GROUNDWATER INVESTIGATION REPORT
DYNO-NOBEL INC. SITE
PORT EWEN, NEW YORK
VOLUME I
TEXT - APPENDICES A Through E

Prepared for:

Hercules Incorporated
Hercules Plaza
Wilmington, Delaware 19894

and

DYNO-NOBEL INC.
Ulster Avenue
PO Box 730
Port Ewen, New York 12466

Prepared by:

ECKENFELDER INC.®
1200 MacArthur Boulevard
Mahwah, New Jersey 07430

January 1996

9596.08
January 29, 1996

Mr. Eugene Galper
NYS Department of Environmental Conservation
Div. Of Solid and Hazardous Materials
21 South Putt Corners Rd.
New Paltz, NY 12561

RE: Dyno Nobel, Port Ewen, New York Facility
Groundwater Investigation Report

Dear Mr. Eugene Galper:

Please find attached the Groundwater Investigation Report for the above referenced facility. We submit this report for your comments and approval.

Do not hesitate to call with any questions or comments. My telephone number is 914-334-3205.

Sincerely,

[Signature]

Kevin Kirkpatrick
Environmental Manager
be c: R. Aldrich - NYSDEC, New Paltz, New York
L. Whitbeck - NYSDEC, Albany, New York
G. Schmiesing - Hercules Incorporated
N. Olsen - DYNO-Nobel, Inc., Salt Lake City, Utah
S. Fein - Whiteman, Osterman & Hanna
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<td>October 4, 1995</td>
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EXECUTIVE SUMMARY

Geology

The site is located in the center of a shale and graywacke bedrock valley, which runs north-south. The bedrock is overlain by a layer of undetermined thickness of sand and gravel that ranges from less than one to over 23 feet thick. The sand and gravel is overlain by a layer of silt and clay that is between three and 68 feet thick.

Hydrogeology

Groundwater flows from the east and west and discharges to surface wetlands on the eastern border of the site.

Receptors

The population downgradient of the site and within a mile radius of the site is served by a municipal water utility. There is little health risk to neighboring residents due to groundwater migration from the site.

Groundwater Quality

The groundwater data indicate that the site activities have not had a significant impact on groundwater quality across the site. The inorganic results of filtered groundwater samples did not exceed standards, except for a few minor instances. The results of metal analyses of unfiltered samples exceeded standards upgradient, as well as downgradient of the areas of concern.

Elevated concentrations of volatile organic compounds (VOCs) were observed in the vicinity of the Shell Plant, the most prevalent of which was trichloroethylene (TCE). The concentration of VOCs increased with depth. One sample exhibited concentrations greater than 1 percent of the solubility limit of TCE. Further investigation should be made into the potential presence of a dense non-aqueous phase liquid (DNAPL) layer.
ECKENFELDER INC. recommends the installation of three monitoring well couplets in the vicinity of the Shell Plant. Each couplet will consist of one well in the bedrock and one in the sand and gravel layer immediately above the bedrock. Interim corrective measures are not recommended.
1.0 INTRODUCTION

A groundwater investigation was conducted at the DYNO-NOBEL INC. (DNI) Plant in Port Ewen, New York. This investigation was completed as a precursor to a Resource Conservation and Recovery Act (RCRA) Facility Assessment - Sampling Visit (RFA-SV) and a RCRA Facility Investigation (RFI). The work plan for the RFA-SV has been submitted to and approved by the New York State Department of Environmental Conservation (NYSDEC). The RFA-SV will be conducted upon completion of Interim Corrective Measures (ICM) for Explosives. The work plan for the ICM for Explosives has been submitted and is awaiting approval from the NYSDEC.

1.1 OBJECTIVES

The goals of this investigation consisted of the following:

- Obtain a better understanding of the hydrogeologic conditions at the facility; including groundwater flow direction, hydraulic conductivity, and vertical and horizontal gradients;

- Collect additional information with respect to potential contaminant distribution in the vicinity of the Detonation Pond;

- Document groundwater quality at the perimeter of the site;

- Assess the potential for groundwater related health concerns to neighboring residents;

- Determine groundwater use in the vicinity of the site, including the use and location of private wells, as well as the availability of public water supplies;

- Evaluate the horizontal and vertical extent of groundwater impacts in the vicinity of the Shell Plant;

- Based on data obtained from this investigation, recommend locations for the installation of monitoring wells associated with the Shell Plant.
1.2 SITE LOCATION AND HISTORY

The DNI, Port Ewen Plant is located approximately one mile south of the village of Port Ewen in Ulster County, New York (Figure 1-1). The site is currently active and manufactures explosives, primers, and igniters. The entire property encompasses approximately 350 acres, 100 of which are developed. The site has been actively employed in the manufacture of explosive primers and igniters since 1912 when the facility was built by Brewster Explosives Co. The plant was purchased by Hercules Incorporated (Hercules) in 1922. Hercules owned and operated the facility until 1985. IRECO Inc. purchased the facility in June of 1985 and is the current owner and operator. In July of 1993, IRECO changed their name to DYNO-NOBEL INC. Additional details regarding site operations may be found in the RFA Report (ECKENFELDER INC., December, 1994).

1.3 SITE TOPOGRAPHY

The site is located in a small valley bordered on the west by Hussey Hill and on the east by a low lying ridge adjacent to the Hudson River. Hussey Hill rises to an elevation in excess of 900 feet (above the National Geodetic Vertical Datum of 1929 (NGVD)) and drops steeply to the western edge of the developed property of the facility to an elevation of approximately 200 feet above NGVD. The developed property then drops gently to the valley floor, over a distance of approximately 1,600 feet, to an elevation of approximately 150 feet above NGVD. The land east of the site then gently rises again to the ridge overlooking the Hudson River, at an elevation of approximately 250 feet above NGVD. The Hudson River is located approximately 1.5 miles east of the site, at an elevation of approximately five feet above NGVD. Esopus Lake, another major feature of the area surrounding the site, is located approximately one mile east of the site at an elevation of 185 feet above NGVD.

The center of the valley gently slopes to the north. Wetlands are located to the east, northeast, and southeast of the developed property, at an elevation of approximately 145 feet above NGVD. These wetlands drain to the north to several unnamed tributaries of Planitasie Creek, which continues northward into Roundout Creek. Roundout Creek discharges into the Hudson River north of Port Ewen. The former
Detonation Pond is the only body of water located within the developed area of the facility. There are no visible streams or channels entering or exiting the pond.

The area surrounding the facility is predominantly rural with the closest off-site building a commercial establishment along Route 9W. The nearest residential building is approximately 1,000 feet from the site. It is estimated that there are approximately 270 residences with 1,026 people within a one-mile radius of the site (Gibbs & Hill, 1990).

1.4 PREVIOUS INVESTIGATIONS

Previous investigations of the facility have been conducted under two independent programs: the RCRA Program and the New York State Superfund Program. The reports generated from these investigations are summarized in Table 1-1.

An RFA was conducted under the RCRA Program, which consisted of a Preliminary Review (PR) of available relevant documents and a Visual Site Inspection (VSI). The PR and VSI were completed by A.T. Kearney Inc., under contract to the U.S. Environmental Protection Agency (U.S. EPA). The results can be found in the RFA Report, which was completed by A.T. Kearney in October, 1993. At the request of NYSDEC, this report was revised by ECKENFELDER INC. in December, 1994, on behalf of Hercules and DNI, to correct various factual errors.

Investigations completed under the New York State program have consisted of Phase I and II site investigations. The preliminary investigation (Phase I) was completed by EA Science and Technology. The final report for this work was issued in December of 1993. A Phase II investigation was completed by Gibbs & Hill Inc., with a final report issued in July of 1990. The purpose of this investigation was to collect information necessary to classify the site for further action and to develop a final Hazard Ranking System (HRS) score.

The RFA Report presents a detailed description of the site history and operation and identifies individual Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) which potentially resulted in a release to the environment. These areas were identified through a review of file materials and visual inspections. The SWMUs and AOCs were evaluated as to their potential to release hazardous waste
# TABLE 1-1

## SUMMARY OF PREVIOUS INVESTIGATIONS AND REPORTS

<table>
<thead>
<tr>
<th>Name of Investigation</th>
<th>Investigation Conducted By</th>
<th>Final Report Date</th>
</tr>
</thead>
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<tr>
<td><strong>New York State Superfund Program</strong></td>
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<td></td>
</tr>
<tr>
<td>Phase I Investigation</td>
<td>EA Science and Technology</td>
<td>December 1983</td>
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<tr>
<td>Phase II Investigation</td>
<td>Gibbs and Hill Inc.</td>
<td>July 1990</td>
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<td><strong>USEPA Resource Conservation and Recovery Act</strong></td>
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<tr>
<td>RCRA Facility Assessment (RFA)(^a)</td>
<td>A.T. Kearney Inc.</td>
<td>October 1993</td>
</tr>
<tr>
<td></td>
<td>ECKENFELDER INC.</td>
<td>December 1994(^b)</td>
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</table>

\(^a\) Includes a Preliminary Review (PR) and Visual Site Inspection (VSI).

\(^b\) The A.T. Kearney report was revised and finalized, at the request of NYSDEC, by ECKENFELDER INC., on behalf of Hercules and DYNO Nobel.
or constituents to the environment. Based on this evaluation, the RFA Report documents those SWMUs and/or AOCs which either; 1) require no further action; 2) require confirmatory sampling (i.e., an RFA-SV); 3) require an RFI to collect information on a known or suspected release to the environment; or 4) require that an ICM be implemented on an expedited basis.

The Phase II investigation built upon the information obtained from the Phase I preliminary investigation. The work conducted during Phase II consisted of the installation of 12 monitoring wells in groups of three, at four locations within the facility. These areas are scattered across the facility and include the Burning Pad Area (SWMU Nos. 6 and 7), the Old Discharge Area (Shell Plant) (SWMU No. 30), the Old Dump Area (SWMU No. 23), and the Detonation Pond Area (SWMU No. 1). Discussion of the results of this investigation can be found in the Phase II Report (Gibbs and Hill, 1990).
2.0 METHODS AND PROCEDURES

The groundwater investigation was conducted in accordance with the approved Work Plan (Groundwater Investigation Work Plan, ECKENFELDER INC., April, 1995). The following sections describe the methods and procedures used during this investigation.

2.1 OLD DISCHARGE AREA (SHELL PLANT, BUILDING NO. 2036)

The area surrounding the Shell Plant was investigated to estimate the vertical and horizontal extent of impacts to the groundwater quality, and to aid in the placement of future monitoring wells and remedial strategies. Groundwater samples were collected with the use of a HydroPunch® borehole sampler. Samples were collected and analyzed for Target Compound List (TCL) volatile organic compounds (VOCs).

2.1.1 HydroPunch® Boring Locations

Sixteen borings were completed in the vicinity of the Shell Plant. Their locations are depicted on Figure 2-1. Two borings (HP-14 and HP-15) were completed adjacent to SWMU No. 18 (Former Waste Degreaser Storage Building Area) to evaluate the potential impact to groundwater quality associated with this SMWU. These borings were completed during this investigation, rather than during the RFA-SV, because of the limited amount of information available regarding the operation of this unit. In addition, SMWU No. 18 is located within close proximity to the Shell Plant, allowing for the completion of these borings without having to remobilize the drilling equipment. The remaining fourteen locations were chosen to evaluate the extent of horizontal migration of the contaminants associated with the Shell Plant.

2.1.2 HydroPunch® Sampling Procedures

The HydroPunch® borings were advanced with a truck-mounted or track-mounted drill rig (depending on the location and surface conditions) equipped with 4 1/4-inch inside diameter hollow-stem augers. Soil samples were collected every five feet with a two-inch diameter split-spoon sampler in accordance with the Standard Penetration Test (ASTM Method D-1586). The soil borings were completed by
tremie grouting the borehole with a cement/bentonite grout mixture per ASTM D-5299. The locations of the borings were staked to be surveyed by a New York State licensed land surveyor for ground surface elevation (relative to NGVD) and location (relative to New York State Plane Coordinate System) at a later time. A summary of the survey data is presented in Table 2-1.

Soil samples were visually classified and described in accordance with a modified Burmister Soils Classification System (1958) and the Unified Soil Classification System (ASTM D-2488). A representative portion of the split-spoon sample was placed in a glass jar, sealed with aluminum foil and the jar lid, and properly labeled. The samples were allowed to equilibrate to room temperature, and were then subjected to field-screening for volatile organics with an HNu Systems Model PI-101 Photoionization Detector. The samples were then placed in boxes and stored on-site for future reference. The soil description and classification, along with information such as boring depth, length of recovered portion of the sample interval, blow counts for split-spoon samples, depth to saturation, head space results, depth of the HydroPunch® sample collected for laboratory analyses, and other distinguishing characteristics of the soil (e.g., odor, color, etc.), if present, were recorded. These observations are contained in the boring logs presented in Appendix A.

A minimum of one groundwater sample was collected at each HydroPunch® boring location. The shallowest sample was collected approximately 25 feet below ground surface, or a minimum of five feet below saturation. This depth corresponds with the ten-foot screened interval in the existing monitoring wells adjacent to the Shell Plant (MW-3, MW-4A, and MW-4B). One of the HydroPunch® borings (HP-10) was located adjacent to existing well MW-4A, for which analytical data is available, as a control location to provide a comparison of the data obtained from the HydroPunch® investigation (see Section 3.3).

Upon reaching the target groundwater sample depth, the HydroPunch® sampler, equipped with a dedicated five-foot screen and drive point, was attached to the drilling rods and lowered through the augers to the bottom of the boring. The device was then pushed or driven approximately five-feet into the underlying undisturbed soils. The HydroPunch® sheath was then retracted between one to four feet, exposing the screen to the soils. The clay deposits into which the HydroPunch® sampler was driven were so dense, that many times the drive point detached from
TABLE 2-1

SUMMARY OF SURVEY DATA (a)

<table>
<thead>
<tr>
<th>Well Name</th>
<th>Northing (b)</th>
<th>Easting (b)</th>
<th>Ground Surface Elevation (c) (feet)</th>
<th>PVC Elevation (c) (feet)</th>
<th>Protective Casing Elevation (c) (feet)</th>
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<tr>
<td>HP-1</td>
<td>685,400.08</td>
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<td>HP-2</td>
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### TABLE 2-1

SUMMARY OF SURVEY DATA (a) (Continued)

<table>
<thead>
<tr>
<th>Well Name</th>
<th>Northing (b)</th>
<th>Easting (b)</th>
<th>Ground Surface Elevation (c) (feet)</th>
<th>PVC Elevation (c) (feet)</th>
<th>Protective Casing Elevation (c) (feet)</th>
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<tr>
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<td>NA</td>
<td>147.5</td>
<td>NA</td>
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</tbody>
</table>

(a) Survey performed by North and Houston Land Surveyors, November - December, 1995.
NA indicates data not available
(b) Northing and easting based on NYS Plane Coordinate System.
(c) Elevations relative to National Geodetic Vertical Datum of 1929.
the screen. Thus, only a small portion of the screen was exposed to the soils. This, coupled with the low rate of recharge into the sampler, required that many of the HydroPunch® samplers had to be left in the borehole overnight to allow enough water to enter the screened interval to collect a minimum of 40 mL for the analyses for VOCs. The groundwater samples were collected with a very small diameter bailer, manufactured specifically for use with the HydroPunch® sampler. Dedicated nylon cord was used to lower the bailer through the drilling rods and into the sample chamber. The bailer was retrieved and the sample was transferred to the sample containers in a manner that limited the amount of volatilization of the sample.

The boring was then advanced to a depth of 40 feet below ground surface, with soil samples collected at five-foot intervals. A second HydroPunch® sample was collected at this depth. This second groundwater sample was analyzed only if any VOCs were detected in the shallowest groundwater sample within that boring. An exception to the above procedure was employed at HP-10, where the second groundwater sample was collected at a depth of 37 to 37.5 feet below ground surface because bedrock was encountered at 37.5 feet. Further, an additional groundwater sample (HP-10A, 32 to 34 feet) was collected from a boring adjacent to this location to allow for a larger length of screen exposed to the soils. A final exception occurred at HP-9, where a second HydroPunch® sample was not collected because the analytical results for the shallow sample were obtained prior to completion of the borehole and indicated no detected values for VOCs.

A final soil sample was collected approximately five feet below the depth from which the HydroPunch® sample was pushed or driven, to characterize the soils associated with the HydroPunch® sample. A split-spoon sample could not be collected from the same depth interval as the groundwater sample, as indicated in the Work Plan, because the screen and drive point remained in the borehole. Split-spoon samples collected above the second groundwater sample did not indicate that the sand and gravel unit had been penetrated, thus, no temporary casing was necessary.

The HydroPunch® sampler and bailers, employed above, were cleaned prior to each use via the following procedures:
• The sampler and bailer were decontaminated with a high-pressure hot water jet spray, followed by a laboratory detergent wash and potable water rinse;

• The screen, o-rings, and drive-point of the HydroPunch® sampler were replaced after each use. It is not possible to recover the screen and drive-point from the borehole; and

• A final distilled/deionized water rinse was conducted after the sampler and bailer were reassembled.

2.1.3 HydroPunch® Sample Analysis

Thirty-two groundwater samples were collected from 16 soil borings, in accordance with the approved Work Plan. It was not necessary to analyze seven of the deeper samples, because no values were detected in the shallow sample from the same boring. The samples were shipped via overnight express to the ECKENFELDER INC. laboratory in Nashville, Tennessee, which is certified by the New York State Department of Health (NYSDOH). The analyses were conducted in accordance with the ECKENFELDER INC. Laboratory Quality Assurance Manual, contained in Appendix C of the Work Plan.

Trip blank, equipment blank, and replicate samples were collected and analyzed for quality control and to provide a quantitative basis for validating the analytical data. One trip blank sample was collected per sample shipment. The trip blank consisted of an analyte-free water sample prepared by the laboratory. The trip blank sample accompanied the sample container shipment from the laboratory, to the field, and back. The trip blank samples were labeled with a "TB" prefix, followed by the six digit sample date. A total of 14 trip blank samples were analyzed.

Two equipment blank samples (EB062295 and EB071795) were collected as part of the HydroPunch® sampling. The equipment blanks consisted of analyte-free water, obtained from the ECKENFELDER INC. laboratory, poured over the cleaned HydroPunch® sampler and bailer, and collected into the appropriate sample containers.
Blind replicate samples were collected at HP-8, 23 to 24 feet, and HP-10, 21 to 24 feet (DUP071395 and DUP060895, respectively). The replicate samples were collected from borings where a considerable amount of water had entered the sample chamber. The replicate samples were evenly split from the same bailer.

2.2 SITE-WIDE GROUNDWATER INVESTIGATION

The groundwater investigation was conducted to gain a better understanding of the hydrogeologic conditions at the facility. The objectives of this phase of the investigation included obtaining a better understanding of the groundwater flow direction, hydraulic conductivity, the vertical and horizontal gradients, and the potential for off-site migration of contaminants.

2.2.1 Monitoring Well Installation

The technical approach for evaluating the site hydrogeology included the installation of well couplets at six locations throughout the facility, plus two additional wells associated with the Detonation Pond area. A total of fourteen wells were installed and their locations are depicted on Drawing 9596-01. The distribution of the well locations throughout the facility and the use of couplets allows for a better understanding of the horizontal and vertical flow components present at the site. The Work Plan called for the installation of a well couplet downgradient of the Detonation Pond; however, because bedrock was encountered at a depth of 10.8 feet, only one well (MW-17S) was installed at this location. MW-17S was installed a month after the other wells were completed because of difficulties obtaining permission from the property owner. All the monitoring wells were screened within the overburden deposits; the underlying bedrock deposits were not targeted for investigation during this phase of work. In addition, one staff gauge (SG-1) was installed to evaluate the relationship between the surface and groundwater.

Each couplet location consists of one well screened within the unconfined silt and clay deposits (shallow overburden) and one in the confined sand and gravel unit (deep overburden). The shallow monitoring wells were generally screened between 15 to 20 feet below ground surface. The deep monitoring wells were installed on the top of bedrock, with the exception of MW-11D, which was screened within the upper 15 feet of the sand and gravel unit. Bedrock was not encountered at this location.
In addition, only a thin layer of silt and clay deposits were encountered at two locations, MW-17S and MW-18S; thus, these wells are screened on the top of bedrock within the sand and gravel unit.

The borings into which the monitoring wells were installed were advanced with a truck-mounted or track-mounted drill rig (depending on the location and surface conditions) equipped with 4 1/4-inch inside diameter hollow-stem augers. Soil samples were collected every five feet with a two-inch diameter split-spoon sampler in accordance with the Standard Penetration Test (ASTM Method D-1586). The samples were classified and subjected to head space analysis as described in Section 2.1.2, HydroPunch® Sampling Procedures. The monitoring wells were installed in accordance with ASTM D-5092. They consist of two-inch diameter Schedule 40 PVC, with a ten-foot long, 0.010-inch slot-size PVC screen. The shallow depth to bedrock at two locations (MW-15D and MW-17S), mandated the use of a five-foot long PVC screen, with the same slot size. This was necessary at the MW-15 cluster to eliminate the possibility of overlap in the screen lengths for the shallow and deep wells.

Once the borehole was advanced to the designated depth, the well screen and riser pipe were placed in the borehole. A primary filter pack was then emplaced into the annular space to a height approximately two to three feet above the top of the screen. A secondary filter pack, consisting of one to two feet of fine silica sand, was then placed above the primary filter pack. The depth to the top of each of the filter packs was tamped and measured with a weighted tape. A bentonite pellet or slurry seal three to five feet in thickness was then placed on top of the secondary filter pack. A cement/bentonite grout mixture, consisting of eight gallons of water and five pounds of high-grade bentonite per 94-pound bag of Portland cement (Type I or II), was then tremied into the remaining annular space. The monitoring well was completed with a lockable, steel protective casing that extends approximately 2.5 feet above ground surface. The casing was secured in concrete in the form of a well pad four to six inches above ground surface, angled to direct surface water away from the well. The well construction details can be found on the boring logs presented in Appendix A.

All existing and newly installed monitoring wells were surveyed by a New York State-licensed land surveyor for location and elevation. The survey included location
coordinates (referenced to NYS Plane Coordinate System), ground surface elevation, top of PVC elevation, and top of protective casing elevation for each monitoring well (elevations relative to NGVD). A summary of the survey information is provided on Table 2-1.

2.2.2 Well Development

Following the well construction and after the cement/bentonite grout had set (a minimum of 24 hours), each monitoring well was developed to remove fine-grained particles from the filter pack in accordance with the following procedures:

- **Surge Block** - A surge block with an outside diameter slightly smaller than the inside diameter of the well was placed in the well and manually moved up and down to produce a surging action. The use of the surge block was alternated with one of the following methods to remove the accumulated sediments within the well screen.

- **Dual Line Air Development (airlift pumping)** - Dual line air development is a method where two pipes, an air supply line and an air and water discharge line, are placed in the well. The air supply line was then connected to an air compressor, equipped with an in-line oil filter. The compressed air was turned on, and air was jetted into the air discharge line from the supply line. This creates a pressure differential that pushes the water into the air discharge line, where it is collected in a drum at the ground surface. This method generally allows the purging of water at a relatively slow rate and does not inject air into the formation.

- **Bailer** - A bailer was used in conjunction with the surge block on the shallow wells that had very low recovery rates. In general, the wells were bailed dry four times during the course of development and allowed to fully recover between bailing episodes.

2.2.3 In-Situ Hydraulic Conductivity Testing

Following development, in-situ hydraulic conductivity tests (slug tests) were conducted at each of the newly installed wells and five of the existing monitoring
wells (MW-1, MW-2B, MW-3, MW-4B, and MW-8) because existing hydraulic conductivity data could not be located. Slug tests involve lowering the water level in the well by instantaneously removing a quantity of water from the well and measuring the rate at which the water level recovers to initial static conditions.

In wells that recover slowly (i.e., the wells screened in the shallow overburden), the recovery rate was recorded manually. Wells that recover too quickly for this method were measured by means of a pressure transducer and electronic data logging system. Measurements were also collected with a data logger in many of the slow recovery wells to allow the tests to run overnight or over the period of a few days (a weekend). If the test had not reached 90 percent recovery at this point, the test was stopped at the discretion of the hydrogeologist. The methods for conducting slug tests can be found in Appendix A of the Work Plan.

The data collected from the slug tests were evaluated using the AQTESOLV software program (Geraghty & Miller, Inc., October, 1994). The program utilizes two separate methods for analyzing slug test data, depending upon whether the aquifer is confined or unconfined. The data collected from those wells under apparent unconfined conditions (i.e., the wells screened within the shallow overburden deposits) were evaluated using the method of Bouwer and Rice (1976). The data from wells under apparent confining conditions (i.e., wells screened within the deep overburden deposits) were evaluated utilizing the method of Cooper, et al. (1967) and Bouwer and Rice. The Bouwer and Rice method supports solutions for wells screened in both confined and unconfined aquifers. The values calculated using the Bouwer and Rice method were, generally, an order of magnitude larger than the values calculated by the Cooper, et al. method. The more conservative values (i.e., the higher values) are reported in this document. A summary of the hydraulic conductivity data is presented in Table 2-2. The slug test solutions can be found in Appendix B.

2.2.4 Water Level Measurements

Three rounds of water level measurements were obtained from all the new and existing monitoring wells and staff gauges. The depth to groundwater was measured with an electronic water level indicator. The probe was lowered into the well until the meter indicated the water was reached. The probe was then raised
<table>
<thead>
<tr>
<th>Well Name</th>
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<th>Hydraulic Conductivity (cm/sec)</th>
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</thead>
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<td>1989</td>
<td>S</td>
<td>3.0E-05</td>
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<td>1989</td>
<td>S</td>
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<td>Geometric Mean (Deep overburden):</td>
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</table>

<table>
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</tr>
</tbody>
</table>

(a) S indicates well screened in shallow overburden;  
    D indicates well screened in deep overburden;  
    R indicates well screened in bedrock
above the water level and slowly lowered, until the water was again indicated. The cable was held against the side of the inner well at the point designated for water level measurements and a depth reading taken. This procedure was followed three times or until a consistent value was obtained. The value was recorded to the nearest 0.01 feet in a field notebook. The probe was then decontaminated with a distilled water rinse as it was raised to the surface. A summary of the water level measurements is presented in Table 2-3.

2.2.5 Surface and Groundwater Sampling and Analysis

Groundwater samples were collected from each of the existing and newly installed monitoring wells. Well MW-5 was not sampled because it was dry when the sampling was conducted. MW-17S was sampled at a later date because it had not yet been installed when the initial sampling occurred. The existing monitoring wells were sampled previously as a part of the Phase II Investigation. This sampling event thus provides confirmation of these initial sampling results. The locations of the new wells are distributed across the site and, in many cases, are near an identified SWMU or AOC. There is no previous information regarding groundwater quality in these areas. Well cluster MW-11 is located upgradient of the facility and provides background water quality conditions.

Two surface water samples (SW-2 and SW-3) were collected from the wetlands bordering the eastern boundary of the site. The surface water sampling occurred at the same time MW-17S was sampled, because all the surface water sample locations were dry during the initial sampling event. A surface water sample could not be collected from the background location, SW-1, as this location was dry during the sampling event. SW-2 was collected from an area directly downgradient of the Shell Plant area, while SW-3 was collected from a downstream location. The location of SW-3 was chosen to be representative of the surface water quality leaving the general wetlands area, closest to the site and adjacent to the area of immediate concern. It is located at an area removed from the Shell Plant before the stream forks. The locations of the surface water samples are depicted on Drawing 9596-01. The surface and groundwater sampling field data sheets are presented in Appendix C. The chain-of-custody forms are presented in Appendix D.
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<th>Depth to Groundwater (d)</th>
<th>Groundwater Elevation</th>
<th>Depth to Groundwater (d)</th>
<th>Groundwater Elevation</th>
<th>Depth to Groundwater (d)</th>
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<td>156.6</td>
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<tr>
<td>MW-12S</td>
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<td>160.7</td>
<td>18.89</td>
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</tbody>
</table>

(a) All elevations and depths measured in feet. Elevations are relative to National Geodetic Vertical Datum of 1929.
NM indicates water level measurement not taken.

(b) S indicates well screened in shallow overburden; D indicates well screened in deep overburden; Rock indicates well screened in bedrock.

(c) Survey performed by North and Houston Land Surveyors, Kingston, N.Y.

(d) Depth to groundwater measurement taken from top of PVC well casing.
2.2.5.1 Surface and Groundwater Sampling Procedures. Procedures for the
collection of surface and groundwater samples are presented in Sections 6.3 and 6.1,
respectively of the Work Plan. The monitoring wells were purged of three well
volumes of water or completely evacuated, depending on recharge rates, prior to
sampling. Purging was performed by bailing with a pre-cleaned PVC bailer for the
monitoring wells with low recharge rates, or with a small diameter Grundfos
Redi-Flo2® submersible pump. Dedicated high density polyethylene (HDPE) tubing
was used in conjunction with the pumps and dedicated polyethylene cord was used
to suspend the bailers into the wells. Groundwater samples were collected using
either the pump or a disposable Teflon® bailer with nylon bailer cord.

Nearly all the equipment used to collect the surface and groundwater samples was
dedicated to a given monitoring well. The only exceptions were the PVC bailers
used for purging, the Grundfos Redi-Flo 2® submersible pumps, and the filtration
vessel used to filter the samples for soluble metals analysis. This equipment was
decontaminated prior to each use according to the following procedures:

- A laboratory detergent wash followed by a potable water rinse. These
  solutions were flushed through the pump for approximately five minutes;

- A 10 percent nitric acid solution rinse; and

- A final rinse with analyte-free deionized water.

2.2.5.2 Surface and Groundwater Sample Analysis. Twenty-five groundwater
samples and two surface water samples were collected and shipped via overnight
express to the ECKENFELDER INC. laboratory in Nashville, Tennessee. The
groundwater samples were analyzed for TCL Organics (volatiles and semivolatiles)
and total and soluble metals. The surface water samples were analyzed for TCL
Organics and total metals. The list of metals are summarized on Table 2-4. The
analyses were conducted in accordance with the ECKENFELDER INC. Laboratory

Trip blank, equipment blank, and replicate samples were collected and analyzed for
quality control and to provide a quantitative basis for validating the analytical data.
One trip blank sample was collected per sample shipment. The trip blank samples
<table>
<thead>
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<th>Parameter</th>
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<tr>
<td>Antimony</td>
<td>6010</td>
</tr>
<tr>
<td>Arsenic</td>
<td>7060</td>
</tr>
<tr>
<td>Barium</td>
<td>6010</td>
</tr>
<tr>
<td>Cadmium</td>
<td>6010</td>
</tr>
<tr>
<td>Chromium</td>
<td>6010</td>
</tr>
<tr>
<td>Cobalt</td>
<td>6010</td>
</tr>
<tr>
<td>Copper</td>
<td>6010</td>
</tr>
<tr>
<td>Lead</td>
<td>7421</td>
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<td>Mercury</td>
<td>7470</td>
</tr>
<tr>
<td>Potassium</td>
<td>6010</td>
</tr>
<tr>
<td>Selenium</td>
<td>7740</td>
</tr>
<tr>
<td>Silver</td>
<td>6010</td>
</tr>
<tr>
<td>Zinc</td>
<td>6010</td>
</tr>
</tbody>
</table>
were analyzed only for VOCs. The trip blank samples were labeled with a "TB" prefix, followed by the six digit sample date. A total of three trip blank samples were analyzed.

Two equipment blank samples (EB091295 and EB091395) were collected as part of the groundwater sampling. One of the equipment blank samples consisted of analyte-free water, obtained from the ECKENFELDER INC. laboratory, poured over the equipment used when collecting the samples with the submersible pump; and the other for the samples collected with bailers. One equipment blank sample (EB091495SUR) was collected as part of the surface water sampling. Two blind replicate samples were also collected (REP091495 for well MW-8, and REP091595 for well MW-11D).
3.0 INVESTIGATIVE FINDINGS

3.1 SITE GEOLOGY

3.1.1 Bedrock Geology

There has been limited work conducted to identify and describe the bedrock geology of this area, and this phase of work did not include any investigation into the these deposits. The site lies within the Hudson River Lowlands, located between the Hudson River to the east, and the Marlboro Mountains to the west. The Hudson Valley fold and thrust belt, located to the west, is the prominent structure of this area and has been studied in great detail. The bedrock deposits underlying the facility consist of the Ordovician Austin Glen Formation of the Normanskill unit. This formation is composed of graywacke that grades up into shale (ECKENFELDER INC., December, 1994).

Bedrock was encountered in nine of the borings conducted during this investigation. Five of the existing monitoring wells had also been sampled to the top of bedrock. Bedrock elevations across the site ranged from a high of 223.5 feet above NGVD in well MW-1, to 80.0 feet above NGVD in well MW-12D, located at the center of the facility. Elevations of the top of bedrock then rise beneath the wetland area east of the developed portion of the site to an elevation of 180.0 feet above NGVD in well MW-17S. The bedrock valley is oriented in a northeastward direction in the northern reaches of the site, and is offset to the western side of the topographic valley occupied by the wetlands. Bedrock is observed to outcrop in the western portion of the facility along the edge of Hussey Hill. A structural contour map of the top of bedrock is depicted on Drawing 9596-02. The bedrock surface is also shown in three cross-sections depicted on Drawing 9596-03.

3.1.2 Overburden Deposits

Ulster County was completely covered by a continental glacier, which reached its estimated maximum thickness about 27,000 years ago. The depth of glacial erosion by abrasion, scouring, and plucking is notable in only some areas of the county. Most soils in the county formed directly in glacial or glacial-related deposits during
the past 14,000 years. As a consequence, some of the soils found in the county appear unrelated to the underlying bedrock (ECKENFELDER INC., 1994).

The facility is located in a transitional area between two soil associations. To the north and east of the facility, the soil association is Bath-Nassau. This consists of deep to shallow, well-drained and somewhat excessively drained, dominantly hilly, medium-textured soils underlain by shale deposits. To the south and west of the facility, the soil association is Stockbridge-Farmington-Bath. These soils consist of deep to shallow, well-drained and somewhat excessively drained, predominately hilly, medium-textured soils underlain by limestones. The soil beneath the facility is primarily Rhinebeck silt loam, as well as, Canandaigua silt loam and Hudson silt loam, with slopes of three to eight percent and eight to 15 percent (ECKENFELDER INC., 1994).

Descriptions of the overburden materials encountered in each soil boring conducted during this investigation are presented in the soil boring logs in Appendix A. Soil boring logs for the existing monitoring wells are also included in Appendix A. The nature of the overburden deposits is described in the following sections based on the findings from both this investigation and those presented in the Phase II Report.

The overburden deposits consist of a "moist, brown Silty CLAY, trace f Sand" within the upper 15 feet. At approximately 15 feet, the deposits grade to a "wet, gray Silty CLAY to CLAY, trace to no f Sand". The silt and clay layer ranges in thickness from 3.5 feet in MW-17S to 66.8 feet in MW-12D. A sand and gravel layer was encountered beneath the silt and clay deposits in 22 borings, including six of the existing soil borings. The sand and gravel layer ranges from 3.5 feet below ground in MW-17S to 66.8 feet below ground surface in MW-12D. In the borings where a thickness could be determined, the thickness of sand and gravel layer ranges from less than one foot thick in HP-10 to greater than 23 feet in MW-11D.

The combined thickness of the overburden deposits ranges from 1.5 feet in MW-1 to 85.1 feet in MW-12D, and is depicted on the isopachous map presented on Drawing 9596-04. The thickness contours are consistent with the contours presented on the structural contour map discussed above, and exhibit a similar northeast orientation. The overburden deposits are thin along the western edge of the facility bordering Hussey Hill, thicken in the center of the bedrock valley (i.e.,
the central portion of the site), and thin in the eastern portion of the facility in the vicinity of the wetlands. The overburden deposits, including relative portions of the silt and clay layer and the sand and gravel layer, are depicted in the three cross-sections on Drawing 9596-03.

3.2 SITE HYDROGEOLOGY

In the following sections, the findings of the site wide groundwater investigation are presented. Section 3.2.1 provides a description of the hydrogeologic character of the overburden deposits. Section 3.2.2 describes the site-wide groundwater quality. Finally, Section 3.2.3 discusses potential receptors.

3.2.1 Overburden Water-Bearing Zone

Groundwater flow within the overburden deposits has been subdivided based upon the grain size of the encountered soils, as described previously in Section 3.1.2. Two groundwater contour maps (for the shallow overburden and deep overburden deposits) were generated using water level measurements collected on October 4, 1995. Potentiometric surface contours (i.e., the water table) for the shallow overburden deposits are depicted on Drawing 9596-05. Drawing 9596-06 illustrates the piezometric surface contours for the deep overburden deposits. The data used in the preparation of these maps is presented in Table 2-3.

The potentiometric surface map of the shallow overburden (Drawing 9596-05) indicates, in general, that the groundwater in these deposits flows from Hussey Hill towards the wetlands in the eastern portion of the site. The groundwater flow direction then turns to the north-northeast, mimicking the surface water flow patterns. Groundwater flow in the deep overburden deposits (Drawing 9596-06) flows toward the low in the bedrock valley described in Section 3.1.1 (i.e., the center of the site) from both the east and west, and continues towards the northeast, similar to the flow in the shallow overburden deposits.

It should be noted that the groundwater flow maps for both the shallow and deep overburden deposits indicate a groundwater low associated with the wetlands northeast of the active facility. This results in converging groundwater flow lines and precludes the migration of potential contaminants from the facility east of the
wetlands. As discussed further in Section 3.2.3, private wells screened within the sand and gravel deposits east of the wetland area are located upgradient of any potential plume which may migrate from the facility, and are thus not considered potential receptors.

Groundwater occurs in the shallow overburden deposits under unconfined (i.e., water table) conditions. The lateral hydraulic conductivity of the shallow overburden deposits can be estimated using the results of the slug tests. Slug tests were conducted on the thirteen wells screened within these deposits, and ranged from \(8.1 \times 10^{-4}\) cm/sec at MW-8 to \(4.3 \times 10^{-7}\) cm/sec in MW-13S. The geometric mean lateral hydraulic conductivity is \(1.6 \times 10^{-5}\) cm/sec. These data are summarized on Table 2-2 and the solutions for the slug tests conducted during this investigation are presented in Appendix B.

A comparison of the water level data collected at the various couplet locations installed across the site indicates that the hydraulic gradients are downward in the vicinity of the active portion of the site and, generally, upward at the perimeter of the site. The vertical hydraulic gradients are summarized in Table 3-1. On the basis of these gradients, and the relatively low hydraulic conductivity of the shallow overburden deposits as compared with the higher hydraulic conductivity of the deep overburden deposits (discussed below), groundwater flow within the shallow overburden is anticipated to be predominately vertical. This assumption is supported by the Tangent Law for the refraction of groundwater flow lines between two units with different values of hydraulic conductivity (Freeze and Cherry, 1979).

The seepage velocity \((V_s)\), or the average speed at which a particle of water will move in the subsurface, is given by the following relationship:

\[
V_s = ki/\eta_e
\]

Where:
- \(k\) = hydraulic conductivity
- \(i\) = hydraulic gradient
- \(\eta_e\) = effective porosity

For the purpose of these calculations, the effective porosity for the shallow overburden deposits was assigned a value of 0.50, which is within the range of
### TABLE 3-1

**SUMMARY OF VERTICAL HYDRAULIC GRADIENTS**

<table>
<thead>
<tr>
<th>Well Cluster</th>
<th>Water Level Elevation</th>
<th>Vertical Difference (a)</th>
<th>Head Difference (feet)</th>
<th>Vertical Hydraulic Gradient</th>
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<td></td>
<td>Shallow Well</td>
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<tr>
<td>MW-11</td>
<td>154.4</td>
<td>154.6</td>
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<td>137.2</td>
<td>138.0</td>
<td>23.9</td>
<td>-0.8</td>
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</table>

ARITHMETIC MEAN: 0.187

(a) The vertical distance is the difference between the midpoints of the shallow and deep well screens.
typical porosities for silt and clay deposits (Freeze and Cherry, 1979). The hydraulic gradient is the average vertical gradient measured from the well clusters located across the site and is calculated on Table 3-1. The value for the vertical hydraulic conductivity used in this calculation was estimated from the geometric mean of the lateral hydraulic conductivity value calculated from the slug tests. Freeze & Cherry (1979) report values of horizontal hydraulic conductivity are typically two to ten times larger than values of vertical hydraulic conductivity. Hence, a vertical hydraulic conductivity value of $4.5 \times 10^{-3}$ ft/day was used in the following calculation. The vertical seepage velocity may be calculated as:

$$V_s = \frac{4.5 \times 10^{-3} \text{ ft/day} \times 0.19}{0.50} = 1.7 \times 10^{-3} \text{ ft/day}$$

The vertical seepage velocity is, thus, on the order of $1.7 \times 10^{-3}$ feet/day or 0.61 feet/year.

The values of hydraulic conductivity for the wells screened within the deep overburden deposits ranged from a high of $1.9 \times 10^{-2}$ cm/sec in MW-13D, to a low of $2.3 \times 10^{-4}$ cm/sec in MW-5. The geometric mean lateral hydraulic conductivity was calculated at $2.6 \times 10^{-3}$ cm/sec. As discussed above, the hydraulic conductivity contrast between the shallow and deep overburden deposits suggests a predominantly horizontal flow path within the deep overburden. The seepage velocity in these deposits was calculated using an effective porosity of 0.35 which is consistent with the typical range of values for these deposits (Freeze and Cherry, 1979). The hydraulic gradient is defined as the average horizontal gradient as measured on the piezometric surface map for the deep overburden, Drawing 9596-06. The lateral seepage velocity for the deep overburden deposits may be calculated as:

$$V_s = \frac{7.4 \text{ ft/day} \times 0.02}{0.35} = 0.45 \text{ ft/day}$$

The lateral seepage velocity within the deep sand and gravel deposits is, thus, on the order of 0.45 feet/day or 163 feet/year.
3.2.2 Site-Wide Groundwater Quality

In this section, the results of the site-wide groundwater and surface water samples are evaluated. The results of the groundwater quality samples collected in the vicinity of the Shell Plant are discussed in greater detail in Section 3.3. The results of the groundwater samples are compared with Class GA water quality standards (NYSDEC Water Quality Standards, Table 1, Section 703.5) and EPA primary drinking water standards. Detections of organic (volatile and semivolatile organic compounds) and inorganic compounds are summarized on Tables 3-2 and 3-3, respectively. Complete analytical results for the surface and groundwater samples are presented in Appendix E. The laboratory report forms, including the report narrative, are presented in Appendix F, Volume II.

3.2.2.1 Organic Compounds. A total of eight VOCs were detected in nine wells throughout the entire site. No VOCs were detected in the upgradient wells (MW-11S and MW-11D), the surface water samples (SW-2 and SW-3), or the wells located downgradient of the detonation pond (MW-17S and MW-18S).

Methylene chloride was detected in wells MW-1 and MW-14D at concentrations of 1J and 1.2J µg/L, respectively. The J qualifier indicates the compound is estimated. Methylene chloride is a common laboratory contaminant; therefore, these detections are not attributed to any source at the facility.

The analytical results for the organic compounds were compared with NYS Class GA water quality standards and the EPA primary drinking water standards (maximum contaminant levels (MCLs)). No exceedances of NYS water quality standards were observed. Exceedances of the MCLs were observed for 1,1-dichloroethene, cis-1,2-dichloroethene, 1,1,1-trichloroethane (1,1,1-TCA), and trichloroethene (TCE). All of the exceedances were in the three wells located near the Shell Plant Area (MW-3, MW-4A, and MW-4B), with the exception of TCE in well MW-13S. The TCE value of 8.5J µg/L in MW-13S is estimated and only slightly above the standard of 5 µg/L. The detected values and the standards are summarized on Table 3-2.

TCE was detected in four wells outside of the Shell Plant Area (1.1J in MW-2B, 4.3J µg/L in MW-8, 8.5J µg/L in MW-13S, and 2.9J µg/L in MW-16D). MW-16D is located adjacent to the Old Waste Burning Grounds (SWMU No. 34). MW-8 is
<table>
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<th>Units</th>
<th>Water Quality Standard (a)</th>
<th>MW- 1</th>
<th>MW- 2A</th>
<th>MW- 2B</th>
<th>MW- 3</th>
<th>MW- 4A</th>
<th>MW- 4B</th>
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<tr>
<td>1,2-Dichlorobenzene</td>
<td>µg/L</td>
<td>4.7(600)</td>
<td>--</td>
<td>(b)</td>
<td>--</td>
<td>--</td>
<td>0.7 J</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Dichlorodifluoromethane</td>
<td>µg/L</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td>1,1-Dichloroethene</td>
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<td>(7)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>6,500 D</td>
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<td>cis-1,2-Dichloroethene</td>
<td>µg/L</td>
<td>(70)</td>
<td>--</td>
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<td>--</td>
</tr>
<tr>
<td>Methylene Chloride</td>
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<td>--</td>
<td>--</td>
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J - an estimated value; B - present in the method blank; D - diluted sample
**TABLE 3-2 (Continued)**

**SUMMARY OF DETECTED CONCENTRATIONS OF ORGANIC COMPOUNDS GROUNDWATER SAMPLES**

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*J* - an estimated value; *B* - present in the method blank; *D* - diluted sample
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J - an estimated value; B - present in the method blank; D - diluted sample
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(a) Water quality standards taken from NYSDEC Water Quality Standards, Table 1, Section 703.5. Where no standard is given, standard was not listed on table. EPA Primary Drinking Water Standards (Maximum Contaminant Levels (MCLs)) given in parentheses, if applicable.

(b) -- indicates compound not detected

J - an estimated value; B - present in the method blank; D - diluted sample
### TABLE 3-3

**SUMMARY OF DETECTED CONCENTRATIONS OF INORGANIC COMPOUNDS**

**SURFACE AND GROUNDWATER SAMPLES**

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<thead>
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<th>Compound</th>
<th>Water Quality</th>
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<th>MW- 2A</th>
<th>MW- 2B</th>
<th>MW- 3</th>
<th>MW- 4A</th>
<th>MW- 4B</th>
<th>MW- 6</th>
<th>MW- 7</th>
<th>MW- 8</th>
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<td>µg/L</td>
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<td>9.7</td>
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<td>110 140</td>
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(a) Standard concentration is expressed as the maximum contaminant level (MCL) limit for drinking water.
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<tr>
<td>Copper, total</td>
<td>µg/L</td>
<td>120</td>
<td>9.6</td>
<td>160</td>
<td>43</td>
<td>120</td>
<td>140</td>
<td>62</td>
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<td>130</td>
<td>--</td>
<td>26</td>
<td>50</td>
<td>77</td>
<td>32</td>
<td>43</td>
<td>30</td>
</tr>
<tr>
<td>Mercury, total</td>
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<td>--</td>
<td>--</td>
<td>--</td>
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<td>--</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>0.33</td>
</tr>
<tr>
<td>Potassium, soluble</td>
<td>µg/L</td>
<td>1.8</td>
<td>1.8</td>
<td>1.6</td>
<td>1.7</td>
<td>2.5</td>
<td>2.4</td>
<td>1.2</td>
<td>--</td>
<td>--</td>
<td>2.8</td>
</tr>
<tr>
<td>Potassium, total</td>
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<td>22</td>
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<td>18</td>
<td>2.6</td>
<td>7.4</td>
<td>14</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>Selenium, total</td>
<td>µg/L</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>150</td>
<td>220</td>
</tr>
<tr>
<td>Silver, total</td>
<td>µg/L</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
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<td>Zinc, soluble</td>
<td>µg/L</td>
<td>22</td>
<td>--</td>
<td>48</td>
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<td>24</td>
<td>--</td>
<td>22</td>
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<tr>
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<td>470</td>
<td>23</td>
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<td>280</td>
<td>420</td>
<td>170</td>
<td>270</td>
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### TABLE 3-3 (Continued)

**SUMMARY OF DETECTED CONCENTRATIONS OF INORGANIC COMPOUNDS**  
**SURFACE AND GROUNDWATER SAMPLES**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Units</th>
<th>MW-16S</th>
<th>MW-16D</th>
<th>MW-17S</th>
<th>MW-18S</th>
<th>SW-2</th>
<th>SW-3</th>
<th>EB091395</th>
<th>REP091495</th>
<th>REP091595</th>
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<tr>
<td>Aluminum, soluble</td>
<td>µg/L</td>
<td>--</td>
<td>64</td>
<td>66</td>
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<td>NA (c)</td>
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</tr>
<tr>
<td>Aluminum, total</td>
<td>µg/L</td>
<td>860</td>
<td>24,000</td>
<td>35,000</td>
<td>77,000</td>
<td>180</td>
<td>290</td>
<td>--</td>
<td>33,000</td>
<td>5,400</td>
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<td>Antimony, soluble</td>
<td>µg/L</td>
<td>5.4</td>
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<td>--</td>
<td>NA</td>
<td>NA</td>
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</tr>
<tr>
<td>Antimony, total</td>
<td>µg/L</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>Arsenic, soluble</td>
<td>µg/L</td>
<td>--</td>
<td>13</td>
<td>--</td>
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<td>NA</td>
<td>NA</td>
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<td>--</td>
<td>66</td>
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<tr>
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<td>190</td>
<td>170</td>
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<td>NA</td>
<td>--</td>
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<td>180</td>
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<td>600</td>
<td>800</td>
<td>100</td>
<td>120</td>
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<td>50</td>
<td>120</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>47</td>
<td>11</td>
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<tr>
<td>Cobalt, soluble</td>
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<td>--</td>
<td>2.1</td>
<td>--</td>
<td>--</td>
<td>NA</td>
<td>NA</td>
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</tr>
<tr>
<td>Cobalt, total</td>
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<td>31</td>
<td>20</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>25</td>
<td>3.1</td>
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<tr>
<td>Copper, total</td>
<td>µg/L</td>
<td>15</td>
<td>41</td>
<td>76</td>
<td>170</td>
<td>130</td>
<td>35</td>
<td>--</td>
<td>50</td>
<td>7.8</td>
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<tr>
<td>Lead, total</td>
<td>µg/L</td>
<td>14</td>
<td>17</td>
<td>27</td>
<td>42</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>22</td>
<td>--</td>
</tr>
<tr>
<td>Mercury, total</td>
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<td>--</td>
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<td>--</td>
</tr>
<tr>
<td>Potassium, soluble</td>
<td>µg/L</td>
<td>3.7</td>
<td>4.1</td>
<td>2.2</td>
<td>8.7</td>
<td>NA</td>
<td>NA</td>
<td>--</td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>Potassium, total</td>
<td>µg/L</td>
<td>4.4</td>
<td>11</td>
<td>13</td>
<td>33</td>
<td>2.9</td>
<td>2.7</td>
<td>--</td>
<td>9.2</td>
<td>3.8</td>
</tr>
<tr>
<td>Selenium, soluble</td>
<td>µg/L</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>NA</td>
<td>NA</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Selenium, total</td>
<td>µg/L</td>
<td>26</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>160</td>
<td>10</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Silver, total</td>
<td>µg/L</td>
<td>1.6</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Zinc, soluble</td>
<td>µg/L</td>
<td>39</td>
<td>62</td>
<td>20</td>
<td>21</td>
<td>NA</td>
<td>NA</td>
<td>24</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Zinc, total</td>
<td>µg/L</td>
<td>64</td>
<td>110</td>
<td>150</td>
<td>220</td>
<td>68</td>
<td>74</td>
<td>170</td>
<td>34</td>
<td>--</td>
</tr>
</tbody>
</table>

(a) Water quality standards taken from NYSDEC Water Quality Standards, Table 1, Section 703.5.
   Where no standard is given, standard was not listed on table.
(b) -- indicates compound not detected
(c) NA indicates compound not analyzed
located downgradient of the Old Dump Area (SWMU No. 23). TCE detected in these wells could be attributed to these SWMUs. In addition to TCE, cis-1,2-dichloroethene and dichlorodifluromethane were detected, as estimated values, in MW-13S. The source of these compounds in well MW-13S is not readily apparent at this time. MW-2B is located downgradient of the Open Burning Pads (SWMU Nos. 6 and 7). The two compounds (TCE, 1.1J µg/l and 1,1,1-TCA, 1.8J µg/l) detected in the sample collected from this well are estimated values and are most likely associated with this SWMU. 1,1,1-TCA was detected in this well previously at a value of 6 µg/L. The values of TCE detected throughout the entire facility during the sampling event conducted as part of the Phase II investigation, and its assumed "prevalence across the site", are thus, not confirmed by this sampling.

Fifteen semivolatile compounds were detected in the surface and groundwater samples; however, no water quality standard exceedances were noted. Two compounds (di-n-butyl phthalate and bis-2-ethylhexyl phthalate) were detected at low level concentrations in every sample analyzed. In most cases, these detections were qualified with a B, indicating that they were also detected in the method blank samples. These compounds are common laboratory contaminants.

Most of the semivolatile compounds were detected in samples collected from wells located in the Shell Plant Area (MW-3, MW-4A, and MW-4B). No semivolatile compounds were detected in the upgradient monitoring wells (MW-11S and MW-11D). Other detected compounds included dibenzofuran in MW-1; N-nitrosodiphenylamine in wells MW-6 and MW-16D; and naphthalene in MW-14D.

3.2.2.2 Inorganic Compounds. As a result of the presence of clay deposits located across the site, a wide range of metals were detected in the groundwater samples collected during this investigation. As expected, the groundwater samples collected from wells screened within the shallow overburden clays were, generally, very turbid and the concentration of the detected metals varied significantly between filtered and unfiltered samples. As noted in the Work Plan, this variation was anticipated given that the samples collected during the Phase II Investigation were reported as being very turbid. The Work Plan, thus, called for the collection of both filtered (i.e., soluble) and unfiltered (i.e., total) samples to further evaluate the impact of turbidity on the inorganic sample results.
A review of the soluble metals results indicates that only selenium (at MW-2B, MW-15S, and MW-15D) and barium (at MW-16S) exceeded NYS water quality standards. The remaining analytes were either "not detected" or below the water quality standard, where available. In comparison, the total metals analyses indicated an exceedance of water quality standard, with the exception of mercury and silver, in at least one location for all the analyzed metals. Given that the only difference between the total and soluble metals analysis is the turbidity of the sample, it can be concluded that the turbidity has a significant impact upon the reported metals results. This impact is most readily seen when comparing the total and soluble aluminum results. Clay minerals, which are responsible for the turbidity of the sample, are comprised of hydrous aluminosilicates and other metallic ions. The presence of these clay minerals within the turbid samples allows the aluminum to leach into solution, such that reported aluminum concentrations are up to four orders of magnitude higher in the unfiltered samples versus the filtered sample. This same process occurs with the other metallic ions as well; however, the predominance of aluminum is a clear indicator of the impact of the suspended clay minerals on the analytical results. It should be noted that the turbidity of the samples is elevated to the extent that the unfiltered samples contain significantly more than just colloidal solids. Although it is recognized that the NYSDEC generally requires the analysis of total metals for comparison to water quality standards, the disparity between total and soluble reported values cannot be ignored, and must be taken into consideration when evaluating the collected data.

An alternative method of evaluating the data is to compare both the total and soluble metal results from the downgradient wells with the results from the upgradient well cluster. As described previously, well cluster MW-11 was installed upgradient of the active portion of the site and is intended to represent naturally-occurring background conditions. A comparison of the downgradient metals data to that collected at MW-11 indicates that the metals concentrations range both above and below the background values. Further, those concentrations that do exceed background, generally do so by less than a factor of two, or within the anticipated range of spatial variability. This generalization is not consistent with a comparison of many of the results from MW-11D, screened within the sand and gravel, to the downgradient wells also screened within the sand and gravel. In fact, the downgradient deep wells are generally more consistent with the results from MW-11S. This apparent discrepancy is attributable to the very low percentage of
silt and clay within the sand and gravel deposits in MW-11D, versus the percentage of silt and clay in the deposits screened by the remaining deep wells. Given the significant variation in the grain size and thickness of the sand and gravel at MW-11D, versus the other deep well locations, a direct comparison of water quality results is likely not applicable.

An evaluation of the site wide inorganic water quality results indicates that the naturally-occurring metals concentrations generally exceed NYS Class GA water quality standards. The inorganic results were not compared with MCLs as the NYS water quality standards are generally more conservative and include the same compounds. The elevated total metals concentrations are likely attributable to the significant clay deposits underlying the site, and the associated turbidity of the samples collected for groundwater analysis. However, the comparison of upgradient versus downgradient concentrations does not suggest that the site operations have impacted the inorganic water quality on a site wide basis. We are, thus, not in agreement with the conclusions presented by Gibbs and Hill (1990); and suggest that the reported concentrations are consistent with naturally-occurring conditions.

3.2.3 Identification of Potential Receptors

An evaluation of groundwater and surface water use within a one-mile radius of the site was conducted to provide information regarding the potential impact to human population by a release from the facility. Groundwater use in the vicinity of the site was evaluated by comparing tax maps with customer billing records from the Port Ewen Water Supply Company. It was determined that there are approximately 288 lots owned by 191 families, individuals, companies, or groups within a one-mile radius of the site. Of these, 76 lots, owned by 62 families, individuals, companies, or groups are not connected to Port Ewen Water Supply. The area supplied by the Port Ewen Water Supply is depicted on Figure 3-1. This figure indicates that all potential receptors (i.e., properties located downgradient of the facility) are located within the area served by Port Ewen Water Supply. The area identified as not having access to public water supply is located upgradient of the facility. On the basis of the groundwater flow directions discussed in Section 3.2.1, and to a lesser degree, the availability of public water, there is little possibility for groundwater-related health concerns to neighboring residents.
3.3 HYDROPUNCH® INVESTIGATION

The area surrounding the Shell Plant was investigated to estimate the vertical and horizontal extent of impacts to groundwater quality, and to aid in the placement and evaluation of future monitoring wells and remedial strategies. Groundwater samples were collected with the use of a HydroPunch® borehole sampler and analyzed for TCL VOCs. A summary of the detected compounds is presented in Table 3-4. All of the analytical results for the HydroPunch® samples are presented in Appendix E. The laboratory report forms, including the report narrative are presented in Appendix F, contained in Volume II.

Thirteen volatile organic compounds were detected in twelve of the HydroPunch® samples and one of the replicate samples. The compounds include: acetone, chloroethane, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 4-methyl-2-pentanone, methylene chloride, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene (TCE), and vinyl chloride. In addition, methylene chloride was detected in two of the trip blank samples (TB061295 and TB062195). TCE was the most detected analyte, found in eight samples, ranging in detected concentrations from 8.3J µg/L (in HP-13, 22 to 22.5 feet) to 46,000 µg/L (in HP-10, 37 to 37.5 feet).

The comparison of the analytical results in HP-10 (21-24 feet) with prior analytical results from MW-4A indicates that TCE was detected in both samples. However, the reported concentrations were not consistent (1,300 µg/L in HP-10 (21-24 feet) and 11,000,000 µg/L in MW-4A). In addition, cis-1,2-dichloroethene was detected in HP-10 (21-24 feet) (39 µg/L). The following compounds were detected previously in MW-4A; acetone, tetrachloroethene, and bis-2-ethylhexyl phthalate. The difference in the reported values is likely due to the differences in the groundwater sampling interval.

The deep sample from HP-10 was collected between 37 and 37.5 feet, because bedrock was encountered shallower than the estimated depth. As such, only a small length of the HydroPunch® sampler was open to the adjacent overburden deposits immediately above bedrock. As a result, HP-10A was drilled adjacent to HP-10 to collect a sample from a larger open interval within the overburden. The analytical results from the samples collected from these two borings, however, do not correlate
# TABLE 3-4

## SUMMARY OF DETECTED CONCENTRATIONS
**HYDROPUNCH® SAMPLES**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Units</th>
<th>HP-1 (28-29')</th>
<th>HP-2 (26-29')</th>
<th>HP-3 (23-24')</th>
<th>HP-4 (27.5-28.5')</th>
<th>HP-4 (42-43')</th>
<th>HP-10 (31-24')</th>
<th>HP-10 (37-37.5')</th>
<th>HP-10A (32-34')</th>
<th>HP-12 (42-43')</th>
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</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>µg/L</td>
<td>7.6 J</td>
<td>--</td>
<td>30 J</td>
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<td>--</td>
<td>--</td>
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<td>--</td>
</tr>
<tr>
<td>Chloroethane</td>
<td>µg/L</td>
<td>-- (a)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>1,1-Dichloroethane</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>1,1-Dichloroethene</td>
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<td>--</td>
<td>--</td>
<td>--</td>
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</tr>
<tr>
<td>cis-1,2-Dichloroethene</td>
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<td>--</td>
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<td>670 D</td>
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<td>--</td>
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<td>1,1,2-Trichloroethane</td>
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<td>--</td>
<td>9.9 J</td>
<td>24 JD</td>
<td>--</td>
<td>--</td>
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J - an estimated value; B - present in the method blank; E - exceeds instrument calibration limit; D - diluted sample.
### TABLE 3-4 (Continued)

**SUMMARY OF DETECTED CONCENTRATIONS HYDROPUNCH® SAMPLES**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Units</th>
<th>HP-13 (22-22.5°)</th>
<th>HP-13 (43-44°)</th>
<th>HP-15 (28-29°)</th>
<th>DUP060895</th>
<th>TB061295</th>
<th>TB062195</th>
<th>TB062995</th>
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<tr>
<td>Acetone</td>
<td>µg/L</td>
<td>--</td>
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</tr>
<tr>
<td>Chloroethane</td>
<td>µg/L</td>
<td>200 E</td>
<td>--</td>
<td>--</td>
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<tr>
<td>1,1-Dichloroethane</td>
<td>µg/L</td>
<td>850 D</td>
<td>--</td>
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<tr>
<td>1,1-Dichloroethene</td>
<td>µg/L</td>
<td>3.5 J</td>
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<tr>
<td>cis-1,2-Dichloroethene</td>
<td>µg/L</td>
<td>800 D</td>
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<tr>
<td>trans-1,2-Dichloroethene</td>
<td>µg/L</td>
<td>5.9 J</td>
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<tr>
<td>4-Methyl-2-Pentanone</td>
<td>µg/L</td>
<td>2.9 J</td>
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<td>2 J</td>
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<tr>
<td>Methylene Chloride</td>
<td>µg/L</td>
<td>--</td>
<td>--</td>
<td>0.7 J</td>
<td>1.1 J</td>
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<tr>
<td>Toluene</td>
<td>µg/L</td>
<td>2.1 J</td>
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<td>1,1,1-Trichloroethane</td>
<td>µg/L</td>
<td>930 D</td>
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<tr>
<td>1,1,2-Trichloroethane</td>
<td>µg/L</td>
<td>2.9 J</td>
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<tr>
<td>Trichloroethene</td>
<td>µg/L</td>
<td>8.8 J</td>
<td>6,900 D</td>
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<tr>
<td>Vinyl Chloride</td>
<td>µg/L</td>
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<td>84</td>
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(a) -- indicates compound not detected

*J - an estimated value; B - present in the method blank; E - exceeds instrument calibration limit; D - diluted sample.*
well. The concentration of TCE detected in HP-10, 37 to 37.5 feet, was 46,000 µg/L and in HP-10A, 32 to 34 feet was 560 µg/L. The groundwater sample from HP-10A was collected predominately from the clay deposits, while the sample from HP-10 was collected from clay and sand deposits immediately above the top of bedrock. The higher concentrations in the sample collected from the soils at the top of bedrock suggests that the VOCs have migrated through the silt and clay to the bedrock surface.

The USEPA's guidance (USEPA, 1992) suggests that if a compound's measured concentration in groundwater is greater than one percent of its upper solubility limit, then a non-aqueous phase liquid (NAPL) source may be present at the site. The 46,000 µg/L concentration of TCE in HP-10, 37 to 37.5 feet, is greater than one percent of the solubility limit of 1,000,000 µg/L for this compound (i.e., one percent of the solubility limit for TCE is 10,000 µg/L). Thus, the possibility exists that a source of dense non-aqueous phase liquid (DNAPL) may exist in this area.

Isoconcentration maps for total volatile organics (TVOs) were prepared for both shallow and deep overburden deposits and are presented in Figures 3-2 and 3-3, respectively. The TVO values were determined by adding the measured values of the volatile compounds detected. The isoconcentration contours (isocons) were drawn using a logarithmic interval beginning with 10 µg/L. The overall distribution of the TVOs in the vicinity of the Shell Plant is consistent on both maps as depicted with a "not detected" (ND) isocon. A 10,000 µg/L isocon is depicted on the map for the deep overburden deposits, however, TVO concentrations of this magnitude were not observed in the shallow overburden. Higher concentrations of TVOs were observed in the deeper samples from borings HP-4, HP-10, HP-12, and HP-13, supporting the possibility of downward migration of the organic compounds. The TVO concentration for HP-10A, 32 to 34 feet, is represented on Figure 3-3, however, this value was not used in the contouring. The value detected in this sample is more representative of the TVO concentrations present in the silt and clay layer.

A concentration of 2.9 µg/L was detected in HP-15, 28 to 29 feet for 4-methyl-2-pentanone. This value is located outside the "ND" line on Figure 3-2 because it is believed this compound is not attributed to the Shell Plant. This compound is likely attributable to SWMU No. 18. No values of VOCs were detected in the deep sample (HP-15, 43 to 44 feet) collected from this boring.
LEGEND:

MW-3  MONITORING WELL LOCATION
HP-5  HYDROPUNCH® BORING LOCATION

(8.6) TVO CONCENTRATION (ppb)

(-100) ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)
CONTOUR INTERVAL = LOGARITHMIC

--ND-- APPROXIMATE EXTENT OF TVO CONTAMINATION ASSOCIATED WITH SHELL PLANT

(NA) SAMPLE NOT ANALYZED
(ND) NOT DETECTED

FIGURE 3-2
ISOCONCENTRATION MAP OF TOTAL VOLATILE ORGANICS (TVO) IN GROUNDWATER—SHALLOW OVERBURDEN

HERCULES/DYNO-NOBEL INC.
DYNO-NOBEL INC. SITE
PORT EWEN, NEW YORK

ECKENFELDER INC.
Nashville, Tennessee
Mahwah, New Jersey
LEGEND:

MW-3 MONITORING WELL LOCATION
HP-5 HYDROPUNCH® BORING LOCATION
(2.9) TVO CONCENTRATION (ppb)
-100 ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

ND APPROXIMATE EXTENT OF TVO CONTAMINATION ASSOCIATED WITH SHELL PLANT
(NA) SAMPLE NOT ANALYZED
(ND) NOT DETECTED
* VALUE FOR HP-10A NOT CONTOURED. REFER TO SECTION 3.3 IN TEXT.

FIGURE 3-3
ISOCONCENTRATION MAP OF TOTAL VOLATILE ORGANICS (TVO) IN GROUNDWATER – DEEP OVERBURDEN

HERCULES/DYNO-NOBEL INC.
DYNO-NOBEL INC. SITE
PORT EWEN, NEW YORK

ECKENFELDER INC.
4.0 CONCLUSIONS AND RECOMMENDATIONS

The activities described in this document are designed as a first phase of investigation for the upcoming RFA-SV and RFI. The resulting data will be used to focus future work, and the conclusions and recommendations developed on the basis of this investigation will be refined as the work proceeds. The information obtained from this investigation is presented below with respect to the site wide geologic and hydrogeologic conditions and the more focused investigation associated with the Shell Plant. Please note that the following conclusions and recommendations should be considered preliminary until further data becomes available.

4.1 SITE-WIDE GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

The active portion of the facility is underlain by 27 to 67 feet of low permeability silty clay to clay, which is subsequently underlain by a layer of sand and gravel over shale bedrock. Groundwater flow paths are believed to be predominantly vertical within the low permeability silt and clay deposits and primarily horizontal within the higher permeability sand and gravel deposits. A potential groundwater flow zone within the underlying bedrock has not been identified to date. However, given the reported depth of the on-site production wells, on the order of 60 to 80 feet, and the results of this investigation, suggesting the overburden thickness immediately east of the developed portion of the site is only on the order of 30 feet, we suspect that the site production wells are screened within the underlying bedrock (there are no available well logs). In addition, weathering of the shale and graywacke in this area typically results in a zone of increased transmissivity within the top of rock. Therefore, we believe that a flow zone within the upper ten to twenty feet of the bedrock is likely present, and it is recommended that a limited investigation of the bedrock be undertaken as discussed below in Section 4.2.

In most cases, the presence of thick sequences of low permeability silt and clay beneath the active portion of the site provides a barrier to the migration of potential contaminants to the underlying sand and gravel deposits and bedrock. However, as observed in the Shell Plant Area, sufficient contaminant loading has the potential to overcome this barrier. Nonetheless, it is likely that the extent of potential contaminants associated with many of the SWMUs and AOCs will be limited by
these geologic deposits. Additional data with respect to the effectiveness of this clay layer in limiting the migration of potential contaminants will be obtained as part of the on-going work.

The available data are sufficient to evaluate the overall groundwater flow direction in the overburden deposits within the vicinity of the site. These data clearly indicate that the wetlands area located to the east of the active portion of the facility is the local discharge point for groundwater flow, both in the shallow and deep overburden deposits. This is significant in that any potential groundwater contaminants associated with the site will not migrate east of the wetlands. Further, the converging of the groundwater flow lines will tend to limit the extent of any potential contaminant plume and focus any potential remedial measures. As discussed previously in Section 3.2.3, the combination of the groundwater flow paths, the location of potential receptors, and the availability of public water, suggests there is little probability for groundwater related health concerns to neighboring residents. This is further supported by the groundwater quality data, discussed below, which does not provide any evidence to suggest that potential contaminants are migrating off site.

The collected groundwater quality data does not provide any evidence to suggest that the site activities are impacting the inorganic groundwater quality across the site. A review of these data indicates that the total metals concentrations generally exceed NYS Class GA water quality standards throughout the area. However, these exceedances are attributed to the high turbidity of the samples collected, in that the concentrations of soluble metals, with a few exceptions, are generally below the respective standards. The comparison of water quality values across the site is, thus, most appropriately done by comparing downgradient to upgradient conditions.

With the exception of the Shell Plant Area discussed below, organic constituents detected across the site were limited and sporadic. As discussed in Section 3.2.2.1, those constituents detected are likely associated with an adjacent SWMU. These SWMUs will be more fully evaluated during subsequent phases of investigation. It is noteworthy that the data do not support a pervasive site wide presence of TCE as suggested by Gibbs and Hill (1990). Further, many of the organic constituents reported in the NYSDEC Phase II Report were not confirmed during this round of sampling (excluding the Shell Plant Area).
The available data suggests potential impacts to groundwater are limited to the vicinity of the source areas (SWMUs, AOCs, etc.) and there is no site wide impact to groundwater. There is, thus, no basis for implementation of any interim corrective measures (ICMs) at this time. This preliminary conclusion will be further evaluated during subsequent phases of work.

4.2 SHELL PLANT INVESTIGATION

Groundwater sampling in the vicinity of the Shell Plant confirmed the presence of elevated concentrations of volatile organics in this area; the most prevalent of which is TCE. The collected data further indicates that the volatile organic concentrations tend to increase with depth and the highest concentrations are potentially located immediately above the bedrock. In addition, the detected concentration of TCE in one HydroPunch® boring (HP-10, 37-37.5 feet) is in excess of one percent of solubility limit for TCE, which suggests the presence of DNAPL within this area.

On the basis of the HydroPunch® data, the extent of the impacted area is generally limited to the area east of the Shell Plant and west of the Conrail railroad tracks. There is currently no data to suggest that contaminants are migrating off site. However, given the high concentrations of TCE detected in the sample collected immediately above the bedrock in HP-10, there is the potential for contaminants to have migrated to a water-bearing zone within the bedrock. Accordingly, additional work is recommended in this area as discussed below.

A review of the water quality data associated with the Shell Plant Area, in conjunction with the site wide hydrogeologic data, suggests that the volatile organic compounds detected in the vicinity of the Shell Plant will migrate predominantly downward, with an eastward component of flow, through the shallow overburden. Upon reaching the underlying sand and gravel, however, the direction of groundwater flow is likely more lateral and in a west-northwest direction. This indicates the most significant pathway for further lateral migration of a dissolved contaminant plume would be expected to be in a west-northwest direction towards the central portion of the site. In addition, in the event that DNAPL may be present at the top of rock, it may migrate towards the west, in the direction of the slope of the bedrock surface.
In light of the above discussion, the installation of three stainless steel well couplets at the locations illustrated in Figure 4-1 is recommended. Each couplet would consist of a well screened in the sand and gravel deposits immediately above bedrock, and a well screened within the upper 20 to 25 feet of rock. The bedrock wells would be completed with a steel casing grouted into the upper three to five feet of rock to minimize potential contaminant migration during drilling activities. We recommend the placement of three wells within the bedrock, such that a preliminary indication of the direction of groundwater flow within this water-bearing unit may be obtained. In addition, the location of the well cluster east of the Conrail tracks will act as a monitoring well for the nearby site production wells. Although the data does not currently suggest that contaminant migration would occur in this direction, we feel it is prudent to locate a monitoring well between the source area and the production wells until further information is obtained to determine the direction of groundwater flow in the bedrock. It is also advised to initiate periodic water quality monitoring of the production wells. The remaining monitoring well cluster locations have been located around the perimeter of the identified area, as we do not recommend the placement of bedrock monitoring wells within the source area.

As noted above, there is currently no information regarding a potential flow zone within the top of rock. It is assumed, however, that the direction of groundwater flow will be generally consistent with that mapped for the deep sand and gravel deposits. Accordingly, two of the proposed well clusters have been located in the anticipated downgradient flow direction. Subsequent groundwater sampling and analyses, as well as water level measurements, will provide the additional data needed to evaluate the need for and configuration of additional monitoring well locations.
REFERENCES


REFERENCES (CONTINUED)


NYSDEC Water Quality Standards, New York State Code of Rules and Regulations, Table 1, Section 703.5.
APPENDIX A

SOIL BORING LOGS AND WELL CONSTRUCTION DETAILS
EXISTING BORING LOGS AND MONITORING WELL
CONSTRUCTION DETAILS
OVERBURDEN/BEDROCK WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-1
Date Installed: 2/24/89

Water Level from
Top of Casing: 21'6 1/2"
Date: 3/22/89
Time: 10:30 AM

Steel Protective Casing
Cement Pad
Cement and Bentonite Grout
4" PVC Riser
Bentonite Pellets
Cement and Bentonite Grout
3" Diameter Rock Well

Elevations (ft)

0'-0"
2'-0"
1'-6"
2'-0"
3'-0"
4'-6"
9'-6"
34'-0"

Gibbs & Hill, Inc.
**BORING LOG**

**PROJECT:** NYSDEC

**Location:** HERCULES

**Contractor:** EMPIRE

**Inspector:** J. SANGHI

**Date Started:** 2/15/87

**Date Completed:**

**G.W.L.**

**Hour:**

**Notes:**

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<th>Test Type &amp; No.</th>
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</table>

**Description and Remarks:**
- Brown-gray, silt clay
- Shale fragments

**Bedrock**

---

**I.D. Casing:** Wgt. Hammer on Casing

**I.D. Spoon:** Wgt. Hammer on Spoon

**Type Core Drill:** Drop Hammer on Casing

**Core Dia:** Drop Hammer on Spoon

---

Gibbs & Hill, Inc.
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-2A
Date Installed: 2/21/89

Water Level from
Top of Casing: 10'9 1/2"
Date: 3/22/89 Time: 11:15 AM

Elevations (ft)

Steel Protective Casing
Concrete Pad
Cement and Bentonite Grout
Bentonite Pellets
2" PVC Riser
Sand Pack
2" PVC #10 Slotted Screen

2'-2 1/2"
1'-8 1/2"
0'-0"
2'-0"
10'-0"
12'-0"
14'-0"
24'-0"
25'-0"

Gibbs & Hill, Inc.
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**Description and Remarks**

- **5-1**: Brown tuff, orange clay, some silt.
- **3-2**: Brown orange tuff, clay, organic, grey wet clay.
- **5-3**: Mixture of brown and grey clay, wet, mostly grey, low plasticity.
- **5-4**: Gray clay, low to medium plasticity, sandy and silty clay.
- **5-5**: Silty sand, sand, silt mixture.
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-2B
Date Installed: 2/20/89

Water Level from:
Top of Casing: 12'-7 1/2"
Date: 3/22/89 Time: 12:10 PM

Elevations (ft)

- Steel Protective Casing: 0'-0"
- Concrete Pad: 2'-0"
- Cement and Bentonite Grout: 1'-9"
- Bentonite Pellets: 13'-0"
- 2" PVC Riser: 15'-0"
- Sand Pack: 17'-0"
- 2" PVC #10 Slotted Screen: 27'-0"
- Total Depth: 31'-0"

Gibbs & Hill, Inc.
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-3
Date Installed: 3/1/89

Water Level from
Top of Casing: 7' - 1 3/4"
Date: 3/22/89
Time: 1:30 PM

Elevations (ft)

Steel Protective Casing
Concrete Pad
Cement and Bentonite Grout
Bentonite Pellets
2" PVC Riser
Sand Pack
2" PVC #10 Slotted Screen

1'-5 1/2" 1'-3"
0'-0"
2'-0"
12'-0"
14'-0"
16'-0"
26'-0"
28'-0"

Gibbs & Hill, Inc.
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<td>S5-7</td>
<td>57</td>
<td>16</td>
<td>0</td>
<td>Bedrock</td>
<td>Brown, tanish, gravel, some silt, shale, gray, grayish, white, shale</td>
</tr>
</tbody>
</table>

I.D. Casing: Wgt. Hammer on Casing  
I.D. Spoon: Wgt. Hammer on Spoon  
Type Core Drill: Drop Hammer on Casing  
Core Dia.: Drop Hammer on Spoon  
Sample & Test Notations:  

Gibbs & Hill, Inc.
## BORING LOG

**PROJECT:** MYSDEC Phase II  
**PROJECT NO.:** 5583  
**BORING NO.:** Hv-3

**Location:** Hercules Inc  
**Contractor:** Empire  
**Date Started:** 03/01/89  
**Date Completed:** 03/01/89

**Notes:**

<table>
<thead>
<tr>
<th>Depth FT</th>
<th>Elev. Fl.</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows Casing/Per Ft.</th>
<th>Blows Sampler/6&quot;</th>
<th>Recovery</th>
<th>NLV</th>
<th>During Rate</th>
<th>Min./Fl.</th>
<th>Graphic Symbol</th>
<th>Description and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>SS-1</td>
<td></td>
<td>14/16</td>
<td>12/14</td>
<td>19&quot;</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>Brown silt and clay (very hard) fine.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>SS-2</td>
<td></td>
<td>4/8</td>
<td>11/12</td>
<td>23&quot;</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>Brown orange tannish clay with low plasticity.</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>SS-3</td>
<td></td>
<td>4/6</td>
<td>8/11</td>
<td>23&quot;</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>Brown clay little wet, some silt.</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>SS-4</td>
<td></td>
<td>2/3</td>
<td>3/4</td>
<td>22&quot;</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>Gray clay with low to medium plasticity siebo clay.</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>SS-5</td>
<td></td>
<td>0/1</td>
<td>3/8</td>
<td>26&quot;</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>Mostly gray clay with medium plasticity with mixture of brown silt and clay.</td>
</tr>
</tbody>
</table>

---

I.D. Casing  
I.D. Spoon  
Type Core Drill  
Core Dia.  
Sample & Test Notations

---

Gibbs & Hill, Inc.
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-4A
Date Installed: 2/27/89

Water Level from:
Top of Casing: 5' 6 1/2"
Date: 3/22/89 Time: 2:00 PM

Elevations (ft)

Steel Protective Casing

Concrete Pad

Cement and Bentonite Grout

Bentonite Pellets

2" PVC Riser

Sand Pack

2" PVC #10 Slotted Screen

Gibbs & Hill, Inc.
## BORING LOG

### Project Information
- **Project:** NYSDEC Phase II
- **Project No.:**
- **Location:** Hercules, Inc
- **Contractor:** Empire
- **Inspection:** J. Saranwati
- **Date Started:** 02/11/87
- **Ground Elev.:**
- **Date Completed:** 02/27/87
- **G.W.L.:**
- **Hour:**
- **Date:**

### Depth and Sample Details
<table>
<thead>
<tr>
<th>Depth Ft.</th>
<th>Elev. Ft.</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows</th>
<th>Recovery</th>
<th>Sampling</th>
<th>Rate</th>
<th>Material Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>55-1</td>
<td>5</td>
<td>2</td>
<td>14&quot;</td>
<td>0</td>
<td>None</td>
<td>OL Mixture of silt and clay mostly brown, silty clay</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>55-2</td>
<td>3</td>
<td>6</td>
<td>20&quot;</td>
<td>0</td>
<td>None</td>
<td>OL Mixture of silt and clay mostly brown, clay with low plasticity</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>55-3</td>
<td>8</td>
<td>10</td>
<td>24&quot;</td>
<td>0</td>
<td>None</td>
<td>OL Clay and clay mostly brown, clay (little wet)</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>55-4</td>
<td>0</td>
<td>1</td>
<td>12&quot;</td>
<td>0</td>
<td>None</td>
<td>OL Wet silt and clay mostly clay with some very fine sand, low to medium plasticity</td>
</tr>
</tbody>
</table>

### Notes
- I.D. Casing: Wgt. Hammer on Casing
- I.D. Spoon: Wgt. Hammer on Spoon
- Type Core Drill: Drop Hammer on Casing
- Core Dia.: Drop Hammer on Spoon

---

Gibbs & Hill, Inc.
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-4B
Date Installed: 2/28/89

Water Level from Top of Casing: 6’ 5"
Date: 3/22/89 Time: 2:45 PM

Elevations (ft)

- Steel Protective Casing: 1’-9"
- Concrete Pad: 0’-0"
- Cement and Bentonite Grout:
  - 13’-0"
- Bentonite Pellets:
  - 15’-0"
- 2” PVC Riser:
  - 17’-0"
- Sand Pack:
- 2” PVC #10 Slotted Screen:
  - 27’-0"
  - 28’-0"

Gibbs & Hill, Inc.
## Boring Log

**Project:** NYSDEC Phase II  
**Project No.:** 5583  
**Location:** Hercules, Inc.  
**Contractor:** Empire  
**Inspector:** J. Sankari

**Date Started:** 02/25/89 G.W.L.  
**Date Completed:** 02/28/89 G.W.L.

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elev. (ft)</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows</th>
<th>Recovery</th>
<th>ROD *</th>
<th>Tailing Pace (ft/min)</th>
<th>Graphic Symbol</th>
<th>Description and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>SS-1</td>
<td></td>
<td>8/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OL - Mixture of silt and clay, mostly brown clay.</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>SS-1</td>
<td></td>
<td>3/9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>SS-2</td>
<td></td>
<td>7/8</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td>OL - Mostly brown clay with low plasticity and mixture of clay.</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>SS-2</td>
<td></td>
<td>10/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>SS-3</td>
<td></td>
<td>5/4</td>
<td></td>
<td>24</td>
<td></td>
<td></td>
<td>OL - Mostly brown silty clay, very little wet.</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>SS-3</td>
<td></td>
<td>5/6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>SS-4</td>
<td></td>
<td>1/2</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
<td>CL - Brown wet clay with low to medium plasticity.</td>
</tr>
<tr>
<td>17</td>
<td>17</td>
<td>SS-4</td>
<td></td>
<td>2/1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>SS-5</td>
<td></td>
<td>0/1</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td>CL - Mixture of brown and gray clay, wet, low to medium plasticity.</td>
</tr>
<tr>
<td>22</td>
<td>22</td>
<td>SS-5</td>
<td></td>
<td>0/1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**I.D. Casing:** Wgl. Hammer on Casing  
**I.D. Spoon:** Wgl. Hammer on Spoon  
**Type Core Drill:** Drop Hammer on Casing  
**Core Dia.:** Drop Hammer on Spoon  
**Sample & Test Notations:**

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6001260

Gibbs & Hill, Inc.
**BORING LOG**

**PROJECT:** Hercules

**Location:** Port Fourchon, LA

**Contractor:** Empire Drilling

**Inspector:** Mr. Valentine

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elev. Fl.</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows</th>
<th>Recovery (%)</th>
<th>HNu</th>
<th>Description and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brown dry silty medium sand</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brown dry clayey silt - some 1&quot; clay seams present</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brown moist clayey silt - some gray silt in base piece</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gray very moist silty clay - becoming more silty toward bottom - some gravel is present at bottom</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gray wet clayey silt turning - more clayey with seam medium sand at bottom</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gray wet silty clay with pebbles at bottom</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gray wet clayey silt - very fine sand present</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>refusal</td>
</tr>
</tbody>
</table>

**I.D. Casing**  
Wgt. Hammer on Casing

**D. Spoon**  
Wgt. Hammer on Spoon

**Type Core Drill**  
Drop Hammer on Casing

**Core Dia.**  
Drop Hammer on Spoon
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules  
Well No.: MW-5  
Date Installed: 3/15/89

Water Level from  
Top of Casing: 19' - 9 1/2"  
Date: 3/23/89  
Time: 10:00 AM

Elevations (ft)

Steel Protective Casing
Concrete Pad
Cement and Bentonite Grout
Bentonite Pellets
2" PVC Riser
Sand Pack
2" PVC #10 Slotted Screen

Gibbs & Hill, Inc.
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-6
Date Installed: 3/10/89

Water Level from
Top of Casing: 14'-5"
Date: 3/23/89  Time: 11:00 A.M.

Elevations (ft)

- Steel Protective Casing
  - 1'-9 1/2"
  - 1'-6"

- Concrete Pad

- Cement and Bentonite Grout

- Bentonite Pellets

- 2" PVC Riser

- Sand Pack

- 2" PVC #10 Slotted Screen

- 67'-2"
- 67'-6"

Gibbs & Hill, Inc.
## BORING LOG

**PROJECT:** Hercules  
**PROJECT NO.:** 5583-09  
**BORING NO.:** ML-6

**Location:** Port Ewen, NY  
**Coord:**  
**Contractor:** Empire Drilling  
**Date Started:** 3/18/89  
**G.W.L.:** Hour:  
**Inspection:** Milc Valentiho  
**Completed:** 3/18/89  
**G.W.L.:** Hour:

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elev. (ft)</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows Casing</th>
<th>Blows Sampler</th>
<th>Recovery</th>
<th>ROD %</th>
<th>Dilling Make, Model</th>
<th>Drilling Symbol</th>
<th>Description and Remarks</th>
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<tbody>
<tr>
<td>0</td>
<td></td>
<td>S1</td>
<td></td>
<td></td>
<td>16” 7”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Brown sandy clayey silt with organics</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>S2</td>
<td></td>
<td></td>
<td>17” 12”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Brown clayey dry silt</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>S3</td>
<td></td>
<td></td>
<td>15” 19”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Brown clayey dry silt</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>S4</td>
<td></td>
<td></td>
<td>7” 13”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Brown clayey moist silt</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>S5</td>
<td></td>
<td></td>
<td>12” 19”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Gray cohesive wet silty clay</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>S6</td>
<td></td>
<td></td>
<td>12” 19”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Gray cohesive wet silty clay</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>S7</td>
<td></td>
<td></td>
<td>20” 19”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Gray cohesive wet silty clay</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>S8</td>
<td></td>
<td></td>
<td>20” 19”</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td>Gray cohesive wet silty clay</td>
</tr>
</tbody>
</table>

**I.D. Casing:** Wgt. Hammer on Casing  
**I.D. Spoon:** Wgt. Hammer on Spoon  
**Type Core Drill:** Drop Hammer on Casing  
**Core Dia.:** Drop Hammer on Spoon  
**Sample & Test Notations:**

---

Gibbs & Hill, Inc
## Boring Log

**Project:** Hercules  
**Project No.:** 5539-09  
**Boring No.:** MG-6  
**Location:** Port Ewen, NY  
**Contractor:** Empire Drilling  
**Date Started:** 3/9/89  
**G.W.L.:**  
**Date Completed:** 3/13  
**G.W.L.:**  

### Notes:

<table>
<thead>
<tr>
<th>Depth (Ft)</th>
<th>Elev. (Ft)</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Bows</th>
<th>RPM</th>
<th>HU</th>
<th>Dulling Rate</th>
<th>Material Notations</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
<td>S9</td>
<td></td>
<td>LWR</td>
<td>LWR</td>
<td>24'</td>
<td>0</td>
<td>CL Gray cohesive wet silty clay</td>
</tr>
<tr>
<td>45</td>
<td></td>
<td>S10</td>
<td></td>
<td>LWR</td>
<td>LWR</td>
<td>24'</td>
<td>0</td>
<td>CL Gray cohesive wet silt clay</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>S11</td>
<td></td>
<td>LWR</td>
<td>LWR</td>
<td>24'</td>
<td>0</td>
<td>ML Gray wet clayey silt with some fine sands at bottom</td>
</tr>
<tr>
<td>55</td>
<td></td>
<td>S12</td>
<td></td>
<td>LWR</td>
<td>LWR</td>
<td>24'</td>
<td>0</td>
<td>ML Gray, sandy clayey silt with some fine sand seams</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>S13</td>
<td></td>
<td>9</td>
<td>11</td>
<td>20'</td>
<td>0</td>
<td>SM Gray clayey silty medium sands with gravel size fractured shale at bottom.</td>
</tr>
</tbody>
</table>

**I.D. Casing:** Wgt. Hammer on Casing  
**I.D. Spoon:** Wgt. Hammer on Spoon  
**Type Core Drill:** Drop Hammer on Casing  
**Core Dia.:** Drop Hammer on Spoon  

**Sample & Test Notations:**
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-7
Date Installed: 3/17/89

Water Level from
Top of Casing: 9'-7 1/4"
Date: 3/23/89 Time: 11:30 AM

Elevations (ft):
- Steel Protective Casing: 1'-8 1/2"
- Concrete Pad: 0'-0"
- Cement and Bentonite Grout: 2'-0"
- Bentonite Pellets: 29'-6"
- 2" PVC Riser: 31'-6"
- Sand Pack: 33'-6"
- 2" PVC #10 Slotted Screen: 43'-6"
- Bottom: 44'-0"

Gibbs & Hill, Inc.
<table>
<thead>
<tr>
<th>Depth (Fl)</th>
<th>Elev. (Fl)</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows</th>
<th>Recovery</th>
<th>ACE %</th>
<th>HNU</th>
<th>Graphic Symbol</th>
<th>Description and Remarks</th>
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<tbody>
<tr>
<td>0</td>
<td></td>
<td>S1</td>
<td></td>
<td>2-9</td>
<td>18&quot;</td>
<td>0</td>
<td></td>
<td>SM</td>
<td>Dry brown silty gravelly silt</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>S2</td>
<td></td>
<td>3-5</td>
<td>18&quot;</td>
<td>0</td>
<td></td>
<td>ML</td>
<td>Dry brown clayey silt</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>S3</td>
<td></td>
<td>3-4</td>
<td>22&quot;</td>
<td>0</td>
<td></td>
<td>ML</td>
<td>Moist brown clayey silt becoming greyer toward bottom</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>S4</td>
<td></td>
<td>2-2</td>
<td>22&quot;</td>
<td>0</td>
<td></td>
<td>CL</td>
<td>Wet grey silty clay</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>S5</td>
<td></td>
<td>4-2</td>
<td>24&quot;</td>
<td>0</td>
<td></td>
<td>CL</td>
<td>Wet grey silty clay</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>S6</td>
<td></td>
<td>3-2</td>
<td>24&quot;</td>
<td>0</td>
<td></td>
<td>CL</td>
<td>Wet grey silty clay</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>S7</td>
<td></td>
<td>2-3</td>
<td>24&quot;</td>
<td>0</td>
<td></td>
<td>CL</td>
<td>Wet grey silty clay</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>S8</td>
<td></td>
<td>1</td>
<td>24&quot;</td>
<td>0</td>
<td></td>
<td>CL</td>
<td>Wet grey silty clay some gravel at bottom</td>
</tr>
</tbody>
</table>

I.D. Casing: Wgt. Hammer on Casing  
I.D. Spoon: Wgt. Hammer on Spoon  
Type Core Drill: Drop Hammer on Casing  
Core Dia.: Drop Hammer on Spoon  
Sample & Test Notations: 

---

Gibbs & Hill, Inc.
<table>
<thead>
<tr>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL.</td>
</tr>
<tr>
<td>40</td>
</tr>
</tbody>
</table>

**Sample**

- **Type & No.**
  - S9

**Blows**

- **Casing**
  - LWR 5
- **Sampler**
  - 7 5
  - 10/1

**ROC %**

- 12%

**ROC**

- 0

**Drilling**

- Rate: Reqd/Fl: Graphic: Symbol

**Description and Remarks**

- Wet dark shale fragments in a gray clayey silt matrix
- Refusal at 45' BOHT
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site: Hercules
Well No.: MW-8
Date Installed: 3/8/89

Water Level from:
Top of Casing: 8'-5 1/4"
Date: 3/23/89
Time: 100 PM

Elevations (ft)

- Steel Protective Casing: 2'-0"
- Concrete Pad: 0'-0"
- Cement and Bentonite Grout
- Bentonite Pellets: 12'-0"
- 2" PVC Riser
- Sand Pack: 10'-0"
- 2" PVC #10 Slotted Screen
- 2'-0"
- 2'-6 7/8"
- 8'-0"
- 22'-0"
- 25'-0"

Gibbs & Hill, Inc.
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elev. (ft)</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows</th>
<th>Casing</th>
<th>Sampler</th>
<th>Recovery</th>
<th>HPU</th>
<th>Drilling Rate</th>
<th>Min./ft</th>
<th>Graphic Symbol</th>
<th>Description and Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No Sample</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
<td>12&quot;</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ML Yellowish brown moist clayey silt.</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td></td>
<td></td>
<td>12&quot;</td>
<td>6</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ML Yellowish brown moist clayey silt.</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td>10&quot;</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ML Gray wet clayey silt.</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ML Gray saturated clayey silt.</td>
</tr>
</tbody>
</table>

BOL - 25 ft
### Boring Log

**Project:** Hercules  
**Project No.:** 5583-09  
**Boring No.:** M4S-9

<table>
<thead>
<tr>
<th>Depth FL</th>
<th>Elev. FL</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows</th>
<th>6&quot; Blows</th>
<th>6&quot; Recovery</th>
<th>MNU</th>
<th>Graphic Symbol</th>
<th>Description and Remarks</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>13</td>
<td>12&quot;</td>
<td>0</td>
<td>ML</td>
<td>Dry brown clayey silt 14 + 15 ft, 3&quot; frozen</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>7</td>
<td>18&quot;</td>
<td>0</td>
<td>ML</td>
<td>Dry brown clayey silt becoming moist toward bottom of core</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3</td>
<td>24&quot;</td>
<td>0</td>
<td>ML</td>
<td>Moist brown clayey silt changing to gray clayey silt at 111' 8&quot;</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>12&quot;</td>
<td>0</td>
<td>ML</td>
<td>Wet gray clayey silt</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td>18</td>
<td>12&quot;</td>
<td>0</td>
<td>GM</td>
<td>Weathered black shale in a silty matrix</td>
</tr>
</tbody>
</table>

**I.D. Casing:** Wgt. Hammer on Casing  
**I.D. Spoon:** Wgt. Hammer on Spoon  
**Type Core Drill:** Drop Hammer on Casing  
**Core Dia.:** Drop Hammer on Spoon  

**Material Notations:**

---

Gibbs & Hill Inc.
OVERBURDEN WELL CONSTRUCTION SCHEMATIC

Site  Hercules
Well No.  MW-10
Date Installed  3/6/89

Water Level from
Top of Casing  3'-9"
Date 3/23/89  Time 2:45 PM

Elevations (ft)

Steel Protective Casing
Concrete Pad
Cement and Bentonite Grout
Bentonite Pellets
2" PVC Riser
Sand Pack
2" PVC #10 Slotted Screen

2'-1 1/2"
1'-9"
0'-0"
2'-0"
10'-0"
12'-0"
14'-0"
24'-0"
25'-0"

Gibbs & Hill, Inc.
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Elev.</th>
<th>Sample Type &amp; No.</th>
<th>Test Type &amp; No.</th>
<th>Blows</th>
<th>Material Notations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
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<tr>
<td>0</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- **ML**: Brown, clayey, moist clayey silt - Tap 3" faggen
- **ML**: Clayey brown moist silt
- **ML**: Clayey brown, moist silt, changing to gray wet clayey silt at 11 1/2
- **ML**: Wetta gray clayey silt
- **ML**: Saturated gray clayey silt

**BOH**
HYDROPUNCH® BORING LOGS
**Drilling Data**
- **Sampler**: Split Spoon
- **Tube**: NA
- **Core**: NA
- **Type**: Split Spoon
- **Diameter**: 2 inch
- **Other**: 140 lb./30 in.

**Well Construction**
- **Material**: NA
- **Diameter (ID)**: NA
- **Coupling**: NA

**Well Development**
- **Method**: NA
- **Duration**: NA
- **Gals. Purged**: NA
- **Slug Test**: NA
- **Grade**: 16.3.4
- **TWC**: NA
- **TPC**: NA
- **North**: 685,400.09
- **East**: 594,246.34

**Survey Data**

**Well Construction**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil</th>
<th>Rock</th>
<th>Sample Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Visual Classification**
- **15.0' brown CLAY, trace f Sand, saturated**
- **16.9' changing to gray CLAY, trace f SAND**
- **LACUSTRINE DEPOSITS**

**Remarks**
- Borehole backfilled with cement/bentonite grout.
## Subsurface Boring Log

### Project: Groundwater Investigation
Client: Hercules Inc./DYMO Nobel Inc. Port Ewen, N.Y.

**Well Name/Location:** HP-1

**Project No.:** 8598.03
**Start Date:** 06/22/95
**Finish Date:** 06/23/95

---

### WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil rock</th>
<th>SAMPLE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>6&quot; Borehole</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Cement/Bentonite Grout</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SAMPLE DATA

<table>
<thead>
<tr>
<th>Samp. No.</th>
<th>Bows/8 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PFD (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run No.</td>
<td>Hydraz. Cond. cm/sec</td>
<td>Rec. (ft.)</td>
<td></td>
<td>ROD</td>
</tr>
<tr>
<td>S-6</td>
<td>2-1-2-1</td>
<td>0.9'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-7</td>
<td>2-2-1-1</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-8</td>
<td>2-4-31-55</td>
<td>0.1'</td>
<td>GC</td>
<td>0</td>
</tr>
</tbody>
</table>

---

### VISUAL CLASSIFICATION

- Ø 45.0' gray sgravel and f sand, some Silty Clay
- End of Boring at 47.0 feet.

---

**CONTINUATION**

**REMARKS**

- Hydropunch sample collected @ 42-43'
**Drilling Data**

- **Inspector:** Laurie Schenau
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 55
- **Method:** 4 1/4" ID Hollow Stem Augers

**Sampling Methods**

- **Type:** Split Spoon
- **Diameter:** 2 inch
- **Other:** 140 lb./30 in.

**Well Construction**

- **Material:** NA
- **Diameter (ID):** NA
- **Coupling:** NA

**Well Development**

- **Method:** NA
- **Duration:** NA
- **Gals. Purged:** NA
- **Slug Test:** NA

**Survey Data**

- **Datum:** NGVD/NYS Plane
  - **Grade:** 154.7
  - **TWC:** NA
  - **TPC:** NA
  - **North:** 685,422.24
  - **East:** 594,300.83

**Well Construction**

- **Samp. No.:** S-1
  - **Blows/6 in.:** 5-9-7-7
  - **Rec. (ft):** 1.3
  - **USCS:** CH
  - **PFA (ppm):** 0
  - **Hydr. Cond. (cm/sec):** 8

- **Samp. No.:** S-2
  - **Blows/6 in.:** 4-9-7-9
  - **Rec. (ft):** 1.4
  - **USCS:** CH
  - **PFA (ppm):** 0.2

- **Samp. No.:** S-3
  - **Blows/6 in.:** 6-6-6-7
  - **Rec. (ft):** 1.4
  - **USCS:** CH
  - **PFA (ppm):** 30

- **Samp. No.:** S-4
  - **Blows/6 in.:** 2-1-2-2
  - **Rec. (ft):** 1.8
  - **USCS:** CH
  - **PFA (ppm):** 1

- **Samp. No.:** S-5
  - **Blows/6 in.:** 3-8-1-3-2
  - **Rec. (ft):** 2.0
  - **USCS:** CH
  - **PFA (ppm):** 0

- **Samp. No.:** S-6
  - **Blows/6 in.:** 12-7-1/2-2
  - **Rec. (ft):** NR
  - **USCS:** CH
  - **PFA (ppm):** NA

**Visual Classification**

- **Lacustrine Deposits**
  - **Brown CLAY & SILT, trace f**
  - **Sand, with root hairs, dry to moist**

**Remarks**

- Borehole backfilled with cement/bentonite grout.
- Ø 15.0' gray Silty CLAY, trace f
- Sand, saturated

Hydropunch sample collected @ 26-28'
# WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Sample No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-7</td>
<td>1-1-1-2</td>
<td>2.0</td>
<td>CH</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S-8</td>
<td>WDR/24&quot;</td>
<td>2.0</td>
<td>CH</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S-9</td>
<td>WDR/24&quot;</td>
<td>NR</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>S-10</td>
<td>8-4-24-17</td>
<td>0.7</td>
<td>GC</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

## SAMPLE DATA

### VISUAL CLASSIFICATION

- **@ 30.0' gray CLAY, trace f Sand**
- **@ 35.0' gray Silty CLAY, little f Sand**
- **@ 49.0' gray Silty CLAY, some angular in Gravel, little cmf Sand**

### REMARKS

- Hydropunch sample collected @ 46-49'
- End of Boring at 51.0 feet.
**Drilling Data**

- **Inspector:** Laurie Scheuing
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 850/Acker Soil Max
- **Method:** 4 1/4" ID Hollow Stem Augers

**Sampling Methods**

<table>
<thead>
<tr>
<th>Type</th>
<th>Sampler</th>
<th>Tube</th>
<th>Core</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Split Spoon</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Diameter</td>
<td>2 inch</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>140 lb./30 in.</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Well Construction**

- **Material:** NA
- **Diameter (ID):** NA
- **Coupling:** NA

**Screen**

- NA
- NA
- NA

**Well Development**

- **Method:** NA
- **Duration:** NA
- **Galv. Purged:** NA
- **Slug Test:** NA (cm/sec)

**Survey Data**

- **Datum:** NGVD/NYS Plane
- **Grade:** 154.4
- **TWC:** NA
- **TPC:** NA
- **North:** 585,424.48
- **East:** 594,343.98

**Well Construction Sample Data**

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>7-6-7-6</td>
<td>1.2'</td>
<td>SP</td>
<td>24</td>
<td>7-6-7-6</td>
<td>1.2'</td>
<td>24</td>
</tr>
<tr>
<td>S-2</td>
<td>5-8-8-8</td>
<td>1.1'</td>
<td>CH</td>
<td>4.8</td>
<td>5-8-8-8</td>
<td>1.1'</td>
<td>4.8</td>
</tr>
<tr>
<td>S-3</td>
<td>7-7-8-8-8</td>
<td>2.0'</td>
<td>CH</td>
<td>80</td>
<td>7-7-8-8-8-8-8</td>
<td>2.0'</td>
<td>80</td>
</tr>
<tr>
<td>S-4</td>
<td>3-4-3-5</td>
<td>2.0'</td>
<td>CH</td>
<td>12</td>
<td>3-4-3-5</td>
<td>2.0'</td>
<td>12</td>
</tr>
<tr>
<td>S-5</td>
<td>4-2-2-2</td>
<td>2.0'</td>
<td>CH</td>
<td>0.2</td>
<td>4-2-2-2-2-2-2</td>
<td>2.0'</td>
<td>0.2</td>
</tr>
<tr>
<td>S-6</td>
<td>4-3-4-6</td>
<td>1.2'</td>
<td>CH</td>
<td>1.2</td>
<td>4-3-4-6</td>
<td>1.2'</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**Visual Classification**

- **FILL**
  - Light brown to black fine SAND, little Clayey Silt, little gravel, with roots & cinders, dry to moist
- **LACUSTINE DEPOSITS**
  - Gray-black Silty CLAY, trace f Sand, slump
  - @ 5.0 brown & gray Silty CLAY, trace f Sand, moist to wet

**Remarks**

- Borehole backfilled with cement/bentonite grout.
WELL CONSTRUCTION

SAMPLE DATA

(CONTINUATION)

SAMP.
No. Blows/
6 in. Rec.
(ft.) USCS PIP
(ppm)

Run No.

Hydraul.
Cond.
cm/sec Rec.
(ft.) RGD

S-7 3-4-
4-4 12' CH 0

Borehole

S-8 20/24*
2.0' CH 0

Remains at 35.0' gray CLAY, little f Sand

Cement/ Bentonite Grout

S-9 5-5-
4-3 2.0' CH 0

End of Boring at 47.0 feet.

Hydropunch sample collected @ 43-44'

Visual classification

Remarks
Drilling Data

Inspector: Laurie Scheuing
Contractor: B. Bosworth/Empire Soils Investigation Inc.
Equipment: CME 850
Method: 4 1/4" ID Hollow Stem Augers

Sampling Methods

Type:
- Split Spoon: NA
- Diameter: 2 inch
- Other: 140 lb./30 in.
- Core: NA

Well Construction

Material:
- Riser: NA
- Screen: NA
- Diameter (ID):
  - NA
- Coupling: NA

Well Development

Method: NA
Duration: NA
Gas Purged: NA
 slug test: NA

Survey Data

Grade: 164.6
TWC: NA
TPC: NA
North: 685,380.71
East: 584,335.46

Geophysical Log: yes

Visual Classification

Lacusitrine Deposits

Gray mt gravel, some loam sand, little clay & silt, dry to moist @ 0.7".

- Ø 5.0' brown Silty clay, trace of sand, moist to wet

- Ø 16.4' changing to red-brown Silty clay, trace of sand, saturated

- Ø 20.0' gray clay, trace of Sand

Remarks

Borehole backfilled with cement/bentonite grout.

Hydropunch sample collected @ 27.5-28.5'
End of Boring at 47.0 feet.

Hydropunch sample collected @ 42-43'.

Visual Classification:

Remarks:

S-6
1-2
1-1
L2' CH 0

Cement/D Bentonite Grout

S-7
1-1
1-1
NR NA NA

5" Borehole

S-8
1-1
4-5
NR CH NA
**ECKENFELDER INC.**

**Subsurface Boring Log**

**Well Name/Location:** HP-5

**Project:** Groundwater Investigation  
**Client:** Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.

**Project No.:** 9596.03  
**Start Date:** 06/05/95  
**Finish Date:** 06/07/95

**DRILLING DATA**

- **Inspector:** Laurie Scheuing  
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.  
- **Equipment:** CME 55  
- **Method:** 4 1/4" ID Hollow Stem Augers

**WELL CONSTRUCTION**

<table>
<thead>
<tr>
<th>Material:</th>
<th>Riser</th>
<th>Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter (ID):</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Coupling:</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**WELL DEVELOPMENT**

- **Method:** NA  
- **Duration:** NA  
- **Gals. Purged:** NA  
- **Slug Test:** NA

**SURVEY DATA**

- **DATUM:** NGVD/NYS Plane  
- **Grade:** 161.1  
- **TWC:** NA  
- **TPC:** NA  
- **North:** 585,435.55  
- **East:** 594,448.56

**WELL CONSTRUCTION**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Sample No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PID (ton)</th>
<th>Soil/rock</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>S-1</td>
<td>4-3-5-7</td>
<td>0.9'</td>
<td>CL</td>
<td>0</td>
<td>Silt</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>S-2</td>
<td>6-8-7-9</td>
<td>1.2'</td>
<td>CH</td>
<td>0</td>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>S-3</td>
<td>4-7-8-12</td>
<td>1.7'</td>
<td>CH</td>
<td>2</td>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>S-4</td>
<td>3-4-3-3</td>
<td>2.0'</td>
<td>CH</td>
<td>0.8</td>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>S-5</td>
<td>SDS/II-2-3</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>S-8</td>
<td>1/24'</td>
<td>NR</td>
<td>NA</td>
<td>NA</td>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VISUAL CLASSIFICATION**

- **LACUSTINE DEPOSITS**
  - Brown Silt & Clay, trace f Sand, dry
  - Ø 5.0' brown Silty Clay, trace f Sand, moist
  - Ø 16.7' changing to gray Silty Clay, trace f Sand, wet
  - Ø 20.0' gray Silty Clay, trace f Sand, saturated

**REMARKS**

- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected Ø 26-28'
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
<th>VISUAL CLASSIFICATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>S-7</td>
<td>1-1-1</td>
<td>2.0' CH 0.1</td>
<td>@ 30.0' gray CLAY, trace (-) f SAND</td>
</tr>
<tr>
<td>35</td>
<td>S-8</td>
<td>MOR/12'-1-3</td>
<td>2.0' CH 0.1</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>S-9</td>
<td>1-1-1</td>
<td>NR NA NA</td>
<td></td>
</tr>
</tbody>
</table>

End of Boring at 45.0 feet.

Hydropunch sample collected @ 42-45'
**ECKENFELDER INC.**

**Subsurface Boring Log**

**Well Name/Location:** HP-6

**Project:** Groundwater Investigation  
**Client:** Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.  
**Project No.:** 9596.03  
**Start Date:** 05/15/95  
**Finish Date:** 05/19/95

---

**DRILLING DATA**

**Inspector:** Laurie Scheuing  
**Contractor:** B. Bosworth/Empire Soils Investigation Inc.  
**Equipment:** CME 850  
**Method:** 4 1/4" ID Hollow Stem Augers

---

**WELL CONSTRUCTION**

**Material:** NA  
**Diameter (ID):** NA  
**Coupling:** NA

**Screen**

<table>
<thead>
<tr>
<th>Riser</th>
<th>Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

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**WELL DEVELOPMENT**

**Type:** Split Spoon  
**Tube:** NA  
**Core:** NA

**Sample**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inch</td>
<td>140 lb./30 in.</td>
</tr>
</tbody>
</table>

---

**SURVEY DATA**

**DATUM:** NGVD/NYS Plane

| Method: NA | Grade: 157.8 |
| Duration: NA | TWC: NA |
| Gals. Purged: NA | TPC: NA |
| Slug Test: NA | North: 685.379.73 |
| (cm/sec) | East: 584.512.92 |

---

**WELL CLASSIFICATION**

**Samp. No.**

<table>
<thead>
<tr>
<th>Borehole</th>
<th>Rock</th>
<th>Blows/6 in.</th>
<th>Rec. (fl.)</th>
<th>USCS</th>
<th>PDI (ppm)</th>
<th>Geophysical Log:</th>
<th>Comments:</th>
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<tbody>
<tr>
<td>S-1</td>
<td>3-4-3-4</td>
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<td>Cl</td>
<td>0</td>
<td></td>
<td>□ yes</td>
<td></td>
</tr>
<tr>
<td>S-2</td>
<td>4-6-7-8</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
<td></td>
<td>X no</td>
<td></td>
</tr>
<tr>
<td>S-3</td>
<td>3-5-7-7</td>
<td>2.0'</td>
<td>CH</td>
<td>0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-4</td>
<td>3-2-3-3</td>
<td>1.0'</td>
<td>CH</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-5</td>
<td>2-4-4-3</td>
<td>1.5'</td>
<td>CH</td>
<td>0</td>
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<td></td>
</tr>
</tbody>
</table>

**VISUAL CLASSIFICATION**

**LACUSTRINE DEPOSITS**

- Brown Silt & Clay, little mf  
- Sand, with reeds & roots, damp

- Ø 5.0' brown Silty Clay, trace f  
- Sand, moist to wet

- Ø 15.0' gray Silty Clay, trace f  
- Sand, saturated

- Ø 25.0' gray CLAY, trace (-) f  
- Sand

**REMARKS**

Borehole backfilled with cement/bentonite grout.

Hydropunch sample collected Ø 23-24"
### Subsurface Boring Log

**Well Name/Location:** HP-6

**Project:** Groundwater Investigation  
**Client:** Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.  
**Project No.:** 9596.03  
**Start Date:** 06/15/95  
**Finish Date:** 06/19/95

### WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
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<tbody>
<tr>
<td>30</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
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<tr>
<td>60</td>
</tr>
<tr>
<td>65</td>
</tr>
<tr>
<td>70</td>
</tr>
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</table>

**6" Borehole**

**Cement/Bentonite Grout**

### SAMPLE DATA

<table>
<thead>
<tr>
<th></th>
<th>Samp. No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-6</td>
<td>1-3</td>
<td>1.0' CH</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### VISUAL CLASSIFICATION

**@ 30.0' gray CLAY, little f Sand**

### REMARKS

**Hydropunch sample collected @ 41-44'**

**@ 45.0' gray mf GRAVEL, some Silty Clay, some fnc Sand Bedrock @ 45.6 feet.**

**End of Boring at 46.3 feet.**
**Drilling Data**

- **Inspector:** Laurie Scheuing
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 860
- **Method:** 4 1/4" ID Hollow Stem Augers

**Sampling Methods**

- **Type:** Split Spoon
- **Diameter:** 2 inch
- **Other:** 140 lb./30 in.

**Well Construction**

- **Material:** NA
- **Diameter (ID):** NA
- **Coupling:** NA

**Well Development**

- **Method:** NA
- **Duration:** NA
- **Gals. Purged:** NA
- **Slug Test:** NA (cm/sec)

**Survey Data**

- **Grade:** 157.8
- **TWC:** NA
- **TPC:** NA
- **North:** 685,305.36
- **East:** 594,646.83

**Well Construction**

- **Soil Sample Data**
  - **Samp. No.**
  - **Blows/6 in.**
  - **Rec. (ft.)**
  - **USCS**
  - **PID (ppm)**
  - **RCD**

<table>
<thead>
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<th>Depth (feet)</th>
<th>Soil</th>
<th>Sample Data</th>
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<tr>
<td>0</td>
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<td>20</td>
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<td>NA</td>
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<tr>
<td>25</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>30</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

- **Visual Classification**
  - **Lacustrine Deposits**
    - Brown Silty Clay, trace f Sand, with roots, dry to wet

- **Remarks**
  - Borehole backfilled with cement/bentonite grout.

- **Remarks**
  - 15.7" grading to gray Silty CLAY, trace f Sand, saturated

- **Remarks**
  - Hydropunch sample collected ø 23-24"
### WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Borehole</strong></td>
<td><img src="image" alt="8&quot; Borehole" /></td>
<td><img src="image" alt="Cement/ Bentonite Grout" /></td>
<td></td>
<td></td>
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</table>

### SAMPLE DATA

<table>
<thead>
<tr>
<th>Samp. No.</th>
<th>Blows/ 6 in.</th>
<th>Rec. (ft)</th>
<th>USCS</th>
<th>PID (ppm)</th>
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<tbody>
<tr>
<td>S-6</td>
<td>1-1</td>
<td>18</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-7</td>
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<td>18</td>
<td>CH</td>
<td>0</td>
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<tr>
<td>S-8</td>
<td>10-14-42-38</td>
<td>11</td>
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</table>

### VISUAL CLASSIFICATION

- **@ 30.0'** gray Silty CLAY, little (+) f Sand
- **@ 45.0'** gray fmc GRAVEL, some cmf Sand, little Silt & Clay

### REMARKS

- Hydropunch sample collected @ 42-44'
- End of Boring at 47.0 feet.
**Drilling Data**

- **Sampler**: Split Spoon
- **Tube**: NA
- **Core**: NA

**Well Construction**

<table>
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<tr>
<th>Material:</th>
<th>NA</th>
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</thead>
<tbody>
<tr>
<td>Diameter (ID):</td>
<td>NA</td>
</tr>
<tr>
<td>Coupling:</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Well Development**

- **Method**: NA
- **Duration**: NA
- **Gas Purged**: NA
- **Slug Test**: NA

**Survey Data**

- **Datum**: NGVD/NYS Plane
- **Grade**: 162.7
- **TWC**: NA
- **TPC**: NA
- **NORTH**: 885,216.78
- **EAST**: 594,639.62

**Well Construction**

<table>
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<th>Depth (feet)</th>
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<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
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<tbody>
<tr>
<td><strong>Sample Data</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Blows/ 6 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PID (ppm)</th>
<th>Geochemical Log</th>
<th>Comments</th>
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<tbody>
<tr>
<td>S-1</td>
<td>2-4-6-10</td>
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<td>6-8-11-11</td>
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<td>CH</td>
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<tr>
<td>S-3</td>
<td>7-5-8-11</td>
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<td>CH</td>
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<td></td>
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</tr>
<tr>
<td>S-4</td>
<td>5-5-4-5</td>
<td>1.3</td>
<td>CH</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>S-5</td>
<td>2-2-2-4</td>
<td>1.5</td>
<td>CH</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Visual Classification**

- **Silt Clay, trace of sand, dry to wet**
- **15.0' gray Silty CLAY, trace of sand, saturated**
- **25.0' gray Silty CLAY, little trace of sand**

**Remarks**

- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected Ø 23-24" plus DUPO71395
## WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil rock</th>
<th>SAMPLE DATA</th>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
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</table>

### Hydrail. Cond. cm/sec

<table>
<thead>
<tr>
<th>Run No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-6</td>
<td>2-3-1-2-3</td>
<td>1.3'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-7</td>
<td>1-2-1-1</td>
<td>1.5'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-9</td>
<td>12-15-24</td>
<td>1.3'</td>
<td>SP</td>
<td>0</td>
</tr>
</tbody>
</table>

### Visual Classification

- 30.0' gray Silty CLAY, some (-) of Sand
- 45.0' gray cmf SAND, some fmc Gravel, little Silt & Clay

### Remarks

- Hydropunch sample collected @ 42-43'
- End of Boring at 47.0 feet.
**Project:** Groundwater Investigation  
**Client:** Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.  
**Equipment:** CME 850  
**Method:** 4 1/4" ID Hollow Stem Augers

---

**DRILLING DATA**

- **Type:** Sampler, Tube, Core  
- **Diameter:** Split Spoon, 2 inch  
- **Other:** 140 lb./30 in.

---

**WELL CONSTRUCTION**

- **Material:** NA  
- **Diameter (ID):** NA  
- **Coupling:** NA

---

**WELL DEVELOPMENT**

- **Method:** NA  
- **Duration:** NA  
- **Gals. Purged:** NA  
- **Slug Test:** NA (cm/sec)

---

**SURVEY DATA**

- **DATUM:** NGVD/NYS Plane  
- **Grade:** 164.0  
- **TWC:** NA  
- **TPC:** NA  
- **North:** 685,130.17  
- **East:** 594,514.45

---

**WELL CONSTRUCTION SAMPLE DATA**

- **Samp. No.**  
- **Blows/6 in.** 2-5-9-12  
- **Rec. (ft.)** 1.5" CH 0  
- **Run No.**  
- **Hydraul. Cond. cm/sec** B-7-6-10  
- **Rec. (ft.)** 1.7" CH 0  
- **S-1**  
- **6-5-4-4** 1.8" CH 0  
- **S-2**  
- **7-7-6-8** 0.9" CH 0  

---

**VISUAL CLASSIFICATION**

- **LACUSTRINE DEPOSITS**  
- Dark brown SILT, some f Sand, with roots, needles & leaf litter, dry  
- @ 04" grading to brown Silty CLAY, trace f Sand, dry to moist  
- @ 10.4" changing to gray Silty CLAY, trace f Sand, wet to saturated

---

**REMARKS**

- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected @ 22-23'
- End of Boring at 23.0 feet.
Project: Groundwater Investigation
Client: Hercules Inc./DYNO Nobel Inc., Port Ewen, N.Y.

Drilling Data
- Sampler: Split Spoon
- Tube: NA
- Core: NA
- Type: Split Spoon
- Diameter: 2 inch
- Other: 140 lb./30 in.

WELL CONSTRUCTION
- Material: NA
- Diameter (ID): NA
- Coupling: NA

Survey Data
- Datum: NGVD/NYS Plane
- Grade: 158.8
- TWC: NA
- TPC: NA
- North: 685,220.05
- East: 594,500.02

Well Construction

Sample Data

Visual Classification
- Lacustrine Deposits

Remarks
- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected @ 21-24", plus DPU060895

Visual Classification
- LACUSTRIINE DEPOSITS

Brown CLAY & SILT, trace to (-) f Sand, moist to saturated

Visual Classification
- @ 15.3' changing to gray CLAY, trace (-) f Sand, saturated

Representative samples collected at 21", 23", 24", & 25".
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
<th>VISUAL CLASSIFICATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td></td>
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<tr>
<td>70</td>
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</tbody>
</table>

- **WELL CONSTRUCTION**
  - 8" Borehole
  - Cement/Bentonite Grout

- **SAMPLE DATA**
  - Samp. No.  S-7  S-8  S-9
  - Blows/6 in.  1-1/2  WOR/40  100/2"
  - Rec. (ft.)  2.0'  2.0'  NR
  - USCS  CH  CH  CH
  - PID (ppa)  0.4  0.5  NA

- **VISUAL CLASSIFICATION**
  - Hydropunch sample, HP-10A, collected Ø 32-34"
  - Ø 36.6' grading to gray CLAY, some IM Sand
  - Bedrock Ø 37.5 feet.

- **REMARKS**
  - End of Boring at 37.5 feet.
### Drilling Data
- **Inspector:** Laurie Scheuing
- **Contractor:** E. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 850
- **Method:** 4 1/4" ID Hollow Stem Augers

### Sampling Methods
- **Type:** Split Spoon
- **Diameter:** 2 inch
- **Other:** 140 lb./30 in.

### Well Construction
- **Material:** NA
- **Diameter (ID):** NA
- **Coupling:** NA

### Well Development
- **Method:** NA
- **Duration:** NA
- **Gals. Purged:** NA
- **Slug Test:** NA

### Survey Data
- **Datum:** NGVD/NYS Plane
- **Grade:** 161.8
- **TWC:** NA
- **TPC:** NA
- **North:** 685,086.79
- **East:** 584,493.05

### Visual Classification
- **Lacustrine Deposits**
  - Brown Silty CLAY, trace f Sand, dry to moist
  - Ø 15.0' gray Silty CLAY, trace (-) f Sand, wet to saturated

### Remarks
- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected Ø 21-24'
**WELL CONSTRUCTION**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
<th>soil rock</th>
<th>Blows/ 5 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>8&quot; Borehole</td>
<td>S-6</td>
<td>4-3-2-1</td>
<td>NR</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>35</td>
<td>Cement/Bentonite Grout</td>
<td>S-7</td>
<td>3-2-1-1</td>
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<td>0</td>
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<tr>
<td>40</td>
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<td>S-8</td>
<td>3-3-2</td>
<td>2.0&quot;</td>
<td>CH</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**VISUAL CLASSIFICATION**

- Hydropunch sample collected @ 41-43.5'
- End of Boring at 47.0 feet.
**DRILLING DATA**

- **Inspector:** Laurie Scheuing
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 850
- **Method:** 4 1/4" ID Hollow Stem Augers

**WELL CONSTRUCTION**

- **Riser:** NA
- **Screen:** NA

**WELL DEVELOPMENT**

- **Method:** NA
- **Duration:** NA
- **Gals. Purged:** NA
- **Slug Test:** NA

**SURVEY DATA**

- **DATUM:** NGVD/NYS Plane
- **Grade:** 158.9
- **TWC:** NA
- **TPC:** NA
- **North:** 685,152.73
- **East:** 594,414.82

**WELL CONSTRUCTION**

- **rock**
- **SAMPLE DATA**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>S-1</th>
<th>S-2</th>
<th>S-3</th>
<th>S-4</th>
<th>S-5</th>
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<td>0</td>
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<td>30</td>
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</table>

**SOIL CLASSIFICATION**

- **Brown Silty CLAY, trace f Sand, with roots & reeds, moist**
- **5.0' brown Silty CLAY, little f Sand, damp**
- **11/2' grading to gray Silty CLAY, trace f Sand, moist to saturated**
- **15.0' gray CLAY, trace (-) f Sand**

**REMARKS**

- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected @ 23-24°
### Subsurface Boring Log

**Well Name/Location:** HP-12

**Project:** Groundwater Investigation

**Client:** Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.

**Project No.:** 9596.03

**Start Date:** 06/12/95

**Finish Date:** 06/28/95

---

#### WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-8</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Run No.</td>
<td>Hydraul. Cond. cm/sec</td>
<td>Rec. (ft)</td>
<td>RGD</td>
<td></td>
</tr>
<tr>
<td>S-7</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>S-8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SAMPLE DATA

- **S-8**
  - 8"-WOR/28”-WCH/18”
  - 0.8’ CH
  - 0
- **S-7**
  - 3"-I-1-3
  - 1.9’ CH
  - 0
- **S-8**
  - 2.0’ CH
  - 0

#### VISUAL CLASSIFICATION

- Ø 36.0’ gray CLAY, little to some f Sand

#### REMARKS

- Hydropunch sample collected Ø 42-43’
- End of Boring at 47.0 feet
**Subsurface Boring Log**

**Well Name/Location:** HP-13

**Project No.:** 9596.03

**Start Date:** 06/14/95

**Finish Date:** 08/16/95

**Inspector:** Laurie Scheuing

**Contractor:** B. Bosworth/Empire Soils Investigation Inc.

**Equipment:** CME 850

**Method:** 4 1/4" ID Hollow Stem Augers

### DRILLING DATA

- **Type:** Split Spoon
- **Diameter:** 2 inch
- **Other:** 140 lb./30 in.

### WELL CONSTRUCTION

- **Material:** NA
- **Diameter (ID):** NA
- **Coupling:** NA

### SAMPLE DATA

<table>
<thead>
<tr>
<th>Samp. No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft.)</th>
<th>UCS (psi)</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>2-5-5+10</td>
<td>0.5'</td>
<td>CH</td>
<td>1.5</td>
</tr>
<tr>
<td>S-2</td>
<td>7-6-7-10</td>
<td>1.3'</td>
<td>CH</td>
<td>270</td>
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<tr>
<td>S-3</td>
<td>7-6-8-13</td>
<td>0.3'</td>
<td>CH</td>
<td>220</td>
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<td>S-4</td>
<td>3-2-2-4</td>
<td>2.0'</td>
<td>CH</td>
<td>220</td>
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<tr>
<td>S-5</td>
<td>2-2-1-2</td>
<td>2.0'</td>
<td>CH</td>
<td>2</td>
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<tr>
<td>S-6</td>
<td>2-1-2-3</td>
<td>0.7'</td>
<td>CH</td>
<td>0.3</td>
</tr>
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</table>

**Grade:** 163.0

**TWC:** NA

**TPC:** NA

**North:** 685,252.57

**East:** 594,332.84

**SOIL CLASSIFICATION**

- **EILL**
  - Brown Silty CLAY, some mf Sand, with black cinders, saturated

- **LACUSTRINE DEPOSITS**
  - Brown Silty CLAY, trace f Sand, moist

- **Ø 15.4' grading to gray Silty CLAY, trace f Sand, wet to saturated**

- **Ø 20.0' gray CLAY, trace (~) f Sand**

**REMARKS**

- Borehole backfilled with cement/bentonite grout.

- Hydropunch sample collected Ø 22-22.5'
ECKENFELDER INC.

Subsurface Boring Log

Well Name/Location: HP-13

Project: Groundwater Investigation
Client: Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.

Project No.: 9596.03
Start Date: 06/14/95
Finish Date: 06/16/95

(continuation)

WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
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<tr>
<td>30</td>
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<tr>
<td>35</td>
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<td>40</td>
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<td>60</td>
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<td>65</td>
</tr>
<tr>
<td>70</td>
</tr>
</tbody>
</table>

SAMPLE DATA

<table>
<thead>
<tr>
<th>Samp. No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-7</td>
<td>3-3-1-2</td>
<td>1.6'</td>
<td>CH</td>
<td>0.2</td>
</tr>
<tr>
<td>S-8</td>
<td>WQH/0'-1</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-9</td>
<td>1/2'-1/2''</td>
<td>NR</td>
<td>NA</td>
<td>NA</td>
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</tbody>
</table>

VISUAL CLASSIFICATION

REMARKS

End of Boring at 47.0 feet.

Hydropunch sample collected @ 43-44'.

8" Borehole

Cement/Bentonite Grout
Drilling Data
- Inspector: Laurie Scheuing
- Contractor: B. Bosworth/Empire Soils Investigation Inc.
- Equipment: CME 850/CME 55
- Method: 4 1/4" ID Hollow Stem Augers

Sampling Methods
- Sampler: Split Spade
- Tube: NA
- Core: NA

Well Construction
- Material: NA
- Diameter (ID): NA
- Coupling: NA

Well Development
- Method: NA
- Duration: NA
- Gas Purged: NA
- Slug Test: NA

Survey Data
- Datum: NGVD/NYS Plane
- Grade: 163.4
- TWC: NA
- TPC: NA
- North: 685,571.49
- East: 594,387.78

Well Construction

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Rock</th>
<th>SAMPLE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8&quot; Borehole</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cement/Bentonite Grout</td>
<td></td>
</tr>
</tbody>
</table>

Visual Classification
- LACUSTRINE DEPOSITS
- Brown CLAY & SILT, trace f Sand, with root hairs, moist to wet
- Ø 15.5' grading to gray Silty CLAY, trace to no f Sand, moist to saturated

Remarks
- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected Ø 25
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
<th>VISUAL CLASSIFICATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
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<tr>
<td>70</td>
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</tr>
</tbody>
</table>

**8" Borehole**

**Cement/Bentonite Grout**

**S-7**
- Hydr. Cond.: 2.0' CH 0
- Sample No.: WOR/18'-3

**S-8**
- Hydr. Cond.: 2.0' CH 0
- Sample No.: WOR/24'

**S-9**
- Hydr. Cond.: 2.0' CH 0
- Sample No.: WOR/24'

*Hydropunch sample collected @ 42-45'*

*End of Boring at 45.0 feet.*
**Drilling Data**
- Inspector: Laurie Schewing
- Contractor: B. Bosworth/Empire Soils Investigation Inc.
- Equipment: CME 850
- Method: 4 1/4" ID Hollow Stem Augers

**Well Construction**
- Material: NA
- Diameter (ID): NA
- Coupling: NA

**Well Development**
- Sampler: Split Spoon
- Diameter: 2 inch
- Other: 140 lb./30 in.

**Survey Data**
- Datum: NGVD/NYS Plane
- Grade: 183.2
- TWC: NA
- TPC: NA
- North: 685,582.15
- East: 594,431.75

**Well Construction**

<table>
<thead>
<tr>
<th>Soil</th>
<th>Rock</th>
<th>Sample Data</th>
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</thead>
<tbody>
<tr>
<td>S-1</td>
<td>15-21-6 12-14</td>
<td>1.5' CH 0</td>
</tr>
<tr>
<td>S-2</td>
<td>7-6-7-8</td>
<td>1.4' CH 0</td>
</tr>
<tr>
<td>S-3</td>
<td>6-5-7-8</td>
<td>1.5' CH 0.4</td>
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<tr>
<td>S-4</td>
<td>4-3-2-3</td>
<td>1.5' CH NM</td>
</tr>
<tr>
<td>S-5</td>
<td>2-1-2-3</td>
<td>1.7' CH NM</td>
</tr>
</tbody>
</table>

**Visual Classification**
- Fill
  - Gray gravel and black cinders, dry
- Lacustrine Deposits
  - Brown Silty Clay, trace of sand, dry to wet
- 8' 10.0' brown Silty Clay, little of sand wet
- 8' 15.5' grading to gray clay, trace of sand, wet to saturated

**Remarks**
- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected @ 28-29
(CONTINUATION)

<table>
<thead>
<tr>
<th>Depth (feet)</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>65</td>
</tr>
<tr>
<td>70</td>
</tr>
</tbody>
</table>

**WELL CONSTRUCTION**

- **Soil rock**
- **SAMPLE DATA**
  - Samp. No.
  - Blows/ 6 in.
  - Rec. (ft.)
  - USCS
  - PID (ppm)
  - Run No.
  - Hydraul. Cond. cm/sec
  - Rec. (ft.)
  - RQD

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<tbody>
<tr>
<td>30</td>
<td>S-6</td>
<td>2-2-1-1</td>
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<td>1.5</td>
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</table>

**VISUAL CLASSIFICATION**

- S-7: WOH-12'-1-2: NR, NA, NA

**REMARKS**

- Hydropunch sample collected @ 45-44'.
- Ø 45.0' gray Silty CLAY and fnc SAND, trace f Gravel.
- End of Boring at 47.0 feet.
**Drilling Data**

- **Inspector:** Laurie Scheuing
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 350
- **Method:** 4 1/4" ID Hollow Stem Augers
- **Sampler:** Split Spoon
- **Purge:** NA
- **Core Size:** NA
- **Diameter:** 2 inch
- **Depth:** 140 lb./30 in.

---

**Well Construction**

<table>
<thead>
<tr>
<th>Material</th>
<th>Riser</th>
<th>Screen</th>
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<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Diameter (ID):</td>
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<td>NA</td>
</tr>
<tr>
<td>Coupling:</td>
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</tr>
</tbody>
</table>

**Survey Data**

- **Datum:** NGVD/NYS Plane
- **Grade:** 183.0
- **TWC:** NA
- **TPC:** NA
- **North:** 685,205.71
- **East:** 594,314.34

---

**Well Construction Diagram**

- **S-1:** 4-3-2-2, 0.2', SP, 0
- **S-2:** 3-7-10-13, 1.2', CH, 0
- **S-3:** 4-5-5-9, 1.3', CH, 0
- **S-4:** 4-3-2-2, 1.5', CH, 0
- **S-5:** 2-1-1-1, 2.0', CH, 0

---

**Visual Classification**

- **Lacustrine Deposits**
  - Brown & black cmf SAND, some fm gravel, little Clay & Silt, with roots, dry
  - Ø 5.0' brown Silty CLAY, trace f Sand, moist
  - Ø 15.4' grading to gray CLAY, trace f Sand, saturated

---

**Remarks**

- Borehole backfilled with cement/bentonite grout.
- Hydropunch sample collected Ø 23-24'
<table>
<thead>
<tr>
<th>Depth  (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
<th>VISUAL CLASSIFICATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>8&quot; Borehole</td>
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</tr>
<tr>
<td>35</td>
<td>Cement/Bentonite Grout</td>
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<td>40</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td>45.0' gray CLAY, little f SAND</td>
</tr>
<tr>
<td>50</td>
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</tr>
<tr>
<td>55</td>
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<td></td>
<td>End of Boring at 47.0 feet.</td>
</tr>
<tr>
<td>60</td>
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</tr>
<tr>
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<tr>
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</tr>
</tbody>
</table>

(continuation)
NEWLY INSTALLED MONITORING WELLS
Project: Groundwater Investigation
Client: Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.

Inspector: Laurie Scheuing
Contractor: B. Bosworth/Empire Soils Investigation Inc.
Equipment: CME 850
Method: 4 1/4" ID Hollow Stem Augers

Well Name/Location: MW-11S
Project No.: 8596.03
Start Date: 07/31/95
Finish Date: 07/31/95

Subsurface Boring Log

Drilling Data

- Sampler: Split Spoon
- Tube: NA
- Core: NA
- Type: Split Spoon
- Diameter: 2 inch
- Other: 140 lb./30 in.

WELL CONSTRUCTION

- Material: PVC, Sch. 40
- Diameter (ID): 2 inch
- Coupling: Flush-Threaded

Screen

- PVC, 0.010" Screen
- 2 inch
- Flush-Threaded

Well Development

- Method: Surge Block/Bailer
- Grade: 162.1
- TWC: 164.4
- TPC: 164.6
- Duration: 0.5 hours
- Gals. Purged: 14 gallons
- Slug Test: $3.6 \times 10^{-6}$ (cm/sec)
- North: 663,792.33
- East: 593,980.59

Survey Data Datum: NGVD/NYS Plane

Well Construction

- Depth (feet): 30
- 4" Locking Protective Casing
- 8" Borehole
- Cement/Bentonite Grout
- 2" PVC Riser
- Bentonite Pellets
- Secondary Sand Pack
- Primary Sand Pack
- 2" PVC 0.010" Screen
- Endcap

Sample Data

- Samp. No.
- Blows/6 in.
- Rec. (ft.)
- USCS
- PID (ppm)
- Rec. (ft.)
- ROD
- Geophysical Log: yes

Visual Classification

- REMARKS
  - See MW-10D for sample description.
  - End of Boring @ 24.4 feet.
## WELL CONSTRUCTION

### Soil Rock

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>8” Borehole</td>
</tr>
<tr>
<td>35</td>
<td>Cement/Bentonite Grout</td>
</tr>
<tr>
<td>40</td>
<td>2” PVC Riser</td>
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<tr>
<td>45</td>
<td>Bentonite Pellets</td>
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<td>50</td>
<td>Secondary Sand Pack</td>
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<td>Primary Sand Pack</td>
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<td>2” PVC 0.000” Screen</td>
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<td>65</td>
<td>Endcap</td>
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<td>70</td>
<td>End of Boring at 87.0 feet</td>
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### SAMPLE DATA

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<tr>
<th>Sump No.</th>
<th>Blows/6 in</th>
<th>Rec. (ft)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-7</td>
<td>WOR/12”-W01/12”</td>
<td>1.6’</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-8</td>
<td>WOR/18”-W01/18”</td>
<td>1.7’</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-9</td>
<td>WOR/18”-W01/18”</td>
<td>1.6’</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-10</td>
<td>WOR/3-10-7</td>
<td>0.4’</td>
<td>SC</td>
<td>0</td>
</tr>
<tr>
<td>S-11</td>
<td>12-12-8-12</td>
<td>0.6’</td>
<td>GM</td>
<td>0</td>
</tr>
<tr>
<td>S-12</td>
<td>9-12-11-13</td>
<td>1.3’</td>
<td>GM</td>
<td>0</td>
</tr>
<tr>
<td>S-13</td>
<td>36-51-35-30</td>
<td>2.0’</td>
<td>GP</td>
<td>0</td>
</tr>
<tr>
<td>S-14</td>
<td>13-63-104-74</td>
<td>1.8’</td>
<td>GP</td>
<td>0</td>
</tr>
</tbody>
</table>

### VISUAL CLASSIFICATION

- @ 35.0’ gray Silty CLAY, little to trace f Sand
- @ 45.0’ gray cmf SAND, some Clay & Silt, little in Gravel
- @ 50.0’ gray GRAVEL and cmf SAND, little Clay & Silt
- @ 55.0’ gray mF GRAVEL, some fm Sand, trace (~) Clayey Silt
- @ 60.0’ gray cmf SAND and fm GRAVEL, trace Clayey Silt
Project: Groundwater Investigation
Client: Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.

Project No.: 9596.03
Start Date: 05/18/95
Finish Date: 05/18/95

 Inspector: Laurie Scheuing
 Contractor: B. Bosworth/Empire Soils Investigation Inc.
 Equipment: CME 55
 Method: 4 1/4" ID Hollow Stem Augers

WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Material:</th>
<th>Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC, Sch. 40</td>
<td>PVC, 0.010&quot; Screen</td>
</tr>
<tr>
<td>2 inch</td>
<td>2 inch</td>
</tr>
<tr>
<td>Flush-Threaded</td>
<td>Flush-Threaded</td>
</tr>
</tbody>
</table>

WELL DEVELOPMENT

<table>
<thead>
<tr>
<th>Method:</th>
<th>Surge Block/Bailer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration:</td>
<td>0.5 hours</td>
</tr>
<tr>
<td>Gals. Purged:</td>
<td>27 gallons</td>
</tr>
<tr>
<td>Slug Test:</td>
<td>7.4 x 10^-6 (cm/sec)</td>
</tr>
</tbody>
</table>

SURVEY DATA

<table>
<thead>
<tr>
<th>Datum:</th>
<th>NGVD/NYS Plane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade:</td>
<td>186.5</td>
</tr>
<tr>
<td>TWC:</td>
<td>168.8</td>
</tr>
<tr>
<td>TPC:</td>
<td>169.0</td>
</tr>
<tr>
<td>North:</td>
<td>685,004.95</td>
</tr>
<tr>
<td>East:</td>
<td>583,902.75</td>
</tr>
</tbody>
</table>

WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Sample</th>
<th>Blows/ in.</th>
<th>Rec. ft</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>12-12-15-14</td>
<td>1.1'</td>
<td>SM</td>
<td>0</td>
</tr>
<tr>
<td>S-2</td>
<td>6-8-10-13</td>
<td>1.6'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-3</td>
<td>2-4-5-6</td>
<td>1.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-4</td>
<td>7-6-7-7</td>
<td>1.4'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-5</td>
<td>2-1-2-3</td>
<td>1.6'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-6</td>
<td>3-2-3-3</td>
<td>1.7'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-7</td>
<td>WOH-1-2-3</td>
<td>1.5'</td>
<td>CH</td>
<td>0</td>
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</table>

SAMPLE DATA

<table>
<thead>
<tr>
<th>Depth (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
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<tr>
<td>15</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30</td>
</tr>
</tbody>
</table>

REMARKS

LACUSITINE DEPOSITS
Brown fm SAND, some Clayey Silt, little (-) f Gravel, dry
@ 0.5' brown Silty CLAY, trace f Sand, dense, dry to wet
@ 12.8' grading to gray Silty CLAY, trace f Sand, saturated
@ 14.0' gray CLAY

End of Boring at 25.0 feet.
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
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<tr>
<td>45</td>
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</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
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<tr>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### WELL CONSTRUCTION
- **Borehole**: 6" Borehole
- **Cement/ Bentonite Coating**: 2" PVC Riser
- **Bentonite Slurry**: 2" Bentonite Slurry

### SAMPLE DATA

<table>
<thead>
<tr>
<th>Smp. No.</th>
<th>Blows/ 6 in.</th>
<th>Rec. (ft)</th>
<th>USC</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run No.</td>
<td>Hydraul. Cond. cm/sec</td>
<td>Rec. (ft.)</td>
<td>RQD</td>
<td></td>
</tr>
<tr>
<td>S-7</td>
<td>I-I-I-I</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-8</td>
<td>WOR/18&quot;-2</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-9</td>
<td>WOR/24&quot;</td>
<td>1.4'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-10</td>
<td>WOR/18&quot;-4</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-11</td>
<td>WOR/12&quot;-6</td>
<td>1.8'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-12</td>
<td>WOR/12&quot;-2-3</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-13</td>
<td>WOR/18&quot;-3</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-14</td>
<td>WOR/12&quot;-3-2</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
</tbody>
</table>

### VISUAL CLASSIFICATION
- **66.8' gray CLAY, trace (-) fm angular Gravel, trace (-) f Sand**
- **55.0' gray CLAY**
- **46.5' gray CLAY, trace (-) f Sand**

### REMARKS
- **66.8' gray CLAY, trace (-) fm angular Gravel, trace (-) f Sand**
- **55.0' gray CLAY**
- **46.5' gray CLAY, trace (-) f Sand**
### WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Type</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>Secondary Sand Pack</td>
<td>Ø 70.0' gray Silty CLAY, little fm grading to some fnc angular gravel, trace f Sand</td>
</tr>
<tr>
<td>75</td>
<td>Primary Sand Pack</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>2&quot; PVC 0.010&quot; Screen</td>
<td>Ø 80.0' gray cmf SAND, trace Clayey Silt</td>
</tr>
<tr>
<td>85</td>
<td>Collapsed Natural Material</td>
<td>Ø 81.0' gray Silty CLAY and mf GRAVEL, some cf Sand</td>
</tr>
<tr>
<td>90</td>
<td>Endcap</td>
<td>Bedrock Ø 85.1 feet.</td>
</tr>
<tr>
<td>95</td>
<td></td>
<td>End of Boring at 85.1 feet.</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td></td>
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### SAMPLE DATA

<table>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S-15</td>
<td>2-3-3-8</td>
<td>1.3'</td>
<td>GC</td>
<td>0</td>
<td>S-15</td>
<td>2-3-3-8</td>
<td>1.3'</td>
<td>GC</td>
</tr>
<tr>
<td>S-16</td>
<td>5-3-4-6</td>
<td>0.5'</td>
<td>GC</td>
<td>0</td>
<td>S-16</td>
<td>5-3-4-6</td>
<td>0.5'</td>
<td>GC</td>
</tr>
<tr>
<td>S-17</td>
<td>10-15-6-12</td>
<td>1.4'</td>
<td>SM</td>
<td>0</td>
<td>S-17</td>
<td>10-15-6-12</td>
<td>1.4'</td>
<td>SM</td>
</tr>
<tr>
<td>S-18</td>
<td>1000'</td>
<td>0.1'</td>
<td>GC</td>
<td>0</td>
<td>S-18</td>
<td>1000'</td>
<td>0.1'</td>
<td>GC</td>
</tr>
</tbody>
</table>
**Well Name/Location:** MW-13D

**Project:** Groundwater Investigation

**Client:** Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.

**Inspector:** L. Scheuing/D. Gawronski

**Contractor:** B. Bosworth/Empire Soils Investigation Inc.

**Equipment:** CME 55

**Method:** 4 1/4" ID Hollow Stem Augers

### DRILLING DATA

<table>
<thead>
<tr>
<th>Sampler</th>
<th>Tube</th>
<th>Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split Spoon</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

### SAMPLING METHODS

- **Type:** Split Spoon
- **Diameter:** 2 inch
- **Other:** 140 lb./30 in.
- **Type:** Tube
- **Diameter:** NA
- **Core:** NA
- **Type:** Core
- **Diameter:** NA
- **Core:** NA

### WELL DEVELOPMENT

- **Method:** Surge Block/Oval Line Air
- **Grade:** 160.2
- **Duration:** 2.8 hours
- **Gals. Purged:** 205 gallons
- **Slug Test:** $1.9 \times 10^{-2}$ (cm/sec)
- **Wells:**
  - S-1
    - **Material:** PVC, Sch. 40
    - **Diameter:** 2 inch
    - **Screen:** PVC, 0.010" Screen
    - **Coupling:** Flush-Threaded
    - **Soil:** Sand
  - S-2
    - **Material:** PVC, Sch. 40
    - **Diameter:** 2 inch
    - **Screen:** PVC, 0.010" Screen
    - **Coupling:** Flush-Threaded
    - **Soil:** Sand
  - S-3
    - **Material:** PVC, Sch. 40
    - **Diameter:** 2 inch
    - **Screen:** PVC, 0.010" Screen
    - **Coupling:** Flush-Threaded
    - **Soil:** Sand
  - S-4
    - **Material:** PVC, Sch. 40
    - **Diameter:** 2 inch
    - **Screen:** PVC, 0.010" Screen
    - **Coupling:** Flush-Threaded
    - **Soil:** Sand
  - S-5
    - **Material:** PVC, Sch. 40
    - **Diameter:** 2 inch
    - **Screen:** PVC, 0.010" Screen
    - **Coupling:** Flush-Threaded
    - **Soil:** Sand
  - S-6
    - **Material:** PVC, Sch. 40
    - **Diameter:** 2 inch
    - **Screen:** PVC, 0.010" Screen
    - **Coupling:** Flush-Threaded
    - **Soil:** Sand

### SURVEY DATA

- **Datum:** NGVD/NYS Plane
- **Grade:** 160.2
- **TWC:** 162.4
- **TPC:** 162.6
- **North:** 886,123.89
- **East:** 584,562.05

### WELL CONSTRUCTION

- **4" Locking Protective casing**
- **8" Borehole**
- **Cement/Bentonite Grout**
- **2" PVC Riser**
- **Bentonite Slurry**

### SAMPLE DATA

- **Samp. No.**
- **Blows/6 in.**
- **Rec. (It.)**
- **USCS**
- **PID (ppm)**
- **ROD**
- **Comments:**
  - Geophysical Log: Yes
  - Yes
  - No

### VISUAL CLASSIFICATION

- **Fill**
  - Dark gray mf SAND, with cinders, wet
- **Lacustrine Deposits**
  - Brown Silty CLAY, trace of Sand, wet to moist
  - 8.10.0' brown Silty CLAY, little of Sand, trace to no of Gravel, moist
  - 8.15.3' grading to gray Silty CLAY, trace of little of Sand, saturated
WELL CONSTRUCTION

Depth (feet)

30
35
40
45
50
55
60
65
70

Bentonite Slurry
Secondary Sand Pack
Primary Sand Pack
2" PVC 0.90" Screen
Endcap
2" Corehole
Bentonite Slurry

SAMPLE DATA

Samp. No. Blows/6 ft. Rec. (ft.) USCS PID (ppm)

Run No. Hydrail Cond. cm/sec Rec. (ft.) RQD

© 35.0' gray CLAY, with few f Sand partings
© 40.0' gray Silty CLAY, little f Sand
© 43.5' gray f SAND and Clayey SILT, some f Gravel
BEDROCK
Gray & black interbedded SHALE, with quartz & calcite mineralization

REMARKS

End of Boring at 50.5 feet.
**ECKENFELDER INC.**

**Subsurface Boring Log**

**Well Name/Location:** MW-14S

**Project:** Groundwater Investigation  
**Client:** Hercules Inc./DYNOC Nobel Inc., Port Ewen, N.Y.  
**Project No.:** 9596.03

**Start Date:** 05/15/95  
**Finish Date:** 05/25/95

### DRILLING DATA

- **Inspector:** Laurie Scheuing
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 55
- **Method:** 4 1/4" ID Hollow Stem Augers

### SAMPLING METHODS

<table>
<thead>
<tr>
<th>Sampler</th>
<th>Tube</th>
<th>Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split Spoon</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2 inch</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>140 lb./30 in.</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

### WELL CONSTRUCTION

- **Material:** PVC, Sch. 40
- **Diameter (ID):** 2 inch
- **Coupling:** Flush-Threaded

<table>
<thead>
<tr>
<th>Riser</th>
<th>Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC, 0.010&quot; Screen</td>
<td>PVC, 0.010&quot; Screen</td>
</tr>
</tbody>
</table>

### WELL DEVELOPMENT

- **Method:** Surge Block/Bail
- **Duration:** 0.75 hours
- **Gals. Purged:** 27 gallons
- **Slug Test:** $1.6 \times 10^{-5}$ (cm/sec)

### SURVEY DATA

**Datum:** NGVD/NYS Plane
- Grade: 173.1
- TWC: 175.8
- TPC: 175.8
- North: 886,268.37
- East: 593,685.26

### WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30</td>
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</tbody>
</table>

### SAMPLE DATA

<table>
<thead>
<tr>
<th>Samp. No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft)</th>
<th>USCS</th>
<th>PID (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>4-7-8-15</td>
<td>1.3'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-2</td>
<td>35-15-10-10</td>
<td>0.9'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-3</td>
<td>14-7-7-8</td>
<td>1.4'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-4</td>
<td>5-2-2-2</td>
<td>1.5'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-5</td>
<td>1-1-2-3</td>
<td>1.4'</td>
<td>CH</td>
<td>0</td>
</tr>
<tr>
<td>S-6</td>
<td>2-1-0-2</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
</tr>
</tbody>
</table>

### LACUSTRINE DEPOSITS

- **Brown Silty CLAY, little to no f Gravel, trace (~) of f Sand, with roots, dry to moist**
- **@ 15.0' gray Silty CLAY, trace of f Sand, saturated**
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
<th>VISUAL CLASSIFICATION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>8&quot; Borehole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Bentonite Pellets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Cement / Bentonite Grout</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>50</td>
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<td>60</td>
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<td>65</td>
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</tr>
<tr>
<td>70</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**S-7**
- Run No: WOR-2-1-2
- Blows/5 in: 1.5'
- Rec. ft: CH
- USCS: 0

**S-8**
- Run No: 3-1-2-2
- Blows/5 in: 1.5'
- Rec. ft: CH
- USCS: 0

**S-9**
- Run No: MOR/18"-2
- Blows/5 in: 2.0'
- Rec. ft: CH
- USCS: 0

**S-10**
- Run No: MOR/24"
- Blows/5 in: 1.6'
- Rec. ft: CH
- USCS: 0

**S-11**
- Run No: MOR/18"-1
- Blows/5 in: 1.5'
- Rec. ft: CH
- USCS: 0

**S-12**
- Run No: WOR-3-4
- Blows/5 in: 1.8'
- Rec. ft: CH
- USCS: 0

**S-13**
- Run No: MOR/18"-3
- Blows/5 in: 2.0'
- Rec. ft: CH
- USCS: 0

**S-14**
- Run No: 100/0"
- Blows/5 in: NR
- Rec. ft: NA

**Remarks:**
- Ø 35.0' gray Silty CLAY, trace 1 Gravel
- Ø 36.0' gray CLAY
- Ø 40.6' gray CLAY, trace f Sand
- Ø 55.0' gray CLAY, trace f Sand, trace (-) to no f Gravel
- Bedrock Ø 65.0 feet

*End of Boring at 65.0 feet.*
ECKENFELDER INC.  Subsurface Boring Log  Well Name/Location: MW-14D  Project: Groundwater Investigation  Project No.: 9596.03  Client: Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.  Start Date: 05/18/95  Finish Date: 05/25/95

DRILLING DATA

SAMPLING METHODS
Type: NA  Sampler: Tube  Core: NA

WELL CONSTRUCTION
Material: PVC, Sch. 40
Diameter (ID): 2 inch
Coupling: Flush-Thread

Screen
PVC, 0.010" Screen
2 inch
Flush-Thread

WELL DEVELOPMENT
Method: Surge Block/Dual Line Air
Grade: 173.7
Duration: 4 hours
TWC: 176.1
Gals. Purged: 170 gallons
TPC: 176.4
Slug Test: 1.4 x 10^-3
North: 686.262.84
(cm/sec)
East: 593.680.99

SURVEY DATA
DATUM: NGVD/NYS Plane

WELL CONSTRUCTION
soil
rock

SAMPLE DATA
Samp. No.
Blows/ 6 in.
Rec. (1L)
USCS
PID (ppm)

VisuaL CLASSIFICATION
Geophysical Log: □ yes  □ no

REMARKS
See MW-14S for sample descriptions.
**WELL CONSTRUCTION**

- **Depth (feet):**
  - 30
  - 35
  - 40
  - 45
  - 50
  - 55
  - 60
  - 65
  - 70

  - **8" Borehole**
  - **Cement/Bentonite Grout**
  - **2" PVC Riser**
  - **Bentonite Pellets**
  - **Secondary Sand Pack**
  - **Primary Sand Pack**
  - **2" PVC 0.010" Screen**
  - **Endcap**

**SAMPLE DATA**

- **Samp. No.**
- **Blows/6 in.**
- **Rec. (ftL)**
- **USCS**
- **PID (ppm)**

**END OF BORING @ 65.3 FEET.**
Project: Groundwater Investigation
Client: Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.
Project No.: 9596.03
Start Date: 07/25/95
Finish Date: 07/25/95

Well Name/Location: MW-15S

Drilling Data
Inspector: Laurie Scheuing
Contractor: B. Bosworth/Empire Soils Investigation Inc.
Equipment: CME 850
Method: 4 1/4" ID Hollow Stem Augers

Sampling Methods
Type: Split Spoon
Diameter: 2 inch
Other: 140 lb./30 in.

Well Construction
Material: PVC, Sch. 40
Diameter (ID): 2 inch
Coupling: Flush-Threaded

Screen
Material: PVC, 0.010" Screen
Diameter (ID): 2 inch
Coupling: Flush-Threaded

Well Development
Method: Surge Block/Bailer
Duration: 0.5 hours
Gals. Purged: 20 gallons
Slug Test: 6.9 x 10^4 (cm/sec)

Survey Data
Datum: NGVD/NYS Plane
Grade: 159.6
TWC: 162.0
TPC: 162.2
North: 887,480.56
East: 584,477.68

Visual Classification
Geophysical Log: ☑ yes ☒ no

Remarks
See MW-150 for sample description.
End of Boring @ 20.6 feet.
**ECKENFELDER INC.**

**Subsurface Boring Log**

**Well Name/Location:** MW-15D

- **Project:** Groundwater Investigation
- **Client:** Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.
- **Project No.:** 9596.03
- **Start Date:** 07/19/95
- **Finish Date:** 07/24/95

**DRILLING DATA**

- **Inspector:** Laurie Schieving
- **Contractor:** B. Bosworth/Empire Soils Investigation Inc.
- **Equipment:** CME 850
- **Method:** 4 1/4" ID Hollow Stem Augers

**WELL CONSTRUCTION**

<table>
<thead>
<tr>
<th>Riser</th>
<th>Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC, Sch. 40</td>
<td>PVC, 0.010&quot; Screen</td>
</tr>
<tr>
<td>2 inch</td>
<td>2 inch</td>
</tr>
<tr>
<td>Coupling:</td>
<td>Coupling:</td>
</tr>
<tr>
<td>8&quot; Borehole</td>
<td>Flush-Threaded</td>
</tr>
<tr>
<td>2&quot; PVC Riser</td>
<td>Flush-Threaded</td>
</tr>
</tbody>
</table>

**WELL DEVELOPMENT**

- **Method:** Surge Block/Dual Line Air
- **Gals. Purged:** 45 gallons
- **Slug Test:** 1.4 x 10^-2 (cm/sec)
- **Grade:** 159.2
- **Duration:** 1.5 hours
- **TWC:** 162.0
- **TPC:** 161.6
- **North:** 687,485.21
- **East:** 594,477.51

**SURVEY DATA**

**SAMPLING METHODS**

- **Type:** Split Spoon
- **Diameter:** 2 inch
- **Other:** 140 lb./30 in.

**WELL CONSTRUCTION**

**SAMPLE DATA**

- **Samp. No.:** S-1, S-2, S-3, S-4, S-5, S-6, S-7
- **Blows/6 in.:** 2-2, 4-4
- **Rec. (ft.):** 1.5, 1.6, 1.2, 1.1
- **USCS:** CH, CH, CH, CH
- **PID (ppm):** 0, 0, 0, 0
- **Hydraul. Cond. cm/sec:**
  - **Rec. (ft.):** 4-5-6, 3-3-3, 1-1-2-1, 4-5-7-14
  - **ROD:** 0.2, 0.2, 0.2, 0.2
- **Geophysical Log:** yes

**REMARKS**

- **Visual Classification:**
  - Lacustrine Deposits:
    - Brown Silty CLAY, trace to little f Sand, with roots, dry to wet
    - Ø 15.5' gray Silty CLAY, little f Sand, saturated
    - Ø 20.0' gray angular mf GRAVEL, some fine Sand, no to little Clay & Silt
    - Ø 20.0' gray angular GRAVEL and cal SAND
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
<th>SAMPLE DATA</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Collapsed Natural Material</td>
<td>S-7 24 in/hr 0.1' GP 0</td>
<td>Bedrock @ 31.0 feet. End of Boring at 31.0 feet.</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ECKENFELDER INC.

Subsurface Boring Log

Well Name/Location: MW-16S

Project: Groundwater Investigation
Client: Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.
Project No.: 9596.03
Start Date: 07/10/95
Finish Date: 07/11/95

DRILLING DATA
Inspector: Laurie Scheuing
Contractor: B. Bosworth/Empire Soils Investigation Inc.
Equipment: CME 850
Method: 4 1/4" ID Hollow Stem Augers

SAMPLING METHODS
Type: Split Spoon
Diameter: 2 inch
Other: 140 lb./30 in.

WELL CONSTRUCTION
Material: PVC, Sch. 40
Diameter (ID): 2 inch
Coupling: Flush-Threaded

Screen: PVC, 0.010" Screen
Diameter: 2 inch
Coupling: Flush-Threaded

WELL DEVELOPMENT
Method: Surge Block/Bailer
Duration: 0.5 hours
Gals. Purged: 10.5 gallons
Slug Test: 5.0 x 10^-6 (cm/sec)

SURVEY DATA
Datum: NGVD/NYS Plane
Grade: 157.3
TWC: 158.3
TPC: 159.5
North: 686,949.23
East: 595,108.94

WELL CONSTRUCTION

Depth (feet)

Run No. | Blows / 6 in. | Rec. (ft.) | USCS | PDD (ppm) | Geophysical Log | Comments
--- | --- | --- | --- | --- | --- | ---

VISUAL CLASSIFICATION

REMARKS

See MW-16D for sample description.

End of Boring @ 25.4 feet.
### WELL CONSTRUCTION

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>WELL CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Cement/Bentonite Grout</td>
</tr>
<tr>
<td>35</td>
<td>Bentonite Pellets</td>
</tr>
<tr>
<td>40</td>
<td>Secondary Sand Pack</td>
</tr>
<tr>
<td>45</td>
<td>Primary Sand Pack</td>
</tr>
<tr>
<td>50</td>
<td>2&quot; PVC 0.010&quot; Screen</td>
</tr>
<tr>
<td>55</td>
<td>Endcap</td>
</tr>
</tbody>
</table>

### SAMPLE DATA

<table>
<thead>
<tr>
<th>Soilrock</th>
<th>Sample No.</th>
<th>Blows/6 in.</th>
<th>Rec. (ft.)</th>
<th>USCS</th>
<th>PID (ppm)</th>
<th>RQD</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-7</td>
<td>1-2-2</td>
<td>1.5&quot;</td>
<td>CH</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-8</td>
<td>WOH/8&quot;</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-9</td>
<td>WOH/24&quot;</td>
<td>2.0'</td>
<td>CH</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-10</td>
<td>WOH-3-5-8</td>
<td>0.1'</td>
<td>CH</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-11</td>
<td>48-900&quot;F</td>
<td>0.6&quot;</td>
<td>SC</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### VISUAL CLASSIFICATION

- @ 40.0' gray CLAY
- @ 49.0' gray fm SAND, some Silty CLAY, with gray Limestone or Shale fragments
- Bedrock @ 49.5 feet.

### REMARKS

End of Boring at 49.5 feet.
Project: Groundwater Investigation
Client: Hercules Inc./DYNO Nobel Inc. Port Ewen, N.Y.

**DRILLING DATA**

Inspector: Laurie Scheuing
Contractor: R. Heffernan/Empire Soils Investigation Inc.
Equipment: CME 850
Method: 4 1/4" ID Hollow Stem Augers

**WELL CONSTRUCTION**

Material: PVC, Sch. 40
Diameter (ID): 2 inch
Coupling: Flush-Threaded

**WELL DEVELOPMENT**

Method: Surge Block/Bailer
Duration: 0.75 hours
Gals. Purged: 20 gallons
Slug Test: 7.8 x 10^-3 (cm/sec)

**SURVEY DATA**

Datum: NGVD/NYS Plane
Grade: 140.8
TWC: 143.8
TPC: 144.0
North: 888,934.03
East: 595,603.13

**SAMPLE DATA**

Geophysical Log: □ yes □ no

**VISUAL CLASSIFICATION**

LACUSTRINE DEPOSITS
Brown Clayey SILT, trace f
Gravel, with reed fragments, moist
@ 0.5' grading to gray CLAY & SILT, moist

@ 5.0' brown fms SAND and Clayey SILT, some fms Gravel, wet

@ 10.0' gray fms GRAVEL, little f
Sand, saturated

Bedrock @ 10.8 feet.
End of Boring at 10.8 feet.
**Drilling Data**

**Inspector:** Laurie Scheuing  
**Contractor:** B. Bosworth/Empire Soils Investigation Inc.  
**Equipment:** CME 850  
**Method:** 4 1/4" ID Hollow Stem Augers

**Sampling Methods**

- **Type:** Split Spoon  
- **Diameter:** 2 inch  
- **Other:** 140 lb./30 in.

**Well Construction**

- **Material:** PVC, Sch. 40  
- **Diameter (ID):** 2 inch  
- **Coupling:** Flush-Threaded

**Well Development**

- **Method:** Surge Block/Dual Line Air  
- **Duration:** 2 hours  
- **Gals. Purged:** 30 gallons  
- **Slug Test:** 8.3 x 10^-4 (cm/sec)

**Survey Data**

- **Datum:** NGVD/NYS Plane

**Well Construction Diagram**

- **Samp. No.:** S-1 to S-5  
- **Rec. (ft.):** L1" to L14"  
- **USCS:** MH, SM, GP  
- **PID (ppm):** 0, 0, 0

**Visual Classification**

- **Lacustrine Deposits:**  
  - Brown SILT & CLAY, little 1 Sand, moist  
  - Ø 5.0' brown 1 SAND, some to no SILT & Clay, damp  
  - Ø 5.6' grading to gray mf GRAVEL and cmf SAND, little Clayey Silt, damp  
  - Ø 15.0' grey mf GRAVEL and cmf SAND, trace to little Clayey Silt, saturated

**Remarks**

- **Bedrock Ø 20.5 feet.**  
  - End of Boring 20.5 feet.
APPENDIX B

SLUG TEST SOLUTIONS
**MW-1**

**DATA SET:**
MW-1.DAT
10/26/95

**AQUIFER MODEL:**
Unconfined

**SOLUTION METHOD:**
Bouwer-Rice

**PROJECT DATA:**
test date: October 16, 1995
test well: MW-1

**TEST DATA:**
$H_0 = 8.53$ cm
$rt = 3.81$ cm
$r_w = 3.81$ cm
$L = 380.1$ cm
$b = 380.1$ cm
$H = 380.1$ cm

**PARAMETER ESTIMATES:**
$K = 7.648E-05$ cm/sec
$y_0 = 6.906$ cm
MW-3

DATA SET:
MW-3.DAT
10/27/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: October 16, 1995
test well: MW-3

TEST DATA:
H0 = 53.95 cm
c = 2.54 cm
rw = 12.02 cm
L = 304.8 cm
b = 1113.1 cm
H = 53.4 cm

PARAMETER ESTIMATES:
k = 4.976E-05 cm/sec
y0 = 37.01 cm
**Client:** Hercules Inc./DYNO Nobel Inc.  
**Company:** ECKENFELDER INC.  
**Location:** Port Ewen, NY  
**Project:** 9596.02

## MW-4B Test 1

**DATA SET:**
MW-4B_1.DAT  
10/27/95

**AQUIFER MODEL:**
Unconfined

**SOLUTION METHOD:**
Bouwer-Rice

**PROJECT DATA:**
- **Test date:** October 15, 1995
- **Test well:** MW-4B

**TEST DATA:**
- $H_0 = 44.81$ cm
- $r_c = 2.54$ cm
- $r_w = 12.02$ cm
- $L = 304.8$ cm
- $b = 923.2$ cm
- $H = 527.$ cm

**PARAMETER ESTIMATES:**
- $K = 1.739E-05$ cm/sec
- $y_0 = 43.36$ cm
MW-8 Test 1

DATA SET:
MW-B_1.DAT
10/27/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: October 17, 1995
test well: MW-8

TEST DATA:
H0 = 10.36 cm
tc = 2.54 cm
rw = 12.02 cm
L = 304.8 cm
b = 380.1 cm
H = 288.7 cm

PARAMETER ESTIMATES:
K = 0.0008604 cm/sec
y0 = 10.18 cm
MW-11S

DATA SET:
MW-11S.DAT
10/26/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: October 16, 1995
test well: MW-11S

TEST DATA:
H0 = 50.6 cm
rc = 2.54 cm
rw = 10.15 cm
L = 304.8 cm
d = 1156.4 cm
H = 516.3 cm

PARAMETER ESTIMATES:
k = 3.82E-06 cm/sec
y0 = 47.23 cm
**DATA SET:**
KM-1104.DAT
10/27/95

**AQUIFER MODEL:**
Confined

**SOLUTION METHOD:**
Bouwer-Rice

**PROJECT DATA:**
Test date: October 20, 1995
Test well: KM-11D

**TEST DATA:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>H0</td>
<td>84.03 cm</td>
</tr>
<tr>
<td>R0</td>
<td>2.54 cm</td>
</tr>
<tr>
<td>Rw</td>
<td>10.16 cm</td>
</tr>
<tr>
<td>L</td>
<td>304.8 cm</td>
</tr>
<tr>
<td>b</td>
<td>1219.2 cm</td>
</tr>
<tr>
<td>H</td>
<td>1219.2 cm</td>
</tr>
</tbody>
</table>

**PARAMETER ESTIMATES:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>0.008815 cm/sec</td>
</tr>
<tr>
<td>Y0</td>
<td>75.44 cm</td>
</tr>
</tbody>
</table>

**MW-11D Test 4**

**Graph:**

- Displacement (cm)
- Time (sec)

- Axis scales: 100.0 - 900.0, 10.0 - 900.0
MW-12S

DATA SET:
MW-12S.DAT
10/27/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: June 20, 1995
test well: MW-12S

TEST DATA:
H0 = 57.61 cm
rc = 2.54 cm
rw = 10.16 cm
L = 304.8 cm
b = 1916.3 cm
H = 544.7 cm

PARAMETER ESTIMATES:
K = 7.44E-06 cm/sec
y0 = 37.96 cm
MW-12D

DATA SET:
MW-12D.DAT
10/26/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: October 16, 1995
test well: MW-12D

TEST DATA:
H0 = 23.47 cm
rc = 2.54 cm
rw = 10.15 cm
L = 304.8 cm
b = 460.3 cm
H = 460.3 cm

PARAMETER ESTIMATES:
K = 0.0009851 cm/sec
y0 = 7.415 cm
MW-13S

DATA SET:
MW-13S.DAT
10/27/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: July 12, 1995
test well: MW-13S

TEST DATA:
Ho = 72.21 cm
rC = 0.083 cm
rw = 0.333 cm
L = 304.8 cm
b = 906.5 cm
H = 446.2 cm

PARAMETER ESTIMATES:
K = 4.32E-07 cm/sec
y0 = 71.42 cm
MW-13D

DATA SET:
MW-13D.DAT
10/30/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: August 8, 1995
test well: MW-13D

TEST DATA:
HD = 215.2 cm
rc = 2.54 cm
rw = 10.16 cm
L = 167.6 cm
b = 167.6 cm
H = 167.6 cm

PARAMETER ESTIMATES:
K = 0.01898 cm/sec
yO = 122.5 cm

AQTESOLV
MW-14S Test 1

DATA SET:
MW-14S_1.DAT
10/30/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: July 19, 1995
test well: MW-14S

TEST DATA:
H0 = 73.94 cm
tc = 2.54 cm
rw = 10.16 cm
L = 304.8 cm
b = 550.2 cm
H = 550.2 cm

PARAMETER ESTIMATES:
K = 1.77E-05 cm/sec
y0 = 118.2 cm
MW-14D

**DATA SET:**
MW-14D.DAT
10/30/95

**AQUIFER MODEL:**
Unconfined

**SOLUTION METHOD:**
Bouwer-Rice

**PROJECT DATA:**
test date: August 8, 1995
test well: MW-14D

**TEST DATA:**
H0 = 96.44 cm
rc = 2.54 cm
rw = 10.16 cm
L = 304.8 cm
b = 313.9 cm
H = 313.9 cm

**PARAMETER ESTIMATES:**
K = 0.001354 cm/sec
y0 = 36.68 cm
MW-15S Test 1

DATA SET:
MW-15S_1.DAT
10/30/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bauwer-Rice

PROJECT DATA:
test date: August 4, 1995
test well: MW-15S

TEST DATA:
H0 = 49.74 cm
rc = 2.54 cm
rw = 10.15 cm
L = 304.8 cm
b = 421.5 cm
H = 421.5 cm

PARAMETER ESTIMATES:
K = 0.00069 cm/sec
y0 = 32.25 cm
MW-15D

DATA SET:
MW-15D.DAT
10/30/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: August 4, 1995
test well: MW-15D

TEST DATA:
H0 = 80.69 cm
rC = 2.54 cm
rW = 10.16 cm
L = 152.4 cm
b = 335.3 cm
H = 335.3 cm

PARAMETER ESTIMATES:
K = 0.01368 cm/sec
y0 = 74.79 cm
**MW-16S**

**DATA SET:**
- MW-16S.DAT
- 10/26/95

**AQUIFER MODEL:**
- Unconfined

**SOLUTION METHOD:**
- Bouwer-Rice

**PROJECT DATA:**
- Test date: October 16, 1995
- Test well: MW-16S

**TEST DATA:**
- \( H_0 = 29.87 \text{ cm} \)
- \( r_c = 2.54 \text{ cm} \)
- \( r_w = 10.16 \text{ cm} \)
- \( L = 145.4 \text{ cm} \)
- \( b = 145.4 \text{ cm} \)
- \( H = 145.4 \text{ cm} \)

**PARAMETER ESTIMATES:**
- \( K = 5.048 \times 10^{-6} \text{ cm/sec} \)
- \( y_0 = 14.62 \text{ cm} \)
MW-16D Test 2

DATA SET:
MW-16D_20.DAT
10/26/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: October 15, 1995
test well: MW-16D

TEST DATA:
H0 = 38.1 cm
rc = 2.54 cm
rw = 10.16 cm
L = 137.2 cm
b = 137.2 cm
H = 137.2 cm

PARAMETER ESTIMATES:
K = 0.00923 cm/sec
y0 = 43.79 cm
MW-17S Test 2

DATA SET:
MW-17S_2.DAT
10/30/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: October 20, 1995
test well: MW-17S

TEST DATA:
H0 = 65.74 cm
tc = 2.54 cm
rw = 10.16 cm
L = 152.4 cm
b = 211.5 cm
H = 168.9 cm

PARAMETER ESTIMATES:
K = 0.007765 cm/sec
y0 = 53.65 cm
MW-18S Test 1

DATA SET:
MW-18S_1.DAT
10/30/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: October 16, 1995
test well: MW-18S

TEST DATA:
H0 = 64.92 cm
c = 2.54 cm
rw = 10.16 cm
L = 304.8 cm
b = 453.2 cm
H = 428.9 cm

PARAMETER ESTIMATES:
K = 0.0009325 cm/sec
y0 = 54.97 cm
APPENDIX C

SURFACE AND GROUNDWATER FIELD DATA SHEETS
SURFACE WATER FIELD DATA SHEETS
**ENVIROMENTAL SAMPLING FIELD DATA SHEET**

**ECKENFELDER INC.**
- Nashville, Tennessee
- Mahwah, New Jersey
- Rochester, New York

Sample Number: SW-2
Sample I.D.: (if different from samp. no.)

**Project:** SW SAMPLING
**Client:** Hargraves IDYNO
Job No.: 939604
**Personnel:** LESTER

Date: 10/16/95
Time: 12:45
**Weather Conditions:** Sunny, 66°F
**Air Temperature:** 66°F

**SAMPLE MEDIUM:**
- SURFICIAL SOIL: Depth Interval: 
- DEEP SOIL: Depth Interval: 
- SURFACE WATER: Depth Interval: 0-3'
- BOTTOM SEDIMENT
- OTHER: Describe: 

**SAMPLING DATA:**
**SAMPLE COLLECTION EQUIPMENT:**
- Scoop
- Shovel
- Direct into sample container
- Split-spoon sampler
- Hand auger
- Hand Corer
- Petite Ponor Dredge
- Eckman Dredge
- Bottle Sampler
- Peristaltic Pump
- Automated Interval Sampler
- Other: 

**SAMPLER CONSTRUCTION:** (Check as many as apply)
- Teflon®
- PVC
- Stainless Steel
- Polyethylene
- Carbon Steel
- Polypropylene
- Other: 

**SAMPLE TYPE:**
- Grab
- Composite
- Other: 

**SAMPLING EQUIPMENT:**
- Dedicated
- Prepared Off-Site
- Field Cleaned

**FIELD MEASUREMENT DATA:**
**APPEARANCE (describe):**
- Oily
- "Clean"
- Clear
- Turbid
- Color: [ ] Contains Immiscible Liquid

**ODOR?:**
- Yes
- No
- Description: 

**GRAIN SIZE DESCRIPTION:** (Use for soils only)

**FIELD DETERMINATIONS:**
- pH: 7.6
- Meter Model: Dohrmann pH 100
- Meter S/N: __________
- Temperature: 12°C
- Spec. Cond.: 1M
- Meter Model: __________
- Meter S/N: __________
- Other: 

**LABORATORY ANALYSIS:**
- VOA, + Metals, BNA

**NO. OF CONTAINERS:** 6
- Field Blank I.D.: __________
- Trip Blank I.D.: 7810495
- Replicate I.D.: __________

**REMARKS:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

Signature: [Signature]
Date: 10/16/95
**ECKENFELDER INC.**

- Nashville, Tennessee
- Mahwah, New Jersey
- Rochester, New York

**ENVIRONMENTAL SAMPLING FIELD DATA SHEET**

- Sample Number: sw-3
- Sample I.D.: ____________

- Project: GW sampling
- Date: 10/10/95
- Time: 11:56
- Client: Hercules/Divco
- Job No.: 95960
- Weather Conditions: Sunny, breezy
- Personnel: LESTERL
- Alt. Temperature: 60°F

**SAMPLE MEDIUM:**

- SURFICIAL SOIL: Depth Interval: ____________
- DEEP SOIL: Depth Interval: ____________
- SURFACE WATER: Depth Interval: 0-3 ft
- BOTTOM SEDIMENT
- OTHER: Describe: ____________

**SAMPLING DATA:**

**SAMPLE COLLECTION EQUIPMENT:**

- Scoop
- Shovel
- Direct into sample container
- Split-spoon sampler
- Hand auger
- Hand corer
- Petite Ponor Dredge
- Eckman Dredge
- Bottle Sampler
- Peristaltic Pump
- Automated Interval Sampler
- Other: ____________

**SAMPLER CONSTRUCTION:** (Check as many as apply)

- Teflon®
- Stainless Steel
- Carbon Steel
- Glass
- PVC
- Polyethylene
- Polypropylene
- Other: ____________

**SAMPLE TYPE:**

- Grab
- Composite
- Other: ____________

**SAMPLING EQUIPMENT:**

- Dedicated
- Prepared Off-Site
- Field Cleaned

**FIELD MEASUREMENT DATA:**

**APPEARANCE (describe):**

- Oily
- *Clean*
- Clear
- Turbid
- Color: ____________
- Contains Immiscible Liquid

**ODOR?:**

- Yes
- No
- Description: ____________

**GRAIN SIZE DESCRIPTION:** (Use for soils only)

**FIELD DETERMINATIONS:**

- pH: 7.0
- Temperature: 11.0°C
- Spec. Cond.: N/M
- Meter Model: Daktor pH Tec
- Meter S/N: ____________
- Other: ____________

**LABORATORY ANALYSIS:**

- VOA, total metals, BNA

**NO. OF CONTAINERS:** 5

**Field Blank I.D.:** ____________

**Trip Blank I.D.: T801695**

**Replicate I.D.:** ____________

**REMARKS:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** LAURIE SCHELING

**Date:** 10/14/95
GROUNDWATER FIELD DATA SHEETS
**GROUNDWATER SAMPLING FIELD DATA SHEET**

- **Project:** GW Sampling
- **Client:** Hercules / PVNO
- **Job No.:** 0990-6
- **Weather Conditions:** Sunny
- **Date:** 9/18/95
- **Time:** 0815
- **Weather Conditions:** Sunny
- **Air Temperature:** 50°F

### WELL DATA:
- **Casing Diameter:** 4"  □ Stainless Steel □ Galv. Steel □ PVC □ Teflon® □ Other: □
- **Intake Diameter:** 3"  □ Stainless Steel □ Galv. Steel □ PVC □ Teflon® □ Open rock
- **DEPTH TO: Static Water Level:** 23.02 ft
- **Bottom of Well:** 32.7 ft
- **Datum:** Top of Protective Casing □ Top of Well Casing □ Other: □
- **Is the well clean to the bottom?** Yes □ No □
- **Is the well in good condition?** Yes □ No □
- **Volume of Water:** Standing in well: 3.4 gal □ To be purged: 10.2 gal □

### PURGE DATA:
- **Method:** □ Bailier, Size: □ Bladder Pump □ 2" Submersible Pump □ 4" Submersible Pump □ Centrifugal Pump □ Peristaltic Pump □ Inertial Lift Pump □ Other: □
- **Materials:** □ Pump/Bailer: □ Stainless Steel □ PVC □ Other: □
- **Tubing/Rope:** □ Teflon® HD □ Polyethylene □ Polypropylene □ Other: □
- **Pumping Rate:** ~0.5 gpm □ Elapsed Time: 12 m □ Volume Pumped: 69 gal □
- **Was well purged to dryness?** Yes □ No □
- **Number of Well Volumes Removed:** 2 □

### TIME SERIES DATA:
- **Well Volumes:** 1st 2nd
- **Temp.:** 15°C 18°C □
- **pH:** 6.5 □
- **Spec. Cond.:** 200 μmhos □
- **Other:** N/A □
- **Other:** N/A □

### PURGING EQUIPMENT:
- **Dedicated** □ Pre pared Off-Site □ Field Cleaned □

### SAMPLING DATA:
- **Method:** □ Bailier, Size: □ Bladder Pump □ 2" Submersible Pump □ 4" Submersible Pump □ Inertial Lift Pump □ Peristaltic Pump □ Other: □
- **Materials:** □ Pump/Bailer: □ Stainless Steel □ PVC □ Other: □
- **Tubing/Rope:** □ Teflon® □ Polyethylene □ Polypropylene □ Other: □
- **Sampling Equipment:** □ Dedicated □ Prepared Off-Site □ Field Cleaned □
- **Metals samples field filtered?** Yes □ No □
- **Method:** 0.45 μm Quick Filter □
- **Appearance:** Clear □ Turbid □ Color: Brown □ Contains LNAPL □ Contains DNAPL □
- **Odor:** Yes □ No □

### FIELD DETERMINATIONS OF RECORD:
- **pH:** 6.6 □
- **Temperature:** 23°C □
- **Spec. Cond.:** 2014 μmhos □
- **Meter Model:** OAKTON pHTestr □
- **Meter S/N:** □
- **NO. OF CONTAINERS:** 4 □
- **Field Blank I.D.:** □
- **Trip Blank I.D.:** □
- **Replicate I.D.:** □

### REMARKS:
I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/18/95
ECKENFELDER INC.

GROUNDWATER SAMPLING
FIELD DATA SHEET

Nashville, Tennessee
Mahwah, New Jersey

Well Number: NW-2A
Sample I.D.: ________
(If different from well no.)

Project: NW Sampling
Client: Pellegrino/EDNO
Job No.: 95R04
Weather Conditions: Sunny, Breezy
Air Temperature: 70°F

Personnel: LESZEK

Date: 9/19/95
Time: 14:30

WELL DATA:
Casing Diameter: 2"  □ Stainless Steel  □ Galv. Steel  □ PVC  □ Teflon®  □ Other:
Intake Diameter: 2"  □ Stainless Steel  □ Galv. Steel  □ PVC  □ Teflon®  □ Open rock
DEPHT TO: Static Water Level: 15.34'  Bottom of Well: 28.07'
DATUM: □ Top of Protective Casing  □ Top of Well Casing  □ Other: _______
Is the well clean to the bottom?  □ Yes  □ No  □ Other: _______
Is the well in good condition?  □ Yes  □ No  □ Other: _______
VOLUME OF WATER: Standing in well: 1.89  To be purged: 5.59

PURGE DATA:
METHOD: □ Bailer, Size: 16' x 5'  □ Bladder Pump  □ 2' Submersible Pump  □ 4' Submersible Pump
□ Centrifugal Pump  □ Peristaltic Pump  □ Inertial Lift Pump  □ Other:

MATERIALS: Pump/Bailer: □ Teflon®  □ Stainless Steel  □ PVC
□ Tubing/Rope: □ Teflon®  □ Polyethylene  □ Polypropylene
□ Other: ________
Pumping Rate: NA  □ Other: _______
Elapsed Time: NA  □ Volume Pumped: 65
Was well purged to dryness?  □ Yes  □ No  □ Other: _______
Number of Well Volumes Removed: 3

TIME SERIES DATA:
Well Volumes: 1st  □ 2nd  □ 3rd
Temp.: 14°C  □ 14°  □ 13°
PH: 7.1  □ 7.2  □ 9.2
Spec. Cond.: 420 mg/l  □ 350  □ 360
Other: ________
Other: ________

PURGING EQUIPMENT: □ Dedicated  □ Prepared Off-Site  □ Field Cleaned

SAMPLING DATA:
METHOD: □ Bailer, Size: 16' x 3'  □ Bladder Pump  □ 2' Submersible Pump  □ 4' Submersible Pump
□ Inertial Lift Pump  □ Peristaltic Pump  □ Other:

MATERIALS: Pump/Bailer: □ Teflon®  □ Stainless Steel  □ PVC
□ Tubing/Rope: □ Teflon®  □ Polyethylene  □ Polypropylene
□ Other: ________

SAMPLING EQUIPMENT: □ Dedicated  □ Prepared Off-Site  □ Field Cleaned
Metals samples field filtered? □ Yes  □ No  □ Other: _______
Method: 0.45 μm Quick Filter
APPEARANCE: □ Clear  □ Turbid  □ Color: Gray  □ Contains LNAPL  □ Contains DNAPL
Odor: □ Yes  □ No  □ Other: _______

FIELD DETERMINATIONS OF RECORD:
pH: 7.2  □ Meter Model: LA-101  □ Meter S/N: ________

REMARKS:
I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.
Signature: J. Smith  Date: 9/19/95
**Groundwater Sampling Field Data Sheet**

**ECKENFELDER INC.**

- **Location:** Nashville, Tennessee
- **Project:** GW Sampling
- **Client:** Hercules BY NO
- **Job No.:** 9567
- **Weather Conditions:** Sunny, Breezy
- **Air Temperature:** 70°F

### Well Data:

- **Casing Diameter:** 2"  
- **Stainless Steel**  
- **Galv. Steel**  
- **PVC**  
- **Teflon®**  
- **Other:**

- **Intake Diameter:** 2"  
- **Stainless Steel**  
- **Galv. Steel**  
- **PVC**  
- **Teflon®**  
- **Open rock**

- **Depth to:** Static Water Level: 14 ft
- **Bottom of Well:** 28 ft
- **Datum:** Top of Protective Casing

- **Is the well clean to the bottom?** Yes  
- **Is the well in good condition?** Yes

- **Volume of Water:** Standing in well: 239  
- **To be purged:** 68 g

### Purge Data:

- **Method:**
  - Bailier, Size: 16" x 5"  
  - Bladder Pump  
  - 2" Submersible Pump  
  - 4" Submersible Pump  
  - Centrifugal Pump  
  - Peristaltic Pump  
  - Inertial Lift Pump  
  - Other:

- **Materials:**
  - Pump/Bailer: Stainless Steel  
  - PVC  
  - Other: Teflon®

- **Tubing/Rope:**
  - Polyethylene  
  - Polypropylene  
  - Other: nylon

- **Pumping Rate:** NA  
- **Elapsed Time:** NA  
- **Volume Pumped:** 59 g

- **Was well purged to dryness?** Yes  
- **Number of Well Volumes Removed:** 2+

### Time Series Data:

- **Well Volumes:**
  - Initial: 3
  - Temp.: 13°C  
  - 13°C  
  - 12.5°C
  - pH: 7.1  
  - 7.2  
  - 7.2
  - Spec. Cond.: 320 mg/L  
  - 320 mg/L  
  - 325 mg/L

### Purging Equipment:

- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

### Sampling Data:

- **Method:**
  - Bailier, Size: 16 x 3 ft  
  - Bladder Pump  
  - 2" Submersible Pump  
  - 4" Submersible Pump  
  - Inertial Lift Pump  
  - Peristaltic Pump  
  - Other:

- **Materials:**
  - Pump/Bailer: Stainless Steel  
  - PVC  
  - Other: Teflon®

- **Tubing/Rope:**
  - Polyethylene  
  - Polypropylene  
  - Other: nylon

### Sampling Equipment:

- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

### Meta's samples field filtered?

- **Yes**  
- **No**

### Appearance:

- **Clear**  
- **Turbid**  
- **Color:** Brown  
- **Contains LNAPL**  
- **Contains DNAPL**

- **Odor:**
  - Yes:
  - No:

### Field Determinations of Record:

- **pH:** 7.2  
- **Meter Model:** Clarkton  
- **Meter S/N:**

- **Temperature:** 12.5°C  
- **Spec. Cond.:** 325 mg/L  
- **Meter Model:** YSI  
- **Meter S/N:** 90702672

- **NO. OF CONTAINERS:** +
- **Field Blank I.D.:** 12345678
- **Trip Blank I.D.:** 98765432
- **Replicate I.D.:**

### Remarks:

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/12/95
**GROUNDWATER SAMPLING
FIELD DATA SHEET**

**ECKENFELDER INC.**

- Nashville, Tennessee
- Mahwah, New Jersey

**Project:** GWSampling  
**Client:** Hercules  
**Job No.:** 951606  
**Personnel:** LES, ZK  
**Date:** 09/03/95  
**Time:** 13:30  
**Weather Conditions:** Raining  
**Air Temperature:** 65°F

### WELL DATA:
- **Casing Diameter:** 2"  
- **Intake Diameter:** 2  
- **Static Water Level:** 10.5'  
- **Bottom of Well:** 24'  
- **Datum:** Top of Protective Casing  
- **Is the well clean to the bottom?** Yes  
- **Is the well in good condition?** Yes

**VOLUME OF WATER:**
- **Standing in well:** 2.59  
- **To be purged:** 7.59

### PURGE DATA:
- **Method:** No  
- **Materials:** Pump/Bailer  
- **Tubing/Rope:**  
- **Pumping Rate:** NA  
- **Elapsed Time:** NA  
- **Volume Pumped:** 9.9

**Was well purged to dryness?** No  
**Number of Well Volumes Removed:** 3

### TIME SERIES DATA:

<table>
<thead>
<tr>
<th>Time</th>
<th>Temp</th>
<th>pH</th>
<th>Spec. Cond.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>13°C</td>
<td>7.0</td>
<td>RCCumms, Pt.</td>
</tr>
<tr>
<td>1</td>
<td>13°C</td>
<td>7.9</td>
<td>750</td>
</tr>
<tr>
<td>2</td>
<td>13°C</td>
<td>7.9</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>13°C</td>
<td>7.9</td>
<td></td>
</tr>
</tbody>
</table>

### PURGING EQUIPMENT:
- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

### SAMPLING DATA:
- **Method:** No  
- **Materials:** Pump/Bailer  
- **Tubing/Rope:**  
- **Sampling Equipment:** No  
- **Metal samples field filtered?** Yes  
- **Appearance:** Clear  
- **Odor:** Yes

### FIELD DETERMINATIONS OF RECORD:
- **pH:** 6.8  
- **Temperature:** 13°C  
- **NO. OF CONTAINERS:** 7  
- **Field Blank I.D.:** EPO91495  
- **Trip Blank I.D.:** TPO91495  
- **Replicate I.D.:**

**REMARKS:**
I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/8/95

(Rev 92/94 - 01)
**GROUNDWATER SAMPLING FIELD DATA SHEET**

**ECKENFELDER INC.**

- Nashville, Tennessee
- Mahwah, New Jersey

**Project:** GW Sampling  
**Client:** Hercules I DVNO  
**Personnel:** LESIEK  
**Sample I.D.:**  
**Well Number:** MW-4A  
**Job No.:** 9913606  
**Date:** 9/13/95  
**Time:** 11:50  
**Weather Conditions:** Overcast  
**Air Temperature:** 72°F

### WELL DATA:

- **Casing Diameter:** 2"  
- **Stainless Steel**  
- **Galv. Steel**  
- **PVC**  
- **Teflon®**  
- **Other:**  
- **Intake Diameter:** 3"  
- **Stainless Steel**  
- **Galv. Steel**  
- **PVC**  
- **Teflon®**  
- **Open rock**  
- **DEPTH TO:** Static Water Level: 9.75 ft  
- **Bottom of Well:** 235 ft  
- **DATUM:** Top of Protective Casing  
- **Top of Well Casing:**  
- **Other:**  
- **Is the well clean to the bottom?** Yes  
- **Is the well in good condition?** Yes  
- **VOLUME OF WATER:** Standing in well: 2.89 ft³  
- **To be purged:** 6 lb  

### PURGE DATA:

- **METHOD:**  
  - **Bailer, Size:** 1.5"  
  - **Bladder Pump**  
  - **2" Submersible Pump**  
  - **4" Submersible Pump**  
  - **Centrifugal Pump**  
  - **Peristaltic Pump**  
  - **Inertial Lift Pump**  
  - **Other:**  
- **MATERIALS:**  
  - **Pump/Bailer:**  
  - **Stainless Steel**  
  - **Teflon®**  
  - **Polyethylene**  
  - **Polypropylene**  
- **Tubing/Rope:**  
  - **Other:**  
  - **Pumping Rate:** N/A  
  - **Elapsed Time:** N/A  
  - **Volume Pumped:** 7.9 ft³  
  - **Was well purged to dryness?** Yes  
  - **Number of Well Volumes Removed:** 2+  
  - **TIME SERIES DATA:**  
    - **Well Volumes:** Initial 1  
    - **Temp.:** 12.5°C  
    - **13°C**  
    - **pH:** 8.85  
    - **7.2**  
    - **Spec. Cond.:**  
      - **3000 QM**  
      - **2500 QM**  
    - **Other N/A:**  
    - **N/A:**  
  
### SAMPLING DATA:

- **METHOD:**  
  - **Bailer, Size:** 1.5"  
  - **Bladder Pump**  
  - **2" Submersible Pump**  
  - **4" Submersible Pump**  
  - **Inertial Lift Pump**  
  - **Peristaltic Pump**  
  - **Other:**  
- **MATERIALS:**  
  - **Pump/Bailer:**  
  - **Stainless Steel**  
  - **Teflon®**  
  - **Polyethylene**  
  - **Polypropylene**  
- **Tubing/Rope:**  
  - **Other:**  
  - **SAMPLING EQUIPMENT:**  
    - **Dedicated**  
    - **Prepared Off-Site**  
    - **Field Cleaned**  
  - **Metals samples field filtered?** Yes  
  - **Method:** 0.45μm [Typ. filter]  
  - **APPEARANCE:** Clear  
  - **Turbid**  
  - **Color:** Gray  
  - **Odor:**  
    - **Solvent**  
    - **Other:** Chry. Sheen

### FIELD DETERMINATIONS OF RECORD:

- **pH:** 7.2  
- **Meter Model:** Oakton  
- **Meter S/N:**  
- **Temperature:** 13°C  
- **Spec. Cond.:** 79° API  
- **Meter Model:** YSI - 33  
- **Meter S/N:** 90402276  
- **NO. OF CONTAINERS:** 7  
- **Field Blank I.D.:** E8-30  
- **Strip Blank I.D.:** TR-01495  
- **Replicate I.D.:**  

### REMARKS:

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.  
**Signature:** Julia Ramirez  
**Date:** 7/13/95

(Rev 5/94 - 2nd Ed)
**Groundwater Sampling Field Data Sheet**

**Project:** GwSampling

**Client:** Hercules/Dyno

**Job No.:** 991606

**Weather Conditions:** Occas.

**Air Temperature:** 60°F

---

**WELL DATA:**

- **Casing Diameter:** 2" (check)
- **Stainless Steel** (check)
- **Galv. Steel** (check)
- **PVC** (check)
- **Teflon®** (deselect)
- **Other:**

- **Intake Diameter:** 2½" (check)
- **Stainless Steel** (check)
- **Galv. Steel** (check)
- **PVC** (check)
- **Teflon®** (deselect)
- **Open rock** (deselect)

- **Depth to Water Level:** 10.8 ft
- **Bottom of Well:** 27'

**Datum:**
- Top of Protective Casing (check)
- Top of Well Casing (deselect)
- Other: (deselect)

**Is the well clean to the bottom?**
- Yes (check)
- No (deselect)

**Is the well in good condition?**
- Yes (check)
- No (deselect)

**Volume of Water:**
- Standing in well: 9.89
- To be purged: 7.89

---

**PURGE DATA:**

**Method:**
- **Bailer, Size:** 16 x 5 (check)
- **Bladder Pump** (deselect)
- **2" Submersible Pump** (deselect)
- **4" Submersible Pump** (deselect)
- **Centrifugal Pump** (deselect)
- **Peristaltic Pump** (deselect)
- **Inertial Lift Pump** (deselect)
- **Teflon®** (check)
- **Polyethylene** (deselect)
- **Polypropylene** (deselect)
- **Other:**

**Materials:**
- **Pump/Bailer:** Stainless Steel (check)
- **Tubing/Rope:** Polyethylene (check)
- **PVC** (deselect)
- **Other:**

**Pumping Rate:** N/A

**Elapsed Time:** N/A

**Volume Pumped:** 89

**Was well purged to dryness?**
- Yes (check)
- No (deselect)

**Number of Well Volumes Removed:** 3

**Time Series Data:**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13°C</td>
<td>7.2</td>
<td>950</td>
</tr>
<tr>
<td>12°C</td>
<td>7.2</td>
<td>950</td>
</tr>
<tr>
<td>10°C</td>
<td>7.2</td>
<td>950</td>
</tr>
</tbody>
</table>

**Other:**
- N/A (check)
- N/A (deselect)

**Purging Equipment:**
- Dedicated (deselect)
- Prepared Off-Site (check)
- Field Cleaned (check)

---

**Sampling Data:**

**Method:**
- **Bailer, Size:** 16 x 3 (check)
- **Bladder Pump** (deselect)
- **2" Submersible Pump** (deselect)
- **4" Submersible Pump** (deselect)
- **Inertial Lift Pump** (deselect)
- **Peristaltic Pump** (deselect)
- **Teflon®** (check)
- **Polyethylene** (check)
- **Polypropylene** (deselect)
- **Other:**

**Materials:**
- **Pump/Bailer:** Stainless Steel (check)
- **Tubing/Rope:** Polyethylene (check)
- **PVC** (deselect)
- **Other:**

**Sampling Equipment:**
- Dedicated (deselect)
- Prepared Off-Site (check)
- Field Cleaned (check)

**Metals samples field filtered?**
- Yes (check)
- No (deselect)

**Method:** 0.45um CUK5600

**Appearance:**
- Clear (check)
- Turbid (deselect)
- Color: Gray (check)
- Contains LNAPL (deselect)
- Contains DNAPL (deselect)

**Odor:**
- Yes (deselect)
- No (check)
- Other: (deselect)

**Field Determinations of Record:**

- **pH:** 7.2
- **Temperature:** 70°F
- **Spec. Cond.:** 950
- **Field Blank L.D.:** 504.5
- **Trip Blank L.D.:** 504.5
- **Replicate L.D.:**

**Remarks:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/13/95
GROUNDWATER SAMPLING
FIELD DATA SHEET

ECKENFELDER INC.

☐ Nashville, Tennessee  ☐ Mahwah, New Jersey

Well Number: mwa-6
Sample I.D.: ____________ (if different from well no.)

Date: 9/15/45  Time: 16:00
Weather Conditions: Sunny
Air Temperature: 70°F

WELL DATA:

Casing Diameter: 2"  ☐ Stainless Steel  ☐ Galv. Steel  ☐ PVC  ☐ Teflon®  ☐ Other: ____________
Intake Diameter: 2"  ☐ Stainless Steel  ☐ Galv. Steel  ☐ PVC  ☐ Teflon®  ☐ Open rock
DEPTH TO:
Static Water Level: 300  Bottom of Well: 672
DATUM: ☐ Top of Protective Casing  ☐ Top of Well Casing  ☐ Other: ____________
Is the well clean to the bottom? ☐ Yes  ☐ No  Is the well in good condition? ☐ Yes  ☐ No
VOLUME OF WATER:
Standing in well: 5.6 g  To be purged: 16.9 g

PURGE DATA:

METHOD: ☐ Bailier, Size: 16'x3'  ☐ Bladder Pump  ☐ Submersible Pump  ☐ 4" Submersible Pump
☐ Centrifugal Pump  ☐ Peristaltic Pump  ☐ Inertial Lift Pump  ☐ Other: ____________

MATERIALS: ☐ Pump/Bailer: Teflon®  ☐ Stainless Steel  ☐ PVC  ☐ Other: ____________
☐ Tubing/Rope: Teflon®  ☐ Polyethylene  ☐ Polypropylene  ☐ Other: nylon

Pumping Rate: NA  Elapsed Time: NA  Volume Pumped: 17 g
Was well purged to dryness? ☐ Yes  ☐ No  Number of Well Volumes Removed: 3

TIME SERIES DATA:
Well Volumes: Initial 1  2  3
Temp.: 71°  65°  67°  64°  62°  7.7
pH: 11.1  11  9  3.8  7
Spec. Cond.: 355 mhos, 33°C  19.4°C  14.6°C
Other: NA
Other: NA

PURGING EQUIPMENT: ☐ Dedicated  ☐ Prepared Off-Site  ☐ Field Cleaned

SAMPLING DATA:

METHOD: ☐ Bailier, Size: 16"  ☐ Bladder Pump  ☐ 2" Submersible Pump  ☐ 4" Submersible Pump
☐ Inertial Lift Pump  ☐ Peristaltic Pump  ☐ Other: ____________

MATERIALS: ☐ Pump/Bailer: Teflon®  ☐ Stainless Steel  ☐ PVC  ☐ Other: ____________
☐ Tubing/Rope: Teflon®  ☐ Polyethylene  ☐ Polypropylene  ☐ Other: nylon

SAMPLING EQUIPMENT: ☐ Dedicated  ☐ Prepared Off-Site  ☐ Field Cleaned
Metals samples field filtered? ☐ Yes  ☐ No  Method: ____________
APPEARANCE: ☐ Clear  ☐ Turbid  ☐ Color: gray  ☐ Contains LNAPL  ☐ Contains DNAPL
Odor: ☐ Yes  ☐ No  Other: ____________

FIELD DETERMINATIONS OF RECORD:

pH: 9.7  Meter Model: _Calom_  Meter S/N: ____________

REMARKS:
I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.
Signature: ____________  Date: 9/15/95

© 1995 Eckenfelder, Inc.
## Groundwater Sampling Field Data Sheet

**ECKENFELDER INC.**

- Nashville, Tennessee
- Mahwah, New Jersey

### Project:
- **EcoSamping**

### Client:
- **Hercules TDNQ**

### Job No.:
- **95600**

### Weather Conditions:
- **Sunny**

### Sample I.D.:

### Air Temperature:
- **40°F**

### Date:
- **9/5/95**

### Time:
- **7:00**

### WELL DATA:

- **Casing Diameter:** 2"
- **Intake Diameter:** 3"
- **Static Water Level:** 35'55"
- **Bottom of Well:** 43'5`
- **Datum:** Top of Protective Casing
- **Is the well clean to the bottom?** Yes
- **Is the well in good condition?** Yes
- **VOLUME OF WATER:** Standing in well: 39gal

### PURGE DATA:

- **Method:** Baller, Size: 10x3'
- **Tubing/Rope:** Teflon®
- **Volume Pumped:** 49gal
- **Number of Well Volumes Removed:** 3 +

### TIME SERIES DATA:

- **Temp.:** 71°F
- **pH:** 7.1
- **Specific Cond.:** 20°C

### PURGING EQUIPMENT:
- **Dedicated**
- **Prepared Off-Site**

### SAMPLING DATA:

- **Method:** Baller, Size: 10x3'
- **Tubing/Rope:** Polyethylene
- **Sampling Equipment:** Dedicated
- **Metal's samples field filtered?** Yes
- **Method:** 0.45um Chek-Fiter
- **Appearance:** Clear
- **Color:** Gray
- **Odor:** Yes

### FIELD DETERMINATIONS OF RECORD:

- **pH:** 8.1
- **Temperature:** 71°F
- **Spec. Cond.:** 210°C

### Remarks:

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/5/95
**Groundwater Sampling Field Data Sheet**

**Project:** GW Sampling  
**Client:** Green Lawns Dyno  
**Personnel:** LES/ZEK  
**Date:** 9/14/95  
**Time:** 0150  
**Weather Conditions:** Sunny, Decent  
**Air Temperature:** 60°F

### WELL DATA:
- **Casing Diameter:** 2”  
- **Intake Diameter:** 2”  
- **Depth to Static Water Level:** 15’ 6”  
- **Bottom of Well:** 22’

**Datum:** Top of Protective Casing  
**Is the well clean to the bottom?** Yes  
**Is the well in good condition?** Yes  
**VOLUME OF WATER:** Standing in well: 10.1 g  
**To be purged:** 3.0 g

### PURGE DATA:
- **Method:** Bailer, Size: 14” x 1’  
- **Materials:** Pump/Bailer, Stainless Steel, PVC  
- **Tubing/Rope:** Polyethylene, Polypropylene

**Pumping Rate:** N/A  
**Elapsed Time:** N/A  
**Volume Pumped:** 2.5 L

**Was well purged to dryness?** Yes  
**Number of Well Volumes Removed:** 3

### TIME SERIES DATA:
- **Well Volumes:** Initial, 2, 3  
- **Temp.:** 18°C, 12°C, 12°C  
- **pH:** 6.1, 7.0, 6.9  
- **Specific Cond.:** 380, 370, 360

**Other** N/A

### PURGING EQUIPMENT:
- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

### SAMPLING DATA:
- **Method:** Bailer, Size: 14” x 3’  
- **Materials:** Pump/Bailer, Stainless Steel, PVC  
- **Tubing/Rope:** Polyethylene, Polypropylene

**Sampling Equipment:** Dedicated  
**Metals samples field filtered?** Yes  
**Method:** 0.45 μm Quick Filter

**Appearance:** Clear  
**Odor:** Yes  
**No Other:**

### FIELD DETERMINATIONS OF RECORD:
- **pH:** 6.9  
- **Temperature:** 18°C  
- **Spec. Cond.:** 380  
- **NO. OF CONTAINERS:** 14

**Remarks:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]  
**Date:** 9/14/95
<table>
<thead>
<tr>
<th>Project: GWSampling</th>
<th>Date: 9/14/95</th>
<th>Time: 1050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client: Hercules ABN/O</td>
<td>Job No. 95946</td>
<td>Weather Conditions: Sunny</td>
</tr>
<tr>
<td>Personnel: LES/EC</td>
<td>Air Temperature: 70°F</td>
<td></td>
</tr>
</tbody>
</table>

**WELL DATA:**
- Casing Diameter: 2"
- Intake Diameter: 2.5"
- Static Water Level: 7.55’
- Bottom of Well: 19’
- DATUM: Top of Protective Casing
- Is the well clean to the bottom? Yes
- Is the well in good condition? Yes
- VOLUME OF WATER: Standing in well: 189
- To be purged: 5.59

**PURGE DATA:**
- METHOD: Bailier, Size: 16", 5’
- MATERIALS: Pump/Bailier: Stainless Steel, PVC
- Pumping Rate: NA
- Elapsed Time: NA
- Volume Pumped: 69
- Number of Well Volumes Removed: 3

**TIME SERIES DATA:**
- Well Volumes: 1, 2
- Temp.: 14°C, 14°C, 14.5°C
- pH: 6.9, 7.2, 7.2
- Spec. Cond.: 245, 290, 272, 296

**PURGING EQUIPMENT:**
- Dedicated
- Prepared Off-Site
- Field Cleaned

**SAMPLE DATA:**
- METHOD: Bailier, Size: 16", 5’
- MATERIALS: Pump/Bailier: Stainless Steel, PVC
- SAMPLING EQUIPMENT: Dedicated
- Metals samples field filtered? Yes
- Method: Quick Filter
- APPEARANCE: Clear
- Odor: Yes

**FIELD DETERMINATIONS OF RECORD:**
- pH: 7.2
- Temperature: 14.5°C
- Spec. Cond.: 245
- Meter Model: C/O
- Meter S/N:
- Meter Model: YS133
- Meter S/N: 90M022734
- NO. OF CONTAINERS: 7
- Field Blank I.D.: EB0939
- Trip Blank I.D.: TB09105
- Replicate I.D.: 

**REMARKS:**
I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

Signature: L. JOHNSON | Date: 9/14/95
GROUNDFWATER SAMPLING
FIELD DATA SHEET

Well Number: MW-10
Sample I.D.: MW-10-06112G

Project: Groundwater Sampling
Client: Hercules PDVNO
Job No.: 9561

Date: 9/14/98
Time:
Weather Conditions: Sunny
Air Temperature: 70°F

EWELL DATA:
Casing Diameter: 2"
Intake Diameter: 2"
Depth to Static Water Level: 66'
Datum: Top of Protective Casing

Is the well clean to the bottom? Yes
Is the well in good condition? Yes

Volume of Water: 2.5 g

PURGE DATA:
Method: Teflon®, Centrifugal Pump
Materials: Pump/Boiler: Stainless Steel, PVC
Tubing/Rope: Teflon®, Polyethylene

Pumping Rate: NA
Elapsed Time: NA
Volume Pumped: 8 g

TIME SERIES DATA:
Well Volumes: Initial 2 3
Temp.: 13°C 13.5°C 13°C
pH: 7.4 7.4
Specific Conductivity: 2800 μS/cm 2800 μS/cm 2800 μS/cm

Other: NA
Other: NA

PURGING EQUIPMENT: Dedicated
Prepared Off-Site
Field Cleaned

SAMPLING DATA:
Method: Teflon®, Centrifugal Pump
Materials: Pump/Boiler: Stainless Steel, PVC
Tubing/Rope: Teflon®, Polyethylene

Sampling Equipment: Dedicated
Prepared Off-Site
Field Cleaned

Metals samples field filtered? Yes
Method: 0.45 μm Quick Filter

Appearance: Clear Turbid, Color: Brown

Other: Yes
Other: No

FIELD DETERMINATIONS OF RECORD:
pH: 7.4

Temperature: 13°C
Spec. Cond.: 28°C

NO. OF CONTAINERS: 4

REMARKS:
I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

Signature: John Doe
Date: 9/14/98
**GROUNDWATER SAMPLING**

**FIELD DATA SHEET**

**ECKENFELDER INC.**

- Nashville, Tennessee
- Mahwah, New Jersey

**Sample I.D.:**

- Weather Conditions: Sunny
- Air Temperature: 70°F

**WELL DATA:**

- **Casing Diameter:** 2"  - Stainless Steel  - Galv. Steel  - PVC  - Teflon®  - Other:
- **Intake Diameter:** 2"  - Stainless Steel  - Galv. Steel  - PVC  - Teflon®  - Open rock
- **Static Water Level:** 26.4'  - **Bottom of Well:** 24.4'
- **Datum:** Top of Protective Casing  - Top of Well Casing  - Other:
- **Is the well clean to the bottom?** Yes  - No  - Is the well in good condition? Yes  - No
- **VOLUME OF WATER:** Standing in well: 0.59  - To be purged: 7.55

**PURGE DATA:**

- **Method:** Bailer, Size:  - Bladder Pump  - 2" Submersible Pump  - 4" Submersible Pump  - Centrifugal Pump  - Peristaltic Pump  - Inertial Lift Pump  - Other:
- **Tubing/Rope:** Teflon®  - Polyethylene  - Polypropylene  - Other:
- **Pumping Rate:** NA  - **Elapsed Time:** NA  - **Volume Pumped:** 751
- **Was well purged to dryness?** Yes  - No  - **Number of Well Volumes Removed:** 3

**TIME SERIES DATA:**

- **Well Volumes:**  - **Temp.:** 105.8°F  - 104°F  - 102°F  - 101°F  - **pH:** 7.4  - 7.4  - 7.8  - 7.2  - **Spec. Cond.:** 370  - 330
- **Other:** NA

**PURGING EQUIPMENT:**

- Dedicated  - Prepared Off-Site  - Field Cleaned

**SAMPLING DATA:**

- **Method:** Bailer, Size:  - Bladder Pump  - 2" Submersible Pump  - 4" Submersible Pump  - Inertial Lift Pump  - Peristaltic Pump  - Other:
- **Tubing/Rope:** Teflon®  - Polyethylene  - Polypropylene  - Other:
- **Sampling Equipment:** Dedicated  - Prepared Off-Site  - Field Cleaned
- **Metals samples field filtered?** Yes  - No  - **Method:** John Bukich Filter
- **Appearance:** Clear  - Turbid  - Color:
- **Odor:** Yes  - No  - Other:

**FIELD DETERMINATIONS OF RECORD:**

- **pH:** 8.2  - **Meter Model:** Cahn  - **Meter S/N:**
- **Temperature:** 14°C  - **Spec. Cond.:** 330  - **Meter Model:** Vi散步  - **Meter S/N:** 30M022726

**Remarks:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:**

**Date:** 9/15/98
**GROUNDWATER SAMPLING**

**FIELD DATA SHEET**

- **Well Number:** wL-11D
- **Sample I.D.:** plus 04/11/85
- **Date:** 9/15/95
- **Time:** 10:15
- **Weather Conditions:** Sunny
- **Air Temperature:** 70°F

### WELL DATA:

- **Casing Diameter:** 2½
- **Intake Diameter:** 2½
- **Static Water Level:** 8.78
- **Bottom of Well:** 24.7
- **DATUM:** Top of Protective Casing
- **Is the well clean to the bottom?** Yes
- **Is the well in good condition?** Yes
- **VOLUME OF WATER:** Standing in well: 8.79
- **To be purged:** 3.48

### PURGE DATA:

- **METHOD:** Bladder Pump, 2 Submersible Pump, 4 Submersible Pump, Centrifugal Pump, Peristaltic Pump
- **MATERIALS:** Pump/Bailer: Teflon®, PVC, Other
- **Tubing/Rope:** Polyethylene, Polypropylene, Other
- **Pumping Rate:** 8 gpm
- **Elapsed Time:** 5 min
- **Volume Pumped:** 30 g
- **Number of Well Volumes Removed:** 3

### TIME SERIES DATA:

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<td>13°C</td>
<td>7.5</td>
<td>800</td>
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<tr>
<td>2</td>
<td>15°C</td>
<td>7.4</td>
<td>800</td>
</tr>
<tr>
<td>3</td>
<td>16°C</td>
<td>7.3</td>
<td>800</td>
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</tbody>
</table>

### PURGING EQUIPMENT:

- **Dedicated**
- **Prepared Off-Site**
- **Field Cleaned**

### SAMPLING DATA:

- **METHOD:** Bladder Pump, 2 Submersible Pump, 4 Submersible Pump, Inertial Lift Pump, Peristaltic Pump
- **MATERIALS:** Pump/Bailer: Teflon®, Stainless Steel, PVC, Other
- **Tubing/Rope:** Polyethylene, Polypropylene, Other
- **SAMPLING EQUIPMENT:** Dedicated
- **Metals samples field filtered?** Yes
- **APPEARANCE:** Clear
- **Odor:** Yes

### FIELD DETERMINATIONS OF RECORD:

- **pH:** 7.2
- **Temperature:** 18.5°C
- **NO. OF CONTAINERS:** 14
- **Remarks:**
  I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:**

**Date:** 9/15/95
**Groundwater Sampling**

**Field Data Sheet**

**Project:** GW Sampling  
**Client:** Hercules/DVNC  
**Job No.:** GW  
**Weather Conditions:** Rainy  
**Air Temperature:** 65°F

---

**Well Data:**

- **Casing Diameter:** 7"  
- **Intake Diameter:** 5"  
- **Depth:** Static Water Level: 8.18  
- **Datum:** Top of Well: 25A  
- **Is the well clean to the bottom?** Yes  
- **Volume of Water:** Standing in well: 3.8 g  
- **Pumping Rate:** 1 g/sec

---

**Purge Data:**

- **Method:** Bladder Pump  
- **Materials:** Polyethylene  
- **Number of Well Volumes Removed:** 2.5

---

**Time Series Data:**

<table>
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<tr>
<th>Time</th>
<th>Initial Water Volumes</th>
<th>Volume Pumped</th>
</tr>
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<tr>
<td>Temp.</td>
<td>14.5°C</td>
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<td>pH</td>
<td>7.1</td>
<td></td>
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<tr>
<td>Spec. Cond.</td>
<td>4.5</td>
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<tr>
<td>Other</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

---

**Sampling Data:**

- **Method:** Bladder Pump  
- **Materials:** Polyethylene  
- **Sampling Equipment:** Field Cleaned

---

**Field Determinations of Record:**

- **pH:** 7.1  
- **Temperature:** 14°C  
- **Method:** Oakton

---

**Remarks:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.
GROUNDWATER SAMPLING
FIELD DATA SHEET

ECKENFELDER INC.

Nashville, Tennessee
Mahwah, New Jersey

Project: GNSampling
Client: Hercules / NO

Well Number: MW-18D
Sample I.D.: (if different from well no.)

Date: 9/3/95
Time: 08:30
Weather Conditions: Rain
Air Temperature: 65°F

WELL DATA:
Casing Diameter: 2"  Stainless Steel  Galv. Steel  PVC  Teflon®  Other:
Intake Diameter: 2"  Stainless Steel  Galv. Steel  PVC  Teflon®  Open rock

DEPTH TO:
Static Water Level: 18' 4"  Bottom of Well: 84' 5"

DATUM:
Top of Protective Casing  Bottom of Well  Other:

Is the well clean to the bottom? Yes  No
Is the well in good condition? Yes  No
VOLUME OF WATER:
Standing in well: 15.5 g  To be purged: 31.5 g

PURGE DATA:
METHOD:
Bailer, Size:
Bladder Pump  2" Submersible Pump  4" Submersible Pump
Centrifugal Pump  Peristaltic Pump  Inertial Lift Pump  Other:

Teflon®
Tubing/Rope:
Polyethylene  Polypropylene  Other:

MATERIALS:
Pump/Bailer:
Stainless Steel  PVC  Other:

Tubing/Rope:
Polyethylene  Polypropylene  Other:

Purging Rate:
Elapsed Time: 16 min
Volume Pumped: 32 g

Was well purged to dryness? Yes  No
Number of Well Volumes Removed: 3

TIME SERIES DATA:
Well Volumes:
Temp.:
14°C  13°C  12.5°C  12.0°C
pH:
7.2  7.2  7.2  7.2
Spec. Cond.:
140 ppm  550  305  305

Other:

Other:

PURGING EQUIPMENT:
Dedicated  Prepared Off-Site  Field Cleaned

SAMPLING DATA:
METHOD:
Bailer, Size:
Bladder Pump  2" Submersible Pump  4" Submersible Pump
Inertial Lift Pump  Peristaltic Pump  Other:

Teflon®
Tubing/Rope:
Polyethylene  Polypropylene  Other:

MATERIALS:
Pump/Bailer:
Stainless Steel  PVC  Other:

Tubing/Rope:
Polyethylene  Polypropylene  Other:

SAMPLING EQUIPMENT:
Dedicated  Prepared Off-Site  Field Cleaned

Metals samples field filtered? Yes  No
Method: OA5 Lim  Quick Filter

APPEARANCE:
Clear  Turbid  Color:

Contains LNAPL  Contains DNAPL

Odor:
Yes:
No:

FIELD DETERMINATIONS OF RECORD:
ph:
1.2
Meter Model: Chloran
Meter S/N:

Temperature:
12.0°C  Spec. Cond.:

Meter Model: YSI 83
Meter S/N: 90602276

NO. OF CONTAINERS:
4  Field Blank I.D.: 7891495
Trip Blank I.D.: 7891495  Replicate I.D.: 7891495

REMARKS:
I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

Signature:
Date: 9/13/95
**GROUNDWATER SAMPLING FIELD DATA SHEET**

**Project:** GW Sampling  
**Client:** Hercules  
**Personnel:** LES / ZK  
**Date:** 9/11/95  
**Weather Conditions:** Sunny, 65°F  
**Air Temperature:** 65°F  

### WELL DATA:

- **Casing Diameter:** 2"  
- **Intake Diameter:** 3/4"  
- **Static Water Level:** 11.01'  
- **Bottom of Well:** 25.2'  
- **DATUM:** Top of Protective Casing  
- **Is the well clean to the bottom?** Yes  
- **Is the well in good condition?** Yes  
- **VOLUME OF WATER:** Standing in well: 2.3 g  
- **To be purged:** 6.8 g

### PURGE DATA:

- **METHOD:**  
  - Water, Size: 1/4"  
  - Bladder Pump  
  - 2" Submersible Pump  
  - 4" Submersible Pump  
  - Centrifugal Pump  
  - Peristaltic Pump  
  - Inertial Lift Pump  
  - Other:  
- **MATERIALS:**  
  - Pump/Boiler: Stainless Steel  
  - PVC  
  - Other:  
- **Tubing/Rope:**  
  - Teflon®  
  - Polyethylene  
  - Polypropylene  
  - Other: Nylon  
- **Pumping Rate:** NA  
- **Elapsed Time:** NA  
- **Volume Pumped:** NA  
- **Was well purged to dryness?** Yes  
- **Number of Well Volumes Removed:**  
- **TIME SERIES DATA:**  
  - **Well Volumes:** Initial 1  
  - **Temp:** 15°C  
  - **pH:** 6.8  
  - **Spec. Cond.:** 900 mS/cm  
  - **Other:** N/A  
- **PURGING EQUIPMENT:**  
  - Dedicated  
  - Prepared Off-Site  
  - Field Cleaned

### SAMPLING DATA:

- **METHOD:**  
  - Water, Size: 1/4"  
  - Bladder Pump  
  - 2" Submersible Pump  
  - 4" Submersible Pump  
  - Inertial Lift Pump  
  - Peristaltic Pump  
  - Other:  
- **MATERIALS:**  
  - Pump/Boiler: Stainless Steel  
  - PVC  
  - Other:  
- **Tubing/Rope:**  
  - Teflon®  
  - Polyethylene  
  - Polypropylene  
  - Other: Nylon  
- **SAMPLING EQUIPMENT:**  
  - Dedicated  
  - Prepared Off-Site  
  - Field Cleaned  
- **Metals samples field filtered?** Yes  
- **Method:** PASym Quick Filter  
- **APPEARANCE:**  
  - Clear  
  - Turbid  
  - Color: Gray  
  - Contains LNAPL  
  - Contains DNAPL  
- **Odor:** Yes  
- **Other:**  

### FIELD DETERMINATIONS OF RECORD:

- **Temperature:** 68°F  
- **pH:** 6.8  
- **Spec. Cond.:** 900 mS/cm  
- **NO. OF CONTAINERS:**  
  - Field Blank I.D.:  
  - Trip Blank I.D.:  
- **Replicate I.D.:**  

**REMARKS:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.  
**Signature:**  
**Date:** 9/11/95
**GROUNDWATER SAMPLING**

**FIELD DATA SHEET**

- **Well Number:** MN-13D
- **Sample I.D.:**
- **Date:** 9/11/95
- **Time:** 11:45
- **Weather Conditions:** sunny
- **Air Temperature:** 70°F

### WELL DATA:
- **Casing Diameter:** 2"  
  - Stainless Steel  
  - Galv. Steel  
  - PVC  
  - Teflon®  
  - Other:  
- **Intake Diameter:** 2"  
  - Stainless Steel  
  - Galv. Steel  
  - PVC  
  - Teflon®  
  - Open rock
- **DEPTH TO:** Static Water Level: 24.32  
  Bottom of Well: 45.58  
- **DATUM:**  
  - Top of Protective Casing  
  - Top of Well Casing  
  - Other:  
- **Is the well clean to the bottom?**  
  - Yes  
  - No  
- **Is the well in good condition?**  
  - Yes  
  - No
- **VOLUME OF WATER:**  
  - Standing in well: 3.44
  - To be purged: 10.3

### PURGE DATA:
- **METHOD:**  
  - Baller, Size: 1/2" 
  - Bladder Pump  
  - 2" Submersible Pump  
  - 4" Submersible Pump  
  - Centrifugal Pump  
  - Peristaltic Pump  
  - Inertial Lift Pump  
  - Other:
- **MATERIALS:**  
  - Pump/Bailer: Stainless Steel  
  - PVC  
  - Other:
  - Tubing/Rope: Teflon®  
  - Polyethylene  
  - Polypropylene  
  - Other: Nylon
- **Pumping Rate:** NA
- **Elapsed Time:** NA
- **Volume Pumped:** NA
- **Was well purged to dryness?**  
  - Yes  
  - No
- **Number of Well Volumes Removed:** 3

### TIME SERIES DATA:
- **Initial:**  
  - Temp.: 94.9  
  - pH: 9.3  
  - Spec. Cond.: 322.6  
- **Other:** N/A
- **Number of Well Volumes:** 1, 2, 3

### PURGING EQUIPMENT:
- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

### SAMPLING DATA:
- **METHOD:**  
  - Baller, Size: 1/2"  
  - Bladder Pump  
  - 2" Submersible Pump  
  - 4" Submersible Pump  
  - Inertial Lift Pump  
  - Peristaltic Pump  
  - Centrifugal Pump  
  - Other:
- **MATERIALS:**  
  - Pump/Bailer: Stainless Steel  
  - PVC  
  - Other:
  - Tubing/Rope: Teflon®  
  - Polyethylene  
  - Polypropylene  
  - Other: Nylon

### SAMPLING EQUIPMENT:
- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

### Metals samples field filtered?
- **Yes**  
- **No**

**Method:** DASum Quick Filter

### APPEARANCE:
- **Clear**  
- **Turbid**  
- **Color: Gray**
- **Contains LNAPL**  
- **Contains DNAPL**
- **Odor:**  
  - Yes:
  - No:

### FIELD DETERMINATIONS OF RECORD:
- **pH:** 7.2
- **Temperature:** 4°C
- **Spec. Cond.:** 945  
  - Meter Model:  
  - Meter S/N:

### NO. OF CONTAINERS:
- **7**

**Field Blank I.D.:**

**Trip Blank I.D.:**

**Replicate I.D.:**

### REMARKS:
- I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/11/95
**GROUNDWATER SAMPLING FIELD DATA SHEET**

**Project:** GW Sampling

**Client:** Hercules / DYNO

**Job No.:** 959609

**Well Number:** MW-143

**Sample I.D.:** (if different from well no.)

**Date:** 9/12/95  **Time:** 10:30

**Weather Conditions:** Sunny  **Air Temperature:** 68°F

---

**WELL DATA:**

- **Casing Diameter:** 2"  
- **Stainless Steel**  
- **Galv. Steel**  
- **PVC**  
- **Teflon®**  
- **Other:**

- **Intake Diameter:** 3/4"  
- **Stainless Steel**  
- **Galv. Steel**  
- **PVC**  
- **Teflon®**  
- **Open rock**

**DEPTH TO:**  
- **Static Water Level:** 8.0 ft  
- **Bottom of Well:** 8.5 ft

**DATUM:**  
- **Top of Protective Casing**  
- **Top of Well Casing**  
- **Other:**

**Is the well clean to the bottom?**  
- **Yes**  
- **No**

**Is the well in good condition?**  
- **Yes**  
- **No**

**VOLUME OF WATER:**  
- **Standing in well:** 8.5 gal  
- **To be purged:** 8.5 gal

---

**PURGE DATA:**

**METHOD:**  
- **Bailer, Size:** 1.5 ft  
- **Bladder Pump**  
- **2" Submersible Pump**  
- **4" Submersible Pump**  
- **Centrifugal Pump**  
- **Peristaltic Pump**  
- **Inertial Lift Pump**  
- **Other:**

- **Teflon®**  
- **Stainless Steel**  
- **PVC**  
- **Other:**

**Tubing/Rope:**  
- **Teflon®**

- **Polyethylene**

- **Polypropylene**

- **Other:**

**Pumping Rate:** 
- **Elapsed Time:**

**Was well purged to dryness?**  
- **Yes**  
- **No**

**Volume Pumped:** 17 gal

**Number of Well Volumes Removed:** 3

**TIME SERIES DATA:**

**Well Volumes:**  
- **Initial:**

**Temp.:** 17°C  
- **17°C**  
- **17°C**  
- **17°C**  
- **17°C**  
- **17°C**

**pH:** 7.8  
- **7.8**

**Spec. Cond.:** 370 µmhos/cm  
- **540**  
- **295**

**Other:** N/A

**Other:** N/A

**PURGING EQUIPMENT:**  
- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

---

**SAMPLING DATA:**

**METHOD:**  
- **Bailer, Size:** 1.5 ft  
- **Bladder Pump**  
- **2" Submersible Pump**  
- **4" Submersible Pump**  
- **Inertial Lift Pump**  
- **Peristaltic Pump**  
- **Other:**

- **Teflon®**  
- **Stainless Steel**  
- **PVC**  
- **Other:**

**Tubing/Rope:**  
- **Teflon®**

- **Polyethylene**

- **Polypropylene**

- **Other:**

**SAMPLING EQUIPMENT:**  
- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

**Metals samples field filtered?**  
- **Yes**  
- **No**

**Method:** 0.45 µm Quick Filter

**APPEARANCE:**  
- **Clear**  
- **Turbid**  
- **Color:** Gray  
- **Contains LNAPL**  
- **Contains DNAPL**

**Odor:**  
- **Yes**  
- **No**  
- **Other:**

---

**FIELD DETERMINATIONS OF RECORD:**

**pH:** 8.3  
- Meter Model: Oakton  
- Meter S/N:

**Temperature:** 18°C  
- Spec. Cond.: 15°  
- Meter Model: YSI-85  
- Meter S/N: 94023022786

**NO. OF CONTAINERS:** 7  
- **Field Blank I.D.:** EBO01285  
- **Trip Blank I.D.:** TBO01285  
- **Replicate I.D.:**

**REMARKS:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/12/95
**GROUNDWATER SAMPLING**

**FIELD DATA SHEET**

<table>
<thead>
<tr>
<th>Project:</th>
<th>GWSampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client:</td>
<td>Hervis/DVNO</td>
</tr>
<tr>
<td>Job No.:</td>
<td>9506</td>
</tr>
<tr>
<td>Weather Conditions:</td>
<td>Sunny, breezy</td>
</tr>
<tr>
<td>Air Temperature:</td>
<td>60°F</td>
</tr>
</tbody>
</table>

**WELL DATA:**

- Casing Diameter: 2"  
- Intake Diameter: 2"  
- Depth to Static Water Level: 18' 6"  
- Bottom of Well: 6' 3"  
- Datum: Top of Protective Casing  
- Is the well clean to the bottom? Yes  
- Is the well in good condition? Yes  
- Volume of Water: Standing in well: 17.4 gal  
- To be purged: 22.3 gal

**PURGE DATA:**

- Method: Bladder Pump  
- Materials: Pump/Bailer: Stainless Steel  
- Tubing/Rope: Polyethylene  
- Pumping Rate: 250 rpm  
- Elapsed Time: 12 min  
- Volume Pumped: 25 gal

**TIME SERIES DATA:**

<table>
<thead>
<tr>
<th>Well Volumes:</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp:</td>
<td>16°C</td>
<td>16°C</td>
<td>16°C</td>
</tr>
<tr>
<td>pH:</td>
<td>6.0</td>
<td>8.8</td>
<td>8.1</td>
</tr>
<tr>
<td>Spec. Cond.:</td>
<td>1400 mg/l</td>
<td>140</td>
<td>160</td>
</tr>
<tr>
<td>Other:</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**PURGING EQUIPMENT:**

- Dedicated  
- Prepared Off-Site  
- Field Cleaned

**SAMPLING DATA:**

- Method: Bladder Pump  
- Materials: Pump/Bailer: Stainless Steel  
- Tubing/Rope: Polyethylene

**SAMPLING EQUIPMENT:**

- Dedicated  
- Prepared Off-Site  
- Field Cleaned

**FIELD DETERMINATIONS OF RECORD:**

- Temperature: 65°C  
- pH: 8.1  
- Spec. Cond.: 1105 mg/l  
- Field Blank I.D.: 1B09.89  
- Strip Blank I.D.: 1804.89  
- Replicate I.D.: -

**REMARKS:**

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:**  
**Date:** 9/12/95
**GROUNDWATER SAMPLING**

**FIELD DATA SHEET**

**Project:** Low Sampling  
**Client:** Hercules  
**Job No.:** 954125  
**Date:** 9/11/95  
**Weather Conditions:** Sunny, 70°F  
**Personnel:** LES / ZK

**WELL DATA:**
- **Casing Diameter:** 2.14
- **Intake Diameter:** 2.84
- **Static Water Level:** 20.6
- **Bottom of Well:** 20.6
- **Is the well clean to the bottom?** Yes
- **Volume of Water:** Standing in well: 1,909  
  To be purged: 5,709

**PURGE DATA:**
- **Method:** Baller, Size: 1.6 x 3'  
- **Materials:** Pump/Bailer: Stainless Steel  
  Tubing/ Rope: Polyethylene
- **Pumping Rate:** NA  
  **Elapsed Time:** NA  
  **Volume Pumped:** NA
- **Was well purged to dryness?** No  
  **Number of Well Volumes Removed:** 3

**TIME SERIES DATA:**

<table>
<thead>
<tr>
<th>Well Volumes</th>
<th>Initial</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp.: 14°C</td>
<td>15°C</td>
<td>15°C</td>
<td>15°C</td>
<td></td>
</tr>
<tr>
<td>pH: 6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>Spec. Cond.: 350</td>
<td>450</td>
<td>430</td>
<td>430</td>
<td></td>
</tr>
</tbody>
</table>

**PURGING EQUIPMENT:**  
- Dedicated: NA  
- Prepared Off-Site: NA  
- Field Cleaned: NA

**SAMPLING DATA:**
- **Method:** Baller, Size: 1.6 x 3'
- **Materials:** Pump/Bailer: Stainless Steel  
  Tubing/ Rope: Polyethylene
- **Sampling Equipment:**  
  - Dedicated: NA  
  - Prepared Off-Site: NA  
  - Field Cleaned: NA
- **Metals samples field filtered?** Yes
- **Method:** 0.45 um Quick Filter
- **Appearance:** Clear
- **Odor:** Yes

**FIELD DETERMINATIONS OF RECORD:**
- **pH:** 7.1  
- **Temperature:** 85°F  
- **NO. OF CONTAINERS:** 1  
- **Field Blank I.D.:** E8123  
- **Replicate I.D.:** E8123

**Remarks:**
- I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** C. H. Dates  
**Date:** 9/11/95
**GROUNDWATER SAMPLING**  
**FIELD DATA SHEET**

<table>
<thead>
<tr>
<th>Project: GW Sampling</th>
<th>Date: 9/14/95  Time: 16:10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client: Herwies/Byrne</td>
<td>Weather Conditions: Sunny 70°F</td>
</tr>
<tr>
<td>Personnel: Les 1ZK</td>
<td>Air Temperature: 70°F</td>
</tr>
</tbody>
</table>

### WELL DATA:
- **Casing Diameter:** 8"  
- **Intake Diameter:** 8"  
- **Depth to:** Static Water Level: 3.36 ft, Bottom of Well: 29.3 ft  
- **Datum:** Top of Protective Casing  
- **Is the well clean to the bottom?** Yes  
- **Is the well in good condition?** Yes  
- **Volume of Water:** Standing in well: 3.36 gal, To be purged: 10.1 gal

### PURGE DATA:
- **Method:** 
- **Materials:** Pump/Bail: PVC  
- **Pumping Rate:** NA  
- **Elapsed Time:** NA  
- **Volume Pumped:** 3 gal  
- **Number of Well Volumes Removed:** 3

### TIME SERIES DATA:
- **Initial Volume:** 1  
- **Initial Temp.:** 55°C  
- **Initial pH:** 7.7  
- **Initial Spec. Cond.:** 340°  

### SAMPLING DATA:
- **Method:** 
- **Materials:** Pump/Bail: PVC  
- **Sampling Equipment:** Field Cleaned

### FIELD DETERMINATIONS OF RECORD:
- **pH:** 7.3  
- **Temperature:** 16°C  
- **No. of Containers:** 0  
- **Remarks:** I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.  

**Signature:** Laura Johnson  
**Date:** 9/11/95
**Groundwater Sampling Field Data Sheet**

---

**General Information**
- **Location:**
  - Nashville, Tennessee
  - Mahwah, New Jersey
- **Well Number:** MW-165
- **Sample I.D.:** (if different from well no.)
- **Date:** 9/15/95
- **Time:** 08:15
- **Weather Conditions:** Sunny
- **Air Temperature:** 75°F

---

**WELL DATA:**
- **Casing Diameter:** 2”
- **Intake Diameter:** 2”
- **Depth to Water Level:** 20.21'
- **Datum:**
  - Top of Protective Casing
  - Top of Well Casing
  - Open rock
- **Volume of Water:**
  - Standing in well: 0.8 g
  - To be purged: 2.5 g

---

**PURGE DATA:**
- **Method:**
  - Baller, Size: 1.6”x5’
  - Bladder Pump
  - 2” Submersible Pump
  - 4” Submersible Pump
  - Centrifugal Pump
  - Peristaltic Pump
  - Inertial Lift Pump
  - Other:
- **Materials:**
  - Pump/Bailer: Teflon®
  - Tubing/Rope: Polyethylene
  - PVC
  - Other:
- **Pumping Rate:** NA
- **Elapsed Time:** NA
- **Volume Pumped:** 2.5 g
- **Was well purged to dryness?**
  - Yes
  - No
- **Number of Well Volumes Removed:** 3

---

**TIME SERIES DATA:**
- **Well Volumes:**
  - 1
- **Temp.:**
  - 71.0°C
  - 11.2°C
- **pH:**
  - 7.5
  - 7.5
- **Spec. Cond.:**
  - 425
  - 892
- **Other:**
  - NA
  - NA

---

**PURGING EQUIPMENT:**
- Dedicated
- Prepared Off-Site
- Field Cleaned

---

**SAMPLING DATA:**
- **Method:**
  - Baller, Size: 1.6”x3’
  - Bladder Pump
  - 2” Submersible Pump
  - 4” Submersible Pump
  - Inertial Lift Pump
  - Peristaltic Pump
  - Other:
  - Teflon®
  - Polyethylene
  - PVC
  - Other:
- **Materials:**
  - Pump/Bailer: Teflon®
  - Tubing/Rope: Polyethylene
  - PVC
  - Other:
- **Sampling Equipment:**
  - Dedicated
  - Prepared Off-Site
  - Field Cleaned
- **Metals samples field filtered?**
  - Yes
  - No
  - Method: Quick FILTER
- **Appearance:**
  - Clear
  - Turbid
  - Color:
  - Contains LNAPL
  - Contains DNAPL
- **Odor:**
  - Yes
  - No
- **Other:**

---

**FIELD DETERMINATIONS OF RECORD:**
- **pH:** 7.5
- **Temperature:** 11°C
- **Spec. Cond.:** 39°C
- **Bell Model:** Taken
- **Meter S/N:**
- **Temperature:** 39°C
- **Spec. Cond.:** 39°C
- **Bell Model:** YSI 33
- **Meter S/N:** 998999726
- **NO. OF CONTAINERS:** 7
- **Field Blank I.D.:** 5091-95
- **Trip Blank I.D.:** 5091-95
- **Replicate I.D.:**

---

**REMARKS:**
- I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

**Signature:** [Signature]

**Date:** 9/15/95
GROUNDWATER SAMPLING
FIELD DATA SHEET

Well Number: MW-164
Sample I.D.: MW-164-92/06 (different from well no.)

Project: 600 Sampling
Client: Hercules/HDNO
Personnel: LES/II

Date: 9/15/95
Time: 09:00
Weather Conditions: Sunny
Air Temperature: 65°F

WELL DATA:
Casing Diameter: 2½
Intake Diameter: 2½
Depth: Static Water Level: 215' Bottom of Well: 49'
Datum: Top of Protective Casing

Is the well clean to the bottom? Yes
Is the well in good condition? Yes
Volume of Water: Standing in well: 4.7g To be purged: 13.2g

PURGE DATA:
Method: Bailer, Size: Bladder Pump
Pump/Valve: PVC
Tubing/Rope: Polyethylene

Pumping Rate: 72 gpm
Elapsed Time: 32.6
Volume Pumped: 159

Was well purged to dryness? Yes
Number of Well Volumes Removed: 3

TIME SERIES DATA:
Well Volumes: 1
Temp.: 11.5°C 11.5 11.5 12.5
pH: 7.0 7.4 7.5 7.5
Spec. Cond.: 366 mg/L 380 380 410

PURGING EQUIPMENT: Dedicated Prepared Off-Site Field Cleaned

FIELD DETERMINATIONS OF RECORD:

pH: 7.5
Temperature: 12°F

NO. OF CONTAINERS: 6
Field Blank I.D.: 5B91892
Trip Blank I.D.: 4BA15725

REMARKS:

I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.

Signature: F. H. Smith Date: 9/15/95
**GROUNDWATER SAMPLING FIELD DATA SHEET**

**Project:** Spring Project  
**Location:** Nashville, Tennessee  
**Weather Conditions:** Breezy, sunny  
**Ali Temperature:** 60°F  
**Date:** 10/11/95  
**Time:** 11:15  
**Weather Conditions:** Breezy, sunny  
**Ali Temperature:** 60°F  

### WELL DATA:
- **Casing Diameter:** 2"  
- **Intake Diameter:** 2"  
- **Static Water Level:** 386  
- **Bottom of Well:** 18.9  
- **Top of Protective Casing:**  
- **Top of Well Casing:**  
- **Other:**  
- **Is the well clean to the bottom?** Yes  
- **Is the well in good condition?** Yes  
- **Number of Volumes:** 1.4  
- **Volume to be purged:** 4.3g  

### PURGE DATA:
- **Method:** Bladder Pump  
- **Materials:** Pump/Bailer: Stainless Steel, PVC  
- **Tubing/Rope:** Polyethylene, Polypropylene  
- **Pumping Rate:**  
- **Elapsed Time:**  
- **Volume Pumped:** 5.9  
- **Was well purged to dryness?** Yes  
- **Number of Well Volumes Removed:** 3  

### TIME SERIES DATA:
- **Temp.:** 18°C  
- **pH:** 6.5  
- **Spec. Cond.:**  

### PURGING EQUIPMENT:
- **Dedicated**  
- **Prepared Off-Site**  
- **Field Cleaned**

### SAMPLING DATA:
- **Method:** Bladder Pump  
- **Materials:** Pump/Bailer: Stainless Steel, PVC  
- **Tubing/Rope:** Polyethylene, Polypropylene  
- **Sampling Equipment:** Dedicated  
- **Field Blank I.D.:**  
- **Replicate I.D.:**  

### FIELD DETERMINATIONS OF RECORD:
- **pH:** 14°C  
- **Temperature:**  
- **NO. OF CONTAINERS:**  

### REMARKS:
- I certify that this sample was collected and handled in accordance with applicable regulatory and project protocols.
- **Signature:**  
- **Date:** 10/11/95
GROUNDDWATER SAMPLING
FIELD DATA SHEET

Project: Gw Sampling
Client: Hercules/INNO
Personnel: LES/IZK

Well Number: mW-185
Sample I.D.:
Date: 9/15/95 Time: 09:20
Weather Conditions: Sunny
Air Temperature: 60°F

WELL DATA:
Casing Diameter: 2" □ Stainless Steel □ Galv. Steel □ PVC □ Teflon® □ Other: ______
Intake Diameter: 2" □ Stainless Steel □ Galv. Steel □ PVC □ Teflon® □ Open rock
DEPTH TO: Static Water Level: 8.0 g Bottom of Well: 19.4 ft
DATUM: □ Top of Protective Casing □ Top of Well Casing □ Other: ______
Is the well clean to the bottom? □ Yes □ No □ Is the well in good condition? □ Yes □ No
VOLUME OF WATER: Standing in well: 18 g To be purged: 5.4 g

PURGE DATA:
METHOD: □ Bailer, Size: 1/2" □ Bladder Pump □ 2" Submersible Pump □ 4" Submersible Pump
□ Centrifugal Pump □ Peristaltic Pump □ Inertial Lift Pump □ Other: ______
□ Teflon® □ Teflon®
MATERIALS: Pump/Bailer: □ Stainless Steel □ PVC □ Other: ______
Tubing/Rope: □ Polyethylene □ Polypropylene □ Other: ______
Pumping Rate: NA Elapsed Time: NA Volume Pumped: 5.5 g
Was well purged to dryness? □ Yes □ No Number of Well Volumes Removed: 5
TIME SERIES DATA:
Well Volumes: Initial 1 2 3
Temp.: 14°C 14°C 14°C 14°C
pH: 6 7 6.4 6.8 6.8
Spec. Cond.: 4470 m 4920 m 4920 m 5000 m
Other: NA
Other: NA

PURGING EQUIPMENT: □ Dedicated □ Prepared Off-Site □ Field Cleaned

SAMPLING DATA:
METHOD: □ Bailer, Size: 1/2" □ Bladder Pump □ 2" Submersible Pump □ 4" Submersible Pump
□ Inertial Lift Pump □ Peristaltic Pump □ Other: ______
□ Teflon® □ Teflon®
MATERIALS: Pump/Bailer: □ Stainless Steel □ PVC □ Other: ______
Tubing/Rope: □ Polyethylene □ Polypropylene □ Other: nylon

SAMPLING EQUIPMENT: □ Dedicated □ Prepared Off-Site □ Field Cleaned
Metals samples field filtered? □ Yes □ No Method: QASYM Quick Filter
APPEARANCE: □ Clear □ Turbid □ Color: ______ □ Contains LNAPL □ Contains DNAPL
Odor: □ Yes □ Sulfur □ No Other: ______

FIELD DETERMINATIONS OF RECORD:
ph: 6.8 Meter Model: Cakton □ Meter S/N: ______
Temperature: 15°C Spec. Cond.: 500 m Meter Model: VSI 3.3 □ Meter S/N: 90410242746
Replicate I.D.: ______

REMARKS:
I certify that the sample was collected and handled in accordance with applicable regulatory and project protocols.
Signature: [Signature] Date: 9/15/95
APPENDIX D

CHAIN-OF-CUSTODY FORMS
HYDROPUNCH® CHAIN-OF-CUSTODY FORMS
<table>
<thead>
<tr>
<th>Project No.</th>
<th>Project Name</th>
<th>Samplers (Signature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9316.03</td>
<td>Hydropunch Sampling</td>
<td>Laura Leckwein</td>
</tr>
</tbody>
</table>

### Sample Details
- **Cooler No.**: 1
- **Date Shipped**: 7/14/95

### Chain of Custody Record

#### Sample Details
- **Send Invoice To:**
  - Name: 
  - Company: 
  - Address: 
  - City & State: 
  - Phone: 
  - Fax: 
- **Send Results To:**
  - Name: Tim Roepke
  - Company: 
  - Address: 
  - City & State: 
  - Phone: 
  - Fax: 

#### Matrix

<table>
<thead>
<tr>
<th>Date Sampled</th>
<th>Time</th>
<th>Component/Description</th>
<th>Solids/Sediment</th>
<th>Other</th>
<th>Total # of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/14/95</td>
<td>14:00</td>
<td>TCO271495 (+4/2)</td>
<td>✓</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7/14/95</td>
<td></td>
<td>HP-7, 23-24'</td>
<td>✓</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7/14/95</td>
<td></td>
<td>HP-7, 42-44'</td>
<td>✓</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7/14/95</td>
<td></td>
<td>Temperature Blank</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Analysis Requested
- VOA
- VOA
- VOA
- Temperature

#### Remarks
- Cooler #109
- Analyze HP-7, 42-44' only if compounds detected in HP-7, 23-24'.
- Cooler not picked up on 7/14/95 from shipping. Temperature 7/17/95 85°C

**Rush**

---

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Send Invoice To:**
Name ____________________________
Company ____________________________
Address ____________________________
City & State ____________________________
Phone ____________________________
P.O. # ____________________________

**Send Results To:**
Name ___________Roper_________
Company ____________________________
Address ____________________________
City & State ____________________________
Phone ____________________________
Fax ____________________________

**SAMPLE DETAILS:**
Page 2 of 2
Cooler No. 1 of 1
Date Shipped 7/17/95

**Project No.**
959603

**Project Name**
Hydropunch Sampling

**Samplers (Signature)**
Laurie Gelling

**Lab Use Only**

<table>
<thead>
<tr>
<th>Date Sampled</th>
<th>Time</th>
<th>Sample Location/Description</th>
<th>Sold-Solid Sludge</th>
<th>Water</th>
<th>Soil-Solid Sludge</th>
<th>Other</th>
<th>Total # of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/18/95 1800</td>
<td></td>
<td>EBC071795</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Analysis Requested**
VOA

**Remarks** Rush

**Received for Laboratory by:**
[Signature] [Date/Time: 7/18/95 0905]

**Replenished by:**
[Signature] [Date/Time: 7/18/95 0905]

**Received by:**
FedEx [Signature] [Date/Time: 7/16/95 1000]

**Replenished by:**
[Signature] [Date/Time: 7/16/95 1000]

**Replenished by:**
[Signature] [Date/Time: 7/17/95 1000]

**Replenished by:**
[Signature] [Date/Time: 7/17/95 1000]

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

| Shipped To: ECKENFELDER INC. |
| Ship to: ECKENFELDER INC. |
| 227 French Landing Drive |
| Nashville, TN. 37228 |
| Phone No. (615) 255-2288 |
| Fax No. (615) 256-8332 |

**Send Invoice To:**
- Name: Tim Rozer
- Company: Eckenfelder
- Address: Mahwah
- City & State: 801-529-0800
- Phone: 801-529-0818
- Fax: 801-529-0818

**SAMPLE DETAILS:**
- Page: 1
- Cooler No.: 1
- Date Shipped: 6/6/95

**Project No:** 95916.03  **Project Name:** HP Sampling

**Samplers (Signature):** [Signature]

**Lab Use Only**

<table>
<thead>
<tr>
<th>Sample Location/Description</th>
<th>Soil/Sediment/Stuffe</th>
<th>Water</th>
<th>Other</th>
<th>Total # of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP - 14, 95'</td>
<td>✓</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TBC602A5</td>
<td>✓</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HP - 14, 42.45'</td>
<td>✓</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Analysis Requested:**
- VOA
- VOA
- VOA and analysis

**Remarks:**
- Temp 18°C

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Send Invoice To:**
Name: 
Company: 
Address: 
City & State: 
Phone: 
Fax: 

**Send Results To:**
Name: Tim Rooper
Company: 
Address: Main St.
City & State: 
Phone: 
Fax: 

**SAMPLE DETAILS:**
Page 1 of 1
Cooler No. 1 of 1
Date Shipped: 07/95

**Project No.** 95996.03  
**Project Name:** Hydroponic Sampling

**Samplers (Signature):**

<table>
<thead>
<tr>
<th>Lab Use Only Lab #</th>
<th>Temp</th>
<th>Date Sampled</th>
<th>Time</th>
<th>Comp. Method</th>
<th>Sample Location/Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3067</td>
<td>92</td>
<td>06/25</td>
<td>0800</td>
<td>✓</td>
<td>HP-5, 26-38'</td>
<td></td>
</tr>
<tr>
<td>3068</td>
<td></td>
<td>07/30</td>
<td>0900</td>
<td>✓</td>
<td>HP-5, 42-45'</td>
<td></td>
</tr>
<tr>
<td>3069</td>
<td></td>
<td>1600</td>
<td>✓</td>
<td>✓</td>
<td>TB060795 (#413)</td>
<td></td>
</tr>
</tbody>
</table>

**Matrix:**

- **Soil/Sediment:**
  - Water: 2
  - Other: 1

**Analysis Requested:**
- VOA
- VOA *(NM required)*
- VOA

**Requisitioned by:**
- Date / Time: 07/25 1:30
- (Signature)

**Received by:**
- Date / Time: 07/25 16:00
- FedEx (Signature)
- Date / Time: 07/25 16:00
- (Signature)

**Lab Use Only:**

**Remarks:** Rush analyze HP-5, 42-45' only if compounds detected in HP-5, 26-38'.

**Cooler # 100**

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Send Invoice To**:  
Name  
Company  
Address  
City & State  
Phone  
P.O. #  

**Send Results To**:  
Name  
Tim Rooper  
Company  
Address  
City & State  
Phone  

**SAMPLE DETAILS:**  
Page 1 of 1  
Cooler No. 1 of 1  
Date Shipped 6/8/95

---

**Project No.** 957003  
**Project Name** Hydrodural Sampling

<table>
<thead>
<tr>
<th>Date Sampled</th>
<th>Temp</th>
<th>Lab Use Only</th>
<th>Lab #</th>
<th>Sample Location/Description</th>
<th>Water</th>
<th>Other</th>
<th>Foil of Containers</th>
<th>Bottle/Preservatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/8/95</td>
<td>15°F</td>
<td></td>
<td>0100</td>
<td>DWP060895</td>
<td>✓</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0800</td>
<td>HP-10, 81-24'</td>
<td>✓</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1015</td>
<td>HP-10, 37-37.5'</td>
<td>✓</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1800</td>
<td>HP-8, 86-39'</td>
<td>✓</td>
<td>1</td>
<td></td>
<td>1</td>
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<td></td>
<td></td>
<td></td>
<td>1800</td>
<td>150060895 #412</td>
<td>✓</td>
<td>2</td>
<td></td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>0340</td>
<td>HP-2, 46-49'</td>
<td>✓</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Remarks**  
There are bubbles in some of the samples that I couldn't remove.  
*Analyze only if compounds detected in HP-10, 81-24'.

**Analysis Requested**  
VOA  
VOA  
VOA*  
VOA  
VOA*  

**Reinforced by**  
(Signature) 
Date / Time 6/8/95 16:00  
Received by: FEDEx  
(Signature) 

**Remarks**  
*Analyze only if compounds detected in HP-2, 86-29'.

**Cooler #140**  
**CAR#95-140**

---

**DISTRIBUTION**: Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
### Chain of Custody Record

**Project No.:** 4518, C3  
**Project Name:** Hydrocarbon Sampling

<table>
<thead>
<tr>
<th>Samples (Signature)</th>
<th>Laurie Dufresne</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Lab Use Only Lab #/Temp.</th>
<th>Date Sampled</th>
<th>Time</th>
<th>Sampled Grade/Sample Location/Description</th>
<th>Soil/Sediment</th>
<th>Water</th>
<th>Other</th>
<th>Total # of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3194</td>
<td>12/15</td>
<td>0800</td>
<td>HP-11, 21-24'</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>2</td>
</tr>
<tr>
<td>31410</td>
<td>12/15</td>
<td>0930</td>
<td>HP-11, 41-43.5'</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>2</td>
</tr>
<tr>
<td>3141</td>
<td></td>
<td>1600</td>
<td>18801295-2420</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>2</td>
</tr>
</tbody>
</table>

**Remarks:**
*Analyze only if compounds detected in HP-11, 21-24'*

**Analysis Requested:**
- VOA
- VOA* (Didn't Run)
- VOA

**Lab Use Only:**
- VOA Headspace
- Breakage
- Spillage
- Correct Containers
- Custody Seals Intact
- Method of Shipment

**DISTRIBUTION:**
Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.

**Ship to:**
ECKENFELDER INC.  
227 French Landing Drive  
Nashville, TN, 37228

**Phone No.:** (615) 255-2289  
**Fax No.:** (615) 256-8332

**Send Invoice To:**
Name ____________________  
Company ____________________  
Address ____________________  
City & State ____________________  
Phone ____________________  
Fax ____________________

**Send Results To:**
Name Tim Reepeser  
Company ____________________  
Address ____________________  
City & State ____________________  
Phone ____________________  
Fax ____________________

**SAMPLE DETAILS:**
Page 1 of 1  
Cooler No. 1 of 1  
Date Shipped 6/12/95

**Rev. 2/95**
**CHAIN OF CUSTODY RECORD**

**Send Invoice To:**
Name: 
Company: 
Address: 
City & State: 
Phone: 
P.O. #: 

**Send Results To:**
Name: Tim Reiper
Company: 
Address: Manhah
City & State: 
Phone: 
Fax: 

**SAMPLE DETAILS:**
Page 1 of 1
Cooler No. 1 of 1
Date Shipped: 1/16/95

**Project No.:** 0594-03  
**Project Name:** HP Sampling

<table>
<thead>
<tr>
<th>Lab Use Only</th>
<th>Date Sampled</th>
<th>Time</th>
<th>Comp.</th>
<th>Grab</th>
<th>Sample Location/ Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-249, 5sc</td>
<td>9:16</td>
<td>01:16</td>
<td>✓</td>
<td>HP-13, aa-22.5'</td>
</tr>
<tr>
<td></td>
<td>3-240</td>
<td>09:16</td>
<td>2</td>
<td>✓</td>
<td>HP-13, 4-3-44'</td>
</tr>
<tr>
<td></td>
<td>3-241</td>
<td>10:00</td>
<td></td>
<td>✓</td>
<td>TECO1695 (#421)</td>
</tr>
</tbody>
</table>

**Analysis Requested:**
- VOA
- VOA + Was analyzed
- VOA

**Remarks:** *Analyze only if compounds detected in HP-13, aa-22.5'

**Lab Use Only**

- VOA Headspace: Y  N  NA
- Breakage: Y  N  NA
- Spillage: Y  N  NA
- Correct Containers: Y  N  NA
- Custody Seals Intact: Y  N  NA
- Method of Shipment: SX-SH

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

<table>
<thead>
<tr>
<th>Ship to:</th>
<th>ECKENFELDER INC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>227 French Landing Drive</td>
</tr>
<tr>
<td>Phone No.</td>
<td>(615) 255-2288</td>
</tr>
<tr>
<td>Fax No.</td>
<td>(615) 256-8332</td>
</tr>
</tbody>
</table>

**Send Invoice To:**
- Name: 
- Company: 
- Address: 
- Phone: 
- Fax: 

**Send Results To:**
- Name: Tim Roeper
- Company: 
- Address: 
- Phone: 
- Fax: 

**SAMPLE DETAILS:**
- Page 1 of 1
- Cooler No. 01395
- Date Shipped 01/01/95

<table>
<thead>
<tr>
<th>Project No.</th>
<th>Project Name</th>
<th>Project Name Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>9596.03</td>
<td>Hydro pneum Sampling</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sampled Temp</th>
<th>Date</th>
<th>Time</th>
<th>Sampled</th>
<th>Sample Location/Description</th>
<th>Water</th>
<th>Other</th>
<th>Total No. of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3°C</td>
<td>01/01/95</td>
<td>10:00</td>
<td>✓</td>
<td>Temperature Blank</td>
<td>✓</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>32°C</td>
<td>01/01/95</td>
<td>10:00</td>
<td>✓</td>
<td>TBA 01995 #423</td>
<td>✓</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>32°C</td>
<td>01/01/95</td>
<td>07:45</td>
<td>✓</td>
<td>HP-6, 23-24&quot;</td>
<td>✓</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>32°C</td>
<td>01/01/95</td>
<td>07:45</td>
<td>✓</td>
<td>HP-6, 41-44&quot;</td>
<td>✓</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

**Analysis Requested:**
- Temperature
- VOA
- VOA
- VOA

**Remarks:** Analyze HP-6, 41-44" only if compounds detected in HP-6, 23-24".

**Lab Use Only**

- VOA Headspace
- Breakage
- Spillage
- Correct Containers
- Custody Seals Intact
- Method of Shipment

**Requisitioned by:**
- Signature

**Date / Time Received by:**
- Signature

**Date / Time:** 01/01/95

**Number:** 7827

**Rev.:** 2/95

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Send Invoice To:**
- Name: 
- Company: 
- Address: 
- City & State: 
- Phone: 
- Fax: 

**Send Results To:**
- Name: **Tim Roeppe**
- Company: 
- Address: 
- City & State: 
- Phone: 
- Fax: 

**SAMPLE DETAILS:**
- Page: 1 of 1
- Cooler No.: 1 of 1
- Date Shipped: 4/21/95

---

**Project No:** 954603

**Sample Name:** HP Sampling

<table>
<thead>
<tr>
<th>Samples (Signature)</th>
<th>Date Sampled</th>
<th>Time</th>
<th>Temp</th>
<th>Sample Location/ Description</th>
<th>Soil/Sludge/Sludge</th>
<th>Water</th>
<th>Total # of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>4/21/95</td>
<td>12:00</td>
<td>73°C</td>
<td>HP-4, 97.5-98.5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sample 2</td>
<td>4/21/95</td>
<td>9:00</td>
<td></td>
<td>HP-4, 47.4-48.4-43.4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sample 3</td>
<td>4/21/95</td>
<td>16:00</td>
<td></td>
<td>TBO62195 #422</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sample 4</td>
<td>4/21/95</td>
<td>16:00</td>
<td></td>
<td>Temp, blank</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Analysis Requested:**
- VOA
- VOA*
- VOA
- Temperature

---

**Reinstructed by:**
- Signature: 
- Date / Time: 4/21/95 16:00

**Remarks:**
- Analyze HP-4, 47-48° only if compounds detected in HP-4, 97.5-98.5
- CAR #95-263

**Labor Use Only**
- VOA Headspace: No
- Glassware: No
- Spillage: No
- Correct Containers: No
- Custody Seal: Intact
- Method of Shipment: FX-91

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Send Invoice To:**
Name ____________________________
Company __________________________
Address __________________________________
City & State _________________________
Phone _______________________________
P.O. # _____________________________

**Send Results To:**
Name Tim Roepfer
Company ____________________________
Address __________________________________
City & State _________________________
Phone _______________________________
Fax ________________________________

---

**Project No.** 9820 03
**Project Name** Hydropunch Sampling

**Samplers (Signature)**
Laurel Surveying

<table>
<thead>
<tr>
<th>Lab Use Only</th>
<th>Lab #/Temp.</th>
<th>Sampled</th>
<th>Time</th>
<th>Comp.</th>
<th>Grab</th>
<th>Sample Location/Description</th>
<th>Matrix</th>
<th>Bottle/Preservatives</th>
<th>Water</th>
<th>Other</th>
<th>Total # of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3441</td>
<td>4°C</td>
<td>6/23/95</td>
<td>04:40</td>
<td></td>
<td>☑</td>
<td>EB-062395</td>
<td></td>
<td></td>
<td>☑</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>3442</td>
<td></td>
<td>6/23/95</td>
<td>16:00</td>
<td>☑</td>
<td></td>
<td>TB-062395 (#428)</td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
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<td>16:00</td>
<td>☑</td>
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<td>☑</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3443</td>
<td></td>
<td></td>
<td>07:40</td>
<td>☑</td>
<td></td>
<td>HP-1, 28-29'</td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3444</td>
<td></td>
<td></td>
<td>09:00</td>
<td>☑</td>
<td></td>
<td>HP-1, 42-43'</td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Relinquished by:**
Laurel Surveying

**Date / Time** 6/25/95 16:00

**Remarks**
*Analyze HP-1, 42-43' only if compounds detected in HP-1, 28-29'.

**Analysis Requested**
VOA, VOA, Temperature, VOA, VOA *

**Lab Use Only**

---

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**ECKENFELDER INC.**  
Send Invoice To:  
Name  
Company  
Address  
City & State  
Phone  
P.O. #  

Send Results To:  
Name Tim Keeper  
Company  
Address  
City & State  
Phone  
Fax  

**SAMPLE DETAILS:**  
Page of 1  
Cooler No. 1 of 1  
Date Shipped 7/4/95  

---  

**Project No:** 9516-03  
**Project Name:** Hydropneumatic Sampling  
**Sampler (Signature):** [Signature]  

<table>
<thead>
<tr>
<th>Lab Use Only Lab #Temp. Date Sampled</th>
<th>Time</th>
<th>Comp.</th>
<th>Grab</th>
<th>Sample Location/Description</th>
<th>Soil/Sed Sludge</th>
<th>Water</th>
<th>Other</th>
<th>Total # of Containers</th>
<th>Analysis Requested</th>
</tr>
</thead>
<tbody>
<tr>
<td>3516</td>
<td>11/2/95</td>
<td>4°C</td>
<td>6:00</td>
<td>186C 68995 #4-7</td>
<td>v</td>
<td>v</td>
<td>2</td>
<td>1</td>
<td>VOA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Temperature Blank</td>
<td></td>
<td>v</td>
<td>v</td>
<td>1</td>
<td>Temperature</td>
</tr>
<tr>
<td>3516</td>
<td>12/2/95</td>
<td>3°C</td>
<td>0740</td>
<td>HP-13, 33-34</td>
<td>v</td>
<td>v</td>
<td>v</td>
<td>1</td>
<td>VOA</td>
</tr>
<tr>
<td>3516</td>
<td>13/2/95</td>
<td>3°C</td>
<td>0800</td>
<td>HP-16, 33-34</td>
<td>v</td>
<td>v</td>
<td>v</td>
<td>1</td>
<td>VOA</td>
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<tr>
<td>3514</td>
<td>14/2/95</td>
<td>3°C</td>
<td>10:00</td>
<td>HP-16, 43-44</td>
<td>v</td>
<td>v</td>
<td>v</td>
<td>1</td>
<td>VOA</td>
</tr>
</tbody>
</table>

**Remarks:**  
Analyze HP-16, 43-44 only if compounds detected in HP-16, 33-34.

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by sampler.

---  

**Lab Use Only**  
- VOA Headspace  
- Breakage  
- Spillage  
- Correct Containers  
- Custody Seals Intact  
- Method of Shipment: FX-1

---  

**N° 7912**
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<th>Project Name</th>
<th>Sampled</th>
<th>Temp</th>
<th>Comp.</th>
<th>Grab</th>
<th>Description</th>
<th>Soil/Sludge</th>
<th>Water</th>
<th>Other</th>
<th>Total # of Containers</th>
<th>Bottles/Preservatives</th>
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<tr>
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**Remarks:**
- #Analyze HP-12, 42-43' only if compounds detected in HP-12, 23-44' (sent in 6/28/95)
- **#** Analyze HP-15, 43-44' only if compounds detected in HP-15, 28-49'.

**Cooler #109**

**Analysis Requested:**
- Temperature
- VOA
- VOA
- VOA **
- VOA #
**CHAIN OF CUSTODY RECORD**

**Project No:** 96-11.03  **Project Name:** Hydropunch Sampling

<table>
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<th>Date Sampled</th>
<th>Time</th>
<th>Comp.</th>
<th>Grab</th>
<th>Sample Location/ Description</th>
<th>Sell/Sed/Stable</th>
<th>Water</th>
<th>Other</th>
<th>Total # of Containers</th>
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<tr>
<td>10/03/95</td>
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<td></td>
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**Analysis Requested:**
- VOA
- Temperature
- VOA
- VOA

**Relinquished by:**
- Date / Time: 9/11/89 11:00
- Signature: [Signature]

**Received by:**
- Date / Time: 9/11/89 11:00
- Signature: [Signature]

**Remarks:** Rush

**Lab Use Only**
- VOA Headspace: Y
- Breakage: Y
- Spillage: Y
- Correct Containers: Y
- Custody Seals intact: Y
- Method of Shipment: [Signature]

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
# CHAIN OF CUSTODY RECORD

**Ship To:**
- ECKENFELDER INC.
- 227 French Landing Drive
- Nashville, TN 37228
- Phone No.: (615) 255-2288
- Fax No.: (615) 256-8332
- Attn: Lab

**Send Invoice To:**
- Name
- Company
- Address
- City & State
- Phone
- P.O. #

**Send Results To:**
- Name: Tim Roeper
- Company
- Address
- City & State
- Phone
- Fax

**Sample Details:**
- Page 1 of 1
- Cooler No. 1 of 7/7/95
- Date Shipped: 7/7/95

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<th>Date Sampled</th>
<th>Time</th>
<th>Comp. &amp; G</th>
<th>Sample Location/Description</th>
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<th>Other</th>
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<tr>
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<td>VOA</td>
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<td>Temperature</td>
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**Reinquished by:**
- Date / Time: 7/6/95 5:00

**Remarks:** Rush

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Send Invoice To:**
- Name __________________________
- Company ________________________
- Address _________________________
- City & State _____________________
- Phone __________________________
- Fax ____________________________

**Send Results To:**
- Name Tim Roper
- Company ________________________
- Address _________________________
- City & State _____________________
- Phone __________________________
- Fax ____________________________

**Sample Details:**
- Page 1 of 1
- Cooler No. 1 of 1
- Date Shipped 7/5/95

**Project No.** 091603
**Project Name** Hyampunch Sampling

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</tr>
<tr>
<td><strong>Sampled</strong></td>
<td><strong>Sampled</strong></td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td><strong>Time</strong></td>
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<tr>
<td><strong>Comp.</strong></td>
<td><strong>Comp.</strong></td>
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<td><strong>Grab</strong></td>
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<td><strong>Sample Location/Description</strong></td>
<td><strong>Sample Location/Description</strong></td>
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<tr>
<td><strong>Solids/Sediment</strong></td>
<td><strong>Solids/Sediment</strong></td>
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<td><strong>Water</strong></td>
<td><strong>Water</strong></td>
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<tr>
<td><strong>Other</strong></td>
<td><strong>Other</strong></td>
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<tr>
<td><strong>Total # of Containers</strong></td>
<td><strong>Total # of Containers</strong></td>
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<tr>
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**Analysis Requested**
- VOA Temperature

**Relinquished by:**
- Signature: [Signature]
- Date / Time: 7/5/95 09:40

**Received by:**
- Signature: [Signature]
- Date / Time: 7/5/95 10:00

**Relinquished by:**
- Signature: [Signature]
- Date / Time: 7/5/95 10:00

**Received by:**
- Signature: [Signature]
- Date / Time: 7/5/95 10:00

**Remarks**

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
## Chain of Custody Record

**Ship to:**
- ECKENFELDER INC.
- 227 French Landing Drive
- Nashville, TN, 37228
- Phone No. (615) 255-2298
- Fax No. (615) 255-8332
- Attn: Lab

**Send Invoice To:**
- Name: 
- Company: 
- Address: 
- City & State: 
- Phone: 
- P.O. #: 

**Send Results To:**
- Name: Tim Roper
- Company: 
- Address: 
- City & State: 
- Phone: 
- Fax: 

**SAMPLE DETAILS:**
- Page 1 of 1
- Cooler No. 1 of 1
- Date Shipped: 7/13/95

### Project Details
- **Project No.:** 9596.03
- **Project Name:** Hydropunch Sampling

### Sample Information

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<th>Comp.</th>
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### Analysis Requested
- VOA
- Temperature
- VOA
- VOA
- VOA

### Remarks
- Analyze HP-8, 42-43' only if compounds detected in HP-8, 23-24'.

### Received Information

- **Relished by:** [Signature]
- **Date:** 7/14/95
- **Time:** 0915

- **Received by:** [Signature]
- **Date:** 7/14/95
- **Time:** 0915

- **Remarks:**

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
SURFACE AND GROUNDWATER CHAIN-OF-CUSTODY FORMS
**CHAIN OF CUSTODY RECORD**

**ECKENFELDER INC.**

**Send Invoice To:**
Name: Tim Reper
Address:
City & State:
Phone:
P.O. #:

**Send Results To:**
Name: Tim Reper
Address:
City & State:
Phone:
Fax:

**SAMPLE DETAILS:**
Page 1 of 2
Cooler No. 4
Date Shipped 9/11/95

---

**Project No.** 95490.00

**Project Name** GW Sampling

**Sampler (Signature):** [Signature]

**Lab Use Only**

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**Analysis Requested**

- VOA
- BNA
- Total & Soluble Metals
- VOA
- BNA
- Total & Soluble Metals
- VOA

**Relinquished by:** [Signature]

**Date / Time** 9/11/95 16:10

**Received by:** [Signature]

**Date / Time** 9/11/95 16:10

**Remarks** Cooler #22

---

**Lab Use Only**

- VOA Headspace
- Breakage
- Spillage
- Correct Containers
- Custody Seals Intact
- Method of Shipment: FX-P1

---

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.

No.: 8147
**CHAINS OF CUSTODY RECORD**

**Ship to:**
- ECKENFELDER INC.
  - 227 French Landing Dr
  - Nashville, TN, 37228
  - Phone No. (615) 255-2268
  - Fax No. (615) 256-8332

**SAMPLE DETAILS:**
- Page 2 of 2
- Cooler No. 1 of 4
- Date Shipped: 9/12/95

**Project Details:**
- **Project No.:** 4596.06
- **Project Name:** GW Sampling

| Sample No. | Date Sampled | Temp. | Sample Location/Description | Matrix
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**Remarks:**
- Cooler #22

**Analysis Requested:**
- VOA
- VOA
- VOA
- VOA
- VOA
- VOA

**Distribution:**
Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**ECKENFELDER INC.**

**Send Invoice To:**
Name: Tim Keeper  
Company:  
Address:  
City & State:  
Phone:  
P.O. #:  

**Send Results To:**
Name: Tim Keeper  
Company:  
Address:  
City & State:  
Phone:  
Fax:  

**SAMPLE DETAILS:**
Page 1 of 1  
Cooler No. 2 of 4  
Date Shipped 9/12/95

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**Sampler: (Signature)**  
Zelia Manick

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<th>Sampled Time</th>
<th>Comp.</th>
<th>Sample Location/Description</th>
<th>Salts/Sediment</th>
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**Analysis Requested**

- BNA  
- Total Soluble Metals

**Reclaimed by:**
Date / Time:  
(Signature)  

**Remarks**
Cooler #2

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
### Chain of Custody Record

**Send Invoice To:**
- Name: Tim Roepfer
- Company:
- Address:
- City & State:
- Phone:
- P.O. #:

**Send Results To:**
- Name: Tim Roepfer
- Company:
- Address:
- City & State:
- Phone:
- Fax:

**Sample Details:**
- Page 1 of 1
- Cooler No. 3 of 4
- Date Shipped: 9/12/95

### Project Information
- **Project No.:** 4346.00
- **Project Name:** GW Sampling
- **Sampler (Signature):** Zelia Frank

### Sample Details

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### Analysts Requested
- BNA
- Total & Soluble Metals
- Total Metals
- Temperature

### Released Information
- **Revised by:**
  - Date / Time: 9/12/95 10:00
- **Remarks:** Cooler #1003

### Distribution
- Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
## CHAIN OF CUSTODY RECORD

**ECKENFELDER INC.**

**Send Invoice To:**
Name: Tim Roper

**Send Results To:**
Name: Tim Roper

**SAMPLE DETAILS:**
Page: 1 of 1
Cooler No.: 4 of 4
Date Shipped: 9/12/95

### Project Details

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<th>Project Name</th>
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<tbody>
<tr>
<td>9596.06</td>
<td>GW Sampling</td>
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### Samplers

**Catherine Dillenburg**
**Zelia Hundt**

### Sample Details

<table>
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<th>Lab Use Only</th>
<th>Date Sampled</th>
<th>Time</th>
<th>Comp.</th>
<th>Grp.</th>
<th>Sample Location/ Description</th>
<th>Total # of Containers</th>
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<tbody>
<tr>
<td></td>
<td>9/12/95</td>
<td>14:30</td>
<td></td>
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### Analysts Requested

- BNA
- BNA
- Soluble Metals
- Temp.

### Remarks

- Cooler #: 4 of 3
## CHAIN OF CUSTODY RECORD

**Send Invoice To:**  
Name: Tim Rooper  
Company:  
Address:  
City & State:  
Phone:  
P.O. #:  

**Send Results To:**  
Name: Tim Rooper  
Company:  
Address:  
City & State:  
Phone:  
Fax:  

**SAMPLE DETAILS:**  
Page: 1 of 1  
Cooler No.: 1 of 5  
Date Shipped: 9/13/95

### ECKENFELDER INC.

**Ship to:**  
ECKENFELDER INC.  
227 French Landing Drive  
Nashville, TN, 37228  
Phone No.: (615) 255-2288  
Fax No.: (615) 256-8332  

**Altin Lab**

### Project Information

- **Project No.**: 9596.06  
- **Project Name**:  

### Sample Information

- **Samplers (Signature)**: GW, SN, Jon, Tim  
- **Sampler (Signature)**:  

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### Analysis Requested

- **BNA**  
- **Total & Soluble Metals**  
- **BNA**  
- **Total & Soluble Metals**  
- **BNA**  
- **Total & Soluble Metals**  
- **Soluble Metals**  
- **Temperature**

### Laboratory Use

- **Lab Use Only**

### Remarks

- **Cooler #1**

### Reelinquished by:

- **Date / Time**: 9/13/95 10:00  
- **Received by**:  

- **Date / Time**: 9/13/95 10:00  
- **Received by**:  

- **Date / Time**: 9/13/95 10:00  
- **Received by**:  

**Distribution**: Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.

**No**: 8073
## CHAIN OF CUSTODY RECORD

**Project No.** 9416.06  
**Project Name** GW Sampling

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<th>Water</th>
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<th>Chloride</th>
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**Analysis Requested:**  
- BNA  
- Total & Soluble Metals

**Lab Use Only:**  
- VOA Headspace
- Breakage  
- Spillage
- Correct Containers
- Custody Seals In tact
- Method of Shipment: FedEx

**Remarks:** Cooler #80

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Ship to:**
ECKENFELDER INC.
227 French Landing Drive
Nashville, TN 37228
Phone No. (615) 255-2288
Fax No. (615) 256-8332

**Data:**

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<th>Water</th>
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**Remarks:**
Cooler #95

**Analysis Requested:**
- BNA
- Total Metals
- BNA
- Total and Soluble Metals
- BNA
- Total and Soluble Metals
- Total Metals
- Temperature

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

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**Lab Use Only**

- BNA
- Total & Soluble Metals
- Soluble Metals
- BNA
- Total Metals
- Total Metals
- Temperature

**Remarks**

Cooler # 131

**Lab Use Only**

- VOA Headspace
- Breakage
- Spillage
- Correct Containers
- Custody Seals Intact
- Method of Shipment

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
## CHAIN OF CUSTODY RECORD

**ECKENFELDER INC.**

**Send Invoice To:**
- Name: Tim Rocper
- Company: 
- Address: 
- Phone: 
- P.O. 

**Send Results To:**
- Name: Tim Rocper
- Company: 
- Address: 
- Phone: 
- Fax: 

**SAMPLE DETAILS:**
- Page: 1 of 3
- Cooler No.: 5 of 5
- Date Shipped: 9/14/95

### MATRIX

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<th>Lab #/Temp.</th>
<th>Date Sampled</th>
<th>Time</th>
<th>Comp.</th>
<th>Grab</th>
<th>Sample Location/Description</th>
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### Bottle/Preservatives

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### Analysts Requested

- BNA
- Total Metals
- BNA
- VOA

### Remarks

- Cooler #110

### DISTRIBUTION:

Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
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| Remarks     | Cooler # 110 |

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DISTRIBUTION: Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Name:** Tim Roeper

**Project No.:** 4596.06  
**Project Name:** GW Sampling

**Sample Details:**  
**Page:** 1 of 1  
**Cooler No.:** 1 of 4  
**Date Shipped:** 9/15/95

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**Analysis Requested:**  
- BNA  
- Total & Soluble Metals  
- Soluble Metals  
- Total Metals  
- ENA  
- Temperature

**Relinquished by:**  
- [Signature]  
- [Signature]  
- [Signature]  

**Received by:**  
- [Signature]  
- [Signature]

**Remarks:** Col. # 119

**Lab Use Only**  
- VOA Headspace: Y  
- Breakage: Y  
- Spillage: Y  
- Correct Containers: C  
- Custody Seals Intact: N  
- Method of Shipment: FED EXSAT

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Project No:** 951606  
**Project Name:** GW Sampling

**Sampled (Signature):** [Signature]

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**Remarks:** Cooler #4

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
# Chain of Custody Record

**Project No:** 95910.06  
**Project Name:** GW Sampling

<table>
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**Remarks:** Cooler #135

**DISTRIBUTION:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
**CHAIN OF CUSTODY RECORD**

**Sample Details:**
- Page: 1 of 2
- Cooler No.: 4
- Date Shipped: 9/15/95

**Project No.:** 959608
**Project Name:** GW Sampling

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**Analysis Requested:**
- BNA
- Temperature
- VOA

**Remarks:**
- Code: #3

**Lab Use Only:**
- VOA Headspace: Y
- Breakage: N
- Spillage: N
- Correct Containers: N
- Custody Seals Intact: N
- Method of Shipment: EXP SAT

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.

**Ship to:**
- ECKENFELDER INC.
  - 227 French Landing Drive
  - Nashville, TN 37228
  - Phone: (615) 285-2880
  - Fax: (615) 285-8332

**Send Invoice To:**
- Name: Tim Rooper
  - Company
  - Address
  - City & State
  - Phone
  - P.O. #

**Send Results To:**
- Name: Tim Rooper
  - Company
  - Address
  - City & State
  - Phone
  - Fax

**Attendance:**
- Lab: Lab
- Att.: Lab

**Sample Details:**
- Page 1 of 2
- Cooler No.: 4
- Date Shipped: 9/15/95

**Recipient:**
- Signature

**Received by:**
- Signature

**Remarks:**
- Code: #3

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
## Chain of Custody Record

**Project No.:** 0596-06  
**Project Name:** GW & Del. Pond Sampling

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<th>BNA / Metals</th>
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### Remarks
- **Cooler #92**
- **Metals:** Al, Sb, Ar, Ba, Cd, Cr, Co, Cu, Pb, Hg, K, Se, Ag, Zn
- **Deliverables:** Water decanted by DMA

**Distribution:** Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
### CHAIN OF CUSTODY RECORD

#### SAMPLE DETAILS:
- Page 1 of 1
- Cooler No. 10/16/95
- Date Shipped 10/16/95

#### Project No. & Project Name
- Project No. 9416-A6
- Project Name: GN Sampling

#### Sample Details
- Sampler's Name: F. Lindell
- Date Sampled: 10/16/95
- Time: 11:15
- Sample Location/Description: MW-175

#### Analysis Requested
- VOA
- Total & Soluble Metals
- BNA
- VOA
- Total Metals
- BNA
- VOA
- Total Metals
- BNA
- VOA

#### Remarks
- Temperature: Blank
- Cooler #23

#### Distribution
- Original and yellow copies accompany sample shipment to laboratory; Pink copy retained by samplers.
APPENDIX E

WATER QUALITY DATA
### HYDROPUNCH® SAMPLING RESULTS

(Grupo 1 of 4)

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<th>Benzene (µg/L)</th>
<th>Bromo-dichloromethane (µg/L)</th>
<th>Bromoform (µg/L)</th>
<th>Bromomethane (µg/L)</th>
<th>2-Butanone (µg/L)</th>
<th>Carbon Disulfide (µg/L)</th>
<th>Carbon Tetrachloride (µg/L)</th>
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U - analyzed for, but not detected, number is reporting limit; J - an estimated value; B - present in the method blank; E- exceeds instrument calibration limits; D - diluted sample.
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U - analyzed for, but not detected, number is reporting limit; J - an estimated value; B - present in the method blank; E - exceeds instrument calibration limits; D - diluted sample.
## SURFACE AND GROUNDWATER SAMPLING RESULTS
### VOLATILE ORGANIC COMPOUNDS

(Group 1 of 4)

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<th>Bromoform (µg/L)</th>
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<th>2-Butanone (µg/L)</th>
<th>Carbon Disulfide (µg/L)</th>
<th>Carbon Tetrachloride (µg/L)</th>
<th>Chlorobenzene (µg/L)</th>
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Water Quality Standard (b): 0.7 5 20

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## SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
### VOLATILE ORGANIC COMPOUNDS
#### (Group 1 of 4)

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<th>Bromoform (µg/L)</th>
<th>Bromomethane (µg/L)</th>
<th>2-Butanone (µg/L)</th>
<th>Carbon Disulfide (µg/L)</th>
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**Water Quality Standard:**

- 0.7
- 5
- 20

**Notes:**
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### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### VOLATILE ORGANIC COMPOUNDS
##### (Group 2 of 4)

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**Water Quality Standard:**

- U: analyzed for, but not detected; number is reporting limit,
- J: an estimated value,
- R: present in the method blank,
- E: exceeds instrument calibration limits,
- D: diluted samples.
**SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)**

**VOLATILE ORGANIC COMPOUNDS**

*(Group 2 of 4)*

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**Water Quality Standard:**

- 7
- 4.7
- 5
- 4.7
- 0.8

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### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### VOLATILE ORGANIC COMPOUNDS
##### (Group 3 of 4)

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**Water Quality Standard:**

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### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### VOLATILE ORGANIC COMPOUNDS
   (Group 3 of 4)

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Water Quality Standard: 5

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U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
### VOLATILE ORGANIC COMPOUNDS
#### (Group 4 of 4)

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U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)

**VOLATILE ORGANIC COMPOUNDS**

*Group 4 of 4*

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**Water Quality Standard:**

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(a) S indicates well screened in shallow overburden; D indicates well screened in deep overburden; R indicates well screened in bedrock

(b) Water quality standards taken from NYSDEC Water Quality Standards, Table 1, Section 703.5. Where no value is given, standard was not listed on table.

(c) Analytical results for 1,2-, 1,3-, and 1,4- dichlorobenzenes taken from the 8270 scan.

U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples.
# SURFACE AND GROUNDWATER SAMPLING RESULTS
## SEMIVOLATILE ORGANIC COMPOUNDS
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<th>Benzo(b)-fluoranthene (µg/L)</th>
<th>Benzo(g,h,i)-perylene (µg/L)</th>
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**Water Quality Standard (b):**

20

ND

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## SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
### SEMIVOLATILE ORGANIC COMPOUNDS
#### (Group 1 of 6)

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<thead>
<tr>
<th>Sample Name</th>
<th>Screened Interval</th>
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<th>Acenaphthene (µg/L)</th>
<th>Acenaphthylene (µg/L)</th>
<th>Anthracene (µg/L)</th>
<th>Benzo(a)-anthracene (µg/L)</th>
<th>Benzo(a)-pyrene (µg/L)</th>
<th>Benzo(b)-fluoranthene (µg/L)</th>
<th>Benzo(g,h,i)-perylen (µg/L)</th>
<th>Benzo(k)-fluoranthene (µg/L)</th>
<th>4-Bromophenylphenylether (µg/L)</th>
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Water Quality Standard: 20 ND

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### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### SEMIVOLATILE ORGANIC COMPOUNDS
##### (Group 2 of 6)

<table>
<thead>
<tr>
<th>Sample Name</th>
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<th>Butylbenzylphthalate (µg/L)</th>
<th>Di-n-butylphthalate (µg/L)</th>
<th>Carbazole (µg/L)</th>
<th>4-Chloro-3-methylphenol (µg/L)</th>
<th>4-Chloroaniline (µg/L)</th>
<th>bis(2-Chloroethoxy) Chloroethane (µg/L)</th>
<th>bis(2-Chloroethyl) Ether (µg/L)</th>
<th>bis(2-Chloroisopropyl) Ether (µg/L)</th>
<th>2-Chloronaphthalene (µg/L)</th>
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**Water Quality Standard:**

|  | 50 | 1 | 10 |

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### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### SEMIVOLATILE ORGANIC COMPOUNDS
##### (Group 2 of 6)

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<th>Di-n-butylphthalate (µg/L)</th>
<th>Carbazole (µg/L)</th>
<th>4-Chloro-3-methylphenol (µg/L)</th>
<th>4-Chloroaniline (µg/L)</th>
<th>bis(2-Chloroethoxy)methane (µg/L)</th>
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Water Quality Standard:

- **50**: 4-Chloroaniline
- **1**: bis(2-Chloroethoxy)methane
- **10**: 2-Chlorophenol

*U* - analyzed for, but not detected; *J* - an estimated value, *B* - present in the method blank, *E* - exceeds instrument calibration limits, *D* - diluted samples.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### SEMIVOLATILE ORGANIC COMPOUNDS
##### (Group 3 of 6)

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<th>Chrysene (µg/L)</th>
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<th>3,3'-Dichlorobenzidine (µg/L)</th>
<th>2,4-Dichlorophenol (µg/L)</th>
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Water Quality Standard: 0.3

U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### SEMIVOLATILE ORGANIC COMPOUNDS
##### (Group 3 of 6)

| Sample Name | Screened Interval | Date   | 4-Chlorophenylphenylether (µg/L) | Chrysene (µg/L) | Dibenzo(a,h)-anthracene (µg/L) | Dibenzofuran (µg/L) | 3,3'-Dichlorobenzidine (µg/L) | 2,4-Dichlorophenol (µg/L) | Diethylphthalate (µg/L) | Dimethylphthalate (µg/L) | 2,4-Dimethylphenol (µg/L) | 4,6-Dinitro-2-methylphenol (µg/L) |
|------------|------------------|--------|---------------------------------|----------------|-------------------------------|--------------------|-----------------------------|--------------------------|-----------------------------|---------------------------|-----------------------------|----------------------------|-----------------------------|
| MW-16D     | D                | 9/15/95| 2 U                             | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| MW-17S     | D                | 10/16/95| 2 U                           | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| MW-16S     | D                | 9/15/95| 2 U                             | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 0.10 J                      | 2 U                       | 2 U                         | 4 U                        |
| SW-2       | S                | 10/16/95| 2 U                           | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| SW-3       | S                | 10/16/95| 2 U                           | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| REF091495  (MW-8) |    | 9/14/95| 2 U                             | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| REF091595  (MW-11D) |              | 9/15/95| 2 U                             | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| EB091295   |                 | 9/12/95| 2 U                             | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| EB091395   |                 | 9/13/95| 2 U                             | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |
| EB091495SUR |                | 9/14/95| 2 U                             | 1 U            | 2 U                           | 2 U                | 2 U                         | 2 U                      | 1 U                         | 2 U                       | 2 U                         | 4 U                        |

**Water Quality Standard:** 0.3

- **U** - analyzed for, but not detected; **J** - an estimated value, **B** - present in the method blank,
- **E** - exceeds instrument calibration limits, **D** - diluted samples.
## SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)

### SEMIVOLATILE ORGANIC COMPOUNDS

(Thresholds based on Groups 1, 2, 3, or 4 of 4)

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<th>Fluoranthene (µg/L)</th>
<th>Fluorene (µg/L)</th>
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U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples.
SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
SEMIVOLATILE ORGANIC COMPOUNDS
(Group 4 of 6)

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Water Quality Standard: 10

U - analyzed for, but not detected; number in reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
### SEMIVOLATILE ORGANIC COMPOUNDS
### (Group 6 of 6)

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**Water Quality Standard:**

- **1**
- **2**
- **10**

*U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples.*
## SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
### SEMIVOLATILE ORGANIC COMPOUNDS
      (Group 6 of 6)

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Water Quality Standard: 30  1  1  10

(a) S indicates well screened in shallow overburden; D indicates well screened in deep overburden; R indicates well screened in bedrock
(b) Water quality standards taken from NYSDEC Water Quality Standards, Table 1, Section 703.6. Where no value is given, standard was not listed on table.

U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank,
E - exceeds instrument calibration limits, D - diluted samples.
### SURFACE AND GROUNDWATER SAMPLING RESULTS

**INORGANIC CONSTITUENTS**

(Groups 1 of 3)

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**Water Quality Standard (b):**

- 25
- 1,000
- 10

U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank,
E - exceeds instrument calibration limits, D - diluted samples, N - predigestion spike recovery was outside the +/- 25% control limits.
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<th>Sample Name</th>
<th>Screened Interval</th>
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<th>Aluminum, Total (μg/L)</th>
<th>Antimony, Soluble (μg/L)</th>
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**Water Quality Standard:**

- U: analyzed for, but not detected; number is reporting limit, J: an estimated value, B: present in the method blank,
- E: exceeds instrument calibration limits, D: diluted samples, N: predigestion spike recovery was outside the +/- 25% control limits.
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Water Quality Standard: 50, 5, 200, 25

U - analyzed for, but not detected; number is reporting limit, J - an estimated value, B - present in the method blank, E - exceeds instrument calibration limits, D - diluted samples, N - predigestion spike recovery was outside the +/- 25% control limits.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### INORGANIC CONSTITUENTS
##### (Group 2 of 3)

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<th>Copper, Total (µg/L)</th>
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</tbody>
</table>

Water Quality Standard:  

- **U** - analyzed for, but not detected; **J** - an estimated value; **B** - present in the method blank.  
- **E** - exceeds instrument calibration limits; **D** - diluted samples; **N** - predigestion spike recovery was outside the +/- 20% control limits.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### INORGANIC CONSTITUENTS
##### (Group 3 of 3)

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>Screened Interval</th>
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<th>Potassium, Soluble (µg/L)</th>
<th>Potassium, Total (µg/L)</th>
<th>Selenium, Soluble (µg/L)</th>
<th>Selenium, Total (µg/L)</th>
<th>Silver, Soluble (µg/L)</th>
<th>Silver, Total (µg/L)</th>
<th>Zinc, Soluble (µg/L)</th>
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- U - analyzed for, but not detected; number is reporting limit.
- J - an estimated value.
- B - present in the method blank.
- E - exceeds instrument calibration limits.
- D - diluted samples.
- N - predigestion spike recovery was outside the ±1-25% control limits.
### SURFACE AND GROUNDWATER SAMPLING RESULTS (Continued)
#### INORGANIC CONSTITUENTS
##### (Group 3 of 3)

<table>
<thead>
<tr>
<th>Sample Name</th>
<th>Screened Interval</th>
<th>Date</th>
<th>Potassium, Soluble (µg/L)</th>
<th>Potassium, Total (µg/L)</th>
<th>Selenium, Soluble (µg/L)</th>
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</tbody>
</table>

(a) S indicates well screened in shallow overburden; D indicates well screened in deep overburden; R indicates well screened in bedrock

(b) Water quality standards taken from NYSDEC Water Quality Standards, Table 1, Section 703.5. Where no value is given, standard was not listed on table.

---

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