directed the remediation of petroleum and solvent contaminated soils.

Remedial Investigation, General Electric Company, Philadelphia, Pennsylvania. Project Manager/Hydrogeologist for the investigation and remediation of LNAPL and PCB contamination at this facility in southeast Pennsylvania. The investigation included the installation of monitoring wells, hydrogeologic site characterization, and the maintenance of a multi-well system which recovers PCB contaminated oil released from a leaking underground pipeline.

Professional Affiliations

Association of Ground Water Scientists and Engineers (National Ground Water Association)
Hudson-Mohawk Professional Geologists Association

Publications/Presentations

Hydrogeologic and Soil Gas Evaluation of Groundwater Contamination at a Municipal Landfill in New York State, co-author, FOCUS Conference on Eastern Regional Groundwater Issues, 1988.

An Air-Lift Development System for Deep Wells, primary author/presenter, FOCUS Conference on Eastern Regional Groundwater Issues, 1988.

Employment History

1998-present	Earth Tech, Inc. (acquired Rust Environment & Infrastructure)
1993-1998	RUST Environment & Infrastructure
1986-1993	Dunn Corporation (merged into RUST)
1984-1986	Saranac Petroleum, Inc.
1982-1984	Petroleum Logging Services, Midland, Texas

Helen H. Mongillo
Environmental Engineer/Hydrogeologist

Education

M.S., 1987, Geological Engineering, University of Missouri-Rolla
B.A., 1985, Geology, State University of New York at Potsdam

Professional Registration

Pennsylvania Certified Professional Geologist #PG-002631-G

Experience

Ms. Mongillo's experience at RUST has been principally with the investigation of environmental conditions at hazardous waste disposal sites and the evaluation of site remedial actions. Ms. Mongillo has been directly responsible for remedial investigations (RI) and feasibility studies (FS). She has served as project manager and project hydrogeologist on CERCLA and RCRA projects for government clients including New York State Department of Environmental Conservation (NYSDEC) and major industrial clients including Occidental Chemical Corporation (OCC) and General Electric. Her technical expertise includes developing conceptual designs and cost estimates for treatment alternatives at hazardous wastes sites, groundwater modeling and other computer methods for quantitative evaluation of hydrogeologic conditions, as well as all forms of environmental data gathering and compilation, and hydrogeologic field investigation. Her management skills include preparation of work plans, quality control and health and safety plans, and client reports, developing budgets, tracking and managing costs and schedules (using PS6 project management software), and managing field activities, subcontractors and laboratories.

Project Experience

Feasibility Studies/Remedial Action Plans

Feasibility Study, NYSDEC, Cumberland Bay PCB Sludge Bed Site, Plattsburg, New York. Project Manager. Developed and evaluated remedial alternatives as part of an FS to address remediate a PCB contaminated sludge bed adjacent to the Bay shoreline. Technologies evaluated included removal of sludge through dredging, control of resuspended sediments and on-site and off-site disposal.

Feasibility Study, Waste Management Inc., Gaess Site, Harriman, New York. FS Task Manager. Through a detailed evaluation of alternatives, concluded that the an existing air stripper system was adequate for the long-term control of low concentrations of residual trichloroethene and tetrachloroethane in groundwater resulting from a remediated contaminated soil cleanup area.

Feasibility Study, General Electric, Malta Rocket Fuel Area (MRFA) Site, Malta, New York. Developed and evaluated remedial alternatives for the MRFA Site, a former rocket fuel testing facility. Site required cleanup of volatile organics in groundwater, and PCB, mercury and lead in soil. Used groundwater modeling (TWODAN) in support of feasibility study activities to identify

the optimum placement of recovery wells to estimate potential pumping rates and capture zones for various alternatives.

Feasibility Study, NYSDEC, Pelican Manufacturing Site, Jamestown, New York. FS Task Manager. Developed and evaluated remedial alternatives for the Pelican Site, a former metals finishing and fabricating business. Site required cleanup of volatile organics in groundwater, soil and sediment. Technologies evaluated included vapor extraction, pump and treat and air sparging. Analytical groundwater modeling (TWODAN) was used to identify the optimum placement and pumping rates of interceptor trenches or recovery wells under the pump and treat options.

Feasibility Study, NYSDEC, Lehigh Valley Railroad Derailment Site, LeRoy, New York. FS Task Manager. Assisted in the development and evaluation of remedial alternatives for groundwater and unsaturated bedrock contaminated with trichloroethene resulting from a railroad car spill. Technologies evaluated included enhancement of bedrock permeability through subsurface blasting or hydro-fracturing; horizontal recovery wells; bedrock vapor extraction; and air sparging.

Feasibility Study, Orange and Rockland County Utilities Site, Orange County, New York. Assisted in the FS preparation. Evaluated alternatives for remediating volatile organics in groundwater and PCBs in soil at a site adjacent to a river. Technologies evaluated included groundwater pump and treat, air sparging, vapor extraction, capping and soil excavation.

Feasibility Study, NYSDEC, Almy Brothers Site, Binghamton, New York. Assistant Project Engineer responsible for developing and evaluating remedial alternatives for clean-up of pesticide contaminated media (some classified as F027 wastes). Recommended technologies included on-site base-catalyzed dechlorination for site soils and sediment and carbon treatment of groundwater recovered from extraction wells.

Feasibility Study for Remediation of Groundwater/Leachate, Tannery Road Landfill, Rome, New York. Developed and evaluated several remedial alternatives for contaminated groundwater and leachate at an inactive landfill registered as a Class 2 on the NYS Registry of Inactive Hazardous Waste Sites. Used analytical model (TWODAN) to determine optimum placement of interceptor trenches and to estimate potential pumping rates and capture zones.

Feasibility Study/Remedial Action Plan, OXY-USA, Former Levey Ink Plant, Monmouth Junction, New Jersey. Assisted in preparing a feasibility study and remedial action plan for an industrial hazardous waste site with elevated levels of volatile and semi-volatile organic compounds and metals. Remedial technologies included soil excavation and consolidation in a former settling pond area, construction of an engineered soil cover and enhanced groundwater recovery and treatment.

Feasibility Study for a New York State Inactive Hazardous Waste Site, Syracuse, New York. Site contained elevated levels of chlorinated solvents in soil and groundwater. Used analytical groundwater models to predict the effect of pumping and recharge on groundwater flow for a variety

of remedial alternatives. These included pump and treat methods, vacuum extraction technologies and the construction of a slurry wall and cap.

Remedial Design/Operation and Maintenance Activities

Design of Landfill Closure and Remedial Action Plan, Tannery Road

Dense Nonaqueous Phase Liquid (DNAPL) Extraction Program, OCC Inlet, North Tonawanda, New York. Task manager for the design and installation of five DNAPL Extraction Wells. Performed analytical groundwater modeling for evaluating performance of the proposed extraction wells and of the DNAPL containment system. Designed DNAPL pump test program to evaluate the practicability of long-term DNAPL recovery. Prepared Operation & Maintenance Plan.

Groundwater Interceptor Trench Performance Monitoring, OCC Durez Facility, North Tonawanda, New York. From November 1990 to June 1992, prepared quarterly Groundwater Level Monitoring Program reports to evaluate the performance of an intercepter trench designed to control groundwater flow at a large industrial hazardous waste site. Included measurement of water levels at over 100 wells, chemistry monitoring in selected wells, preparing contour maps and hydrographs and interpreting results.

Remedial Investigations/Design Investigations

Remedial Investigation, NYSDEC, Almy Brothers Site, Binghamton, New York. RI Task Manager responsible for determining the extent of pesticide contamination in waste drums, surficial and subsurface soil, storm sewer and river sediment, air and groundwater for the purpose of evaluating site remedial alternatives.

DNAPL Design Investigation, OCC Inlet, North Tonawanda, New York. Project Hydrogeologist for investigation to determine the extent and migration pathways of a subsurface pool of DNAPL, and to characterize the site geology for design of a recovery well and cutoff wall DNAPL containment system.

Site Investigation (SI), Genessee Sand and Gravel Site, Western, New York. Project Hydrogeologist for investigation at Class 2a site on the NYS Registry of Inactive Hazardous Waste Sites. Project involved review of historical documents, a hydrogeologic investigation and environmental monitoring. Used current EPA PA-Score hazard ranking system software for preparation of the site preliminary assessment score. The site investigation report and site score were approved by the NYSDEC and the site was subsequently removed from the NYS Registry.

Soil and Groundwater Investigation and Remedial Program, American National Can Company, Hammond Facility, Hammond, Indiana. Project Hydrogeologist for evaluation of potential groundwater impact from contamination associated with historic releases from underground heating oil storage tanks and above ground solvent storage tanks. Prepared groundwater and soil investigation plans and assisted in determining areas requiring soil remediation (excavation). Investigations were performed in accordance with Indiana tank closure requirements.

Stormwater and Erosion Control Plans

Stormwater Management Plan, Waste Management, Inc., Mohawk Valley, New York. Prepared storm water management plan to control surface water runoff and erosion in accordance with NYCRR Part 360 and NYS Guidelines for completion of a landfill closure plan for a new landfill. Used TR55 and POND2 methodologies for evaluating peak discharge in drainage channels and sedimentation basins.

Landfill Closure Plan, International Paper, Ticonderoga, New York. Prepared storm water management plan for closure of an unlined landfill.

Stormwater Management Plan for a Mining Permit, Redwing Mine, Dutchess County, New York. Prepared a stormwater and erosion control plan for operating conditions of an aggregate mine, as part of a mining permit. Stormwater control plan was approved without comment.

Dewatering/Hydrogeologic Investigations

Dewatering Evaluation for a Surface Consolidated Mining Facility, Vermont. Quantitative evaluation of pumping test and in-situ permeability test results for the purpose of determining the effect of mine dewatering on nearby groundwater users.

Hydrogeologic Investigation for Aggregate Mine Permit Application, Upstate New York. Project hydrogeologist responsible for design of monitoring well network, drilling and monitoring well installation and hydraulic conductivity testing. The investigation results were used to characterize groundwater flow and predict aquifer behavior.

Additional Training/Professional Affiliations

RUST Quality Through Teamwork Education Program Facilitator, 1994-present
Environmental Regulations Course, Executive Enterprises, 1989
Rust Corporate Discipline Program - East Region Steering Committee Representative
National Ground Water Association (Association of Groundwater Scientists and Engineers)

Employment History

1993-Present	Rust Environment & Infrastructure (RUST)
1987-1993	Dunn Corporation (merged into RUST)
Summer 1986	SCS Engineers
Summer 1985	Dunn Corporation

1/97

MARK A. WILLIAMS

ENVIRONMENTAL GEOLOGIST

EDUCATION

M.S.	1990	Environmental Science	SUNY-ESF Syracuse, New York
B.S.	1986	Geology	East Carolina University, Greenville, North Carolina

REGISTRATION & CERTIFICATIONS

Certified Hazardous Site Worker, OSHA 1910.120(e)(2)
Certified Hazardous Site Supervisor, OSHA 1910.120(e)(3)
Professional Geologist, Commonwealth of Pennsylvania - Department of State Bureau of Professional and Occupational Affairs.

PROFESSIONAL EXPERIENCE

Mr. Williams has 10 years of experience as a professional environmental geologist, focused in geology, hydrogeology and environmental consulting. He serves as a project scientist, field supervisor and task manager for various environmental contamination assessment projects and geologic/hydrogeologic investigations. He has ten years of experience conducting and overseeing multi-tasked subsurface investigations at active/inactive landfills and industrial/commercial facilities throughout the State of New York. As a field and project geologist with Earth Tech, Mr. Williams has coordinated and supervised several remediation and remedial construction projects, investigated numerous sites contaminated due to spills and/or leaking underground storage tank (LUST) facilities and performed inspections associated with Operation and Maintenance (O&M) programs. He has also performed Phase I/Phase II environmental due diligence evaluations associated with real estate transactions of industrial and manufacturing facilities, as well as commercial properties.

Mr. Williams has been responsible for borehole and corehole geologic logging, installation of numerous monitoring wells, piezometers and recovery wells by mud and air rotary, air hammer, auger and coring methods, aquifer testing and analysis and the collection of environmental samples. His considerable field experience has allowed him to develop extensive skills in analyzing and describing subsurface conditions. His project tasks include the development of project work plans, sampling and analysis plans and health and safety plans. He also coordinates field investigation activities, oversees and trains staff level personnel, conducts technical research, data evaluation and analysis and report writing.

Remedial Investigation/ Feasibility Study, ORU-West Nyack Service Facility, West Nyack, New York. (1996) Orange and Rockland Utilities, Inc. Mr. Williams provided field supervision and served as project hydrogeologist for a subsurface investigation of a former 10,000 gallon UST Area, former Dry Well and a Suspected Transformer Disposal Area. Supervised the drilling of forty-

five soil borings, drilling and installation of three monitoring wells and subsurface exploration of three test pits. Additional activities included borehole, corehole and test pit logging, collecting sediment, surface water and groundwater samples, surficial geologic mapping, aerial photo interpretation, hydraulic conductivity testing, review and analysis of new and existing data and aided in the determination of the nature and extent of subsurface soil and groundwater contamination.

Remedial Investigation - Philmar Electronics Site, Morrisonville, New York. (1992/1993) NYSDEC. The Philmar Site is an inactive hazardous waste site where groundwater was contaminated by chlorinated volatile organic chemicals and petroleum hydrocarbons as a result of waste spills and disposal on the property. Mr. Williams served as the project hydrogeologist for the entire Project. Tasks included supervision of field activities, surface and subsurface soil sampling and logging, groundwater monitoring well construction supervision, borehole and monitoring well log preparation, well development, groundwater sampling, hydraulic conductivity testing, data evaluation and analysis and report writing. Objectives of the Investigation were to determine the extent of groundwater contamination at the Site for the purpose of evaluating site remedial alternatives. Based on the results of the RI/FS, the NYSDEC selected a remedy for the site which provided for installation of a recovery trench in the weathered till, treatment of recovered groundwater, and disposal of water in an on-site infiltration field.

Remedial Construction Oversight - Philmar Electronics Site, Morrisonville, New York. (1994/1995) NYSDEC. As a field manager, Mr. Williams provided field construction management of remedial activities (oversight of recovery trench and infiltration field construction) at the Philmar Electronics Site. As assistant construction manager and project hydrogeologist, responsibilities included: supervising and coordinating the activities of all on-site contractors, review of submittals, approval of subcontractors' invoices, inspection of equipment installation, daily oversight and tracking of excavation, oversight of the installation of recovery trench and discharge piping, oversight of installation of a permeable soil cap, performing required inspection and quality assurance testing, yield testing and the collection of treatability samples. Based on water quality and yield tests performed on the recovery trench after construction, design plans were subsequently prepared for the treatment system. The treatment system design included thermal enhanced air stripping followed by filtration and activated carbon adsorption. In late 1995, the treatment system was built and the recovery and treatment system was put into operation in early 1996.

Environmental Liability Assessment/Subsurface Investigation, Newell, West Virginia. (1994) MCI. Mr. Williams was a project hydrogeologist/environmental scientist that performed test pit supervision, soil logging, oversight of monitoring well installation and groundwater sampling for a pre-purchase site assessment of a specialty chemicals manufacturing facility in northwestern West Virginia. The project involved a hydrogeologic investigation, environmental monitoring, review of historical files and calculation of a preliminary liability assessment score. Mr. Williams also provided project management, technical direction and supervision, data compilation and reporting. The liability assessment focused on the level of current regulatory compliance, the possible effect

of future regulations on the operating ability of the plant, and the condition of soil and groundwater quality at the site. After review of our report, the client did not pursue further acquisition efforts.

East Street/Lyman Street Site Investigation, Pittsfield, Massachusetts. (1994) General Electric. Mr. Williams served as project hydrogeologist and project manager for a remedial investigation/pilot study focused on determining the extent of DNAPL in subsurface soil and groundwater at the EPA-regulated Site. Responsibilities included: supervision of field activities, soil sampling and logging, supervision of groundwater monitoring well, piezometer and recovery well construction, borehole and monitoring well log preparation using gINT software, well development using compressed nitrogen, groundwater sampling, hydraulic conductivity testing, data evaluation and analysis and report writing.

Domestic Well and Initial Environmental Sampling Report (IRM), Lehigh Valley Railroad Derailment Site, LeRoy, New York. (1993) NYSDEC. Objectives of the investigation were to determine the extent of TCE and cyanide contamination in surficial and subsurface soil, river sediment, and groundwater (bedrock) at the Site for the purpose of evaluating site remedial alternatives. Mr. Williams was the task manager and health and safety officer for this phase of the investigation. He supervised the logging and sampling of over twenty test pits, using Level C health and safety protection, at a railroad derailment site where liquid trichloroethane (TCE) and crystalline cyanide were spilled. In addition, he served as the air monitoring/field health and safety officer during initial sampling activities using real-time direct reading instruments and indirect sampling techniques for organic vapors and respirable particulate. Activities included collecting work zone/perimeter monitoring for volatile organic contaminants and cyanide particulate to determine effects of sampling activities on adjacent properties. Mr. Williams also conducted personnel monitoring for a number of other contaminants using various collection methods. During later stages of the Investigation, Mr. Williams performed groundwater sampling, hydraulic conductivity testing and data analysis of all fifty-five newly-installed bedrock monitoring wells.

Remedial Investigation - Almy Brothers Site, Binghamton, New York. (1992) NYSDEC Objectives of the investigation were to determine the extent of pesticide contamination in waste drums, surficial and subsurface soil, storm sewer and river sediment, air and groundwater at the Site for the purpose of evaluating site remedial alternatives. Mr. Williams was the project geologist and performed the following tasks: supervision of field activities, surface and subsurface soil sampling and logging, groundwater monitoring well construction supervision, borehole and monitoring well log preparation, well development, groundwater sampling, drum sampling (Level B), hydraulic conductivity testing, data evaluation and analysis and report writing. The investigation results were used to evaluate the nature and extent of pesticide and dioxin contamination and to collect design information necessary for selection of a remedial system.

Engineering Investigation at Construction and Demolition Debris Sites - Final Preliminary Site Assessment, upstate and southern New York State. (1990/1991) NYSDEC. Conducted Phase II investigations under contract to the NYSDEC at seven Class 2A construction and demolition debris landfills located in upstate and southern New York State. The objective of these investigations was to determine if hazardous waste was disposed of at any of these Sites. Mr. Williams, providing assistance as a task manager, was involved with the development of a generic work plan, generic quality assurance project plan (QAPP), site-specific health and safety plans and preliminary site assessment reports. Mr. Williams also served as field/project geologist for one site in Columbia County (LaMunyan) and one site in Greene County (Ferro). Tasks performed in the field included test trench logging, geologic research and field mapping, soil logging/waste characterization and sampling and drum sampling. In addition, he also collected air samples for hydrogen sulfide using real-time direct reading and indirect sampling techniques. Other responsibilities included oversight and coordination of project personnel for completion of field tasks, evaluation/interpretation of hydrogeologic and analytical data and the organization and preparation of project report(s). Investigation concluded that hazardous wastes were not present at these Sites.

Nineteen (19) Class 2A Preliminary Site Assessments, New York State. (1990/1991) NYSDEC. Subtask manager of a multi-site work assignment for the NYSDEC - Division of Hazardous Waste Remediation. The focus of these multi-task investigations was to determine whether the disposal of hazardous waste, as defined by 6 NYCRR Part 371, is documented at these sites, and if so, to determine whether they present a potential threat to public health and/or the environment as a result of the presence of hazardous waste. Responsibilities included the development and implementation of site-specific scopes of work, data interpretation and report preparation.

Hydrogeologic Investigation of Valley Phase II Area - High Acres Landfill and Recycling Center, Perinton, New York. (1998 - Present) Waste Management, LLP Mr. Williams served as project hydrogeologist and supervised the excavation of fourteen test pits, drilling and installation of nine monitoring wells, five piezometers and five test borings. Performed borehole and corehole logging, packer testing, well development and hydraulic conductivity testing. In addition, he reviewed and analyzed new and existing data and prepared the site investigation report.

Subsurface Investigation Report for Proposed Phase III Landfill Development, Ticonderoga, New York. (1994-1997) Mr. Williams, field hydrogeologist, provided field supervision of a hydrogeologic investigation as part of a permit application for a lateral expansion of an existing solid waste management facility. The investigation included the design of the monitoring well network, test pitting, drilling, borehole and corehole logging, geotechnical sampling, monitoring well installation, packer testing, hydraulic conductivity testing, groundwater sampling using Well Wizard™ equipment. The investigation results were used to characterize groundwater flow, assess groundwater quality and to develop design information necessary for landfill cell construction.

Engineering Report for Cement Kiln Dust Monofill Expansion, Ravena, New York. (1994) Blue Circle Cement, Inc. Project hydrogeologist responsible for design of monitoring well network and supervision of field activities including: drilling, monitoring well and piezometer installation, well development, hydraulic conductivity testing and surface, sediment and groundwater sampling. He also evaluated the geologic and hydrogeologic data and aided in the NYSDEC-approved Engineering Report. Tasks included the following: regional and site geologic and hydrogeologic characterization, preparation of groundwater contour maps utilized in the design of the northern expansion footprint, determination of causes for groundwater elevation fluctuation, determination of potential groundwater monitoring zones and the establishment of a long-term groundwater monitoring system.

Hydrogeologic Investigation of Proposed Papermill Byproduct Management Facility, South Glens Falls, New York. (1993) Serving as project hydrogeologist, Mr. Williams performed site screening and ranking, supervised the drilling and installation of over twenty-five monitoring wells, test pit supervision, borehole and corehole logging, packer testing, collecting groundwater and surface water samples and hydraulic conductivity testing. In addition, he reviewed and analyzed new and existing data, prepared the site investigation report and provided analysis of solid waste/environmental impact on areas relating to solid waste treatment for a Draft Environmental Impact Statement of a proposed development area.

Supplemental Hydrogeologic Investigation/Engineering Report and Remedial Design for Groundwater/Leachate Interceptor Trench, Seneca Falls, New York. (1991) Seneca Meadows, Inc. Mr. Williams was the task manager and project hydrogeologist on this Project. Responsibilities included field supervision of a hydrogeologic investigation as part of a permit application for one of the largest solid waste landfills in New York State. The investigation included design of a monitoring well network, test pitting, drilling, borehole and corehole logging, monitoring well installation, hydraulic conductivity testing, geotechnical and groundwater sampling and participated in meetings with regulatory agencies. The investigation results were used to evaluate the nature and extent of groundwater contamination, to characterize groundwater flow and to develop design information necessary for development of a remedial system.

Monitoring of Free-Product at the Gulf Terminal, Port of Rensselaer, New York. (1996) Chevron. Mr. Williams was a field hydrogeologist for the preparation of a site investigation report for a former owner of a petroleum storage terminal. Tasks included the supervision of geoprobe drilling, collection and logging of subsurface soils, evaluation of the existing monitoring well network, extension of select monitoring wells in the West Yard and the collection and review of quarterly depth to product / depth to water measurements.

Leaking UST Investigation, Verona, New York. (1995) Freihofer Baking Company. Mr. Williams was a project hydrogeologist for a project involving the evaluation of an existing groundwater pump and treat/soil venting system. Based on the results of this evaluation, Mr.

Williams supervised drilling by geoprobe and hollow stem auger techniques, logged subsurface soils, installed monitoring wells, developed the newly-installed and existing monitoring wells, collected groundwater samples and conducted additional historical research. The investigation results were used to delineate impacted subsurface soils and groundwater, to characterize groundwater flow, to evaluate if off-site sources contributed or were responsible for the petroleum contamination and to develop design information necessary for the development of an effective remedial system. A new system consisting of a shallow tray air-stripper and recovery wells was selected, designed and subsequently installed.

Leaking UST Investigation and Tank Removal, Whitehouse, Ohio. (1994) American National Can Company. Mr. Williams served as a task geologist for a project which involved the drilling of soil borings, collection of subsurface soil samples for headspace screening and laboratory analysis, characterization of impacts to subsurface soil and groundwater, removal of underground storage tanks and off-site disposal of contaminated soils.

Field Activity/Odor Control Report, Metz Construction and Demolition Debris Landfill, South Bethlehem, New York. (1993) WMI. Mr. Williams provided field supervision and served as project hydrogeologist for a subsurface investigation and fire abatement study at a permitted construction and demolition debris landfill. Services included the installation and monitoring of temperature probes, temperature probing, health and safety monitoring and supervision of boring and grouting activities. Tasks also included geologic and geotechnical logging, subsurface soil sampling, coordination of field activities, installation of monitoring wells, groundwater sampling, data evaluation and report preparation for this project.

Professional Memberships

National Water Well Association (Association of Groundwater Scientists and Engineers)
National Solid Waste Management Association
Hudson-Mohawk Professional Geologists Association

Presentations, Publications, Awards

Presentations

"Secondary Material Utilization." University of Montreal, Environmental Issues Symposium, 1988.

Awards

Utilization Award - 1991, Dunn Corporation

Robin Hood Oak Award - 1988, SUNY - Environmental Science and Forestry College

Who's Who Among Colleges and Universities - 1989, SUNY-Environmental Science and Forestry College

W.A. Tarr Award - 1986, Sigma Gamma Epsilon - Epsilon Phi Chapter, East Carolina University

Outstanding Senior Award - 1986, Department of Geology, East Carolina University

EMPLOYMENT HISTORY

1998-Present	Earth Tech, Inc.
1993-1998	RUST Environment & Infrastructure (merged into Earth Tech, Inc.)
1989-1993	Dunn Corporation (merged into RUST)
1987-1989	SUNY - Environmental Science and Forestry College
1986 (Summer)	Dunn Geoscience Corporation

2/99

C. BRETT MONGILLO

MANAGER, CHEMISTRY SERVICES

EDUCATION

BS 1986 Chemistry University of Missouri- Rolla, Rolla, Missouri

REGISTRATIONS & CERTIFICATIONS

NYSDEC accepted third party data validation contractor.
NYSDEC accepted Immunoassay Field Technician.

PROFESSIONAL EXPERIENCE

Chemistry: Varied chemistry experience includes ten years of consulting in hazardous waste site investigations involving collection and on-site analysis of environmental samples. Conducted field and laboratory analyses involving gas chromatography and immunoassay technologies. Media of interest have included soil, water, surface samples, ambient air and soil gas. Ten years experience in data validation of analytical data deliverables for adherence to USEPA CLP protocols and NYSDEC ASP protocols. Consulting work also included interpretation of analytical data in reference to the condition of sites under investigation. Early employment experiences included analyst positions in laboratories conducting gas chromatography.

- Currently acting as QA/QC Officer on three NYSDEC Superfund remedial projects.
- Prepared Quality Assurance Project Plans (QAjPPs) and Sampling and Analysis Plans (SAPS) and acted as QA/QC officer for environmental investigation and remediation projects.
- Acted as technical advisor to management on numerous projects for the preparation of project work plans.
- Set up and managed field laboratories employing gas chromatographs with PID, FID, and ECD for the analysis of soil, water and soil gas.
- Coordinated and conducted numerous field investigations employing field screening techniques such as soil/water head space and soil gas analysis by gas chromatography and immunoassay analysis of soil, water and wipe samples for pesticides, herbicides, petroleum hydrocarbons and PCBs.
- Versed in the data quality objectives required by state and federal environmental analytical methods as well as validation criteria established by various state and federal agencies. Have employed this knowledge to assess the validity and usability of data

generated on many levels of environmental investigations and subsequently prepared data validation and usability reports to regulatory agencies.

Industrial Hygiene/Safety: Experienced in many areas of industrial hygiene including construction safety oversight, environmental project health and safety oversight, HASP preparation and review, HAZWOPER (OSHA 1910.120) initial and refresher training, exposure assessment monitoring, industrial health and safety compliance auditing, development of health and safety programs and procedures for industrial clients, and program-related client training. Expert in the use of typical personal exposure and ambient air quality sampling equipment, as well as real-time instrumentation used for indoor air quality assessments and HAZWOPER style investigations for health and safety monitoring (e.g., FID, PID, DataRam, SUMMA, CO, CO_2, LEL, calorimetric tubes, etc.). Safety experience includes extensive lockout/tagout, and machine guarding and confined space evaluations.

- Served as Site Safety Officer for slurry wall trenching and construction at a project in Schenectady, New York chemical plant. Excavation was conducted through heavily contaminated soil.

- Served as night shift safety officer during annual paper plant shut down in Fort Edward, New York. Was responsible for all aspects of safety over site and permit processing.

- Served as Site Safety Officer at a contaminated soil removal and thermal treatment project in Saratoga Springs, New York. Was responsible for all aspects of construction safety and air monitoring for project personnel and public safety.

- Prepared and conducted 40 hour (initial) and 8 hour (refresher) HAZWOPER training courses (OSHA 1910.120).

- Prepared written health and safety programs and policies for industrial clients. Also prepared and conducted associated safety training programs for these clients (e.g., hazard communication, confined space entry, respiratory protection, lockout/tagout, asbestos awareness, lead awareness, blood borne pathogens, emergency spill response, etc.).

- Prepared, or reviewed for completeness, numerous health and safety plans (HASPS) for environmental investigation and remediation projects.

- Served as Health and Safety Officer on numerous environmental investigation and remedial construction projects.

- Conducted full OSHA compliance audit of an abrasives manufacturing facility in Troy, New York. Project report included discussion of potential risk, root causes for non-compliance, immediate corrective actions, and long range managed solutions to prevent a reoccurrence of non-compliance.

- Conducted and managed quarterly assessment monitoring for silica exposure at an iron foundry in Hudson Falls, New York. Also conducted an initial noise exposure assessment and subsequent personal dosimetry at the same facility. Peripheral project work involved on-going consultation with the client on health and safety issues.

- Conducted machine guarding audit of electronics manufacturing facility in Schenectady, New York. The completed assessment detailed potential risks and suggested corrective actions.

- Prepared Job Hazard Assessments (JHA) and lockout/tagout procedures for over one hundred machines at an electronics manufacturing facility in Schenectady, New York.

PROFESSIONAL MEMBERSHIPS

Iroquois Section of the American Industrial Hygiene Association

EMPLOYMENT HISTORY

1998-present	Earth Tech, Inc. (acquired Rust Environment &Infrastructure)
1996-1998	Absolute Consulting Services (Sole Proprietorship)
1993-1996	ERM Northeast
1987-1993	Dunn Corporation (merged into RUST)

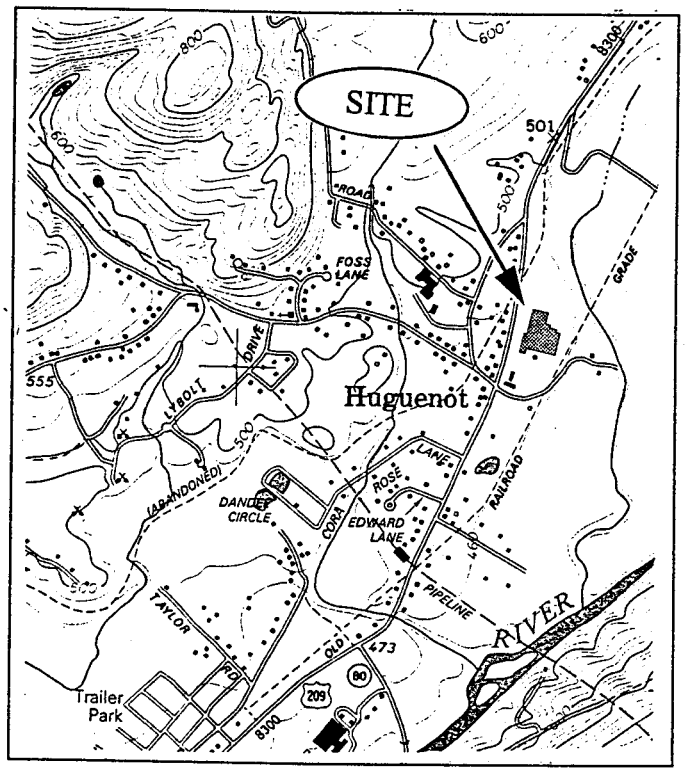
APPENDIX D

Remedial Investigation Fact Sheet

C&D Power Systems (C&D Batteries) Site
Current Operator: C&D Technologies, Inc.
Route 209, Huguenot, Orange County, NY
NYSDEC Site No. 336001

Amended Fact Sheet No. 1 November 1999

This is the first fact sheet in a series of fact sheets prepared to describe the status of the environmental investigation being conducted at the C&D Power Systems (C&D Batteries) Site located at C&D Technologies, Inc., Route 209, Huguenot, Orange County, New York. This site is listed in the New York Registry of Inactive Hazardous Waste Disposal Sites as Site No. 336001. This fact sheet describes the scope of the Remedial Investigation/Feasibility Study (RI/FS) which will be performed by the current operator of the site, C&D Technologies, Inc. This fact sheet was prepared in cooperation with the New York State Departments of Health (NYSDOH) and Environmental Conservation (NYSDEC).



SITE LOCATION

Background

From 1959 until at least 1968, the site was used by Empire Tube Corporation for the manufacture of black and white television picture tubes. In the manufacturing process, hydrofluoric acid was used to clean the picture tubes. Wastewater containing hydrofluoric acid was disposed of by Empire Tube Corporation in an on-site lagoon having a diameter of approximately 150 feet. In 1966, the NYSDOH filed a complaint against Empire Tube Corporation for the disposal of untreated sewage, industrial wastes and other wastes into the water of New York State. Violations of these standards were reported to occur until 1968.

Between 1982 and 1992 several investigations of the former Empire Tube Corporation site were completed. Fluoride was detected in groundwater. In 1988 and 1989, Gibbs & Hill, Inc. performed a comprehensive investigation of the site for NYSDEC designed to identify any contamination of concern at the site other than fluoride. Gibbs & Hill concluded that "there is no evidence of contamination or migration of contaminants from the site. Hence the site does not have an adverse impact on the environment." However, in May, 1990 NYSDEC conducted additional sampling which revealed the presence of fluorides in groundwater at levels exceeding the groundwater standard. On the basis of the fluorides detected as a result of the additional sampling, NYSDEC determined that the site presented a "significant threat to the environment" and classified the site as a Class 2 site. In 1992 NYSDOH performed testing of adjacent residential wells. No organic and no elevated inorganic contaminants were detected. C&D Technologies, Inc., the current operator of the Site, has entered into an Order on Consent with NYSDEC to conduct a Remedial Investigation (RI)/Feasibility Study (FS) at the site.

Purpose of the RI/FS

The main objective of the RI is to further identify and delineate the source or sources of the contamination (in this case fluoride), and to determine the extent of any migration of that contamination. The main objective of the FS is to evaluate remedial alternatives to eliminate or mitigate, to the maximum extent practicable, all health and environmental hazards resulting from hazardous waste disposal at the site. The RI/FS will also further investigate two areas which were previously determined by NYSDEC to contain elevated levels of inorganic substances, barium and lead, associated with the operations of Empire Tube Corporation.

The RI/FS Work Plan

As required by the RI/FS Order on Consent, a work plan has been prepared by C&D Technologies, Inc. which specifies the sampling, analysis, and reporting to be performed in connection with the site. Shallow soil samples will be taken from within and adjacent to the former lagoon area. Additional subsurface soil samples will be taken if necessary based upon the results of the shallow soil sampling. Groundwater samples will be taken from monitoring wells located around the former lagoon. Sediment samples will be taken from the stream which traverses the site. The samples will be sent to an analytical laboratory for analysis for fluoride and certain other organic and inorganic substances associated with the operations of Empire Tube Corporation. The work plan also addresses the process of evaluating remedial alternatives.

Report of Findings

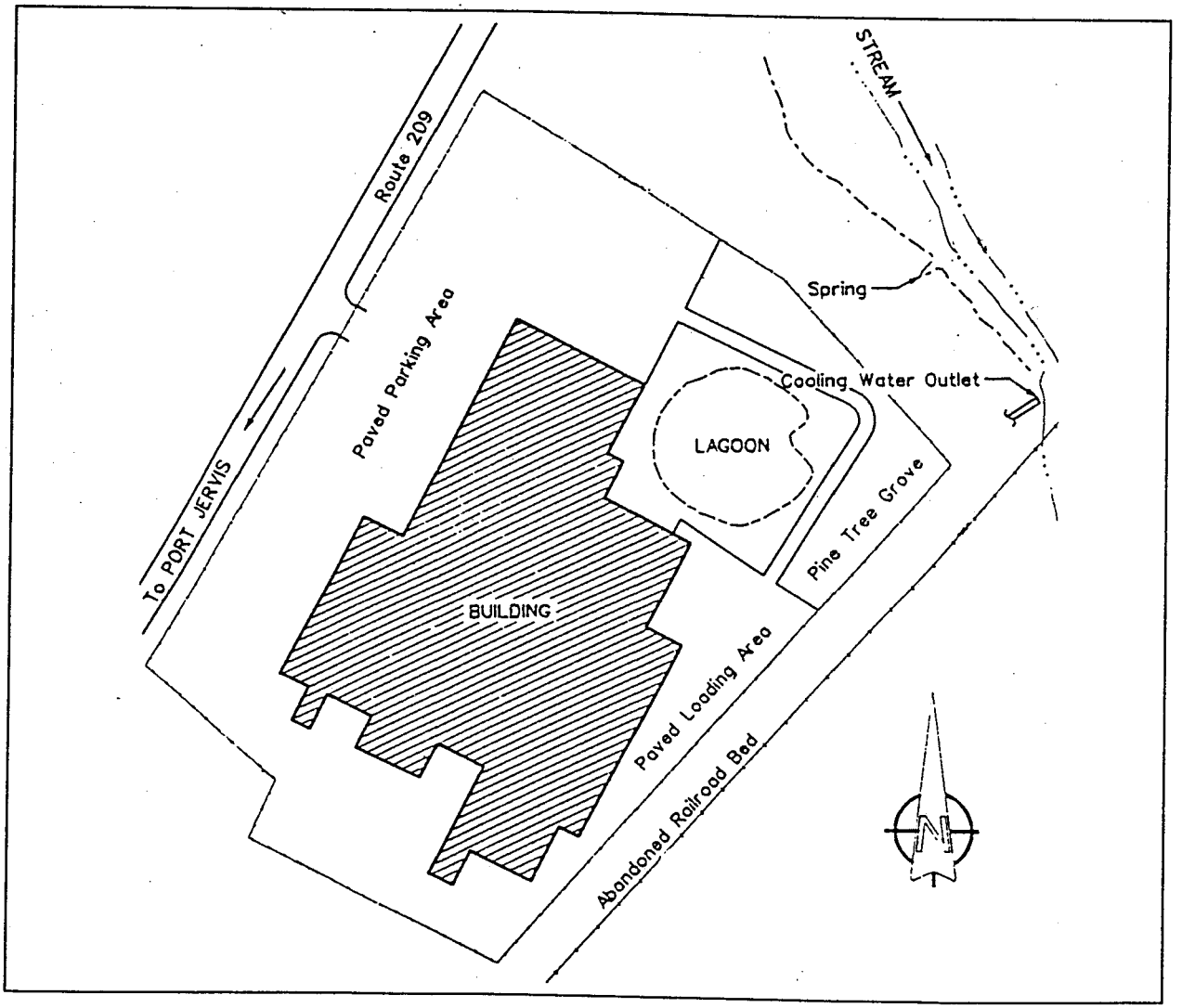
Pursuant to the Order on Consent, the progress of the RI/FS will be documented in monthly progress reports and the ultimate findings of the investigation will be reported

to NYSDEC in a Remedial Investigation Report and a Feasibility Study. The Remedial Investigation Report will include all data generated during the RI/FS.

The results of the RI/FS will be described in a future fact sheet and mailed to all parties on the site's Contact List.

Future Work

Following the completion and review of the RI/FS, NYSDEC will propose its preferred alternative by issuing a document for public review called the Proposed Remedial Action Plan (PRAP). Following public review and input, the PRAP may be modified. NYSDEC will then choose the cleanup alternative through a Record of Decision (ROD). The ROD documents NYSDEC's decision-making process.



SITE PLAN

Document Repositories

The following locations are accessible to the concerned public and maintain reports related to the site. The Order on Consent and the RI/FS Work Plan are presently available for review. Other reports and documents mentioned in this Fact Sheet will be placed in these repositories as they become available.

Port Jervis Library
138 Pike Street
Port Jervis, NY 12771
(914) 856-7313
Mon. and Thurs., 10 a.m. - 9 p.m.
Tues., Wed. and Fri., 10 a.m. - 6 p.m.
Sat. 9 a.m. - 5 p.m.

Town Clerk
Deerpark Town Hall
Drawer A
420 Rt. 209
Huguenot, NY 12746
(914) 856-5705
Mon. - Fri., 8 a.m. - 4 p.m.

NYSDEC, Region 3
21 South Putt Corner Road
New Paltz, NY 12561
(914) 256-3154
Mon. - Fri., 8:45 a.m - 4:45 p.m.

Public Participation

In addition to this Fact Sheet, NYSDEC, NYSDOH and C&D Technologies, Inc. are committed to keeping you informed and involved throughout the process of investigating and remediating this site. At a minimum, the Citizen Participation activities for this site will include:

Activity	Time
Set up Document Repositories	Start of RI
RI Fact Sheet	During RI
Fact Sheet for RI Results	End of RI Fieldwork
Mailing Describing Proposed Remedial Action Plan (PRAP) and Public Comment Period	During PRAP Stage
30-Day Public Comment Period for PRAP	During PRAP Stage
Public Meeting to Discuss PRAP	Within 30-Day PRAP Comment Period
Mailing Describing Selected Site Remedy and Response to Comments	After Remedy is Selected/Finalized

To help you to keep informed about activities at the site throughout the process, you are encouraged to take advantage of the site's document repositories and staff contacts listed below. For information about:

Environmental Concerns
Alicia Thorne
Project Manager
NYSDEC - Region 3
(914) 256-3153

Health-related concerns:
Geoff Laccetti
Public Health Specialist
NYSDOH
800-458-1158 X27880

Citizen Participation
Michael J. Knipfing
Citizen Participation Specialist
NYSDEC
(914) 256-3154

Citizen Participation
Mark Van Deusen
Public Health Liaison
NYSDOH
800-458-1158 X27530

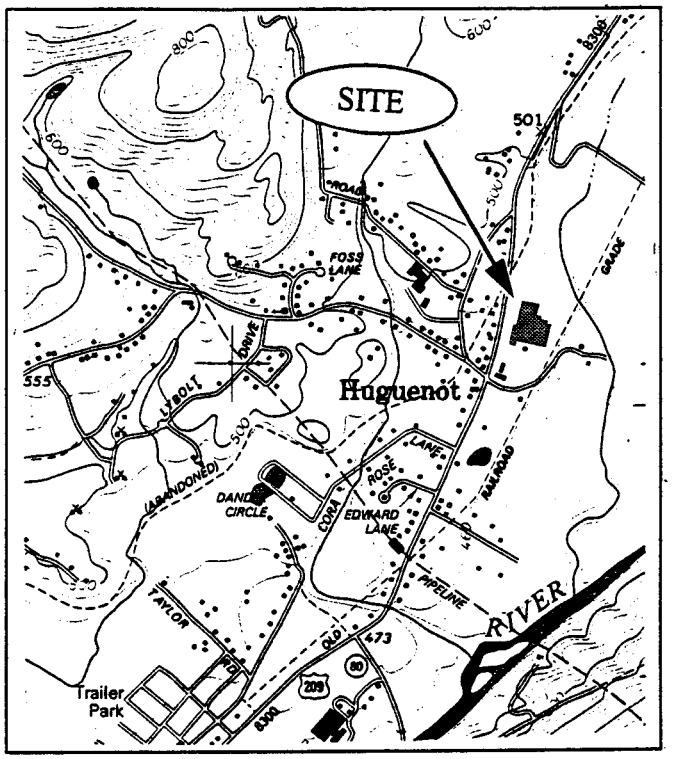
C&D Technologies, Inc. (C&D Batteries) Site

Route 209, Huguenot, Orange County, NY

NYSDEC Site No. 336001

Fact Sheet No. 1 February 1999

This is the first fact sheet in a series of fact sheets prepared to describe the status of the environmental investigation being conducted at the C&D Technologies, Inc. Site located on Route 209, Huguenot, Orange County, New York. This site is listed in the New York Registry of Inactive Hazardous Waste Sites as NYSDEC Site No. 336001. This fact sheet describes the scope of the Remedial Investigation/Feasibility Study (RI/FS) which will be performed by the current operator of the site, C&D Technologies, Inc. This fact sheet was prepared in cooperation with the New York State Departments of Health (NYSDOH) and Environmental Conservation (NYSDEC).



SITE LOCATION

Background

From 1959 until at least 1968, the site was used by Empire Tube Corporation for the manufacture of black and white picture tubes. In the manufacturing process, hydrofluoric acid was used to clean the picture tubes. Wastewater containing hydrofluoric acid was disposed of by Empire Tube Corporation in an on-site lagoon having a diameter of approximately 150 feet. In 1966, the NYSDOH filed a complaint against Empire Tube Corporation for the disposal of untreated sewage, industrial wastes and other wastes into the water of New York State. Violations of these standards were reported to occur until 1968.

Between 1982 and 1992 several investigations of the former Empire Tube Corporation site were completed. Fluoride was detected in groundwater. In 1988 and 1989, Gibbs & Hill, Inc. performed a comprehensive investigation of the site for NYSDEC

designed to identify any contamination of concern at the site other than fluoride. Gibbs & Hill concluded that "there is no evidence of contamination or migration of contaminants from the site. Hence the site does not have an adverse impact on the environment." However, in May, 1990 NYSDEC conducted additional sampling which revealed the presence of fluorides in groundwater at levels exceeding the groundwater standard. On the basis of the fluorides detected as a result of the additional sampling, NYSDEC determined that the site presented a "significant threat to the environment" and classified the site as a Class 2 site. In 1992 NYSDOH performed testing of adjacent residential wells. No organic and no elevated inorganic contaminants were detected. C&D Technologies, Inc., the current operator of the Site, has entered into an Order on Consent with NYSDEC to conduct a Remedial Investigation (RI)/Feasibility Study (FS) at the site.

Purpose of the RI/FS

The main objective of the RI is to further identify and delineate the source or sources of the contamination (in this case fluoride), and to determine the extent of any migration of that contamination. The main objective of the FS is to evaluate remedial alternatives to eliminate or mitigate, to the maximum extent practicable, all health and environmental hazards resulting from hazardous waste disposal at the site. The RI/FS will also further investigate two areas which were previously determined by NYSDEC to contain elevated levels of inorganic substances, barium and lead, associated with the operations of Empire Tube Corporation.

The RI/FS Work Plan

As required by the RI/FS Order on Consent, a work plan has been prepared by C&D Technologies, Inc. which specifies the sampling, analysis, and reporting to be performed in connection with the site. Shallow soil samples will be taken from within and adjacent to the former lagoon area. Additional subsurface soil samples will be taken if necessary based upon the results of the shallow soil sampling. Groundwater samples will be taken from monitoring wells located around the former lagoon. Sediment samples will be taken from the stream which traverses the site. The samples will be sent to an analytical laboratory for analysis for fluoride and certain other organic and inorganic substances associated with the operations of Empire Tube Corporation. The work plan also addresses the process of evaluating remedial alternatives.

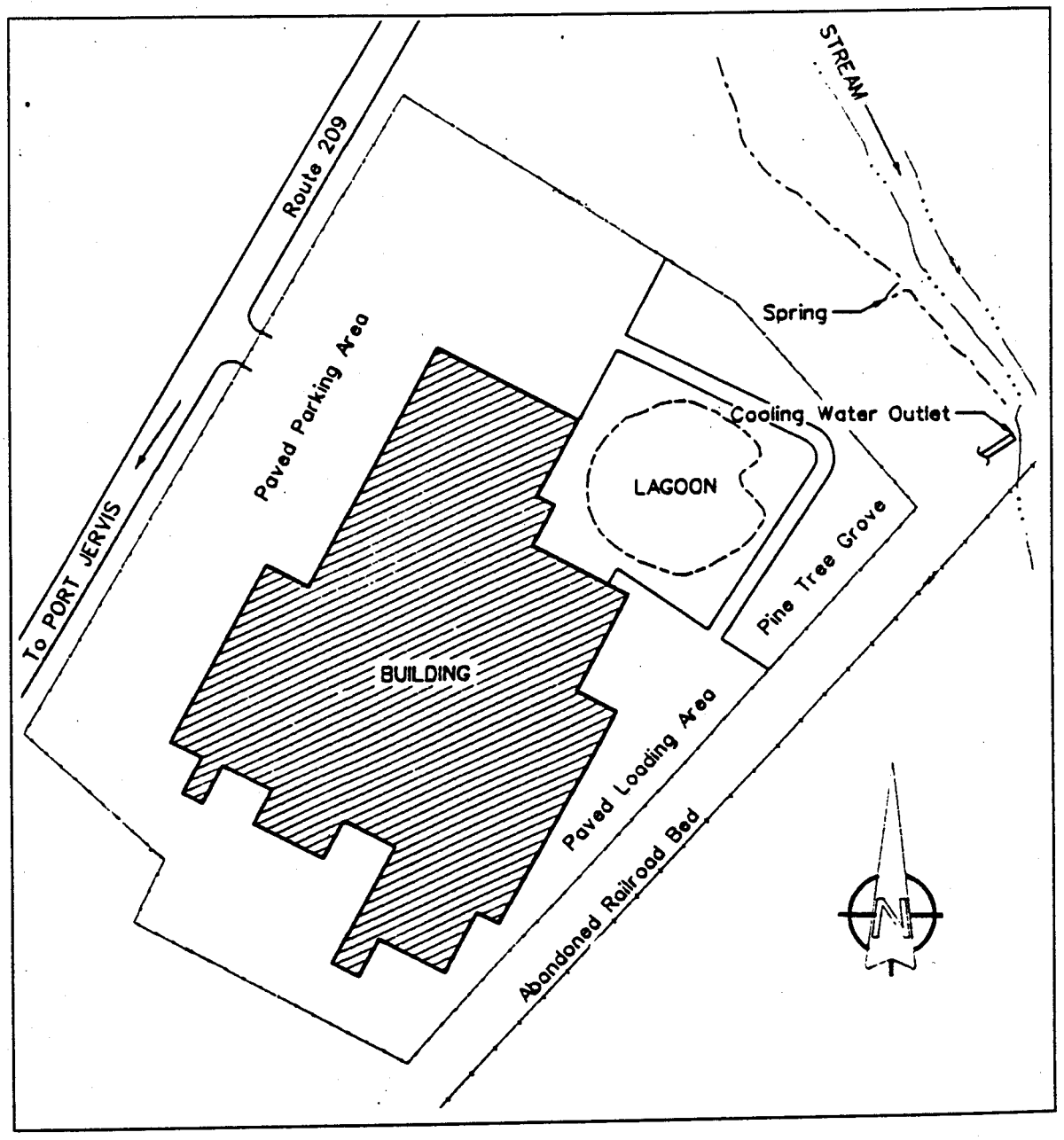
Report of Findings

Pursuant to the Order on Consent, the progress of the RI/FS will be documented in monthly progress reports and the ultimate findings of the investigation will be reported to NYSDEC in a Remedial Investigation Report and a Feasibility Study. The Remedial Investigation Report will include all data generated during the RI/FS.

The results of the RI/FS will be described in a future fact sheet and mailed to all parties on the site's Contact List.

Future Work

Following the completion and review of the RI/FS, NYSDEC will propose its preferred alternative by issuing a document for public review called the Proposed Remedial Action Plan (PRAP). Following public review and input, the PRAP may be modified. NYSDEC will then choose the cleanup alternative through a Record of Decision (ROD). The ROD documents NYSDEC's decision-making process.



SITE PLAN

Document Repositories

The following locations are accessible to the concerned public and maintain reports related to the site. The Order on Consent and the RI/FS Work Plan are presently available for review. Other reports and documents mentioned in this Fact Sheet will be placed in these repositories as they become available.

Port Jervis Library
138 Pike Street
Port Jervis, NY 12771
(914) 856-7313
Mon. and Thurs., 10 a.m. - 9 p.m.
Tues., Wed. and Fri., 10 a.m. - 6 p.m.
Sat. 9 a.m. - 5 p.m.

Town Clerk
Deerpark Town Hall
Drawer A
420 Rt. 209
Huguenot, NY 12746
(914) 856-5705
Mon. - Fri., 8 a.m. - 4 p.m.

NYSDEC, Region 3
21 South Putt Corner Road
New Paltz, NY 12561
(914) 256-3154
Mon. - Fri., 8:45 a.m - 4:45 p.m.

Public Participation

In addition to this Fact Sheet, NYSDEC, NYSDOH and C&D Technologies, Inc. are committed to keeping you informed and involved throughout the process of investigating and remediating this site. At a minimum, the Citizen Participation activities for this site will include:

Activity	Time
Set up Document Repositories	Start of RI
RI Fact Sheet	Start of RI
Fact Sheet for RI Results	End of RI Fieldwork
Mailing Describing Proposed Remedial Action Plan (PRAP) and Public Comment Period	During PRAP Stage
30-Day Public Comment Period for PRAP	During PRAP Stage
Public Meeting to Discuss PRAP	Within 30-Day PRAP Comment Period
Mailing Describing Selected Site Remedy and Response to Comments	After Remedy is Selected/Finalized

To help you to keep informed about activities at the site throughout the process, you are encouraged to take advantage of the site's document repositories and staff contacts listed below. For information about:

Environmental Concerns
Melissa Mastro
Project Manager
NYSDEC - Region 3
(914) 256-315

Health-related concerns:
Geoff Laccetti
Public Health Specialist
NYSDOH
(518) 458-6305

Citizen Participation
Michael J. Knipfing
Citizen Participation Specialist
(914) 256-3154

Citizen Participation
Nina Knapp
Public Health Liaison
(518) 458-6402

Toll-free NYSDEC: 1-800-342-9296
Toll-free NYSDOH: 1-800-458-1158 ext. 6402

PH2\288296.1

APPENDIX E

Citizen Participation Plan

CITIZEN PARTICIPATION PLAN
C&D FACILITY
SITE #3-36-001

Prepared for:

C&D Technologies
1400 Union Meeting Road
Blue Bell, PA

Prepared by:

Rust Environment &
Infrastructure
12 Metro Park Road
Albany, New York 12205

September 1998
Revised April 1999

Rust Environment & Infrastructure

TABLE OF CONTENTS

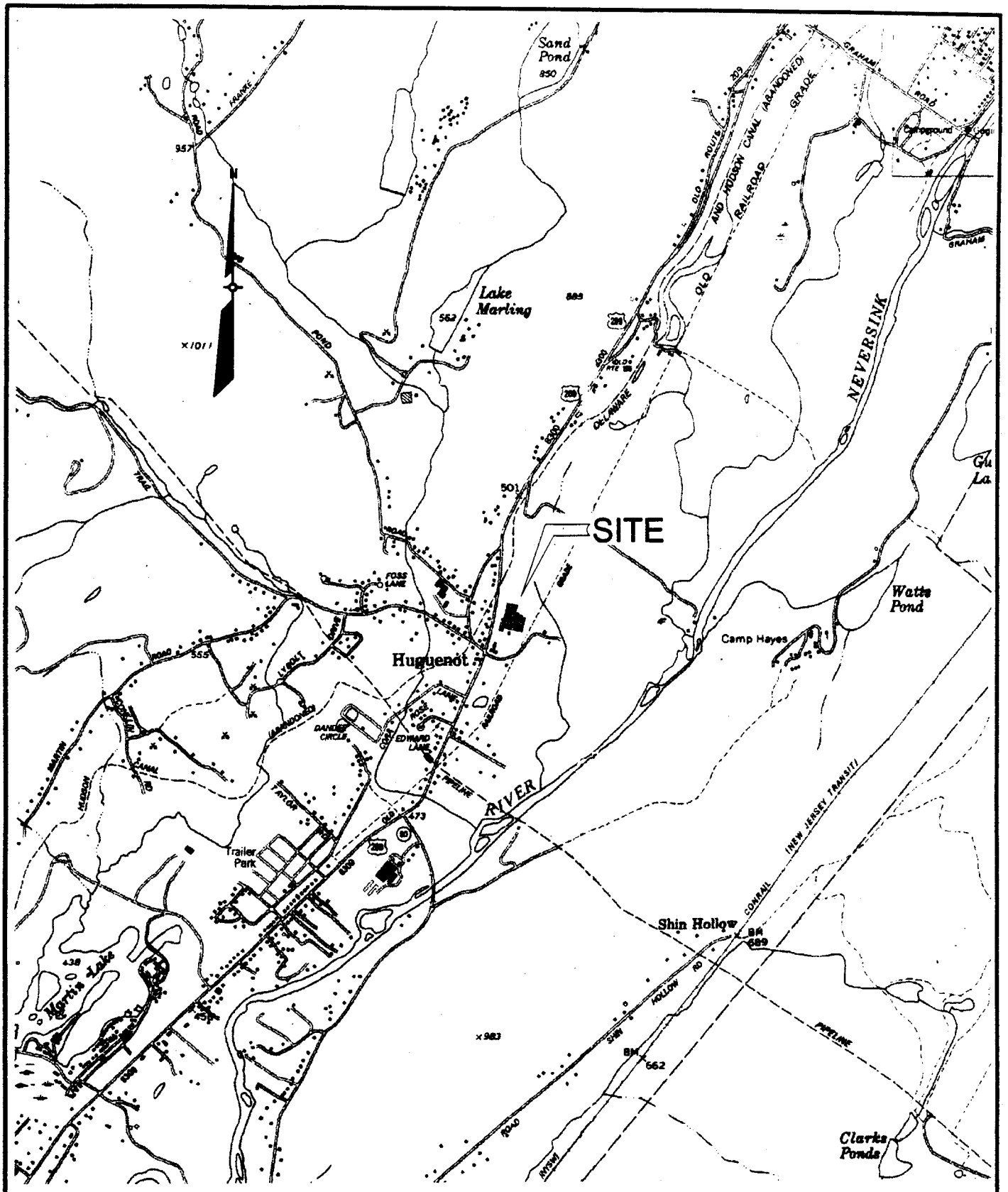
LIST OF FIGURES

1.0 INTRODUCTION

This document represents the site-specific citizen participation Plan for the C&D Facility located in Orange County in the Town of Deerpark, Huguenot, New York (see Figure 1). The purpose of this plan, as set forth in page 1 of the New York State Inactive Hazardous Waste Site Citizen Participation Plan, published by the New York State Department of Environmental Conservation (NYSDEC) and dated August 30, 1998, is as follows:

> "The New York State Department of Environmental Conservation (the Department or DEC) is committed to carry out an aggressive, proactive citizen participation program that emphasizes two-way communication and the involvement of all interested or affected citizens in the decision making process.
>
> Public understanding, confidence and involvement are essential to the success of New York State's Inactive Hazardous Waste Site Remediation Program. Citizen participation in the State's remedial program is essential to promote public understanding of New York State's responsibilities, plans and activities at inactive hazardous waste sites. Citizen participation is necessary for the Department to understand the public's concerns and develop comprehensive remedial programs that meet these concerns and are protective of public health and the environment."

Citizen participation is an essential component that will be fully integrated with the technical component to achieve the most effective and environmentally sound remedial program. This participation will be accomplished by identifying the affected and/or interested public, establishing a local repository for the review of site documents, providing adequate notice of availability of site documents and public meetings, assessing the public concerns and responding in an appropriate manner.



SOURCE:
NYSDOT 7.5 MIN. QUAD., PORT JERVIS NORTH AND OTISVILLE 1992 EDITION

RUST

Rust Environment & Infrastructure Inc.

FIGURE 1
SITE LOCATION MAP
C & D TECHNOLOGIES, INC.
TOWN OF DEERPARK
ORANGE COUNTY, NEW YORK

SEPTEMBER 1998

201476.10700

$$REF03$$
$$REF04$$
$$REF01$$
$$REF02$$
$$USER$$
$$PEN$$
$$PRF$$
$$DATE$$
$$DWG$$

2.0 BACKGROUND INFORMATION

2.1 SITE HISTORY

2.1.1 The C&D Facility

The facility is approximately 10 acres in size and is situated immediately east of Route 209 and approximately four miles northeast of the City of Port Jervis. The facility is located in the Neversink River Valley and is bordered on the west by Route 209 and on the north and east by a tributary to the Neversink River. The facility is currently operated by C&D. C&D has operated the facility since the mid 1970's.

2.1.2 The Site

Available information indicates that from 1959 to approximately 1970, the facility was used by Empire Tube Corporation (ETC) to process black and white picture tubes. Hydrofluoric acid was used in the process to remove carbon, potassium silicate, phosphorus and barium from the picture tubes. Historically, industrial process wastewater consisting of rinse waters, wash waters, and floor drainage was directed by ETC to a lagoon adjacent to the northeastern corner of the plant building. This lagoon was approximately 150 feet in diameter and between 15 to 16 feet deep. As reported in the Phase II Investigation Report, conducted on behalf of the NYSDEC by Gibbs & Hill (G&H), the process wastewater contained wash water, rinse water and floor drainage.

2.2 PREVIOUS INVESTIGATIONS

Dating back to 1981 and 1982, C&D has conducted investigations into the possible nature and extent of soil and groundwater contamination on the Site. The most recent investigative activity, conducted by NYSDEC personnel in 1990, consisted of fluoride groundwater monitoring at the Site. Results indicated that the on-Site fluoride levels were ten times greater than background values and also exceeded New York State's groundwater standard.

Although the Phase II Investigation, prepared by G&H, reported that there was no evidence of contamination or the migration of contamination from the Site, the NYSDEC reclassified the Site to Class 2 based on excessive fluoride levels in groundwater on the Site.

Although fluoride has been detected in groundwater, due to significant attenuation rates, fluoride has not been detected in either the sediment or surface water samples taken from the tributary to the Neversink River located approximately 350 feet from the plant building.

Presented below is a chronological list of previous investigations performed at the Site. A brief summary of activities performed and recommendations provided, based upon review of results and conclusions, from each investigation is also included.

May, 1964: New York State Department of Health (NYSDOH) inspected ETC's waste disposal system. Surface water and groundwater samples were collected on a monthly basis. Samples

collected from the spring emanating from a bank of the lagoon contained, on average, approximately 100 mg/l of fluoride. Samples from the nearby production well and tributary of the Neversink River exhibited fluoride levels of 0.0 to 5.5 mg/l and 8.0 mg/l, respectively. However, no action was taken by ETC.

September, 1966: Complaint filed by NYSDOH regarding discharge of various wastes into the waters of the State of New York. Complaint centered around the discharge of industrial wastes containing approximately 2,500 ppm of fluorides and unidentified concentrations of barium and silicates. These discharges exceeded water quality standards since February 1, 1963.

December 1981/January 1982: In connection with C&D's interest in expanding the plant building over the former lagoon, C&D retained Environmental Resources Management, Inc. (ERM) to perform a hydrogeologic assessment of the former lagoon and surrounding area. The objective behind this voluntary investigation was to gather data necessary to determine if the filling of the former lagoon would pose an adverse environmental effect on the Site and surrounding area.

Soil samples collected at the Site reported levels of lead, cadmium and zinc, possibly attributable to paint waste disposed by ETC, which exceeded the common range of inorganics in soil. Soil samples collected from the bottom of the former lagoon indicated fluoride concentrations ranging from 28 to 358 mg/kg. Groundwater samples collected demonstrated that water in the vicinity of the former lagoon were of "acceptable quality" except for fluoride concentrations (13 to 30 mg/l) which exceeded New York State's sanitary code for fluoride (2.2 mg/l).

These investigations identified the presence of fluoride in both the groundwater downgradient of the former lagoon and in soils at the bottom of the former lagoon. Lead was found in one well only. It is important to note that ERM concluded that fluoride and barium levels in subsurface soil and groundwater attenuated significantly with distance from the former lagoon.

November 14, 1983: The Site was classified as 2a in the New York State Registry of Inactive Hazardous Waste Sites. Class 2a is a temporary classification assigned to sites that have inadequate and/or insufficient data for inclusion in any other classification.

July 21, 1988 to March 1990: A Phase II investigation was completed by G&H in January 1989 to collect the necessary information to determine if any imminent and/or significant environmental or human health hazard existed as a result of the presence of hazardous wastes. In addition to a historical records search, additional sampling and analysis of groundwater, surface water and sediment was conducted. The G&H Phase II investigation reported that there was no evidence of contamination or the migration of contamination from the Site. It did, however, acknowledge the presence of lead in one groundwater well at levels above the Federal Primary Drinking Water standards. As noted above, the G&H Phase II Investigation did not include analysis of fluoride in the groundwater and subsurface soil in the former lagoon.

July 16, 1990: NYSDEC conducted additional groundwater monitoring and found fluoride levels at more than ten times background levels and exceeding the New York Class GA groundwater standard for fluoride of 1.5 mg/l. Subsequently, the Site was reclassified as a Class 2 site in the New

York State Registry of Inactive Hazardous Waste Sites. Class 2 designation means that the NYSDEC has determined that there is a significant threat to the public health or environment - action required.

2.3 NATURE AND EXTENT OF CONTAMINATION

Based upon the results from the ERM investigations, Phase II Investigation and other Site inspections/investigations, no elevated concentrations of volatile organic compounds, semi-volatile organic compounds, pesticides or PCBs were reported in subsurface soil, sediment, surface water from a tributary to the Neversink River or groundwater.

Fluoride has been detected in elevated concentrations in soils and in groundwater beneath and downgradient of the former lagoon, based upon analytical results obtained to date. Lead has been detected in elevated concentrations in soil and in groundwater at one monitoring well location. The lateral migration of fluoride appears to be limited. Based upon the existing data, off-site migration does not appear to have occurred within the overburden soil or shallow overburden groundwater. However, NYSDEC has requested that fluoride and metals (lead and barium) concentrations in soil at the former lagoon and in on-Site groundwater, sediment and surface water be further characterized.

3.0 PROJECT DESCRIPTION

3.1 REMEDIAL INVESTIGATION

Previous investigative results were reviewed to aid in scoping the Remedial Investigation (RI). The RI tasks presented below will provide the additional data necessary to characterize the nature and extent of hazardous waste at the Site as necessary for the development and evaluation of remedial alternatives in the Feasibility Study (FS). The following items are the primary components of the RI activities:

- Review of existing data and inspection of the existing monitoring network;
- Site mapping and topographic survey;
- Water level monitoring; development of existing monitoring wells and hydraulic conductivity testing;
- Groundwater sampling and analysis;
- Shallow soil sampling and analysis;
- Subsurface soil sampling and analysis;
- Sediment sampling and analysis;
- Validation of all new analytical data; and
- Report preparation.

3.2 FEASIBILITY STUDY

A Feasibility Study (FS) will be performed utilizing the stepwise approach outlined in EPA guidance. The first step involves the development of remedial action alternatives. These alternatives are screened, as necessary or appropriate, during the second step. The third and final step involves the detailed analysis of the remaining remedial alternatives according to the selection criteria specified in the National Contingency Plan (NCP). This process culminates in the recommendation of one or more remedial alternatives in the FS Report. This stepwise approach can be phased to maximize the value of data gathering and evaluation efforts performed in the RI, keeping the RI focused on collecting information pertinent to the selection of remedial alternatives.

A detailed evaluation of the remedial alternatives which remain following the preliminary screening will be conducted. This detailed evaluation will follow the process specified in the EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (Interim Final, October 1988) and "Guidance on Superfund Selection of Remedy" (July 1987) as well as NYSDEC Technical and Administrative Guidance Memorandum No. 4030 entitled "Selection of Remedial

Actions at Inactive Hazardous Waste Sites", dated September 13, 1989 and revised May 15, 1990. The seven criteria against which the remedial alternatives will be evaluated are:

- Overall protection of human health and the environment.
- Compliance with applicable New York State Standard Criteria and Guidelines (SCGS);
- Short-term impacts and effectiveness;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility or volume;
- Implementability (i.e., technical and administrative); and
- Cost (i.e., capital, annual operation and maintenance and present worth).

Two additional evaluation criteria, state and community acceptance, must be addressed by the NYSDEC in the Record of Decision (ROD).

Evaluation of these alternatives will be performed using a relative weighting system. Each evaluation criteria will be assigned a relative weighting factor. Each of the alternatives will be compared to each evaluation criteria and will be assigned a relative score representative of the alternatives' achievement of the goals of the evaluation criteria. Following completion of this evaluation, the results of the comparison of alternatives will be tested using a sensitivity analysis. Various design aspects of each alternative will be altered to reflect uncertainties in the design.

Following the evaluation of each remedial alternative, a comparative analysis will be performed to determine the relative performance of each remedial alternative against the seven criteria. The remedial alternative(s) or combination of alternatives which receives the highest evaluation will be recommended as the preferred alternative(s).

3.3 PROJECT SCHEDULE

The estimated duration of the Remedial Investigation is 42 weeks, with work to start within 45 days of signing of the Consent Order. The estimated duration of the Feasibility Study is 36 weeks. The overall estimated project duration is 52 weeks. A Gantt Chart that depicts the duration of the individual tasks which comprise the project is included in the RI/FS Work Plan.

4.0 CONTACT LIST

4.1 GOVERNMENT OFFICIALS

Federal Elected Officials

Senate
Alfonse D'Amato
520 Hart Senate Office Building
Washington, DC 20510
(202) 224-6542
Fax - 224-5871
E Mail - senator_al@damato.senate.gov

Daniel Patrick Moynihan
464 Russell Senate Office Building
Washington, DC 20510
(202) 224-4451
Fax - 228-0406
E Mail - senator@dpm.senate.gov

House of Representatives
Benjamin Gilman
2449 Rayburn House Office Building
Washington, DC 20515
(202) 225-3776
Fax - 225-2541
E Mail - ben@mail.house.gov

State Elected Officials

Senate
Charles D. Cook
512 Legislative Office Building
Albany, NY 12247
(518) 455-3181
E Mail - CCOOK@senate.state.ny.us

County and Town Officials

Orange County Legislator
Richard Roberts
139 E. Main Street
Port Jervis, NY 12771
(914) 856-6564
Fax - 291-4809

Assemblyman
Jacob E. Gunther, III
Legislative Office Building
Room 417
Albany, NY 12248
(518) 455-5355
Fax - 455-5239

City Officials (Port Jervis)

Mayor
R. Michael Worden
11 Rumsey Street
Port Jervis, New York
(914) 858-4017
E Mail - ptjervis@magiccarpet.com

4.2 ENVIRONMENTAL GROUPS AND OTHER INTERESTED PARTIES

Orange County Citizens Foundation
35 Matthews Street
P.O. Box 56
Goshen, NY 10924

Scenic Hudson
9 Vassar Street
Poughkeepsie, NY 12601

Richard Morse
Legislative Programs & Counsel Staff
NYS Assembly
Room 520, State Capitol
Albany, NY 12224

Hudson River Keeper
P.O. Box 130
Garrison, NY 10524

Environmental Citizens Coalition
33 Central Avenue
Albany, NY 12210

Orange Environment
P.O. Box 25
Goshen, NY 10924

Clearwater, Inc.
112 Market Street
Poughkeepsie, NY 12601

CURE
P.O. Box 522
Vails Gate, NY 12584-0222

Hudson River Valley Greenway
Capitol Bldg., Room 254
Albany, NY 12224

Hudson River Defense League
P.O. Box 606
Nyack, NY 10960

4.3 MEDIA

News Director
TKR Cable Co.
19 South Street
Warwick, NY 10990
(914) 986-2069
Fax - 986-0031

News Director
Time Warner Cablevision
P.O. Box 887
Middletown, NY 10940
(914) 692-6796
Fax - 692-4745
No E Mail

News Director
Cable 6 TV
Industrial Drive
Middletown, NY 10940
(914) 692-6781
Fax - 692-0779
No E Mail

News Director
Access 8 TV
P.O. Box 321
Port Jervis, NY 12780
(914) 856-5666
No Fax
No E Mail

News Director
WRNN TV
721 Broadway
Kingston, NY 12401
(914) 339-6200
Fax - 339-6264

News Director
WALL/WKOJ
1 Broadcast Plaza
Middletown, NY 10940
(914) 343-7400
Fax - 343-1201
No E Mail

News Director
WDLC/WTSX
P.O. Box 920
Port Jervis, NY 12771
(914) 856-5185
Fax - 856-4757
E Mail - WTSX@pike on line.net

News Director
WGNY
P.O. Box 2307
Newburgh, NY 12550
(914) 561-2131
Fax - 561-2138
No E Mail

News Director
WTBQ
62 N. Main Street
Florida, NY 10921
(914) 651-1110
Fax - 651-1025
E Mail - WTBQ.com.info@WTBQ.com

News Director
WZAD
P.O. Box 978
Wurstburo, NY 12790
(914) 888-0077
Fax - 888-0021
No E Mail

City Editor
Times Herald Record
40 Mulberry Street
Middletown, NY 10940
(914) 343-2181
Fax - 343-2170
E Mail - readeradvocate@TH-Record.Com

City Editor
Times Herald Record
233 Broadway
Newburgh, NY 12550
(914) 565-5000
Fax - 565-4794
E Mail - readeradvocate@TH-Record.Com

City Editor
Ottaway Newspapers, Inc.
P.O. Box 401
Campbell Hall, NY 10916
(914) 294-8181
Fax - 294-1659
No E Mail

City Editor
The Cornwall Local
P.O. Box B
Cornwall, NY 12518
(914) 534-7771
Fax - 534-3855
No E Mail

City Editor
Independent Republican
P.O. Drawer A
Goshen, NY 10924-0628
(914) 294-6111
Fax - 294-0532
No E Mail

City Editor
Orange County Post
P.O. Box 500
Washingtonville, NY 10992
(914) 496-3611
Fax - 496-1715
No E Mail

City Editor
Greenwood Lake & West Milford News
P.O. Box 1117
Greenwood Lake, NY 10925
(914) 477-2575
Fax - 477-2577
E Mail - GLnews@Warwick.Com

City Editor
News of the Highlands
P.O. Box 278
Highland Falls, NY 10928
(914) 446-4519
Fax - 446-0532
No E Mail

City Editor
Warwick Advertiser
P.O. Box 190
Warwick, NY 10990
(914) 986-2061
Fax - 986-2063
No E Mail

City Editor
Photo News
45 Gilbert Street
Monroe, NY 10950
(914) 782-4000
Fax - 782-1711

City Editor
Strauss Newspapers
P.O. Box 190
Warwick, NY 10990
(914) 986-2061
Fax - 986-2063
No E Mail

City Editor
Tri-State Gazette
84-88 Fowler Street
Port Jervis, NY 12771
(914) 856-5385
Fax - 858-8484
No E Mail

City Editor
Mid Hudson Times
P.O. Box 434
Walden, NY 12586
(914) 561-0170
Fax - 778-1196
E Mail - WVTimes@AOL.Com

City Editor
Ellenville Press
P.O. Box 31
Ellenville, NY 12428
(914) 647-7222
Fax - 647-7443
No E Mail

City Editor
Hudson Valley Black Press
P.O. Box 2160
Newburgh, NY 12550
(914) 562-1313
Fax - 562-1348
No E Mail

City Editor
The Sentinel
P.O. Box 406
Vails Gate, NY 12584
(914) 562-1218
Fax - 562-0488
E Mail - The-Sentinel.Com

City Editor
The Warwick Valley Dispatch
P.O. Box 594
Warwick, NY 10990
(914) 986-2216
Fax - 987-1180
No E Mail

City Editor
Hudson Valley Business Journal
P.O. Box 339
Pine Island, NY 10969
(914) 258-4007
Fax - 258-4111
E Mail - hvbsnjnl@warwick.com

5.0 IDENTIFICATION OF DEPARTMENT CONTACTS

For Information About:

Environmental Concerns

Melissa Mastro
Project Manager
NYSDEC - Region 3
21 South Putt Corners Road
New Paltz, NY 12561
(914) 256-3150

Citizen Participation

Michael J. Knipfing
Citizen Participation Specialist
NYSDEC - Region 3
21 South Putt Corners Road
New Paltz, NY 12561
(914) 256-3154

Health-Related Concerns

Geoff Lacetti
Public Health Specialist
NYSDOH
2 University Place
Albany, NY 12203
(518) 458-6305

Citizen Participation

Nina Knapp
Public Health Liaison
NYSDOH
2 University Place
Albany, NY 12203
(518) 458-6402

Toll-free NYSDEC: 1-800-342-9296
Toll-free NYSDOH: 1-800-458-1158 ext. 6402

6.0 IDENTIFICATION OF DOCUMENT REPOSITORIES

Documents related to the remedial program at the C&D Site are available for public review at the following locations:

Port Jervis Free Library
138 Pike Street
Port Jervis, NY 12771
(914) 856-7313

Hours:	Monday	10:00 a.m.-9:00 p.m.	
	Tuesday	10:00 a.m.-9:00 p.m.	(10:00 a.m.-6:00 p.m. in Summer)
	Wednesday	10:00 a.m.-6:00 p.m.	
	Thursday	10:00 a.m.-9:00 p.m	
	Friday	10:00 a.m.-6:00 p.m.	
	Saturday	9:00 a.m.-5:00 p.m.	

Town Clerk
Deerpark Town Hall
Drawer A
420 Route 209
Huguenot, NY 12746
(914) 856-5705

Hours: Mon-Fri. 8:00 a.m. - 4:00 p.m.

NYSDEC, Region 3
21 South Putts Corners Road
New Paltz, NY 12561
(914) 256-3154

Mon. - Fri., 8:45 a.m. - 4:45 p.m.

The following documents, if applicable, will be placed in the repositories when they become available:

- Consent Orders/Consent Judgements/Stipulations
- Final draft work plans developed by PRPs
- Remedial Investigation Report
- Feasibility Study Report
- Remedial Design Document
- Plans and specifications for remedial construction
- Quality Assurance/Quality Control Plans
- Health and Safety Plans (including continency plans)
- Testing, sampling and monitoring data

- All responsiveness summaries
- The Site-Specific Citizen Participation Plan, and
- All fact sheets, newsletters, etc.

A document availability notice will be mailed to the contact list periodically to update the interested public about project documents that are available to review. These notices may be combined with other mailings.

7.0 DESCRIPTION OF SPECIFIC CITIZEN PARTICIPATION ACTIVITIES

NYSDEC, NYSDOH, and C&D Technologies, Inc. are committed to keeping the public informed and involved throughout the process of investigating and remediating this site. At a minimum, the Citizen Participation Activities will include:

At the start of the RI, the document repositories will be set up. These repositories will be updated as documents become available throughout the remediation process.

Both at the start of the RI, and after the RI is completed, Fact Sheets will be sent out to the Contact List.

After the FS is completed and the PRAP developed, there will be a mailing to the Contact List describing the PRAP. There will also be a public meeting, and a public comment period.

After the remedy is selected and the ROD is signed, there will be a mailing to the Contact List describing the selected remedy and response to public comments.

8.0 GLOSSARY OF KEY TERMS AND MAJOR PROGRAM ELEMENTS

8.1 DEFINITIONS OF COMMONLY USED CITIZEN PARTICIPATION TERMS

Availability Session - Scheduled gathering of the Department staff and other involved individuals with the public in a setting less formal than a public meeting. This setting encourages "one-to-one" discussions in which the public meets with people involved with the project on an individual or small group basis to discuss particular questions or concerns.

Citizen Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of inactive hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Citizen Participation Plan - A document that describes the site-specific citizen participation activities that will take place to complement the "technical" (remedial) activities. It also provides site background and rationale for the selected citizen participation program for the site. A plan may be updated or altered as public interest or the technical aspects of the program change.

Citizen Participation Specialist - A Department staff member who provides guidance, evaluation and assistance to help the Project Manager carry out the site-specific Citizen Participation program.

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations and media interested and/or affected by a particular hazardous waste site. Compiled and updated by the Department. Interest in the site, stage of remediation and other factors guide how comprehensive the list becomes. Used to assist the Department to inform and involve the interested/affected public.

Document Repository - Typically a regional DEC office and/or public building, such as a library, near a particular site, at which documents related to remedial and citizen participation activities at the site are available for public review. Provides access to documents at times and a location convenient to the public. Environmental Management Council (EMCs), Conservation Advisory Committees (CACS) as well as active local groups often can serve as supplemental document repositories.

Fact Sheet - A written discussion about part or all of a site's remedial process. A Fact Sheet may focus on: a particular element of the site's remedial program; opportunities for public involvement; availability of a report or other information; or announcement of a public meeting or comment period.

Information Sheet - A written discussion of a site's remedial process, or some part of it, prepared by the Department for the public in easily understandable language. May be prepared for the "general" public or a particular segment. Uses may include, for example: discussion of an element of the remedial program, opportunities for public involvement, availability of a report or other information or announcement of a public meeting. May be mailed to all or part of the interested public, distributed at meetings and availability sessions or sent on an "as requested" basis.

Project Manager - A department staff member within the Division of Environmental Remediation (DER) (usually an engineer, geologist or hydro geologist) responsible for the day-to-day administration of activities, and ultimate disposition of, one or more hazardous waste sites. The Project Manager works with the Office of Public Affairs as well as fiscal and legal staff to accomplish site-related goals and objectives.

Public - The universe of individuals, groups and organizations: a) affected (or potentially affected) by an inactive hazardous waste site and/or its remedial program; b) interested in the site and/or its remediation; c) having information about the site and its history.

Public Meeting - A scheduled gathering of the Department staff and the public to give and receive information, ask questions and discuss concerns. May take one of the following forms: large-group meeting called by the Department; participation by the Department at a meeting sponsored by another organization such as at town board or Department of Health; working group or workshop; tour of the hazardous waste site.

Responsiveness Summary - A formal or informal written or verbal summary and response by the Department to public questions and comments. Prepared during or after important elements in a site's remedial program. The responsiveness summary may list and respond to each question, or summarize and respond to questions in categories.

Toll-Free "800" Telephone Information Number - Provides cost-free access to the Department by members of the public who have questions, concerns or information about a particular hazardous waste site. Calls are taken and recorded 24 hours a day and a Department staff member contacts the caller as soon as possible (usually the same day).

8.2 DEFINITIONS OF SIGNIFICANT ELEMENTS AND TERMS OF THE REMEDIAL PROGRAM

Note: The first ten definitions represent major elements of the remedial process. They are presented in the order in which they occur, rather than in alphabetical order, to provide a context to aid in their definition.

Site Placed on Registry of Inactive Hazardous Waste Sites - Each inactive site known to contain hazardous waste must be included in the Registry. Therefore, all sites which state or county environmental or public health agencies identify as known to have received hazardous waste should be listed in the Registry as they are identified.

Phase I Site Investigation - Preliminary characterizations of hazardous substances present at a site; estimates pathways by which pollutants might be migrating away from the original site of disposal; identifies population or resources which might be affected by pollutants from a site; observes how the disposal area was used or operated; and gathers information regarding who might be responsible for wastes at a site. Involves a search of records from all agencies known to be involved with a site, interviews with site owners, employees and local residents to gather pertinent information about a site. Information gathered is summarized in a Phase I report.

After a Phase I investigation, DEC may choose to initiate an emergency response; to nominate the site for the National Priorities List; or, where additional information is needed to determine site significance, to conduct further (Phase II) investigation.

Phase II Site Investigation - Ordered by DEC when additional information is still needed after completion of the Phase I to properly classify the site. A Phase 11 investigation is not sufficiently detailed to determine the full extent of the contamination, to evaluate remedial alternatives, or to prepare a conceptual design for construction. Information gathered is summarized in a Phase II report and is used to arrive at a final hazard ranking score and to classify the site.

Remedial Investigation (RI) - A process to determine the nature and extent of contamination by collection data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for, and proposed extent of, a remedial program for the site.

Feasibility Study (FS) - A process for developing, evaluating and selecting remedial actions, using data gathered during the remedial investigation to: define the objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Proposed Remedial Action Plan (PRAP) - An analysis by DER of each alternative considered for the remediation of a hazardous waste site and a rationale for selection of the alternative it recommends. The PRAP is created based on information developed during the site's RI/FS. The PRAP is reviewed by the public and other state agencies.

Record of Decision (ROD) - A document that provides definitive record of the cleanup alternative that has been selected by the NYSDEC to remediate an inactive hazardous waste site. The ROD is based on information and analyses developed during the RI/FS and public comment.

Remedial Design - Once a remedial action has been selected, technical drawings and specifications for remedial construction at a site are developed, as specified in the final RI/FS report. Design documents are used to bid by consulting engineers with experience in inactive hazardous waste disposal site remedial actions.

Construction - PRP selects contractors and supervises construction work to carry out the designed remedial alternative. Construction may be as straightforward as excavation of contaminated soil with disposal at a permitted hazardous waste facility. On the other had, it may involve drum sampling and identification, complete encapsulation, leachate collection, storage and treatment, groundwater management, or other technologies. Construction costs may vary from several thousand dollars to many millions of dollars, depending on the size of the site, the soil, groundwater and other conditions, and the nature of the wastes.

Monitoring/Maintenance - Denotes post-closure activities to insure continued effectiveness of the remedial actions. Typical monitoring/maintenance activities include quarterly inspection by an

engineering technician; measurement of level of waste in monitoring wells; or collection of groundwater and surface water samples and analysis for factors showing the condition of waster, presence of toxic substances, or other indicators of possible pollution from the site. Monitoring/maintenance may be required indefinitely at many sites.

Consent Order - A legal and enforceable negotiated agreement between the Department and responsible parties where responsible parties agree to undertake investigation or cleanup or pay for the costs of investigation and cleanup work at a site. The order includes a description of the remedial actions to be undertaken at the site and a schedule for implementation.

Contract - A legal document signed by a contractor and the Department to carry out specific site remediation activities.

Contractor - A person or firm hired to furnish materials or perform services, especially in construction projects.

Delisting - Removal of a site from the state Registry based on study which shows the site does not contain hazardous wastes.

Potentially Responsible Party (PRP) Lead Site - An inactive hazardous waste site at which those legally liable for the site have accepted responsibility for investigation problems at the site, and for developing and implementing the site's remedial program. PRPs include: those who owned the site during the time wastes were placed, current owners, past and present operators of the site and those who generated the wastes placed at the site. Remedial programs developed and implemented by PRPs generally result from an enforcement action taken by the State and the costs of the remedial program are generally borne by the PRP.

Ranking System - The United States Environmental Protection Agency uses a hazard ranking system (HRS) to assign numerical scores to each inactive hazardous waste site. The scores express the relative risk or danger from the site.

Responsible Parties - Individuals, companies (e.g. site owners, operators, transporters or generators of hazardous waste) responsible for or contributing to the contamination problems at a hazardous waste site. PRP is a potentially responsible party.

Site Classification - The Department assigns sites to classifications established by state law, as follows:

* Classification 1 - A site causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment. Immediate action is required.

* Classification 2 - A site posing a significant threat to the public health or environment. Action is required

* Classification 2a - Temporary classification assigned to sites that have inadequate and/or insufficient data for inclusion in any of the other classifications. Most likely the site will require a Preliminary Site Assessment to obtain more information. Based on the results, the site would then be reclassified or removed from the Registry.

* Classification 3 -- A site which has hazardous waste confirmed, but not a significant threat to the public health or environment. Action may be deferred.

* Classification 4 - A site which has been properly closed. Requires continued management.

* Classification 5 - A site which has been properly closed, with no evidence of present or potential adverse impact. No further action is required.

State-Lead Site - An inactive hazardous waste site at which the Department has responsibility for investigating problems at the site and for developing and implementing the site's remedial program. The Department uses money available from the State Superfund and the Environmental Quality Bond Act of 1986 to pay for these activities. The Department has direct control and responsibility for the remedial program.