INTERA

INTERA INC. • 6850 Austin Center Boulevard • Suite 300 • Austin, Texas 78731, USA • Telephone: 512-346-2000 • Facsimile: 512-346-9436

Report on the Preliminary Site Assessment of the Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York

SITE NO. 932036

Prepared For: The Carborundum Company
Electric Products Division
3425 Hyde Park Blvd.
Town of Niagara, New York 14305-2201

Mailing Address: P.O. Box 339
Niagara Falls, New York 14302

Prepared By: INTERA INC.
Austin, Texas

91-022

May 1993

Table of Contents

Page

1 INTRODUCTION 1

2 PURPOSE 3

3 SCOPE OF WORK 4
  3.1 SITE HISTORY REVIEW AND PROJECT PLANS 4
    3.1.1 Site History Review 4
    3.1.2 Project Plans 6
  3.2 FIELD INVESTIGATIONS 6

4 SITE ASSESSMENT 8
  4.1 SITE HISTORY AND DESCRIPTION 8
  4.2 SITE TOPOGRAPHY AND GEOLOGY 12
    4.2.1 Site Topography 12
    4.2.2 Site Geology 12
  4.3 PREVIOUS INVESTIGATIONS 13
    4.3.1 Carborundum Electric Products Division Facility 13
    4.3.1.1 Preliminary Site Assessment - 1985 13
    4.3.1.2 Data Records Search and Preliminary Assessment - 1990 16
    4.3.2 Other Facilities 17
    4.3.2.1 Union Carbide Corporation Carbon Products Division Site 17
    4.3.2.2 U.S. Vanadium Corporation Site 21
    4.3.2.3 Occidental Chemicals Hyde Park Landfill Site 24
  4.4 SITE CHARACTERIZATION AT THE CARBORUNDUM ELECTRIC PRODUCTS DIVISION FACILITY 24
    4.4.1 Health and Safety Program 25
    4.4.1.1 Site Ambient Air Monitoring 25
    4.4.1.2 Community Air Monitoring 26
    4.4.2 Groundwater Sampling Program 28
    4.4.2.1 Rationale for Sampling Locations 28
    4.4.2.2 Deep Monitor Well Installation 31
    4.4.2.3 Shallow Monitor Well Installation 33
    4.4.2.4 Well Development 33
    4.4.2.5 Hydraulic Conductivity Testing 36
    4.4.2.6 Water Level Monitoring 36
    4.4.2.7 Groundwater Sampling 38
    4.4.3 Soil Sampling Programs 39
    4.4.3.1 Rationale for Sample Locations 39
    4.4.3.2 Soil Sampling 43
    4.4.3.3 Additional Soil Sampling 44

5 RESULTS AND DISCUSSION OF SOIL AND GROUNDWATER SAMPLING PROGRAM 48
5.1 GEOLOGY 48
5.2 HYDROGEOLOGY 48
5.3 DATA VALIDATION 54
5.4 GROUNDWATER SAMPLING 54
5.4.1 Overburden Wells 54
5.4.1.1 Volatile Organic Compounds 54
5.4.1.2 Semi-Volatile and Non-Volatile Organic Compounds 55
5.4.1.3 Pesticides/PCBs 57
5.4.1.4 Inorganic Parameters 57
5.4.2 Bedrock Wells 59
5.4.2.1 Volatile Organic Compounds 59
5.4.2.2 Semi-Volatile Organic Compounds 60
5.4.2.3 Pesticides/PCBs 60
5.4.2.4 Inorganic Parameters 60
5.4.3 Summary of Groundwater Contamination 62
5.5 SOIL SAMPLING 63
5.5.1 Monitor Well Samples 64
5.5.1.1 Volatile Organic Compounds 67
5.5.1.2 Semi-Volatile Organic Compounds 67
5.5.1.3 Pesticides/PCBs 68
5.5.1.4 Inorganic Parameters 68
5.5.2 Soil Borehole Samples 69
5.5.2.1 Volatile Organic Compounds 69
5.5.2.2 Semi-Volatile Organic Compounds 71
5.5.2.3 Pesticides/PCBs 72
5.5.2.4 Dioxins and Furans 72
5.5.2.5 Inorganic Parameters 75
5.5.2.6 Summary of Soil Sampling Results 76

6 HAZARD RANKING SYSTEM EVALUATION 77
6.1 BACKGROUND 77
6.2 HRS SCORE 78
6.2.1 Groundwater Migration Pathway 79
6.2.2 Surface Water Migration Pathway 80
6.2.3 Soil Exposure Pathway 80
6.2.4 Air Pathway 81

7 CONCLUSIONS 82

8 RECOMMENDATIONS 86

9 REFERENCES 87

APPENDIX A Air Quality Monitoring Results
APPENDIX B Correspondence to NYSDEC Regarding Modifications to the Work Plan
APPENDIX C Stratigraphic Logs - Monitor Well Boreholes
APPENDIX D Stratigraphic Logs - Soil Boreholes
APPENDIX E Analytical Results - Groundwater
APPENDIX F Analytical Results - Soil (Monitor Well Samples)
APPENDIX G Analytical Results - Soil (Soil Borehole Samples)
APPENDIX H Supporting Documentation for HRS

Executive Summary

The Carborundum Company Electric Products Division facility is currently listed as a Class 2a site on the NYSDEC list of Inactive Hazardous Waste Disposal Sites. A Class 2a site is, by definition, a site which requires additional data and/or investigation because the environmental significance of the site cannot be determined based on available information. Class 3 sites have some identified contamination but "investigations indicate that they do not pose significant threat to the environment or public health" (NYSDEC, 1990). In order to provide sufficient information to NYSDEC for the purposes of reclassification and/or delisting, the Carborundum Company completed a preliminary site assessment of its facility based on a work plan approved by NYSDEC. The results of this preliminary site assessment are provided in this report. We believe that sufficient information, as presented below, has been obtained for NYSDEC's consideration to reclassify the Carborundum Electric Products Division site to Class 3.

1. Two primary areas of soil contamination were identified. One area is located in the northeastern portion of the site formerly used as a storage area. The other area is located in a courtyard between plant buildings. The soil contamination is not the result of deliberate disposal of hazardous waste. The contamination is principally volatile organics and some metals. The soil contamination, which is most likely due to spills or leaks, is localized and does not present a significant threat to the environment or public health.

2. A third area of soil contamination, near a railroad spur, was identified with elevated PAH concentrations. There is no known, past or present, onsite product or processing material source of PAH compounds. The PAHs are likely due to an identified Union Carbide coal tar spill, or leaching of creosote from railroad tiles. The PAHs are not the result of disposal of hazardous waste. PAHs were not detected in groundwater samples and are relatively immobile in soils. The PAHs do not present a significant threat to the environment or to public health.

3. Although groundwater in the overburden and bedrock contains some volatile organics (up to 1.9mg/L in the overburden groundwater and up to 2.3mg/L in the bedrock groundwater), the groundwater does not present an immediate threat to public health.

   Using very conservative assumptions, the offsite transport of contaminants in the groundwater is less than 0.1 lbs/day. This is about a hundred times less than the typical offsite loading in the groundwater from many of the industrial facilities in Niagara Falls. In addition, there are no drinking water wells located downgradient from the Electric Products Division facility and the groundwater discharge to the Niagara Gorge, about 1.3 miles from the site, occurs below the municipal water intake for the Town of Niagara.

4. Metals were detected at elevated levels in the fill (hauled in from unknown offsite sources) at four locations in the former material storage area, and in the courtyard area. The metals are relatively immobile. There is no contamination of groundwater with metals. Three overburden groundwater samples and one bedrock groundwater sample exceeded the state water quality standards for aluminum, iron, or antimony. However, these constituent concentrations are considered to be due to natural sources and within the potential range of background values for the Niagara Falls area.

5. The Hazard Ranking System (HRS) score for the facility, using site specific conditions, is 0.96. The HRS score using extremely conservative assumptions is 1.12. Both HRS scores are very low, indicating that the site does not present a significant threat to the environment or human health.

The Electric Products Division facility manufactures heating elements and electronic components from silicon carbide. The facility was purchased by the Carborundum Company from the Globar Company in 1936. Historically, the northeast portion of the facility was used as a material storage area prior to removal for offsite disposal. Stored materials included sand, silicon carbide, empty drums, scrap graphite, scrap steel, and obsolete equipment. Some burning of wood, paper and cardboard occurred in a caged enclosure in the material storage area.

The preliminary site assessment in this report included installation, sampling and analysis of 10 groundwater monitoring wells; five in the bedrock aquifer and five in the overburden. Soil samples were obtained from 11 separate areas of the facility and analyzed for the NYSDEC Target Compound List, a total of 149 individual organic and inorganic constituents.

The groundwater flow direction across the site in the bedrock and the overburden is approximately southwest to west-southwest. Groundwater in the bedrock enters the Carborundum site after flowing potentially beneath the U.S. Vanadium Corporation (formerly known as the SKW Alloys/Airco Carbon site) facility and the Union Carbide Carbon Products Division site.

The U.S. Vanadium Corp. site, which is immediately south of the Occidental Chemicals Hyde Park landfill, includes a 62 acre landfill which has not been active for the past several years. Groundwater sampling results for individual organic constituents were not obtained during the records search conducted for the U.S. Vanadium Corp. site. However, TOC levels in the groundwater beneath the site are relatively high.

The Union Carbide site is immediately south of the U.S. Vanadium Corp. site and immediately north and east of the Carborundum site. The Union Carbide site includes a closed Part 360 landfill in which suspected hazardous waste was disposed. The landfill is believed to contain coal tar, petroleum tars, machine oils and spent degreasing sludges. On the upgradient side of the Union Carbide landfill, the groundwater in the bedrock aquifer was found to contain elevated levels of trichloroethene, 1,1,2,2 tetrachloroethene, vinyl chloride, chloroform and hexachlorobutadiene. No groundwater sampling results from the downgradient side of the landfill on Union Carbide property were located, based on a records search. The downgradient side of the Union Carbide landfill is upgradient of the Carborundum Electric Products Division facility.

Considering (i) the direction of groundwater flow (i.e., from the Union Carbide site to the Carborundum facility) and (ii) the identified groundwater contamination in the bedrock at the Union Carbide site as well as upgradient from the Union Carbide site, it is clear that interpretation of any groundwater contamination below the Carborundum site must consider the obvious offsite, upgradient sources of groundwater contamination, as well as any potential onsite sources. Additional perimeter wells between the Carborundum site and the Union Carbide site will be necessary to further define the extent of the upgradient contribution.

In the groundwater samples from the Carborundum site analyzed in this investigation, State Groundwater Quality Standards or Guidance Values were exceeded for vinyl chloride by 6 monitor wells (4 bedrock and 2 overburden), for trichloroethene by 2 monitor wells (bedrock only), for dichloroethene by 8 monitor wells (5 bedrock and 3 overburden), and for benzene by 1 monitor well (bedrock). Vinyl chloride, trichloroethene and tetrachloroethene have been reported in the bedrock groundwater at the Union Carbide facility. Vinyl chloride and dichloroethene can also be derived as degradation products of trichloroethene and tetrachloroethene. Degradation products would be expected in the downgradient direction from potential source areas such as the Union Carbide site. The single groundwater sample from the Carborundum site that was in excess of the benzene standard showed a concentration of 1.0μg/L, compared to the State standard of 0.7μg/L. Three overburden groundwater samples and one bedrock groundwater sample also exceeded the standards for aluminum, iron or antimony. However these constituent concentrations are considered to be due to natural sources and within the potential range of background values for the Niagara Falls area.

While it is probable that upgradient, offsite sources have contributed to the bedrock groundwater contamination at the Carborundum site, the overburden groundwater contamination is more likely due to onsite sources. This statement is based on two points: 1) the horizontal velocity in the overburden is estimated at less than 10 to 20 feet per year, and 2) the vertical hydraulic gradient is downward, i.e. from the overburden to the bedrock at most of the well installations. The potential is low for contaminated groundwater in the overburden to migrate onto Carborundum property from offsite sources. It is possible that seasonal fluctuations in water levels could result in upward groundwater movement from the bedrock to the overburden, which could contribute contaminants from the bedrock aquifer to the overburden groundwater. However, based on existing information on contaminants in the soils and upper fill, the onsite sources are likely contributing to overburden groundwater contamination.

Soil samples from the material storage area on the Carborundum facility contained elevated levels (trace concentrations to 400mg/kg) of 1,2-dichloroethene, trichloroethene, toluene, ethyl benzene, xylenes, acetone and 2-butanone. The highest concentrations were found in the upper fill material. The soil samples from the underlying natural overburden in the material storage area contained, in general, lesser amounts (trace concentrations to 23mg/kg) of the same contaminants. The elevated concentrations in the soil samples may be due to (i) contamination in the fill, which was hauled onsite from unknown offsite sources, or (ii) minor leaks or spills from waste solvents stored prior to offsite disposal. A review of the historical operations of the Carborundum facility indicates that the solvents used at the facility were acetone, carbon tetrachloride, toluene, xylene, 1,1,1 trichloroethane and trichloroethene.

Soil samples taken adjacent to the railway spur near the north property fence contained 450mg/kg of polynuclear aromatic hydrocarbons (PAHs), which are components of coal tar, creosote and oil and grease. The elevated PAHs are likely due to either a coal tar spill which occurred in the mid 1960's on the adjacent Union Carbide facility, or to leaching of creosote from railroad ties. PAHs are relatively immobile and limited to the upper fill. PAHs were not detected in groundwater at the facility and do not present a significant threat to the environment or to public health.

Elevated levels of PCBs, copper, nickel and zinc were found in the former material storage area and in the courtyard area. The highest PCB level was 2.4mg/kg in the soil sample from the courtyard. PCBs are relatively immobile and were not detected in groundwater at the facility. The TSCA guidance level for PCBs is 10mg/kg, therefore no action is required. The metals are relatively immobile and do not pose a hazard to human health or the environment.

One soil sample from the former material storage area contained very low levels of dioxins and furans, which are likely products of combustion from the burning area. The dioxin 2,3,7,8-TCDD was not detected. Analytical results for individual dioxin and furan compounds were normalized to 2,3,7,8-TCDD. The normalization results in a toxicity equivalent concentration of 2,3,7,8-TCDD of 0.90ppb. Although EPA does not have guidance values for dioxins and furans, the toxicity equivalent concentration of 0.90ppb for 2,3,7,8-TCDD is likely below any potential action levels.

The Hazard Ranking System (HRS) score for the Carborundum facility was calculated using the 1990 amended version of HRS and the EPA PREscore model. The site was scored using two approaches. The first approach was to assign reasonable and site specific conditions. The second approach was to assume very conservative conditions. The conservative assumptions allowed the nearest upgradient drinking water well to be considered as a downgradient well and considered the human consumption of sport fish from the Niagara River. In both instances, the overall HRS score for the site is very low.

Hazard Ranking System

Carborundum Electric Products Division Facility - Site Scores

Site Specific Conditions	Conservative Assumptions
Sgw = 0.00	Sgw = 1.14
Ssw = 0.30	Ssw = 0.30
Ss = 0.61	Ss = 0.61
Sg = 1.81	Sg = 1.81
S = 0.96	S = 1.12

The overall site scores of 0.96 and 1.12 are well below the EPA cutoff value of 28.50 for placing a site on the National Priorities List, and the low values indicate that the overall environmental impact from the Electric Products Division facility is extremely low.

Additional investigations are necessary to further define the extent of soil contamination and the extent of the upgradient, offsite contribution to the bedrock groundwater contamination.

1 INTRODUCTION

The Carborundum Company's Electric Products Division facility in Niagara Falls is listed on the New York State Department of Environmental Conservation's (NYSDEC) list of Inactive Hazardous Waste Disposal Sites as a Class 2a site (NYSDEC 1990). The 2a classification indicates that the environmental significance of the site cannot be determined based on available information. Previous soil and groundwater investigations conducted by The Carborundum Company (Carborundum) were determined by the State to contain insufficient information to allow the site to be reclassified or delisted. In 1985 the EPA indicated that the potential for chemical migration from the site was indeterminable because of the lack of available geologic, hydrologic or chemical information (Koszalka et al 1985).

In 1990 NYSDEC retained URS Consultants Inc. of Buffalo to complete a site assessment of the Electric Products Division facility and to provide recommendations to undertake the additional work required to allow the site to be reclassified or delisted. Recommended additional work included the following:

- Drilling five boreholes in the fill area north of the parking lot including the area near the drum storage cage, to assess the extent of contamination of the fill. Laboratory analyses of fill samples for the Target Compound List (TCL) parameters and dioxin.

- Installing five groundwater monitor well pairs and sampling of groundwater from the overburden and the top of bedrock to determine the extent of contamination of the aquifer, to monitor any offsite contamination, and to identify the direction of groundwater flow in the bedrock and overburden.

INTERA Inc. was retained by The Carborundum Company to undertake a preliminary site assessment of its Electric Products Division facility following the work program recommended by URS Consultants Inc. and approved by NYSDEC. This report provides the results of the preliminary site assessment and evaluates the significance of the results with respect to reclassifying or delisting the site.

2 PURPOSE

The purpose of this site investigation is to provide sufficient information regarding the impact of the site on human health and the environment that would allow the site to be reclassified or delisted. Specific objectives of the study are:

- To determine the nature and extent of contamination at the site; and
- To assess the impact of contamination at the site on human health and the environment.

A secondary objective was to assess the extent to which groundwater contamination at the site may have been generated from offsite sources based on the knowledge of industrial activities in the area.

3 SCOPE OF WORK

The scope of work consisted of two phases:

(i) A first phase consisting of a review of site history information and preparation of a set of project documents describing how the field investigation would proceed, and

(ii) A second phase consisting of field investigations.

3.1 SITE HISTORY REVIEW AND PROJECT PLANS

3.1.1 Site History Review

A review of site history and background information was conducted and included review of the following information:

REPORTS

•	URS Consultants Inc. (1990)	Engineering Investigations at Inactive Hazardous Waste Sites, Preliminary Site Assessment, Carborundum Company Globar Plant Site No. 932036 Niagara (T), Niagara (C). Prepared for: New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.
•	NUS Corporation (1987)	Preliminary Assessment Carborundum. Prepared under Technical Directive Document No. 02-8712-06, Contract No. 68-01-7346 for the Environmental Services Division, U.S. Environmental Protection Agency.
•	Earth Dimensions Inc. (1985)	Soils Report Preliminary Site Assessment Hyde Park Facility, Carborundum Globar Manufacturing, Niagara Falls, New York.
•	Ecology and Environment Engineering, P.C. (1991)	Engineering Investigations at Inactive Hazardous Waste Sites in the State of New York, Preliminary Site Assessment, Union Carbide Corp., Carbon Products Division, Site No. 932035, Town of Niagara, Niagara County. Prepared for: New York State Department of

Environmental Conservation, Division of Hazardous Waste Remediation.

- Ecology and Environment Engineering, P.C. (1989)	Engineering Investigations at Inactive Hazardous Waste Sites, Phase 1 Investigation SKW Alloys, Inc., Site No. 932001, Town of Niagara, Niagara County. Prepared for: New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.
- Conestoga-Rovers & Associates (1991)	Redefinition of Hyde Park Bedrock Non-Aqueous Phase Liquid Plume. Hyde Park Requisite Remedial Technology Program, Niagara Falls, New York. Prepared for: Occidental Chemical Corporation.
- Conestoga-Rovers & Associates(1987)	Residential Community Monitoring Wells Installation, Development and Initial Sampling. Hyde Park Requisite Remedial Technology Program

Aerial Photographs

Year	Aerial Photo No.	Scale	Source
1938	ARE-18-34		National Archives and Records Administration Washington, D.C. (703) 756-6704
1951	ARE-5H-152	1"=1,667'	US Dept. of Agriculture
1958	ARE-1V-23	1"=1,667'	Aerial Photo Field Office
1966	ARE-2GG-61	1"=1,667'	Salt Lake City, Utah
1982	177-91	1"=3,333'	(801) 524-5856
1985	207-35 HAP857	1"=5,000'	
1969	12-13-47	1"=2,000'	McIntosh & McIntosh Inc.
1974	13-02-09	1"=2,000'	Lockport, New York
1981	164-07-13	1"=2,000'	(716) 433-2535
1985	05-08-85-917-1-No4	1"=2,000'	Lockwood Support System Rochester, New York (716) 342-5810

3.1.2 Project Plans

A set of Preliminary Site Assessment (PSA) documents describing the proposed Work Plan, Health and Safety Plan and Quality Assurance Project Plan were prepared and submitted to NYSDEC for approval prior to commencing the field investigation. These plans are referenced as follows:

• Intera Inc. (1992a)	Preliminary Site Assessment Work Plan for The Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York, Site No. 932036, April 1992
• Intera Inc. (1992b)	Preliminary Site Assessment Health and Safety Plan for The Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York, Site No. 932036, April 1992
• Intera Inc. (1992c)	Quality Assurance Plan for a Preliminary Site Assessment of The Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York, Site No. 932036, April 1992.

3.2 FIELD INVESTIGATIONS

Field investigations involved soil and groundwater sampling. Groundwater monitor wells were installed in couplets at five locations on the facility property to sample groundwater in the shallow overburden and deeper bedrock. Groundwater was sampled from each well following well development and submitted for laboratory analysis of Target Compound List (TCL) of parameters following the NYSDEC ASP 91 protocol. Water level monitoring was conducted in all wells, and groundwater monitor wells were surveyed for elevation. Hydraulic conductivity testing was conducted in all overburden wells and one bedrock well.

Soil samples were collected from one of the monitor well boreholes at each couplet location. In addition, soil samples were collected at six locations in the northeast corner of the property and in the courtyard to determine the extent of contamination in the fill material and natural overburden. Soil samples were submitted for laboratory analysis of TCL parameters following the NYSDEC ASP 91 protocol. One soil sample, collected from the area formerly used to burn wood, paper and cardboard, was submitted for analysis of dioxins and furans following EPA Method 8280.

4 SITE ASSESSMENT

An assessment of the site is described under the following headings:

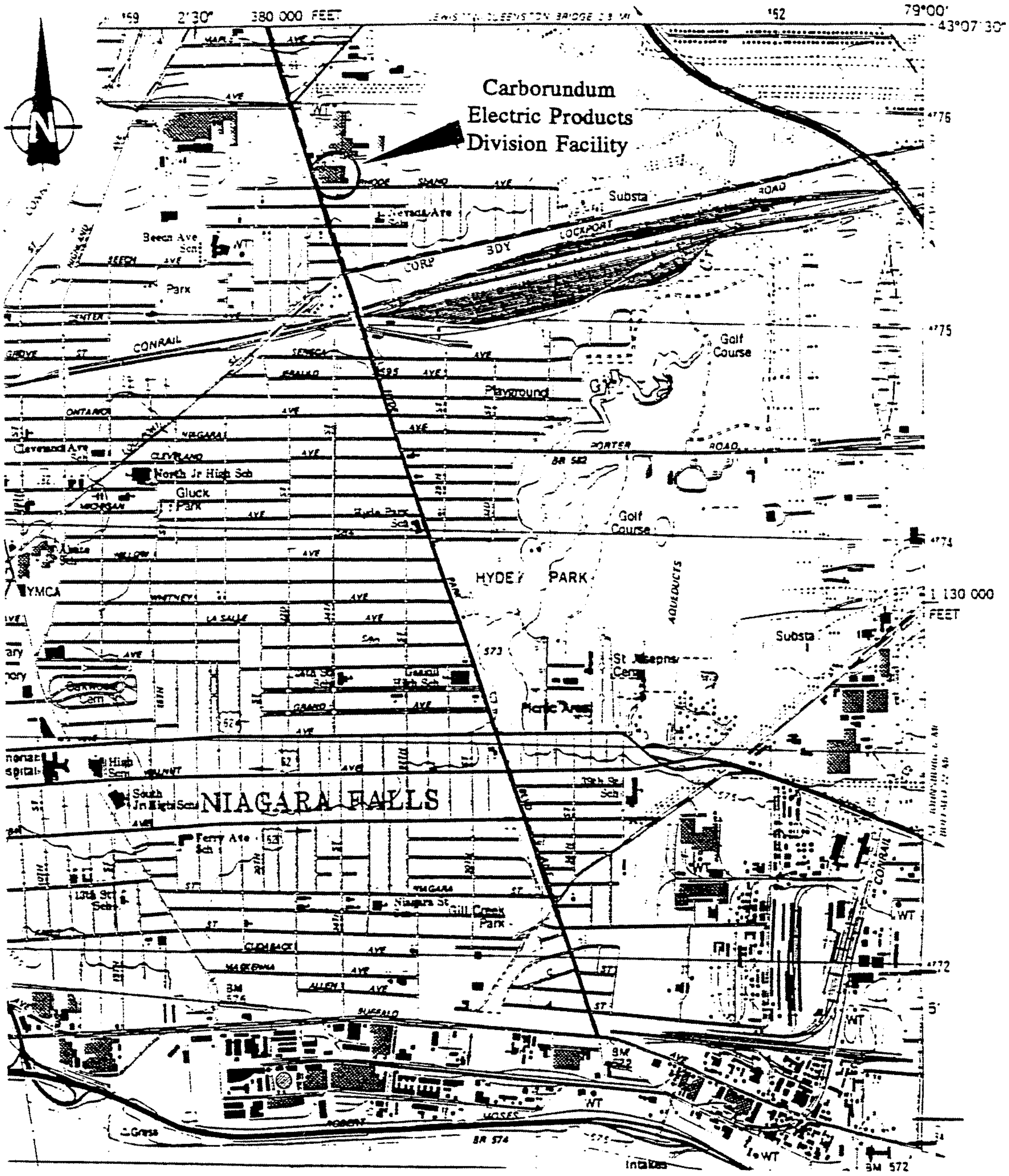
- site history and description
- site topography and geology
- previous investigations
- site characterization

4.1 SITE HISTORY AND DESCRIPTION

The Carborundum Company's Electric Products Division facility is bordered on the west side by Hyde Park Boulevard and on the south side by Rhode Island Avenue in the Town of Niagara in Niagara County, New York. A location map showing the site is provided on Figure 4.1. The plant manufactures heating elements and electronic components from silicon carbide and was purchased by The Carborundum Company from the Globar Company in 1936.

The area immediately to the north and west of The Carborundum Company facility is occupied by light and heavy industry while the area immediately to the east and south is residential.

A site map is shown on Figure 4.2. The west half of the site is occupied by the plant buildings. The east half of the site consists of a paved parking lot and a gravel area that was formerly used as a staging area to store excess materials (sand, silicon carbide, scrap graphite and steel, and empty drums). Prior to 1962 this area was also used to burn cardboard, paper and scrap wood, (URS Consultants, Inc. 1990). The gravel area is the area classified as an inactive hazardous waste disposal site and occupies an area of less than one acre in the northeastern portion of the Carborundum facility property. The gravel area is referred to in this report is the "former material storage area".

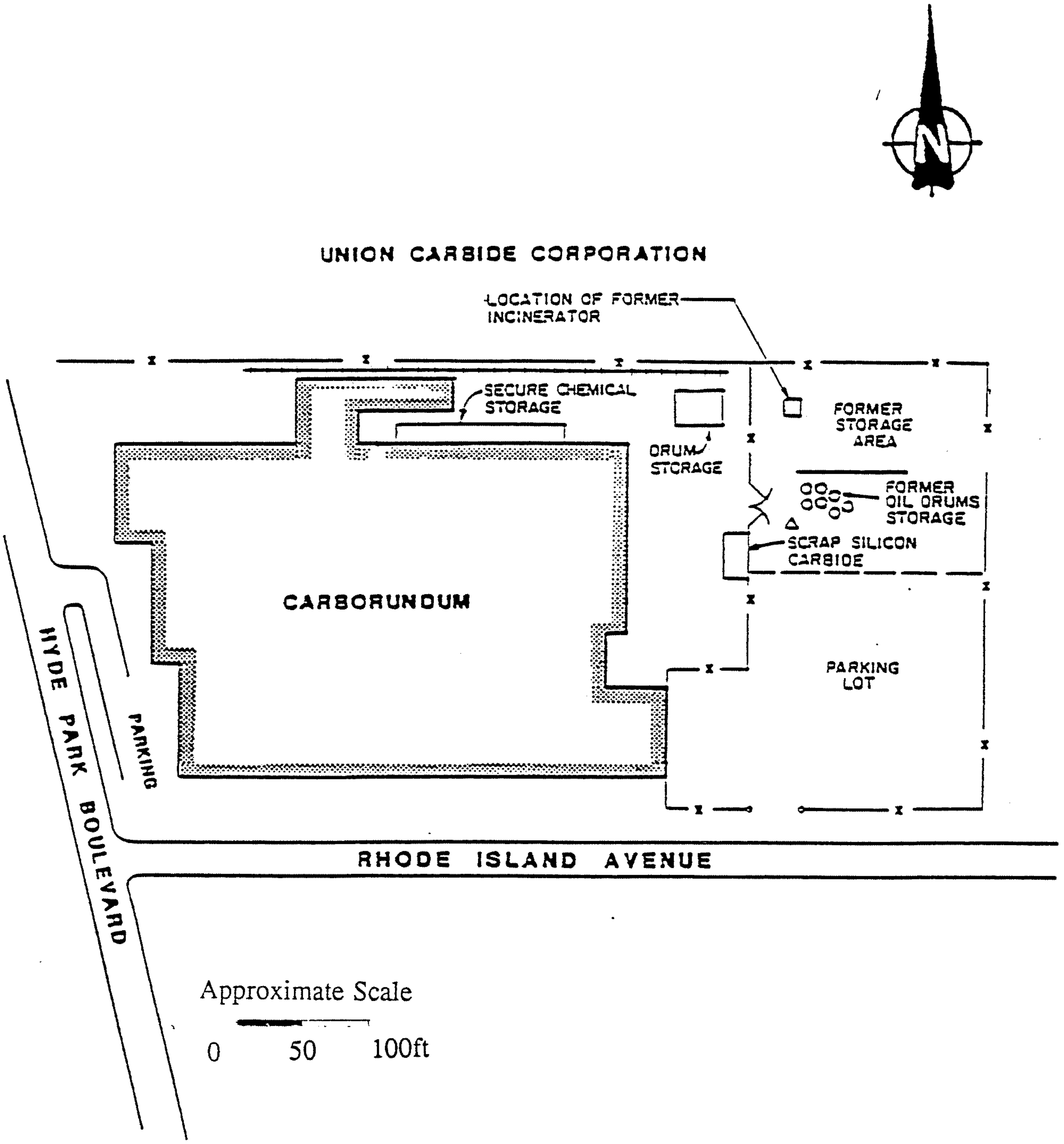


Scale

0 0.5 1 mile

EXCERPT FROM
NIAGARA FALLS, N. Y.-ONT.
SE/4 NIAGARA FALLS 15' QUADRANGLE
N4300-W7900/7.5

DATE:	Location Map of Carborundum Electric Products Division Facility
REF:	
INTERA	Figure 4.1



DATE:

REF:

Site Plan

Source: URS (1990)

Figure 4.2

Currently the gravel (unpaved) area is clear of scrap material except for the following:

- scrap carbon/silicon carbide pieces continue to be stored in the western end of the unpaved area as indicated in Figure 4.2
- the concrete based storage area with a protective steel fenced cage, formerly used to burn cardboard, paper and wood, is currently used to secure and store empty drums prior to off-site disposal
- the northwest corner of the unpaved area continues to be used as a drum storage area for waste liquids, primarily oils, prior to removal for off-site disposal.

The contamination in this area is subsurface. There is no known significant human exposures from continued use of this area as confirmed by baseline air quality monitoring prior to the start of drilling.

A review of the available records and discussions with long-term employees of the facility support the URS report that the northeast quadrant of the site was utilized to store waste materials prior to removal for off-site disposal. Based on employee interviews, it was determined that materials such as sand, silicon carbide, empty drums, scrap graphite, scrap steel, and obsolete equipment, including electrical equipment, were stored in the area. Interviews with employees indicated that solvent wastes were not intentionally disposed of on-site, but instead were sewered or sent off-site for disposal.

Solvents currently used at the site include toluene, xylene and 1,1,1-trichloroethane. Fewer than three drums of solvent in total would be used in any calendar month (R. Spears, Carborundum Company - personal communication). Other solvents that have been utilized at the facility included trichloroethene, carbon tetrachloride and acetone.

An area known as the courtyard, consists of an open area between the original plant building and a later addition. Previously, until about 1984, scrubber water from metal spraying operations was discharged onto the ground in the courtyard area before entering the site's sewer system. This waste stream contained copper, aluminum, nickel, brass, and/or zinc. Since 1984 this material has been hard piped to the sewer system and is discharged under a valid wastewater discharge permit from the City of Niagara Falls. The courtyard area consists of gravel with a paved central walkway. The walkway is occasionally used to provide access from the parking area to the plant. The western most end of the courtyard contains a patio area used for employee breaks. Facility management indicate that the patio is rarely used. No significant human exposures from soil contaminants are anticipated in the courtyard as the area is covered by asphalt and/or crushed rock. Baseline air quality monitoring in the courtyard prior to drilling did not detect any levels of volatile organic compounds.

A railway spur line is located adjacent to the west half of the north property fence. This area is partly revegetated. The railway spur line is no longer in service and there is no activity in this area. There is no significant human exposure to contamination in this area as the area is covered with gravel and/or vegetation. Baseline monitoring of air quality prior to drilling did not detect any level of volatile organic compounds in the area. A gravel roadway provides access between the rail spur and the plant from the former material storage area to the secure chemical storage area.

In response to the NYSDEC Interagency Task Force (1978), the Electric Products Division facility previously reported disposal of solid material wastes at Lynch Park, Niagara Falls (1930-1978) and Newco Waste Systems (1972-1978). BFI Waste Systems or BFI's prior owners are believed to have disposed of all the facility's non-hazardous solid material waste since 1978.

Employee interviews indicated that fill material was brought to the site in the early 1960's to level the east half of the property. The source of the fill is not known. Some of the contamination at the facility could be the result of the emplacement of contaminated fill. Employee interviews also indicated that a coal tar spill in the mid 1960s on the adjacent Union Carbide facility entered the Electric Products Division facility near the drum storage cage.

4.2 SITE TOPOGRAPHY AND GEOLOGY

4.2.1 Site Topography

The topography at the site is flat with a gentle slope across the property to the south. Elevation at the site is approximately 600 feet above mean sea level. The land immediately north of The Carborundum Company site is several feet higher in elevation and is occupied by an industrial park. This area was formerly owned and occupied by Union Carbide Corporation.

4.2.2 Site Geology

General geology in the area consists of glaciolacustrine sediments and glacial till 15-25 feet in thickness overlying dolostone bedrock of the Lockport Dolomite. The water table in the vicinity of the site has been reported at depths ranging from 1 foot to greater than 14 feet with perched conditions reported at the northeast edge of the site (URS 1990). The major aquifer in the area is the weathered portion of bedrock which occurs in the upper 15 to 20 feet of the Lockport Dolomite.

4.3 PREVIOUS INVESTIGATIONS

Previous environmental investigations have been undertaken at the Carborundum Electric Products Division facility and at nearby facilities. Environmental reports for the adjacent Union Carbide facility and nearby facilities at U.S. Vanadium Corp. and Occidental Chemicals Hyde Park landfill were reviewed to assess the potential for the migration of contaminants onto The Carborundum Company property.

4.3.1 Carborundum Electric Products Division Facility

Environmental conditions and concerns relating to the facility have been described in reports from two previous investigations that were conducted at the facility. In 1985, The

Carborundum Company retained Earth Dimensions Inc. of East Aurora, New York to undertake soil sampling and monitor well installation to characterize soil and groundwater contamination at the site. In 1990 NYSDEC contracted URS Consultants Inc. of Buffalo, New York to undertake a data records search to provide a preliminary assessment and hazard ranking of the site.

4.3.1.1 Preliminary Site Assessment - 1985

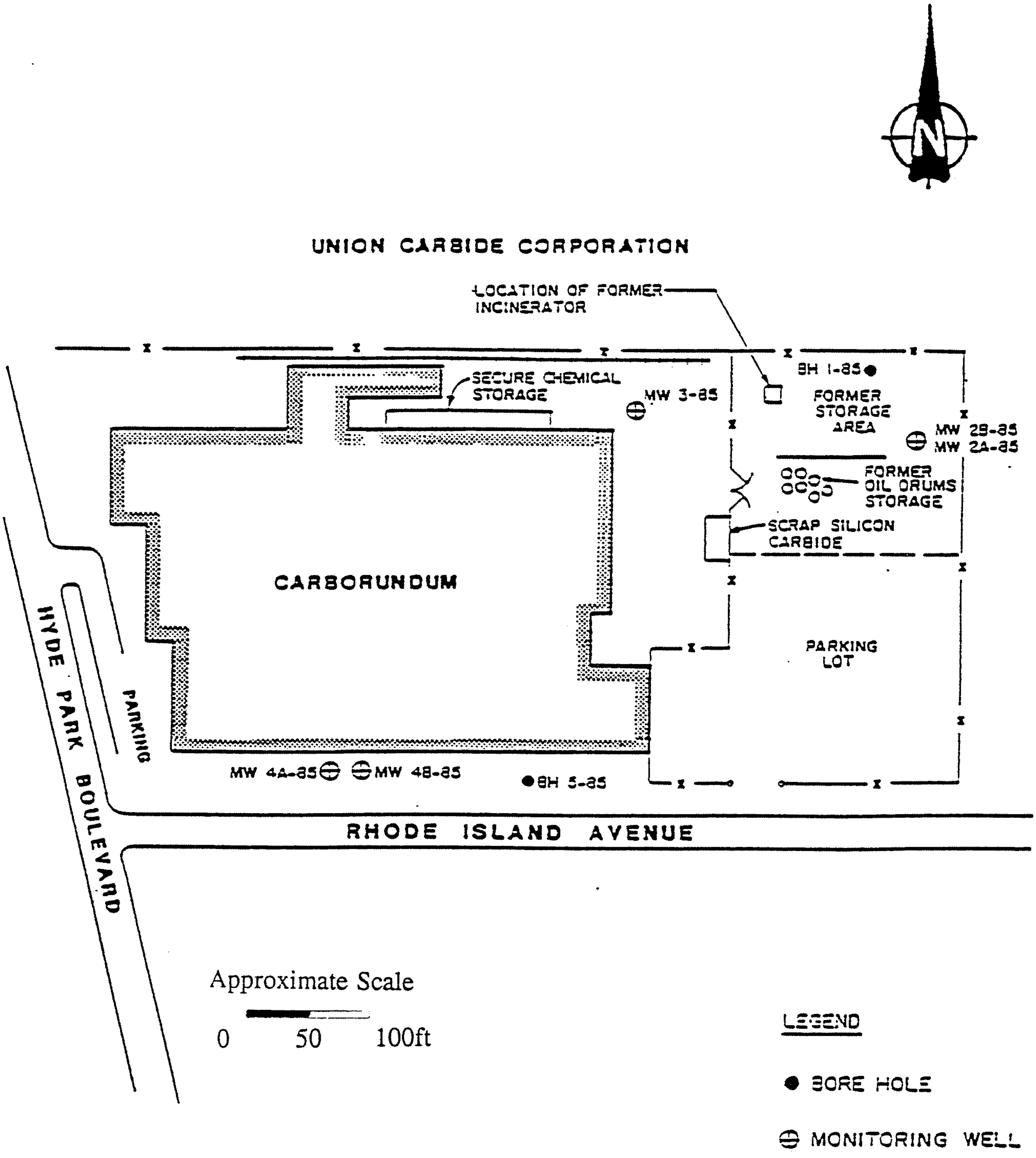
The work program carried out by Earth Dimension Inc. can be summarized as follows:

- Hollow stem auger drilling was carried out at six locations at the facility with continuous split spoon sampling to depths ranging from 10-15 feet (see sample locations Figure 4.3);

- Four soil samples were taken from depths ranging from 0.5-3.5 feet. Samples were submitted to Advanced Environmental Systems Inc. for laboratory analysis for volatile organic compounds (VOCs), PCBs and selected metals;

- Two inch diameter PVC monitoring wells were installed at four of the sites to depths ranging between 12.5 to 14 feet. Two of the wells were completed within the former material storage area and two were completed along the south end of the plant building adjacent to Rhode Island Avenue. At one of the borehole locations in the former storage area, monitor wells were installed as a couplet with one completed to a depth of 6 feet and the other completed to a depth of 12.5 feet;

- Three groundwater samples were submitted to Advanced Environmental Systems Inc. for analysis for pH, specific conductance, total organic carbon, (TOC) total organic halogen (TOH), VOCs, and selected metals.



DATE:	Previous Borehole and Monitor Well Locations Source: URS (1990)
REF:	
INTERA	Figure 4.3

Results of the investigation indicated the following:

- The stratigraphy at the site includes a fill layer 0.8-4 feet in thickness which contains black silt to gravel sized material overlying natural overburden. The overburden consists of clayey silt ranging in thickness from 6.5 to 12.2 feet which in turn overlies a sandy silt unit which ranges in thickness from 1 to 4 feet. Boreholes did not extend into the underlying dolostone of the Lockport Dolomite;

- VOCs were not detected in soil samples taken from the fill zone or natural soil. PCBs were detected at low levels in fill from the former material storage area at concentrations ranging from 0.02 to 0.07 ppm, and were below detection at other locations. PCB concentrations in soil at the site are well below the current most stringent Toxic Substance Control Act cleanup limits of 10ppm (40 CFR 761.125(c)(4)(v). In addition, levels are below the cut-off concentration of 1ppm used in the definition of clean fill (40 CFR 761.125(c)(4)(v);

- VOCs were detected in groundwater in the former material storage area and along the southern edge of the site. Specific compounds included trichloroethene (TCE) at a maximum concentration of 135 ppb and 1,1,1-trichloroethane at a maximum concentration of 60 ppb. Trans 1,2-dichloroethene, 1,1-dichloroethene and vinyl chloride, all of which are known to be transformation products of TCE, were found at concentrations of 41, 10 and 29 μg/l respectively. Maximum metal concentrations in groundwater for copper, lead and nickel were 1.9, 0.15 and 0.47 mg/L respectively;

- Levels of trichlorethene and lead exceeded New York groundwater standards in monitor wells 2A located in the northeast portion of the site, and in monitor well 4A located at the southwest corner of the facility. Vinyl chloride levels exceeded groundwater standards in well 4A, and copper exceeded groundwater standards in well 2A. Lead concentrations also exceeded groundwater standards in monitor well 6 which was located in the southwest corner of the facility.

4.3.1.2 Data Records Search and Preliminary Assessment - 1990

The work program conducted by URS involved the following components:

- a file search at NYSDEC's offices in Buffalo and Albany, and the Niagara County Health Department, and
- a site inspection to observe conditions at the site and in the immediate vicinity of the facility and to measure air quality, explosive levels and radioactivity levels at the site.

Results of the assessment are reported in URS (1990) and summarized below:

- During the site inspection, VOC concentrations in air and radioactivity levels in soil did not exceed background levels
- There is no documentation of hazardous waste deposition at the site
- Three private residential wells are located approximately 3200 feet north and upgradient of the site. Only one of these wells is functional. There are no known private residential wells downgradient of the site
- Groundwater samples taken during the 1985 assessment exceeded New York State groundwater standards for vinyl chloride, TCE, lead and copper
- The Carborundum Company was cited by the City of Niagara Falls for exceeding metals discharge limits to the city sanitary sewer in 1987, but there have been no violations since that time
- The following EPA Hazard Ranking System scores were calculated for the site:

  $S_M = 16.56$
  $S_{FE} = 13.33$
  $S_{DC} = 0$

These scores indicate that some concentration of contaminants was found at the site but the levels do not pose an immediate threat to human health or the environment.

The Carborundum site was classified by NYSDEC as 2a. A classification of 2a indicates that additional date is required for adequate site classification.

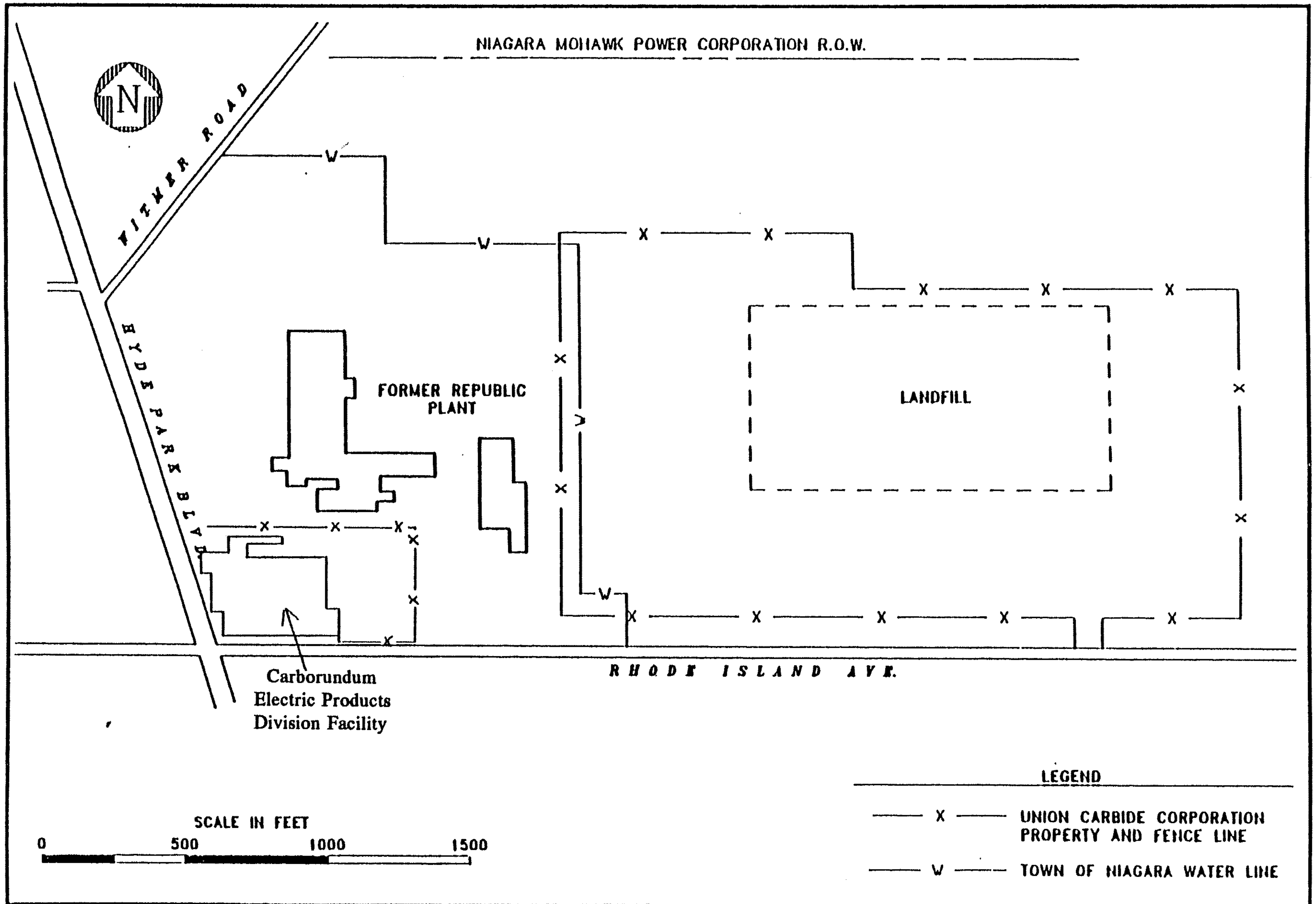
4.3.2 Other Facilities

4.3.2.1 Union Carbide Corporation Carbon Products Division Site

In 1991 NYSDEC retained Ecology and Environment Engineering, P.C. of Lancaster, New York to complete a preliminary site assessment of the Union Carbide inactive hazardous landfill located approximately 1,500 feet to the north and east of The Carborundum Company Electric Products Division facility. The results of the assessment are reported in Ecology and Environment Engineering, P.C. (1991). A location map of the site is provided in Figure 4.4.

The landfill was operated by Union Carbide from 1934 until 1987. The type of wastes disposed of at the site included carbon dust, scrap firebrick, waste wood, coke, pitch, domestic waste from the plant, silica sand, coal tar, petroleum tars, machine oils and spent degreasing sludges. Degreasing sludges and oily waste were disposed of at the site at the rate of 100 gallons per month. In 1987, waste materials were discovered west of the landfill during ground excavation for the installation of a water main for the town of Niagara. Review of the historic aerial photos listed in Section 3.1.1 shows that some disposal and/or waste material storage took place west of the landfill in the vicinity of the present day location of the easternmost building on the former Union Carbide Republic Plant, prior to the construction of that building (1951 aerial photo no. ARE-5H-152). Pitch and coal tar seepage have recently been reported on the property west of the landfill (Ecology and Environment Engineering PC 1991).

Hazardous wastes including coke, pitch, coal tars, petroleum tars and phenols have been identified in soil and groundwater samples taken from the Union Carbide landfill site.



INTERA

Site Plan of Union Carbide Corporation Carbon Products Division Landfill Site
Source: Modified from Ecology and Environment Engineering, P.C. (1991)

Figure 4.4

The following contaminants were identified in bedrock monitoring well BW-4-86, located on the north (upgradient) side of the landfill, during 1988-1990 sampling:

Contaminant	Concentration Range	Water Quality Standards
trichloroethene	30 - 740 μg/L	10 μg/L[1]
1,1,2,2 tetrachloroethene	44 - 1,600 μg/L	--
vinyl chloride	34 - 250 μg/L	2 μg/L[2]
chloroform	5.5 μg/L	100 μg/L[1]
hexachlorabutadiene	10 - 150 μg/L	--

[1] NYS Ground Water Quality Standards, 1986.
[2] NYS Water Quality Standards for Surface Waters and Groundwaters, 1991

No groundwater sampling results were reported for the downgradient side of the landfill.

Levels of trichloroethene and vinyl chloride exceeded New York State guidelines for groundwater quality.

The following constituents were reported in groundwater in three monitoring wells sampled during the period 1978-1984:

Contaminant	Water Quality Standard	Contaminant Concentration		
		Well 1	Well 2	Well 3
arsenic	25 μg/L[1]	<5 - 11.4 μg/L	<5.0 μg/L	<5.0 μg/L
total chromium	--	0.005 - 0.09 mg/L	<0.002 - 0.012 mg/L	<0.005 mg/L
hexavalent chromium	0.05 mg/L[2]	<0.001 - 0.09 mg/L	<0.002 - 0.008 mg/L	<0.005 mg/L
total copper	0.2 mg/L[1]	0.010 - 0.783 mg/L	<0.003 - 0.05 mg/L	<0.003 - 0.042 mg/L
total lead	0.025 mg/L[1]	0.02 - 0.72 mg/L	<0.02 - <0.04 mg/L	<0.04 mg/L
total mercury	2 μg/L[1]	0.82 - 36.6 μg/L	<0.4 - 2.6 μg/L	<0.7 - <1.0 μg/L
halogenated organic scan	--	1.3 - 21.0 μg/L	0.7 - 8.8 μg/L	1.0 - 22.0 μg/L
total organic carbon		11-108mg/L	5.5-130 mg/L	<1.0-35mg/L

[1] NYS Water Quality Standards for Surface Waters and Groundwaters, 1991.
[2] NYS Ground Water Quality Standards, 1986.

Levels of hexavalent chromium and lead in Well 1, and mercury in Wells 1 and 2 exceeded New York State guidelines for groundwater quality.

Groundwater flow directions in the overburden materials, based on static water elevations in three monitor wells was reported to be to the south-southeast. Groundwater flow directions in the bedrock were not determined because static water level information was not available.

The following selected contaminants were measured in samples of soil taken from the Union Carbide landfill site:

Contaminant	**Concentration (ppm)**
toluene	63*
naphthalene	290*
fluorene	470*
fluoranthene	7,300*
benzo (b) fluoranthene	11,000*
benze (a) pyrene	6,500*
dibenzofuran	270*

*value reported as estimated

Field measurements of radioactivity and volatile organic compounds in air at the site were at background levels. A Hazard Ranking System (HRS) score was not reported for the Union Carbide facility. A site investigation of the landfill is scheduled for the summer of 1993.

4.3.2.2 U.S. Vanadium Corporation Site

The U.S. Vanadium Corporation site #932001 is owned by SKW Alloys Inc. (37 acres) and Airco Properties Inc. (25 acres). In 1989 Ecology and Environment P.C. undertook a preliminary site assessment of the 62-acre landfill for NYSDEC. The landfill is located approximately 2500 feet northeast of the Carborundum Electric Products Division facility. The site location is shown on Figure 4.5. The results of the assessment are reported in Ecology and Environment Engineering, P.C. (1989) and summarized below.

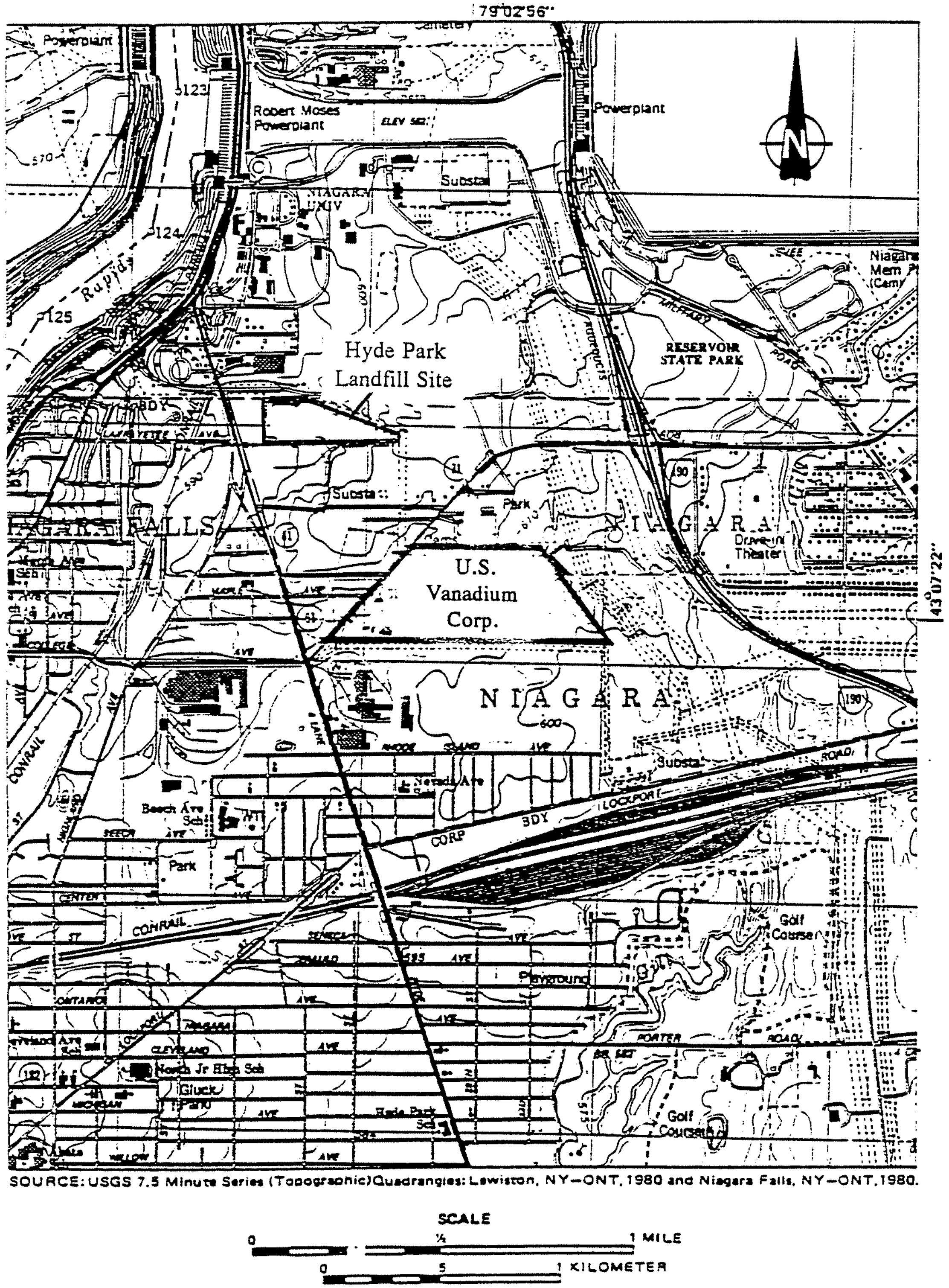
The site, until recently, had been used as a landfill for the disposal of ferrochrome silicon alloy dust, ferromanganese slag, ferrochrome silicon slag, ferrosilicon dust, calcium hydroxide, brick, wood, scrap machinery and raw materials, since 1920. The eastern 25 acres was operated as a landfill by Airco Properties Inc. for the disposal of brick, coke, concrete, carbon fines, and graphite plant waste. Their permit to operate a landfill was not renewed and the future of the site is currently under negotiation (M. Hinton, NYSDEC - personal communication). A portion of the western 37 acres was operated as a landfill by SKW Alloys Inc. The landfill has been closed for several years in accordance with 6NYCRR Part 360 (M. Hinton, NYSDEC - personal communication).

A preliminary HRS score for the U.S. Vanadium Corp. site was calculated as follows:

$S_M = 13.31$
$S_{FE} =$ not scored
$S_{DC} = 50.00$

Air quality monitoring indicated that organic vapours were at background levels.

Water quality monitoring was conducted in monitor wells located on the periphery of the landfill during 1979 to 1984. Groundwater samples were analyzed for general water chemistry and selected metals. The following concentration ranges of contaminants and water quality parameters were measured in the monitor wells:



SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangles: Lewiston, NY–ONT, 1980 and Niagara Falls, NY–ONT, 1980.

DATE:	Location Map for U.S. Vanadium Corp. and Hyde Park Landfill Sites Source: Ecology and Environment Engineering P.C. 1989
REF:	
INTERA	Figure 4.5

Contaminant	Monitor Well No.								
	1	2	3	4	5	6	7	12	13
chromium VI	<0.05 - 0.010	<0.005 - 0.33	<0.005 - <0.02	<0.005 - 0.0271	<0.005 - 0.546	<0.005 - 0.18	0.03 - 1.27	<0.005 - 0.064	<0.005 - 0.013
barium	<0.1 - 1.9	<0.05 - 0.073	<0.05 - 0.24	<0.1 - <0.3.1	0.05 - 1.8	<0.2 - 4.9	<0.1 - 4.9	<0.2 - 1.4	<0.2 - 1.4
TOC	<2 - 130	<5 - 56.2	5.5 - 78	<5 - 100	<2 - 115	<1 - 60.3		<5 - 130	<5 - 110

The groundwater samples were not analyzed for specific organic contaminants, but the levels of TOC measured at U.S. Vanadium Corp. approach the levels of TOC measured in the Union Carbide facility located approximately 800 feet south of the U.S. Vanadium Corp. site.

Groundwater flow directions are expected to be in a southwesterly direction across the U.S. Vanadium Corp. site (Ecology and Environment Engineering, P.C. 1989).

4.3.2.3 Occidental Chemicals Hyde Park Landfill Site

The Hyde Park landfill site is located approximately 4400 feet to the north of The Carborundum Company Electric Products Division facility. The site is located on Figure 4.5.

During the period 1953 to 1975, approximately 80,000 tons of chemical wastes consisting predominantly of hexchloropentadiene derivatives, chlorendic acid, and chlorinated toluenes, benzenes and phenols and approximately 0.66 to 1.65 tons of dioxin (2,3,7,8-TCDD) were disposed of at the site. Groundwater flow is west-northwest from the north half of the site and southwest from the south half of the site. Chlorinated organic compounds including dioxin have been detected on groundwater seeping from the Niagara River gorge face located 3,000 feet west-northwest of the site (GeoTrans, Inc. 1988).

Investigations defining the extent of contamination from the Hyde Park landfill based on levels of non-aqueous phase liquids (NAPLs) shows contamination extending approximately 900 feet west-northwest of the landfill and 1600 feet south of the landfill in 1991 (Conestoga Rovers 1991). The zone of contamination is based on the occurrence of free product NAPL and a dissolved contaminant plume would extend considerably further to the southwest in the direction of regional groundwater flow.

4.4 SITE CHARACTERIZATION AT THE CARBORUNDUM ELECTRIC PRODUCTS DIVISION FACILITY

The Preliminary Site Assessment (PSA) site characterization studies at the Carborundum Electric Products Division facility were conducted during the period July 27 to August 25, 1992. Additional field work that involved resampling four soil sample locations was completed in October 1992. The resampling was necessary because the contract laboratory had exceeded sample holding times.

The PSA site characterization studies are described under the following headings:

- Health and Safety Program
- Groundwater Sampling Program
- Soil Sampling Program

4.4.1 Health and Safety Program

A health and safety program (HSP) was developed for the PSA and accepted by NYSDEC (see INTERA Inc. 1992b). A safety meeting was held at The Carborundum Company Electric Products Division facility and was attended by INTERA field personnel, drilling contractor personnel and safety and environmental personnel from The Carborundum Company.

Plant safety issues were discussed by Ms. M.L. Maggard, Carborundum Company Plant Safety Officer. The PSA HSP was reviewed by Mr. R. Timlin, INTERA Site Safety Officer (SSO). At the conclusion of the meeting, INTERA and subcontractor personnel involved in the field program signed the HSP confirming that they had read the HSP.

All utilities were staked or cleared prior to the commencement of field work.

4.4.1.1 Site Ambient Air Monitoring

Site worker personal protection was initially set at level D. The level of protection was determined by air quality monitoring. Air quality was monitored prior to the commencement of drilling and during drilling for levels of volatile organic compounds, oxygen and combustible gas.

Volatile organic compounds were measured using an HNu photoionization detector (PID). Oxygen and combustible gas levels were measured using a model MX251 detector manufactured by Industrial Scientific. Instruments were calibrated and checked for battery condition daily. Prior to the start of drilling, baseline conditions were determined at eight stations along the perimeter of The Carborundum Company property and at each proposed borehole location. Levels of volatile organic compounds, oxygen and combustible gas at each station were constant and normal at 0ppm, 21% and 0% respectively.

During drilling a total of four or six stations were established on the boundary of the exclusion zone for each borehole and in the breathing zone of the borehole. Stations were monitored for air quality on approximately hourly intervals. Levels of volatile organic compounds generally registered 0ppm except during the drilling of monitor wells MW-3b, MW-4b, MW-4a and MW-5b. A maximum VOC reading of 2.1ppm was recorded during the drilling of MW-5b in a heavy rainstorm. The elevated VOC was attributed to moisture effect. The VOC levels were always within the acceptable range for Level D personal protection. Oxygen levels ranged from 20.5 to 21.9% and did not show any significant variation.

Combustible gas levels of 0% LEL were recorded for each site with the exception of one measurement during the drilling of MW-2b which registered 1% LEL. This level did not indicate any significant explosion hazard and did not require any corrective action to be taken.

Results of baseline air quality monitoring and air quality monitoring during drilling are provided in Appendix A.

4.4.1.2 Community Air Monitoring

Community air quality monitoring was conducted because of the proximity of private residences to the site. Community air monitoring was conducted hourly for volatile organic compounds using the HNu PID. During coring operations into bedrock, particulate air emissions were monitored at one hour intervals within the work area using a Mini Ram PDM3 manufactured by MIE.

VOC emissions were measured at levels that were below the action levels for community air monitoring that were listed in the HSP. During bedrock drilling particulate air emissions were measured as the difference between background and the station reading. These differences ranged from 0.00 to 3.02μg/m^3, with the exception of boreholes MW-2b, MW-3b and MW-4b which are discussed below.

During the drilling of borehole MW-2b on July 31, 1992, considerable particulate emissions were produced because of a poor seal between the temporary drill casing and bedrock which allowed rock dust to escape during the initial stages of coring (see discussion section 4.2.2.2). Particulate emissions reached a level of 278μg/m^3 above background in the breathing zone. Particulate emissions 25ft downwind were measured at a level of 27.8μg/m^3 above background; a level that was below the action level listed in the HSP. Drillers were ordered to wear cartridge type respirators until particulate emission levels in the breathing zone returned to normal. Within 5-10 minutes after formation water was encountered, dust was suppressed and particulate emission levels dropped to a range of 0.00 to 18.5μg/m^3 above background in the breathing zone. Particulate emission levels ranged from 13.2 to 78.2 above background at a distance of 25ft downwind. Within 80 minutes particulate levels 25ft downwind were reduced to background levels.

During the drilling of borehole MW-3b on August 4, 1992, particulate emissions reached a maximum level of 68.7$\mu g/m^3$ above background in the breathing zone and 8.29$\mu g/m^3$ above background 25ft downwind of the work zone. Within one half hour particulate emission levels were within 1$\mu g/m^3$ above background levels.

On August 11, 1992, particulate emissions reached 22.4$\mu g/m^3$ above background in the breathing zone during the drilling of borehole MW-4b. Within one half hour emission levels returned to background levels.

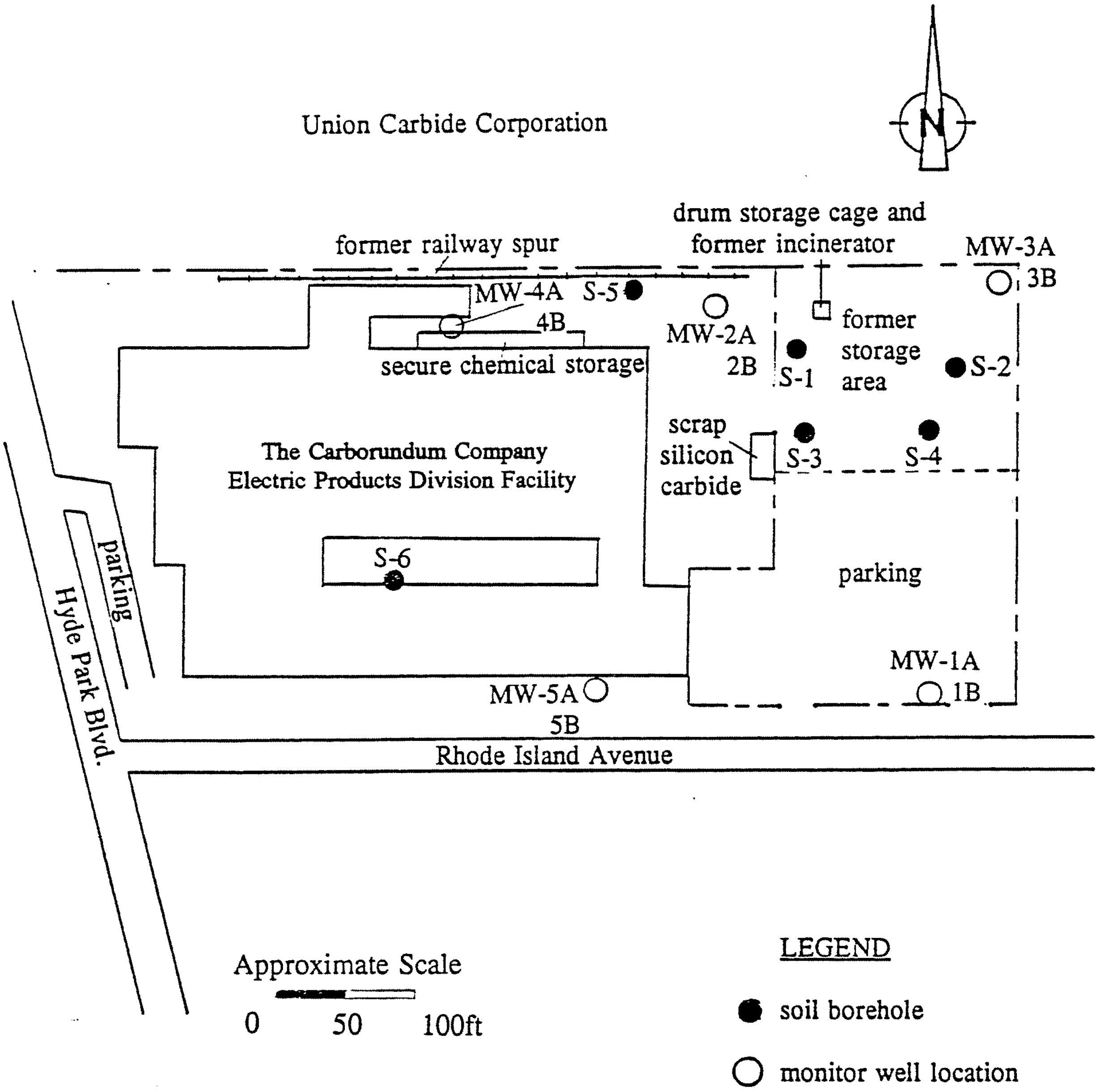
At no time during the drilling did particulate emissions exceed 100$\mu g/m^3$ above background at the station located 25ft downwind of the work zone. Consequently, mitigative measures including the cessation of work or the employment of dust suppression methods, which are actions listed in the HSP for community air monitoring, were not required. Particulate emission monitoring results are provided in Appendix A.

4.4.2 Groundwater Sampling Program

The groundwater sampling program was conducted according to the program work plan (INTERA Inc. 1992a).

4.4.2.1 Rationale for Sampling Locations

A total of ten groundwater monitor wells were completed at five locations on the property as shown on Figure 4.6. Monitor wells were completed as couplets at each location with a shallow monitoring well installed in the natural overburden above the Lockport Dolomite and a deeper monitoring well installed into the upper portion of the Lockport Dolomite. Each monitor well was installed in separate boreholes to ensure the integrity of the samples. A schematic of monitor well completions in the overburden and the bedrock is provided as Figure 4.7.



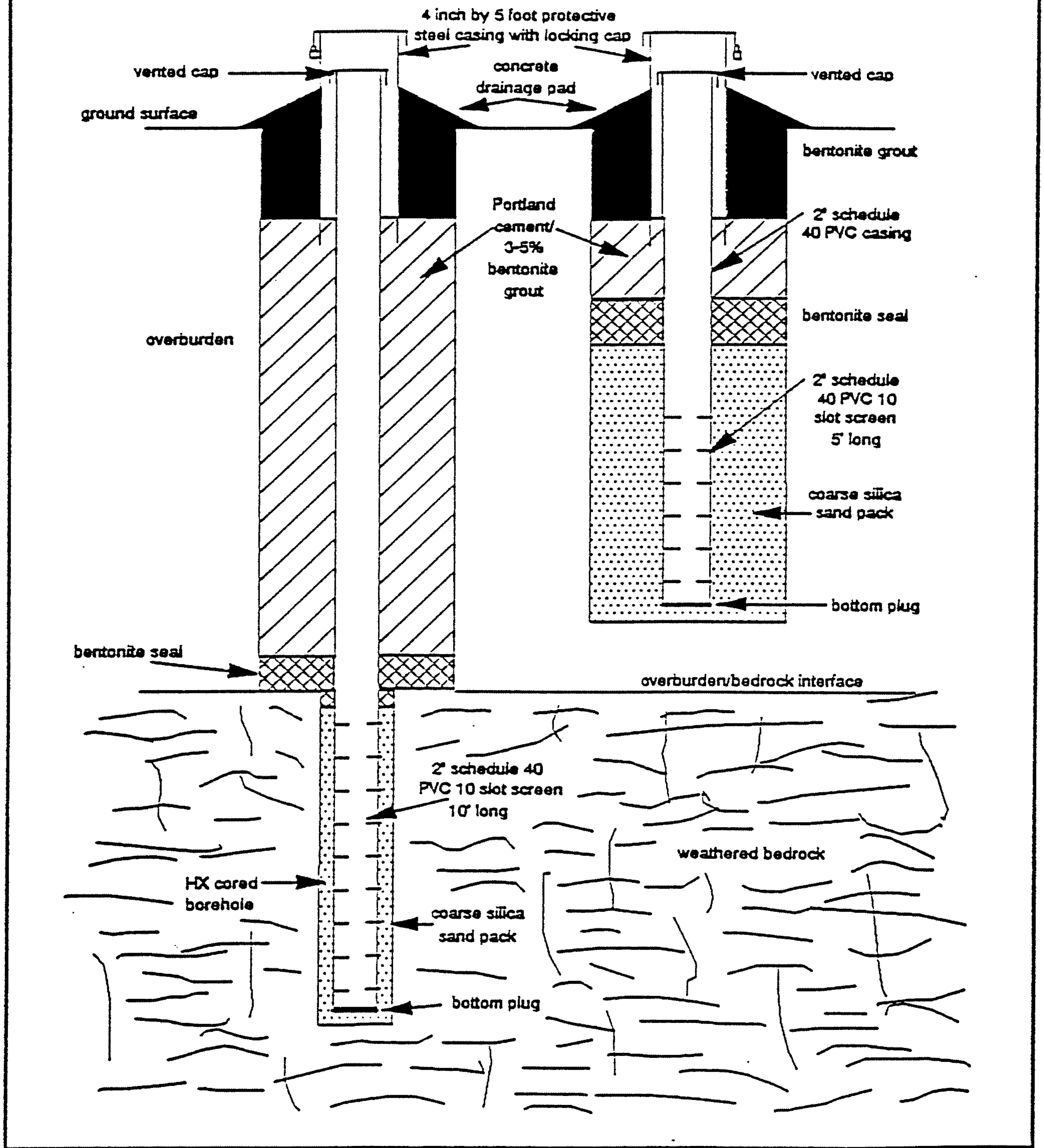
DATE:

REF:

Monitor Well and Soil Sample Locations

INTERA

Figure 4.6



DATE:	Schematic of Nested Monitor Well Completion
REF:	

INTERA

Figure 4.7

MW-1 was located in the southeast corner of the Carborundum facility, in what was thought to be the general downgradient direction from the former storage area, which is the primary potential source of onsite contamination. The purpose of MW-1 was to assess the potential for offsite migration. MW-2 was located in the north central portion of the facility. The purpose of MW-2 was to assess groundwater quality downgradient from the Union Carbide site and to assess soil and groundwater impacts from possible spillage associated with chemical handling and transfer operations in the vicinity of the railway spur line. MW-3 was located in the northeast portion of the facility to monitor upgradient groundwater quality. MW-4 was situated adjacent to the secure chemical storage and the solvent transfer stations. MW-4 was located to assess impacts to soil and groundwater from possible spillage during solvent transfer. MW-5 was located at the southeast end of the facility building in the parking area between the plant building and Rhode Island Avenue. MW-5 was initially located at the southwest end of the plant building but the proximity of overhead power lines prevented the safe operation of drilling equipment in that area. MW-5 was located to assess any offsite migration of contamination from the facility.

4.4.2.2 Deep Monitor Well Installation

Drilling was conducted by Empire Soil Investigations of Hamburg, New York using a truck mounted CME 55 drill rig with capability for hollow stem augering and air rotary coring.

An exclusion zone was established around the drilling rig with caution tape to prevent unauthorized entry. The drilling contractor placed 6 mil plastic sheeting over the ground surface at each well location to minimize contamination of surface soils. A four foot by eight foot sheet of 5/8 inch thick plywood was placed over the plastic as a working surface and a hole was cut into the plywood to accommodate down-hole tools.

Deep monitor wells, identified as MW-1b to MW-5b on Figure 4.6, were installed into the upper 15 feet of the Lockport Dolomite at each couplet location. The boreholes were advanced using 2 inch I.D. hollow stem augers to the top of bedrock. A temporary 4 inch I.D.

steel casing with a spin bit was advanced into the top of bedrock to secure the casing. An HQ-sized core barrel and drill rods fitted with a diamond bit were advanced into bedrock using air rotary methods to complete the hole.

During the coring of the first deep borehole (MW-2b) the drilling contractor failed to supply spin bits to the drilling crew. Consequently the 4 inch, temporary casing was not properly seated into bedrock and drilling was suspended when water was discharged from the annulus during air rotary drilling. The drilling procedure described in the Work Plan was modified with concurrence from NYSDEC (see letters to NYSDEC dated July 31 and August 4, 1992, Appendix B) for the purposes of completing the first hole. The modification included grouting permanent 4 inch I.D. schedule 40 PVC casing into the top of bedrock and air rotary coring inside the casing. This modified method failed when the grout seal between the bottom of casing and bedrock was breached by air pressure, which forced air into the formation and up to ground surface. The hole was abandoned by filling the open hole with a grout mixture of Portland cement and bentonite using a tremie pipe. Spin bits were delivered to the job site and MW-2b and all remaining boreholes were drilled according to the original method described in the Work Plan.

A second deep monitor well (MW-4b) was abandoned because the monitor well casing was pulled out of the borehole during removal of the temporary casing. The hole was abandoned and sealed using the same procedure described for MW-2b, and redrilled.

Drill cores were logged in the field for lithology, color, texture, fracture density and visual evidence of contamination.

Monitor wells were completed using 2 in I.D. schedule 40 flush jointed PVC riser pipe attached to a 10 foot long screen. The screen and riser pipe were placed inside the temporary casing and into the open bedrock borehole.

Coarse, clean, silica sand was placed between the well screen and bedrock to approximately 1 foot above the screened interval. The top of the sand pack was measured with a tape to ensure that it was completed above the screen. A bentonite seal 2 feet in thickness was placed above the sand pack. A grout consisting of Portland cement and 3 to 5 percent bentonite was placed in the borehole annulus above the bentonite seal to ground surface.

A 4 inch diameter, 5 foot long, locking steel surface casing was installed at surface to protect the monitor well casing for monitor wells MW-1, MW-2, MW-3 and MW-5. The surface casing was sealed with a cement pad sloped to facilitate surface water runoff away from the well. MW-4 was installed in a high traffic area of the facility and was completed with flush mounted casing.

4.4.2.3 Shallow Monitor Well Installation

At each couplet location (MW-1a to MW-5a), a shallow monitor well was completed into the natural overburden using hollow stem auger drilling techniques. Monitor wells were installed inside hollow stem augers which were withdrawn as the borehole annulus was backfilled. Monitor well materials and completion techniques were the same as described for the deep monitor wells except that screens for the shallow monitor wells were 5 feet in length.

Each couplet, with the exception of MW-4 which was flush-mounted was protected from damage from vehicular traffic by bollards which consist of 6 foot lengths of steel casing driven into the ground below the frost line and filled with concrete. A summary of monitor well completion information is provided in Table 4.1.

4.4.2.4 Well Development

Each of the groundwater monitor wells was developed by bailing, surging or pumping. The Work Plan had recommended that well development be completed within 48 hours of completion. This requirement became a logistical problem and well development was not carried

Table 4.1 Summary of Monitor Well Completion

Monitor Well Number	Date Started	Date Completed	Total Depth of Monitor Well (ft BGS)
MW-1a	Aug. 7, 1992	Aug. 7, 1992	20.5
MW-1b	Aug 6, 1992	Aug. 6, 1992	35.3
MW-2a	July 29, 1992	July 29, 1992	18.1
MW-2b	July 29, 1992	Aug, 3, 1992	abandoned/sealed
reinstallation of MW-2b	Aug. 7, 1992	Aug. 10, 1992	38.2
MW-3a	Aug. 5, 1992	Aug. 5, 1992	19.5
MW-3b	Aug. 3, 1992	Aug. 4, 1992	45.5
MW-4a	Aug. 12, 1992	Aug. 12, 1992	20.0
MW-4b	Aug. 10, 1992	Aug. 11, 1992	abandoned/sealed
reinstallation of MW-4b	Aug. 12, 1992	Aug. 12, 1992	34.5
MW-5a	Aug. 14, 1992	Aug. 14, 1992	20.0
MW-5b	Aug. 13, 1992	Aug. 13, 1992	37.3

BGS = below ground surface

out until all of the wells had been installed (see letters to NYSDEC dated July 31 and August 4, 1992, Appendix B). This change in plan was approved by NYSDEC.

During well development, purge water was analyzed in the field for turbidity, pH, temperature and conductivity. NYSDEC requires that well development proceed until turbidity falls to 50 nephelometric units (NTU).

Overburden Wells

The overburden wells were initially very turbid and difficult to develop. The wells were developed by repeatedly pumping them dry and allowing them to slowly recover each time. Recovery of each well after pumping took several hours. Each well was pumped dry several times per day. The volume of water removed from each well during development ranged from 21 to 92 gallons. Water remained turbid to very turbid in MW-1a, MW-2a, MW-4a and MW-5a. The final turbidity in MW-3a was 284 NTU.

Bedrock Wells

Bedrock wells were developed by pumping. Monitor well MW-2b was the only bedrock well that had initial turbidity readings of less than 50 NTU. Final turbidity readings of 5 NTU were reached after 75 gallons of water were removed.

Monitor wells MW-1b, MW-4b and MW-5b all had initial turbidities of greater than 100 NTU but reached final turbidity readings of between 5 to 38 NTU after removal of between 90-110 gallons of water. Monitor well MW-3b had an initial turbidity reading of 1100 NTU. Its final turbidity measurement stabilized to 172 NTU along with conductivity and pH after 100 gallons were removed.

The following modifications were made to the well development protocol where turbidity levels exceeded 50 NTU after 3 hours of well development. These modifications were agreed to by NYSDEC (see letter to NYSDEC dated September 1, 1992, Appendix B):

(i) for overburden wells, wells were developed for a minimum of three hours, after which time the well would be allowed to recover and suspended material would be allowed to settle prior to sampling the upper portion of the water column with a bailer, and

(ii) for bedrock wells, wells would be developed for a period of three hours. Turbidity, pH, conductivity and temperature were monitored during development. If, after three hours, turbidity exceeded 50 NTU but pH, conductivity and temperature had stabilized to the point that there was little change in parameter readings during three successive readings, groundwater sampling could be undertaken.

A summary of well development for each well is provided in Table 4.2.

4.4.2.5 Hydraulic Conductivity Testing

Hydraulic conductivity testing included recovery tests (slug tests) on overburden wells and a pump test on one of the bedrock wells. Recovery tests are suitable for formations with low hydraulic conductivities. Pump tests are conducted on formations with high hydraulic conductivities.

Overburden Wells

Overburden wells were tested by removing a slug of water from the well casing and recording the recovery of the well with an electric water level tape. The response data were evaluated using the method of Hvorslev (1951).

Bedrock Wells

A pump test was completed on bedrock well MW-2b only. The remaining bedrock wells were not pump tested because of disposal costs associated with the large volume of potentially contaminated groundwater produced during pumping. The pump test consisted of a steady state

Table 4.2 Summary of Well Development

Well No.	Volume of Water Removed (gallons)	Initial Turbidity (NTU)	Final Turbidity (NTU)
MW-1a	30.75	very turbid	very turbid
MW-1b	92	>100	38
MW-2a	20.75	turbid	turbid
MW-2b	75	23	5
MW-3a	27.25	turbid	284
MW-3b	100	1100	172
MW-4a	33.25	very turbid	very turbid
MW-4b	90	264	7
MW-5a	92.25	very turbid	very turbid
MW-5b	110	260	12

drawdown at a constant discharge. The drawdown and discharge rate was used to calculate the hydraulic conductivity using a modification of steady flow in confined aquifers after Driscoll (1986).

4.4.2.6 Water Level Monitoring

Water levels in monitor wells were monitored during well development, before and after hydraulic conductivity testing, and before and after groundwater sampling. Water levels were measured with an electric tape. After each measurement the tape was decontaminated using the following protocol:

- paper towel wipe
- non-phosphate detergent wash
- deionized water rinse
- paper towel wipe

Ground surface elevations and the elevations to the top of the PVC monitor well and the top of the metal protective casing for each monitor well were surveyed by Advance Survey Group of Niagara Falls, New York.

Elevations were tied to the arrow on the top of the first fire hydrant west of 20th Street on Virginia Avenue, a City of Niagara Falls datum which has an elevation of 593.73 ft above mean sea level (a.m.s.l.).

4.4.2.7 Groundwater Sampling

Following well development and hydraulic conductivity testing, each well was sampled using a bailer and/or a dedicated hand inertial pump. The hand inertial pump consisted of a delrin foot valve attached to polyethylene riser pipe. Groundwater sampling was conducted during the period August 20 to August 23, 1992.

Overburden wells were generally slow to recover and produced turbid water when pumped. The strategy for sampling these wells included purging a minimum of three volumes of standing water from the casing or purging to dryness using a bailer. The wells were allowed to recover for a minimum of 12 hours to allow suspended material to settle out. The upper portion of the water column was sampled with a bailer. Samples for all constituents except soluble metals were obtained with a bailer and sent to the analytical laboratory unfiltered. Samples for soluble metals were collected using a dedicated hand inertial pump and were filtered in the field using an attached in-line disposable 0.45μm pore size filter.

Bedrock wells were sampled using dedicated hand inertial pumps. All samples from bedrock well, except for soluble metal samples, were sent to the analytical laboratory unfiltered. Samples for soluble metals in the bedrock wells were collected and filtered as described above for the overburden wells. A summary of groundwater sampling is provided in Table 4.3.

Groundwater samples were collected for analysis of the Superfund Target Compound List (TCL) of parameters which include volatile organic compounds, semi-volatile and non-volatile organic compounds, PCBs, total metals, soluble metals, and total cyanide. A list of specific compounds and elements is provided in Table 4.4.

All samples were collected in clean, laboratory prepared, pre-labelled bottles, according to the specifications summarized in Table 4.5. Samples were stored in refrigerated coolers, sealed and delivered to Recra Environmental Inc. of Amherst, New York within 48 hours of collection. Samples were analyzed using NYSDEC ASP 91 protocols.

4.4.3 Soil Sampling Programs

During the installation of groundwater monitor wells, soil samples of the overburden were collected using hollow stem auger drilling techniques. In addition, six boreholes were located elsewhere on the facility to assess the nature and extent of any contamination in the fill material and natural overburden.

Table 4.3 Summary of Groundwater Sampling

Well No.	Date Sampled	Weather Conditions	Volume Purged (gallons)	Final Turbidity (NTU)
MW-1a	Aug. 23, 1992	sunny, hot, no breeze	20	51
MW-1b	Aug. 21, 1992	clear, sunny	20	34
MW-2a	Aug. 23, 1992	sunny, hot, no breeze	3.75	7
MW-2b	Aug. 20, 1992	clear, hot, breeze from southeast	70	29
MW-3a	Aug. 23, 1992	sunny, hot, no breeze	4.5	5
MW-3b	Aug. 20, 1992	clear, sunny	80	180
MW-4a	Aug. 21, 1992	clear, mild, breeze from northeast	6.75	64
MW-4b	Aug. 20, 1992	clear, sunny, breeze from south	75	42
MW-5a	Aug. 21, 1992	sunny, mild, breeze from southeast	42	81
MW-5b	Aug. 21, 1992	clear, sunny, hot	65	28
MW-6a	Aug. 21, 1992	clear, sunny, hot	20	N.M.
MW-6b	Aug. 21, 1992	clear, sunny, hot	20	34

note: MW-6a - field blank
MW-6b - field duplicate of MW-1b
N.M. - not measured

Table 4.4 Superfund Target Compound List

Volatile Compounds

1. Chloromethane
2. Bromomethane
3. Vinyl chloride
4. Chloroethane
5. Methylene chloride

6. Acetone
7. Carbon Disulfide
8. 1,1-Dichloroethylene
9. 1,1-Dichloroethane
10. 1,2-Dichloroethylene(total)

11. Chloroform
12. 1,2-Dichloroethane
13. 2-Butanone
14. 1,1,1-Trichloroethane
15. Carbon tetrachloride

16. Vinyl acetate
17. Bromodichloromethane
18. 1,2-Dichloropropane
19. cis-1,3-Dichloropropene
20. Trichloroethene

21. Dibromochloromethane
22. 1,1,2-Trichloroethane
23. Benzene
24. trans-1,3-Dichloropropene
25. Bromoform

26. 4-Methyl-2-pentanone
27. 2-Hexanone
28. Tetrachloroethene
29. Toluene
30. 1,1,2,2-Tetrachloroethane
31. Chlorobenzene
32. Ethyl Benzene
33. Styrene
34. Total Xylenes

Semi-Volatile Compounds

35. Phenol
36. bis(2-Chloroethyl) ether
37. 2-Chlorophenol
38. 1,3-Dichlorobenzene
39. 1,4-Dichlorobenzene

40. Benzyl alcohol
41. 1,2-Dichlorobenzene
42. 2-Methylphenol
43. 2,2'-oxybis(1-Chloro-priopane
44. 4-Methylphenol

45. N-Nitroso-di-n-propylamine
46. Hexachloroethane
47. Nitrobenzene
48. Isophorone
49. 2-Nitrophenol

50. 2,4-Dimethylphenol
51. Benzoic acid
52. bis(2-Chloroethoxy) methane
53. 2,4-Dichlorophenol
54. 1,2,4-Trichlorobenzene

55. Naphthalene
56. 4-Chloroaniline
57. Hexachlorobutadiene
58. 4-Chloro-3-methylphenol (p-chloro-m-cresol)
59. 2-Methylnaphthalene

60. Hexachlorocyclopentadiene
61. 2,4,6-Trichlorophenol
62. 2,4,5-Trichlorophenol
63. 2-Chloronaphthalene

64. 2-Nitroaniline
65. Dimethyl phthalate
66. Acenaphthylene
67. 2,6-Dinitrotoluene
68. 3-Nitroaniline
69. Acenapnthene

70. 2,4-Dinitrophenol
71. 4-Nitrophenol
72. Dibenzofuran
73. 2,4-Dinitrotoluene
74. Diethylphthalate

75. 4-Chlorophenyl phenyl ether
76. Fluorene
77. 4-Nitroaniline
78. 4,6-Dinitro-2-methylphenol
79. N-nitrosodiphenylamine

80. 4-Bromophenyl phenyl ether
81. Hexachlorobenzene
82. Pentachlorophenol
83. Phenanthrene
84. Anthracene

85. Di-n-butyl phthalate
86. Fluoranthene
87. Pyrene
88. Butyl benzyl phthalate
89. 3,3'-Dichlorobenzidine

90. Benz(a)anthracene
91. Chrysene
92. bis(2-Ethylhexyl)phthalate
93. Di-n-octyl phthalate
94. Benzo(b)fluoranthene

95. Benzo(k)fluoranthene
96. Benzo(a)pyrene
97. Indeno(1,2,3-cd)pyrene
98. Dibenz(a,h)anthracene
99. Benzo(g,h,i)perylene

Pesticides/PCBs

100. alpha-BHC
101. beta-BHC
102. delta-BHC
103. gamma-BHC (Lindane)
104. Heptachlor

105. Aldrin
106. Heptachlor epoxide
107. Endosulfan I
108. Dieldrin
109. 4,4'-DDE

110. Endrin
111. Endosulfan II
112. 4,4'-DDD
113. Endosulfan sulfate
114. 4,4'-DDT

115. Endrin ketone
116. Methoxychlor
117. alpha-Chlordane
118. gamma-Chlordane
119. Toxaphene

120. AROCLOR-1016
121. AROCLOR-1221
122. AROCLOR-1232
123. AROCLOR-1242
124. AROCLOR-1248

125. AROCLOR-1254
126. AROCLOR-1260

Inorganics

1. Aluminum
2. Antimony
3. Arsenic
4. Barium
5. Beryllium
6. Cadmium
7. Calcium
8. Chromium
9. Cobalt
10. Copper
11. Iron
12. Lead
13. Magnesium
14. Manganese
15. Mercury
16. Nickel
17. Potassium
18. Selenium
19. Silver
20. Sodium
21. Thallium
22. Vanadium
23. Zinc
24. Cyanide

Table 4.5 Summary of Sampling Specifications for Groundwater Sampling

Sample Type	Container Specifications	Sample Volume (total)	Preservation	Maximum Holding Time (days)*
Volatile Organic Compounds	40ml glass vial	2	cool, 4°C	7
Semi and Non-Volatile Organic Compounds	1 liter glass with teflon	2	cool, 4°C	5 (to extract) 40 (to analyze)
PCBs	1 liter glass bottle	1	cool, 4°C	5 (to extract) 40 (to analyze)
Metals (total)	1 liter plastic	1	Nitric Acid $pH<2$ cool, 4°C	6 months (Hg 26 days)
Metals (soluble)	1 liter plastic	1	field filter ($0.45\mu m$) Nitric Acid $pH <2$ cool, 4°C	6 months (Hg 26 days)
Total Cyanide	1 16oz plastic	1	Sodium Hydroxide $pH > 12$ cool, 4°C	12

* note: holding time measured from the verifiable time of sample receipt by the laboratory

4.4.3.1 Rationale for Sample Locations

Sample locations are provided in Figure 4.6. Soil samples collected at each monitor well site were labelled MW-1 to MW-5. Soil samples collected elsewhere were labelled S-1 to S-6. The rationale for monitor well locations was discussed in Section 4.4.2.1. The rationale for locating soil samples S-1 to S-6 is provided below.

S-1 was located adjacent to the fenced area which was previously used to store empty drums. Samples from the fill and natural overburden were obtained to assess the impact of spillage or leakage that may have occurred during transfer of drums and to assess the impact of burning waste wood, cardboard, and paper that occurred in this area prior to 1962. Sample S-1 also provides information on the effects of the reported coal tar spill from the adjacent Union Carbide facility. S-2 was located at the east end of the site adjacent to former monitor well 2B. This location was selected to assess the fill material and the natural overburden soils in the area of the facility where low concentrations of PCBs were detected in the fill during the 1985 investigation.

S-3 was located adjacent to the former oil drum storage area, and was sampled to assess the fill material and natural overburden in this area. S-4 sampled the southern portion of the gravel/fill area adjacent to the paved parking lot. S-5 was located adjacent to the railway spur line to assess the impact of chemical spillage that may have occurred during past transfer and unloading operations at the site. S-6 was located in the courtyard, in the area where, prior to 1984, scrubber wastewater containing metals was discharged onto the ground. Since 1984 scrubber wastewater from this area has been sewered under a valid wastewater discharge permit from the City of Niagara Falls.

4.4.3.2 Soil Sampling

Continuous soil sampling of fill and natural overburden materials was conducted using a 2 inch diameter, split spoon sampler, 2 feet in length. The split spoon sampler is advanced inside hollow stem augers following ASTM-D-1586 standards.

At sites MW-1 to MW-5 a single soil sample was taken from each borehole. At sites S-1 to S-6, two soil samples were taken from each borehole; one sample from the fill materials and one sample from the underlying natural overburden. Soil samples were collected using the following criteria.

a. Each split spoon sample was scanned with an HNu-PID. Samples were taken for laboratory analysis of TCL constituents from discrete horizons registering relatively high levels of HNu readings.

b. If no indication of contamination was found in a specific horizon by the HNu-PID scan, but suspected contamination was visually observed, then a discrete sample was taken from the area judged to represent the area of maximum contamination.

c. If no indication of contamination was found in a specific horizon with the HNu-PID or by visual inspection, then a representative field composited sample was collected from all split spoon samples taken from the borehole.

In addition to the TCL parameters, one field composited sample was taken from the fill area at S-1 and analyzed for dioxin. Dioxin was analyzed because of the past indication of low levels of PCBs at that location and the past history of on-site burning. A summary of soil sample intervals is provided in Table 4.6.

Soil analytical work for TCL parameters was completed by Recra Environmental Inc. in accordance with NYSDEC ASP 91 protocols. The dioxin sample was analyzed by Environment

Table 4.6 Summary of Soil Sample Intervals

Borehole No.	Date Sampled	Sample Interval (ft)
MW-1b	August 6, 1992	0-23.3
MW-2a	July 29, 1992	4-6
MW-3a	August 5, 1992	0-20
MW-4b	August 10, 1992	0.5-23.5
MW-5b	August 13, 1992	2-4
S-1 (fill)	August 14, 1992	0.5-4
(natural)	August 14, 1992	4-16
S-2 (fill)	August 17, 1992	0-10
(natural)	August 17, 1992	10-16
S-3 (fill)	August 17, 1992	0-4
(natural)	August 17, 1992	8-12
S-4 (fill)	August 17, 1992	10-12
(natural)	August 17, 1992	12-14
S-5 (fill)	August 17, 1992	0-2
(natural)	August 17, 1992	6-16
S-6 (fill)	August 17, 1992	0-8
(natural)	August 17, 1992	8-18
Repeat Samples		
MW-5	October 21, 1992	0-2, 4-6
S-4 (natural)	October 21, 1992	10-12
S-5 (fill)	October 21, 1992	0-2
S-5 (natural)	October 21, 1992	12-16

Protection Laboratories (EPL) inc. of Toronto, Ontario following EPA Method 8280. Samples were stored in refrigerated coolers, sealed and delivered to the laboratories within 48 hours of collection. A summary of soil sampling, analytical protocols and sampling specifications are provided in Tables 4.7 and 4.8.

4.4.3.3 Additional Soil Sampling

Soil sampling was repeated at three sites on October 21, 1992 because the contract laboratory exceeded the sample holding times of the original samples. Sampling methodology and protocols for the repeat sampling followed the methods and protocols described in the Work Plan.

Repeat samples were taken for cyanide at sample S-4 (natural overburden) and S-5 (fill material; natural overburden) and for pesticides at MW-5. Samples were submitted to Recra Environmental Inc. on October 22, 1992. Sample intervals are listed in Table 4.6.

Table 4.7 Summary of Soil Sampling Analytical Work

TCL Parameter	No. Field Samples	No. Field Duplicates	No. Blanks/Rinsate Samples	No. Matrix Spike, Matrix Spike Dup, Matrix Spike Blank	Protocol	Method	Analytical Laboratory
Volatile Organic Compounds	17	1	2	3	NYSDEC ASP 89	89-1	Recra Environmental Inc.
Semi and Non-Volatile Organic Compounds	17	1	1	3	NYSDEC ASP 89	89-2	Recra Environmental Inc.
PCBs	17	1	0	3	NYSDEC ASP 89	89-3	Recra Environmental Inc.
Metals	17	1	1	3	NYSDEC ASP 89	CLP-M	Recra Environmental Inc.
Total Cyanide	17	1	0	3	NYSDEC ASP 89	CLP-M	Recra Environmental Inc.
Dioxin	1	0	0	2	--	USEPA 8280	EPL Inc.

Table 4.8 Summary of Sampling Specifications for Soil Sampling

Sample Type	Container Specifications	Sample Volume	Preservation	Maximum Holding Time (days)*
Volatile Organic Compounds	4oz wide mouthed glass jar with teflon top	4oz	cool, 4°C	7
Semi and Non-Volatile Organic Compounds	16oz wide mouthed glass jar with teflon top	16oz	cool, 4°C	5 (to extract) 40 (to analyze)
PCBs	16oz wide mouthed glass jar with teflon top	16oz	cool, 4°C	5 (to extract) 40 (to analyze)
Metals	16oz wide mouthed glass jar with teflon top	16oz	cool, 4°C	6 months (Hg 26 days)
Total Cyanide	16oz wide mouthed glass jar with teflon top	16oz	cool, 4°C	12
Dioxin	16oz wide mouthed glass jar with teflon top	8oz	cool, 4°C	5 (to extract) 40 (to analyze)

* note: holding time measured from the verifiable time of sample receipt by the laboratory

5 RESULTS AND DISCUSSION OF SOIL AND GROUNDWATER SAMPLING PROGRAM

The results of soil and groundwater sampling program are discussed under the following headings:

- geology
- hydrogeology
- data validation
- groundwater sampling
- soil sampling

5.1 GEOLOGY

The site geology has been previously summarized in Section 4.3.1. The results of the PSA investigation identified following stratigraphic sequence at the Carborundum Electric Products Division facility; an upper fill layer, a silty clay unit, a silty clay till and the Lockport Dolomite. The upper fill layer consists of 2 to 10 feet of gravel and disturbed silty clay fill. The fill is underlain by a silty clay unit which grades into a lower silty clay till. The till overlies dolostone of the Lockport Dolomite. The Lockport Dolomite consists of dark grey to black, fossiliferous, dolostone with shaly interbeds and occurs at a depth ranging from 23.5 feet to 31 feet below ground surface. Fractures in the Lockport Dolomite are both horizontal and inclined at intervals generally between 1 to 10 inches. Open fractures are infilled with clay and silt. Closed fractures show secondary carbonate mineralization. Vugs and rubbly zones are prevalent in the upper portion of the Lockport Dolomite. Borehole stratigraphic logs are provided in Appendices C and D.

5.2 HYDROGEOLOGY

The hydraulic conductivity of the overburden aquifer based on recovery tests analyzed using the method described by Hvorslev (1951), indicated a range of 4.37×10^{-7} ft/s to 3.35×10^{-5} ft/s. The geometric mean of the hydraulic conductivities is 4.315×10^{-6} ft/s. The hydraulic conductivity of the Lockport Dolomite based on a pump test of one well was 3.6 x 10^{-4} ft/s. A summary of hydraulic testing is provided in Table 5.1.

A summary of equilibrium water levels based on measurements taken on August 24, 1992 is summarized in Table 5.2. Equilibrium water level elevations in monitor wells MW-2, MW-3 and MW-4 have a higher elevation in the overburden wells than in the adjacent bedrock wells at each monitor well couplet indicating that groundwater is recharging to the Lockport Dolomite through the overburden. The equilibrium water level elevations at MW-5 is higher in the Lockport Dolomite than in the overburden indicating potential upward gradients at this location. The equilibrium water level elevation at MW-1 is the same for both bedrock and overburden wells, indicating no vertical movement of groundwater through the stratigraphic interval monitored.

The equilibrium water levels for the overburden and bedrock wells define the potentiometric surface for the overburden and bedrock aquifers. The potentiometric surface for each aquifer are plotted in Figures 5.1 and 5.2 respectively. Groundwater flow is approximately southwesterly across the site in the overburden aquifer and west southwesterly across the site in the Lockport Dolomite assuming that groundwater flow is perpendicular to the potentiometric surface contours. Groundwater flow directions are consistent with assumed flow directions for the U.S. Vanadium Corp. (SKW Alloys) site (Ecology and Environmental Engineering 1989) but are opposite to the south-southeast directions reported for groundwater flow in the overburden at the adjacent Union Carbide facility landfill (Ecology and Environment Engineering 1991).

The average horizontal groundwater velocity in the overburden is estimated at less than 10 to 20 feet per year. Groundwater in the bedrock beneath the Carborundum Electric Products Division facility enters the property after flowing potentially beneath the SKW Alloys facility and the Union Carbide Carbon Products Division site. The average horizontal groundwater velocity in the bedrock is estimated at greater than 200 to 250 feet per year.

Table 5.1 Hydraulic Conductivity Measurements in Monitor Wells

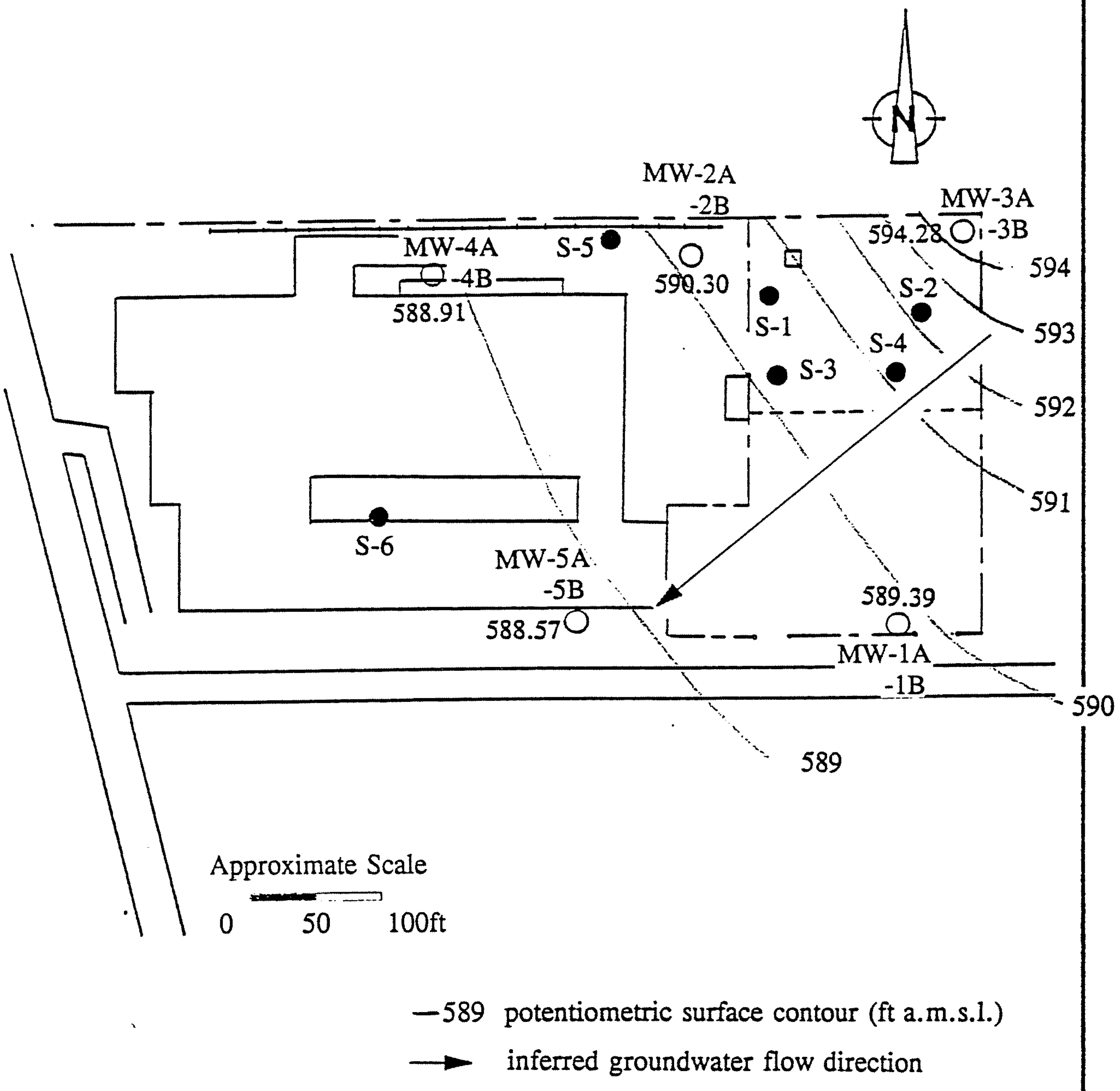
Well No.	Type of Test	To (s)	Hydraulic Conductivity (ft/s)
MW-1a	recovery	$2.97\text{x}10^{2}$	$1.64\text{x}10^{-5}$
MW-2a	recovery	$1.17\text{x}10^{4}$	$4.37\text{x}10^{-7}$
MW-3a	recovery	$9.18\text{x}10^{3}$	$5.49\text{x}10^{-7}$
MW-4a	recovery	$4.50\text{x}10^{2}$	$1.14\text{x}10^{-5}$
MW-5a	recovery	$1.53\text{x}10^{2}$	$3.35\text{x}10^{-5}$
MW-2b	constant discharge pump test		$3.6\text{x}10^{-4}$

To = basic time lag

Hydraulic conductivities for recovery tests calculated using the method described by Hvorslev (1951). Hydraulic conductivity for pump test calculated using modification of steady flow in confined aquifers after Driscoll (1986).

Table 5.2 Summary of Ground Surface, Casing and Static Water Elevations

Well No.	Elevation Ground Surface (ft a.m.s.l.)	Elevation Top of Monitor Well Casing (ft a.m.s.l.)	Elevation Static Water Level (Aug. 24, 1992) (ft a.m.s.l.)	Depth of Static Level (Aug. 24, 1992) (ft below ground surface)
MW-1a	595.42	597.56	589.39	6.03
MW-1b	595.43	597.63	589.39	6.04
MW-2a	593.77	595.68	590.30	3.47
MW-2b	593.63	595.82	589.09	4.54
MW-3a	597.71	599.69	594.28	3.43
MW-3b	597.71	599.98	589.65	8.06
MW-4a	591.92	591.61	588.91	3.01
MW-4b	591.88	591.51	588.88	3.00
MW-5a	595.87	597.95	588.57	7.30
MW-5b	595.87	597.85	588.96	6.91



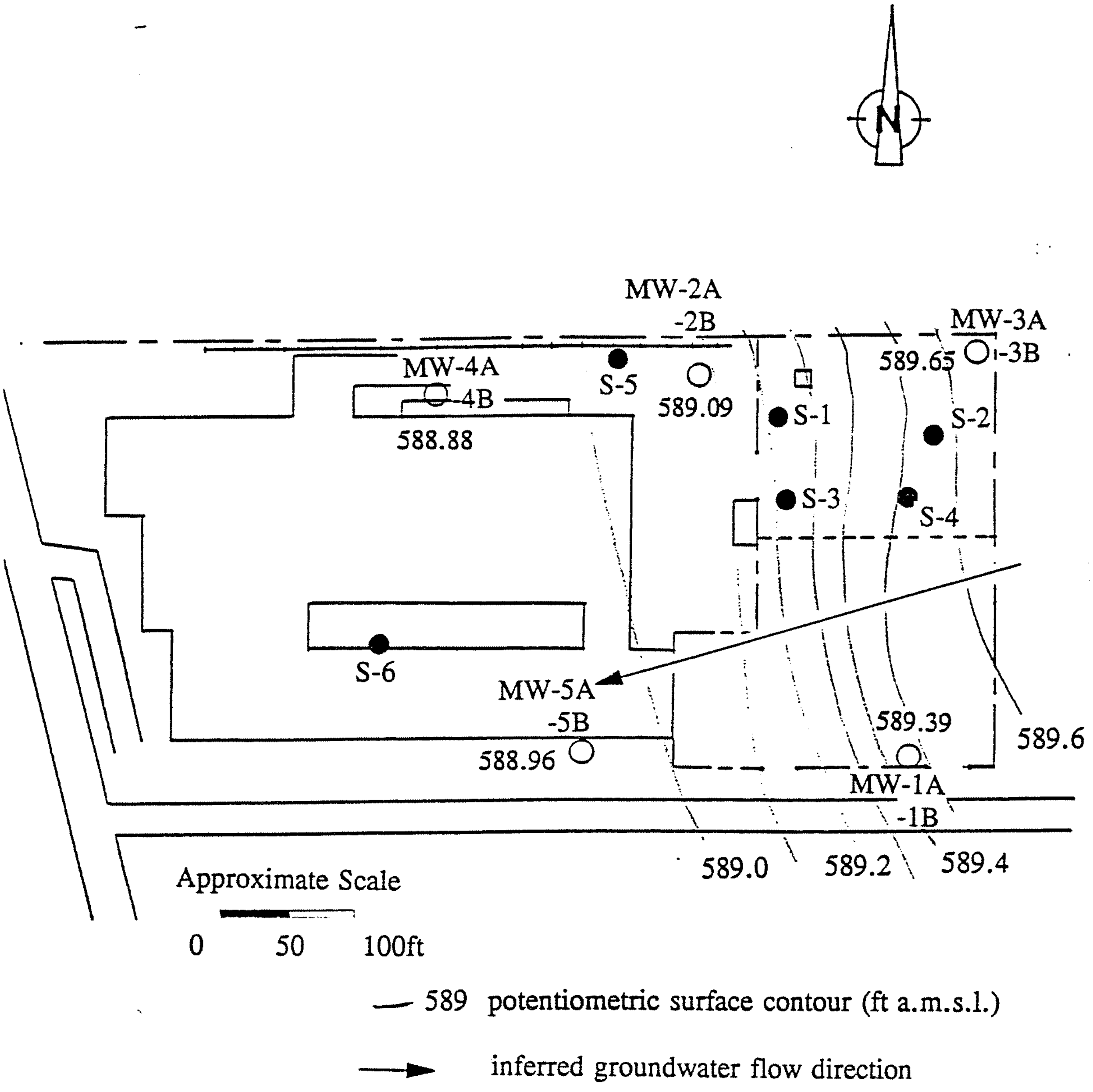
DATE:

REF:

Potentiometric Surface Elevations -
Overburden Wells

INTERA

Figure 5.1



DATE:	Potentiometric Surface Elevations - Bedrock Wells
REF:	
INTERA	Figure 5.2

Groundwater flow directions in bedrock within the region are depicted in Figure 5.3. The largest influence on bedrock groundwater flow directions is the Niagara Gorge which creates a hydraulic gradient toward the gorge. Groundwater flow directions in the bedrock south of the Occidental Hyde Park Landfill is inferred from the southwesterly oriented bedrock contaminant plume reported by Conestoga Rovers (1991). Ecology and Environmental Engineering (1989) assumed groundwater flow beneath the U.S. Vanadium Corp. landfill site to be southwesterly, although measurements of hydraulic head were not reported.

5.3 DATA VALIDATION

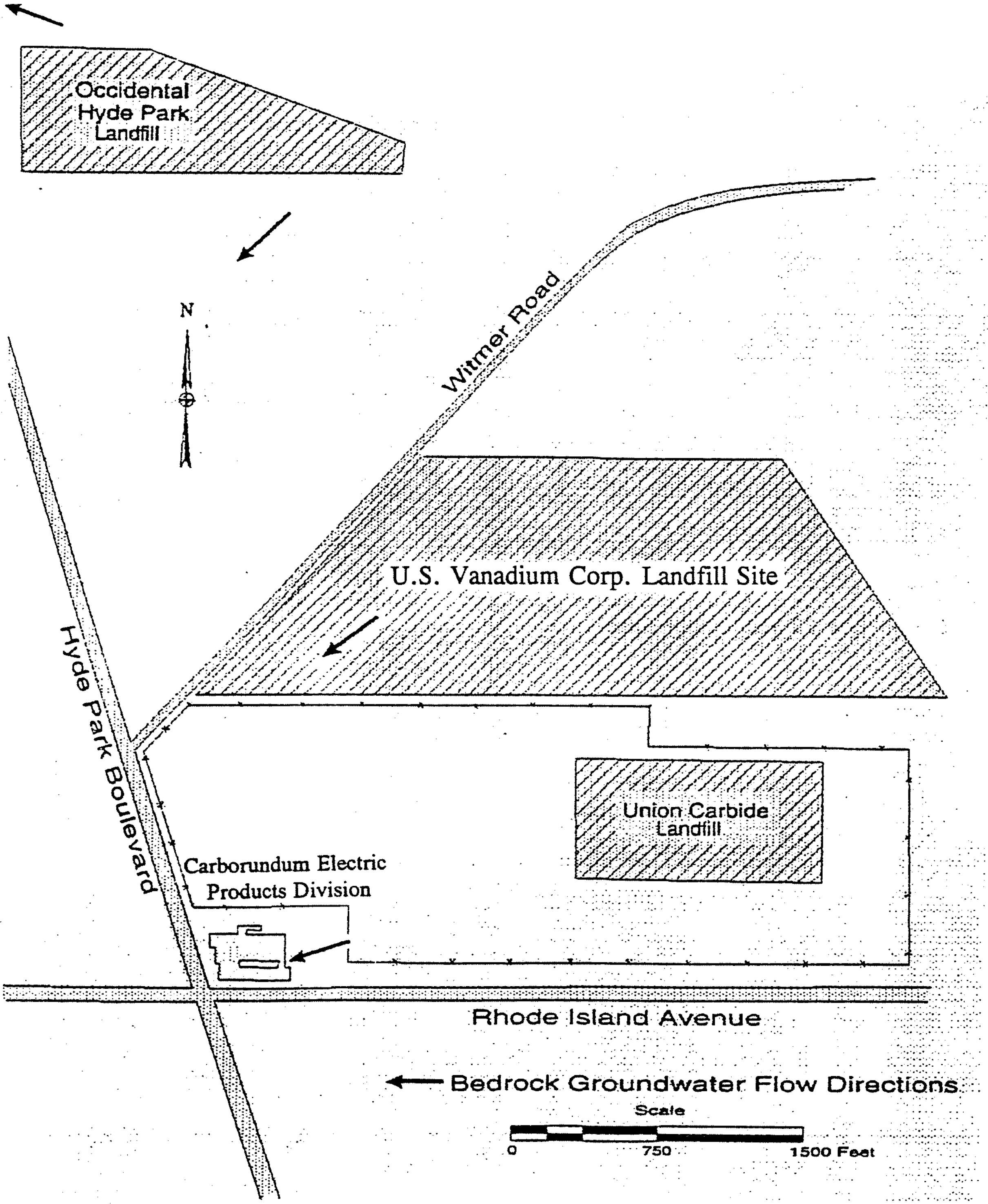
Validation of the data is provided under separate cover. The data validation report includes an assessment of the field sampling protocols and QA/QC and the laboratory analytical methodology and QA/QC.

5.4 GROUNDWATER SAMPLING

Analytical results for groundwater samples are provided in Appendix E.

The analytical results for groundwater were compared against the following groundwater regulations to assess the environmental significance of the results:

- Water Quality Regulations for Surface Waters and Groundwaters (NYSDEC 1991 - 6NYCRR, Part 203)
- Ambient Water Quality Standards and Guidance Values TOGS 1.1.1 (NYSDEC 1991)
- Maximum Contaminant Levels - State Sanitary Code Part 5 Drinking Water Supplies Subpart 5-1 Public Water Systems (NYSDOH 1991 - 10NYCRR Subpart 5-1)



DATE:

REF:

Measured and Inferred Bedrock Groundwater Flow Directions in the Vicinity of the Carborundum Electric Products Division Facility

INTERA

Figure 5.3

5.4.1 Overburden Wells

5.4.1.1 Volatile Organic Compounds

Volatile organic compounds (VOCs) were detected in all overburden wells. Monitor wells MW-2a and MW-3a contained trace levels only. The most commonly detected compounds were 1,2-dichloroethene and vinyl chloride. 1,2-dichloroethene ranged in concentration from trace level in MW-3a to 1900ppb in MW-5a. 1,2-dichloroethene was not detected in monitor well MW-2a.

Vinyl chloride was not detected in MW-2a or MW-3a but was detected in concentrations ranging from trace level in MW-1a to 1300ppb in MW-5a. Other VOCs were detected at trace levels only and included 1,1-dichloroethane, 1,1-dichloroethene, trichloroethene, methylene chloride, toluene, ethyl benzene, and xylenes. All of these compounds were detected in soil samples with the exception of 1,1-dichloroethane (see Section 5.5). Vinyl chloride in MW-4a and MW-5a, and 1,2-dichloroethene in MW-1a, MW-4a and MW-5a exceeded New York State groundwater quality standards. Contaminant concentrations and groundwater quality standards are listed in Table 5.3.

Monitor wells MW-2a and MW-3a were the least contaminated of the overburden wells. MW-2a is located at the north edge of the property between the plant and the former storage area and MW-3a is located at the northeast upgradient edge of the property adjacent to the Union Carbide property.

Overburden well MW-5a, which is located along the southern property boundary adjacent to the plant and downgradient from the source area, showed the highest level of contamination.

The occurrence of trichloroethene, toluene and xylene in groundwater in overburden wells is consistent with the solvents known to have been used at the facility. Vinyl chloride 1,1-

Table 5.3 Groundwater Samples that Exceed Water Quality Standards

Contaminant	Well No. and Concentration (μg/L)										Water Quality Standard (μg/L)	
	MW-1A	MW-1B	MW-2A	MW-2B	MW-3A•	MW-3B•	MW-4A	MW-4B	MW-5A	MW-5B	1.	2.
vinyl chloride				66		5	13	26	1300	75	2	
1,2-dichloroethene	14	10		2300		18	230	130	1900	520		5
trichloroethene				670						71		5
benzene				1							0.7	
aluminum	234										100	
iron		830					860		1310		300	
antimony	7						6					3

Note:
1. NYSDEC (1991) (6NYCRR Part 703)
2. NYSDEC (1991) (TOGS 1.1.1)

• well located on upgradient boundary

dichloroethene and 1,2-dichloroethene are known degradation products of trichloroethene and tetrachloroethene.

5.4.1.2 Semi-Volatile and Non-Volatile Organic Compounds

Semi-volatile and non-volatile organic compounds were not detected above trace levels in any of the overburden monitor wells. Bis(2-ethylhexyl)phthalate was found at trace levels in monitor wells MW-2a, MW-3a, MW-4a and MW-5a. Bis(2-ethylhexyl)phthalate is a common industrial plasticizer and is also used as a fluid in vacuum pumps. It was not listed as a commonly used compound at the Carborundum Electric Products Division facility. A drinking water standard of $50\mu g/L$ has been set by NYSDEC for this compound. The trace levels reported in groundwater from overburden monitor wells were well below the State standard. Bis(2-ethylhexyl)phthalate was also detected at elevated levels in most of the soil samples. Its occurrence is attributed to contamination during drilling and sampling (see discussion Section 5.6.1.2).

5.4.1.3 Pesticides/PCBs

Pesticides and PCBs were not detected at any level in any of the overburden monitor wells.

5.4.1.4 Inorganic Parameters

Samples submitted for inorganic analyses were analyzed for (i) dissolved inorganics and (ii) total inorganics. Samples taken for dissolved inorganic analysis were filtered through a $0.45\mu m$ in-line disposable filter and acidified in the field prior to laboratory analysis. Samples taken for total inorganic analysis were acidified in the field without prior filtration.

Dissolved Inorganics

Calcium, magnesium, sodium and potassium are major constituents of groundwater and were detected in all overburden monitor wells. Calcium levels ranged from 99,000 to 167,000μg/L; magnesium ranged from 49,500 to 195,000μg/L; sodium ranged from 30,600 to 79,000μg/L and potassium ranged from 3120 to 4690μg/L. There are no drinking water standards for calcium, magnesium or potassium in groundwater. The levels reported in the overburden wells are within expected concentration ranges for these parameters in low permeability carbonate-rich materials and are the result of dissolution of minerals in the soil by slow moving groundwater. The levels of sodium are also within the range expected in low permeability materials. Sodium is considered to be a secondary contaminant and is listed under Part 5 of the State Sanitary Code (NYSDOH 1991). While there is no designated limit for sodium, water containing more than 20,000μg/L should not be used for drinking by individuals on severely restricted sodium diets. Water containing in excess of 270,000μg/L should not be used for drinking by people on moderately restricted sodium diets. Groundwater in all overburden wells meets the criteria for moderately restricted sodium diets. Groundwater from several overburden wells contain levels of sodium in excess of the limit for severely restricted diets. The levels of sodium are not considered to be environmentally significant because groundwater downgradient from the Carborundum facility is not used as a source of potable water.

Iron and manganese are common constituents of groundwater and are common constituents of soil minerals. Iron ranged in concentration in groundwater from below detection to 1310μg/L while manganese ranged from 22.7 to 171μg/L. Individual standards for iron and manganese in groundwater are 300μg/L for each element or 500μg/L total iron plus manganese where both are present. Iron exceeded groundwater standards in monitor well MW-4a and MW-5a. Manganese levels were below State standards in all wells. Iron and manganese are secondary contaminants. Elevated levels of iron and manganese in groundwater can lead to staining of laundry and plumbing fixtures.

Aluminum and arsenic were detected in monitor well MW-1a only, at a concentration of 234μg/L and 10μg/L respectively. Aluminum is a common constituent of soil minerals but it is not readily solubilized. There is no groundwater standard for aluminum. The level of arsenic in MW-1a is below the State standard of 25μg/L.

Antimony was detected in monitor wells MW-1a and MW-4a at concentrations of 7.0μg/L and 6.0μg/L respectively, and exceeds the State guidance values of 3μg/L. The levels of antimony are not considered environmentally significant because groundwater downgradient from the facility is not used as a source of potable water.

Barium was detected at concentrations of 183μg/L and 51.4μg/L in monitor wells MW-1a and MW-2a respectively. Barium is often associated with secondary mineralization in carbonate rock. The levels of barium reported in overburden wells are well below the State standard of 1000μg/L and are not considered to be environmentally significant.

Total Inorganics

Total inorganic analyses showed levels of calcium, magnesium, sodium, potassium and barium similar to dissolved inorganic analyses. Total iron, manganese and aluminum were generally found to be at slightly higher to significantly higher levels than dissolved inorganic analyses. Chromium, copper, lead and zinc were detected in the total inorganic analyses. These elements were not detected in the dissolved inorganic analyses.

The analysis for total inorganic constituents is not representative of the constituents normally found in groundwater taken from a private residential well. Some small amount of fine, suspended solids was most likely included in the groundwater samples taken from monitor wells at the Carborundum Electric Products Division facility. Acidification of groundwater samples without prior filtration will result in the release of inorganic constituents adsorbed onto or structurally bound within suspended solids. Consequently, total inorganic analyses should not be considered as representative of inorganic constituents in drinking water.

5.4.2 Bedrock Wells

5.4.2.1 Volatile Organic Compounds

Volatile organic compounds were detected in each of the bedrock wells at concentrations above trace levels. 1,2-dichloroethene was detected at levels ranging from 10μg/L in monitor well MW-1b to 2300μg/L in MW-2b. Trichloroethene was detected in MW-5b and MW-2b at concentrations of 71μg/L and 670μg/L respectively. Vinyl chloride was detected in MW-2b, MW-3b, MW-4b and MW-5b at concentrations of 66μg/L, trace, 26μg/L and 75μg/L respectively. Additional compounds including 1,1-dichloroethene (MW-2b, MW-4b, MW-5b), 1,1-dichlorethane (MW-1b, MW-5b), 1,2-dichloroethane (MW-1b), and benzene (MW-2b, MW-3b) were detected at trace levels.

Concentrations of 1,2-dichloroethene in each bedrock well and trichloroethene concentrations in MW-2b and MW-5b exceeded State standards. Vinyl chloride concentrations in MW-2b, MW-3b, MW-4b and MW-5b exceeded State standards. The trace level of 1.0μg/L benzene reported for MW-2b exceeded the State standard of 0.7μg/L. Exceedances to water quality standards are listed in Table 5.3.

The most commonly occurring VOCs in bedrock groundwater include 1,2-dichloroethene, trichloroethene and vinyl chloride. Both vinyl chloride and trichloroethene were reported in bedrock groundwater samples taken from the Union Carbide landfill which is located 1500 feet upgradient of the Carborundum Electric Products Division facility.

5.4.2.2 Semi-Volatile Organic Compounds

Bis(2-ethylhexyl)phthalate was the only semi-volatile compound found in bedrock wells. It was detected at trace levels in monitor wells MW-1b, MW-4b and MW-5b. Its occurrence is thought to be due to contamination during sampling (see discussion Section 5.4.1.2).

5.4.2.3 Pesticides/PCBs

Pesticides and PCBs were not detected at any level in bedrock groundwater samples.

5.4.2.4 Inorganic Parameters

Dissolved Inorganic

Calcium, magnesium, sodium and potassium concentrations in bedrock wells are within the range of major ion constituents reported for the Lockport Dolomite (Johnston 1964). Iron ranged in concentration from below detection to 830μg/L while manganese ranged in concentration from 69.9μg/L to 162μg/L. These levels are of the same order of magnitude as the levels reported for the overburden wells. The iron concentration of 830μg/L in monitor well MW-1b exceeded State standards by 2.8 times. The elevated levels of iron in MW-1b could cause staining of clothing and porcelain, but are not significant in terms of impact to human health.

Barium was detected in each bedrock well at concentrations ranging from 51.7μg/L to 249μg/L. Barium is a common constituent of carbonate rock and occurs naturally in the Lockport Dolomite. The levels of barium detected are well below the State standard.

A number of trace metals were found in one or more wells at levels generally below groundwater quality standards or guidance values with the exception of antimony which was detected at a concentration of 7.0μg/L in MW-4b and exceeded the State guidance value of 3μg/L.

Zinc was detected in MW-1b, MW-2b, MW-4b and MW-5b at concentrations ranging from 27.0 to 235μg/L and below the groundwater quality standard of 300μg/L.

Chromium and copper were detected in monitor well MW-3b at concentrations of 10.0μg/L and 11.4μg/L respectively. The State standard for chromium is 50μg/L. The State standard for copper is 200μg/L.

Lead was detected in MW-2b at a concentration of 8.0μg/L. The State standard for lead is 25μg/L.

Total Inorganic

Total inorganic analyses for bedrock wells contained similar levels of major ion constituents as the dissolved inorganic parameters.

Total trace metal constituents such as chromium, copper and lead were detected in several bedrock wells at generally higher concentrations than dissolved inorganic analyses. Total inorganic analyses are not representative of metal concentrations in drinking water (see discussion Section 5.4.1.4).

5.4.3 Summary of Groundwater Contamination

1,2-dichloroethene, vinyl chloride and trichloroethene are the major organic contaminants in overburden and bedrock groundwater at the Carborundum Electric Products Division facility. These compounds were detected at lower concentrations in a study conducted previously at the facility (URS Consultants Inc. 1990). 1,2-dichloroethene, trichloroethene and vinyl chloride were detected in soil samples taken during the present study, from the fill and natural overburden in the former storage area of the facility (see Section 5.6). Trichloroethene and vinyl chloride were also detected in groundwater sampled from a bedrock well on the upgradient side of the Union Carbide Corporation Carbon Products Division Landfill Site located approximately 1500 feet east-northeast of the Carborundum facility.

Copper and lead which had previously been reported at levels that exceeded State standards (URS Consultants Inc. 1990) were detected in only one monitor well each at levels that were below groundwater quality guidelines.

On site sources are likely a significant contributor to groundwater contamination in the overburden based on the relatively low horizontal groundwater flow velocity (less than 10 feet per year) and the generally downward vertical hydraulic gradients. Seasonal fluctuations in water levels resulting in local upward hydraulic gradients could contribute some portion of contaminants from the bedrock to the overburden. Interpretation of groundwater contamination beneath the Carborundum site must consider offsite, upgradient sources as well as onsite sources.

Potable water is supplied to local residents from the Niagara River. There is no use of groundwater as a source of potable drinking water within a one mile radius downgradient from the Electric Products Division facility. Consequently the environmental impact to local residents via the drinking water pathway is not significant.

Contaminant loadings can be calculated by multiplying the volumetric groundwater flux by contaminant concentrations according to equation (1).

$$J = QC \qquad (1)$$

where J = contaminant loading
Q = volumetric groundwater flux
$= KiA$
where K = hydraulic conductivity
i = hydraulic gradient
A = cross sectional area
C = contaminant concentration

An estimate of the daily contaminant loading in groundwater flowing beneath the Electric Products Division facility is calculated at less than 0.1 lbs/day. The estimate is based on a number of conservative assumptions. Hydraulic conductivity is taken from Section 5.2 of this report as 3.6 x 10^{-4}ft/s. The hydraulic gradient is estimated as 0.002 based on potentiometric surface information taken from Figure 5.2. The cross sectional area of the facility through which groundwater flows is taken as 8000 ft^2 based on a depth of 20 feet and a width of 400 feet. The depth of 20 feet is taken as the upper most permeable portion of the Lockport Dolomite through which most of the shallow bedrock groundwater flows. Contaminant concentrations were taken from the analytical results provided in Appendix E.

5.5 SOIL SAMPLING

Analytical results for soil samples are provided in Appendices F and G.

Soil guidance levels are generally not available for New York State and are determined on a case by case basis. PCB cleanup levels of 10ppm are defined under the Toxic Substance Control Act.

An assessment of the environmental significance of levels of soil contaminants at the Carborundum Electric Products Division facility was made by calculating theoretical cleanup levels based on equilibrium partition theory. It was assumed in making these calculations that groundwater beneath the facility would be protected to drinking water standards. Calculated cleanup levels for selected contaminants; 1,2-dichloroethene, xylenes and benzo(b)fluoranthene are provided in Table 5.4.

NYSDEC has developed guidance values for the cleanup of soil contaminated with gasoline and fuel oil for the purpose of groundwater protection and the protection of human health (NYSDEC 1992). Selected NYSDEC guidance values are provided in Table 5.5.

The development of soil cleanup levels is beyond the scope of this investigation.

Table 5.4 Calculated Cleanup Guidelines for Contaminants in Soil Based on Protection of Groundwater to Drinking Water Standards

Contaminant	Calculated Soil Cleanup Level (ppb)
1,2-dichloroethene	47
xylene	69
benzo(b)fluoranthene	11

Note: Calculated soil cleanup level $(C_t) = \frac{Kd\ C_w\ \varrho b + C_w\ \phi_w + C_w\ H_c\ \phi a}{\varrho b}$ (i)

(Feenstra et al 1990)

Where
C_t = total soil chemical concentration (mg/kg)
C_w = drinking water standard
Kd = distribution coefficient between porewater and soil solids (mL/g)
$= K_{oc} \bullet f_{oc}$
K_{oc} = organic carbon partitioning coefficient (m^3/kg)
f_{oc} = organic carbon fraction
ϱb = dry bulk density of the soil (g/cm^3)
ϕ_w = water filled porosity (volume fraction)
H_c = Henry's Law coefficient (dimensionless)
ϕa = air filled porosity (volume traction)

Calculations based on
$f_{oc} = 0.01$
$pb = 1.65\ gm/cm^3$
$\phi_w = 0.05$
$\phi a = 0.15$

Table 5.5 Guidance Values for Soil Contaminated with Gasoline and Fuel Oil

Contaminant	Guidance Value for the Protection of Groundwater (ppb)	Guidance Value (nuisance) (ppb)	Guidance Value for the Protection of Human Health (ppb)
benzene	14	10,000	2.4×10^4
ethyl benzene	100	10,000	8.0×10^6
toluene	100	10,000	2.0×10^7
m-xylene	100	10,000	2.0×10^8
phenanthrene	1000	10,000	N.A.
benzo(b)fluoranthene	0.04	10,000	220
benzo(a)pyrene	0.04	10,000	61

Source: NYSDEC (1992)

The results for soil sampling during this investigation are discussed under the following headings:

- monitor well samples
- soil borehole samples

5.5.1 Monitor Well Samples

One soil sample from each monitor well couplet location was submitted for laboratory analysis. Soil samples were representative of different portions of the underlying fill and natural overburden.

Samples collected from MW-1b, MW-3a, and MW-4b were composite samples of the entire overburden section and included fill as well as natural overburden. Composite samples were taken from these boreholes because discrete intervals of contamination were not identified during drilling (see discussion Section 4.4.3).

Sample collected from MW-2a was collected from a two foot thick interval at the top of the natural overburden. The sample from MW-5b was collected from a two foot thick interval straddling the base of the fill and the top of the underlying natural overburden. Both samples were selected on the basis of elevated HNu readings in the field.

5.5.1.1 Volatile Organic Compounds

Volatile organic compounds were detected at generally low levels in samples taken from monitor well locations. VOCs were not detected in MW-5b located along the south boundary of the facility building. Soil samples from MW-1b and MW-3a located at the southeast and northeast corners of the facility respectively contained only 1 VOC each. Acetone was detected at 28ppb in MW-1b and trace levels of trichloroethene were detected in MW-3a. Soil from MW-2b located near the northeast corner of the facility building contained trace levels of acetone, 1,1-dichloroethane, 1,1,1-trichloroethane and elevated levels of ethyl benzene and total xylenes up to 1200 ppb. MW-4b located in the chemical storage area contained acetone, 1,2-dichloroethene and trichloroethene at concentrations ranging from 18 to 29ppb, and trace levels of 1,1-dichloroethane and 1,1,1-trichloroethane.

Acetone, trichloroethene, 1,1,1-trichloroethane and xylene were known to have been used at the Carborundum Electric Products Division facility.

5.5.1.2 Semi-Volatile Organic Compounds

Bis(2-ethylhexyl)phthalate was detected at levels ranging from 200ppb to 8100ppb. This compound is a common constituent of industrial and laboratory plastics. Its occurrence in all soil samples suggests possible contamination during sampling. Likely sources of contamination include a plastic "basket" used to retain soil samples in the split spoon sampler during borehole sampling, and rubber gloves used during soil sampling. Trace levels of di-n-butylphthalate and butylbenzyphthalate were detected in MW-1a, MW-2a and MW-3a. These compounds are associated with plastic materials and are at levels that are not considered significant.

Trace levels of polynuclear aromatic hydrocarbons (eg. phenanthrene, fluoranthene, pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, ideno(1,2,3-cd)pyrene and benzo(g,h,i)perylene were detected in soil samples from MW-2b, Mw-3a and MW-4b. These compounds are components of coal tar, creosote and oil and grease. The levels of polynuclear aromatic hydrocarbons reported in monitor well soil samples are not considered to be environmentally significant for industrial land use.

5.5.1.3 Pesticides/PCBs

Pesticides were not detected in any of the MW series soil samples. The low levels of pesticides originally reported in the soil sample from MW-5b were confirmed by the laboratory to be due to spiking of the sample matrix in the laboratory (J. Calvert, Recra Environment Inc. -

personal communication). Resampling of MW-5b in October, 1992 confirmed that there were no detectable levels of pesticides in this sample.

Trace levels of PCB (Arochlor-1260) were detected in samples from MW-2b, MW-3a and MW-4b. These same samples contained trace levels of PAHs. The levels of PCB are well below the PCB cleanup level of 10ppm.

5.5.1.4 Inorganic Parameters

Aluminum, barium, calcium, iron, magnesium, manganese, potassium and sodium are elements that are ubiquitous in nature and occur in most natural rocks and soils. The levels of these metals reported in soils from the Carborundum Electric Products Division facility are not considered to be environmentally significant. The levels of arsenic, chromium, cobalt, copper, lead, nickel, vanadium and zinc reported in monitor well soil samples are generally within the normal levels reported for soils in urban environments in southern Ontario (Ontario Ministry of the Environment, 1989). Sample MW-3a contained elevated copper concentration of 518ppm. Copper was also detected in groundwater taken from bedrock well MW-3b. The source of copper could be due to offsite upgradient sources or imported fill.

5.5.2 Soil Borehole Samples

Soil borehole samples taken from locations S-1 to S-6 included two samples from each borehole. One sample was taken from the fill material and one sample from the underlying natural overburden. Depth intervals for each sample are summarized on Table 4.6.

5.5.2.1 Volatile Organic Compounds

Fill Samples

Trace levels of acetone and trichloroethene were detected in soil samples from locations S-2, located at the eastern edge of the former storage area, and S-6, located in the courtyard.

Sample S-4, located at the southeast corner of the former storage area contained 23ppb of trichloroethene, 21ppb of acetone, and trace levels of methylene chloride, 1,2-dichloroethene, ethylbenzene and xylene. Sample S-3, taken from the southeastern corner of the former storage area contained 40ppb acetone, 820ppb 1,2-dichloroethane and toluene, ethyl benzene and xylenes at concentrations ranging from 94-330ppb. Sample S-3 also contained trace concentrations of 2-butanone, trichloroethene and benzene. Sample S-5, located adjacent to the former railway spur contained 17,000ppb trichloroethene and trace levels of 1,2-dichloroethene, 2-butanone, toluene, ethyl benzene and xylenes.

Sample S-1 was located in front of the drum storage cage and was the most contaminated of the fill samples. S-1 contained 24,000ppb 1,2-dichloroethene, 300,000ppb trichloroethene, 63,000ppb toluene, 53,000ppb ethyl benzene, 339,000ppb total xylenes. S-1 contained lesser amounts of vinyl chloride, acetone, 1,1-dichloroethene, benzene, and 4-methyl-2-pentanone ranging in concentration from 120ppb-400pb. Sample S-1 also contained trace levels of 2-hexanone, tetrachloroethene and chlorobenzene. A number of the VOCs identified in sample S-1 are compounds or breakdown products of compounds known to have been used at the facility.

The contaminants and the levels reported do not pose any immediate threat to human health or the environment. Organic vapour concentrations were not detected during the organic vapour survey conducted prior to drilling. Special precautions, such as the use of protective clothing and the use of cartridge type respirators, should be taken if any excavation is conducted in the former storage area. These precautions would protect workers from exposure by dermal contact or inhalation.

Natural Overburden Samples

Natural overburden samples contained detectable levels of the same VOCs as the fill samples. Highest contaminated concentrations were found in samples S-3 and S-4 located along the southern edge of the former storage area. Trichloroethene, toluene and xylenes were detected at the highest level in S-3 at concentrations of 23,000ppb, 10,000ppb and 17,000ppb respectively. S-4 contained trichloroethene at a concentration of 23,000ppb. Other compounds detected in samples S-3 and S-4 included methylene chloride, acetone, 1,1-dichloroethene, 1,2-dichloroethene, 2-butanone, benzene, and 4-methyl-2-pentanone.

Sample S-1, which was the most contaminated sample taken from the fill, contained significantly lower concentrations of 1,2-dichloroethene, trichloroethene and xylenes in the native overburden at concentrations of 360ppb, 560ppb and 16ppb respectively. Sample S-5 also contained concentrations of trichloroethene and 1,2-dichloroethene of 99ppb and 20ppb respectively. These levels are significantly lower than the levels reported in the fill sample taken from the same location.

Samples S-2 and S-6 were the least contaminated of the overburden samples. S-6 contained 30ppb of 1,2-dichloroethene. S-2 and S-6 contained only trace levels of acetone and trichloroethene.

5.5.2.2 Semi-Volatile Organic Compounds

Fill Samples

Bis-(2-ethylhexyl)phthalate was detected in all fill samples except S-6 at concentrations ranging from 81ppb to 2800ppb. Its occurrence is most likely due to contamination from drilling and sampling equipment (see discussion Section 5.6.1.2).

Samples S-2 and S-3 contained no detectable levels of other TCL semi-volatile compounds. Samples S-1, S-2 and S-6 contained trace levels of polynuclear aromatic hydrocarbons (PAHs) which are constituents of coal tar, creosote and oil and grease. The trace levels in S-1 and S-2 may be attributed to spillage of grease or oil from surplus machinery that was stored in the former storage area. The levels of PAHs detected in S-1, S-2, and S-6 are not environmentally significant. Sample S-5, which was located approximately 10 feet from the railway spur, contained trace levels of phenol and approximately 450,000ppb of total PAH. The sample was taken from the upper 2 feet of fill which is described in the stratigraphic log as containing black stained gravel overlying clayey silt with black stained fractures. The source of the PAHs are likely due to either a coal tar spill which occurred in the mid 1960's on the adjacent Union Carbide facility to leaching of railway ties. PAHs are not mobile contaminants. The levels do not present an immediate hazard to human health or the environment. Workers involved in excavation in the area should wear protective clothing to prevent dermal contact.

Natural Overburden Samples

All natural overburden samples contained detectable levels of bis(2-ethylhexyl)phthalate in concentrations ranging from 120ppb to 2800ppb. The occurrence and significance of this compound has been discussed previously.

Samples S-2 to S-6 did not contain any detectable levels of TCL semi-volatile compounds.

Sample S-1 contained trace levels of four PAH compounds. It was taken from the upper portion of the native overburden. The levels detected are not environmentally significant.

5.5.2.3 Pesticides/PCBs

Fill Samples

Trace levels of endosulfan II and alpha chlordane; and low levels of 4,4'-DDT (48ppb) and endrin aldehyde (24ppb) were detected in sample S-5. These chemicals are chlorinated hydrocarbon pesticides and are very resistant to natural breakdown. The levels of these pesticides are not considered to be environmentally significant.

PCB arochlor-1260 was detected at trace levels in S-4 and in soil samples S-1, S-2 and S-6 at concentrations of 2000ppb, 320ppb and 2400ppb respectively. S-1 and S-6 also contained PCB arochlor-1242 at concentrations of 660ppb and 910ppb respectively. S-1 is located in front of the drum storage cage, and S-6 is located in the courtyard. Concentrations of all samples are below the 10ppm guidance level defined under the Toxic Substance Control Act.

Natural Overburden Samples

Pesticides and PCBs were not detected in any samples from natural overburden.

5.5.2.4 Dioxins and Furans

Fill Samples

Dioxins and furans are complex mixtures of compounds that contain up to 75 different chlorinated dibenzo-p-dioxins (PCDD) and 135 different chlorinated dibenzofurans (PCDF). The different congeners that make up PCDD and PCDF have differing levels of toxicity. PCDD and PCDF are expressed relative to the most hazardous dioxin congener: 2,3,7,8-TCDD. NATO has developed International Toxicity Equivalent Factors (I-TEFs) that normalize the toxicity of specific toxic congeners relative to 2,3,7,8-TCDD. These (I-TEFs) are multiplied by the concentration of the congener to provide a 2,3,7,8-TCDD equivalent concentration.

Dioxin and furans were detected at low levels in the fill sample from borehole S-1 located adjacent to the drum storage cage. Analytical results are provided in Appendix H. The levels reported represent non-normalized data. 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8T CDD) was not detected in soil at the facility. One toxic dioxin congener was detected at a level of 869ppt and seven toxic furan congeners were detected at concentrations ranging from 212 to 3173ppt.

Analytical results were normalized to 2,3,7,8-TCDD. Analytical results and normalized results are provided in Table 5.6. The normalization resulted in a toxicity equivalent concentration of 2,3,7,8-TCDD of 0.90ppb.

Dioxins and furans are products of combustion. They are present in incinerator ash, and ash from fossil fuel fired power plants, particulate exhaust emissions from diesel and gasoline engines, airborne dust and smoke from cigarettes and home fireplaces (Crummett and Townsend, 1984).

Table 5.6

Analytical Results and Normalized Results for Dioxin and Furan Analyses for Sample S1

Congener	Concentration S-1 (fill) (ppt)	I-TEF	Normalized Result (ppt)
DIOXINS			
2,3,7,8-tetrachloro dibenzo-p-dioxin	nd	1.0	0
1,2,3,7,8-pentachloro dibenzo-p-dioxin	nd	0.5	0
1,2,3,4,7,8-hexachloro dibenzo-p-dioxin	nd	0.1	0
1,2,3,6,7,8-hexachloro dibenzo-p-dioxin	nd	0.1	0
1,2,3,7,8,9-hexachloro dibenzo-p-dioxin	nd	0.1	0
1,2,3,4,6,7,8-heptachloro dibenzo-p-dioxin	869	0.01	8.7
octochloro dibenzo-p-dioxin	2203	0.001	2.2
FURANS			
2,3,7,8-tetrachloro dibenzofuran	261	0.1	26.1
1,2,3,7,8-pentachloro dibenzofuran	nd	0.05	0
2,3,4,7,8-pentachloro dibenzofuran	309	0.5	154.5
1,2,3,4,7,8-hexachloro dibenzofuran	2605	0.1	260.5
1,2,3,6,7,8-hexachloro dibenzofuran	1008	0.1	100.8
1,2,3,7,8,9-hexachloro dibenzofuran	212	0.1	21.2
2,3,4,6,7,8-hexachloro dibenzofuran	nd	0.1	0
1,2,3,4,6,7,8-heptachloro dibenzofuran	3173	0.1	317.3
1,2,3,4,7,8,9-heptachloro dibenzofuran	589	0.01	5.9
octochloro dibenzofuran	1238	0.001	1.2
TOTAL NORMALIZED RESULT			898.4 ppt = 0.90ppb

Levels of non-normalized PCDD in soil 1000 feet from a municipal incinerator in Chicago were reported at 10,000ppb (Eduljee and Townsend 1987). Sediment samples from the Lower Fox River and Green Bay, Wisconsin contained normalized PCDD and PCDF values ranging from 3.5 to 56.6ppt (Ankley et al 1992). Levels of PCDD and PCDF in soil adjacent to roadways and in rural areas in Italy and Switzerland showed levels of non-normalized PCDD and PCDF of up to 170ppt (Benfenati et al 1992) and normalized PCDD and PCDF ranging from 0.5ppt to 26.1ppt (Galli et al 1992).

The EPA does not have guidance values for cleanup of dioxins and furans in soil. In Canada, the Canadian Council of Ministers of the Environment have developed an interim remediation criteria of 1ppb for residential and parkland land use for total toxic dioxins plus furans (normalized to 2,3,7,8-TCDD) for contaminated federal sites in Canada based on a multi-media human health risk assessment (CCME 1991). Although EPA does not have guidance values for dioxins and furans, the toxicity equivalent concentration of 0.90ppb for 2,3,7,8-TCDD is likely below any potential action levels.

5.5.2.5 Inorganic Parameters

Fill Samples

The levels of aluminum, barium, calcium, iron, magnesium, manganese, potassium and sodium are reported at generally the same order of magnitude concentrations as the soil samples collected from monitor wells. Elevated levels of calcium and magnesium in samples S-1 and calcium in S-4 are not environmentally significant.

Beryllium, cadmium, thallium, and cyanide were not detected in any of the samples. Arsenic, chromium, mercury and vanadium were detected at concentrations within the normal levels for urban soils reported for Southern Ontario (Ontario Ministry of the Environment 1989).

Antimony was detected in all fill samples at concentrations ranging from 18.4ppm to 69.1ppm. These levels are not considered to have any significant impact to human health.

Sample S-1 contained the highest levels of metals including cobalt at a concentration of 2270ppm, and copper at a concentration of 4770ppm. Other metals detected in S-1 at lower, but still elevated concentrations, included; lead, nickel, silver and zinc. Sample S-2 contained elevated levels of copper, nickel and cadmium.

Samples S-5 and S-6 both contained elevated levels of copper and nickel. The source of elevated metal concentrations could be associated with fill material that was originally imported to level the site or from materials stored in the area prior to offsite disposal.

Natural Overburden Samples

Soil samples of natural overburden contain levels of metals within normal levels for urban environments. There are no significantly elevated metal levels in the natural overburden.

5.5.2.6 Summary of Soil Sampling Results

Bis(2-ethylhexyl)phthalate was found in most soil samples. Its occurrence in most soil samples at relatively elevated levels is attributed to contamination during drilling and sampling (see discussion Section 5.6.1.2).

VOC contaminants, primarily trichlorethene and 1,2-dichloroethene, were found in both fill and native soil samples taken within the former storage area. Highest concentrations were found in the sample S-1 taken from the borehole located in front of the drum storage cage. This sample also contained the highest levels of toluene, ethyl benzene and xylenes.

PAH compounds were found at elevated levels in the fill sample of S-5 taken adjacent to the railway spur line. PAH compounds are constituents of coal tar, creosote and oil and grease.

PCBs, specifically arochlors-1242 and 1260, were detected in fill from sample locations S-1 and S-6. S-1 is located in front of the drum storage cage and S-6 is located in the courtyard.

Fill from S-1 contained the highest levels of metal contaminants including cobalt, copper, lead, nickel and zinc. Elevated levels of copper, nickel and selenium were detected in fill samples from S-2, S-5 and S-6.

The contaminant levels do not pose an immediate threat to human health or the environment. Appropriate precautions should be taken if any excavation is undertaken in contaminated areas to ensure that workers do not ingest contaminants either by dermal contact or inhalation. Such precautions would include air quality monitoring, the use of rubberized protective clothing and cartridge type respirators where appropriate.

6 HAZARD RANKING SYSTEM EVALUATION

6.1 BACKGROUND

The Hazard Ranking System (HRS) was developed by the EPA to evaluate potential threats from a hazardous waste site to human health and the environment. The results of HRS were used as a screening tool for placing sites on the National Priority List (NPL).

The HRS was first developed in 1982 and appended to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (47FR 31180, July 16, 1982). Under the 1982 HRS, a site was evaluated and given an S_M score on the basis of contaminant migration in groundwater, surface water and air. In addition, sites were scored separately for the potential threat of fire and explosion hazard, and exposure hazard by direct contact. Any site that scored $S_M = 28.50$ or greater was placed on the NPL.

The HRS was revised in 1990 to include a number of new factors that were not considered in the 1982 version. Scores determined using the 1982 version are not directly comparable to the scores determined from the 1990 version although a total site score of 28.50 was retained as the lower level for placing a site on the NPL.

In 1990 URS Consultant Inc. calculated an HRS score for the Carborundum Electric Products Division facility based on the 1982 version of the HRS as follows:

$S_M = 16.56$
$S_{FE} = 13.33$
$S_{DC} = 0.00$

The S_M score indicated that the environmental threat posed by the Carborundum Electric Products Division facility was sufficiently low that the facility would not be considered for listing on the NPL. `INTERA recalculated the HRS score for the facility using the 1990 version and the additional site information obtained during this investigation. The site was scored using two approaches. The first approach was to assign reasonable and site specific conditions to the model. The second approach was to assume very conservative conditions to the groundwater and surface water pathway. These assumptions allowed the nearest upgradient drinking water well to be considered as a downgradient well and considered the human consumption of sport fish from the Niagara River. INTERA utilized the EPA menu-driven software, PREscore (EPA 1991) and the discussion of the use of HRS (Federal Register 1990) to derive the new scores.

6.2 HRS SCORE

PREscore determines the following scores:

- Groundwater migration pathway score (Sgw)
- Surface water migration pathway score (Ssw)
- Soil exposure pathway score (Ss)
- Air migration pathway score (Sa)
- Site score (S)

The site score is calculated by taking the root mean average of the individual pathway scores as follows:

$$S=\sqrt{\frac{S^2gw+S^2sw+S^2s+S^2a}{4}}$$

The following scores were calculated for the Electric Products Division facility using the two approaches discussed above:

$Sgw_1 = 0.00$ $Sgw_2 = 1.14$

$Ssw_1 = 0.30$ $Ssw_2 = 0.30$

$Ss_1 = 0.61$ $Ss_2 = 0.61$

$Sa_1 = 1.81$ $Sa_2 = 1.81$

$S_1 = 0.96$ $S_2 = 1.12$

The site scores of 0.96 and 1.12 are well below the EPA cutoff value of 28.50 for placing a site on the NPL. The low values indicate that overall environmental impact from the Carborundum Electric Products Division facility is extremely low.

Supporting documentation for the derivation of the HRS score for the Electric Products Division facility is provided in Appendix H. A brief description of the assumptions and data input for each pathway is provided in the following sections.

6.2.1 Groundwater Migration Pathway

The groundwater migration pathway was assessed for both the overburden materials and bedrock aquifer based on the physical and chemical characteristics for each that were determined during the field program. The depth of contamination was taken as lowest depth interval of contaminated sample from the former storage area which is 14 feet into the native overburden from sample S-4.

The depth to the aquifer from surface was taken as the approximate depth to the water table in the former storage area or 3.5 feet for the overburden aquifer and the approximate depth to the top of the Lockport Dolomite for the bedrock aquifer. The hydraulic conductivity for the overburden aquifer was taken as the geometric mean of the individual recovery tests for overburden wells; and for the bedrock aquifer as the calculated hydraulic conductivity for MW-2b.

Concentrations of hazardous substances were taken from the groundwater chemistry results. There are no domestic water wells within a distance of 1 mile downgradient from the facility. It was assumed that there were no domestic water wells in use within a distance of 4 miles downgradient from the facility. It was assumed that there is no wellhead protection area within 4 miles of the facility.

Three residential wells were identified within one mile upgradient of the Electric Products Division facility (URS 1990). Only one well was considered functional. These wells were ignored in the calculation of the S_1 score because of their location upgradient of the facility. In the calculation of the S_2 score, all three upgradient wells, and a total of eleven individuals were identified as a potential target population.

6.2.2 Surface Water Migration Pathway

The closest surface water body was assumed to be the Niagara River located approximately 7000 feet to the west of the facility.

The drainage area was calculated as the area between the PASNY Forebay Canal to the north, the PASNY buried conduits to the east, the railway corridor to the south and the Niagara River to the west.

The soil was classified as a moderately textured soil with a low infiltration rate. Drinking water in the area of the facility is supplied from the Niagara River. All surface water intakes are located upstream from any groundwater discharge to the Niagara River, from the facility. No sensitive surface water environments were identified within 4 miles downgradient of the site.

S_1 was calculated assuming that there was no impact to the human food chain from the facility. The calculation for S_2 assumed a sport fishery in the Lower Niagara River with an annual human consumption of 500,000 lbs of fish. The addition of the sport fishery did not alter the surface water migration pathway score.

6.2.3 Soil Exposure Pathway

The source of contamination was estimated as the area surrounding S-1, S-3 and S-4 in the former storage area and has an area of 15,680 ft^2.

The onsite population of the Electric Products Division facility was estimated at 75 workers. The number of workers whose workplace is located within 200 feet of the former storage area was estimated at 20. Contaminants and concentrations were determined from soil analytical results.

Area population was estimated on the basis of house and commercial building counts taken from 1:24,000 scale 1974 aerial photography. The average number of individuals per residence was estimated to be 2.6 based on information supplied by the Town of Niagara Planning Department. The average number of people working in commercial buildings was estimated at 10 while the average number of people working in industrial plants was estimated at 100.

6.2.4 Air Pathway

Information for the air pathway calculation was obtained from data input for the previous pathway.

7 CONCLUSIONS

1. The groundwater flow direction beneath the Carborundum Electric Products Division facility is approximately southwest to west-southwest. The horizontal groundwater flow velocity in the overburden is estimated at less than 10 to 20 feet per year. The horizontal groundwater flow velocity in the Lockport Dolomite is estimated at greater than 200 to 250 feet per year.

2. Two potential sources of bedrock (Lockport Dolomite) groundwater contamination exist upgradient from the Carborundum facility. Since 1920, an industrial waste landfill has operated at the U.S. Vanadium Corp. site located approximately 2,500 feet northeast of the Carborundum facility. The U.S. Vanadium Corp. landfill is 62 acres in size, and is currently inactive. From 1934 to 1987, the Union Carbide Corporation Carbon Products Division accepted some hazardous wastes in an 18-acre landfill about 1,500 feet northeast of the Carborundum facility. The U.S. Vanadium Corp. site was classified as 3 and the Union Carbide site is classified as 2a by NYSDEC. The organic contaminants identified at levels less than 2.3 mg/L in the bedrock groundwater beneath the Carborundum facility are similar to the groundwater contaminants, or their degradation products, in the upgradient wells at the U.S. Vanadium Corp. and Union Carbide sites.

3. The preliminary site assessment of the Carborundum facility indicated that there has been no deliberate disposal of hazardous wastes on the Carborundum site. Localized areas of soil contamination are the result of either (i) contaminated fill hauled onsite from unknown off-site sources; (ii) spills, or (iii) inadvertent leaks from material or equipment that was stored onsite prior to off-site disposal.

4. Low levels of PCBs (maximum of 2.4ppm) were identified in four soil samples. The PCB concentrations in soil are well below the 10ppm TSCA guidance level. PCBs were not detected in groundwater at the facility. PCBs are not a concern at the Carborundum Electric Products Division site.

5. Dioxins (PCDP) and furans (PCDF) were detected at low levels in a soil sample taken adjacent to the drum storage cage in the storage area. Concentrations of individual dioxin and furan congeners were normalized to 2,3,7,8-TCDD. The total normalized dioxin and furan concentration was calculated as 0.90ppb and is considered to be below any actionable level. These compounds were most likely produced as a result of burning wood and paper on soil containing small amounts of PCBs. The dioxins or furans are not a concern at the Carborundum Electric Products Division site.

6. We believe that sufficient information, as presented below, has been obtained for NYSDEC's consideration to reclassify the Carborundum Electric Products Division site to Class 3.

   a) Two localized areas of soil contamination are not the result of deliberate disposal of hazardous waste. The contamination is principally volatile organics and some metals. One area containing contaminated soils was formerly used to store material prior to off-site disposal. The other area is in a courtyard between plant buildings. The soil contamination is localized and air monitoring prior to drilling indicated no volatile airborne contaminants. The metals are relatively immobile in the soils. The limited soil contamination does not present a significant threat to the environment or public health.

   b) A third area of soil contamination, near a railroad spur, was identified with elevated PAH concentrations. The PAHs are likely due to either (i) a Union Carbide coal tar spill in the mid 1960s, or (ii) leaching of creosote from railroad ties. PAHs are relatively immobile and are not detected in groundwater at the site. The PAHs are not the result of disposal of hazardous waste and the PAHs do not present a significant threat to the environment or to public health.

   c) Metals were detected at elevated levels in the fill (hauled in from unknown off-site sources) at four locations in the storage area and in the courtyard. The metals are relatively immobile. There is no contamination of groundwater with metals. Three overburden groundwater samples and one bedrock groundwater sample exceeded the State water quality standards for aluminum, iron, or antimony. However, these constituent concentrations are considered to be due to natural sources and within the potential range of background values for the Niagara Falls area.

d) Although groundwater in the overburden and bedrock contains some volatile organics (up to 1.9 mg/L in the overburden groundwater and up to 2.3 mg/L in the bedrock groundwater), the groundwater does not present an immediate threat to public health.

Using very conservative assumptions, the off-site transport of contaminants in the groundwater is less than 0.1 lbs/day. This is about a hundred times less than the typical off-site loading in the groundwater from many of the industrial facilities in Niagara Falls. There are no drinking water wells located downgradient from the Electric Products Division facility and the groundwater discharge to the Niagara Gorge, about 1.3 miles from the site, occurs below the municipal water intake for the town of Niagara.

e) The HRS score for the facility was calculated using the EPA PREscore model based on two approaches. The first approach was based on site-specific conditions, and the second approach assumed very conservative conditions. The conservative assumptions allowed the nearest upgradient well to be considered as a downgradient well and considered the human consumption of sport fish from the Niagara River. The following pathway and site scores were determined:

$Sgw_1 = 0.00$ $Sgw_2 = 1.14$
$Ssw_1 = 0.30$ $Ssw_2 = 0.30$
$Ss_1 = 0.61$ $Ss_2 = 0.61$
$Sa_1 = 1.81$ $Sa_2 = 1.81$
$S_1 = 0.96$ $S_2 = 1.12$

The overall site scores of 0.96 and 1.12 compare to the EPA cutoff value of 28.50 for placing a site on the NPL. The low scores indicate that the overall environmental impact from the Electric Products Division facility is extremely low and that the facility does not present a significant threat to the environment or to public health.

8 RECOMMENDATIONS

1. Conduct additional soil sampling in the material storage area to further define the localized areas of soil contamination.

2. Install additional upgradient monitoring wells to determine the nature and extent of contamination in the bedrock groundwater due to upgradient sources.

9 REFERENCES

Ankley, G.T. et al. (1992) Integrated Assessment of Contaminated Sediments in the Lower Fox River and Green Bay, Wisconsin. Ecotoxicology and Environmental Safety, Vol. 23, pp. 46-63.

Benfenati, E., S. Valzacchi, G. Mariani, L. Airoldi, and R. Fanelli (1992) PCDD, PCDF, PCB, PAH, Cadmium and Lead in Roadside Soil: Relationship Between Road Distance and Concentration. Chemosphere, Vol. 24, No. 8, pp. 1077-1083.

CCME (1991) Interim Canadian Environmental Quality Criteria for Contaminated Sites. Prepared by the CCME Subcommittee on Environmental Quality Criteria for Contaminated Sites.

Conestoga-Rovers & Associates (1991) Redefinition of Hyde Park Bedrock Non-Aqueous Phase Liquid Plume. Hyde Park Requisite Remedial Technology Program, Niagara Falls, New York. Prepared for: Occidental Chemical Corporation.

Crummett, W.B. and D.I. Townsend (1984) The Trace Chemistries of Fire Hypothesis: Review and Update. Chemosphere, Vol. 13, No. 7, pp. 777-788.

Driscoll, F.G. (1986) Groundwater and Wells. 2nd Ed. Johnson Filtration Systems Inc. St. Paul, Minn. 1089p.

EPA (1991) PREScore Software Users Manual and Tutorial Version 1.0. USEPA Office of Emergency and Remedial Response. Publication 9345.1-04.

Earth Dimensions Inc. (1985) Soils Report Preliminary Site Assessment Hyde Park Facility, Carborundum Globar Manufacturing, Niagara Falls, New York.

Ecology and Environment Engineering, P.C. (1991) Preliminary Site Assessment: Union Carbide Corp; Carbon Products Division Site. Site Number 932035, Town of Niagara, Niagara County. Prepared for: New York State Department of Environmental Conservation.

Ecology and Environment Engineering (1989) Phase 1 Investigation SKW Alloys, Inc., Site Number 932001, Town of Niagara, Niagara County. Prepared for: New York State Department of Environmental Conservation.

Eduljee, G.H. and D.I. Townsend (1987) Simulation and Evaluation of Potential Physical and Mass Transfer Phenomena Governing Congener Group Profiles in Soils Near Combustion Sources. Chemosphere, Vol. 16, Nos. 8/9, pp. 1841-1845.

Federal Register (1990) 40CFR Part 300 Hazard Ranking System; Final Rule. Vol. 55, NO. 241, Friday, December 14, 1990.

Galli, R., J. Krebs, M. Kraft, M. Good (1992) PCDDs and PCDFs in Soil Samples from Switzerland. Chemosphere, Vol. 24, No. 8, pp. 1095-1102.

GeoTrans Inc. (1988) Potential Contaminant Loadings to the Niagara River from U.S. Hazardous Waste Sites.

Hvorslev, M.J. (1951) Time Lag and Soil Permeability in Groundwater Observation. U.S. Army Corps Engineers, Waterway Exp. Sta. Bull. 36 Vicksburg, Miss.

Intera Inc. (1992a) Preliminary Site Assessment Work Plan for The Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York, Site No. 932036, April 1992

Intera Inc. (1992b) Preliminary Site Assessment Health and Safety Plan for The Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York, Site No. 932036, April 1992

Intera Inc. (1992c) Quality Assurance Plan for a Preliminary Site Assessment of The Carborundum Company - Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York, Site No. 932036, April 1992.

Johnston, R.H. (1964) Ground Water in the Niagara Falls Area, New York With Emphasis on the Water-Bearing Characteristics of the Bedrock. Bulletin GW-53. Prepared for the State of New York Conservation Department Water Resources Commission.

Koszalka, E.J., J.E. Paschal Jr., T.S. Miller and P.B. Duran (1985) Preliminary Evaluation of Chemical Migration to Groundwater and the Niagara River from Selected Waste - Disposal Sites. Report EPA - 905/4-85-001.

NUS Corporation (1987) Preliminary Assessment Carborundum. Prepared under Technical Directive Document No. 02-8712-06, Contract No. 68-01-7346 for the Environmental Services Division, U.S. Environmental Protection Agency.

NYSDEC (1992) STARS Memo #1 Petroleum-Contaminated Soil Guidance Policy. Prepared by Division of Construction Management Bureau of Spill Prevention and Response, August 1992.

NYSDEC (1990) Inactive Hazardous Waste Disposal Sites in New York State. Annual Report. A Joint Report of the New York State Departments of Environmental Conservation and Health.

Ontario Ministry of the Environment (1989) Guidelines for the Decommissioning and Cleanup of Sites in Ontario.

URS Consultants Inc. (1990) Engineering Investigations at Inactive Hazardous Waste Sites, Preliminary Site Assessment, Carborundum Company Globar Plant Site No. 932036 Niagara (T), Niagara (C). Prepared for: New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.

APPENDIX A

Air Quality Monitoring Results

Site Ambient Air Monitoring

Date	Time	Station	PID reading ppm
July 29, 1992	9:36 a.m.	MW-1	0
	9:38 a.m.	MW-2	0
	9:35 a.m.	MW-3	0
	9:44 a.m.	MW-4	0
	9:38 a.m.	MW-5	0
	9:30 a.m.	S-1	0
	9:34 a.m.	S-2	0
	9:31 a.m.	S-3	0
	9:33 a.m.	S-4	0
	9:45 a.m.	S-5	0
	9:49 a.m.	S-6	0
	9:42 a.m.	Perimeter 1	0
	9:41 a.m.	Perimeter 2	0
	9:40 a.m.	Perimeter 3	0
	9:39 a.m.	Perimeter 4	0
	9:37 a.m.	Perimeter 5	0
	9:36 a.m.	Perimeter 6	0
	9:50 a.m.	Perimeter 7	0
	9:44 a.m.	Perimeter 8	0

Air Quality Monitoring

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission (μg/m^3)
July 29, 1992	11:00 a.m.	MW-2a	1	0	21	0	–
			2	0	21	0	–
			3	0	21	0	–
			4	0	21	0	–
July 29, 1992	12:00 p.m.	MW-2a	0	0	21	0	–
			1	0	21	0	–
			2	0	21	0	–
			3	0	21	0	–
			4	0	21	0	–
July 29, 1992	2:20 p.m.	MW-2b	0	0	20.9	0	BG: 2.30 0.00
			1	0	21	0	25ft upwind 0.00
			2	0	21	0	25ft downwind 0.00
			3	0	21	0	
			4	0	21	0	
July 29, 1992	3:20 p.m.	MW-2b	0	0	21	0	–
			1	0	21	0	–
			2	0	21	0	–
			3	0	21	0	–
			4	0	21	0	–
July 30, 1992	8:45 a.m.	MW-2b	0	0	20.8	0	–
			1	0	20.8	0	–
			2	0	20.8	0	–
			3	0	20.8	0	–
			4	0	20.8	0	–
July 30, 1992	9:00 a.m.	MW-2b					BG: 2.31 0.00
							25ft upwind 0.00
							25ft downwind 0.01
July 30, 1992	9:57 a.m.	MW-2b					BG: 2.31 0.00
							25ft upwind 0.00
							25ft downwind 0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
July 30, 1992	10:45 a.m.	MW-2b	0	0	21.0	0	BG: 2.81 0.00
			1	0	21.1	0	0.00
			2	0	21.1	1	0.00
			3	0	21.1	0	0.00
			4	0	21.1	0	0.00
			5	0	21.1	0	0.00
			6	0	21.1	0	0.00
			7	0	21.1	0	0.00
July 30, 1992	12:57 p.m.	MW-2b	1	0	21.0	0	–
			2	0	21.1	0	–
			3	0	21.1	0	–
			4	0	21.1	0	–
			5	0	21.1	0	–
			6	0	21.1	0	–
			7	0	21.1	0	–
July 30, 1992	1:57 p.m.	MW-2b	1	0	0	0	–
			2	0	0	0	–
			3	0	0	0	–
			4	0	0	0	–
			5	0	0	0	–
			6	0	0	0	–
			7	0	0	0	–
July 31, 1992	8:20 a.m.	MW-2b	0	0	20.8	0	BG: 2.35 0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
			7	0	20.8	0	0.00
July 31, 1992	9:00 a.m.	MW-2b	0	0	–	–	278
							25ft downwind 27.8
July 31, 1992	9:20 a.m.	MW-2b					25ft upwind 0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
							25ft downwind 0.09
July 31, 1992	9:45 a.m.	MW-2b	0	–	–	–	0.89
July 31 ,1992	9:50 a.m.	MW-2b	0	0	21.8	0	0.33-18.5
			1	0	21.8	0	25ft upwind 0.01-0.016
			2	0	21.8	0	25ft downwind 13.2-78.2
			3	0	21.8	0	
			4	0	21.8	0	
			5	0	21.8	0	
			6	0	21.8	0	
			7	0	21.8	0	
July 31, 1992	10:12 a.m.	MW-2b	0	0	–	0	–
							25ft upwind 0.01
							25ft downwind 0.05
July 31, 1992	10:20 a.m.	MW-2b					25ft upwind 0.00
							25ft downwind 0.00
July 31, 1992	10:50 a.m.	MW-2b	0	0	21.7	0	0.00-0.10
			1	0	21.8	0	
			2	0	21.8	0	
			3	0	21.8	0	
			4	0	21.7	0	
			5	0	21.7	0	
			6	0	21.7	0	
			7	0	21.7	0	
July 31, 1992	1:40 p.m.	MW-2b	0	–	–	–	BG: 2.35 0.00
							25ft upwind 0.00
							25ft downwind 0.00
July 31, 1992	2:10 p.m.	MW-2b	0	0	21.8	0	25ft upwind 0.00
			1	0	21.8	0	25ft downwind 0.00-0.03
			2	0	21.8	0	
			3	0	21.8	0	
			4	0	21.8	0	
			5	0	21.8	0	
			6	0	21.8	0	

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)
			7	0	21.8	0
Aug. 3, 1992	10:00 a.m.	MW-2b	0	0	20.8	0
			1	0	20.8	0
			2	0	20.8	0
			3	0	20.8	0
			4	0	20.8	0
			5	0	20.8	0
			6	0	20.8	0
			7	0	20.8	0

Particulate Emission ($\mu g/m^3$)
BG: 2.36 0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
Aug. 3, 1992	12:50 p.m.	MW-3b	0	0	20.8	0	0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 3, 1992	2:00 p.m.	MW-3b	0	0	21.8	0	0.00
			1	0	21.8	0	0.00
			2	0	21.8	0	0.00
			3	0	21.8	0	0.00
			4	0	21.8	0	0.00
			5	0	21.8	0	0.00
			6	0	21.8	0	0.00
Aug. 4, 1992	10:35 a.m.	MW-3b	0	0	20.8	0	BG: 2.33 0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 4, 1992	10:50 a.m.	MW-3b	0	0	20.8	0	0.29
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.9	0	0.00
			4	0	20.9	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 4, 1992	2:05 p.m.	MW-3b	0	0-0.2	–	–	0.08-2.3
							25ft downwind 0.00
Aug. 4, 1992	2:35 p.m.	MW-3b	0	–	–	–	68.7
							25ft upwind 0.19
							25ft downwind 8.29

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
Aug. 4, 1992	3:05 p.m.	MW-3b	0	0	20.9	0	1.28
			1	0	21.0	0	0.14
			2	0	21.0	0	0.14
			3	0	21.0	0	0.03
			4	0	21.0	0	0.14
			5	0	21.0	0	0.44
			6	0	21.0	0	0.96
Aug. 4, 1992	3:35 p.m.	MW-3b	0	–	–	–	0.16
			1	–	–	–	0.14
			2	–	–	–	0.16
			3	–	–	–	0.10
			4	–	–	–	0.12
			5	–	–	–	0.14
			6	–	–	–	0.12
Aug. 4, 1992	4:05 p.m.	MW-3b	0	0	21.0	0	0.61
			1	0	21.0	0	0.44
			2	0	21.0	0	0.66
			3	0	21.0	0	0.44
			4	0	21.0	0	0.44
			5	0	21.0	0	0.55
			6	0	21.0	0	0.51
Aug. 4, 1992	4:35 p.m.	MW-3b	0	–	–	–	0.00
			1	–	–	–	0.33
			2	–	–	–	0.40
			3	–	–	–	0.36
			4	–	–	–	0.00
			5	–	–	–	0.00
			6	–	–	–	0.00
Aug. 5, 1992	8:25 a.m.	MW-3b	0	0	20.8	0	0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
			6	0	20.9	0	0.00
Aug. 5, 1992	11:22 a.m.	MW-3b	0	–	–	–	0.00
			1	–	–	–	0.00
			2	–	–	–	0.00
			3	–	–	–	0.00
			4	–	–	–	0.00
			5	–	–	–	0.00
			6	–	–	–	0.00
Aug. 5, 1992	11:50 a.m.	MW-3b	0	0	21.0	0	0.08
			1	0	21.0	0	0.08
			2	0	21.0	0	0.08
			3	0	21.0	0	0.08
			4	0	21.0	0	0.08
			5	0	21.0	0	0.08
			6	0	21.0	0	0.08

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
Aug. 6, 1992	9:02 a.m.	MW-1b	0	0	–	–	BG: 2.92 0.00
			1	0	–	–	25ft upwind 0.00
			2	0	–	–	25ft downwind 0.00
			3	0	–	–	0.00
			4	0	–	–	0.00
			5	0	–	–	0.00
			6	0	–	–	0.00
Aug. 6, 1992	10:50 a.m.	MW-1b	0	0	21.8	0	–
			1	0	21.8	0	–
			2	0	21.8	0	–
			3	0	21.8	0	–
			4	0	21.8	0	–
			5	0	21.9	0	–
			6	0	21.8	0	–
Aug. 6, 1992	12:50 p.m.	MW-1b	0	0	21.9	0	–
			1	0	21.9	0	0.00
			2	0	21.9	0	0.00
			3	0	21.9	0	0.00
			4	0	21.9	0	0.00
			5	0	21.9	0	0.00
			6	0	21.9	0	0.00
Aug. 6, 1992	1:20 p.m.	MW-1b	0	–	–	–	–
			1	–	–	–	0.00
			2	–	–	–	0.00
			3	–	–	–	0.00
			4	–	–	–	0.00
			5	–	–	–	0.00
			6	–	–	–	0.00
Aug. 6, 1992	1:50 p.m.	MW-1b	0	0	21.0	0	0.00
			1	0	21.0	0	0.00
			2	0	20.9	0	0.00
			3	0	20.9	0	0.00
			4	0	21.0	0	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
			5	0	21.0	0	0.00
			6	0	21.0	0	0.00
Aug. 6, 1992	2:20 p.m.	MW-1b	0	–	–	–	0.00
			1	–	–	–	0.00
			2	–	–	–	0.00
			3	–	–	–	0.00
			4	–	–	–	0.00
			5	–	–	–	0.00
			6	–	–	–	0.00
Aug. 6, 1992	2:50 p.m.	MW-1b	0	0	21.0	0	0.00
			1	0	21.0	0	0.00
			2	0	21.0	0	0.00
			3	0	21.0	0	0.00
			4	0	21.0	0	0.00
			5	0	21.0	0	0.00
			6	0	21.0	0	0.00
Aug. 7, 1992	7:42 a.m.	MW-1b	0	0	20.7	0	BG: 2.87 0.11-0.33
			1	0	20.7	0	0.00
			2	0	20.7	0	0.00
			3	0	20.7	0	0.00
			4	0	20.7	0	0.00
			5	0	20.7	0	0.00
			6	0	20.7	0	0.00
Aug. 7, 1992	9:50 a.m.	MW-1a	0	0	20.9	0	0.00
			1	0	20.9	0	0.00
			2	0	20.9	0	0.00
			3	0	20.9	0	0.00
			4	0	20.9	0	0.00
			5	0	20.9	0	0.00
			6	0	20.9	0	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission (µg/m³)
Aug. 7, 1992	1:30 p.m.	MW-2b	0	0	21.0	0	–
			1	0	21.0	0	–
			2	0	21.0	0	–
			3	0	21.0	0	–
			4	0	21.0	0	–
			5	0	21.0	0	–
			6	0	21.0	0	–
Aug. 7, 1992	3:00 p.m.	MW-2b	0	0	21.0	0	–
			1	0	21.0	0	–
			2	0	21.0	0	–
			3	0	21.0	0	–
			4	0	21.0	0	–
			5	0	21.0	0	–
			6	0	21.0	0	–
Aug. 7, 1992	4:00 p.m.	MW-2b	0	0	21.0	0	–
			1	0	21.0	0	–
			2	0	21.0	0	–
			3	0	21.0	0	–
			4	0	21.0	0	–
			5	0	21.0	0	–
			6	0	21.0	0	–
Aug. 10, 1992	9:45 a.m.	MW-2b	0	–	–	–	BG: 2.83 0.00-0.38
			1	–	–	–	0.00-0.07
			2	–	–	–	0.14
			3	–	–	–	0.07
			4	–	–	–	0.07
			5	–	–	–	0.00
			6	–	–	–	0.00
Aug. 10, 1992	10:15 a.m.	MW-2b	0	0	20.9	0	0.33
			1	0	20.9	0	0.01
			2	0	20.9	0	0.03
			3	0	20.9	0	0.00
			4	0	20.8	0	0.00

			5	0	20.9	0	0.00
			6	0	20.9	0	0.00
Aug. 10, 1992	10:35 a.m.	MW-2b	0	–	–	–	0.00
			1	–	–	–	0.00
			2	–	–	–	0.00
			3	–	–	–	0.00
			4	–	–	–	0.00
			5	–	–	–	0.00
			6	–	–	–	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
Aug. 10, 1992	2:25 p.m.	MW-4b	0	0	20.8	0	0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 10, 1992	4:40 p.m.	MW-4b	0	0	20.8	0	–
			1	0	20.8	0	–
			2	0	20.8	0	–
			3	0	20.8	0	–
			4	0	20.8	0	–
			5	0	20.8	0	–
			6	0	20.8	0	–
Aug. 11, 1992	8:00 a.m.	MW-4b	0	0	20.7	0	0.00
			1	0	20.7	0	0.00
			2	0	20.7	0	0.00
			3	0	20.7	0	0.00
			4	0	20.7	0	0.00
			5	0	20.7	0	0.00
			6	0	20.7	0	0.00
Aug. 11, 1992	9:00 a.m.	MW-4b	0	0	20.8	0	0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 11, 1992	10:00 a.m.	MW-4b	0	0-0.8	20.8	0	6.58
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
			6	0	20.8	0	0.00
Aug. 11, 1992	10:05 a.m.	MW-4b	0	–	–	–	22.4
Aug. 11, 1992	11:00 a.m.	MW-4b	0	0	20.9	0	0.00
			1	0	20.9	0	0.00
			2	0	20.9	0	0.00
			3	0	20.9	0	0.00
			4	0	20.9	0	0.00
			5	0	20.9	0	0.00
			6	0	20.9	0	0.00
Aug. 11, 1992	11:30 a.m.	MW-4b	0	–	–	–	0.00
			1	–	–	–	0.00
			2	–	–	–	0.00
			3	–	–	–	0.00
			4	–	–	–	0.00
			5	–	–	–	0.00
			6	–	–	–	0.00
Aug. 11, 1992	12:00 p.m.	MW-4b	0	0	20.9	0	0.00
			1	0	20.9	0	0.00
			2	0	20.9	0	0.00
			3	0	20.9	0	0.00
			4	0	20.9	0	0.00
			5	0	20.9	0	0.00
			6	0	20.9	0	0.00
Aug. 12, 1992	7:41 a.m.	MW-4b	0	0	20.7	0	BG: 2.83 0.00
			1	0	20.7	0	0.00
			2	0	20.7	0	0.00
			3	0	20.7	0	0.00
			4	0	20.7	0	0.00
			5	0	20.7	0	0.00
			6	0	20.7	0	0.00
Aug. 12, 1992	8:40 a.m.	MW-4b	0	0	20.8	0	0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 12, 1992	9:10 a.m.	MW-4b	0	–	–	–	0.00
			1	–	–	–	0.00
			2	–	–	–	0.00
			3	–	–	–	0.00
			4	–	–	–	0.00
			5	–	–	–	0.00
			6	–	–	–	0.00
Aug. 12, 1992	9:40 a.m.	MW-4b	0	0	20.8	0	0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 12, 1992	10:40 a.m.	MW-4b	0	0	20.8	0	0.00
			1	0	20.8	0	0.00
			2	0	20.8	0	0.00
			3	0	20.8	0	0.00
			4	0	20.8	0	0.00
			5	0	20.8	0	0.00
			6	0	20.8	0	0.00
Aug. 12, 1992	11:40 a.m.	MW-4b	0	0	20.9	0	0.18
			1	0	20.9	0	0.00
			2	0	20.9	0	0.00
			3	0	20.9	0	0.00
			4	0	20.9	0	0.00
			5	0	20.9	0	0.00
			6	0.8	20.9	0	0.00
Aug. 12, 1992	3:20 p.m.	MW-4a	0	0	20.9	0	0.00
			1	0	20.9	0	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
			2	0	20.9	0	0.00
			3	0	20.9	0	0.00
			4	0	20.9	0	0.00
			5	0	20.9	0	0.00
			6	0.4	20.9	0	0.00
Aug. 12, 1992	4:30 p.m.	MW-4a	0	0	20.9	0	–
			1	0	20.9	0	–
			2	0	20.9	0	–
			3	0	20.9	0	–
			4	0	20.9	0	–
			5	0	20.9	0	–
			6	0	20.9	0	–

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
Aug. 13, 1992	7:40 a.m.	MW-5b	0	0	21.0	0	BG: 3.02 0.00
			1	0	21.0	0	0.00
			2	0	21.0	0	0.00
			3	0	21.0	0	0.00
			4	0	21.0	0	0.00
			5	0	21.0	0	0.00
			6	0	21.0	0	0.00
Aug. 13, 1992	9:00 a.m.	MW-5b	0	0.4	20.5	0	–
			1	0.6	20.5	0	–
			2	0.6	20.5	0	–
			3	1.0	20.5	0	–
			4	0.8	20.5	0	–
			5	0.8	20.5	0	–
			6	1.2	20.5	0	–
Aug. 13, 1992	10:00 a.m.	MW-5b	0	0.1	20.6	0	0.00
			1	0.1	20.6	0	0.00
			2	0.1	20.6	0	0.00
			3	0.1	20.6	0	0.00
			4	1.2	20.6	0	0.00
			5	0.8	20.6	0	0.00
			6	0.6	20.6	0	0.00
Aug. 13, 1992	11:05 a.m.	MW-5b	0	0.8	20.6	0	0.64
			1	0.9	20.6	0	0.00
			2	1.0	20.6	0	0.00
			3	1.1	20.6	0	0.00
			4	1.3	20.6	0	0.00
			5	1.5	20.6	0	0.00
			6	2.1	20.6	0	0.00
Aug. 13, 1992	1:30 p.m.	MW-5b	0	–	–	–	1.40
Aug. 13, 1992	2:00 p.m.	MW-5b	0	0	20.6	0	0.12
			1	0	20.6	0	0.00
			2	0	20.6	0	0.00
			3	0	20.6	0	0.00

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
			4	0	20.6	0	0.00
			5	0	20.6	0	0.00
			6	0	20.6	0	0.00
Aug. 14, 1992	9:20 a.m.	MW-5a	0	0	20.7	0	–
			1	0	20.7	0	–
			2	0	20.7	0	–
			3	0	20.7	0	–
			4	0	20.7	0	–
			5	0	20.7	0	–
			6	0	20.7	0	–
Aug. 14, 1992	10:47 a.m.	MW-5a	0	0	20.8	0	–
			1	0	20.8	0	–
			2	0	20.8	0	–
			3	0	20.8	0	–
			4	0	20.8	0	–
			5	0	20.8	0	–
			6	0	20.8	0	–

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
Aug. 14, 1992	1:35 p.m.	S-1	0	0	20.9	0	–
			1	0	20.9	0	–
			2	0	20.9	0	–
			3	0	20.9	0	–
			4	0	20.9	0	–
			5	0	20.9	0	–
			6	0	20.9	0	–
Aug. 17, 1992	8:37 a.m.	S-6	0	0	20.8	0	–
			1	0	20.8	0	–
			2	0	20.8	0	–
			3	0	20.8	0	–
			4	0	20.8	0	–
			5	0	20.8	0	–
			6	0	20.8	0	–
Aug. 17, 1992	9:25 a.m.	S-5	0	0	20.8	0	–
			1	0	20.8	0	–
			2	0	20.8	0	–
			3	0	20.8	0	–
			4	0	20.8	0	–
			5	0	20.8	0	–
			6	0	20.8	0	–
Aug. 17, 1992	10:37 a.m.	S-3	0	0	20.7	0	–
			1	0	20.7	0	–
			2	0	20.7	0	–
			3	0	20.7	0	–
			4	0	20.7	0	–
			5	0	20.7	0	–
			6	0	20.7	0	–
Aug. 17, 1992	11:35 a.m.	S-3	0	0	20.9	0	–
			1	0	20.9	0	–
			2	0	20.9	0	–
			3	0	20.9	0	–
			4	0	20.9	0	–
			5	0	20.9	0	–

Date	Time	Borehole No.	Station	PID (ppm)	Oxygen (%)	Combustible Gas (% LEL)	Particulate Emission ($\mu g/m^3$)
			6	0	20.9	0	–
Aug. 17, 1992	2:00 p.m.	S-2	0	0	20.8	0	–
			1	0	20.8	0	–
			2	0	20.8	0	–
			3	0	20.8	0	–
			4	0	20.8	0	–
			5	0	20.8	0	–
			6	0	20.8	0	–
Aug. 17, 1992	2:42 p.m.	S-2	0	0	20.8	0	–
			1	0	20.8	0	–
			2	0	20.8	0	–
			3	0	20.8	0	–
			4	0	20.8	0	–
			5	0	20.8	0	–
			6	0	20.8	0	–

Note:
Station 0 = breathing zone at borehole
Station 1-7 = measurement stations on the perimeter of work zone
BG = background level for particulate emissions taken at borehole
25ft upwind = measurement station located 25ft upwind from work zone
25ft downwind = measurement station located 25ft downwind from work zone

Measurements for particulate emissions are reported as the difference in reading between the station and background.

APPENDIX B

Correspondence to NYSDEC

Regarding Modifications to the Work Plan

INTERA

INTERA INC. • 6850 Austin Center Boulevard • Suite 300 • Austin, Texas 78731, USA • Telephone: 512-346-2000 • Facsimile: 512-346-9436

July 31, 1992

New York State Department of Environmental Conservation
Division of Hazardous Waste Site Remediation
270 Michigan Avenue
Buffalo, New York ~~14202-1073~~ 14203-2999

Attn: Mr. E. Joseph Sciascia

RE: <u>CARBORUNDUM COMPANY, ELECTRIC PRODUCTS DIVISION FACILITY MONTHLY PROGRESS REPORT, TOWN OF NIAGARA, NY (SITE NO. 932036)</u>

Dear Mr. Sciascia,

Intera Inc. is writing this letter on behalf of its client, The Carborundum Company, for their Electric Products Division Facility which is located in the Town of Niagara, New York. The purpose of the letter is to present the monthly progress report per the requirements of the consent order for this site. The progress report is divided into the categories as listed in the consent order. This particular report documents the activities performed during July 1992 and the activities planned for August 1992.

Important activities performed during this period and activities planned are presented as follows:

1. Important Actions - July 1992:

   - The Carborundum Company and Intera Inc. conducted a plant safety and a health and safety meeting on July 28, 1992, for representatives of The Carborundum Company, Intera Inc. and Empire Soil Investigations Inc. who are involved in the Preliminary Site Assessment (PSA). Plant safety was discussed by Ms. M.L. Maggard, Health, Safety and Environmental Supervisor, The Carborundum Company. A health and safety presentation outlining safe operating procedures and emergency response during the PSA was presented by the Site Safety Officer (SSO), Mr. R. Timlin.

   - Public utility line locates were requested and completed and on site electrical lines were located prior to the commencement of drilling.

   - Final borehole locations and locations for the decontamination pad were decided upon prior to the start of drilling.

.../2

- Drilling of the first overburden well was completed at site MW-2a as shown on Figure 4.1 of the Work Plan on July 29. Soil sampling was completed and a groundwater monitor well was installed at this location. A soil sample was submitted for laboratory analysis on July 30, 1992 to Recra Environmental Inc.

- Drilling of first bedrock well commenced on July 30, 1992 at site MW-2b as shown on Figure 4.1 of the Work Plan. A hole was augered through overburden as per the Work Plan and a steel casing was set onto bedrock. During subsequent coring, water was forced from the hole in an uncontrolled manner due to a poor seal between the bedrock and the casing and drilling was stopped. After discussion with NYSDEC, representatives of Intera Inc. and the drilling contractor, it was agreed to grout schedule 40 PVC casing to the top of bedrock. Grouting was completed on July 30 and coring of the top 12 feet of bedrock was completed on July 31, 1992. During removal of drilling rods in preparation of monitor well installation, and due to the fractured nature of the top of bedrock, the hole collapsed. The hole was abandoned by grouting to surface in a manner agreed to by NYSDEC. A second attempt to complete the deeper well will be made in August.

2. Proposed Work - August 1992

- Drilling, soil sampling and monitor well installation will be completed at sites MW-1a, 1b, MW-2b, MW3a, 3b, MW-4a, 4b and MW-5a, 5b as shown in Figure 4.1 of the Work Plan.

- Soil sampling will be completed at locations S-1 to S-6 as shown on Figure 4.1 of the Work Plan.

- Selected soil samples will be submitted to Recra Environmental Inc. for geochemical analysis.

- Monitor wells will be developed prior to sampling. Monitor wells will be sampled and groundwater samples will be submitted to Recra Environmental Inc. for geochemical analysis.

- Groundwater levels will be measured.

- Hydraulic conductivity testing of groundwater monitor wells will be completed.

- Groundwater monitor wells will be surveyed for elevation.

.../3

3. Percentage Completion

- The Work Plan is approximately 5% complete. Completion of the field work is anticipated during August.

4. Proposed Changes to the Work Plan

- Section 4.3.1.4 describing well development on page 25 of the Work Plan states that each well will be developed within 48 hours of completion. We would request that the wells be allowed to be developed on completion of the drilling program. The reason for this request is that the driller is providing technicians other than the drillers to develop the wells. If development is to proceed within 48 hours the technician would have to be mobilized and demobilized after the installation of each well rather than completing the development of all of the wells at one time.

- Table 4.4 on page 35 of the Work Plan indicates that one blank/rinsate sample will be taken for field QA/QC. This QA/QC sample is a typographical error and should refer instead to the total cyanide sample listed immediately above dioxin on the same table. The reason for this request is that only one soil sample is being taken for dioxin and a blank/rinsate QA/QC sample is not warranted.

This concludes the monthly progress report for July. Please contact Mr. Paul Beck, Project Manager at (416) 513-9400 with any questions or comments regarding this report.

Sincerely,

Paul Beck per

Gerald E. Grisak
Vice President, Hydrogeology
INTERA, Inc.

cc. R. Spears (Carborundum)
J. Lorenz (Carborundum)
L. Maggard (Carborundum)
Director (Bureau of Environmental Exposure Investigations
NYSDEC, 2 University Place, Albany, NY 12203)
Mr. Walter Demick
(NYSDEC, 50 Wolf Road, Albany, NY 12233)
Mr. Michael J. Hinton
(NYSDEC, 270 Michigan Ave., Buffalo, NY 14203-2999)

INTERA

INTERA INC. • 6850 Austin Center Boulevard • Suite 300 • Austin, Texas 78731, USA • Telephone: 512-346-2000 • Facsimile: 512-346-9436

August 4, 1992

New York State Department
of Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Attn: Mr. Michael J. Hinton, P.E., Environmental Engineer II

RE: CHANGES TO WORK PLAN DESCRIPTION AT THE CARBORUNDUM COMPANY'S HYDE PARK FACILITY

Dear Mr. Hinton,

Intera Inc. is writing this letter on behalf of its client, the Carborundum Company, in regards to the preliminary site assessment (PSA) of its Electric Products Division facility located in the Town of Niagara, New York.

During drilling into the bedrock of the first hole at the facility on July 30, 1992 four inch casing was not adequately seated into the bedrock. Consequently, during air drilling groundwater was forced out of the hole in an uncontrolled manner and drilling was stopped. During discussions with the drilling contractor, the Project Site Safety Officer, Mr. Robert Timlin, and yourself, it was agreed that a four inch diameter schedule 40 PVC casing could be grouted into the hole and that drilling would proceed after the grout had set. This procedure was a departure from the Work Plan. Would you please confirm your agreement to this procedure in writing and send copies to:

Mr. Ronald Spears, Jr.
The Carborundum Company
Health Safety & Environmental Quality
P.O. Box 337
Niagara Falls, NY 14302

Mr. Paul Beck
Raven Beck Environmental Ltd.
3780 Fourteenth Avenue, Suite 210
Markham, Ontario
L3R 9Y5

This procedure was used on the first bedrock hole only. Subsequent holes will be completed according to the Work Program by seating the four inch steel casing deeper into bedrock using a casing shoe or spin bit.

In addition to the change in procedure for drilling the deep hole I would request the following additional changes to the Work Plan:

.../2

1. Section 4.3.1.4 describing well development on page 25 of the Work Plan states that each well will be developed within 48 hours of completion. I would request that the wells be allowed to be developed on completion of the drilling program. The reason for this request is that the driller is providing technicians other than the drillers to develop the wells. If development is to proceed within 48 hours the technician would have to be mobilized and demobilized after the installation of each well rather than completing the development of all of the wells at one time.

2. Table 4.4 on page 35 of the Work Plan indicates that one blank/rinsate sample will be taken for field QA/QC. This QA/QC sample is a typographical error and should refer instead to the total cyanide sample listed immediately above dioxin on the same table. The reason for this request is that only one soil sample is being taken for dioxin and a blank/rinsate QA/QC sample is not warranted.

These changes to the Work Plan will in no way compromise the quality of the PSA. If you have any questions or need any clarification regarding these changes please feel free to contact Mr. Paul Beck, Project Manager at (416) 513-9400.

Sincerely,

Paul Beck per

Gerald E. Grisak
Vice President, Hydrogeology
INTERA, Inc.

cc. R. Spears (Carborundum)

INTERA

INTERA INC. • 6850 Austin Center Boulevard • Suite 300 • Austin, Texas 78731, USA • Telephone: 512-346-2000 • Facsimile: 512-346-9436

September 1, 1992

New York State Department of Environmental Conservation
Division of Hazardous Waste Site Remediation
270 Michigan Avenue
Buffalo, New York 14203-2999

Attn: Mr. E. Joseph Sciascia

RE: CARBORUNDUM COMPANY, ELECTRIC PRODUCTS DIVISION FACILITY MONTHLY PROGRESS REPORT, TOWN OF NIAGARA, NY (SITE NO. 932036)

Dear Mr. Sciascia,

Intera Inc. is writing this letter on behalf of its client, The Carborundum Company, for their Electric Products Division Facility which is located in the Town of Niagara, New York. The purpose of the letter is to present the monthly progress report per the requirements of the consent order for this site. The progress report is divided into the categories as listed in the consent order. This particular report documents the activities performed during August 1992 and the activities planned for September 1992.

Important activities performed during this period and activities planned are presented as follows:

1. Important Activities - August 1992

- Drilling and monitor well installation were completed at the locations shown on Figure 4.1 of the Work Plan in the following sequence during the period August 4 to August 14: MW3b, MW3a, MW1b, MW1a, MW2b, MW4b, MW4a, MW5b, MW5a. MW4b was abandoned after the installation of monitor well casing when monitor well casing was pulled out of the hole during removal of temporary casing. The hole was grouted and a new hole MW4b was drilled.

- Drilling and soil sampling of soil boreholes were completed at the locations shown on Figure 4.1 of the Work Plan in the following sequence during the period August 14 to August 18: S-1, S-6, S-5, S-3, S-4, S-2.

- The installation of protective bollards around monitor wells was completed on August 18.

.../2

- Soil sampling of monitor well boreholes (MW-1 to MW-5) and soil sample boreholes (S1 to S6) were completed during the period August 4 to August 18. Soil samples were submitted to RECRA Environmental Inc. in Amherst, New York within 48 hours of sampling.

- Water levels in monitor wells were monitored during the period August 4 to August 24.

- Waste soil and clothing generated during drilling are temporarily stored on site in a secure area in 55 gallon steel drums. Material will be characterized and disposed of using an approved waste hauler.

- Monitor wells were developed by bailing, pumping and surging during the period August 18 to August 23. Groundwater generated during well development, purging and hydraulic testing is stored in 55 gallon steel drums and 475 gallon plastic tanks in a secure area on site. Groundwater will be characterized and disposed of at an approved off-site waste disposal facility.

- Hydraulic conductivity testing was completed in monitor wells: MW4a, MW5a, MW3a, MW2a, MW1a, and MW2b during the period August 19 - August 24. Hydraulic conductivity testing in the overburden wells MW1a to MW5a consisted of bail tests. A constant drawdown pump test was completed in MW2b.

- Groundwater sampling at monitor wells was completed in the following sequence: MW2b, MW4b, MW3b, MW1b, MW5b, MW5a, MW4a, MW2a, MW3a, MW1a during the period August 20 to August 23. Groundwater samples were submitted to RECRA Environmental Inc. within 48 hours of sampling.

- An elevation survey for ground surface and the top of monitor well casing was completed on August 24.

2. Proposed Work - September 1992

- Analytical results will be submitted to Intera by RECRA Environmental Inc. for data validation.

- Preparation of a report describing in detail all activities related to the site investigation and an assessment of environmental impacts will be initiated.

3. Percentage Completion

- The Work Plan is approximately 85% complete. Data validation and report preparation will be initiated during September.

.../3

4. Approved Changes to the Work Plan

- Section 4.3.1.5 describing hydraulic conductivity testing on page 25 of the Work Plan implies that each monitor well will be tested for hydraulic conductivity. Hydraulic conductivity testing of the overburden wells was completed using bail tests. The permeability of the bedrock was found to be very high and necessitated the use of a pump test. There was concern that a large volume of water of would be generated during pump testing and that this water would have to be stored on site until disposal could be arranged. After discussion with NYSDEC it was agreed that a pump test would be carried out on only one of the bedrock monitoring wells as being representative of hydraulic conductivity in the bedrock.

- According to ASP-91 protocol, groundwater samples for semi-volatile analyses must be extracted by the laboratory within 5 days of receipt of the samples. The USEPA requirement for extraction for semi-volatiles is 7 days from the time of sampling. RECRA Environmental informed INTERA on August 26 that the holding times for samples from MW2b, MW3b, MW4b and the field QA/QC sample had been extracted within 6 days instead of the required 5 days; however, the groundwater samples had been delivered to the laboratory within 24 hours of sampling. After discussion with NYSDEC it was agreed that the delay in extraction would have no affect on the results of the analysis because the time interval between the time of sampling and sample extraction remained at 7 days.

This concludes the monthly progress report for August. Please contact Mr. Paul Beck, Project Manager, at (416) 513-9400 with any questions or comments regarding this report.

Sincerely,

Paul Beck per.

Gerald E. Grisak
Vice President, Hydrogeology
INTERA, Inc.

cc. R. Spears (Carborundum)
J. Lorenz (Carborundum)
L. Maggard (Carborundum)
Director (Bureau of Environmental Exposure Investigations
NYSDEC, 2 University Place, Albany, NY 12203)
Mr. Walter Demick
(NYSDEC, 50 Wolf Road, Albany, NY 12233)
Mr. Michael J. Hinton
(NYSDEC, 270 Michigan Avenue, Buffalo NY 14203-2999)

INTERA

INTERA INC. • 6850 Austin Center Boulevard • Suite 300 • Austin, Texas 78731, USA • Telephone: 512-346-2000 • Facsimile: 512-346-9436

September 1, 1992

91-022

New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203-2999

Attn: Mr. Michael J. Hinton, P.E. Environmental Engineer II

RE: Carborundum Company, Electric Products Division Facility
Monthly Progress Report, Town of Niagara, NY (Site No. 932036)

Dear Mr. Hinton,

INTERA INC. is writing this letter on behalf of its client, the Carborundum Company, to discuss several issues relating to the preliminary site assessment of the Hyde Park Facility in Niagara Falls. The issues have been discussed with NYSDEC and this letter provides a record of the issues discussed and the agreed course of action.

The issues include:

- depth of sampling of fill and overburden in soil boreholes S1 to S6 and
- requirements for groundwater monitor well development

Depth of Soil Sample Boreholes (S1-S6)

In discussions with NYSDEC concerning soil sampling in the S-series boreholes, NYSDEC suggested that it was not necessary to sample to a depth of 20 feet in the overburden as indicated in the Work Plan. INTERA INC. and the Carborundum Company agreed that sampling would be completed to a depth of 10 feet below the bottom of the fill in order to provide a reasonable depth of sample for the native soil.

Requirements for Groundwater Monitor Well Development

NYSDEC requires that groundwater monitor wells be developed until a turbidity reading of 50 nephelometric units is reached. According to the Work Plan for the Preliminary Site Assessment, if the turbidity in the monitor wells did not reach 50 nephelometric units within a three hour period, INTERA, on behalf of the Carborundum Company, would inform NYSDEC and a methodology for well development would be determined.

.../2

Wells were developed by a combination of surging, pumping and bailing. The overburden wells were generally slow to recover and were pumped or bailed to dryness during well development. Bedrock wells, however, recovered very quickly and produced large volumes of water during development.

The following methodology for well development was agreed to: for overburden wells, wells would be developed for three hours after which time the well would be allowed to recover and suspended material allowed to settle prior to sampling the upper portion of the water column with a bailer.

For bedrock wells, wells would be developed for a period of three hours. During development turbidity, pH, conductivity and temperature were monitored. After three hours, if the monitored parameters had stabilized to the point that there was little change in parameter readings during three successive readings, groundwater sampling could be undertaken.

Sincerely,

Paul Bush per

Gerald E. Grisak
Vice President, Hydrogeology

cc. R. Spears, Carborundum

APPENDIX C

Stratigraphic Logs

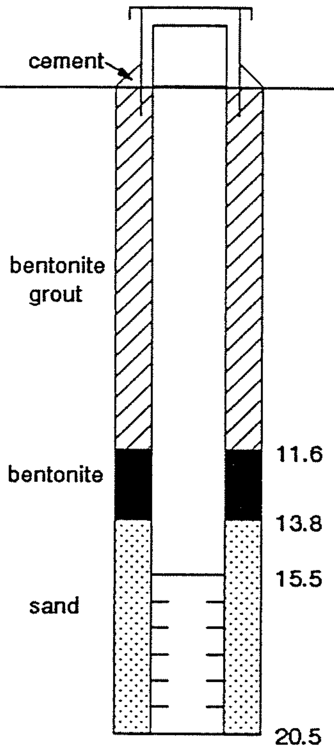
Monitor Well Boreholes

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-1A
Client:	The Carborundum Company	Date Completed:	August 7, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

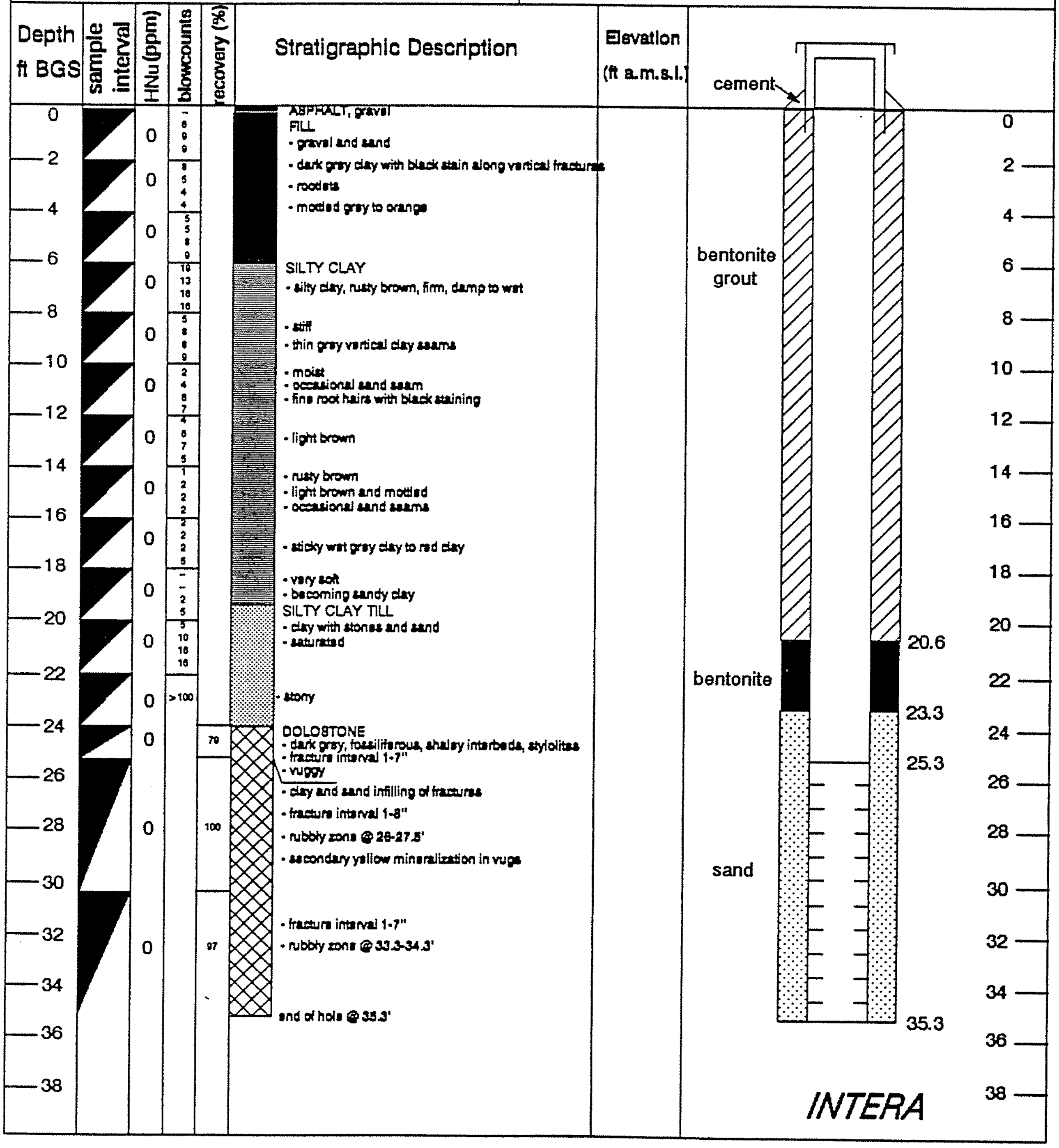
Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)	
0							0
2							2
4					see MW-1B for stratigraphic log of overburden		4
6							6
8							8
10							10
12							12
14							14
16							16
18							18
20					end of hole @ 20.5'		20
22							22
24							24
26							26
28							28
30							30
32							32
34							34
36							36
38							38



INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-1B
Client:	The Carborundum Company	Date Completed:	August 6, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger, Diamond Coring
Reference Elevation:		Drill Supervisor:	R.T.



ASPHALT, gravel

FILL
- gravel and sand
- dark grey clay with black stain along vertical fractures
- rootlets
- mottled grey to orange

SILTY CLAY
- silty clay, rusty brown, firm, damp to wet
- stiff
- thin grey vertical clay seams
- moist
- occasional sand seam
- fine root hairs with black staining
- light brown
- rusty brown
- light brown and mottled
- occasional sand seams
- sticky wet grey clay to red clay
- very soft
- becoming sandy clay

SILTY CLAY TILL
- clay with stones and sand
- saturated
- stony

DOLOSTONE
- dark grey, fossiliferous, shaley interbeds, stylolites
- fracture interval 1-7"
- vuggy
- clay and sand infilling of fractures
- fracture interval 1-8"
- rubbly zone @ 26-27.5'
- secondary yellow mineralization in vugs
- fracture interval 1-7"
- rubbly zone @ 33.3-34.3'

end of hole @ 35.3'

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	**Borehole No.:**	MW-2A
Client:	The Carborundum Company	**Date Completed:**	July 29, 1992
Location:	Niagara Falls, N.Y.	**Drilling Method:**	Hollow Stem Auger 8" O.D.
Reference Elevation:		**Drill Supervisor:**	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Elevation (ft a.m.s.l.)
0–2	◩	2	6 10 5 6		
2–4	◩	1	5 7 8 12		
4–6	◩	18	6 8 12 14		
6–8	◩	4	10 9 12 11		
8–10	◩	0	3 4 5 6		
10–12	◩	1	1 2 2 3		
12–14	◩	0	3 4 6 6		
14–16	◩	0	4 6 10 29		
16–18	◩		20 28 34 47		
18–20	◩		50		

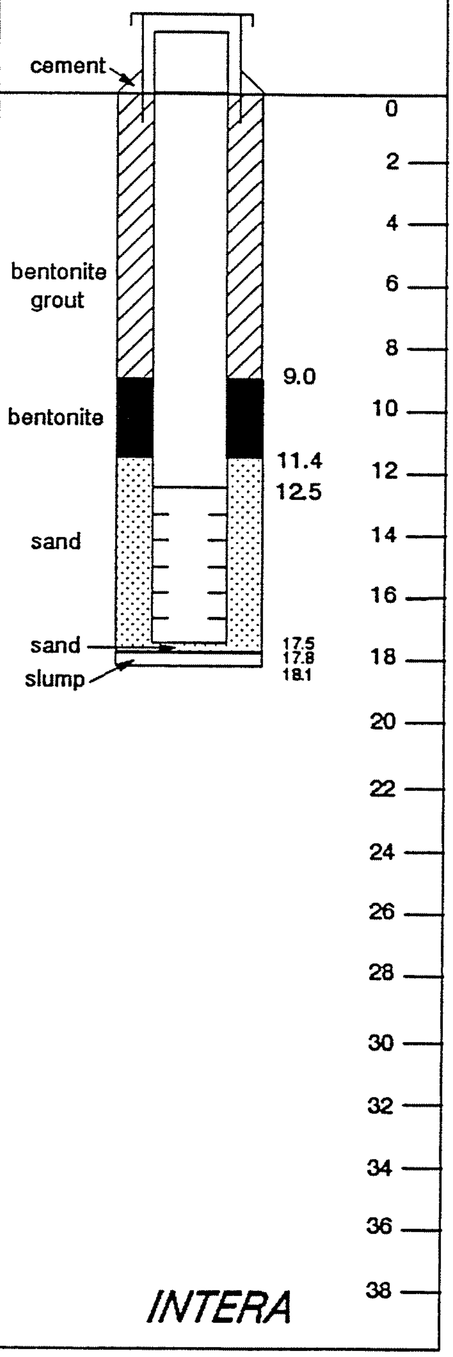
Stratigraphic Description

FILL
- black gravel and stones
- black silt and gravel
- dark brown silty clay with organic debris

SILTY CLAY
- disturbed becoming stiff and dry
- orange brown with small stones; organic debris
- minor black staining around stones
- thin lens of very fine silty sand
- mottled red, yellow, grey, green staining
- wet but stiff
- rusty brown with grey zones, saturated
- minor fine grey sand
- no staining
- no staining

SILTY CLAY TILL
- subangular with sand and subrounded stones
- no staining

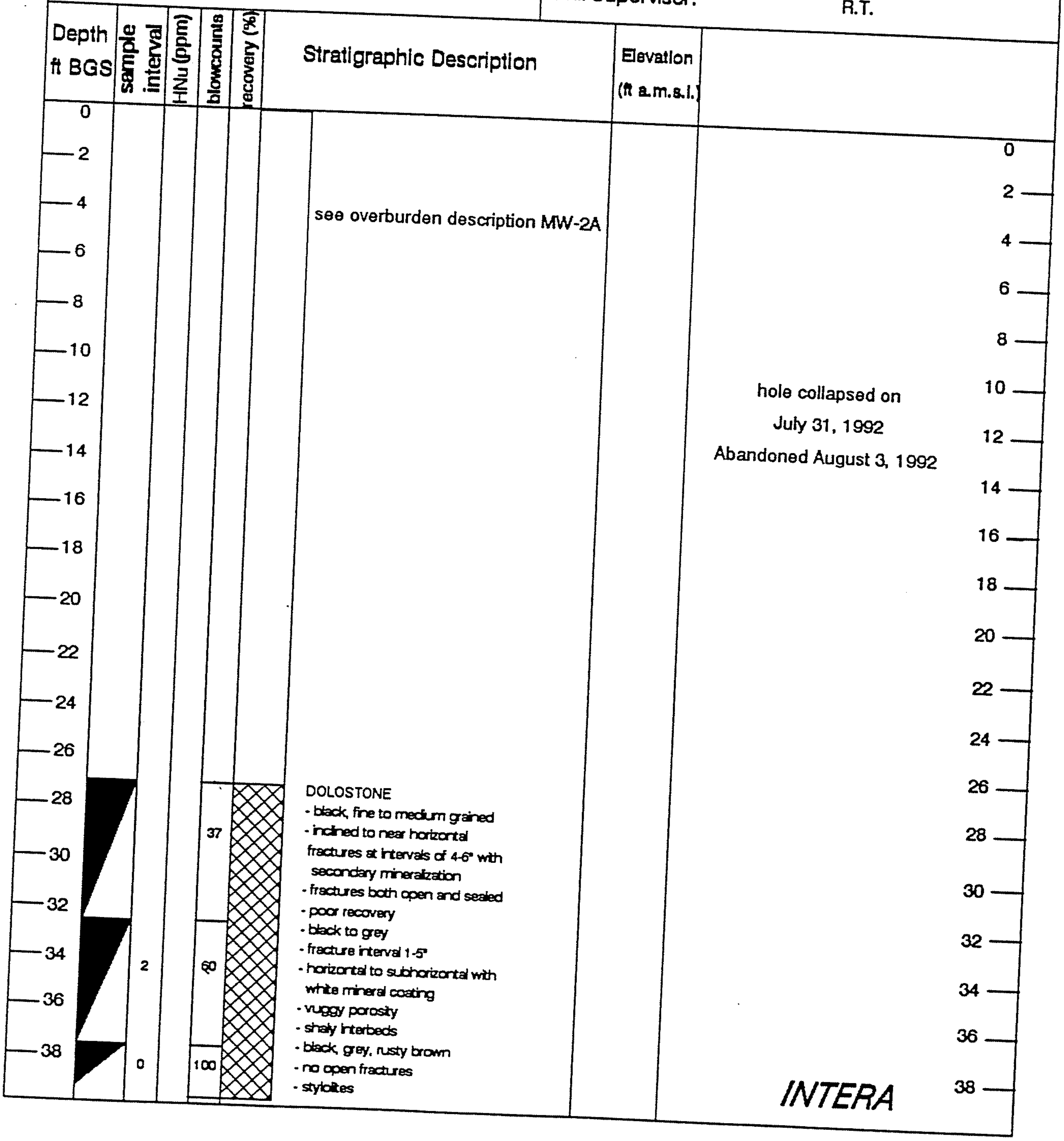
end of hole @ 18.1'



INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-2B
Client:	The Carborundum Company	Date Completed:	Abandoned August 3, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger and Diamond Coring
Reference Elevation:		Drill Supervisor:	R.T.



Stratigraphic Description

see overburden description MW-2A

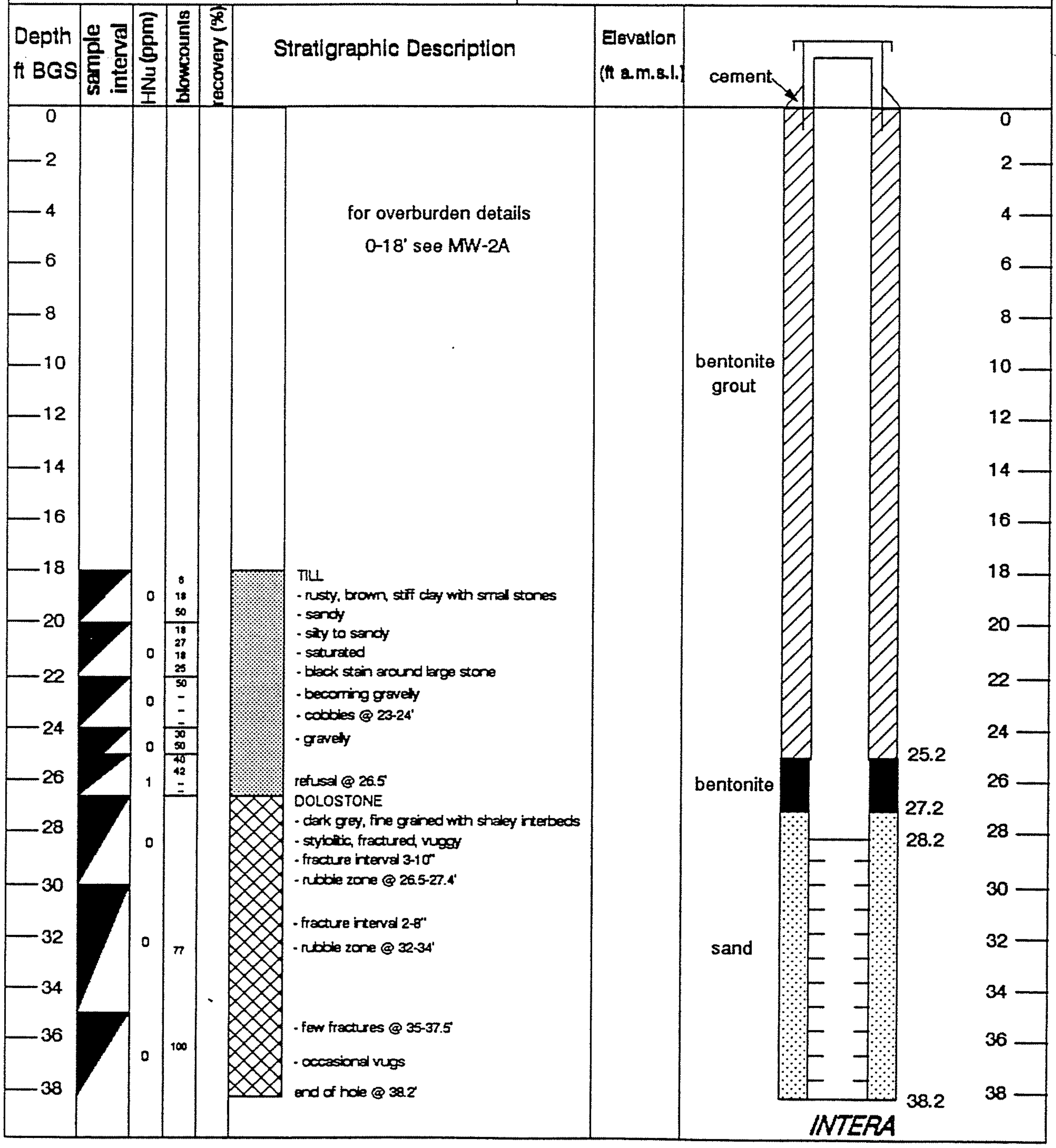
DOLOSTONE
- black, fine to medium grained
- inclined to near horizontal fractures at intervals of 4-6" with secondary mineralization
- fractures both open and sealed
- poor recovery
- black to grey
- fracture interval 1-5"
- horizontal to subhorizontal with white mineral coating
- vuggy porosity
- shaly interbeds
- black, grey, rusty brown
- no open fractures
- stylolites

hole collapsed on
July 31, 1992
Abandoned August 3, 1992

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-2B
Client:	The Carborundum Company	Date Completed:	August 10, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger and Diamond Coring
Reference Elevation:		Drill Supervisor:	R.T.



for overburden details 0-18' see MW-2A

TILL
- rusty, brown, stiff clay with small stones
- sandy
- silty to sandy
- saturated
- black stain around large stone
- becoming gravely
- cobbles @ 23-24'
- gravely

refusal @ 26.5'
DOLOSTONE
- dark grey, fine grained with shaley interbeds
- stylolitic, fractured, vuggy
- fracture interval 3-10"
- rubble zone @ 26.5-27.4'

- fracture interval 2-8"
- rubble zone @ 32-34'

- few fractures @ 35-37.5'

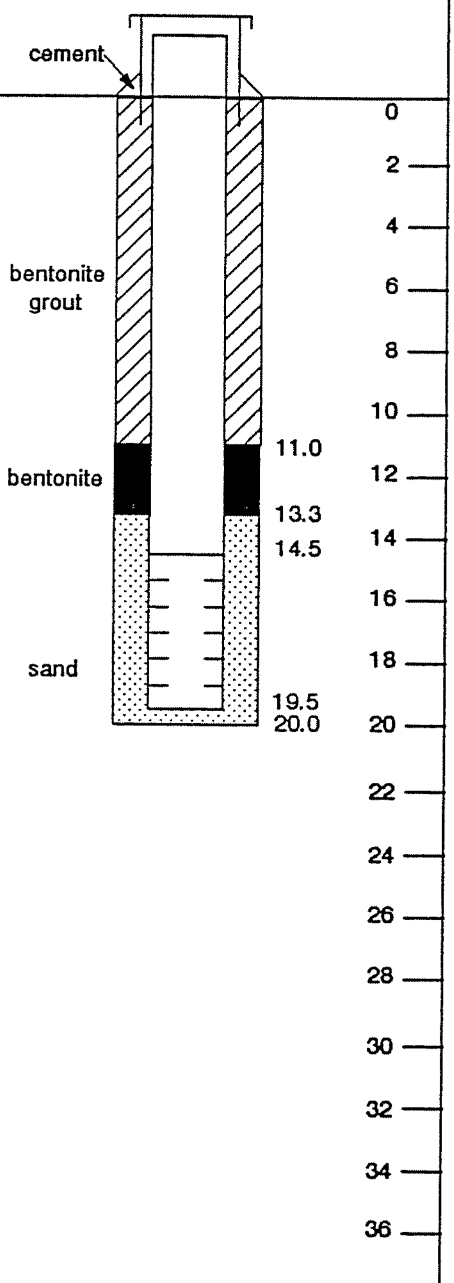
- occasional vugs

end of hole @ 38.2'

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	**Borehole No.:**	MW-3A
Client:	The Carborundum Company	**Date Completed:**	August 5, 1992
Location:	Niagara Falls, N.Y.	**Drilling Method:**	Hollow Stem Auger
Reference Elevation:		**Drill Supervisor:**	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)
0		0	4 3 3 4		FILL - black to brown clay with stones and organic debris	
2		0	4 5 6 8		- moist - root fragments - mottled grey and black staining	
4		0	9 10 10 13		SILTY CLAY - brown silty clay	
6		0	11 13 19 20		- mottled red and grey - soft, moist	
8		0	11 20 21 22		- rusty brown - piece of steel, sticks, stones - wet	
10		0	2 3 3 3		- plastic clay - no staining	
12		0	3 4 4 5		- wet - soft, silty clay - 1" layer of black fill	
14		0	3 2 2 3		- plastic to stiff clay overlying grey-brown, sticky, wet clay	
16		0	3 2 2 1		TILL - occasional small stones	
18		0	1 1 1 3		- no staining - bright red clay with grey sand	
20					end of hole @ 20'	
22						
24						
26						
28						
30						
32						
34						
36						
38						

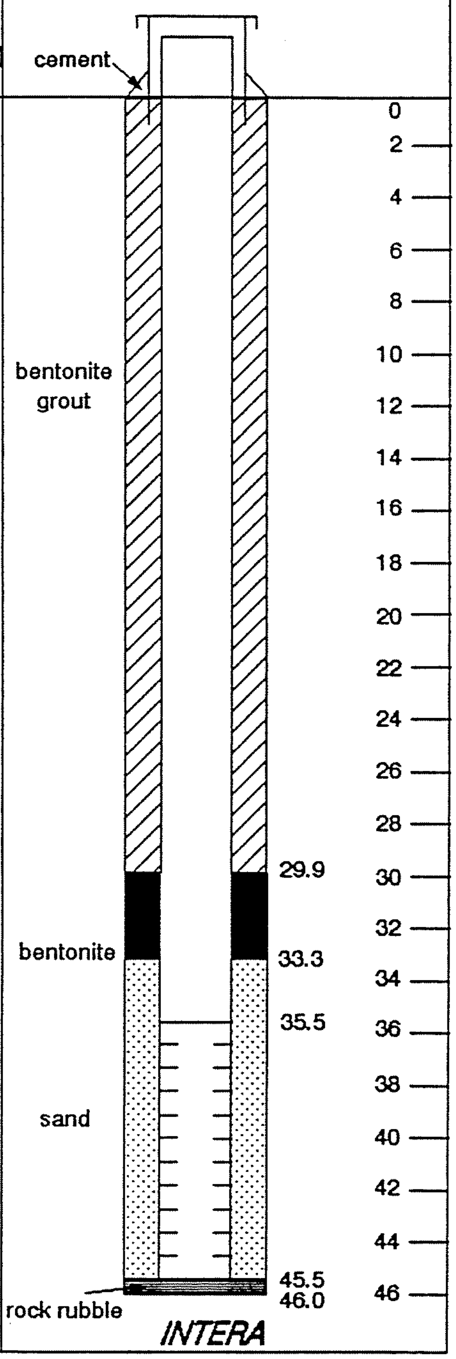


INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-3B
Client:	The Carborundum Company	Date Completed:	August 5, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger and Diamond Coring
Reference Elevation:		Drill Supervisor:	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)
0–30					see overburden description MW-3A cobbles and boulders in overburden	
31–36	◢			98	DOLOSTONE - dark grey, shaly - fractured at intervals 1-6" - open and closed fractures inclined and horizontal - shaly and sandy interbeds	
36–41	◢	0		100	- vuggy - secondary mineralization along some fractures and in vugs - stylolitic - fracture interval 1-10" - secondary mineralization	
41–46	◢				- highly fractured - very porous 45-48" - minor metallic mineralization - fracture interval 1-9" - occasional vugs - veinlets of gypsum or anhydrite - end of hole @ 46.0'	

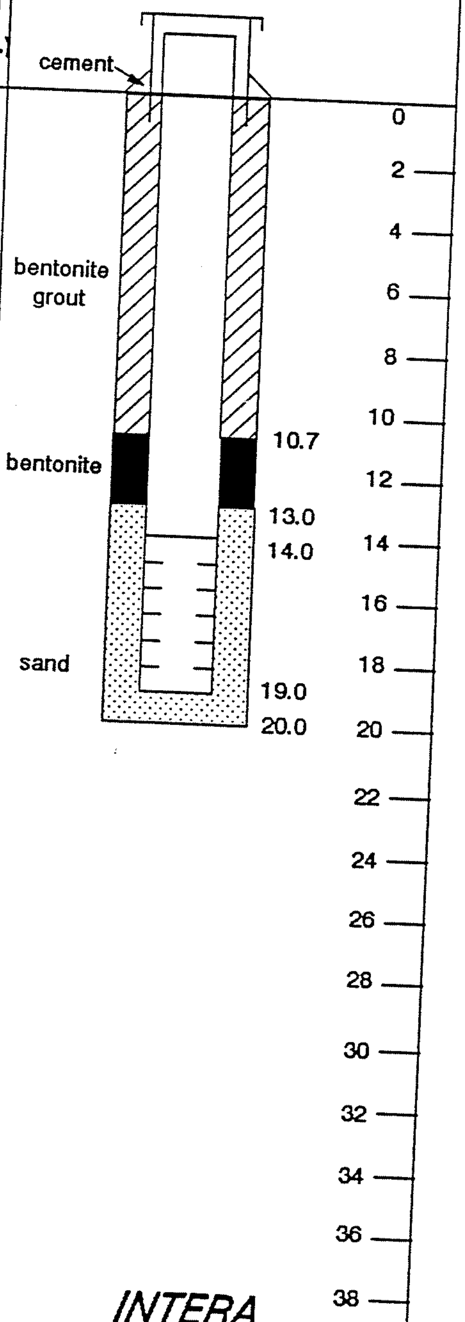


INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-4A
Client:	The Carborundum Company	Date Completed:	August 12, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

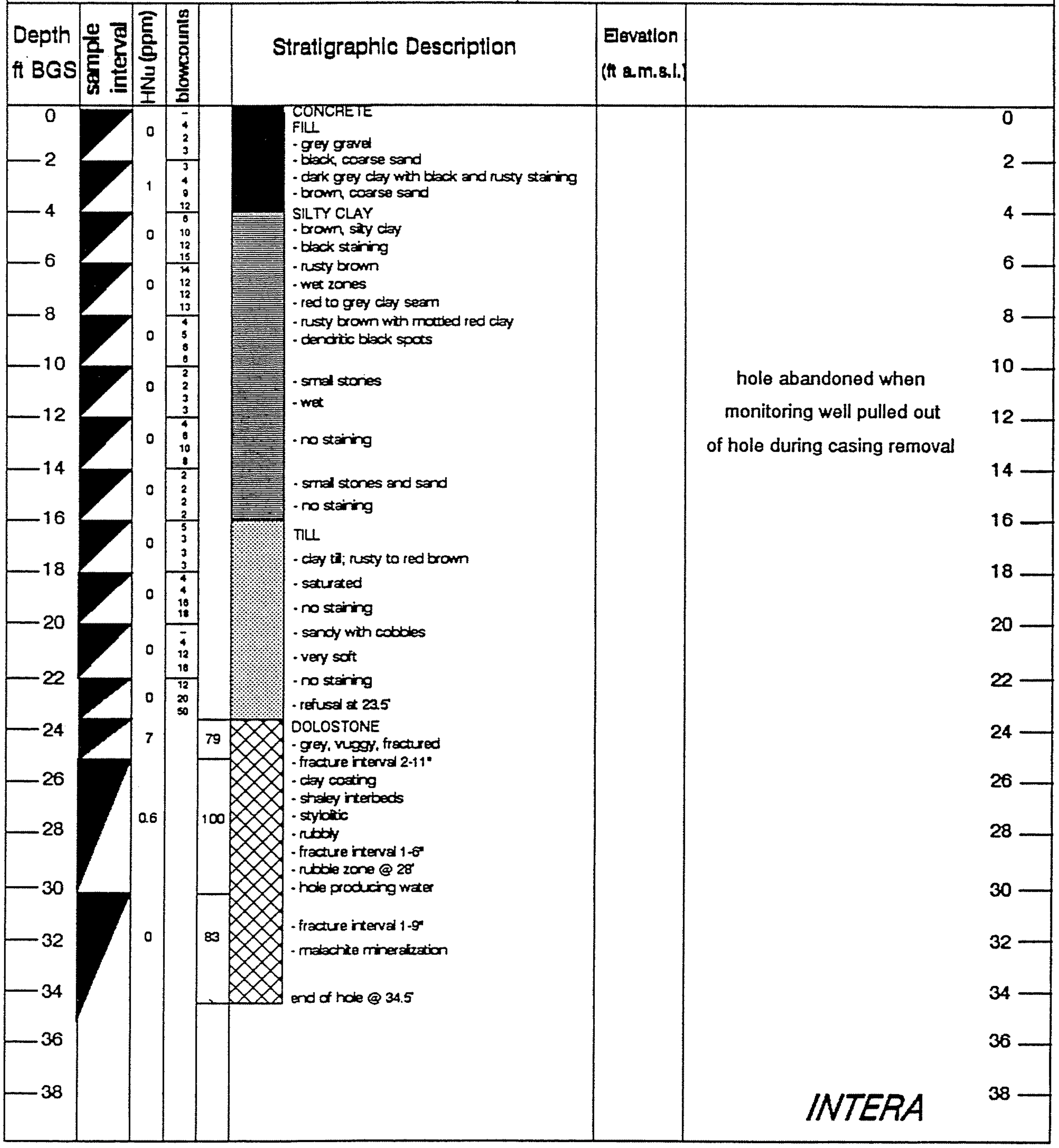
Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)
0						
2						
4					for overburden	
6					stratigraphy details	
8					see MW-4B	
10						
12						
14						
16						
18						
20					end of hole @ 20.0'	
22						
24						
26						
28						
30						
32						
34						
36						
38						



INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-4B
Client:	The Carborundum Company	Date Completed:	Abandoned August 11, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger and Diamond Coring
Reference Elevation:		Drill Supervisor:	R.T.



HNu (ppm)	blowcounts	
0	- 4 2 3	
1	3 4 9 12	
0	6 10 12 15	
0	14 12 12 13	
0	4 5 6 6	
0	2 2 3 3	
0	4 6 10 8	
0	2 2 2 2	
0	5 3 3 3	
0	4 4 16 18	
0	- 4 12 18	
0	12 20 50	
7		79
0.6		100
0		83

CONCRETE

FILL
- grey gravel
- black, coarse sand
- dark grey clay with black and rusty staining
- brown, coarse sand

SILTY CLAY
- brown, silty clay
- black staining
- rusty brown
- wet zones
- red to grey clay seam
- rusty brown with mottled red clay
- dendritic black spots
- small stones
- wet
- no staining
- small stones and sand
- no staining

TILL
- clay till; rusty to red brown
- saturated
- no staining
- sandy with cobbles
- very soft
- no staining
- refusal at 23.5'

DOLOSTONE
- grey, vuggy, fractured
- fracture interval 2-11"
- clay coating
- shaley interbeds
- stylolitic
- rubbly
- fracture interval 1-6"
- rubble zone @ 28'
- hole producing water
- fracture interval 1-9"
- malachite mineralization

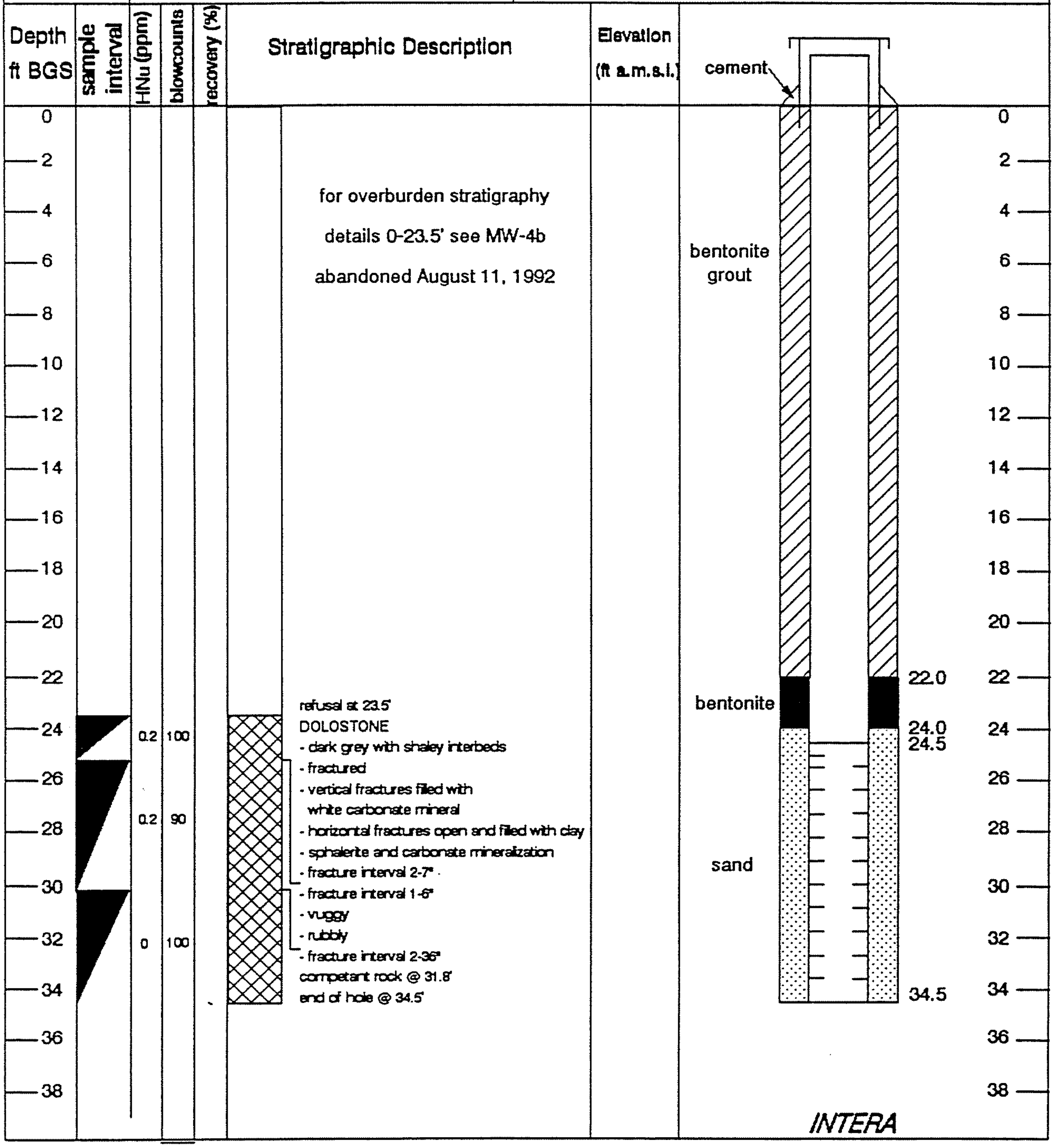
end of hole @ 34.5'

hole abandoned when monitoring well pulled out of hole during casing removal

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-4B
Client:	The Carborundum Company	Date Completed:	August 12, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger and Diamond Coring
Reference Elevation:		Drill Supervisor:	R.T.



for overburden stratigraphy details 0-23.5' see MW-4b abandoned August 11, 1992

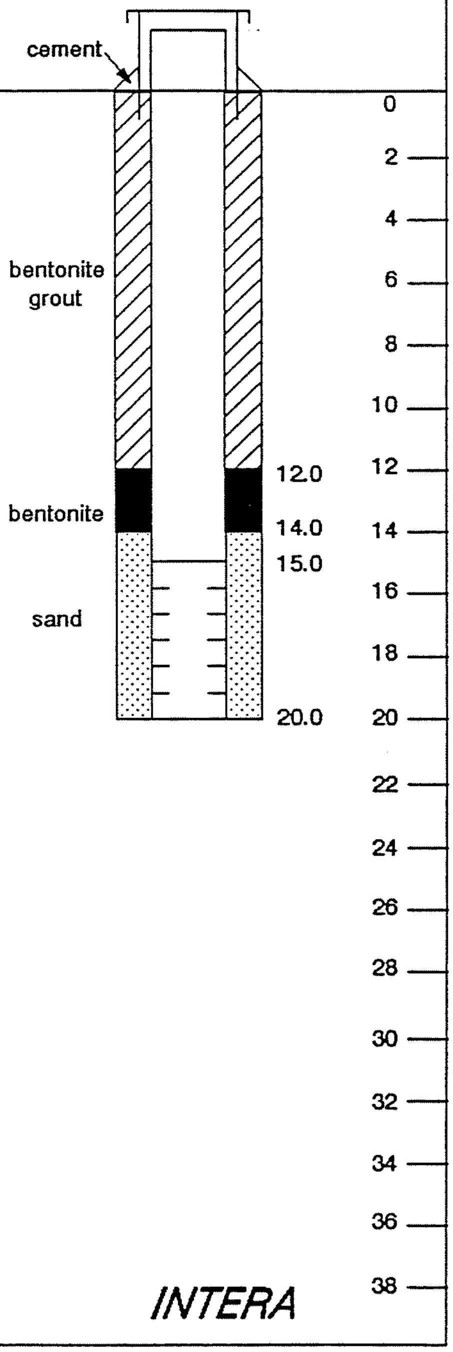
refusal at 23.5'
DOLOSTONE
- dark grey with shaley interbeds
- fractured
- vertical fractures filled with white carbonate mineral
- horizontal fractures open and filled with clay
- sphalerite and carbonate mineralization
- fracture interval 2-7"
- fracture interval 1-6"
- vuggy
- rubbly
- fracture interval 2-36"
competant rock @ 31.8'
end of hole @ 34.5'

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	MW-5A
Client:	The Carborundum Company	Date Completed:	August 14, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

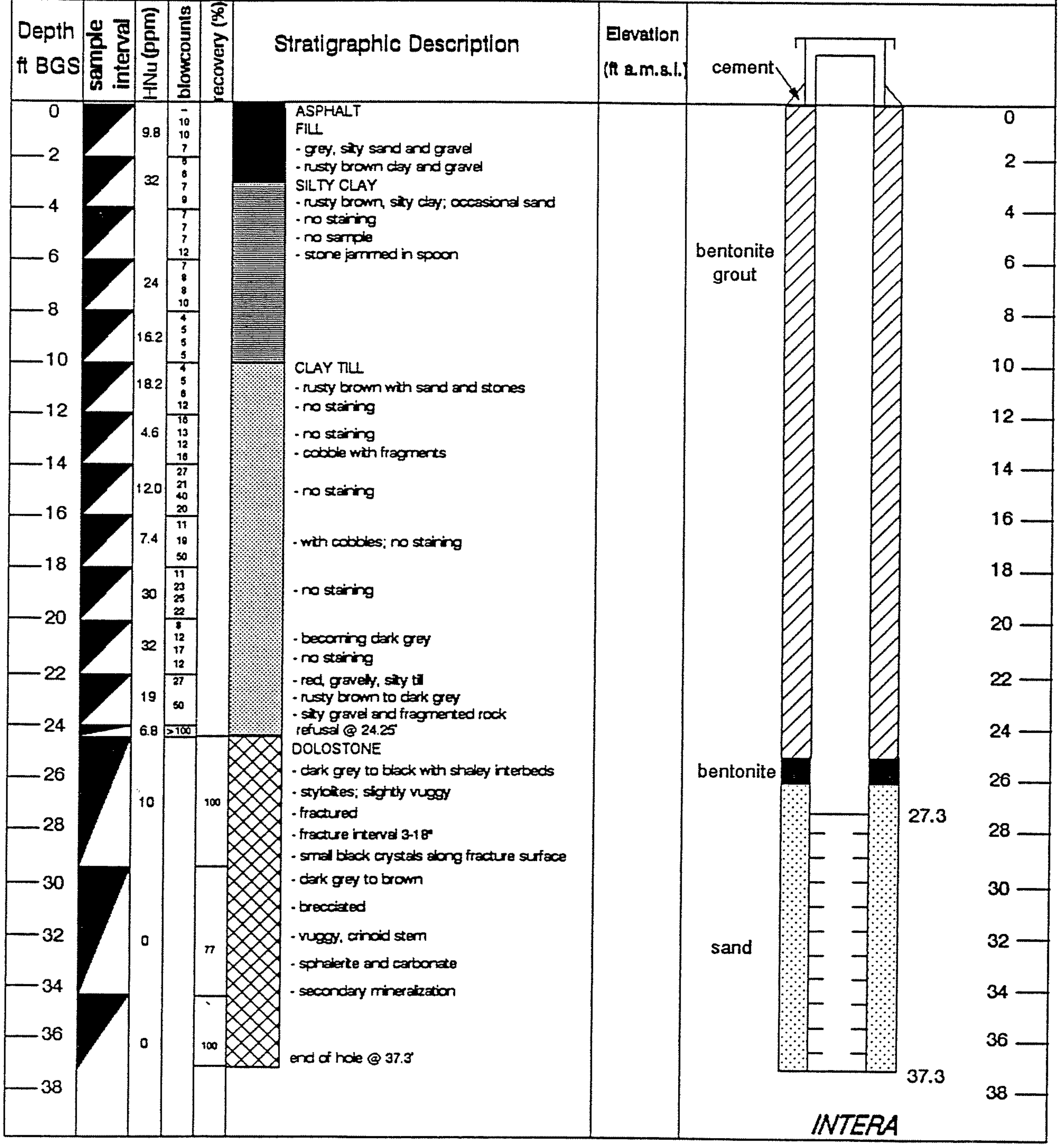
Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)
0						
2						
4					for details on overburden stratigraphy see MW-5B	
6						
8						
10						
12						
14						
16						
18						
20					end of hole @ 20.0'	
22						
24						
26						
28						
30						
32						
34						
36						
38						



INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	**Borehole No.:**	MW-5B
Client:	The Carborundum Company	**Date Completed:**	August 13, 1992
Location:	Niagara Falls, N.Y.	**Drilling Method:**	Hollow Stem Auger and Diamond Coring
Reference Elevation:		**Drill Supervisor:**	R.T.



HNu (ppm)	blowcounts	recovery (%)
9.8	- 10 10 7	
32	5 6 7 9	
	7 7 7 12	
24	7 8 8 10	
16.2	4 5 5 5	
18.2	4 5 6 12	
4.6	16 13 12 16	
12.0	27 21 40 20	
7.4	11 19 50	
30	11 23 25 22	
32	8 12 17 12	
19	27 50	
6.8	>100	
10		100
0		77
0		100

Stratigraphic Description

ASPHALT

FILL
- grey, silty sand and gravel
- rusty brown clay and gravel

SILTY CLAY
- rusty brown, silty clay; occasional sand
- no staining
- no sample
- stone jammed in spoon

CLAY TILL
- rusty brown with sand and stones
- no staining
- no staining
- cobble with fragments
- no staining
- with cobbles; no staining
- no staining
- becoming dark grey
- no staining
- red, gravelly, silty till
- rusty brown to dark grey
- silty gravel and fragmented rock

refusal @ 24.25'

DOLOSTONE
- dark grey to black with shaley interbeds
- stylolites; slightly vuggy
- fractured
- fracture interval 3-18"
- small black crystals along fracture surface
- dark grey to brown
- brecciated
- vuggy, crinoid stem
- sphalerite and carbonate
- secondary mineralization

end of hole @ 37.3'

APPENDIX D

Stratigraphic Logs

Soil Boreholes

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	S-1
Client:	The Carborundum Company	Date Completed:	August 14, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)	
0			–		ASPHALT		0
1		110	13 21		FILL		1
2			24 4		- black stained gravel and silicon carbide		2
3		60	5 7		- grey to brown silty clay with stones		3
4			9 7		- mottled with black staining CLAY		4
5		1	8 10 12		- rusty brown, silty		5
6			10		- no staining		6
7		0.2	12 14 16		- soft to stiff - saturated		7
8			5		- becoming grey, soft		8
9		1	4 4 5		- small stones		9
10			2		CLAY TILL		10
11		0.2	2 2 2		- rusty brown, silty - no staining		11
12			3		- occasional stones		12
13		0.2	4 3 2		- grey lenses		13
14			1				14
15		0.8	4 3		- no staining		15
16			3		end of hole @ 16.0'		16
17							17
18							18
19							19
20							20
21							

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	S-2
Client:	The Carborundum Company	Date Completed:	August 14, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)
0			5 6		FILL	
1		0	6 7		- dark grey gravel with black staining	
2			6			
3		0	6 6 7		- no recovery	
4			10		- grey brown to rusty brown	
5		0	10 17 26		- no staining - silty clay	
6			12		CLAY	
7		0	15 25 25		- rusty brown, silty - no staining	
8			7			
9		0	14 16 15		- no staining	
10			6			
11		0	12 17 18		- occasional grey silt lenses - no staining	
12			17			
13		0	15 20 21		- no staining	
14			17			
15		0	20 27 21		- no staining	
16					end of hole @ 16.0'	
17						
18						
19						
20						
21						

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	S-3
Client:	The Carborundum Company	Date Completed:	August 14, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)	
0			26		FILL		0
1		0	31 12 7		- black gravel - stone blocked split spoon		1
2			8		resulting in poor recovery		2
3		26	10 16 5		CLAY - light brown, silty		3
4			6		- white, grey, black staining along fractures		4
5		130	8 9 8		- rusty brown		5
6			6				6
7		400	9 8 8		- black staining along fractures		7
8			6				8
9		400	6 6 9		- black oily staining along fractures - strong oily odour		9
10			3				10
11		400	3 5 5		- minor black, oily staining in top 6"		11
12			3				12
13		20	3 5 5		- minor black to white staining		13
14			5				14
15		17	9 13 9		- gravelly with minor black stain		15
16			36				16
17		17	50		- sandy to gravelly		17
18			46		- silty with small stones refusal at 19.0'		18
19		10.8	50		end of hole at 19.0'		19
20							20
21							

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	S-4
Client:	The Carborundum Company	Date Completed:	August 14, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description	Elevation (ft a.m.s.l.)
0–2		0	9 11 8 5		FILL - gravel - grey, silty clay with stones and small metallic fragments	
2–4		0	8 12 15 17		- iron staining CLAY - rusty brown, silty clay	
4–6		2	7 8 11 14		- mottled, orange, grey, black staining - occasional black stain along fracture	
6–8		0	20 20 17 18		- no staining	
8–10		0	7 8 11 14		- red, black, grey staining along fracture	
10–12		0.2	3 7 9 15		- thick (¼") black gravel lense	
12–14		0.6	6 7 16 12		- reddish stain along fractures	
14–16		0	8 6 6 4		- infrequent small black blebs end of hole at 16.0'	
16–21						

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	**Borehole No.:**	S-5
Client:	The Carborundum Company	**Date Completed:**	August 14, 1992
Location:	Niagara Falls, N.Y.	**Drilling Method:**	Hollow Stem Auger
Reference Elevation:		**Drill Supervisor:**	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)	Stratigraphic Description		Elevation (ft a.m.s.l.)	
0		5	3 4 5 6		■	FILL - black stained gravel with clay, plastic sheeting		0
1					■			1
2		1	4 6 8 8		■	- light brown clay with silt and black staining along fractures - light to dark brown and grey staining along fractures		2
3					■			3
4		0	6 9 10 10		■	- occasional stones and organic debris - minor dark brown staining		4
5					■			5
6		0	10 9 16 14		▤	CLAY - rusty brown, silty with occasional sand lenses		6
7					▤			7
8		0	5 4 5 5		▤	- very silty		8
9					▤			9
10		0	3 4 5 6		░	TILL - rusty red to brown, clay rich - occasional small stones - no staining		10
11					░			11
12		0	3 14 12 10		░	- sandy, stoney with clay and silt - no staining		12
13					░			13
14		0	3 4 14 10		░	- clay rich, stoney with sand - no staining end of hole at 16.0'		14
15					░			15
16								16
17								17
18								18
19								19
20								20
21								

INTERA

STRATIGRAPHIC AND INSTRUMENTATION LOG

Project Name and No.:	Hyde Park PSA 91-022	Borehole No.:	S-6
Client:	The Carborundum Company	Date Completed:	August 14, 1992
Location:	Niagara Falls, N.Y.	Drilling Method:	Hollow Stem Auger
Reference Elevation:		Drill Supervisor:	R.T.

Depth ft BGS	sample interval	HNu (ppm)	blowcounts	recovery (%)		Stratigraphic Description	Elevation (ft a.m.s.l.)	
0	◣		4		■	FILL		0
1		0	4 3		■	- dark brown gravel with brick fragments		1
2	◣		2 2		■	- rusty brown clay with occasional sand		2
3		0	3 7		■	- occasional black sandy fill		3
4	◣		10 5		■			4
5		0	6 7		■	- dark brown clay with occasional black sandy fill		5
6	◣		10 5		■	- silty clay with coarse, sandy lenses and black gravel lens		6
7		0	8 8		■	- black to grey irridescent staining along fractures		7
8	◣		8 5		■	- contains lens of grey silt		8
9		0	6 5		■	- minor iron and black staining along infrequent fractures		9
10	◣		8 3		▒	CLAY TILL		10
11		0	3 5		▒	- rusty red to brown, silty		11
12	◣		3 3		▒	- occasional small stones with minor black staining		12
13		0	3 4		▒	- no staining		13
14	◣		3 3		▒	- occasional large stones		14
15		0	3 7		▒	- no staining		15
16	◣		6 10		▒	- occasional sand grading into		16
17		0	18 22		▒	sandy till with clay and stones		17
18			24			end of hole at 18.0'		18
19								19
20								20
21								

INTERA

APPENDIX E

Analytical Results

Groundwater

INTERA

LIST OF QUALIFIERS

(J)	Estimated value. Value is greater than zero but below quantitation.
(B_1)	Compound found in blank. (Organic analyses only.)
(D)	Diluted.
(P)	Greater than 25% difference for detected concentrations between 2 GC columns.
(R)	Data unusable.
(F)	Fill sample.
(N_1)	Native soil sample. (Organic analyses only.)
(M)	Medium level contamination.
(E_1)	Concentrations exceed calibration range of instrument. (Organic analyses only.)
RE	Sample reanalyzed.
(E_2)	Estimated value due to interference effects. (Inorganic analyses only.)
(N_2)	Spike sample recovery is not within control limits. (Inorganic anlyses only).
*	Duplicate analysis is not within control limits.
(B_2)	Value greater than or equal to the instrument detection limit but less than contract required detection limit. (Inorganic analyses only.)
(S)	Value determined by Method of Standard Addition.
(W)	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Volatile Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW2BD (20x)	MW3A	MW3B	MW4A	MW4AD (2.0x)	MW4B	MW5A	MW5B	MW5BD (20x)
1	Chloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	Bromomethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	Vinyl Chloride	2(J)	nd	nd	66	90(J)	nd	5(J)	13	11(J)	26	1300	75	66(J)
4	Chloroethane	nd	nd(J)	nd	nd(J)	nd(J)	nd	nd(J)	nd(J)	nd	nd(J)	nd	nd(J)	nd
5	Methylene Chloride	nd	nd	0.9(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Carbon Disulfide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	1,1-Dichloroethene	nd	nd	nd	6(J)	nd	nd	nd	0.8(J)	nd	2(J)	nd	2(J)	nd
9	1,1-Dichloroethane	2(J)	3(J)	3(J)	nd	nd	nd	nd	2(J)	2(J)	10	nd	3(J)	nd
10	1,2-Dichloroethene (total)	14	10	nd	270(E)	2300	nd	18	270(E)	230	130	1900	760(E)	520
11	Chloroform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12	1,2-Dichloroethane	nd	2(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
13	2-Butanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
14	1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	Carbon Tetrachloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Bromodichloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
17	1,2-Dichloropropane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	cis-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
19	Trichloroethene	nd	nd	nd	920(E)	670	4(J)	nd	3(J)	3(J)	5(J)	nd	71	43(J)
20	Dibromochloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
21	1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Benzene	nd	nd	nd	1(J)	nd	nd	0.6(J)	nd	nd	nd	nd	nd	nd
23	trans-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
24	Bromoform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Volatile Analyses (µg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW2BD (20x)	MW3A	MW3B	MW4A	MW4AD (2.0x)	MW4B	MW5A	MW5B	MW5BD (20x)
25	4-Methyl-2-Pentanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
26	2-Hexanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
27	Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
28	1,1,2,2-Tetrachloroethane	nd(J)	nd	nd(J)	nd	nd	nd(J)	nd	nd	nd(J)	nd	nd(J)	nd	nd(J)
29	Toluene	nd	nd	2(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
30	Chlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
31	Ethylbenzene	nd	nd	3(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
32	Styrene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
33	Total Xylenes	nd	nd	9(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

(J) Estimated value. Value is greater than zero but below quantitation.
(B) Compound found in blank.
(D) Diluted.

Semi-Volatile Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B
1	Phenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	bis(2-Chloroethyl)Ether	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
3	2-Chlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
5	1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
6	1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
7	2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	2,2'-oxybis(1-Chloropropane)	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
9	4-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	N-Nitroso-Di-n-Propylamine	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
11	Hexachloroethane	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
12	Nitrobenzene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
13	Isophorone	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
14	2-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	2,4-Dimethylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	bis(2-Chloroethoxy)Methane	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
17	2,4-Dichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
19	Naphthalene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
20	4-Chloroaniline	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
21	Hexachlorobutadiene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
22	4-Chloro-3-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Semi-Volatile Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B
23	2-Methylnaphthalene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
24	Hexachlorocyclopentadiene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
25	2,4,6-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
26	2,4,5-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
27	2-Chloronaphthalene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
28	2-Nitroaniline	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
29	Dimethyl Phthalate	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
30	Acenaphthylene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
31	2,6-Dinitrotoluene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
32	3-Nitroaniline	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
33	Acenaphthene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
34	2,4-Dinitrophenol	nd(J)	nd(J)	nd(J)	nd(J)	nd(J)	nd	nd(J)	nd(J)	nd	nd(J)
35	4-Nitrophenol	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd	nd
36	Dibenzofuran	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
37	2,4-Dinitrotoluene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
38	Diethylphthalate	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
39	4-Chlorophenyl-phenylether	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
40	Fluorene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
41	4-Nitroaniline	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
42	4,6-Dinitro-2-Methylphenol	nd(J)	nd	nd(J)	nd(J)	nd(J)	nd	nd	nd(J)	nd(J)	nd
43	N-Nitrosodiphenylamine (1)	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
44	4-Bromophenyl-phenylether	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd

Semi-Volatile Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B
45	Hexachlorobenzene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
46	Pentachlorophenol	nd(J)	nd	nd(J)	nd(J)	nd(J)	nd	nd	nd(J)	nd	nd
47	Phenanthrene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
48	Anthracene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
49	Carbazole	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
50	Di-n-Butylphthalate	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
51	Fluoranthene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
52	Pyrene	nd	nd	nd	nd(J)	nd	nd(J)	nd	nd	nd	nd
53	Butylbenzylphthalate	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
54	3,3'-Dichlorobenzidine	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
55	Benzo(a)Anthracene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
56	Chrysene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
57	Bis(2-Ethylhexyl)Phthalate	nd	0.8(J)	4(J)	nd	1(J)	nd(J)	2(J)	0.9(J)	0.8(J)	0.6(J)
58	Di-n-Octyl Phthalate	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
59	Benzo(b) Fluoranthene	nd	nd	nd	nd(J)	nd	nd(J)	nd	nd	nd	nd
60	Benzo(k) Fluoranthene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
61	Benzo(a) Pyrene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
62	Ideno(1,2,3-cd)Pyrene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
63	Dibenz(a,h) Anthracene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd
64	Benzo(g,h,i) Perylene	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd

(J) Estimated value. Value is greater than zero but below quantitation.
(D) Diluted.

INTERA

Pesticide/PCB Analyses (μg/L or ppb) WATER											
		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B
1	alpha-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	beta-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	delta-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	gamma-BHC (Lindane)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Heptachlor epoxide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	Endosulfan I	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
9	Dieldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	4,4'-DDE	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11	Endrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12	Endosulfan II	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
13	4,4'-DDD	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
14	Endosulfan sulfate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	4,4'-DDT	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Methoxychlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
17	Endrin ketone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	Endrin aldehyde	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
19	alpha-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
20	gamma-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
21	Toxaphene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Aroclor-1016	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Pesticide/PCB Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B
23	Aroclor-1221	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
24	Aroclor-1232	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
25	Aroclor-1242	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
26	Aroclor-1248	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
27	Aroclor-1254	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
28	Aroclor-1260	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Inorganic Analyses (μg/L or ppb) WATER (total)

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B
1	Aluminum	2060	183(B)	245	87.6(B)	100(B)	2550	1670	498	2320	113(B)
2	Antimony	nd	nd	nd	5.0(B)	nd	nd	nd	nd	nd	6.0(B)
3	Arsenic	7.0(B)	nd	7.0(B)	nd	nd	nd	nd	nd	nd	nd
4	Barium	292	231	51.8(B)	79.3(B)	nd	93.6(B)	nd	52.6(B)	50.0(B)	168(B)
5	Beryllium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Cadmium	nd	nd	nd	nd	nd	nd	8.0	nd	nd	nd
7	Calcium	172,000(B)	149,000(B)	110,000(B)	192,000(B)	141,000(B)	166,000(B)	197,000(B)	195,000(B)	173,000(B)	236,000(B)
8	Chromium	16.0	nd	nd	11.0	10.0	15.0	14.0	10.0	16.0	19.0
9	Cobalt	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	Copper	25.0(B)	18.0(B)	25.4	12.9(B)	11.7	nd	52.8	19.0(B)	nd	10.0(B)
11	Iron	3460	982	383	139	107	1300	2230	481	3360	156
12	Lead	3.0	11.0	8.8	18.0	6.7	51.7	1750	28.0	9.0	12.7
13	Magnesium	55,900	68,800	60,700	64,900	186,000	63,500	68,800	64,100	61,700	71,700
14	Manganese	202	179	64.6	82.6	41.3	108	114	103	249	183
15	Mercury	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Nickel	nd	nd	nd	nd	nd	nd	nd	nd	nd	72.0
17	Potassium	4780(B)	3840(B)	3860(B)	4450(B)	2750(B)	5560	5890	7500	5250	2890(B)
18	Selenium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
19	Silver	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
20	Sodium	41,400	45,800	24,300	132,000	45,900	81,000	79,600	110,100	51,700	1,590,000
21	Thallium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Vanadium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
23	Zinc	422	148	83.0	212	126	196	273	124	83.0	512
24	Cyanide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

(B) Compound found in blank.

Inorganic Analyses (μg/L or ppb) WATER (dissolved)

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B
1	Aluminum	234	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	Antimony	7.0(B)	nd	nd	nd	nd	nd	6.0(B)	7.0(B)	nd	6.0(B)
3	Arsenic	10.0	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	Barium	183(B)	249	51.4(B)	72.1(B)	nd	81.7(B)	nd	51.7(B)	nd	167(B)
5	Beryllium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Cadmium	nd	nd	nd	nd	nd	nd	nd	5.0	nd	nd
7	Calcium	99,000(B)	136,000(B)	100,000(B)	181,000(B)	164,000(B)	164,000(B)	167,000(B)	178,000(B)	143,000(B)	1,740,000
8	Chromium	nd	nd	nd	nd	nd	10.0	nd	nd	nd	nd
9	Cobalt	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	Copper	nd	nd	nd	nd	nd	11.4(B)	nd	nd	nd	nd
11	Iron	52.0(B)	830	53.1(B)	111	nd	53.6(B)	860	80.2(B)	1310	nd
12	Lead	nd	nd	nd	8.0	nd	nd	nd	nd	nd	nd
13	Magnesium	52,500	68,800	62,600	61,900	195,000	58,000	73,200	57,800	49,500	70,700
14	Manganese	22.7	162	76.7	79.5	40.9	69.9	75.0	88.2	171	152
15	Mercury	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Nickel	nd	nd	nd	nd	nd	nd	nd	nd	nd	72.7
17	Potassium	4690(B)	3850(B)	4560(B)	4670(B)	3120(B)	4920(B)	4080(B)	7560	4130(B)	2580(B)
18	Selenium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
19	Silver	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
20	Sodium	43,600	43,800	30,600	139,000	49,600	82,900	79,000	112,000	39,800	79,000
21	Thallium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Vanadium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
23	Zinc		36.0	nd	160	nd	nd	nd	27.0	nd	235
24	Cyanide	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

(B) Compound found in blank.

APPENDIX F

Analytical Results

Soil (Monitor Well Samples)

LIST OF QUALIFIERS

(J)	Estimated value. Value is greater than zero but below quantitation.
(B_1)	Compound found in blank. (Organic analyses only.)
(D)	Diluted.
(P)	Greater than 25% difference for detected concentrations between 2 GC columns.
(R)	Data unusable.
(F)	Fill sample.
(N_1)	Native soil sample. (Organic analyses only.)
(M)	Medium level contamination.
(E_1)	Concentrations exceed calibration range of instrument. (Organic analyses only.)
RE	Sample reanalyzed.
(E_2)	Estimated value due to interference effects. (Inorganic analyses only.)
(N_2)	Spike sample recovery is not within control limits. (Inorganic anlyses only).
*	Duplicate analysis is not within control limits.
(B_2)	Value greater than or equal to the instrument detection limit but less than contract required detection limit. (Inorganic analyses only.)
(S)	Value determined by Method of Standard Addition.
(W)	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Inorganic Analyses (mg/kg or ppm) SOIL						
		MW1B	MW2B	MW3A	MW4B	MW5B
1	Aluminum	14,300	21,200	13,400	14,600	14,300
2	Antimony	nd	nd	nd	nd	nd
3	Arsenic	2.0(B)	7.7	5.3	5.5	4.0
4	Barium	70.3	107	101	68.5	93.7
5	Beryllium	nd	nd	nd	nd	nd
6	Cadmium	nd	nd	nd	nd	nd
7	Calcium	48,300	33,100	50,600	40,900	4,040
8	Chromium	11.6	27.1	27.5	16.5	18.9
9	Cobalt	9.0(B)	15.2	35.9	10.7(B)	9.1(B)
10	Copper	13.4	25.1	518	23.8	18.9
11	Iron	14,200	28,700	27,300	20,100	22,000
12	Lead	35.4	28.8	30.4	26.5	30.9
13	Magnesium	19,000	13,700	16,200	9,980(B)	6,070(B)
14	Manganese	529	561	682	519	294
15	Mercury	nd	nd	nd	nd	nd
16	Nickel	18.1	24.8	80.2	16.9	11.4
17	Potassium	1550	2,580	3,430	1,930	921(B)
18	Selenium	nd	nd	nd	nd	nd
19	Silver	nd	nd	nd	nd	nd
20	Sodium	331(B)	389(B)	458(B)	373(B)	518(B)
21	Thallium	nd	nd	nd	nd	nd
22	Vanadium	14.0	33.3	31.9	19.7	24.2
23	Zinc	67.5	68.8	162	51.1	48.1
24	Cyanide	nd	nd	nd	nd	nd

(B) Compound found in blank.

Semi-Volatile Analyses (μg/kg or ppb) SOIL

		MW1B	MW2B	MW2BD(5x)	MW3A	MW3AD(10x)	MW4B	MW4BD(2x)	MW5B
1	Phenol	nd	nd	nd	nd	nd	nd	nd	nd
2	bis(2-Chloroethyl)Ether	nd	nd	nd	nd	nd	nd	nd	nd
3	2-Chlorophenol	nd	nd	nd	nd	nd	nd	nd	nd
4	1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd
5	1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd
6	1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd
7	2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd
8	2,2'-oxybis(1-Chloropropane)	nd(J)	nd	nd	nd(J)	nd(J)	nd	nd	nd
9	4-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd
10	N-Nitroso-Di-n-Propylamine	nd	nd	nd	nd	nd	nd	nd	nd
11	Hexachloroethane	nd	nd	nd	nd	nd	nd	nd	nd
12	Nitrobenzene	nd	nd	nd	nd	nd	nd	nd	nd
13	Isophorone	nd	nd	nd	nd	nd	nd	nd	nd
14	2-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd
15	2,4-Dimethylphenol	nd	nd	nd	nd	nd	nd	nd	nd
16	bis(2-Chloroethoxy)Methane	nd	nd	nd	nd	nd	nd	nd	nd
17	2,4-Dichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd
18	1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd
19	Naphthalene	nd	nd	nd	nd	nd	nd	nd	nd
20	4-Chloroaniline	nd	nd	nd	nd	nd	nd	nd	nd
21	Hexachlorobutadiene	nd	nd	nd	nd	nd	nd	nd	nd
22	4-Chloro-3-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd

Semi-Volatile Analyses (μg/kg or ppb) SOIL

		MW1B	MW2B	MW2BD(5x)	MW3A	MW3AD(10x)	MW4B	MW4BD(2x)	MW5B
23	2-Methylnaphthalene	nd	nd	nd	nd	nd	nd	nd	nd
24	Hexachlorocyclopentadiene	nd(J)	nd	nd	nd(J)	nd(J)	nd	nd	nd
25	2,4,6-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd
26	2,4,5-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd
27	2-Chloronaphthalene	nd	nd	nd	nd	nd	nd	nd	nd
28	2-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd
29	Dimethyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd
30	Acenaphthylene	nd	nd	nd	nd	nd	nd	nd	nd
31	2,6-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd
32	3-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd
33	Acenaphthene	nd	nd	nd	nd	nd	nd	nd	nd
34	2,4-Dinitrophenol	nd	nd	nd(J)	nd	nd	nd	nd	nd
35	4-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd
36	Dibenzofuran	nd	nd	nd	nd	nd	nd	nd	nd
37	2,4-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd
38	Diethylphthalate	nd	nd	nd	nd	nd	nd	nd	nd
39	4-Chlorophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd
40	Fluorene	nd	nd	nd	nd	nd	nd	nd	nd
41	4-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd
42	4,6-Dinitro-2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd
43	N-Nitrosodiphenylamine (1)	nd	nd	nd	nd	nd	nd	nd	nd
44	4-Bromophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd

Semi-Volatile Analyses (μg/kg or ppb) SOIL

		MW1B	MW2B	MW2BD(5x)	MW3A	MW3AD(10x)	MW4B	MW4BD(2x)	MW5B
45	Hexachlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd
46	Pentachlorophenol	nd	nd	nd(J)	nd	nd	83(J)	nd	nd
47	Phenanthrene	nd	nd	nd	nd	nd	14(J)	nd	nd
48	Anthracene	nd	nd	nd	nd	nd	nd	nd	nd
49	Carbazole	nd	nd	nd	nd	nd	nd	nd	nd
50	Di-n-Butylphthalate	15(J)	20(J)	nd	15(J)	nd	nd	nd	nd
51	Fluoranthene	nd	nd	nd	nd	nd	16(J)	nd	nd
52	Pyrene	nd	nd	nd	nd	nd	14(J)	nd	nd
53	Butylbenzylphthalate	nd	17(J)	nd	11(J)	nd	nd	nd	nd
54	3,3'-Dichlorobenzidine	nd	nd	nd	nd	nd	nd	nd	nd
55	Benzo(a)Anthracene	nd	nd	nd	3(J)	nd	nd	nd	nd
56	Chrysene	nd	nd	nd	17(J)	nd	nd	nd	nd
57	Bis(2-Ethylhexyl)Phthalate	2,800	5,700	4,900	5,200	8,100	3,200	2,200	410
58	Di-n-Octyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd
59	Benzo(b) Fluoranthene	nd(J)	15(J)	nd	7(J)	nd	15(J)	nd	nd
60	Benzo(k) Fluoranthene	nd	6(J)	nd	2(J)	nd(J)	7(J)	nd	nd
61	Benzo(a) Pyrene	nd	nd	nd	7(J)	nd	10(J)	nd	nd
62	Ideno(1,2,3-cd)Pyrene	nd	10(J)	nd	nd	nd	nd	nd	nd
63	Dibenz(a,h) Anthracene	nd	nd	nd	nd	nd	nd	nd	nd
64	Benzo(g,h,i) Perylene	nd	11(J)	nd	3(J)	nd	nd	nd	nd

(J) Estimated value. Value is greater than zero but below quantitation.
(D) Diluted.

Pesticide Organics Analyses (μg/kg or ppb) SOIL

		MW1B	MW2B	MW3A	MW4B	MW5B	MW5B(R)
1	alpha-BHC	nd	nd	nd	nd	nd	nd
2	beta-BHC	nd	nd	nd	nd	nd	nd
3	delta-BHC	nd	nd	nd	nd	nd	nd
4	gamma-BHC (Lindane)	nd	nd	nd	nd	8.3(P)	nd
5	Heptachlor	nd	nd	nd	nd	7.9	nd
6	Aldrin	nd	nd	nd	nd	7.1	nd
7	Heptachlor epoxide	nd	nd	nd	nd	nd	nd
8	Endosulfan I	nd	nd	nd	nd	nd	nd
9	Dieldrin	nd	nd	nd	nd	15	nd
10	4,4'-DDE	nd	nd	nd	nd	nd	nd
11	Endrin	nd	nd	nd	nd	19	nd
12	Endosulfan II	nd	nd	nd	nd	nd	nd
13	4,4'-DDD	nd	nd	nd	nd	nd	nd
14	Endosulfan sulfate	nd	nd	nd	nd	nd	nd
15	4,4'-DDT	nd	nd	nd	nd	18	nd
16	Methoxychlor	nd	nd	nd	nd	nd	nd
17	Endrin ketone	nd	nd	nd	nd	nd	nd
18	Endrin aldehyde	nd	nd	nd	nd	nd	nd
19	alpha-Chlordane	nd	nd	nd	nd	nd	nd
20	gamma-Chlordane	nd	nd	nd	nd	nd	nd
21	Toxaphene	nd	nd	nd	nd	nd	nd
22	Aroclor-1016	nd	nd	nd	nd	nd	nd
23	Aroclor-1221	nd	nd	nd	nd	nd	nd
24	Aroclor-1232	nd	nd	nd	nd	nd	nd
25	Aroclor-1242	nd	nd	nd	nd	nd	nd
26	Aroclor-1248	nd	nd	nd	nd	nd	nd
27	Aroclor-1254	nd	nd	nd	nd	nd	nd
28	Aroclor-1260	nd	40(J)	24(J)	9.5(J)	nd	nd

(J) Estimated value. Value is greater than zero but below quantitation.
(P) Greater than 25% difference for detected concentrations between 2 GC columns.
(R) Repeat analysis.

Volatile Analyses (μg/kg or ppb) SOIL

		MW1B	MW2B	MW3A	MW4B	MW5B
1	Chloromethane	nd	nd	nd	nd	nd
2	Bromomethane	nd(J)	nd	nd(J)	nd(J)	nd(J)
3	Vinyl Chloride	nd	nd	nd	nd	nd(J)
4	Chloroethane	nd	nd	nd	nd(J)	nd(J)
5	Methylene Chloride	nd	nd	nd	nd	nd
6	Acetone	28	48(J)	nd	26(J)	nd
7	Carbon Disulfide	nd(J)	nd	nd(J)	nd(J)	nd
8	1,1-Dichloroethene	nd	nd	nd	nd	nd
9	1,1-Dichloroethane	nd	45(J)	nd	2(J)	nd
10	1,2-Dichloroethene (total)	nd	nd	nd	29	nd
11	Chloroform	nd	nd	nd	nd	nd
12	1,2-Dichloroethane	nd	nd	nd	nd	nd
13	2-Butanone	nd	nd	nd	nd	nd
14	1,1,1-Trichloroethane	nd	39(J)	nd	3(J)	nd
15	Carbon Tetrachloride	nd	nd	nd	nd	nd
16	Bromodichloromethane	nd	nd	nd	nd	nd
17	1,2-Dichloropropane	nd	nd	nd	nd(J)	nd
18	cis-1,3-dichloropropene	nd	nd	nd	nd	nd
19	Trichloroethene	nd	nd	2(J)	18	nd
20	Dibromochloromethane	nd	nd	nd	nd	nd
21	1,1,2-Trichloroethane	nd	nd	nd	nd	nd

Volatile Analyses (μg/kg or ppb) SOIL						
		MW1B	MW2B	MW3A	MW4B	MW5B
22	Benzene	nd	nd	nd	nd	nd
23	trans-1,3-dichloropropene	nd	nd	nd	nd	nd
24	Bromoform	nd	nd	nd	nd	nd
25	4-Methyl-2-Pentanone	nd	nd	nd	nd	nd
26	2-Hexanone	nd	nd	nd	nd	nd
27	Tetrachloroethene	nd	nd	nd	nd	nd(J)
28	1,1,2,2-Tetrachloroethane	nd	nd	nd	nd	nd
29	Toluene	nd	nd	nd	nd	nd
30	Chlorobenzene	nd	nd	nd	nd	nd
31	Ethylbenzene	nd	370	nd	nd	nd
32	Styrene	nd	nd	nd	nd	nd
33	Total Xylenes	nd	1,200	nd	nd	nd

(J) Estimated value. Value is greater than zero but below quantitation.
(B) Compound found in blank.
(D) Diluted.

APPENDIX G

Analytical Results

Soil (Soil Borehole Samples)

LIST OF QUALIFIERS

(J)	Estimated value. Value is greater than zero but below quantitation.
(B_1)	Compound found in blank. (Organic analyses only.)
(D)	Diluted.
(P)	Greater than 25% difference for detected concentrations between 2 GC columns.
(R)	Data unusable.
(F)	Fill sample.
(N_1)	Native soil sample. (Organic analyses only.)
(M)	Medium level contamination.
(E_1)	Concentrations exceed calibration range of instrument. (Organic analyses only.)
RE	Sample reanalyzed.
(E_2)	Estimated value due to interference effects. (Inorganic analyses only.)
(N_2)	Spike sample recovery is not within control limits. (Inorganic anlyses only).
*	Duplicate analysis is not within control limits.
(B_2)	Value greater than or equal to the instrument detection limit but less than contract required detection limit. (Inorganic analyses only.)
(S)	Value determined by Method of Standard Addition.
(W)	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Volatile Analyses (μg/kg or ppb) SOIL

		S1(F)	S1(F)(M)	S1(F)(M)D 10X	S1(N)	S1(N)D	S2(F)	S2(N)	S3(F)	S3(F)D	S3(N)(M)	S4(F)	S4(N)	S4(N)(M)	S5(F)(M)	S5(N)	S6(F)	S6(N)
1	Chloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	Bromomethane	nd(J)	nd	nd	nd(J)	nd(J)	nd(J)	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd	nd
3	Vinyl Chloride	400(J)	nd	nd	4(J)	nd(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	Chloroethane	nd(J)	nd	nd(J)	nd(J)	nd(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	Methylene Chloride	nd	nd	nd	0.8(J)	nd	nd	nd	nd	nd	nd	0.9(J)	1(J)	nd	nd	nd	1(J)	nd
6	Acetone	170	nd	nd	13	nd	nd(B)	9(J)	40	80(D)	6100	nd(B)	19	nd	nd	10(J)	45(B)	15(B)
7	Carbon Disulfide	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd	nd
8	1,1-Dichloroethene	120	60(J)	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd	6(J)	nd	nd	nd	nd	nd
9	1,1-Dichloroethane	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd	nd
10	1,2-Dichloroethene (total)	37,000(E)	26,000(J)	24,000	360(E)	360	nd	nd	560(E)	820(D)	3300	9(J)	1700(E)	1300(J)	560(J)	20	nd	30
11	Chloroform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12	1,2-Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
13	2-Butanone	88	nd(B)	nd	nd	nd	nd	nd	9(J)	nd	7900(B)	nd	nd	nd(B)	nd(B)	nd	nd	nd
14	1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	Carbon Tetrachloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Bromodichloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
17	1,2-Dichloropropane	nd	nd	nd	nd	nd	nd(J)	nd(J)	nd	nd	nd	nd(J)	nd(J)	nd	nd	nd	nd	nd
18	cis-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd(J)	nd	nd	nd(J)	nd	nd
19	Trichloroethene	31,000(E)	300,000 (EJ)	290,000	400(E)	560	1(J)	1(J)	2(J)	nd	23,000	23	5900(E)	23,000	17,000	99	2(J)	8(J)
20	Dibromochloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
21	1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Benzene	140	120(J)	nd	1(J)	nd	nd	nd	3(J)	5(DJ)	76(J)	nd	25	nd	nd	nd	nd	nd
23	trans-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
24	Bromoform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
25	4-Methyl-2-Pentanone	210	110(J)	nd	nd	nd	nd	nd	nd	nd	8300	nd	nd(J)	nd	nd	nd	nd	nd

Volatile Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(F)(M)	S1(F)(M)D 10X	S1(N)	S1(N)D	S2(F)	S2(N)	S3(F)	S3(F)D	S3(N)(M)	S4(F)	S4(N)	S4(N)(M)	S5(F)(M)	S5(N)	S6(F)	S6(N)
26	2-Hexanone	12(J)	nd	nd	nd(J)	nd(J)	nd	nd	nd	nd	nd	nd	nd(J)	nd	nd	nd	nd	nd
27	Tetrachloroethene	44(J)	240(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	2(J)	nd	nd	nd	nd	nd
28	1,1,2,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
29	Toluene	16,000(E)	84,000 (BEJ)	63,000	4(J)	16(J)	nd	nd	94	170(D)	10,000(B)	nd	34	49(J)	nd(B)	nd	nd	nd
30	Chlorobenzene	15(J)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1(J)	nd	nd	nd	nd	nd
31	Ethylbenzene	16,000(E)	90,000 (EJ)	53,000	7(J)	39(J)	nd	nd	140	270(D)	1900	7(J)	120	500(J)	120(J)	nd	nd	nd
32	Styrene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
33	Total Xylenes	58,000(E)	400,000 (EJ)	339,000	16	110	nd	nd	330	640(D)	17,000	4(J)	150	590(J)	800(J)	nd	nd	nd

(F)	Fill sample.
(N)	Native soil sample.
(J)	Estimated value. Value is greater than zero but below quantitation.
(B)	Compound found in blank.
(D)	Diluted.
(M)	Medium level contamination.

Semi-Volatile Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(F)D (100x)	S5(F)RE	S5(N)	S6(F)	S6(F)RE	S6(N)
1	Phenol	nd	nd	nd	nd	nd	nd	nd	nd	200(J)	nd(J)	280(J)	nd	nd(J)	nd(J)	nd
2	bis(2-Chloroethyl)Ether	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
3	2-Chlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
4	1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
5	1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
6	1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
7	2-Methylphenol	62(J)	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
8	2,2'-oxybis(1-Chloropropane)	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
9	4-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
10	N-Nitroso-Di-n-Propylamine	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
11	Hexachloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
12	Nitrobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
13	Isophorone	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
14	2-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
15	2,4-Dimethylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
16	bis(2-Chloroethoxy)Methane	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
17	2,4-Dichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
18	1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
19	Naphthalene	78(J)	nd	nd	nd	nd	nd	nd	nd	16,000(EJ)	4300(J)	14,000(EJ)	nd	nd(J)	nd(J)	nd
20	4-Chloroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
21	Hexachlorobutadiene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
22	4-Chloro-3-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
23	2-Methylnaphthalene	49(J)	nd	nd	nd	nd	nd	nd	nd	3600(EJ)	470(J)	2800(J)	nd	nd(J)	nd(J)	nd
24	Hexachlorocyclopentadiene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
25	2,4,6-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
26	2,4,5-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd

Semi-Volatile Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(F)D (100x)	S5(F)RE	S5(N)	S6(F)	S6(F)RE	S6(N)
27	2-Chloronaphthalene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
28	2-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
29	Dimethyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
30	Acenaphthylene	nd	nd	nd	nd	nd	nd	nd	nd	18,000(EJ)	2600(E)	16,000(EJ)	nd	nd(J)	nd(J)	nd
31	2,6-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
32	3-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
33	Acenaphthene	8(J)	nd	13(J)	nd	nd	nd	nd	nd	1700(J)	nd	1800(J)	nd	nd(J)	nd(J)	nd
34	2,4-Dinitrophenol	nd	nd	nd(J)	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
35	4-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
36	Dibenzofuran	nd	nd	nd	nd	nd	nd	nd	nd	14,000(EJ)	2800(J)	16,000(EJ)	nd	nd(J)	nd(J)	nd
37	2,4-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
38	Diethylphthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
39	4-Chlorophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
40	Fluorene	nd	nd	nd	nd	nd	nd	nd	nd	29,000(EJ)	4900(J)	31,000(EJ)	nd	nd(J)	nd(J)	nd
41	4-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
42	4,6-Dinitro-2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
43	N-Nitrosodiphenylamine (1)	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
44	4-Bromophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
45	Hexachlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
46	Pentachlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
47	Phenanthrene	66(J)	nd	69(J)	nd	nd	nd	nd	nd	62,000(EJ)	28,000(J)	55,000(EJ)	nd	140(J)	130(J)	nd
48	Anthracene	15(J)	nd	nd	nd	nd	nd	nd	nd	16,000(EJ)	5200(J)	19,000(EJ)	nd	26(J)	nd(J)	nd
49	Carbazole	7(J)	nd	12(J)	nd	nd	nd	nd	nd	5100(EJ)	2000(J)	7400(EJ)	nd	23(J)	18(J)	nd
50	Di-n-Butylphthalate	92(J)	nd	nd	nd	nd	nd	nd	nd	120(J)	nd	170(J)	nd	nd(J)	nd(J)	nd
51	Fluoranthene	130(J)	nd	160(J)	nd	nd	nd	nd	nd	53,000(EJ)	27,000(J)	49,000(EJ)	nd	230(J)	270(J)	nd
52	Pyrene	170(J)	nd	150(J)	nd	nd	nd	nd	nd	54,000(EJ)	23,000(J)	47,000(EJ)	nd	340(J)	300(J)	nd

Semi-Volatile Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(F)D (100x)	S5(F)RE	S5(N)	S6(F)	S6(F)RE	S6(N)
53	Butylbenzylphthalate	77(J)	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
54	3,3'-Dichlorobenzidine	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
55	Benzo(a)Anthracene	81(J)	nd	140(J)	nd	nd	nd	nd	nd	35,000(EJ)	14,000(J)	31,000(EJ)	nd	220(J)	220(J)	nd
56	Chrysene	170(J)	nd	140(J)	nd	nd	nd	nd	nd	28,000(EJ)	14,000(J)	25,000(EJ)	nd	260(J)	270(J)	nd
57	Bis(2-Ethylhexyl)Phthalate	340(J)	1500	1100(B)	900(B)	nd(B)	160(BJ)	1100(B)	2,800(B)	820(BJ)	nd	1200(BJ)	nd(B)	nd(J)	nd(J)	650(B)
58	Di-n-Octyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd(R)	nd	nd(J)	nd	nd(J)	nd(J)	nd
59	Benzo(b) Fluoranthene	210(J)	nd	280(J)	nd	nd	nd	nd	nd	53,000(EJ)	14,000(J)	76,000(EJ)	nd	nd(J)	nd(J)	nd
60	Benzo(k) Fluoranthene	110(J)	nd	100(J)	nd	nd	nd	nd	nd	66,000(EJ)	6700(J)	12,000(EJ)	nd	nd(J)	nd(J)	nd
61	Benzo(a) Pyrene	96(J)	nd	nd	nd	nd	nd	nd	nd	24,000(EJ)	11,000(J)	22,000(EJ)	nd	nd(J)	nd(J)	nd
62	Ideno(1,2,3-cd)Pyrene	nd(J)	nd(J)	nd	nd	nd	nd	nd	nd	7300(EJ)	6400(J)	9100(EJ)	nd	nd(J)	nd(J)	nd
63	Dibenz(a,h) Anthracene	nd	nd	nd	nd	nd	nd	nd	nd	2200(J)	1200(J)	2700(J)	nd	nd(J)	nd(J)	nd
64	Benzo(g,h,i) Perylene	39(J)	nd	nd	nd	nd	nd	nd	nd	3500(EJ)	4200(J)	5100(EJ)	nd	nd(J)	nd(J)	nd

(J)	Estimated value. Value is greater than zero but below quantitation.
(D)	Diluted.
(E)	Concentrations exceed calibration range of instrument.
(R)	Unusable.
RE	Sample reanalyzed.

Pesticide Organics Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(N)	S6(F)	S6(N)
1	alpha-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	beta-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	delta-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	gamma-BHC (Lindane)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Heptachlor epoxide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	Endosulfan I	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
9	Dieldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	4,4'-DDE	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11	Endrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12	Endosulfan II	nd	nd	nd	nd	nd	nd	nd	nd	6.4(JP)	nd	nd	nd
13	4,4'-DDD	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
14	Endosulfan sulfate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	4,4'-DDT	nd	nd	nd	nd	nd	nd	nd	nd	48(P)	nd	nd	nd
16	Methoxychlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
17	Endrin ketone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	Endrin aldehyde	nd	nd	nd	nd	nd	nd	nd	nd	24(P)	nd	nd	nd
19	alpha-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	6.5(JP)	nd	nd	nd
20	gamma-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
21	Toxaphene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Aroclor-1016	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Pesticide Organics Analyses (μg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(N)	S6(F)	S6(N)
23	Aroclor-1221	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
24	Aroclor-1232	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
25	Aroclor-1242	660(P)	nd	nd	nd	nd	nd	nd	nd	nd	nd	910(P)	nd
26	Aroclor-1248	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
27	Aroclor-1254	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
28	Aroclor-1260	2000	nd	320(P)	nd	nd	nd	12(J)	nd	nd	nd	2400	nd

(J) Estimated value. Value is greater than zero but below quantitation.

(P) Greater than 25% difference for detected concentrations between 2 GC columns.

Inorganic Analyses (mg/kg or ppm) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(N)	S6(F)	S6(N)
1	Aluminum	2590(E)	12,800(E)	11,200(E)	7370(E)	8950(E)	13,700(E)	12,900(E)	13,500(E)	9360(E)	5620(E)	10,900(E)	8350(E)
2	Antimony	18.4(N)	62.8(N)	46.4(N)	29.9(N)	47.7(N)	63.0(N)	69.1(N)	57.5(N)	47.9(N)	33.4(N)	49.6(N)	38.6(N)
3	Arsenic	3.7	2.2(B)	2.8	3.4	2.2(B)	17.8	7.3	2.8	19.8	2.3	3.9	2.6
4	Barium	81.1	99.1	90.8	84.5	53.9	60.4	213	122	64.9	93.8	67.1	74.2
5	Beryllium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Cadmium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Calcium	156,000	59,200	68,900	45,600	55,000	56,200	52,400	64,700	54,800	65,500	39,900	45,000
8	Chromium	34.9*	21.5*	22.1*	12.9*	16.4*	24.0*	21.1*	22.3*	32.0*	11.3*	19.9*	14.0*
9	Cobalt	2270*	14.1*	60.5*	10.0(B)*	12.1*	12.3(B)*	12.6(B)*	13.5*	32.2*	7.5(B)*	53.5*	9.7(B)*
10	Copper	4770*	31.3*	709*	17.7*	26.1*	33.7*	29.8(B)*	27.6*	5040*	22.2*	5540*	41.9*
11	Iron	9470	23,700	20,000	16,600	19,000	27,900	25,600	24,900	16,100	12,200	19,600	16,300
12	Lead	719	18.8(S)	61.7	6.7	7.7	13.2	8.6	17.7(S)	78.6	23.5(S)	21.6$^+$	10.3
13	Magnesium	90,700	11,700	19,500	8790	9460	10,700	114,000	12,800	27,900	22,000	9310	10,200
14	Manganese	3610(E)	608(E)	636(E)	731(E)	712(E)	573(E)	822(E)	664(E)	545(E)	625(E)	900(E)	657(E)
15	Mercury	0.15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Nickel	545(N)*	32.6(N)*	148(N)*	29.9(N)*	27.4(N)*	32.2(N)*	36.4(N)*	33.5(N)*	770(N)*	25.2(N)*	953(N)*	28.8(N)*
17	Potassium	473(B)	2350	1670	1140(B)	901(B)	2330	2290	2660	890(B)	1060(B)	1230(B)	1480
18	Selenium	nd	nd(WN)	11.9(WN)	nd(WN)	nd(WN)	nd(WN)	nd(WN)	nd(WN)	nd(WN)	nd(WN)	nd(WN)	nd(WN)
19	Silver	69.6	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
20	Sodium	413(B)	353(B)	343(B)	308(B)	348(B)	378(B)	362(B)	376(B)	287(B)	300(B)	320(B)	320(B)
21	Thallium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Vanadium	14.0	26.0	24.0	16.0	18.9	27.4	24.4	27.6	20.8	11.6(B)	20.8	15.9

Inorganic Analyses (mg/kg or ppm) SOIL													
		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(N)	S6(F)	S6(N)
23	Zinc	788	62.5	272(N)*	45.6(N)*	51(N)*	71.7(N)*	73.3(N)*	67.7(N)*	403(N)*	158(N)*	300(N)*	58.7(N)*
24	Cyanide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

(E)	Estimated value due to interference effects.
(N)	Spike sample recovery is not within control limits.
*	Duplicate analysis is not within control limits.
(B)	Value greater than or equal to the instrument detection limit but less than contract required detection limit.
(S)	Value determined by Method of Standard Addition.
(W)	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

APPENDIX H

Supporting Documentation for HRS

PREscore 1.0 - PRESCORE.TCL File 12/23/91
NPL Characteristics Data Collection Form
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

Record Information

1. Site Name: CARBORUNDUM COMPANY HYDE PARK
   (as entered in CERCLIS)
2. Site CERCLIS Number: NYSDEC 932036
3. Site Reviewer: INTERA INC.
4. Date: December 1992
5. Site Location: Town of Niagara, Niagara County, New York.
   (City/County,State)
6. Congressional District:
7. Site Coordinates: Unknown

Latitude: Longitude:

Site Description

1. Setting: Suburban
2. Current Owner: Private - Industrial
3. Current Site Status: Inactive
4. Years of Operation: Inactive Site,from and to dates: 1936 to 1978
5. How Initially Identified: State/Local Program
6. Entity Responsible for Waste Generation:
   - Manufacturing
     - Other Manufacturing
7. Site Activities/Waste Deposition:
   - Drum/Container Storage
   - Airborne Release/Incineration

Waste Description

8. Wastes Deposited or Detected Onsite:

   - Organic Chemicals
   - Solvents
   - Metals
   - Lead
   - PCBs
   - Dioxins

Response Actions

9. Response/Removal Actions:

   - Site Access Has Been Restricted

RCRA Information

10. For All Active Facilities, RCRA Site Status:

    - Not Applicable

Demographic Information

11. Workers Present Onsite: 75

12. Distance to Nearest Non-Worker Individual: 250 feet

13. Residential Population Within 1 Mile: 7,353

14. Residential Population Within 4 Miles: 85,031

Water Use Information

15. Local Drinking Water Supply Source:

    - No Water Withdrawals Within Target Distance Limits

16. Total Population Served by Local Drinking Water Supply Source: 102,000

17. Drinking Water Supply System Type for Local Drinking Water Supply Sources:

    - Surface Water

18. Surface Water Adjacent to/Draining Site:

    - None

HRS DOCUMENTATION RECORD
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

1. Site Name: CARBORUNDUM COMPANY HYDE PARK
(as entered in CERCLIS)

2. Site CERCLIS Number: NYSDEC 932036

3. Site Reviewer: INTERA INC.

4. Date: December 1992

5. Site Location: Town of Niagara, Niagara County, New York.
(City/County,State)

6. Congressional District:

7. Site Coordinates: Unknown

Latitude: Longitude:

	Score
Ground Water Migration Pathway Score (Sgw)	0.00
Surface Water Migration Pathway Score (Ssw)	0.30
Soil Exposure Pathway Score (Ss)	0.61
Air Migration Pathway Score (Sa)	1.81

Site Score	0.96

NOTE

EPA uses the terms "facility," "site," and "release" interchangeably. The term "facility" is broadly defined in CERCLA to include any area where hazardous substances have "come to be located" (CERCLA Section 109(9)), and the listing process is not intended to define or reflect boundaries of such facilities or releases. Site names, and references to specific parcels or properties, are provided for general identification purposes only. Knowledge regarding the extent of sites will be refined as more information is developed during the RI/FS and even during implementation of the remedy.

GROUND WATER MIGRATION PATHWAY SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

GROUND WATER MIGRATION PATHWAY Factor Categories & Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer Aquifer: Surficial		
1. Observed Release	550	550
2. Potential to Release		
2a. Containment	10	10
2b. Net Precipitation	10	3
2c. Depth to Aquifer	5	5
2d. Travel Time	35	35
2e. Potential to Release [lines 2a(2b+2c+2d)]	500	430
3. Likelihood of Release	550	550
Waste Characteristics		
4. Toxicity/Mobility	*	1.00E+04
5. Hazardous Waste Quantity	*	10
6. Waste Characteristics	100	18
Targets		
7. Nearest Well	50	0.00E+00
8. Population		
8a. Level I Concentrations	**	0.00E+00
8b. Level II Concentrations	**	0.00E+00
8c. Potential Contamination	**	0.00E+00
8d. Population (lines 8a+8b+8c)	**	0.00E+00
9. Resources	5	0.00E+00
10. Wellhead Protection Area	20	0.00E+00
11. Targets (lines 7+8d+9+10)	**	0.00E+00
12. Targets (including overlaying aquifers)	**	0.00E+00
13. Aquifer Score	100	0.00
GROUND WATER MIGRATION PATHWAY SCORE (Sgw)	100	0.00

* Maximum value applies to waste characteristics category.

** Maximum value not applicable.

PREscore 1.0 - PRESCORE.TCL File 12/23/91

AIR PATHWAY SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

AIR MIGRATION PATHWAY Factor Categories & Factors	Maximum Value	Value Assigned
Likelihood of Release		
1. Observed Release	550	0
2. Potential to Release		
2a. Gas Potential to Release	500	360
2b. Particulate Potential to Release	500	280
2c. Potential to Release	500	360
3. Likelihood of Release	550	360
Waste Characteristics		
4. Toxicity/Mobility	*	2.00E+02
5. Hazardous Waste Quantity	*	10
6. Waste Characteristics	100	6
Targets		
7. Nearest Individual	50	2.00E+01
8. Population		
8a. Level I Concentrations	**	0.00E+00
8b. Level II Concentrations	**	0.00E+00
8c. Potential Contamination	**	4.90E+01
8d. Population (lines 8a+8b+8c)	**	4.90E+01
9. Resources	5	0.00E+00
10. Sensitive Environments		
10a. Actual Contamination	***	0.00E+00
10b. Potential Contamination	***	0.00E+00
10c. Sens. Environments(lines 10a+10b)	***	0.00E+00
11. Targets (lines 7+8d+9+10c)	**	6.90E+01
AIR MIGRATION PATHWAY SCORE (Sa)	100	1.81E+00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.
*** No specific maximum value applies, see HRS for details.

SOIL EXPOSURE PATHWAY SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

SOIL EXPOSURE PATHWAY Factor Categories & Factors RESIDENT POPULATION THREAT	Maximum Value	Value Assigned
Likelihood of Exposure		
1. Likelihood of Exposure	550	550
Waste Characteristics		
2. Toxicity	*	1.00E+04
3. Hazardous Waste Quantity	*	10
4. Waste Characteristics	100	18
Targets		
5. Resident Individual	50	0.00E+00
6. Resident Population		
6a. Level I Concentrations	**	0.00E+00
6b. Level II Concentrations	**	0.00E+00
6c. Resident Population (lines 6a+6b)	**	0.00E+00
7. Workers	15	5.00E+00
8. Resources	5	0.00E+00
9. Terrestrial Sensitive Environments	***	0.00E+00
10. Targets (lines 5+6c+7+8+9)	**	5.00E+00
11. RESIDENT POPULATION THREAT SCORE	**	4.95E+04

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.
*** No specific maximum value applies, see HRS for details.

PREscore 1.0 - PRESCORE.TCL File 12/23/91
SOIL EXPOSURE PATHWAY SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

SOIL EXPOSURE PATHWAY Factor Categories & Factors NEARBY POPULATION THREAT	Maximum Value	Value Assigned
Likelihood of Exposure		
12. Attractiveness/Accessibility	100	5.00E+00
13. Area of Contamination	100	2.00E+01
14. Likelihood of Exposure	500	5.00E+00
Waste Characteristics		
15. Toxicity	*	1.00E+04
16. Hazardous Waste Quantity	*	10
17. Waste Characteristics	100	18
Targets		
18. Nearby Individual	1	1.00E+00
19. Population Within 1 Mile	**	5.00E+00
20. Targets (lines 18+19)	**	6.00E+00
21. NEARBY POPULATION THREAT SCORE	**	5.40E+02
SOIL EXPOSURE PATHWAY SCORE (Ss)	100	0.61

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	Maximum Value	Value Assigned
Likelihood of Release		
12. Likelihood of Release (same as line 3)	550	550
Waste Characteristics		
13. Toxicity/Mobility/Persistence/Bioacc.	*	5.00E+04
14. Hazardous Waste Quantity	*	10
15. Waste Characteristics	1000	18
Targets		
16. Food Chain Individual	50	0.00E+00
17. Population		
17a. Level I Concentrations	**	0.00E+00
17b. Level II Concentrations	**	0.00E+00
17c. Pot. Human Food Chain Contamination	**	0.00E+00
17d. Population (lines 17a+17b+17c)	**	0.00E+00
18. Targets (lines 16+17d)	**	0.00E+00
19. HUMAN FOOD CHAIN THREAT SCORE	100	0.00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	Maximum Value	Value Assigned
Likelihood of Release		
20. Likelihood of Release (same as line 3)	550	550
Waste Characteristics		
21. Ecosystem Tox./Mobility/Persist./Bioacc.	*	5.00E+05
22. Hazardous Waste Quantity	*	10
23. Waste Characteristics	1000	32
Targets		
24. Sensitive Environments		
24a. Level I Concentrations	**	0.00E+00
24b. Level II Concentrations	**	0.00E+00
24c. Potential Contamination	**	0.00E+00
24d. Sensitive Environments (lines 24a+24b+24c)	**	0.00E+00
25. Targets (line 24d)	**	0.00E+00
26. ENVIRONMENTAL THREAT SCORE	60	0.00
27. WATERSHED SCORE	100	0.10
28. SW: GW to SW COMPONENT SCORE (Sgs)	100	0.10

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors ENVIRONMENTAL THREAT	Maximum Value	Value Assigned
Likelihood of Release		
22. Likelihood of Release (same as line 5)	550	279
Waste Characteristics		
23. Ecosystem Toxicity/Persistence/Bioacc.	*	5.00E+08
24. Hazardous Waste Quantity	*	10
25. Waste Characteristics	1000	180
Targets		
26. Sensitive Environments		
26a. Level I Concentrations	**	0.00E+00
26b. Level II Concentrations	**	0.00E+00
26c. Potential Contamination	**	0.00E+00
26d. Sensitive Environments (lines 26a+26b+26c)	**	0.00E+00
27. Targets (line 26d)	**	0.00E+00
28. ENVIRONMENTAL THREAT SCORE	60	0.00
29. WATERSHED SCORE	100	0.30
30. SW: OVERLAND/FLOOD COMPONENT SCORE (Sof)	100	0.30

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

GROUND WATER TO SURFACE WATER MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	Maximum Value	Value Assigned
Likelihood of Release to Aquifer Aquifer: Surficial		
1. Observed Release	550	550
2. Potential to Release		
2a. Containment	10	10
2b. Net Precipitation	10	3
2c. Depth to Aquifer	5	5
2d. Travel Time	35	35
2e. Potential to Release [lines 2a(2b+2c+2d)]	500	430
3. Likelihood of Release	550	550
Waste Characteristics		
4. Toxicity/Mobility/Persistence	*	4.00E+01
5. Hazardous Waste Quantity	*	10
6. Waste Characteristics	100	3
Targets		
7. Nearest Intake	50	0.00E+00
8. Population		
8a. Level I Concentrations	**	0.00E+00
8b. Level II Concentrations	**	0.00E+00
8c. Potential Contamination	**	0.00E+00
8d. Population (lines 8a+8b+8c)	**	0.00E+00
9. Resources	5	5.00E+00
10. Targets (lines 7+8d+9)	**	5.00E+00
11. DRINKING WATER THREAT SCORE	100	0.10

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors DRINKING WATER THREAT	Maximum Value	Value Assigned
Likelihood of Release		
1. Observed Release	550	0
2. Potential to Release by Overland Flow		
2a. Containment	10	9
2b. Runoff	25	25
2c. Distance to Surface Water	25	6
2d. Potential to Release by Overland Flow [lines 2a(2b+2c)]	500	279
3. Potential to Release by Flood		
3a. Containment (Flood)	10	0
3b. Flood Frequency	50	0
3c. Potential to Release by Flood (lines 3a x 3b)	500	0
4. Potential to Release (lines 2d+3c)	500	279
5. Likelihood of Release	550	279
Waste Characteristics		
6. Toxicity/Persistence	*	1.00E+04
7. Hazardous Waste Quantity	*	10
8. Waste Characteristics	100	18
Targets		
9. Nearest Intake	50	0.00E+00
10. Population		
10a. Level I Concentrations	**	0.00E+00
10b. Level II Concentrations	**	0.00E+00
10c. Potential Contamination	**	0.00E+00
10d. Population (lines 10a+10b+10c)	**	0.00E+00
11. Resources	5	5.00E+00
12. Targets (lines 9+10d+11)	**	5.00E+00
13. DRINKING WATER THREAT SCORE	100	0.30

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET
CARBORUNDUM COMPANY HYDE PARK - 12/28/92

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT Factor Categories & Factors HUMAN FOOD CHAIN THREAT	Maximum Value	Value Assigned
Likelihood of Release		
14. Likelihood of Release (same as line 5)	550	279
Waste Characteristics		
15. Toxicity/Persistence/Bioaccumulation	*	5.00E+08
16. Hazardous Waste Quantity	*	10
17. Waste Characteristics	1000	180
Targets		
18. Food Chain Individual	50	0.00E+00
19. Population		
19a. Level I Concentrations	**	0.00E+00
19b. Level II Concentrations	**	0.00E+00
19c. Pot. Human Food Chain Contamination	**	0.00E+00
19d. Population (lines 19a+19b+19c)	**	0.00E+00
20. Targets (lines 18+19d)	**	0.00E+00
21. HUMAN FOOD CHAIN THREAT SCORE	100	0.00

* Maximum value applies to waste characteristics category.
** Maximum value not applicable.

INTERA

INTERA INC. • 6850 Austin Center Boulevard • Suite 300 • Austin, Texas 78731, USA • Telephone: 512-346-2000 • Facsimile: 512-346-9436

Data Validation Report for Preliminary Site Assessment of The Carborundum Company Electric Products Division, Hyde Park Facility, Town of Niagara, Niagara County, New York (Site no. 932036)

Case No: 4165
SDG: MW-2B
S1
MW2BW
Sampling Dates: July 29, 1992
August 6, 10, 13, 14, 17, 20, 24, 1992
Prepared for: The Carborundum Company
Niagara Falls, New York

Prepared By: INTERA INC.
Austin, Texas

91-022

May 1993

Albuquerque • Austin • Carlsbad • Los Angeles • Switzerland

Table of Contents

Page

1 INTRODUCTION 1

2 VOLATILE ORGANIC COMPOUNDS 4
  2.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE 4
  2.2 HOLDING TIMES 4
  2.3 SURROGATE RECOVERY 5
  2.4 MATRIX SPIKE/MATRIX SPIKE DUPLICATES 5
  2.5 BLANKS 5
    2.5.1 Method Blanks 6
  2.6 GC/MS INSTRUMENT TUNING 7
  2.7 TARGET COMPOUND LIST (TCL) ANALYTE IDENTIFICATION 8
  2.8 TENTATIVELY IDENTIFIED COMPOUNDS 8
  2.9 INTERNAL STANDARDS 8
  2.10 INITIAL AND CONTINUING CALIBRATION 8
    2.10.1 Field Duplicates 11

3 SEMI-VOLATILE ORGANIC COMPOUNDS 13
  3.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE 13
  3.2 HOLDING TIMES 13
  3.3 SURROGATE RECOVERY 14
  3.4 MATRIX SPIKE/MATRIX SPIKE DUPLICATES (MS/MSD) 15
  3.5 BLANKS 17
    3.5.1 Field Blanks 17
    3.5.2 Method Blank 17
  3.6 GC/MS INSTRUMENT TUNING 19
  3.7 TARGET COMPOUND LIST (TCL) ANALYTE IDENTIFICATION 19
  3.8 TENTATIVELY IDENTIFIED COMPOUNDS 19
  3.9 INTERNAL STANDARDS 19
  3.10 INITIAL AND CONTINUING CALIBRATION 20
  3.11 FIELD DUPLICATES 23

4 PESTICIDES/PCBs 24
  4.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE 24
  4.2 HOLDING TIMES 24
  4.3 SURROGATE RECOVERY 25
  4.4 MATRIX SPIKES/MATRIX SPIKE DUPLICATES 27
  4.5 BLANKS 28
    4.5.1 Field Blanks 28
    4.5.2 Blanks 28
  4.6 CALIBRATION AND INSTRUMENT PERFORMANCE 29

4.7 TARGET COMPOUND LIST 30
4.8 FIELD DUPLICATES 31

5 INORGANIC ANALYSES 32
5.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE 32
5.2 HOLDING TIMES 32
5.3 CALIBRATION 33
5.4 BLANKS 35
5.5 ICP INTERFERENCE CHECK 36
5.6 SPIKE SAMPLE RECOVERY 36
5.7 LABORATORY DUPLICATES 37
5.8 FIELD DUPLICATES 38
5.9 LABORATORY CONTROL SAMPLE 41
5.10 ICP SERIAL DILUTIONS 41
5.11 METHOD OF STANDARD ADDITION 41
5.12 FIELD BLANK 42
5.13 VERIFICATION OF INSTRUMENT PARAMETERS 42
5.14 TARGET COMPOUND LIST 43

6 DIOXINS AND FURANS 44

Appendix A Volatile Organic Compounds
Appendix B Tentatively Identified Volatile Organic Compounds
Appendix C Semi-Volatile Organic Compounds
Appendix D Tentatively Identified Semi-Volatile Organic Compounds
Appendix E Pesticide/PCB Compounds
Appendix F Correspondence with NYSDEC Regarding QA/QC Analysis
Appendix G Inorganic Analysis
Appendix H Dioxins and Furans
Appendix I Laboratory Case Narrivates

1 INTRODUCTION

This Data Validation Report assesses analytical data for 18 soil and 13 water samples that were submitted under Case Number 4165 for Sample Delivery Groups (SDGs) MW2B, S1 and MW2BW. The samples were taken during the preliminary site assessment of the Carborundum Company Electric Products Division's Hyde Park facility in Niagara Falls, New York.

The analytical laboratory work was performed by Recra Environmental Inc. of Amherst, New York. One soil sample for dioxin and furan analysis was analyzed by EPL Inc. of Mississauga, Ontario. Analytical testing was conducted for the Target Compound List (TCL) of contaminants following NYSDEC's 1991 Analytical Service Protocol (ASP91). Laboratory analyses involved the following analytical methods:

(i) Volatile Organic Compounds by Gas Chromatography/Mass Spectroscopy (GC/MS)
(ii) Semi-Volatile Organic Compounds by GC/MS
(iii) Pesticides and PCBs by GC
(iv) Metals by Inductively Coupled Argon Plasma Spectrophotometry (ICP), Flame Atomic Absorption (AA) and Furnace AA
(v) Mercury by Cold Vapour Extraction AA
(vi) Cyanide by Distillation/Colorimetry
(vii) Dioxins and Furans by GC/MS

The data has been validated in accordance with the following United States Environmental Protection Agency's (USEPA) Region II Standard Operating Procedures (SOP):

(i) CLP Organics Data Review and Preliminary Review (SOP Revision #8) (January 1992)
(ii) Evaluation of Metals Data for the Contract Laboratory Program (CLP) (SOP Revision XI) (January 1992)

This validation report applies to the Sample Delivery Groups and samples listed in Table 1.1.

The report is organized into a discussion of Target Compounds in the following order:

- volatile organic compounds
- semi-volatile organic compounds
- pesticides/PCBs
- inorganic elements and compounds
- dioxins and furans

Table 1.1 Sample Delivery Groups and Associated Samples

Sample Delivery Group	Sample No.	Sample Type	Sample Delivery Group	Sample No.	Sample Type	Sample Delivery Group	Sample No.	Sample Type
MW2B	MW-1b	soil	S1	S-1	soil	MW2BW	MW-1A	water
	MW-2b	soil		S-1	soil		MW-1B	water
	MW-3a	soil		water rinsate	water		MW-2A	water
	MW-4b	soil		S-2	soil		MW-2B	water
	MW-5b	soil		S-2	soil		MW-3A	water
	MW-6b	soil		S-3	soil		MW-3B	water
				S-3	soil		MW-4A	water
				S-4	soil		MW-4B	water
				S-4	soil		MW-5A	water
				S-5	soil		MW-5B	water
				S-5	soil		MW-6A	water
				S-6	soil		MW-6B	water
				S-6	soil			

2 VOLATILE ORGANIC COMPOUNDS

Volatile organic compounds were analyzed using gas chromatography/mass spectrometry (GC/MS). The following items were reviewed:

- Traffic Reports and Laboratory Narrative
- Holding Times
- Surrogate Recovery
- Matrix Spike and Matrix Spike Duplicates
- Blanks
- GC/MS Instrument Tuning
- Target Compound List (TCL) Analyte Identification
- Tentatively Identified Compounds
- Internal Standards
- Initial and Continuing Calibration
- Field Duplicates

2.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE

All traffic reports were present and complete. Soil samples contained less than 50% moisture. All samples were refrigerated in the field immediately after sampling and upon receipt at the laboratory. Water samples were collected in a manner that eliminated any air bubbles within sample vials. A laboratory or case narrative accompanied each sample delivery group (SDG) sample data package and is reproduced in Appendix I. Matrix interference was reported for some soil samples in SDG MW2BW and SDG S1.

2.2 HOLDING TIMES

All holding times were compliant with ASP91 protocol. All samples were analyzed within seven days of the date of collection.

2.3 SURROGATE RECOVERY

Surrogate recovery was generated within acceptable limits for toluene-18, bromofluorobenzene and 1,2-dichloroethane-d4 with the following exception in SDG S1:

Soil Sample	Surrogate	Reported Recovery (%)	Required QC Recovery (%)
S1 Fill ML	Bromoflurobenzene	117	59-113

All positive values for the affected soil sample were qualified as estimated "J" due to the high surrogate recovery for bromofluorobenzene. The non-detectable values were unqualified.

2.4 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

All matrix spike/matrix spike duplicates were generated within QC limits for Percent Recovery (%R) and Relative Percent Difference (RPD).

2.5 BLANKS

One field blank and one trip blank was analyzed for water from SDG MW2BW. One equipment blank was analyzed for soil from SDG S1. The trip blank did not contain any detectable VOCs, indicating that sample handling and delivery protocols were acceptable. The following contamination was noted in the field blank and the equipment blank:

MW6A (field blank)

acetone	14μg/L
1,2-dichloroethene (total)	0.9μg/L
chloroform	4μg/L
bromodichloromethane	1μg/L
dibromochloromethane	0.8μg/L
Unknown Tentatively Identified Compound (TIC)	10μg/L

Rinsate (equipment blank)

acetone	14μg/L
chloroform	2μg/L

The field blank MW6A is associated with water samples MW-1A through MW-6B. Acetone, chloroform, bromodichloromethane and dibromochloromethane were detected in the field blank but were not detected in any of the associated water samples. Qualification of the water samples was not required. 1,2-dichloroethene (total) was detected in the field blank and most of the water samples. Only sample MW-3A was qualified as undetected "U" because it contained a level of 1,2-dichloroethene that was less than 10 times the blank value.

The equipment rinsate blank was associated with soil samples S1 Fill through S-6 Native. Chloroform was detected in the equipment blank but not in the soil samples. Therefore qualification for chloroform is not necessary. Acetone was qualified as undetected, "U" where acetone concentrations in soil were less than or equal to 14μg/Kg, and as estimated, "J" where concentrations ranged from 15μg/Kg to 140μg/Kg. Concentrations of acetone in soil that exceeded 140μg/Kg were not qualified.

2.5.1 Method Blanks

A total of five method blanks were analyzed for soil samples from SDG MW2B; eight method blanks were analyzed for soil and water samples from SDG S1; and two method blanks were analyzed for water samples from SDG MW2BW.

The following blanks contained detectable levels of TCL compounds:

SDG: MW2B

VBLK 85

1-butanone	720μg/kg
toluene	25μg/kg

SDG: S1

VBLK 84	
2-butanone	800μg/kg
VBLK 85	
2-butanone	720μg/kg
toluene	25μg/kg
VBLK 86	
2-butanone	630μg/kg
VBLK 87	
acetone	7μg/kg

No qualification for 2-butanone or toluene was required for the samples associated with VBLK 85 in SDG: MW2B because the concentration of 2-butanone and toluene in the samples were greater than ten times the concentrations of 2-butanone and toluene in VBLK 85.

The concentration of 2-butanone in the sample associated with VBLK 84 was reported as the Contract Required Quantitation Limit (CRQL) and qualified as not detected "U" because the concentration was less than the CRQL and less than ten times the concentration of VBLK 84.

The three samples associated with VBLK 85 were qualified in accordance with the U.S. EPA SOP. The concentration of 2-butanone in the sample associated with VBLK 86 was qualified as not detected "U" and reported as the CRQL. The concentration of acetone in samples associated with VBLK 17 were qualified in accordance with the SOP.

2.6 GC/MS INSTRUMENT TUNING

GC/MS instrument tuning was generated within QC criteria for bromofluorobenzene.

2.7 TARGET COMPOUND LIST (TCL) ANALYTE IDENTIFICATION

GC/MS analyses are acceptable for each SDG. Chromatographic performance is acceptable. Retention times and mass spectra were generated within appropriate performance specifications. TCL compounds are identified and summarized in Appendix A of this report.

2.8 TENTATIVELY IDENTIFIED COMPOUNDS

Tentatively Identified Compounds (TICs) are summarized in data summary tables that are listed in Appendix B of this data validation report.

2.9 INTERNAL STANDARDS

Internal standards were generated within QC specifications for area and retention time with the exception of the following soil sample from SDG: S1.

Soil Sample	Compound	Area Count Recorded	QC Lower Limit
S4 Native	chlorobenzene	82100	88352

VOC data for soil sample S4 Native were qualified as estimated "J" for positive values and estimated "UJ" for non-detectable compounds (non-detects).

2.10 INITIAL AND CONTINUING CALIBRATION

Initial and continuing calibration was performed within acceptable limits for average Relative Response Factors (RRF), Percent Relative Standard Deviation (%RSD) and Percent Difference (%D) with the following exceptions:

SDG: MW2B

Initial Calibration

Date	Compound	Reported % RSD	Maximum QC % RSD
23/7/92	bromomethane	32.7	30.0
12/8/92-13/8/92	chloroethane	31.4	30.0

Continuing Calibration

Sample	Date	Compound	Reported % D	Max QC % D
MW5b	17/8/92	bromomethane	-28.3	25.0
		vinyl chloride	-35.6	25.0
		chloroethane	-28.5	25.0
		2-hexanone	27.5	25.0
MW1b	10/8/92	bromomethane	28.4	25.0
MW3a		carbon disulfide	-38.2	25.0
MW4b	13/8/92	bromomethane	36.5	25.0
		chloroethane	26.2	25.0
		acetone	26.8	25.0
		carbon disulfide	-43.0	25.0
		1,1-dichloroethane	-30.7	25.0
		1,2-dichloropropane	-31.9	25.0

SDG: S1

Initial Calibration

Date	Compound	Reported % RSD	Maximum QC % RSD
23/7/92	bromomethane	32.7	30.0
12/8/92-13/8/92	chloroethane	31.4	30.0

Continuing Calibration

Sample	Date	Compound	% D	Max QC % D
rinsate S1 Fill S1 Native S1 Native DL	17/8/92	bromomethane	-28.3	25.0
		vinyl chloride	-35.6	25.0
		chloroethane	-28.5	25.0
		2-hexanone	27.5	25.0
S2 Native S4 Native S5 Native	18/8/92	1,2-dichloropropane	-26.5	25.0
		cis-1,3-dichloropropene	-26.5	25.0
		4-methyl-2-pentanone	-29.6	25.0
		2-hexanone	-26.2	25.0
S2 Fill S4 Fill S6 Fill S6 Native	19/8/92	bromomethane	27.4	25.0
		carbon disulfide	-41.0	25.0
		1,1-dichloroethane	-28.2	25.0
		1,2-dichloropropane	-31.2	25.0
S1 Fill MLDL	17/8/92	chloroethane	27.2	25.0
S4 Native ML	19/8/92	chloroethane	31.1	25.0
T Blank	25/8/92	1,1,2,2-tetrachloroethane	28.4	25.0

SDG: MW2BW

Continuing Calibration

Sample	Date	Compound	% D	Max QC % D
MW-1B MW-2B MW-2BDL MW-3B MW-4A MW-4B MW-5B MW-6A MW-6B T Blank	24/8/92	chloroethane	29.2	25.0
MW-1A MW-2A MW-3A MW4ADL MW-5A MW-5BDL	25/8/92	1,1,2,2-tetrachloroethane	28.4	25.0

Samples affected by continuing calibration performance that fell outside acceptable QC limits for the above noted compounds were qualified as estimated, "J" for positive results and "UJ" for non-detects.

2.10.1 Field Duplicates

One set of field duplicate samples were taken for soil and water samples and analyzed for volatile organic compounds. Soil sample MW6b of SDG: MW2B is a field duplicate of sample S3 Native of SDG: S1. Water sample MW6B of SDG: MW2BW is a field duplicate of MW1B of the same SDG. VOCs were identified in each sample and the Relative Percent Difference (RPD) calculated as follows:

VOC	Soil Sample Concentration (μg/kg)		RPD
	MW6b	S3 Native	
acetone	5,000	6,100	20
1,2-dichloroethene (total)	5,200	3,300	45
2-butanone	8,100	7,900	2.5
trichloroethene	64,000	23,000	94
benzene	150(J)	76(J)	65
4-methyl-2-pentanone	8,100	8,300	2.4
toluene	29,000	10,000	97
ethyl benzene	4,800	1,900	87
total xylenes	68,000	17,000	120

The RPD measures the precision of chemical analyses from duplicate samples. The low RPD for 2-butanone and 4-methyl-2-pentanone indicates very high precision. The high RPD for trichloroethene, toluene, ethyl benzene and total xylenes indicates very low precision. The variability in the precision is most likely due to the variability in the distribution of the VOCs in the soil matrix and is not a true reflection of the precision of the analytical methodology. All of the VOCs that were identified in sample MW6b were also identified in sample S3 Native at concentrations that were within a factor of four times. The reported precision is considered acceptable given the heterogeneous nature of soil samples.

The RPDs for VOCs in the two water samples are much lower than for duplicate soils reflecting the more homogeneous matrix of water samples. The RPDs for water are acceptable.

VOC	Water Sample Concentration (μg/L)		RPD
	MW6B	MW1B	
1,1-Dichloroethane	3(J)	3(J)	0
1,2-Dichloroethene (total)	10	11	9.5
1,2-Dichloroethane	2(J)	2(J)	0

3 SEMI-VOLATILE ORGANIC COMPOUNDS

Semi-volatile organic compounds were analyzed using gas chromatography/mass spectrometry (GC/MS). The following items were reviewed:

- Traffic Reports and Laboratory Narratives
- Holding Times
- Surrogate Recovery
- Matrix Spikes/Matrix Spike Duplicates
- Blanks
- GC/MS Instrument Tuning
- Target Compound List (TCL) Analyte Identification
- Tentatively Identified Compounds
- Internal Standards
- Initial and Continuing Calibration
- Field Duplicates

3.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE

All traffic reports were present and complete. Soil samples contained less than 50% moisture. All samples were refrigerated in the field immediately after sampling and upon receipt at the laboratory. A laboratory or case narrative accompanied each sample delivery group (SDG) sample data package and is reproduced in Appendix I. Matrix interference was reported for some soil samples in SDG: MW2B and SDG: S1.

3.2 HOLDING TIMES

All holding times were compliant with ASP91 protocol. All samples were extracted within five days and analyzed within 40 days of sample collection.

3.3 SURROGATE RECOVERY

Surrogate recovery was generated within acceptable QC limits for nitrobenzene-d5, 2-fluorobiphenyl, terphenyl-d14, phenol-d5, 2-fluorophenol, 2,4,6-tribromophenol, 2-chlorophenol-d4, and 1,2-dichlorobenzene-d4 with the following exceptions:

SDG: MW2B

Soil Sample	Compound	Reported Recovery (%)	Required QC Recovery (%)
MW1b	2,4,6-tribromophenol	125	19-122
MW2bDL	2,4,6-tribromophenol	168	19-122
MW3a	2,4,6-tribromophenol	149	19-122
MW3aDL	2,4,6-tribromophenol	170	19-122

SDG: S1

Soil Sample	Compound	Reported Recovery (%)	Required QC Recovery (%)
S2 Native	2-fluorobiphenyl	24	30-115

SDG: MW2B

Water Sample	Compound	Reported Recovery (%)	Required QC Recovery (%)
MS Blank	2-chlorophenol-d4	124	33-110
MW1A	2,4,6-tribromophenol	136	10-123
	2-chlorophenol-d4	121	33-110
MW2B	2-chlorophenol-d4	112	33-110
MW3B	nitrobenzene-d5	34	35-114

Water Sample	Compound	Reported Recovery (%)	Required QC Recovery (%)
	2-fluorobiphenyl-d5	38	43-116
	terpheryl-d14	13	33-141
MW4B	2-chlorophenol-d4	116	33-110
MW2BMS	2-fluorophenol	119	21-110
	2-chlorophenol-d4	117	33-110
MW2BMSD	2-fluorophenol	112	21-110
	2-chlorophenol-d4	120	33-110
SBLK25	2-fluorophenol	118	21-110
	2-chlorophenol-d4	115	33-110

All base neutral and acid (BNA) extractable surrogate recoveries were greater than 10%. Only one surrogate compound recovery was outside QC limits for soil samples in SDG: MW2B and SDG: S1. Consequently no qualification of sample data was required.

Samples MW1a, MW2BMS, MW2BMSD, and SBLK25 in SDG: MW2BW contained two or more surrogate compounds within the acid fraction that had recoveries that exceeded QC limits. None of these samples contained detectable levels of acid fraction compounds, therefore no qualification of data was required. Surrogate recoveries for sample MW3b were below QC limits for 3 base/neutral surrogate compounds. There were no detectable levels of base/neutral compounds. Non-detects in MW3b were qualified as estimated "UJ".

3.4 MATRIX SPIKE/MATRIX SPIKE DUPLICATES (MS/MSD)

Matrix spike/matrix spike duplicates were generated within QC limits for percent recovery (%R) and Relative Percent Difference (RPD) with the following exceptions:

SDG: S1

Soil Sample	Compound	%R Reported for MS	%R Reported for MSD	%R Required QC limits	Reported RPD	Required QC RPD (upper limit)
S2 Fill	pentachlorophenol	0	0	17-109	0	47

SDG: MW2BW

Water Sample	Compound	%R Reported for MS	%R Reported for MSD	%R Required QC limits	Reported RPD	Required QC RPD (upper limit)
MW2B	N-nitroso-di-n-propylamine	198	106	41-116	61	38
	1,2,4-Trichlorobenzene	95	100	39-98	5	28
	4-chloro-3-methylphenol	103	98	23-97	5	42
	4-nitrophenol	166	166	10-80	0	50
	2,4-dinitrotoluene	114	117	24-96	3	38
	pentachlorophenol	160	160	9-103	0	50

Data were not qualified based on MS/MSD analyses because the above compounds that were outside QC limits were generally not detected in significant concentrations in soil or groundwater samples.

3.5 BLANKS

3.5.1 Field Blanks

One equipment rinsate blank (sample RINSATE) was analyzed for soil from SDG: S1, and one field blank (sample MW6A) was analyzed for water from SDG: MW2BW. The field blank did not contain any semi-volatile compounds at detectable levels from the TCL, but did contain detectable levels of tentatively identified compounds (TICs) including several unknown compounds and 2-cyclohexen-1-one at very low concentrations (less than 54μg/L).

The equipment rinsate blank contained very low concentrations of bis(2-ethylhexyl) phthalate (3μg/L) and 2-cyclohexen-1-one (3μg/L). No qualification of bis(2-ethylhexyl)phthalate was made to soil samples because of the very low level found in the blank.

2-cyclohexen-1-one was detected in most of the water samples as well as in some of the method blanks. The data for 2-cyclohexen-1-one was qualified as estimated "J".

3.5.2 Method Blank

A total of five method blanks were analyzed for soil samples from SDG: MW2B; three method blanks were analyzed for soil and water samples from SDG: S1 and two method blanks were analyzed for water from SDG: MW2BW. The following blanks contained detectable levels of TCL compounds:

SDG: MW2B

Blank	Associated Samples	Compound	Concentration
SBLK91	MW1b	diethylphthalate	44μg/Kg
	MW3a		
	MW3aDL		

SDG: S1

Blank	Associated Sample	Compound	Concentration
SBLK98Z	MSBlank	Bis(2-ethylhexyl)phthalate	15μg/Kg
	S2 Fill		
	S2 Native		
	S3 Fill		
	S3 Native		
	S4 Fill		
	S4 Native		
	S5 Fill		
	S5 Fill DL		
	S5 Fill RE		
	S5 Native		
	S6 Fill		
	S6 Fill RE		
	S6 Native		
	S2 Fill MS		
	S2 Fill MSD		
SBLK87	RINSATE	Bis(2-ethylhexyl)phthalate	0.6μg/L

Sample concentrations that exceeded the CRQL for Bis(2-ethylhexyl)phthalate and were greater than 10 times the blank concentration were unqualified. Sample concentrations that were less than the CRQL and less than 10 times the blank value were reported as the CRQL and qualified as not detected "U".

3.6 GC/MS INSTRUMENT TUNING

GC/MS instrument tuning was generated within QC criteria for decafluorotriphenylphosphine.

3.7 TARGET COMPOUND LIST (TCL) ANALYTE IDENTIFICATION

GC/MS results are acceptable for each SDG. Chromatographic performance showed some baseline instability for the medium to heavy polynuclear aromatic hydrocarbon (PAH) compounds in some soil samples from SDG: S1 and several water samples in MW2BW but performance was considered acceptable.

Retention times and mass spectra were generated within appropriate performance specifications. TCL compounds are identified and summarized in Appendix C of this report.

3.8 TENTATIVELY IDENTIFIED COMPOUNDS

Tentatively Identified Compounds are summarized in data summary tables that are listed in Appendix D of this report.

3.9 INTERNAL STANDARDS

Internal standards were generated within QC specifications for area and retention time with the exception of the following soil samples from SDG: S1.

Soil Sample	Standard	Area Count Recorded	QC Lower Limit
S6 Fill	perylene d-12	12,302	29,911
S5 Fill	1,4dichlorobenzene d-4	968	8495
	naphthalene d-8	14,608	29,346

Soil Sample	Standard	Area Count Recorded	QC Lower Limit
	acenaphthene d-10	10,820	16,717
	perylene d-12	8451	31,478
S6 Fill RE	perylene d-12	30,124	31,478
S5 Fill RE	1,4 dichlorobenzene d-4	8976	11,543
	naphthalene d-8	32,300	37,433
	acenaphthene d-10	15,158	20,091
	perylene d-12	17392	36,590

Internal standard areas that were outside QC limits were all below the lower limit. All positive semi-volatile compounds were qualified as estimated "J" and all non-detects, with the exception of sample S5 Fill, were qualified as estimated "UJ". Non-detects for sample S5 Fill were qualified as unusable "R" because of the extremely low area count for 1,4dichlorobenzene d-4.

3.10 INITIAL AND CONTINUING CALIBRATION

Initial and continuing calibration was performed within acceptable limits for average Relative Response Factors (RRF), Percent Relative Standard Deviation (%RSD), and Percent Difference (%D) with the following exceptions.

SDG: MW2B

Continuing Calibration

Sample	Date	Compound	%D	Max QC %D
MW2bDL	20/8/92	2,4-dinitrophenol	25.3	25
		pentachorophenol	34.5	25
MW5b	31/8/92	2,4-dinitrophenol	27.9	25
MW6b	1/9/92	2,4-dinitrophenol	34.4	25

Sample	Date	Compound	%D	Max QC %D
		indeno(1,2,3-cd)pyrene	-26.8	25
MW6b	2/9/92	2,4-dinitrophenol	33.9	25
		4-nitrophenol	34.8	25
		4,6-dinitro-2-methylphenol	33.7	25
		butylbenzylphthalate	25.1	25
		indeno(1,2,3-cd)pyrene	-26.0	25
MW1b	25/8/92	2,2-oxybis(1-chloropropane)	-51.1	25
MW3a		hexachlorocyclopentadiene	43.0	25
MW3aDL		benzo(k)fluoranthene	-30.1	25

SDG: S1

Continuing Calibration

Sample	Date	Compound	Reported %D	Maximum QC %D
S1 Fill S1 Native	1/9/92	indeno(1,2,3-cd)pyrene	-26.8	25
RINSATE	23/8/92	hexachlorocyclopentadiene	34.4	25
	24/8/92	hexachlorocyclopentadiene	37.0	25
		benzo(k)fluoranthene	-28.6	25
MS Blank S2 Fill S2 Fill MSD	3/9/92	2,4-dinitrophenol	30.2	25
S5 Fill S6 Fill RE	5/9/92	phenol	-32.1	25
		bis(2-chloroethyl)ether	-26.6	25
S5 Fill DL S5 Fill RE	7/9/92	phenol	-25.3	25
		benzo(g,h,i)perylene	-28.3	25

SDG: MW2BW

Initial Calibration

Date	Compound	Reported %RSD	Maximum QC %RSD
1/9/92	2,4-dinitrophenol	43.8	30
	4,6-dinitro-2-methylphenol	30.9	30

Continuing Calibration

Sample	Date	Compound	Reported %D	Maximum QC %D
MW2B	29/8/92	2,4-dinitrophenol	52.7	25
MW2BMS MW2BMSD		4-nitrophenol	41.8	25
		4,6-dinitro-2-methylphenol	40.6	25
		pentachlorophenol	34.0	25
		pyrene	29.0	25
		benzo(b)fluoranthene	-26.9	25
MSBlank	1/9/92	2,4-dinitrophenol	44.2	25
MW1A		4,6-dinitro-2-methylphenol	30.8	25
MW2A MW3A MW3B MW4B		pentachlorophenol	35.6	25
MW1B MW4A MW5A MW5B MW6A MW6B	31/8/92	2,4-dinitrophenol	27.1	25

No positive values were reported for those compounds that were outside QC limits for %RSD during initial calibration. Positive values and non-detects for those compounds that were outside QC limits for %RSD for continuing calibration were qualified as estimated "J".

3.11 FIELD DUPLICATES

Soil sample MW6b of SDG: MW2B is a field duplicate of soil sample S3 Native of SDG: S1. Bis(2-ethylhexyl)phthalate was the only semi-volatile compound that exceeded CRQL in sample MW6b. Bis(2-ethylhexyl)phthalate was quantified at less than the CRQL in S3 Native. No other semi-volatile compounds were positively identified in sample S3 Native. A meaningful calculation of the precision of the data for both field soil samples using Relative Percent Difference (RPD) cannot be made because all of the analytes are at or below CRQL.

Water samples MW6B and MW1B of SDG: MW2BW are field duplicates. Bis(2-ethylhexyl)phthalate was the only semi-volatile compound detected in either sample at concentrations below the CRQL. No assessment of analytical precision could be made because all the analytes are at or below CRQL.

4 PESTICIDES/PCBs

Pesticides/PCBs were analyzed using gas chromatography (GC). The following items were reviewed:

- Traffic Reports and Laboratory Narrative
- Holding Times
- Surrogate Recovery
- Matrix Spikes/Matrix Spike Duplicates
- Blanks
- Calibration and Instrument Performance
- Target Compound List Analyte Identification
- Field Duplicates

4.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE

All traffic reports were present and complete. Soil samples contained less than 50% moisture. All samples were refrigerated in the field immediately after sampling and upon receipt at the laboratory. A laboratory or case narrative accompanied each sample delivery group sample data package and is reproduced in Appendix I.

4.2 HOLDING TIMES

All holding times were compliant with ASP91 protocols. All samples were extracted within 7 days and analyzed within 40 days of the date of collection. During the re-analysis of sample MW5B, the holding time for extraction was exceeded and the data was qualified as unusable "R". The sample location was resampled on October 21, 1992 and reanalyzed. Holding times were compliant with ASP91 protocols during the resampling and re-analysis.

4.3 SURROGATE RECOVERY

Surrogate recovery was generated within acceptable limits for approximately 75% of the surrogate recovery for tetrachloro-m-xylene (TCX) and decachlorobiphenyl (DCB). The following surrogate recoveries were outside QC limits.

SDG: MW2B

Soil Sample	Compound	GC Column Number	Reported Recovery (%)	Required QC Recovery (%)
PBLK72	DCB	1	154	60-150
PBLK83	TCX	1	154	60-150
	TCX	2	166	60-150
	DCB	1	155	60-150
	DCB	2	156	60-150
MW1b	DCB	1	1615	60-150
MW3a	DCB	1	1052	60-150
MW5b	TCX	2	154	60-150
	DCB	1	475	60-150
	DCB	2	152	60-150
MW6b	DCB	1	375	60-150

SDG: S1

Soil Sample	Compound	GC Column Number	Reported Recovery (%)	Required QC Recovery (%)
S4 Fill	TCX	1	170	60-150
	TCX	2	186	60-150
	DCB	1	198	60-150
	DCB	2	200	60-150
S4 Native	TCX	1	175	60-150

Soil Sample	Compound	GC Column Number	Reported Recovery (%)	Required QC Recovery (%)
	TCX	2	204	60-150
	DCB	1	190	60-150
	DCB	2	193	60-150
S5 Fill	DCB	1	428	60-150
	DCB	2	175	60-150
S5 Native	TCX	1	226	60-150
	TCX	2	248	60-150
	DCB	1	244	60-150
	DCB	2	212	60-150
S6 Fill	TCX	1	171	60-150
	TCX	2	175	60-150
	DCB	1	202	60-150
	DCB	2	168	60-150
S6 Native	TCX	1	156	60-150
	TCX	2	186	60-150
	DCB	1	162	60-150
	DCB	2	171	60-150

SDG: MW2BW

Water Sample

Soil Sample	Compound	GC Column Number	Reported Recovery (%)	Required QC Recovery (%)
PBLK 95	TCX	1	44	60-150
PBLK 96	TCX	1	28	60-150
	TCX	2	24	60-150
MW1A	DCB	1	54	60-150

Soil Sample	Compound	GC Column Number	Reported Recovery (%)	Required QC Recovery (%)
	DCB	2	52	60-150
MW4A	DCB	2	56	60-150
MW4B	TCX	1	56	60-150
MW5A	DCB	1	55	60-150
	DCB	2	50	60-150
MW6A	TCX	1	50	60-150
	DCB	1	41	60-150
	DCB	2	37	60-150
MW2BMSD	TCX	1	37	60-150
	TCX	2	45	60-150
	DCB	1	56	60-150
	DCB	2	52	60-150

Positive pesticide results for sample MW5B from SDG: MW2B were qualified as unusable "R" because the sample was spiked with EPA CLP compounds in the lab. Positive results for sample S6 Fill in SDG: S1 were qualified as estimated "J" because surrogate recoveries for both compounds exceeded QC limits.

Results for sample MW6A in SDG: MW2BW were all below detection. Non-detects were qualified as estimated "UJ" because both surrogate recoveries were below QC limits.

4.4 MATRIX SPIKES/MATRIX SPIKE DUPLICATES

Matrix spikes/matrix spike duplicates were generated within QC limits for percent recovery (%R) and (Relative Percent Difference) RPD for soil samples in SDG: S1. MS/MSDS for water samples in SDG: MW2BW were outside QC limits for %R for one compound and for RPD for all compounds as follows.

SDG: S1

Compound	%R Reported MS	%R Reported MSD	%R QC Limits	Reported RPD	QC RPD Upper Limit
gamma-BHC (lindane)		53	56-123	60	15
heptachlor				58	20
aldrin				57	22
dieldrin				56	18
endrin				57	21
4,4^1-DDT				60	27

The data generated for pesticides in water were not qualified based on the MS/MSDS because none of the pesticide compounds were detected in any of the samples.

4.5 BLANKS

4.5.1 Field Blanks

One field blank (sample MW6A) was analyzed for water from SDG: MW2BW. The field blank did not contain any detectable levels of pesticides or PCBs.

4.5.2 Blanks

A total of five method blanks were analyzed for soil samples from SDG: MW2B; two method blanks were analyzed for soil samples from SDG: S1; and two method blanks were analyzed for water samples from SDG: MW2BW. None of the method blanks contained any detectable levels of pesticides or PCBs.

Instrument blanks were run every 12 hours following initial calibration. None of the instrument blanks contained detectable levels of pesticides or PCBs.

4.6 CALIBRATION AND INSTRUMENT PERFORMANCE

Standard retention times for pesticides and arochlors were generated within QC limits. Linearity criteria for individual standards were generated within QC limits with the following exceptions.

Soil Sample

GC Column	Compound	Reported %RSD	QC Required % RSD
SDG:MW2B			
DB608	4,4'-DDD	26.8	20
DB1701	alpha-BHC	20.4	20
	delta-BHC	23.2	20
SDG: S1			
DB1701	delta-BHC	24.7	20
	4,4'-DDT	24.9	20
SDG: MW2BW			
DB1701	delta-BHC	24.7	20
	4,4'-DDT	24.9	20

Pesticide data for those analytes that were outside QC limits was qualified as estimated "J". Peak resolution for both columns was generated within QC limits. PEM calibration standards generated amounts within QC limits for RPD with the following exception.

SDG: MW2B

Standard Sample No.	Compound	Reported RPD	QC RPD
PEM 07	beta-BHC	30.0	25.0
	endrin	84.0	25.0
	4,4'-DDT	43.0	25.0
	methoxychlor	46.4	25.0

Data was not qualified because the standard was run at the very end of the analytical sequence. Percent breakdown for 4,4'-DDT and endrin and the combined breakdown for 4,4'-DDT + endrin were generated within QC limits.

Retention times for compounds in individual mixtures were generated within QC limits. Analytical sequence was correctly followed. Percent recoveries of pesticide and surrogate compounds for florisil cartridge check and GPC calibration were generated within QC limits.

4.7 TARGET COMPOUND LIST

GC results are acceptable for each SDG with the exceptions discussed below. Retention times were generated within QC limits for both columns with the following exceptions:

SDG: MW2B

Sample No.	Analyte	Reported %D	QC %D
MW6b	Aroclor 1260	34.6	25

SDG: S1

Sample No.	Analyte	Reported %D	QC %D
S5 Fill	Endosulfan II	621.9	25
	4,4'-DDT	37.7	25
	Endrin aldehyde	999.9	25
	Alpha-chlordane	626.4	25
S1 Fill	Aroclor 1242	51.5	25
S2 Fill	Aroclor 1260	28.1	25
S4 Fill	Aroclor 1260	27.3	25
S6 Fill	Aroclor 1242	53.8	25

Matrix interference was attributed to the exceedances of QC limits for MW6B, S5 Fill (4,4'-DDT), S1 Fill and S6 Fill. These data were not qualified. Data for endosulfan II, endrin aldehyde and alpha-chlordane in sample S5 Fill were qualified as unusable "R". Data for 4,4'-DDT from the same sample was unqualified because of matrix interference. Data for Arochlor 1260 from sample S4 Fill was qualified as estimated "J". TCL compounds are identified and summarized in Appendix E of this report.

4.8 FIELD DUPLICATES

Soil sample MW6b of SDG: MW2B is a duplicate of sample S3 Native of SDG: S1. Pesticides and PCBs were below detection for all compounds in sample S3 Native. MW6b contained Arochlor 1260 at a concentration of 52μg/Kg, just above the CRQL of 42μg/Kg. The occurrence of a low level of Arochlor 1260 in one field duplicate and a non-detectable level of the same compound in the other field duplicate is acceptable given the heterogeneity of soil samples.

Duplicate water samples did not contain any detectable levels of pesticides or PCBs.

5 INORGANIC ANALYSES

Metals were analyzed using inductively coupled plasma spectrophotometry (ICP) and flame and furnace atomic absorption (AA). Mercury and cyanide were analyzed by cold vapour extraction AA and distillation/colorimetry respectively.

The following items were reviewed:

- Traffic Reports and Laboratory Narrative
- Holding Times
- Calibration
- Blanks
- ICP Interference Check
- Spike Sample Recovery
- Laboratory Duplicates
- Field Duplicates
- Laboratory Control Sample
- ICP Serial Dilutions
- Method of Standard Addition
- Field Blank
- Verification of Instrument Parameters

5.1 TRAFFIC REPORTS AND LABORATORY NARRATIVE

All traffic reports were present and complete. All laboratory or case narrative accompanied each sample delivery group (SDG) sample data package.

5.2 HOLDING TIMES

All holding times for metals were compliant with ASP91 protocols. Distillation for cyanide for samples S4 Native, S5 Native, and S5 Fill from SDG: S1 exceeded QC holding times. Resampling of soil at those locations was conducted and the samples were re-submitted for laboratory analysis. Holding times for these samples were compliant with ASP91 protocols.

5.3 CALIBRATION

Calibration was completed with the required number of calibration points for ICP, Flame AA, Furnace AA and mercury and cyanide analysis. Correlation coefficients are greater than 0.995 for mercury, cyanide, and AA analysis. All calibration standards are within control limits for metals, mercury, and cyanide for %R. Continuing calibration was performed at a frequency within QC limits.

Appropriate Contract Required Detection Limit (CRDL) standards were run for ICP and AA, and at the contract required frequency. CRDL standard recoveries were within QC limits for %R with the following exceptions.

SDG: MW2B

Metal	Analytical Method	Reported %R	QC Required %R
aluminum	AA	135	80-120
chromium	AA	20	80-120
lead	AA	66.7	80-120
cadmium	ICP	121	80-120
copper	AA	240	80-120
lead	AA	66.7	80-120
nickel	ICP	65.8	80-120
	ICP	61.1	80-120
lead	AA	66.7	80-120

SDG: S1

Metal	Analytical Method	Reported %R	QC Required %R
aluminum	AA	135	80-120
chromium	AA	20	80-120
lead	AA	66.7	80-120
nickel	ICP	65.8	80-120
	ICP	61.1	80-120
antimony	ICP	150.5	80-120
chromium	AA	130	80-120
copper	AA	70	80-120
lead	AA	66.7	80-120
lead	ICP	137	80-120

SDG: MW2BW

Metal	Analytical Method	Reported %R	QC Required %R
chromium	AA	130	80-120
lead	AA	66.7	80-120
lead	AA	133.3	80-120

Aluminum, cadmium, copper and nickel data for SDG: MW2B; aluminum, nickel, antimony, chromium and copper data for SDG: S1; and chromium data for SDG: MW2BW were qualified as estimated "J" because the reported %R was within 25% of upper and lower QC limits. Chromium data for SDG: MW2B and SDG: S1 were rejected and qualified as "R" because of the extremely low %R.

Reported %R for lead was generated outside QC limits using flame AA and ICP. Lead data was reported using furnace AA. Calibration for furnace AA was within QC limits. Consequently lead data was not qualified.

5.4 BLANKS

Initial and continuing calibration blanks were analyzed at the contract required frequency. Calibration blanks were within QC limits with the exception of the following.

SDG: MW2B

Metal	Concentration (μg/L)	CRDL (μg/L)
iron	38.5	30.0
manganese	5.7	5.0
iron	36.4	30.0
manganese	6.8	5.0

SDG: S1

Metal	Concentration (μg/L)	CRDL (μg/L)
antimony	55.1	50.0
manganese	6.8	5.0
iron	34.2	30
	42.5	30
antimony	88.0	50
	59.9	50
iron	41.5	30

SDG: MW2BW

Metal	Concentration (μg/L)	CRDL (μg/L)
iron	45.8	30
	43.5	30

No qualification of data was required because concentrations of these elements in the samples were greater than the concentration in the calibration blank.

Preparation blanks were analyzed for each SDG and for both AA and ICP on the same analyte. Preparation blank values are within QC limits.

5.5 ICP INTERFERENCE CHECK

ICP interference checks were run at the contract required frequency. All interference check sample recoveries were generated within QC limits.

5.6 SPIKE SAMPLE RECOVERY

Spike sample recovery was not analyzed for samples from SDG: MW2B as per the QA/QC protocol accepted by NYSDEC in the letter dated July 14, 1992 attached in Appendix F.

Spike sample recovery was generated within QC limits with the following exceptions.

SDG: S1

Analyte	Reported %R	QC Required %R
antimony	437.1	75-125
copper	59.6	75-125
manganese	261.9	75-125
nickel	38.8	75-125
selenium	0	75-125
zinc	-43.3	75-125

SDG: MW2BW

Analyte	Reported %R	QC Required %R
cadmium	126	75-125
mercury	70.6	75-125

Analyte	Reported %R	QC Required %R
silver	22.5	75-125
thallium	136.0	75-125

Copper and manganese data from SDG: S1 were not qualified because the sample concentration was greater than four times the spike concentration. The data for the remaining metals was qualified as "N". In addition, other qualifiers were also added. Antimony data from SDG: S1 was rejected and qualified "R" because %R exceeded 200%. Nickel data from SDG: S1 was qualified as estimated "J". Selenium and zinc data from SDG: S1 were rejected and qualified as "R" because %R was less than 10%.

Silver data from SDG: MW2BW was rejected and qualified as "R" because %R was less than 30%. Mercury data from SDG: MW2BW was qualified as estimated "J". Thallium and cadmium data from SDG: MW2BW that exceeded CRDL was qualified as estimated "J".

5.7 LABORATORY DUPLICATES

Laboratory duplicates were not analyzed for samples from SDG: MW2B (see comments Section 5.6). RPD for laboratory duplicates were generated within QC limits with the following exceptions.

SDG: S1 - Sample S2F

Analyte	Reported RPD	QC Required RPD
chromium	24.3	20
cobalt	77.0	20
copper	99.3	20
nickel	82.7	20
zinc	25.0	20

SDG: MW2BW - Sample SB

Analyte	Reported RPD	QC Required RPD
chromium	200	20
zinc	29.8	20

Sample data for metals generated outside QC limits were flagged with *. In addition, the data for copper, nickel and zinc from SDG: S1 was qualified as estimated "J" because the difference between the sample and the duplicate was greater than 2 times the CRDL.

5.8 FIELD DUPLICATES

Soil sample MW6B of SDG: MW2B is a field duplicate of soil sample S3 Native of SDG: S1. The RPDs of the inorganic analyses for the two samples are provided as follows:

Analyte	Sample MW6B Concentration (mg/Kg)	Sample S3 Native Concentration (mg/Kg)	RPD
Aluminum	15,600	13,700	13
Antimony	1.2(U)	63.0	192
Arsenic	4.4	17.8	121
Barium	97.7	60.4	47
Beryllium	1.3(U)	1.3(U)	N.C.
Cadmium	1.3(U)	1.3(U)	N.C.
Calcium	57,000	56,200	1.4
Chromium	26.8	24.0	11
Cobalt	14.7	12.3	18
Copper	30.6	33.7	10
Iron	28,300	27,900	14
Lead	30.7	13.2	73
Magnesium	11,100	10,700	37

Analyte	Sample MW6B Concentration (mg/Kg)	Sample S3 Native Concentration (mg/Kg)	RPD
Manganese	666	573	1
Mercury	0.12(U)	0.12(U)	0
Nickel	30.6	32.2	5
Potassium	3,420	2,330	38
Selenium	1.2(U)	1.3(U)	N.C.
Silver	0.24(U)	2.6(U)	N.C.
Sodium	404	378	7
Thallium	1.2(U)	1.3(U)	N.C.
Vanadium	31.2	27.4	13
Zinc	93.8	71.7	27
Cyanide	1.6(U)	1.6(U)	N.C.

(U) = not detected

N.C. = not calculated

The highest RPD is associated with the antimony analysis. The antimony data from sample S3 Native was rejected as unusable because spike sample recovery was less than 10% (see Section 5.6). The RPDs for the remaining analytes are acceptable given the heterogeneous nature of the soil and the random distribution of elements within soil materials and constituents

Water Sample

Water samples MW6B and MW1B of SDG: MW2BW are field duplicates. RPDs were calculated for dissolved inorganic analyses for the two samples as follows:

Analyte	Sample MW6B Concentration (μg/L)	Sample MW1B Concentration (μg/L)	RPD
Aluminum	60.0(U)	60.0(U)	N.C.
Antimony	5.0(U,W)	5.0(U,W)	N.C.
Arsenic	5.0(U,W)	5.0(U)	N.C.
Barium	240	249	4
Beryllium	5.0(U,W)	5.0(U)	N.C.
Cadmium	5.0(U,W)	5.0(U)	N.C.
Calcium	134,000(B)	136,000(B)	1
Chromium	10.0(U,J)	10.0(U,J)	N.C.
Cobalt	20.0(U,J)	20.0(U,J)	N.C.
Copper	10.0(U,J)	10.0(U,J)	N.C.
Iron	798	830	4
Lead	3.0(U,J)	3.0(U)	N.C.
Magnesium	66,300(J,E)	68,800(J,E)	4
Manganese	154	162	5
Mercury	0.20(U)	0.20(U)	N.C.
Nickel	30.0(U)	30.0(U)	N.C.
Potassium	3830(B)	3850(B)	1
Selenium	5.0(U,W)	5.0(U,W)	N.C.
Silver	10.0(U)	10.0(U)	N.C.
Sodium	43,500(J,E)	43,800(J,E)	1
Thallium	5.0(U,W)	5.0(U,W)	N.C.
Vanadium	20.0 (U)	20.0(U)	N.C.
Zinc	47.0	36.0	13
Cyanide	(NA)	(NA)	N.C.

RPDs were calculated for those analytes that were detected. The highest RPD was 13 for zinc but generally RPDs were less than or equal to 5 which indicates acceptable analytical precision.

5.9 LABORATORY CONTROL SAMPLE

All laboratory control samples for aqueous and solid matrices were within QC limits for %R.

5.10 ICP SERIAL DILUTIONS

ICP serial dilutions are within QC limits for %D when initial concentrations are equal to or greater than 50 times instrument detection limit (IDL) with the following exceptions.

SDG: MW2B		SDG: MWS1		SDG: MW2BW	
Analyte	**%D**	**Analyte**	**%D**	**Analyte**	**%D**
calcium	16.6	aluminum	10.2	magnesium	13.3
iron	14.7	manganese	11.7	sodium	16.1
manganese	13.9				

Analytes outside QC limits were flagged as "E", and analyte concentrations were qualified as estimated "J".

5.11 METHOD OF STANDARD ADDITION

Method of standard addition was performed for lead and was within QC limits for correlation coefficient (r) with the following exceptions.

SDG: MW2B		SDG: S1		SDG: MW2BW	
Sample	**Reported r**	**Sample**	**Reported r**	**Sample**	**Reported r**
MW6B	0.3433	S5 Native	0.8268	MW3B	0.9898
		S5 Native	0.9841	MW3B	0.9937
		S6 Fill	0.9878	MW5B	0.9701
		S6 Fill	0.9930	MW5B	0.9821

Lead data was rejected and qualified as "R" for r values less than 0.990. Lead data was qualified as estimated "J" for r values less than 0.995 but greater than 0.990.

5.12 FIELD BLANK

Field blanks included an equipment rinsate blank (sample RINSATE) for soil from SDG: S1 and a field blank (sample MW6A) for water from SDG: MW2BW. The equipment rinsate blank contained low levels of cadmium (8.2μg/L), lead (48μg/L) and zinc (33μg/L). No qualification of soil data was made because of the low levels in the rinsate blank.

The field blank contained non-detectable levels of dissolved inorganic analytes with the exception of antimony. Antimony was detected at a concentration above the instrument detection limit but less than the CRDL. Antimony was out of QC control limits for post digestion spike recovery and had low sample absorbency. Consequently no qualification of aqueous inorganic data was made on the basis of the field blank data.

5.13 VERIFICATION OF INSTRUMENT PARAMETERS

Instrument detection limits, ICP interelement correction factors and ICP linear ranges were provided.

Instrument detection limits (IDLs) were below CRDLs with the exception of lead analyzed using ICP. Where the reported value of lead was less than five times the IDL for ICP, the data was qualified as estimated "J".

5.14 TARGET COMPOUND LIST

Inorganic analyses are acceptable for each SDG, subject to the qualifications discussed in the previous sections. TCL compounds are identified and summarized in Appendix G.

6 DIOXINS AND FURANS

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans were analyzed in one soil sample (S1 Fill) from SDG: S1 using gas chromatography/mass spectrometry (GC/MS) following U.S. EPA Method 8280.

The sample was extracted and analyzed within required QC holding times. Surrogate recovery for 2,3,7,8-tetrachloro dibenzo-p-dioxin; 1,2,3,4,7,8-hexachloro dibenzo-p-dioxin; and 1,2,3,4,6,7,8,9-octochloro dibenzo-p-dioxin ranged from 56 to 68% in the method blank and 36 to 157% in the sample. The surrogate recovery is considered acceptable.

No dioxins or furans were detected in the process blank.

GC/MS results are acceptable. Chromatograms show baseline stability, and acceptable peak shape and resolution. The sample mass spectrum correlates well with the standard mass spectrum. Dioxin and furan compounds are identified and summarized in Appendix H of this report.

APPENDIX A

Volatile Organic Compounds

SDG: MW2B
S1
MW2BW

LIST OF QUALIFIERS

B_1	Compound found in blank. (Organic analyses only.)
B_2	Value greater than or equal to the instrument detection limit but less than contract required detection limit. (Inorganic analyses only.)
D	Diluted.
E_1	Concentrations exceed calibration range of instrument. (Organic analyses only.)
E_2	Estimated value due to interference effects. (Inorganic analyses only.)
F	Fill sample.
J	Estimated value. Value is greater than zero but below quantitation.
M	Medium level contamination.
N_1	Native soil sample. (Organic analyses only.)
N_2	Spike sample recovery is not within control limits. (Inorganic anlyses only).
P	Greater than 25% difference for detected concentrations between 2 GC columns.
R	Data unusable.
nd	CRQL (Organic analyses only.)
nd	CRDL (Inorganic analyses only.)
RE	Sample reanalyzed.
RS	Resampled.
S	Value determined by Method of Standard Addition.
W	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
*	Duplicate analysis is not within control limits.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Volatile Analyses (µg/kg or ppb) SOIL

		MW1B	MW2B	MW3A	MW4B	MW5B	MW6B	MW6BD(5x)
1	Chloromethane	nd	nd	nd	nd	nd	nd	nd
2	Bromomethane	nd J	nd	nd J	nd J	nd J	nd	nd
3	Vinyl Chloride	nd	nd	nd	nd	nd J	nd	nd
4	Chloroethane	nd	nd	nd	nd J	nd J	nd	nd
5	Methylene Chloride	nd	nd	nd	nd	nd	nd	nd
6	Acetone	28	48 J	nd	26 J	nd	5,000	6,300 J
7	Carbon Disulfide	nd J	nd	nd J	nd J	nd	nd	nd
8	1,1-Dichloroethene	nd	nd	nd	nd	nd	nd	nd
9	1,1-Dichloroethane	nd	45 J	nd	2 J	nd	nd	nd
10	1,2-Dichloroethene (total)	nd	nd	nd	29	nd	5,200	5,300 J
11	Chloroform	nd	nd	nd	nd	nd	nd	nd
12	1,2-Dichloroethane	nd	nd	nd	nd	nd	nd	nd
13	2-Butanone	nd	nd	nd	nd	nd	8,100 B	7,500 B
14	1,1,1-Trichloroethane	nd	39 J	nd	3 J	nd	68,000	64,000
15	Carbon Tetrachloride	nd	nd	nd	nd	nd	nd	nd
16	Bromodichloromethane	nd	nd	nd	nd	nd	nd	nd
17	1,2-Dichloropropane	nd	nd	nd	nd J	nd	nd	nd
18	cis-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd
19	Trichloroethene	nd	nd	2 J	18	nd	nd	nd
20	Dibromochloromethane	nd	nd	nd	nd	nd	nd	nd
21	1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	nd

Volatile Analyses (μg/kg or ppb) SOIL

		MW1B	MW2B	MW3A	MW4B	MW5B	MW6B	MW6BD(5x)
22	Benzene	nd	nd	nd	nd	nd	150 J	nd
23	trans-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd
24	Bromoform	nd	nd	nd	nd	nd	nd	nd
25	4-Methyl-2-Pentanone	nd	nd	nd	nd	nd	8,100	8,100
26	2-Hexanone	nd	nd	nd	nd	nd J	nd	nd
27	Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd
28	1,1,2,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	nd
29	Toluene	nd	nd	nd	nd	nd	30,000 B	29,000
30	Chlorobenzene	nd	nd	nd	nd	nd	nd	nd
31	Ethylbenzene	nd	370	nd	nd	nd	4,800	4,500 J
32	Styrene	nd	nd	nd	nd	nd	nd	nd
33	Total Xylenes	nd	1,200	nd	nd	nd	42,000	68,000

J	Estimated value. Value is greater than zero but below quantitation.
B	Compound found in blank.
D	Diluted.

Volatile Analyses (μg/kg or ppb) SOIL

		S1(F)	S1(F)(M)	S1(F)(M)D 10X	S1(N)	S1(N)D	S2(F)	S2(N)	S3(F)	S3(F)D	S3(N)(M)	S4(F)	S4(N)	S4(N)(M)	S5(F)(M)	S5(N)	S6(F)	S6(N)
1	Chloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
2	Bromomethane	nd J	nd	nd	nd J	nd J	nd J	nd	nd	nd	nd	nd J	nd J	nd	nd	nd	nd	nd
3	Vinyl Chloride	400 J	nd	nd	4 J	nd J	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
4	Chloroethane	nd J	nd	nd J	nd J	nd J	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
5	Methylene Chloride	nd	nd	nd	0.8 J	nd	nd	nd	nd	nd	nd	0.9 J	1 J	nd	nd	nd	1 J	nd
6	Acetone	170	nd	nd	nd	nd	nd B	nd	40 J	80 D,J	6100	nd B	19 J	nd	nd	10 J	45 B	15 B
7	Carbon Disulfide	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd J	nd J	nd	nd	nd	nd	nd
8	1,1-Dichloroethene	120	60 J	nd	nd	nd	nd J	nd	nd	nd	nd	nd	6 J	nd	nd	nd	nd	nd
9	1,1-Dichloroethane	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd J	nd J	nd	nd	nd	nd	nd
10	1,2-Dichloroethene (total)	37,000 E	26,000 J	24,000	360 E	360	nd	nd	560 E	820 D	3300	9 J	1700 E,J	1300 J	560 J	20	nd	30
11	Chloroform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
12	1,2-Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
13	2-Butanone	88	nd B	nd	nd	nd	nd	nd	9 J	nd	7900 B	nd	nd J	nd B	nd B	nd	nd	nd
14	1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
15	Carbon Tetrachloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
16	Bromodichloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
17	1,2-Dichloropropane	nd	nd	nd	nd	nd	nd J	nd J	nd	nd	nd	nd J	nd J	nd	nd	nd	nd	nd
18	cis-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd J	nd	nd	nd J	nd	nd
19	Trichloroethene	31,000 E	300,000 E,J	290,000	400 E	560	1 J	1 J	2 J	nd	23,000	23	5900 E,J	23,000	17,000	99	2 J	8 J
20	Dibromochloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
21	1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
22	Benzene	140	120 J	nd	1 J	nd	nd	nd	3 J	5 D,J	76 J	nd	25 J	nd	nd	nd	nd	nd
23	trans-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
24	Bromoform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
25	4-Methyl-2-Pentanone	210	110 J	nd	nd	nd	nd	nd	nd	nd	8300	nd	nd J	nd	nd	nd	nd	nd

Volatile Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(F)(M)	S1(F)(M)D 10X	S1(N)	S1(N)D	S2(F)	S2(N)	S3(F)	S3(F)D	S3(N)(M)	S4(F)	S4(N)	S4(N)(M)	S5(F)(M)	S5(N)	S6(F)	S6(N)
26	2-Hexanone	12 J	nd	nd	nd J	nd J	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
27	Tetrachloroethene	44 J	240 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	2 J	nd	nd	nd	nd	nd
28	1,1,2,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
29	Toluene	16,000 E	84,000 B,E,J	63,000	4 J	16 J	nd	nd	94	170 D	10,000 B	nd	34 J	49 J	nd B	nd	nd	nd
30	Chlorobenzene	15 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1 J	nd	nd	nd	nd	nd
31	Ethylbenzene	16,000 E	90,000 E,J	53,000	7 J	39 J	nd	nd	140	270 D	1900	7 J	120 J	500 J	120 J	nd	nd	nd
32	Styrene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd
33	Total Xylenes	58,000 E	400,000 E,J	339,000	16	110	nd	nd	330	640 D	17,000	4 J	150 J	590 J	800 J	nd	nd	nd

F	Fill sample.
N	Native soil sample.
J	Estimated value. Value is greater than zero but below quantitation.
B	Compound found in blank.
D	Diluted.
M	Medium level contamination.

Volatile Analyses (µg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW2BD (20x)	MW3A	MW3B	MW4A	MW4AD (2.0x)	MW4B	MW5A	MW5B	MW5BD (20x)	MW6A	MW6 B
1	Chloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	Bromomethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	Vinyl Chloride	2 J	nd	nd	66	90 J	nd	5 J	13	11 J	26	1300	75	66 J	nd	nd
4	Chloroethane	nd	nd J	nd	nd J	nd J	nd	nd J	nd J	nd	nd J	nd	nd J	nd	nd	nd
5	Methylene Chloride	nd	nd	0.9 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14	nd
7	Carbon Disulfide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	1,1-Dichloroethene	nd	nd	nd	6 J	nd	nd	nd	0.8 J	nd	2 J	nd	2 J	nd	nd	nd
9	1,1-Dichloroethane	2 J	3 J	3 J	nd	nd	nd	nd	2 J	2 J	10	nd	3 J	nd	nd	3 J
10	1,2-Dichloroethene (total)	14	10	nd	270 E	2300	nd	18	270 E	230	130	1900	760 E	520	0.9 J	11
11	Chloroform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	4 J	nd
12	1,2-Dichloroethane	nd	2 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	2 J
13	2-Butanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
14	1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	Carbon Tetrachloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Bromodichloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1 J	nd
17	1,2-Dichloropropane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	cis-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
19	Trichloroethene	nd	nd	nd	920 E	670	4 J	nd	3 J	3 J	5 J	nd	71	43 J	nd	nd
20	Dibromochloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.8 J	nd
21	1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Benzene	nd	nd	nd	1 J	nd	nd	0.6 J	nd	nd	nd	nd	nd	nd	nd	nd
23	trans-1,3-dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
24	Bromoform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
25	4-Methyl-2-Pentanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
26	2-Hexanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Volatile Analyses (µg/L or ppb) WATER																
		MW1A	MW1B	MW2A	MW2B	MW2BD (20x)	MW3A	MW3B	MW4A	MW4AD (2.0x)	MW4B	MW5A	MW5B	MW5BD (20x)	MW6A	MW6 B
27	Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
28	1,1,2,2-Tetrachloroethane	nd J	nd	nd J	nd	nd	nd J	nd	nd	nd J	nd	nd J	nd	nd J	nd	nd
29	Toluene	nd	nd	2 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
30	Chlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
31	Ethylbenzene	nd	nd	3 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
32	Styrene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
33	Total Xylenes	nd	nd	9 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

J	Estimated value. Value is greater than zero but below quantitation.
B	Compound found in blank.
D	Diluted.

APPENDIX B

Tentatively Identified Volatile Organic Compounds

SDG: MW2B
S1
MW2BW

Volatile Organic Analysis

Tentatively Identified Compounds

Sample No.	Compound Name	RT	Est. Conc.
MW6A	unknown	4.60	10
S1 Fill	unsaturated hydrocarbon	13.68	47
	hexane	17.62	61
	unsaturated hydrocarbon	18.52	61
	trimethyl pentane isomer	20.42	96
	unknown alkene	21.47	130
	unsaturated hydrocarbon	24.67	350
	methylethyl benzene isomer	27.60	790
	benzene derivative	31.50	79
S1 FillML	unknown	16.27	3300
	saturated hydrocarbon	19.83	1300
	saturated hydrocarbon	21.62	2300
	saturated hydrocarbon	21.83	33000
	saturated hydrocarbon	22.63	17000
	unknown hydrocarbon	22.87	5800
	unknown	23.35	9500
	dimethylethyl benzene isomer	23.77	14000
	saturated hydrocarbon	24.47	4800
S1 FillMLDL	unsaturated hydrocarbon	21.85	20000
	oxygenated hydrocarbon	22.67	15000
	unknown	23.37	9100
	dimethylethyl benzene isomer	23.78	11000
S5 FillML	aromatic derivative	24.67	970
MW6B	saturated hydrocarbon	22.65	1500
	saturated hydrocarbon	24.50	1800

APPENDIX C

Semi-Volatile Organic Compounds

SDG: MW2B
S1
MW2BW

LIST OF QUALIFIERS

B_1	Compound found in blank. (Organic analyses only.)
B_2	Value greater than or equal to the instrument detection limit but less than contract required detection limit. (Inorganic analyses only.)
D	Diluted.
E_1	Concentrations exceed calibration range of instrument. (Organic analyses only.)
E_2	Estimated value due to interference effects. (Inorganic analyses only.)
F	Fill sample.
J	Estimated value. Value is greater than zero but below quantitation.
M	Medium level contamination.
N_1	Native soil sample. (Organic analyses only.)
N_2	Spike sample recovery is not within control limits. (Inorganic anlyses only).
P	Greater than 25% difference for detected concentrations between 2 GC columns.
R	Data unusable.
nd	CRQL (Organic analyses only.)
nd	CRDL (Inorganic analyses only.)
RE	Sample reanalyzed.
RS	Resampled.
S	Value determined by Method of Standard Addition.
W	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
*	Duplicate analysis is not within control limits.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Semi-Volatile Analyses (μg/kg or ppb) SOIL

		MW1B	MW2B	MW2BD (5x)	MW3A	MW3AD (10x)	MW4B	MW4BD (2x)	MW5B	MW6B
1	Phenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	bis(2-Chloroethyl)Ether	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	2-Chlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	40 J
8	2,2'-oxybis(1-Chloropropane)	nd J	nd	nd	nd J	nd J	nd	nd	nd	nd
9	4-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	N-Nitroso-Di-n-Propylamine	nd	nd	nd	nd	nd	nd	nd	nd	nd
11	Hexachloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd
12	Nitrobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd
13	Isophorone	nd	nd	nd	nd	nd	nd	nd	nd	nd
14	2-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	2,4-Dimethylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	bis(2-Chloroethoxy)Methane	nd	nd	nd	nd	nd	nd	nd	nd	nd
17	2,4-Dichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd
19	Naphthalene	nd	nd	nd	nd	nd	nd	nd	nd	nd
20	4-Chloroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd

Semi-Volatile Analyses (µg/kg or ppb) SOIL

		MW1B	MW2B	MW2BD (5x)	MW3A	MW3AD (10x)	MW4B	MW4BD (2x)	MW5B	MW6B
21	Hexachlorobutadiene	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	4-Chloro-3-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
23	2-Methylnaphthalene	nd	nd	nd	nd	nd	nd	nd	nd	nd
24	Hexachlorocyclopentadiene	nd J	nd	nd	nd J	nd J	nd	nd	nd	nd
25	2,4,6-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
26	2,4,5-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
27	2-Chloronaphthalene	nd	nd	nd	nd	nd	nd	nd	nd	nd
28	2-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd
29	Dimethyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd
30	Acenaphthylene	nd	nd	nd	nd	nd	nd	nd	nd	nd
31	2,6-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd
32	3-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd
33	Acenaphthene	nd	nd	nd	nd	nd	nd	nd	nd	nd
34	2,4-Dinitrophenol	nd	nd	nd J	nd	nd	nd	nd	nd	nd
35	4-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
36	Dibenzofuran	nd	nd	nd	nd	nd	nd	nd	nd	nd
37	2,4-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd
38	Diethylphthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd
39	4-Chlorophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd	nd
40	Fluorene	nd	nd	nd	nd	nd	nd	nd	nd	nd

Semi-Volatile Analyses (µg/kg or ppb) SOIL

		MW1B	MW2B	MW2BD (5x)	MW3A	MW3AD (10x)	MW4B	MW4BD (2x)	MW5B	MW6B
41	4-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd
42	4,6-Dinitro-2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd
43	N-Nitrosodiphenylamine (1)	nd	nd	nd	nd	nd	nd	nd	nd	nd
44	4-Bromophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd	nd
45	Hexachlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd
46	Pentachlorophenol	nd	nd	nd J	nd	nd	83 J	nd	nd	nd
47	Phenanthrene	nd	nd	nd	nd	nd	14 J	nd	nd	nd
48	Anthracene	nd	nd	nd	nd	nd	nd	nd	nd	nd
49	Carbazole	nd	nd	nd	nd	nd	nd	nd	nd	nd
50	Di-n-Butylphthalate	15 J	20 J	nd	15 J	nd	nd	nd	nd	nd
51	Fluoranthene	nd	nd	nd	nd	nd	16 J	nd	nd	nd
52	Pyrene	nd	nd	nd	nd	nd	14 J	nd	nd	nd
53	Butylbenzylphthalate	nd	17 J	nd	11 J	nd	nd	nd	nd	nd
54	3,3'-Dichlorobenzidine	nd	nd	nd	nd	nd	nd	nd	nd	nd
55	Benzo(a)Anthracene	nd	nd	nd	3 J	nd	nd	nd	nd	nd
56	Chrysene	nd	nd	nd	17 J	nd	nd	nd	nd	nd
57	Bis(2-Ethylhexyl)Phthalate	2,800	5,700	4,900	5,200	8,100	3,200	2,200	410	540
58	Di-n-Octyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd
59	Benzo(b) Fluoranthene	nd J	15 J	nd	7 J	nd	15 J	nd	nd	nd
60	Benzo(k) Fluoranthene	nd	6 J	nd	2 J	nd J	7 J	nd	nd	nd

Semi-Volatile Analyses (µg/kg or ppb) SOIL										
		MW1B	MW2B	MW2BD (5x)	MW3A	MW3AD (10x)	MW4B	MW4BD (2x)	MW5B	MW6B
61	Benzo(a) Pyrene	nd	nd	nd	7 J	nd	10 J	nd	nd	nd
62	Ideno(1,2,3-cd)Pyrene	nd	10 J	nd	nd	nd	nd	nd	nd	nd
63	Dibenz(a,h) Anthracene	nd	nd	nd	nd	nd	nd	nd	nd	nd
64	Benzo(g,h,i) Perylene	nd	11 J	nd	3 J	nd	nd	nd	nd	nd

J Estimated value. Value is greater than zero but below quantitation.
D Diluted.

Semi-Volatile Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(F)D (100x)	S5(F)RE	S5(N)	S6(F)	S6(F)RE	S6(N)
1	Phenol	nd	nd	nd	nd	nd	nd	nd	nd	200 J	nd J	280 J	nd	nd J	nd J	nd
2	bis(2-Chloroethyl)Ether	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
3	2-Chlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
4	1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
5	1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
6	1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
7	2-Methylphenol	62 J	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
8	2,2'-oxybis(1-Chloropropane)	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
9	4-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
10	N-Nitroso-Di-n-Propylamine	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
11	Hexachloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
12	Nitrobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
13	Isophorone	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
14	2-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
15	2,4-Dimethylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
16	bis(2-Chloroethoxy)Methane	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
17	2,4-Dichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
18	1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
19	Naphthalene	78 J	nd	nd	nd	nd	nd	nd	nd	16,000 E,J	4300 J	14,000 E,J	nd	nd J	nd J	nd
20	4-Chloroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
21	Hexachlorobutadiene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
22	4-Chloro-3-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
23	2-Methylnaphthalene	49 J	nd	nd	nd	nd	nd	nd	nd	3600 E,J	470 J	2800 J	nd	nd J	nd J	nd
24	Hexachlorocyclopentadiene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
25	2,4,6-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
26	2,4,5-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd

Semi-Volatile Analyses (µg/kg or ppb) SOIL																
		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(F)D (100x)	S5(F)RE	S5(N)	S6(F)	S6(F)RE	S6(N)
27	2-Chloronaphthalene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
28	2-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
29	Dimethyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
30	Acenaphthylene	nd	nd	nd	nd	nd	nd	nd	nd	18,000 E,J	2600 E	16,000 E,J	nd	nd J	nd J	nd
31	2,6-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
32	3-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
33	Acenaphthene	8 J	nd	13 J	nd	nd	nd	nd	nd	1700 J	nd	1800 J	nd	nd J	nd J	nd
34	2,4-Dinitrophenol	nd	nd	nd J	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
35	4-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
36	Dibenzofuran	nd	nd	nd	nd	nd	nd	nd	nd	14,000 E,J	2800 J	16,000 E,J	nd	nd J	nd J	nd
37	2,4-Dinitrotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
38	Diethylphthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
39	4-Chlorophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
40	Fluorene	nd	nd	nd	nd	nd	nd	nd	nd	29,000 E,J	4900 J	31,000 E,J	nd	nd J	nd J	nd
41	4-Nitroaniline	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
42	4,6-Dinitro-2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
43	N-Nitrosodiphenylamine (1)	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
44	4-Bromophenyl-phenylether	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
45	Hexachlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
46	Pentachlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
47	Phenanthrene	66 J	nd	69 J	nd	nd	nd	nd	nd	62,000 E,J	28,000 J	55,000 E,J	nd	140 J	130 J	nd
48	Anthracene	15 J	nd	nd	nd	nd	nd	nd	nd	16,000 E,J	5200 J	19,000 E,J	nd	26 J	nd J	nd
49	Carbazole	7 J	nd	12 J	nd	nd	nd	nd	nd	5100 E,J	2000 J	7400 E,J	nd	23 J	18 J	nd
50	Di-n-Butylphthalate	92 J	nd	nd	nd	nd	nd	nd	nd	120 J	nd	170 J	nd	nd J	nd J	nd
51	Fluoranthene	130 J	nd	160 J	nd	nd	nd	nd	nd	53,000 E,J	27,000 J	49,000 E,J	nd	230 J	270 J	nd

Semi-Volatile Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(F)D (100x)	S5(F)RE	S5(N)	S6(F)	S6(F)RE	S6(N)
52	Pyrene	170 J	nd	150 J	nd	nd	nd	nd	nd	54,000 E,J	23,000 J	47,000 E,J	nd	340 J	300 J	nd
53	Butylbenzylphthalate	77 J	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
54	3,3'-Dichlorobenzidine	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
55	Benzo(a)Anthracene	81 J	nd	140 J	nd	nd	nd	nd	nd	35,000 E,J	14,000 J	31,000 E,J	nd	220 J	220 J	nd
56	Chrysene	170 J	nd	140 J	nd	nd	nd	nd	nd	28,000 E,J	14,000 J	25,000 E,J	nd	260 J	270 J	nd
57	Bis(2-Ethylhexyl)Phthalate	340 J	1500	1100 B	900 B	nd B	160 B,J	1100 B	2,800 B	820 B,J	nd	1200 B,J	nd B	nd J	nd J	650 B
58	Di-n-Octyl Phthalate	nd	nd	nd	nd	nd	nd	nd	nd	nd R	nd	nd J	nd	nd J	nd J	nd
59	Benzo(b) Fluoranthene	210 J	nd	280 J	nd	nd	nd	nd	nd	53,000 E,J	14,000 J	76,000 E,J	nd	nd J	nd J	nd
60	Benzo(k) Fluoranthene	110 J	nd	100 J	nd	nd	nd	nd	nd	66,000 E,J	6700 J	12,000 E,J	nd	nd J	nd J	nd
61	Benzo(a) Pyrene	96 J	nd	nd	nd	nd	nd	nd	nd	24,000 E,J	11,000 J	22,000 E,J	nd	nd J	nd J	nd
62	Ideno(1,2,3-cd)Pyrene	nd J	nd J	nd	nd	nd	nd	nd	nd	7300 E,J	6400 J	9100 E,J	nd	nd J	nd J	nd
63	Dibenz(a,h) Anthracene	nd	nd	nd	nd	nd	nd	nd	nd	2200 J	1200 J	2700 J	nd	nd J	nd J	nd
64	Benzo(g,h,i) Perylene	39 J	nd	nd	nd	nd	nd	nd	nd	3500 E,J	4200 J	5100 E,J	nd	nd J	nd J	nd

J	Estimated value. Value is greater than zero but below quantitation.
D	Diluted.
E	Concentrations exceed calibration range of instrument.
R	Unusable.
RE	Sample reanalyzed.

Semi-Volatile Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B	MW6A	MW6B
1	Phenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	bis(2-Chloroethyl)Ether	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
3	2-Chlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
4	1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
5	1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
6	1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
7	2-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	2,2'-oxybis(1-Chloropropane)	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
9	4-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	N-Nitroso-Di-n-Propylamine	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
11	Hexachloroethane	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
12	Nitrobenzene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
13	Isophorone	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
14	2-Nitrophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	2,4-Dimethylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	bis(2-Chloroethoxy)Methane	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
17	2,4-Dichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
19	Naphthalene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
20	4-Chloroaniline	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
21	Hexachlorobutadiene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
22	4-Chloro-3-Methylphenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
23	2-Methylnaphthalene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd

Semi-Volatile Analyses (μg/L or ppb) WATER													
		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B	MW6A	MW6B
24	Hexachlorocyclopentadiene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
25	2,4,6-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
26	2,4,5-Trichlorophenol	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
27	2-Chloronaphthalene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
28	2-Nitroaniline	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
29	Dimethyl Phthalate	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
30	Acenaphthylene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
31	2,6-Dinitrotoluene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
32	3-Nitroaniline	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
33	Acenaphthene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
34	2,4-Dinitrophenol	nd J	nd J	nd J	nd J	nd J	nd	nd J	nd J	nd	nd J	nd	nd
35	4-Nitrophenol	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd	nd	nd
36	Dibenzofuran	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
37	2,4-Dinitrotoluene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
38	Diethylphthalate	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
39	4-Chlorophenyl-phenylether	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
40	Fluorene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
41	4-Nitroaniline	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
42	4,6-Dinitro-2-Methylphenol	nd J	nd	nd J	nd J	nd J	nd	nd	nd J	nd J	nd	nd	nd
43	N-Nitrosodiphenylamine (1)	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
44	4-Bromophenyl-phenylether	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
45	Hexachlorobenzene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
46	Pentachlorophenol	nd J	nd	nd J	nd J	nd J	nd	nd	nd J	nd	nd	nd	nd

Semi-Volatile Analyses (µg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B	MW6A	MW6B
47	Phenanthrene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
48	Anthracene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
49	Carbazole	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
50	Di-n-Butylphthalate	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
51	Fluoranthene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
52	Pyrene	nd	nd	nd	nd J	nd	nd J	nd	nd	nd	nd	nd	nd
53	Butylbenzylphthalate	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
54	3,3'-Dichlorobenzidine	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
55	Benzo(a)Anthracene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
56	Chrysene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
57	Bis(2-Ethylhexyl)Phthalate	nd	0.8 J	4 J	nd	1 J	nd J	2 J	0.9 J	0.8 J	0.6 J	nd	1 J
58	Di-n-Octyl Phthalate	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
59	Benzo(b Fluoranthene	nd	nd	nd	nd J)	nd	nd J	nd	nd	nd	nd	nd	nd
60	Benzo(k) Fluoranthene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
61	Benzo(a) Pyrene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
62	Ideno(1,2,3-cd)Pyrene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
63	Dibenz(a,h) Anthracene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd
64	Benzo(g,h,i) Perylene	nd	nd	nd	nd	nd	nd J	nd	nd	nd	nd	nd	nd

J	Estimated value. Value is greater than zero but below quantitation.
D	Diluted.

APPENDIX D

Tentatively Identified
Semi-Volatile Organic Compounds

SDG: MW2B
S1
MW2BW

Semi-Volatile Organic Analysis

Tentatively Identified Compounds - SDG: MW2BW

Sample No.	Compound	RT	Est. Conc.
MW1A	unknown	7.1	48
	3-chloro cyclohexene	7.47	4
	2-cyclohexen-1-one	8.07	35
	chlorinated compound	8.38	2
	unknown	10.9	16
	unsaturated hydrocarbon	11.23	5
	oxygenated compound	12.83	5
	unknown	25.93	5
	unknown	28.08	8
	unknown	28.45	9
MW1B	unknown	6.43	35
	chlorocyclohexene isomer	6.78	13
	1,1,2,2-tetrachlorethane	7.13	8
	2-cyclohexen-1-one	7.35	9
	chlorinated compound	7.72	47
	unknown	10.50	3
	1, cyclohexyl-2-propanone	11.45	4
	oxygenated compound	12.12	74
	unknown	12.18	11
	unknown	16.15	5
	unknown	20.58	6
	unknown	25.17	3
	unknown	27.27	3
	unknown	27.63	7
MW2A	unknown	7.08	48

Sample No.	Compound	RT	Est. Conc.
	2-cyclohexen-1-one	8.05	28
	chlorinated compound	8.38	2
	unknown	10.13	3
	unknown	10.90	7
	unknown	10.97	5
	oxygenated compound	12.83	3
	unknown	25.92	4
	unknown	28.07	2
	unknown	28.43	7
MW2B	unknown	7.17	61
	2-cyclohexen-1-one	8.15	28
	unknown	11.03	37
	unknown	11.12	3
	unknown	28.60	4
MW3A	unknown	7.08	32
	2-cyclohexen-1-one	8.05	25
	chlorinated compound	8.38	3
	oxygenated compound	10.13	4
	unknown	10.90	6
	oxygenated compound	12.83	2
	unknown acid	25.92	3
	unknown	28.42	5
	unknown	34.90	3
MW3B	chlorinated compound	7.03	3
	unknown	7.20	6
	unknown	7.28	4
	chloro cyclohexene isomer	7.53	21
	1,1,2,2-tetrachloroethane	7.97	1300

Sample No.	Compound	RT	Est. Conc.
	chlorinated compound	8.40	3
	unknown	10.40	120
	dichloro cyclohexane	11.27	77
	unknown siloxane	12.50	4
	oxygenated compound	12.83	2
	unknown siloxane	15.72	2
	unknown	25.92	3
	unknown	28.42	5
MW4A	unknown	6.45	32
	chlorocyclohexene isomer	6.80	10
	1,1,2,2-tetrachloroethane	7.15	11
	2-cyclohexen-1-one	7.37	11
	chlorinated compound	7.75	53
	unknown	9.87	7
	unknown	10.30	6
	unknown	10.53	4
	1-cyclohexyl-2-propanone	11.48	7
	unknown	12.15	100
	unknown	16.18	7
	unknown	20.62	8
	unknown acid	25.17	7
	unknown hydrocarbon	27.27	4
	unknown	27.65	17
	unknown	34.10	5
	saturated hydrocarbon	36.17	5
	saturated hydrocarbon	37.22	6
	saturated hydrocarbon	38.43	6
	saturated hydrocarbon	39.88	4

Sample No.	Compound	RT	Est. Conc.
MW4B	unknown	7.08	47
	2-cyclohexen-1-one	8.05	34
	chlorinated compound	8.38	4
	oxygenated compound	9.45	3
	unknown	10.90	20
	oxygenated compound	12.83	4
	2-chloro dimethyl benzamide	20.12	2
	unknown	25.95	5
	unknown	28.08	4
	unknown hydrocarbon	28.15	3
	unknown	28.45	9
MW5A	unknown	6.45	32
	2-cyclohexen-1-one	7.37	17
	unknown	10.27	21
	unknown acid	25.15	9
	unknown hydrocarbon	27.27	9
	unknown hydrocarbon	27.33	6
	unknown	27.63	17
	unknown	34.08	7
MW5B	unknown	6.48	50
	chlorocycloalkane	6.82	9
	1,1,2,2-tetrachloroethane	7.17	7
	2-cyclohexen-1-one	7.40	19
	chlorinated compound	7.75	38
	unknown	9.45	2
	unknown	10.15	4
	unknown	10.30	11
	unknown	10.53	6

Sample No.	Compound	RT	Est. Conc.
	1-cyclohexyl-2-propanone	11.48	5
	oxygenated compound	12.15	73
	unknown	16.18	4
	unknown	18.43	2
	unknown	20.62	4
	unknown acid	25.17	3
	unknown hydrocarbon	27.28	3
	unknown hydrocarbon	27.35	2
	unknown	27.65	7
MW6A	unknown	6.47	54
	chlorinated compound	6.78	9
	2-cyclohexen-1-one	7.37	21
	chlorinated compound	7.70	8
	unknown	10.13	5
	unknown	10.28	35
	unknown	10.52	7
	oxygenated compound	12.10	19
	unknown	27.58	2
MW6B	unknown	6.47	71
	chlorocyclohexene isomer	6.80	15
	2-cyclohexen-1-one	7.38	35
	chlorinated compound	7.73	42
	unknown	10.13	9
	unknown	10.27	22
	dichloro cyclohexane isomer	10.52	13
	1-cyclohexyl-2-propanone	11.47	3
	oxygenated compound	12.12	65
	unknown	16.17	2

Sample No.	Compound	RT	Est. Conc.
	unknown	18.42	2
	unknown acid	19.57	4
	unknown	20.60	2
	unknown acid	25.22	22
	unknown hydrocarbon	27.32	17
	unknown hydrocarbon	27.40	10
	unknown	27.72	37

Semi-Volatile Organic Analysis

Tentatively Identified Compounds - SDG: S1

Sample No.	Compound	RT	Est. Conc.
Rinsate	2-cyclohexen-1-one	6.92	3
S1 Fill	dimethylbenzene isomer	6.52	21000
	unsaturated hydrocarbon	7.37	3600
	trimethylbenzene isomer	8.77	1600
	saturated hydrocarbon	8.93	1800
	unsaturated hydrocarbon	9.10	1300
	saturated hydrocarbon	11.12	1200
	unknown	26.88	1700
	unknown	29.72	530
	unknown	30.48	1500
	unknown	30.87	990
	saturated hydrocarbon	31.28	560
	unknown ester	31.65	4700
	unknown hydrocarbon	32.30	430
	unknown	32.65	1300
	unknown	32.82	510
	long chain saturated hydrocarbon	33.28	400
	unknown	33.78	580
	long chain saturated hydrocarbon	34.25	440
	unknown	34.68	380
	long chain saturated hydrocarbon	35.18	980
S1 Native	unknown	6.32	93
	unknown	6.40	120
	unknown	7.02	1300
	1,1,2,2-tetrachloroethane	7.12	200

Sample No.	Compound	RT	Est. Conc.
	2-cyclohexen-1-one	7.32	430
	unknown	7.68	220
	unknown	19.80	110
	unknown	28.18	94
	saturated hydrocarbon	34.15	100
	saturated hydrocarbon	36.03	250
	saturated hydrocarbon	37.07	300
	saturated hydrocarbon	38.28	260
	saturated hydrocarbon	39.72	210
S2 Fill	unknown	6.35	670
	unknown	7.05	340
	unknown hydrocarbon	20.95	350
	unknown	22.42	170
	unknown	23.68	120
	unknown acid	24.53	310
	unknown	24.98	120
	unknown acid	27.02	290
	hexanedioic acid derivative	29.57	5400
	unknown	30.65	94
	PAH derivative	34.13	210
S2 Native	unknown	6.30	400
	unknown	33.65	150
S3 Fill	unknown	6.37	870
	2-cyclohexen-1-one	6.63	120
	unknown	7.03	130
	saturated hydrocarbon	8.27	130
	unknown hydrocarbon	26.17	200
	hexanedioic acid derivative	29.53	9900

Sample No.	Compound	RT	Est. Conc.
	unknown	30.97	210
	saturated hydrocarbon	31.63	85
	unknown hydrocarbon	32.62	130
	unknown hydrocarbon	33.55	95
	saturated hydrocarbon	35.35	190
	saturated hydrocarbon	36.25	170
	unknown hydrocarbon	37.28	140
	saturated hydrocarbon	38.48	120
S3 Native	dimethyl benzene isomer	5.75	2200
	unknown	6.40	1100
	2-cyclohexen-1-one	6.67	260
	oxygenated compound	7.05	120
	oxygenated compound	9.70	360
	saturated hydrocarbon	17.82	120
	saturated hydrocarbon	19.38	140
	long chain saturated hydrocarbon	20.88	190
	long chain saturated hydrocarbon	22.30	150
	long chain saturated hydrocarbon	23.63	130
	unknown	24.47	150
	saturated hydrocarbon	24.93	100
	unknown hydrocarbon	26.17	230
	unknown	26.93	190
	hexanedioic acid derivative	29.57	15000
	unknown	30.07	140
	unknown hydrocarbon	32.60	88
S4 Fill	unknown	6.38	1100
	unknown	26.17	910
	hexanedioic acid derivative	29.53	12000

Sample No.	Compound	RT	Est. Conc.
S4 Native	unknown	6.30	1000
	unknown	6.98	240
	saturated hydrocarbon	16.12	450
	saturated hydrocarbon	17.78	730
	long chain saturated hydrocarbon	19.35	840
	saturated hydrocarbon	20.03	350
	long chain saturated hydrocarbon	20.85	1200
	long chain saturated hydrocarbon	22.27	740
	saturated hydrocarbon	23.62	770
	long chain saturated hydrocarbon	24.90	570
	long chain saturated hydrocarbon	26.13	560
	unknown	26.90	150
	unknown hydrocarbon	27.32	450
	unknown hydrocarbon	28.45	500
	saturated hydrocarbon	29.53	360
	saturated hydrocarbon	30.58	370
	saturated hydrocarbon	31.58	320
	unknown hydrocarbon	32.57	300
	saturated hydrocarbon	33.50	250
	saturated hydrocarbon	35.30	170
S5 Fill	PAH derivative	23.80	13000
	unknown	24.03	43000
	unknown	24.12	7600
	PAH derivative	24.67	9000
	PAH derivative	26.28	760
	PAH derivative	27.75	760
	PAH derivative	27.95	600
	unknown	28.03	350

Sample No.	Compound	RT	Est. Conc.
	PAH derivative	29.73	800
	unknown	29.82	260
	unknown	30.08	300
	unknown	30.67	2400
	unknown	30.92	240
	unknown	31.07	230
	PAH derivative	31.23	210
	unknown	32.00	160
	unknown	32.07	160
	PAH derivative	33.88	190
	PAH derivative	34.52	880
	PAH derivative	34.67	200
S5 Fill RE	PAH derivative	23.98	38000
	PAH derivative	25.95	2000
	unknown	26.23	630
	unknown	26.78	3600
	PAH derivative	27.70	720
	PAH derivative	27.90	890
	unknown	29.63	760
	unknown	29.77	220
	PAH derivative	30.52	2500
	unknown	30.63	2500
	PAH derivative	30.75	130
	PAH derivative	31.63	250
	PAH derivative	33.87	250
	PAH derivative	34.48	950
	PAH derivative	34.63	230
S5 Native	unknown	6.30	840

Sample No.	Compound	RT	Est. Conc.
	unknown	6.98	110
	unknown	30.90	420
S6 Fill	saturated hydrocarbon	27.78	630
	saturated hydrocarbon	28.72	1100
	unknown	29.88	700
	unknown	30.72	1400
	unknown	31.02	640
	saturated hydrocarbon	31.32	1000
	unknown	31.38	710
	unknown	31.78	930
	unknown	32.37	1700
	unknown	32.57	940
	saturated hydrocarbon	33.13	1200
	unknown	33.52	410
	unknown	33.62	390
	unknown	34.00	770
	unknown	34.12	650
	unknown	34.33	1400
	unknown	34.63	540
	unknown hydrocarbon	34.78	520
	unknown	35.02	420
	unknown	35.28	640
S6 Fill RE	unknown	28.67	1100
	unknown	28.92	570
	unknown	29.17	410
	unknown	29.62	530
	unknown	29.82	730
	unknown	30.65	1400

Sample No.	Compound	RT	Est. Conc.
	unknown	31.22	1600
	unknown	31.70	730
	unknown	32.28	1400
	unknown	32.47	620
	unknown	33.05	1100
	unknown	33.30	1500
	unknown	33.42	430
	unknown	33.53	520
	unknown	33.68	280
	unknown	33.90	850
	unknown	34.00	720
	unknown	34.25	1500
	unknown	34.70	810
	unknown	35.17	970
S6 Native	unknown	6.30	890
	unknown	6.98	210
	unknown acid	24.42	110
	unknown hydrocarbon	26.12	100
	unknown	29.37	96
	unknown hydrocarbon	32.55	110
	unknown hydrocarbon	33.50	100
	unknown hydrocarbon	35.30	150
	unknown hydrocarbon	36.20	160
	saturated hydrocarbon	37.22	130
	unknown hydrocarbon	38.42	120

Semi-Volatile Organic Analysis

Tentatively Identified Compounds - SDG: MW2B

Sample No.	Compound	RT	Est. Conc.
MW1B	unknown	6.47	740
	suspected aldol cond. product	7.17	210
	unknown	8.25	350
	saturated hydrocarbon	17.97	130
	long chain saturated hydrocarbon	19.55	150
	long chain saturated hydrocarbon	21.05	220
	long chain saturated hydrocarbon	23.82	160
	long chain saturated hydrocarbon	25.10	140
	long chain saturated hydrocarbon	26.33	150
	long chain saturated hydrocarbon	27.52	140
	long chain saturated hydrocarbon	28.65	200
	octadecanoic acid derivative	29.60	420
	long chain saturated hydrocarbon	29.75	240
	long chain saturated hydrocarbon	30.80	210
	long chain saturated hydrocarbon	31.80	210
	long chain saturated hydrocarbon	32.78	170
	long chain saturated hydrocarbon	33.72	150
	long chain saturated hydrocarbon	35.53	150
	long chain saturated hydrocarbon	36.45	160
	long chain saturated hydrocarbon	37.52	140
MW2B	unknown	4.42	1300
	unknown	4.65	170
	unknown	4.77	880
	suspected aldol cond. product	5.15	300
	unknown	11.38	110

Sample No.	Compound	RT	Est. Conc.
	unknown	16.97	210
	unknown	24.27	100
	hexanedioic acid derivative	27.00	430
	unknown hydrocarbon	30.12	130
MW2BDL	unknown	4.27	1100
	hexanedioic acid derivative	26.88	430
MW3A	unknown	6.47	730
	suspected aldol cond. product	7.18	350
	unknown	8.27	500
	saturated hydrocarbon	17.97	260
	long chain saturated hydrocarbon	19.55	330
	long chain saturated hydrocarbon	21.05	410
	long chain saturated hydrocarbon	22.47	330
	long chain saturated hydrocarbon	23.82	260
	long chain saturated hydrocarbon	25.10	220
	saturated hydrocarbon	26.33	220
	unknown	27.35	340
	long chain saturated hydrocarbon	27.52	190
	long chain saturated hydrocarbon	28.65	230
	octadecanoic acid derivative	29.60	450
	long chain saturated hydrocarbon	29.75	260
	long chain saturated hydrocarbon	30.80	290
	long chain saturated hydrocarbon	31.80	300
	long chain saturated hydrocarbon	32.78	220
	long chain saturated hydrocarbon	33.73	190
	long chain saturated hydrocarbon	36.45	190
MW4B	unknown	6.57	170
	unknown	7.18	1100

Sample No.	Compound	RT	Est. Conc.
	1,1,2,2-tetrachloroethane	7.28	110
	unknown	7.48	250
	unknown	7.85	310
	unknown hydrocarbon	23.12	88
	unknown hydrocarbon	24.47	100
	unknown	25.23	140
	unknown hydrocarbon	25.75	65
	unknown hydrocarbon	26.98	75
	unknown	27.72	120
	unknown	28.42	98
	unknown hydrocarbon	29.28	78
	unknown	30.23	86
	unknown hydrocarbon	30.38	61
	unknown	32.08	82
	unknown hydrocarbon	34.38	73
	unknown hydrocarbon	36.25	130
	long chain saturated hydrocarbon	38.57	170
	unknown	40.03	150
MW4BDL	unknown	6.92	620
MW5B	unknown	6.42	110
	unknown	6.5	130
	1,1,2,2-tetrachloroethane	7.20	240
	2-cyclohexen-1-one	7.42	570
	unknown	19.92	240
	unknown acid	25.13	130
	unknown	27.60	92
	unknown	31.73	110
MW6B	dimethyl benzene isomer	6.40	4700

Sample No.	Compound	RT	Est. Conc.
	saturated hydrocarbon	6.57	350
	unknown	7.00	1600
	saturated hydrocarbon	8.87	1100
	unknown hydrocarbon	11.05	1000
	unknown	27.45	350
	unknown	29.05	290
	unknown	30.22	630
	unknown	30.28	250
	unknown	30.67	840
	unknown	31.07	220
	unknown	31.55	290
	unknown hydrocarbon	32.47	270
	unknown hydrocarbon	33.15	220
	long chain saturated hydrocarbon	33.45	300
	long chain saturated hydrocarbon	34.12	210
	unknown	34.40	280
	long chain saturated hydrocarbon	35.97	340
	long chain saturated hydrocarbon	37.00	290
	unknown hydrocarbon	38.18	240

APPENDIX E

Pesticide/PCB Compounds

SDG: MW2B
S1
MW2BW

LIST OF QUALIFIERS

B_1	Compound found in blank. (Organic analyses only.)
B_2	Value greater than or equal to the instrument detection limit but less than contract required detection limit. (Inorganic analyses only.)
D	Diluted.
E_1	Concentrations exceed calibration range of instrument. (Organic analyses only.)
E_2	Estimated value due to interference effects. (Inorganic analyses only.)
F	Fill sample.
J	Estimated value. Value is greater than zero but below quantitation.
M	Medium level contamination.
N_1	Native soil sample. (Organic analyses only.)
N_2	Spike sample recovery is not within control limits. (Inorganic anlyses only).
P	Greater than 25% difference for detected concentrations between 2 GC columns.
R	Data unusable.
nd	CRQL (Organic analyses only.)
nd	CRDL (Inorganic analyses only.)
RE	Sample reanalyzed.
RS	Resampled.
S	Value determined by Method of Standard Addition.
W	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
*	Duplicate analysis is not within control limits.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Pesticide/PCB Analyses (μg/kg or ppb) SOIL							
		MW1B	MW2B	MW3A	MW4B	MW5B	MW5B(R)
1	alpha-BHC	nd	nd	nd	nd	nd	nd
2	beta-BHC	nd	nd	nd	nd	nd	nd
3	delta-BHC	nd	nd	nd	nd	nd	nd
4	gamma-BHC (Lindane)	nd	nd	nd	nd	8.3(P)	nd
5	Heptachlor	nd	nd	nd	nd	7.9	nd
6	Aldrin	nd	nd	nd	nd	7.1	nd
7	Heptachlor epoxide	nd	nd	nd	nd	nd	nd
8	Endosulfan I	nd	nd	nd	nd	nd	nd
9	Dieldrin	nd	nd	nd	nd	15	nd
10	4,4'-DDE	nd	nd	nd	nd	nd	nd
11	Endrin	nd	nd	nd	nd	19	nd
12	Endosulfan II	nd	nd	nd	nd	nd	nd
13	4,4'-DDD	nd	nd	nd	nd	nd	nd
14	Endosulfan sulfate	nd	nd	nd	nd	nd	nd
15	4,4'-DDT	nd	nd	nd	nd	18	nd
16	Methoxychlor	nd	nd	nd	nd	nd	nd
17	Endrin ketone	nd	nd	nd	nd	nd	nd
18	Endrin aldehyde	nd	nd	nd	nd	nd	nd
19	alpha-Chlordane	nd	nd	nd	nd	nd	nd
20	gamma-Chlordane	nd	nd	nd	nd	nd	nd
21	Toxaphene	nd	nd	nd	nd	nd	nd
22	Aroclor-1016	nd	nd	nd	nd	nd	nd
23	Aroclor-1221	nd	nd	nd	nd	nd	nd
24	Aroclor-1232	nd	nd	nd	nd	nd	nd
25	Aroclor-1242	nd	nd	nd	nd	nd	nd
26	Aroclor-1248	nd	nd	nd	nd	nd	nd
27	Aroclor-1254	nd	nd	nd	nd	nd	nd
28	Aroclor-1260	nd	40(J)	24(J)	9.5(J)	nd	nd

(J)	Estimated value. Value is greater than zero but below quantitation.
(P)	Greater than 25% difference for detected concentrations between 2 GC columns.
(R)	Repeat analysis.

Pesticide/PCB Analyses (µg/kg or ppb) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(N)	S6(F)	S6(N)
1	alpha-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	beta-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
3	delta-BHC	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J
4	gamma-BHC (Lindane)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
5	Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Heptachlor epoxide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
8	Endosulfan I	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
9	Dieldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	4,4'-DDE	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
11	Endrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
12	Endosulfan II	nd	nd	nd	nd	nd	nd	nd	nd	6.4 J,P,R	nd	nd	nd
13	4,4'-DDD	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
14	Endosulfan sulfate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
15	4,4'-DDT	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	48 P,J	nd J	nd J	nd J
16	Methoxychlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
17	Endrin ketone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
18	Endrin aldehyde	nd	nd	nd	nd	nd	nd	nd	nd	24 P,R	nd	nd	nd
19	alpha-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	6.5 J,P,R	nd	nd	nd
20	gamma-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
21	Toxaphene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Aroclor-1016	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
23	Aroclor-1221	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
24	Aroclor-1232	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
25	Aroclor-1242	660 P,J,N	nd	nd	nd	nd	nd	nd	nd	nd	nd	910 P,J,N	nd

Pesticide/PCB Analyses (µg/kg or ppb) SOIL													
		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(N)	S6(F)	S6(N)
26	Aroclor-1248	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
27	Aroclor-1254	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
28	Aroclor-1260	2000	nd	320 P	nd	nd	nd	12 J	nd	nd	nd	2400 J	nd

J Estimated value. Value is greater than zero but below quantitation.
P Greater than 25% difference for detected concentrations between 2 GC columns.
N Native soil sample.

Pesticide/PCB Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B	MW6A	MW6B
1	alpha-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
2	beta-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
3	delta-BHC	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J
4	gamma-BHC (Lindane)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
5	Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
6	Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
7	Heptachlor epoxide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
8	Endosulfan I	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
9	Dieldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
10	4,4'-DDE	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
11	Endrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
12	Endosulfan II	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
13	4,4'-DDD	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
14	Endosulfan sulfate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
15	4,4'-DDT	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J	nd J
16	Methoxychlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
17	Endrin ketone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
18	Endrin aldehyde	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
19	alpha-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
20	gamma-Chlordane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
21	Toxaphene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
22	Aroclor-1016	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd

Pesticide/PCB Analyses (μg/L or ppb) WATER

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B	MW6A	MW6B
23	Aroclor-1221	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
24	Aroclor-1232	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
25	Aroclor-1242	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
26	Aroclor-1248	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
27	Aroclor-1254	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd
28	Aroclor-1260	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd J	nd

APPENDIX F

Correspondence with NYSDEC
Regarding QA/QC Analysis

13

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, NY 14203-2999

Thomas C. Jorling
Commissioner

July 14, 1992

Mr. Ronald F. Spears, Jr.
The Carborundum Company
Health Safety & Environmental Quality
P.O. Box 337
Niagara Falls, NY 14302

Dear Mr. Spears:

Carborundum Globar
Site #932036
QA/QC Analysis

Your consultant, Intera Inc., has submitted a request to this Department in a letter dated July 10, 1992 proposing that one set of QA/QC analysis be required for this project. (1) QA/QC per Matrix JMC 7/17/92

This request has been reviewed by our chemist, Dr. Frances Yang, and found to be acceptable to this Department.

If you have any questions, please call me at 851-7220.

Sincerely,

Michael J. Hinton

Michael J. Hinton, P.E.
Environmental Engineer II

MJH/ad

cc: Mr. E.J. Sciascia
Mr. Gerald Gresak

RECEIVED JUL 16 1992

APPENDIX G

Inorganic Analysis

SDG: MW2B
S1
MW2BW

INTERA

LIST OF QUALIFIERS

B_1	Compound found in blank. (Organic analyses only.)
B_2	Value greater than or equal to the instrument detection limit but less than contract required detection limit. (Inorganic analyses only.)
D	Diluted.
E_1	Concentrations exceed calibration range of instrument. (Organic analyses only.)
E_2	Estimated value due to interference effects. (Inorganic analyses only.)
F	Fill sample.
J	Estimated value. Value is greater than zero but below quantitation.
M	Medium level contamination.
N_1	Native soil sample. (Organic analyses only.)
N_2	Spike sample recovery is not within control limits. (Inorganic anlyses only).
P	Greater than 25% difference for detected concentrations between 2 GC columns.
R	Data unusable.
nd	CRQL (Organic analyses only.)
nd	CRDL (Inorganic analyses only.)
RE	Sample reanalyzed.
RS	Resampled.
S	Value determined by Method of Standard Addition.
W	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
*	Duplicate analysis is not within control limits.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Inorganic Analyses (mg/kg or ppm) SOIL							
		MW1B	**MW2B**	**MW3A**	**MW4B**	**MW5B**	**MW6B**
1	Aluminum	14,300 J	21,200 J	13,400 J	14,600 J	14,300 J	15,600 J
2	Antimony	nd	nd	nd	nd	nd	nd
3	Arsenic	2.0 B	7.7	5.3	5.5	4.0	4.4
4	Barium	70.3	107	101	68.5	93.7	97.7
5	Beryllium	nd	nd	nd	nd	nd	nd
6	Cadmium	nd J	nd J	nd J	nd J	nd J	nd J
7	Calcium	48,300 J,E	33,100 J,E	50,600 J,E	40,900 J,E	4,040 E	57,000 J,E
8	Chromium	11.6 R	27.1 R	27.5 R	16.5 R	18.9 R	26.8 R
9	Cobalt	9.0 B	15.2	35.9	10.7 B	9.1 B	14.7
10	Copper	13.4 J	25.1 J	518 J	23.8 J	18.9 J	30.6 J
11	Iron	14,200 J,E	28,700 J,E	27,300 J,E	20,100 J	22,000 J,E	28,300 J,E
12	Lead	35.4	28.8 S	30.4 J	26.5	30.9	30.7 R,S
13	Magnesium	19,000	13,700	16,200	9,980 B	6,070 B	11,100
14	Manganese	529 J,E	561 J,E	682 J,E	519 J,E	294 J,E	666 J,E
15	Mercury	nd	nd	nd	nd	nd	nd
16	Nickel	18.1 J	24.8 J	80.2 J	16.9 J	11.4 J	30.6 J
17	Potassium	1550	2,580	3,430	1,930	921 B	3,420
18	Selenium	nd	nd	nd	nd	nd	nd W
19	Silver	nd	nd	nd	nd	nd	nd
20	Sodium	331 B	389 B	458 B	373 B	518 B	404 B
21	Thallium	nd	nd	nd	nd	nd	nd
22	Vanadium	14.0	33.3	31.9	19.7	24.2	31.2
23	Zinc	67.5	68.8	162	51.1	48.1	93.8
24	Cyanide	nd	nd	nd	nd	nd	nd

B	Value greater than or equal to the instrument detection limit but less than contract required detection limit.
E	Estimated value due to interference effects.
J	Estimated value. Value is greater than zero but below quantitation.
R	Data unusable.
S	Value determined by Method of Standard Addition.

Inorganic Analyses (mg/kg or ppm) SOIL

		S1(F)	S1(N)	S2(F)	S2(N)	S3(F)	S3(N)	S4(F)	S4(N)	S5(F)	S5(N)	S6(F)	S6(N)
1	Aluminum	2590 J,E	12,800 J,E	11,200 J,E	7370 J,E	8950 J,E	13,700 J,E	12,900 J,E	13,500 J,E	9360 J,E	5620 J,E	10,900 J,E	8350 J,E
2	Antimony	18.4 J,N	62.8 N,R	46.4 N,R	29.9 N,R	47.7 N,R	63.0 N,R	69.1 N,R	57.5 N,R	47.9 N,R	33.4 N,R	49.6 N,R	38.6 N,R
3	Arsenic	3.7	2.2 B	2.8	3.4	2.2 B	17.8	7.3	2.8	19.8	2.3	3.9	2.6
4	Barium	81.1	99.1	90.8	84.5	53.9	60.4	213	122	64.9	93.8	67.1	74.2
5	Beryllium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Cadmium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
7	Calcium	156,000	59,200	68,900	45,600	55,000	56,200	52,400	64,700	54,800	65,500	39,900	45,000
8	Chromium	34.9 R,*	21.5 R,*	22.1 R,*	12.9 R,*	16.4 R,*	24.0 R,*	21.1 R,*	22.3 R,*	32.0 R,*	11.3 R,*	19.9 R,*	14.0 R,*
9	Cobalt	2270 *	14.1 *	60.5 *	10.0 B,*	12.1 *	12.3 B,*	12.6 B,*	13.5 *	32.2 *	7.5 B,*	53.5 *	9.7 B,*
10	Copper	4770 J,*	31.3 J,*	709 J,*	17.7 J,*	26.1 J,*	33.7 J,*	29.8 J,B,*	27.6 S,*	5040 J,*	22.2 J,*	5540 J,*	41.9 *
11	Iron	9470	23,700	20,000	16,600	19,000	27,900	25,600	24,900	16,100	12,200	19,600	16,300
12	Lead	719	18.8 S	61.7	6.7	7.7	13.2	8.6	17.7 S	78.6 J	23.5 S,R	21.6 J,+	10.3
13	Magnesium	90,700	11,700	19,500	8790	9460	10,700	114,000	12,800	27,900	22,000	9310	10,200
14	Manganese	3610 J,E	608 J,E	636 J,E	731 J,E	712 J,E	573 J,E	822 J,E	664 J,E	545 J,E	625 J,E	900 J,E	657 E
15	Mercury	0.15	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Nickel	545 J,N,*	32.6 J,N,*	148 J,N,*	29.9 J,N,*	27.4 J,N,*	32.2 J,N,*	36.4 J,N,*	33.5 J,N,*	770 J,N,*	25.2 J,N,*	953 J,N,*	28.8 N,*
17	Potassium	473 B	2350	1670	1140 B	901 B	2330	2290	2660	890 B	1060 B	1230 B	1480
18	Selenium	nd N	nd W,N,R	11.9 W,N,R	nd W,N,R	nd W,N,R	nd W,N,R	nd W,N,R	nd W,N,R	nd W,N,R	nd W,N	nd W,N,R	nd W,N,R
19	Silver	69.6	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
20	Sodium	413 B	353 B	343 B	308 B	348 B	378 B	362 B	376 B	287 B	300 B	320 B	320 B
21	Thallium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
22	Vanadium	14.0	26.0	24.0	16.0	18.9	27.4	24.4	27.6	20.8	11.6 B	20.8	15.9
23	Zinc	788 N,R,*	62.5 N,R,*	272 N,R,*	45.6 N,R,*	51 N,R,*	71.7 N,R,*	73.3 N,R,*	67.7 N,R,*	403 N,R,*	158 N,R,*	300 N,R,*	58.7 N,R,*
24	Cyanide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

B	Value greater than or equal to the instrument detection limit but less than contract required detection limit.
J	Estimated value. Value is greater than zero but below quantitation.
R	Data unusable.
*	Duplicate analysis is not within control limits.
W	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
E	Estimated value due to interference effects.
N	Spike sample recovery is not within control limits.
S	Value determined by Method of Standard Addition.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.

Inorganic Analyses (µg/L or ppb) WATER		
		RINSATE
1	Aluminum	255 J
2	Antimony	nd J
3	Arsenic	nd
4	Barium	nd
5	Beryllium	nd
6	Cadmium	8.2
7	Calcium	2290 B
8	Chromium	nd R,*
9	Cobalt	nd *
10	Copper	nd J,*
11	Iron	80.1 B
12	Lead	48.0
13	Magnesium	620 B
14	Manganese	6.1 B,E
15	Mercury	nd
16	Nickel	nd J,N,*
17	Potassium	nd
18	Selenium	nd N
19	Silver	nd
20	Sodium	791 B
21	Thallium	nd
22	Vanadium	nd
23	Zinc	33.0 N,*
24	Cyanide	nd

B	Value greater than or equal to the instrument detection limit but less than contract required detection limit.
E	Estimated value due to interference effects.
J	Estimated value. Value is greater than zero but below quantitation.
N	Spike sample recovery is not within control limits.
R	Data unusable.
*	Duplicate analysis is not within control limits.

Inorganic Analyses (µg/L or ppb) WATER (total)

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B	MW6A	MW6B
1	Aluminum	2060	183 B	245	87.6 B	100 B	2550	1670	498	2320	113 B	nd	497
2	Antimony	nd	nd	nd	5.0 B	nd	nd	nd	nd	nd	6.0 B	nd	nd
3	Arsenic	7.0 B	nd	7.0 B	nd	nd	nd	nd	nd	nd	nd	nd	nd W
4	Barium	292	231	51.8 B	79.3 B	nd	93.6 B	nd	52.6 B	50.0 B	168 B	nd	226
5	Beryllium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Cadmium	nd N	nd N	nd N	nd	nd N	nd	8.0 N,J	nd N	nd	nd N	nd N	nd N
7	Calcium	172,000 B	149,000 B	110,000 B	192,000 B	141,000 B	166,000 B	197,000 B	195,000 B	173,000 B	236,000 B	6470	146,000 B
8	Chromium	16.0 J,*	nd J,*	nd J,*	11.0 J,*	10.0 J,*	15.0 J,*	14.0 J,*	10.0 J,*	16.0 J,*	19.0 J,*	nd J,*	18.0 J,*
9	Cobalt	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	Copper	25.0 B	18.0 B	25.4	12.9 B	11.7 B	nd	52.8	19.0 B	nd	10.0 B	15.7 B	nd
11	Iron	3460	982	383	139	107	1300	2230	481	3360	156	nd	1090
12	Lead	3.0	11.0	8.8 S	18.0	6.7 S	51.7 J,+	1750 S	28.0	9.0	12.7 R,+	3.0 W	21.7 S
13	Magnesium	55,900 J,E	68,800 J,E	60,700 J,E	64,900 J,E	186,000 J,E	63,500 J,E	68,800 J,E	64,100 J,E	61,700 J,E	71,700 J,E	nd J,E	65,300 J,E
14	Manganese	202	179	64.6	82.6	41.3	108	114	103	249	183	nd	168
15	Mercury	nd N,J	nd N,J	nd N,J	nd	nd N,J	nd N,J	nd N,J	nd N,J	nd N,J	nd N,J	nd N,J	nd N,J
16	Nickel	nd	nd	nd	nd	nd	nd	nd	nd	nd	72.0	nd	nd
17	Potassium	4780 B	3840 B	3860 B	4450 B	2750 B	5560	5890	7500	5250	2890 B	nd	4160 B
18	Selenium	nd W	nd W	nd W	nd W	nd W	nd W	nd W	nd	nd	nd W	nd	nd W
19	Silver	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R	nd N,R
20	Sodium	41,400 J,E	45,800 J,E	24,300 J,E	132,000 J,E	45,900 J,E	81,000 J,E	79,600 J,E	110,100 J,E	51,700 J,E	1,590,000 J,E	2540 B,E	970,000 E
21	Thallium	nd W,N	nd W,N	nd W,N	nd W,N	nd W,N	nd W,N	nd W,N	nd W,N	nd W,N	nd N	nd N	nd N
22	Vanadium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
23	Zinc	422 *	148 *	83.0 *	212 *	126 *	196 *	273 *	124 *	83.0 *	512 *	54.0 *	148 *
24	Cyanide	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

J	Estimated value. Value is greater than zero but below quantitation.	E	Estimated value due to interference effects.
S	Value determined by Method of Standard Addition.	R	Data unusable.
B	Value greater than or equal to the instrument detection limit but less than contract required detection limit.	N	Spike sample recovery is not within control limits.
+	Indicates the correlation coefficient for method of standard addition is less than 0.996.	*	Duplicate analysis is not within control limits.
W	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.		

Inorganic Analyses (µg/L or ppb) WATER (dissolved)

		MW1A	MW1B	MW2A	MW2B	MW3A	MW3B	MW4A	MW4B	MW5A	MW5B	MW6A	MW6B
1	Aluminum	234	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2	Antimony	7.0 B,W	nd W	nd	nd	nd	nd	6.0 B,W	7.0 B,W	nd W	6.0 B,W	10.0 B,W	nd W
3	Arsenic	10.0	nd	nd W	nd	nd	nd	nd	nd	nd	nd W	nd	nd W
4	Barium	183 B	249	51.4 B	72.1 B	nd	81.7 B	nd	51.7 B	nd	167 B	nd	240
5	Beryllium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
6	Cadmium	nd	nd	nd	nd	nd	nd	nd	5.0	nd	nd	nd	nd
7	Calcium	99,000 B	136,000 B	100,000 B	181,000 B	164,000 B	164,000 B	167,000 B	178,000 B	143,000 B	1,740,000	nd	134,000 B
8	Chromium	nd J	nd J	nd J	nd J	nd J	10.0 J	nd J	nd J	nd J	nd J	nd J	nd J
9	Cobalt	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
10	Copper	nd	nd	nd	nd	nd	11.4 B	nd	nd	nd	nd	nd	nd
11	Iron	52.0 B	830	53.1 B	111	nd	53.6 B	860	80.2 B	1310	nd	nd	798
12	Lead	nd	nd	nd	8.0	nd	nd	nd	nd	nd	nd	nd	nd
13	Magnesium	52,500 J,E	68,800 J,E	62,600 J,E	61,900 J,E	195,000 J,E	58,000 J,E	73,200 J,E	57,800 J,E	49,500 J,E	70,700 J,E	nd E	66,300 J,E
14	Manganese	22.7	162	76.7	79.5	40.9	69.9	75.0	88.2	171	152	nd	154
15	Mercury	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
16	Nickel	nd	nd	nd	nd	nd	nd	nd	nd	nd	72.7	nd	nd
17	Potassium	4690 B	3850 B	4560 B	4670 B	3120 B	4920 B	4080 B	7560	4130 B	2580 B	nd	3830 B
18	Selenium	nd W	nd W	nd W	nd W	nd W	nd W	nd W	nd W	nd W	nd W	nd W	nd W
19	Silver	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
20	Sodium	43,600 J,E	43,800 J,E	30,600 J,E	139,000 J,E	49,600 J,E	82,900 J,E	79,000 J,E	112,000 J,E	39,800 J,E	79,000 J,E	nd E	43,500 J,E
21	Thallium	nd W	nd W	nd	nd	nd W	nd W	nd	nd	nd W	nd	nd	nd W
22	Vanadium	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
23	Zinc		36.0	nd	160	nd	nd	nd	27.0	nd	235	nd	47.0
24	Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

J	Estimated value. Value is greater than zero but below quantitation.
E	Estimated value due to interference effects.
W	Post digestion spike for Furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
B	Value greater than or equal to the instrument detection limit but less than contract required detection limit.
NA	not analyzed.

APPENDIX H

Dioxins and Furans

DIOXINS AND FURANS

Parameter	Limit of Quantitation (ppt)	Concentration (ppt) S-1 Fill
DIOXINS		
2,3,7,8-tetrachloro dibenzo-p-dioxin	130	nd
1,2,3,7,8-pentachloro dibenzo-p-dioxin	245	nd
1,2,3,4,7,8-hexachloro dibenzo-p-dioxin	135	nd
1,2,3,6,7,8-hexachloro dibenzo-p-dioxin	135	nd
1,2,3,7,8,9-hexachloro dibenzo-p-dioxin	135	nd
1,2,3,4,6,7,8-heptachloro dibenzo-p-dioxin	510	869
total tetrachloro dibenzo-p-dioxins	650	nd
total pentachloro dibenzo-p-dioxins	1000	nd
total hexachloro dibenzo-p-dioxins	750	nd
total heptachloro dibenzo-p-dioxins	1000	1806
octochloro dibenzo-p-dioxin	700	2203
FURANS		
2,3,7,8-tetrachloro dibenzofuran	40	261
1,2,3,7,8-pentachloro dibenzofuran	86	nd
2,3,4,7,8-pentachloro dibenzofuran	115	309
1,2,3,4,7,8-hexachloro dibenzofuran	185	2605
1,2,3,6,7,8-hexachloro dibenzofuran	185	1008
1,2,3,7,8,9-hexachloro dibenzofuran	185	212
2,3,4,6,7,8-hexachloro dibenzofuran	185	nd
1,2,3,4,6,7,8-heptachloro dibenzofuran	310	3173
1,2,3,4,7,8,9-heptachloro dibenzofuran	310	589
total tetrachloro dibenzofurans	200	9104
total pentachloro dibenzofurans	450	7418
total hexachloro dibenzofurans	1000	4832
total heptachloro dibenzofurans	1500	6276
octochloro dibenzofuran	460	1238

nd = parameter not detected

APPENDIX I

Laboratory Case Narratives

SDG: MW2B
S1
MW2BW

CASE NARRATIVE

Laboratory Name: Recra Environmental, Inc.

Laboratory Code: RECNY

Case Number: 4165

SDG Number: MW2B

Contract Number: NY92-544R

Sample Identification:

MW-1b
MW-2b
MW-3a
MW-4B
MW-5B
MW-6B

METHODOLOGY

Analyses were performed in accordance with 1991 New York State Analytical Services Protocol.

COMMENTS

Comments pertain to data on one or all pages of this report.

The enclosed data has been reported utilizing data qualifiers (Q) as defined on the Organic and Inorganic Data Comment Pages.

Results of the analyses of soil samples have been corrected for moisture content and are reported on a dry weight basis.

A diskette associated with the enclosed data cannot become available until the required diskette format is conveyed to Recra Environmental, Inc.

This Sample Delivery Group (SDG) has been arranged according to instructions from Raven/Beck Environmental personnel.

The Carborundum Site Project consists of one (1) set of Quality Control (QC) Data per matrix which deviates from requirements in the New York State Analytical Services Protocol. This has been approved, as per the attached letter of July 14, 1992, by the NYSDEC. There is no QC data reported in this particular SDG.

VOLATILE DATA

Volatile sample and standard areas are listed on the corresponding data system printouts.

Volatile data was processed utilizing Finnigan Autoquantitation and QA Formaster software. All compounds determined to be present by the computer-generated autoquantitation were subjected to a manual ion search for secondary and tertiary ions. Unedited quantitation reports are included in this data package.

The abbreviation "NL" on the quantitation report stands for Not Looking For.

Due to the elevated concentrations of Trichloroethene, Toluene and Total Xylenes, sample MW-6B required analysis at a dilution factor of 5.0.

The compounds cis-1,2-Dichloroethene and trans-1,2-Dichloroethene elute separately on a capillary column. They are reported as Total-1,2-Dichloroethene on Forms 1, 6 and 7.

Also, the compounds ortho-Xylene, meta-Xylene and para-Xylene elute separately and are therefore reported as Total Xylenes on the Forms 1, 6 and 7.

Due to its matrix, sample MW-2b was analyzed initially at a dilution factor of 5.0.

Sample MW-6B was analyzed at medium level due to sample matrix.

SEMIVOLATILE DATA

Semivolatile sample and standard areas are listed on the corresponding data system printouts.

Semivolatile data was processed utilizing Finnigan Autoquantitation and QA Formaster software. All compounds determined to be present by the computer-generated autoquantitation were subjected to a manual ion search for secondary and tertiary ions. Unedited quantitation reports are included in this data package.

In some cases a clean sample spectrum was not obtainable due to sample matrix interference.

Sample MW-2b required a dilution of 5.0 due to the elevated concentration of Bis (2-ethylhexyl) phthalate in the sample.

Samples MW-3a and MW-4B required dilutions of 10 and 2 respectively, due to the elevated concentrations of Bis (2-ethylhexyl) phthalate in the samples.

The surrogate 2,4,6-Tribromophenol exhibited recoveries outside QC limits in samples MW-1b, MW-2b DL, MW-3a and MW-3a DL.

PESTICIDES/PCB DATA

Due to a Turbochrom software malfunction, PBLK 09 appears to have been analyzed on September 7, 1992. However, it was actually analyzed on September 8, 1992.

Standard PEM 07 analyzed on September 9, 1992 at 12:13 is non-compliant; however, it does not affect samples in this data package.

All samples were extracted within 5 days and completed within 10 days according to protocol requirements with the following exceptions: MW-1b, MW-3a, MW4B and MW-5B.

Sample MW-5B appears to have been mistakenly spiked with the EPA CLP compounds. This sample is being re-extracted and analyzed to confirm all positively reported compounds. Results will be available at a later date.

INORGANIC DATA

The extra "zzzzz's" found on the form 14's of the flame Inorganic Data represent the re-zeroing of the instrument after each sample.

The Cyanide LCS's (Laboratory Control Sample) is from ERA Lot #210. The Mercury LCS is from ERA Lot #208.

The Laboratory performs two separate digestions on each sample - one for flame and ICP, and the other for Furnace analysis. The appropriate extract (Digestate) is analyzed depending on the method being utilized. The Preparatory Blank for Antimony fell outside of the control limits when analyzed by ICP. The samples were re-analyzed for Antimony (using the furnace digestate) by graphite furnace. The furnace analysis of the Prepatory Blank was compliant.

> "I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or her designee, as verified by the following signature."

Deborah J. Kinecki/KPK

Deborah J. Kinecki
Vice President

9/15/92

Date

RECRA
ENVIRONMENTAL
INC.

CASE NARRATIVE

Laboratory Name: Recra Environmental, Inc.

Laboratory Code: RECNY

Case Number: 4165

SDG Number: S1

Contract Number: NY92-544R

Sample Identification:

- S-1 (Fill)
- S-1 (Native)
- Water Rinsate
- S-2 (Fill)
- S-2 (Native)
- S-3 (Fill)
- S-3 (Native)
- S-4 (Fill)
- S-4 (Native)
- S-5 (Fill)
- S-5 (Native)
- S-6 (Fill)
- S-6 (Native)
- S-2 (Fill) Matrix Spike
- S-2 (Fill) Matrix Spike Duplicate
- S-2 (Fill) Matrix Duplicate
- Matrix Spike Blank
- Trip Blank

METHODOLOGY

Analyses were performed in accordance with 1991 New York State Analytical Services protocol.

COMMENTS

Comments pertain to data on one or all pages of this report.

The enclosed data has been reported utilizing data qualifiers (Q) as defined on the Organic and Inorganic Data Comment Pages.

Results of the analyses of soil samples have been corrected for moisture content and are reported on a dry weight basis.

The dry weights (103°) are as follows on each individual data page.

VOLATILE DATA

Volatile sample and standard areas are listed on the corresponding data system printouts.

Volatile data was processed utilizing Finnigan Autoquantitation and QA Formaster software. All compounds determined to be present by the computer-generated autoquantitation were subjected to a manual ion search for secondary and tertiary ions. If contract laboratory protocol spectral identification criteria were not met, those compounds were deleted from the quantitation report.

Due to software limitations, sample ID's have been shortened to fit on the forms.

The Method Blank (VBLK67) was used for the analysis of both water and soil samples.

Sample S-1 (FILL) required medium level analysis due to the high concentration of 1,2-Dichloroethene (total), Trichloroethtene, Toluene, Ethyl Benzene, and Total Xylenes.

Sample S-1 (FILL)ML,(medium level), required a dilution of 10 due to the high concentrations of Trichloroethene, Toluene, Ethyl Benzene, and Total Xylenes.

Sample S-1 (NATIVE) required a dilution of 5 due to the high concentration of 1,2-Dichloroethene (total) and Trichloroethene, while S-3 (FILL) was diluted by a factor of 5 due to the high concentration of 1,2-Dichloroethene (total).

Sample S-4 (NATIVE) required a dilution due to the high concentration of 1,2-Dichloroethene (total) and Trichloroethene. The sample was reshot at a medium level extraction.

The samples S-3 (NATIVE) and S-5 (FILL) were shot initially at medium level due to sample matrix. The sample ID's are S3NATIVEML and S5FILLML respectively.

The surrogate Bromofluorobenzene was outside of Quality Control limits for sample S-1 (FILL)ML, (medium level). The sample was re-injected as a dilution and the surrogate was within limits.

Ortho-Xylene and Meta and Para-Xylene elute separately on a capillary column. They are reported as Total Xylenes an the Form 1. The concentration is calculated by adding the areas of Ortho, Meta, and Para-Xylene and using only the response factor from Ortho-Xylene to calculate the nanogram amount.

The compounds cis- and trans-1,2-Dichloroethene elute separately on a capillary column. In this data package, they are reported as 1,2-Dichloroethene (total).

In some cases, a clear spectrum was not obtainable due to matrix interferences.

SEMIVOLATILE DATA

Semivolatile sample and standard areas are listed on the corresponding data system printouts.

Semivolatile data was processed utilizing Finnigan Autoquantitation and QA Formaster software. All compounds determined to be present by the computer-generated autoquantitation were subjected to a manual ion search for secondary and tertiary ions. If contract laboratory protocol spectral identification criteria were not met, those compounds were deleted from the quantitation report.

Chromatographically 3-Methylphenol and 4-Methylphenol coelute.

The TIC (Tentatively Identified Compound) identification of PAH Derivative is abbreviated for Polynuclear Aromatic Hydrocarbon Derivative.

The sample S-6 (FILL) exhibited poor Internal Standard recovery for Perylene-d12. The sample was reanalyzed to show similar results indicating sample matrix interference.

Sample S-5(FILL) required reanalysis at a dilution of 100 (S-5(FILL)DL) due to the elevated concentrations of several compounds. Due to the required dilution, all surrogates were diluted out in sample S-5(FILL)DL.

The sample S-5 (FILL) exhibited poor Internal Standard recoveries for 1,4-Dichlorobenzene-d4, Naphthalene-d8, Acenaphthene-d10, and Perylene-d12. The sample was reanalyzed to show similar results indicating sample matrix interference.

Both S-2 (FILL) Matrix Spike and S-2 (FILL) Matrix Spike Duplicate exhibited spike recovery of 0% for the compound Pentachlorophenol, thus indicating sample matrix interference.

In some cases, a clear spectrum was not obtainable due to matrix interferences.

PESTICIDE/PCB DATA

No Pesticide/PCB rinse blank has been included in this data package according to the work plan stated.

Sample S-1 (FILL) and S-5 (FILL) have been diluted by a factor of five while sample S-6 (FILL) has been diluted by a factor of four.

Samples S-1 (FILL) and S-6 (FILL) both contained one Aroclor 1242 peak outside of the established Retention Time window on the DB1701 column. Sample S-4 (FILL) contained one Aroclor 1260 peak outside of the established Retention Time window on the same column.

INORGANIC COMMENTS

Sample identifications have been abbreviated due to the character limitations of the software.

The extra zzzzzz's found on the form 14's of the flame Inorganic Data represent the re-zeroing of the instrument after each sample.

The Cyanide LCS'S (Laboratory Control Sample) is from ERA Lot #210. The Mercury LCS is from ERA Lot #208.

Results of the soil samples have been corrected for percent solids.

The eighth Continuing Calibration Blank on the ICP run from 8/27 is non-compliant for Antimony. All sample results are between compliant CCB's.

Samples S-4 (Native), S-5 (Fill), and S-5 (Native) were distilled for Cyanide outside of holding time due to an oversight by laboratory personnel.

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or her designee, as verified by the following signature."

Deborah J Kinecki/mat
Deborah J. Kinecki
Vice President
09/24/92
Date

CASE NARRATIVE

Laboratory Name: Recra Environmental, Inc.

Laboratory Code: RECNY

Case Number: 4165

SDG Number: MW2BW

Contract Number: NY92-544R

Sample Identification:

- MW-1A
- MW-1B
- MW-2A
- MW-2B
- MW-2B Matrix Spike
- MW-2B Matrix Spike Duplicate
- MW-2B Matrix Duplicate
- MW-3A
- MW-3B
- MW-4A
- MW-4B
- MW-5A
- MW-5B
- MW-6A
- MW-6B
- Trip Blank

METHODOLOGY

Analyses were performed in accordance with 1991 New York State Analytical Services protocol.

COMMENTS

Comments pertain to data on one or all pages of this report.

The enclosed data has been reported utilizing data qualifiers (Q) as defined on the Organic and Inorganic Data Comment Pages.

Sample identifications have been abbreviated due to computer software limitations.

VOLATILE DATA

Volatile sample and standard areas are listed on the corresponding data system printouts.

Volatile data was processed utilizing Finnigan Autoquantitation and QA Formaster software. All compounds determined to be present by the computer-generated autoquantitation were subjected to a manual ion search for secondary and tertiary ions. Unedited quantitation reports have been submitted with this data package.

Due to matrix interference clean spectra was not obtainable for some samples.

A capillary column was used on the 150L. Compounds cis 1,2-Dichloroethene and trans 1,2-Dichloroethene elute separately. Meta-Xylene, para-Xylene and ortho-Xylene also elute separately on the capillary column. These compounds are reported as total on Forms 1, 6 and 7.

Sample MW2B required a dilution of twenty (20) due to the high concentrations of 1,2-Dichloroethene (total) and Trichloroethene. Samples MW2B Matrix Spike and MW2B Matrix Spike Duplicate were analyzed at initial dilutions of twenty (20) due to the high concentrations of 1,2-Dichloroethene (total) and Trichloroethene in sample MW2B.

Sample MW4A required a dilution of two (2.0) due to the high concentration of 1,2-Dichloroethene (total).

Sample MW5A was analyzed at an initial dilution of twenty (20) due to sample matrix.

Sample MW5B required a dilution of twenty (20) due to the high concentration of 1,2-Dichloroethene (total).

SEMIVOLATILE DATA

Semivolatile sample and standard areas are listed on the corresponding data system printouts.

Semivolatile data was processed utilizing Finnigan Autoquantitation and QA Formaster software. All compounds determined to be present by the computer-generated autoquantitation were subjected to a manual ion search for secondary and tertiary ions. Unedited quantitation reports have been submitted with this data package.

Sample MW2B exhibited a noncompliant recovery for Surrogate 2-Chlorophenol-d4. Samples MW2B Matrix Spike and MW2B Matrix Spike Duplicate exhibited noncompliant recoveries for Surrogates 2-Fluorophenol and 2-Chlorophenol-d4.

Sample MW3B exhibited noncompliant recoveries for Surrogates Nitrobenzene-d5, 2-Fluorobiphenyl and Terphenyl-d14. The was no sample volume left to reprep and reanalyze the sample.

Sample MSBLANK exhibited noncompliant recoveries for Laboratory Spiking compounds Phenol, 1,4-Dichlorobenzene, 1,2,4-Trichlorobenzene, 4-Chloro-3-methylphenol, 4-Nitrophenol, 2,4-Dinitrotoluene and Pentachlorophenol.

Sample MW2B Matrix Spike exhibited noncompliant recoveries for Laboratory Spiking compounds N-Nitroso-di-n-propylamine, 4-Chloro-3-methylphenol, 4-Nitrophenol, 2,4-Dinitrotoluene and Pentachlorophenol. Sample MW2B Matrix Spike Duplicate exhibited noncompliant recoveries for Laboratory Spiking compounds 1,2,4-Trichlorobenzene, 4-Chloro-3-methylphenol, 4-Nitrophenol, 2,4-Dinitrotoluene and Pentachlorophenol.

PESTICIDE/PCB DATA

The following samples exhibited noncompliant Surrogate recoveries:

Sample identifications	TCX 1	TCX 2	DCB 1	DCB 2
PBLK95	*			
PBLK96	*	*		
MW1A			*	*
MW4A				*
MW4B	*			
MW5A			*	*
MW6A	*		*	*
MW2BMSD	*	*	*	*

TCX = Tetrachloro-m-xylene
DCB = Decachlorobiphenyl
1 = Column DB608
2 = Column DB1701
* Values outside of contract required QC limits

Sample MW2B Matrix Spike Duplicate exhibited a noncompliant recovery for Laboratory Spiking compound gamma-BHC (Lindane).

INORGANIC DATA

The extra ZZZZZZ's found on the Form 14's of the Flame Inorganic Data represent the rezeroing of the instrument after each sample.

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or her designee, as verified by the following signature."

Deborah J Kinecki /KPK

Deborah J. Kinecki
Vice President

9/25/92

Date

RECRA
ENVIRONMENTAL
INC.