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PHASE II HYDROGEOLOGIC INVESTIGATION WORK PLAN/SAMPLING PLAN/ QUALITY ASSURANCE PROJECT PLAN HI-MILL MANUFACTURING COMPANY HIGHLAND, MICHIGAN

Revision #4

GERAGHTY & MILLER, INC.
Environmental Services

GERAGHTY
& MILLER, INC.
Environmental Services

Ground Water *Engineering* *Hydrocarbon* *Remediation* *Education*

September 30, 1991

Ms. Karla L. Johnson
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

RE: Fourth Revision, Hi-Mill Manufacturing Phase II Investigation Work Plan/
Sampling Plan and QAPP Addendum
Project #MI135.01

Dear Ms. Johnson:

Geraghty & Miller is pleased to submit six copies of the Hi-Mill Manufacturing Company revised Phase II Hydrogeologic Investigation Work Plan/Sampling Plan (Phase II Work Plan).

If you have any questions regarding the enclosed document, please do not hesitate to contact us.

Respectfully submitted,

GERAGHTY & MILLER, INC.

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PHASE II
HYDROGEOLOGIC INVESTIGATION
WORK PLAN/SAMPLING PLAN/
QUALITY ASSURANCE PROJECT PLAN
HI-MILL MANUFACTURING COMPANY
HIGHLAND, MICHIGAN

Revision #4

September 24, 1991

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PHASE II
HYDROGEOLOGIC INVESTIGATION
WORK PLAN/SAMPLING PLAN/
QUALITY ASSURANCE PROJECT PLAN
HI-MILL MANUFACTURING COMPANY
HIGHLAND MICHIGAN

1.0 INTRODUCTION

In order to form a sound technical basis for choosing the appropriate remedial alternative for the Hi-Mill site (Figure 1.0), Geraghty & Miller has identified several data collection activities which need to be performed or addressed prior to drafting the Remedial Investigation Report and initiating the Feasibility Study. A technical memorandum was submitted to the EPA in January outlining the outstanding data requirements. These data requirements will be addressed during Phase II of the investigation. The Phase II investigation will include an Ecological Inventory/Assessment. The Ecological Inventory/Assessment has been presented under a separate cover. However, prior to initiating field activities, the Work Plan for the Ecological Inventory and the Work Plan for the Hydrogeological Investigation will be combined into a single document.

Geraghty & Miller has developed this Work Plan for a Phase II Hydrogeologic Investigation (Phase II Work Plan) to supplement the information produced during the Phase I study and to address the data "gaps" identified in the January 1991, Hi-Mill Technical Memorandum (Technical Memorandum). This Phase II Work Plan provides a description of the Phase II field activities, the anticipated sample collection procedures, and the project organizational structure. The Hi-Mill Quality Assurance Project Plan (QAPP) and the Site Safety Plan (SSP) which typically accompany the Work Plan were previously produced by the Techna Corporation (Techna). All work performed in Phase II of the investigation will be in accordance with the United States Environmental Protection Agency (USEPA) approved QAPP and SSP produced by Techna. Any deviations from the procedures outlined in the Techna QAPP will be explained in the Work Plan or be presented to the USEPA for their approval prior to initiating the change. The Geraghty & Miller QAPP for the portable gas chromatograph is provided in Appendix A.

This Phase II Work Plan is a based upon the Technical Memorandum submitted and approved by the USEPA. It incorporates the concerns expressed by the USEPA and the MDNR with additional development by Geraghty & Miller. Although some of the specifics may have changed, the objectives remain the same.

2.0 PROJECT DESCRIPTION

The focus of the hydrogeologic investigation is to gain a better understanding of the flow directions and water quality in the shallow unconfined saturated zone, and the intermediate confined aquifer. It is also important to understand the interactions between the ground water and surface water at the site.

The current understanding of the site is that there are at least three saturated permeable unit within the unconsolidated material, the shallow saturated zone, the intermediate aquifer, and the deep aquifer. The shallow saturated zone is zero to 10 ft thick, this unit is separated from this underlying intermediate aquifer by 15 ft to 20 ft of less permeable silt and clay. This less permeably layer potentially acts as a confining layer between the shallow and intermediate ground-water flow system.

The intermediate aquifer is 25 ft - 30 ft thick and is separated from the deep aquifer by another less permeable clay layer. Based upon the three wells that fully penetrated this clay layer its thickness ranges from approximately 2 ft to 20 ft. This clay may also function as a confining unit, separating the intermediate and deep aquifer ground water flow systems.

The thickness of the deep aquifer is unknown at this time. Regional geologic information suggests that 200 ft to 400 ft of unconsolidated material is present in the area of the site[1]. it is not known if this is the deepest aquifer within the unconsolidated material at the site or if yet another deeper aquifer exists.

The bedrock beneath the unconsolidated material consists of the Coldwater Shale[1].

After reviewing the information generated during Phase I of the field investigation, the Technical Memorandum identified four issues at the site which need to be addressed during the Phase II investigation. These include 1) the hydraulic connection between Target Pond and Waterbury Lake; 2) the flow direction of shallow ground water west of the Hi-Mill facility;

[1] Hydrogeologic Atlas of Michigan Department of Geology, College of Art and Sciences, Western Michigan University, Kalamazoo, Michigan, 1981.

3) the water quality in the intermediate aquifer downgradient of the site, and; 4) confirmation of the extent and concentrations of the chemical constituents identified during Phase I of the investigation.

To further define the existing site conditions at the Hi-Mill facility and to address the data requirements identified in the Technical Memorandum, various investigative techniques will be employed during the Phase II investigation. The nine tasks proposed in the Work Plan are shown below. They represent a phased approach that Geraghty & Miller recommends before the Feasibility Study can be developed.

- TASK 1: Piezometer Installation and Staff Gauge Replacement
- TASK 2: Hand Auger Borings with On-Site Gas Chromatograph Analysis
- TASK 3: Soil Boring Installation
- TASK 4: Vertical Profiling Activities, (and Possible Monitoring Well Installation If Constituents of Concern Are Detected As a Result of Field Screening)
- TASK 5: Monitoring Well Installation
- TASK 6: Site Survey
- TASK 7: Collection of Static Water Levels
- TASK 8: Monitoring Well Sampling
- TASK 9: Phase III Field Investigation (If Necessary)

Phase II of the investigation entails installing seventeen piezometers, three vertical profiling borings, at least two monitoring wells, (additional monitoring well(s) will be installed in the vertical profile borings if constituents of concern are detected as a result of the gas chromatograph field screening), four soil borings and a minimum of ten hand auger borings. A portable gas chromatograph (GC) will also be used in conjunction with the drilling activities to augment the understanding of any contaminant distribution on-site.

The piezometer and staff gauge installation activities of Task 1 are designed to collect ground-water and surface water elevations in the shallow flow system. The measured ground-water elevations obtained from the piezometers will provide information on a potential westerly ground-water flow direction in the shallow saturated zone and the potential hydraulic connection between Target Pond and Waterbury Lake. As shown in Figure 2.0, the piezometer

locations are concentrated on the west side of the Hi-Mill facility and in the area between Target Pond and Waterbury Lake. The increased areal coverage provided by the newly installed piezometers will allow Geraghty & Miller to better define the shallow flow system surrounding the Hi-Mill facility.

As discussed in the Technical Memorandum, four of the six staff gauges installed at the site have undergone intense weathering and are now unreadable. Therefore Geraghty & Miller is proposing to replace staff gauges SG-1, SG-2, SG-3 and SG-4 (Figure 2.0) to facilitate accurate readings during future monitoring activities.

Task 2 will entail collecting ground-water samples from hand augured boreholes and the piezometers installed in Task 1 in an effort to delineate the extent of the shallow ground-water impact potentially caused by former site operations. The ground-water samples collected will be analyzed by a portable gas chromatograph for the presence of volatile organic compounds. The study will analyze samples from the east and west side of the facility to determine if the existing shallow monitoring wells provide sufficient coverage to monitor impacted areas.

Four soil borings will be installed during Task 3 in areas surrounding the former solvent tanks (Figure 2.0) to supplement the data generated during the Phase I investigation. The analytical results obtained from the soil samples collected during the installation procedures will provide information on the horizontal and vertical extent of impacts.

Task 4 of the RI will include vertical profiling of the intermediate aquifer and field screening of ground-water samples with a field gas chromatograph. If contaminants are detected in any vertical profile borehole as a result of the ground-water field screening, a monitoring well will be constructed in that borehole.

The Technical Memorandum identified three distinct ground-water flow systems at the Hi-Mill site: a shallow perched flow system; an intermediate flow system; and a deep flow system. The vertical profiling activities outlined in Task 4 of the Phase II Work Plan will attempt to detect any impacts in the intermediate aquifer caused by former plant operations and identify the optimal screen placement for the intermediate monitoring wells installed

during Task 5 (Figure 2.0). At least two monitoring wells will be installed, additional wells will be installed if any constituents of concern are detected in a vertical profile borehole,

In order to expedite the project schedule and achieve maximum efficiency from personnel and equipment on-site, the vertical profiling borings and hand auger boring activities, described in Task 2 will proceed simultaneously. This will maximize the use of the on-site portable GC by utilizing it to screen ground-water samples collected from the hand-augured boreholes, the piezometers and vertical profile borings.

After the piezometers, staff gauges, and monitoring wells have been installed, a site survey (Task 6) will be performed to combine all data points to an identical government (USGS) datum. A complete round of static water elevations (Task 7) will then be collected to generate a potentiometric surface map for each flow system and confirm the existing flow directions.

A second round of ground-water sampling (Task 8) is scheduled at the site to confirm the nature and extent of impacted areas. Ground-water samples will be collected from each shallow, intermediate and deep monitoring well in an effort to determine the horizontal and vertical extent of contamination. After the field activities are complete, Geraghty & Miller and the USEPA will review the results of the Phase II study to evaluate whether additional work will be required.

To assure compliance with the project QAPP and adhere to the schedule outlined above, Geraghty & Miller will have at least two geologists on-site for the duration of the field work. The anticipated project schedule is presented in Appendix C.

2.1 Piezometer Installation

2.1.1 Purpose

Seventeen piezometers will be installed in designated areas surrounding the site to help delineate the flow regime of the shallow saturated zone. The purpose of installing the piezometers is to: 1) help determine the hydraulic connection between Target Pond and Waterbury Lake; 2) help determine if a westerly ground-water flow direction exists in the

shallow saturated zone; and 3) assist in determining if the bentonite seals in monitoring wells SW-12 and SW-15 are competent. The piezometers may also be used as data points during the plume delineation activities to obtain semi-quantitative GC analytical results. No quantitative samples will be collected from the piezometers.

2.1.2 Piezometer Locations

Figure 2.1 shows the approximate location of each piezometer. Static water elevations will be collected from the piezometers on a quarterly schedule to determine seasonal fluctuations in water levels. Piezometers P1, P2 and P3 will be installed between Target Pond and Waterbury Lake. The static water level elevations collected from these three piezometers will help determine the hydraulic connection between the two surface water bodies.

Piezometers P4, P5 and P6 will be installed in the area adjacent to monitoring wells SW-12 and SW-15. The static water elevations collected from these three piezometers will help indicate whether the exceptionally high static ground-water elevations observed in the two monitoring wells are representative of site conditions or whether the bentonite seals are incompetent. If the bentonite seals of Monitoring Wells SW-12 and SW-15 are found to be incompetent, the wells will either be replaced or abandoned. If the additional work proposed in the Phase II investigation indicates a shallow ground-water flow direction from the site towards the monitoring wells in question, the wells will be replaced. If the flow direction indicates shallow ground water flowing from the wells toward Target Pond, the monitoring wells will be abandoned after receiving EPA concurrence. Ground-water samples will be collected after the integrity of the seals are determined and wells replaced.

Piezometers P7 and P8 will be installed between the southwest corner of the Hi-Mill facility and the North Arm of Waterbury Lake. Static water elevations collected from these piezometers will confirm the potential gradient between the plant and the surface water body.

Piezometers P9, P10, P11, P12, P13, and P14 will be located on the west to north-west portion of the Hi-Mill property and on the adjacent state property. These piezometers will be used to confirm a possible westerly flow direction in the shallow saturated zone.

Piezometers P15, P16, and P17 will be installed north-west of the site, across M-59. Static water elevations collected from these piezometers will establish the shallow ground-water flow direction west of the highway and the Hi-Mill site.. The location of the MDNR request for a fourth piezometer installed west of M-59 is currently occupied by surface water and is monitored by staff gauge SG-6.

2.1.3 Piezometer Construction

The seventeen, 6-foot long, 1-inch inside diameter (ID), schedule 40 PVC piezometers will have 12 inches of No. 10 slot screening at their base. The design should be adequate since the shallow monitoring wells on-site (screens set in or above the brown clay) typically exhibited a static water elevation between 2 and 4 feet below ground surface.

2.1.4 Piezometer Installation

A Geraghty & Miller geologist will install the piezometers with a stainless steel hand auger and document the geology at each location. The hand auger will be equipped with a 1.5 inch outside diameter (OD) bucket auger at its base. The final depth of each piezometer may vary from borehole to borehole and will be dependant upon the depth to clay, the depth to water, and the lithology of the underlying soils. To avoid potential cross contamination between hydraulic regimes, the brown clay layer will never be fully penetrated during piezometer installation activities.

Each borehole will be advanced to the top of the brown clay layer and the bottom of each piezometer will be set on the surface of this brown clay. If the depth to the brown clay layer exceeds the practical reach of a hand auger, the piezometer will be installed at least three feet below the water table. This screen position will accommodate seasonal fluctuations in the water table and allow year-round monitoring of ground water elevations. Based on the top of clay map generated by Techna during their boring program on the east side of the Hi-Mill facility, it is expected that the majority of the piezometers will be set approximately 4 feet below grade. The final depth may also be dependant upon the character of the underlying soils. If the borehole will not remain open to the desired depth for the placement of the screen, the piezometer will have to be pushed as far as possible into the saturated zone.

The piezometers are constructed with a female threaded top. Therefore, should the brown clay or the saturated horizon not be encountered in the first five feet additional 5 ft section of riser could be added. The threads of the risers will be wrapped with teflon tape to ensure a tight, waterproof seal. The difference in head among the piezometers due to possible minor vertical differences in screen placement within the shallow aquifer will be negligible.

Once the brown clay is encountered, the piezometer will be inserted into the borehole and allowed to equilibrate for at least 24 hours prior to collecting static water elevations. After collecting the initial round of static water elevations, ground-water monitoring will continue on the same quarterly schedule dictated for the staff gauges and monitoring wells. The top of casing elevation for each piezometer will be surveyed to the nearest 0.01 foot after monitoring well installation (Task 5) activities are complete.

If the 1.5-inch OD bucket auger is restricting sample collection or is prohibiting proper piezometer installation, it will be replaced with a 3.0-inch OD auger bit. This conversion would not affect the objectives but it would require changes in the installation procedures described above. The piezometer installation technique with the 3-inch OD auger would be similar to those used in installing monitoring wells. Since the diameter of the bucket auger (3.0" OD) would be greater than that of the PVC piezometer (1.5" OD), clean silica sand would be used to fill the annular space. The sand pack would extend 6 inches above the screened portion of the piezometer. The remainder of the borehole would be completed with bentonite grout.

2.2 Staff Gauge Installation

2.2.1 Purpose

Due to extensive weathering and algae buildup on four of the six staff gauges installed by Techna during their Phase I investigation, Geraghty & Miller will replace staff gauges SG-1, SG-2, SG-3, and SG-4. Staff gauges SG-5 and SG-6 appear relatively clean and do not have to be replaced. The staff gauges are designed to monitor the surface water elevations in relation to the shallow ground-water system and local drainage basins. Staff gauge readings will be collected for one year on a quarterly schedule to determine seasonal fluctuations in water levels. During the quarterly monitoring activities, surface-water elevations will be

collected concurrently with the static water elevations from the piezometers and monitoring wells. Information obtained from all six of the staff gauges will be utilized in the Remedial Investigation.

2.2.2 Staff Gauge Location

Staff gauge SG-1 and SG-2 will be installed in Target Pond in locations similar to the present locations. Staff gauges SG-3 and SG-4 will be installed in Waterbury Lake. A site survey will be performed to collect top of casing elevations from all the gauges and the piezometers after the monitoring well installation activities (Task 5) are complete.

2.2.3 Staff Gauge Construction

The staff gauges will be constructed of rust resistant porcelain enameled iron to avoid discoloration. The staff gauges will be 3.5 inches wide, graduated in feet and tenths, and have the actual surveyed elevations fastened on a plank adjacent to it to facilitate easy, accurate readings. Two feet of the 5-foot section will be submersed in water to allow for seasonal fluctuations in the surface water elevation. The gauges will be mounted on a stake which will be driven at least two feet into the underlying surface water sediments.

2.3 On-Site Analysis of Ground Water

2.3.1 Purpose

A portable gas chromatograph (GC) will be utilized during the Phase II investigation to analyze ground-water samples collected during plume delineation and drilling activities. The GC analysis will be a semi-quantitative pre-screening tool used to delineate the extent of any VOC's surrounding the former lagoon and solvent tank areas.

The purpose of the study is to combine the semi-quantitative analytical data produced from the GC with the CLP analytical data from the monitoring well sampling activities and delineate the horizontal and vertical extent of VOC's. The portable GC analytical results will cover an area that extends radially from the suspected sources of contamination and therefore

give an indication of the horizontal extent the VOC's. The CLP laboratory results from samples collected from the existing shallow monitoring wells during well sampling activities will give an indication of the vertical extent the VOC's. In combining the analytical information from the two separate activities and comparing it to the interpreted ground-water flow direction of the shallow flow system, an assessment of whether the shallow monitoring well distribution is adequate to delineate the areas affected by VOC's can be made.

It should be noted that the analytical results of the GC survey will only be semi-quantitative. Due to the instrumentation utilized and the sample collection methodology, the analytical results may show a slight bias towards detected in the actual VOC concentrations. Since the analytical results produced from the portable GC are intended to be for field screening purposes, no duplicate samples are scheduled for a certified CLP analysis.

2.3.2 Hand Auger Boring Locations

The activities to define the limits of the VOCs detected in ground water in the shallow perched water table will focus on the east and west side of the facility. Ground-water samples collected from the shallow monitoring wells on the east side of the plant (Figure 2.3.2) will act as the initial data points. Additional hand auger borings will then be installed in locations necessary to complete the definition of the extent of the VOC's. The analytical results of the ground-water samples collected from hand augured boreholes will be used to delineate the extent of VOC's.

2.3.3 Hand Auger Boring Installation

During the installation of the hand auger borings, Geraghty & Miller will collect ground-water samples from the shallow saturated zone beneath the site. Stainless steel hand augers equipped with a 3-inch inside diameter bucket auger will be utilized to install 3- to 5-foot deep boreholes. The depth of the borehole will be dependant upon the depth to the top of the perched water table. The borings will extend to at least 2 feet below the water table, unless at that depth the boring will penetrate the brown clay layer. Based on the high clay content of previous samples collected at the site, it is expected that the boreholes will remain open, allowing them to fill with ground water. A disposable polyethylene bottom filling bailer will

be inserted into the borehole to collect a ground-water sample. The ground-water samples will be decanted from the bailer into a labeled 40 milliliter vial and submitted for a VOC field screening using the portable GC.

2.3.4 Gas Chromatograph Analysis

The VOC headspace analysis performed on each ground-water sample with the portable GC will help delineate the extent of VOC's in the ground water. A consistent ratio between sample volume and head space will be maintained in each vial to minimize potential sample bias. Since trichloroethene (TCE) is the volatile compound of primary interest, particularly close attention will be paid to the chromatogram peaks associated with TCE, dichloroethene (DCE) and vinyl chloride. DCE and vinyl chloride can both be degradation products of TCE.

In addition to its use during the investigation of the extent of VOC's in the shallow saturated zone, the portable GC will be utilized during the installation of the vertical profile borings VP-1, VP-2, and VP-3. The instrument to be used is a Photovac 10S50 or 10S70 field portable gas chromatograph. It is equipped with a photo-ionization detector using a lamp energy of 10.6 electron volts. The instrument is configured with a 10 meter CPSIL-5 wide-bore capillary column and isothermal oven capable of maintaining temperatures of either 30°, 40°, or 50° degrees Celsius. The integrator, plotter, and software are integral parts of the unit. The carrier gas used is a certified mixture of hydrocarbon free air.

Stock standards will be prepared by adding microgram quantities of spectrophotometric grade neat solvents into a known volume of spectrophotometric grade methanol. Fresh stock standards are prepared at no more than weekly intervals. Microliter quantities of the methanol stock standard are added to measured quantities of organic free distilled water in dilutions as needed to prepare a calibration standard. Calibration standards are prepared daily.

Analyses and calibrations are performed by a headspace method with quality control measures outlined as follows:

- Water samples will be measured in ug/L of water (parts per billion). Due to the complexity of extractions necessary for exact quantitative analysis in soil samples, soil

samples are measured in ug/kg of soil (parts per billion) relative to an aqueous standard. This procedure, used as a screening process, has proven to be quantitatively accurate when compared to soil samples split for analysis with independent laboratories using extraction procedures. If a more precise quantitative value is required for soil samples in the field, a water extraction can be performed, but will limit the number of analyses due to the additional time involved performing the extraction.

- Water samples to be analyzed by the GC will be prepared by filling a 40-ml vial approximately 1/2-full with ground water and tightly capping.

- All samples will be readied for analysis by placing in a heating block adjusted to 40° Celsius for a minimum of 20 minutes before analysis in order to bring all samples to an equal temperature. If analysis will proceed greater than 1 hour after sample collection, the samples will be kept on ice to inhibit volatilization of constituents in the samples.

- Injection syringes are kept beneath a heat lamp between injections to purge trace constituents. Syringes are tested for blockage before and after every injection. Syringe blanks using organic free water are routinely performed after calibration and at a minimum, one blank for every 10 samples is performed. When analyzing samples with elevated concentrations, syringe blanks are performed more frequently at the discretion of the operator. Reruns are performed at a minimum of 1 for every 10 samples to check data reproducibility.

2.4 Soil Boring Installation

2.4.1 Purpose

Four soil borings will be installed to a depth of approximately 15 ft in the area of the former solvent tanks using a truck-mounted drilling rig. These soil borings are being installed in this area to obtain samples from a greater depth than could be obtained using hand augers. The analytical data generated from the soil samples collected will provide information as to the horizontal and vertical extent of constituents of concern. These data will supplement the existing analytical data that was generated during the Techna Phase I Remedial Investigation.

2.4.2 Soil Boring Locations

Two of the four soil borings will be installed on the north side of the facility and the remaining two borings will be installed on the south side of the facility. Figure 2.1 shows the approximate location of each boring.

2.4.3 Soil Boring Installation

The soil borings will be installed using a 4.25 inch ID hollow stem augers. Each borehole will extend 15 feet below grade and will be sampled continuously using a CME continuous, 5-foot, stainless steel, split-spoon sampler. Non-beveled steel liners will be utilized in the continuous sampler to reduce sample disturbance. All soil sample cores will be screened for volatile organic compounds (VOCs) using a portable photo-ionization detector (HNU). The HNU field pre-screening will help identify appropriate soil samples which will be sent to the ENSECO - Rocky Mountain Analytical Laboratory (ENSECO) for TCL, VOC's and metals (short list) analysis. Upon completion of each boring, the borehole will be filled from the bottom up with a bentonite slurry using a tremmie pipe. The borehole will be finished with a concrete pad that rests flush with the surrounding ground surface. The ground surface elevation will be surveyed to enable correlation of data during the remedial investigation report. All cuttings will be containerized and stored in a secure location.

2.4.4 Soil Boring Sampling

It is anticipated that two soil samples from each borehole will be submitted for subsequent VOC and metals (short list) analysis. Soil samples being submitted to ENSECO for a analysis will be transferred from the split spoon directly into the appropriate sample container provided by the laboratory. All other sample collection methodologies will be performed according to Section 2.4.5 of Techna's Site Sample Plan.

2.5 Vertical Profiling Borings

2.5.1 Purpose

According to the July 25, 1991, EPA dispute resolution ruling, vertical profiling activities will be conducted at three locations at the Hi-Mill site to characterize the ground-water quality in the intermediate aquifer.

The ground-water samples collected during the installation activities will be analyzed for volatile organic compounds (VOCs), pH, conductivity and temperature. The VOC analysis will be conducted with a portable gas chromatograph. The pH and conductivity readings will be obtained from a calibrated pH/conductivity meter and the temperatures will be recorded from a digital thermometer.

2.5.2 Vertical Profile Location

As specified in the July 25, 1991, EPA dispute resolution ruling, vertical profiling activities will be initiated in three locations at the site to evaluate the water quality in the intermediate aquifer and to determine the optimal screened intervals for the intermediate monitoring wells installed during the Phase II investigation. The first vertical profile boring (VP-1) will be completed in an area that is hydraulically downgradient of the former solvent tank located on the north side of the facility. The second vertical profile boring (VP-2) will be completed east of the Hi-Mill facility in the area between Monitoring Wells SW-8 and SW-10. The third vertical profile boring (VP-3) will be completed in an area that is hydraulically downgradient of the former solvent tank located on the southwest side of the facility. The approximate locations of the vertical profile borings are shown on Figure 2.0. The actual locations for the vertical profiles will be field approved by the USEPA.

2.5.3 Vertical Profile Methodology

The vertical profiling techniques considered for the Hi-Mill site included an auger pull back method, a screened auger method and a drive screen sampling system (Hydropunch II™). The Hydropunch II™ ground-water sampling system was selected to perform the vertical

profiling activities due to its cost effective means for obtaining representative ground-water samples and its adaptability to hollow-stem auger drilling techniques. However, if sample collection problems are encountered with the Hydropunch II™ during field operations, an alternate profiling method may be utilized. The alternate profiling method selected will be approved by the USEPA prior to implementation.

The Hydropunch II™ is two inches in diameter and 55.5-inches long. It is constructed with a stainless steel barrel and a hardened carbon steel drive shoe. It is also equipped with a 5.25-inch, 120-mesh stainless steel screen. Additional construction details for the Hydropunch II are provided in Appendix D. The Hydropunch II sampling procedures are described below.

2.5.4 Vertical Profile Boring Installation

To minimize the potential of introducing surface contamination into the intermediate aquifer a 10-inch ID, Schedule 80 PVC casing will be installed at each of the three boring locations. The 10 inch ID casings will be installed using 12.0-inch ID hollow-stem augers and will extend from ground surface to the first significant clay layer. Each protective casing will be sealed in place with a bentonite cement grout. According to the boring logs and geophysical logs developed in the previous investigation, the depth to the first significant clay layer varies at each location selected by the EPA. The logs also indicate that the depth to the top of the intermediate aquifer and its saturated thickness varies across the site.

According to the boring logs developed by Techna for Monitoring Wells IW-3 and DW-2, the top of the intermediate aquifer in the vicinity of VP-1 is approximately 40 ft below land surface (bls). The MDNR gamma log from the abandoned production well on the north side of the facility suggest the top of the intermediate aquifer is located about 35 ft bls. Based on the information presented in the Techna boring logs and the MDNR geophysical log, it is anticipated that the 10-inch ID PVC double casing for Vertical Profile Boring VP-1 will be installed to a depth of 30 ft bls.

According to the Techna boring logs developed for Monitoring Wells IW-5 and DW-3, the clay layer overlying the intermediate aquifer in the vicinity of VP-2 terminates at

approximately 28.5 ft bls. Therefore, prior to installing VP-2, it is anticipated that a protective casing will be set to 25 ft bls.

A review of the Techna boring log from Monitoring Well SW-1 and the MDNR gamma log from the abandoned production well on south side of the facility suggest that the top of the intermediate aquifer in the vicinity of VP-3 is approximately 25 ft bls. Based on the available data, the 10-inch PVC protective casing will be installed to a depth of 20 ft bls.

To assure that the 10-inch ID, Schedule 80 PVC casings are seated in a competent, low permeability clay horizon, a split-spoon sample will be collected once the specified depths are reached. If the split spoon sample contains geologic materials consistent with low permeable clay identified in the logs the 10-inch ID casing will be installed and permanently grouted.

After allowing adequate time for the bentonite-cement grout to set, the cement plug will be broken and drilling activities will continue with 4.25-inch ID hollow stem augers. During the drilling activities, continuous split-spoon samples will be collected until the intermediate aquifer is encountered. According to the boring logs, the depth is expected to be approximately 40 feet bls at VP-1, 28.5 feet bls at VP-2, and 25 feet bls at VP-3. Once the top of the intermediate aquifer is identified, a pre-cleaned hydropunch will be attached to the drive rods and driven approximately 2.0 feet into the uppermost undisturbed horizon. The hydropunch will then be withdrawn approximately 18 inches. This retraction will expose the stainless steel screen and allow ground water to hydrostatically fill the hydropunch sample chamber with a representative water sample from an undisturbed horizon in the formation. During the hydropunch recovery, a ball (check) valve in the sampling device will close and allow the ground-water sample to be retrieved at the surface. This removal procedure will also disconnect the drive point, which will remain in the ground. After decanting the ground-water sample from the hydropunch, the sampling device will be disassembled and decontaminated prior to collecting the next sample. If sufficient head does not exist to fill a Hydro Punch II, a HydroPunch I™ or screened auger will be used to collect the ground-water sample.

After the first ground-water sample is collected and the HydroPunch removed from the center of the hollow-stem augers, the augers will be advanced to the approximate depth at which the ground-water sample was collected. A confirmatory geologic sample will then be

taken using a 2-ft split-spoon sampler. The HydroPunch will then be placed into the center of the hollow-stem augers, driven five feet deeper into the formation and a ground-water sample collected. The HydroPunch will be removed from the center of the hollow-stem augers and the augers will be advanced five feet. This will place the augers at the approximate depth at which the second ground-water sample was collected. The process of taking a confirmatory geologic sample and driving the HydroPunch another five feet and collecting a ground-water sample will then be repeated.

This procedure of collecting a confirmatory geologic sample, a ground-water sample and advancing the hollow-stem augers will continue at 5-ft intervals until the base of the intermediate aquifer is reached. Based upon the boring and gamma logs the anticipated thickness of the intermediate aquifer is 25 to 30 ft. Therefore five or six ground-water samples and confirmatory geologic samples will be collected from each vertical profile boring. After collecting the last sample and reaching the base of the intermediate aquifer, the MDNR will gamma log the borehole. The confirmatory geologic samples will be correlated to the gamma log.

If VOCs are detected by the gas chromatograph field screening, a monitoring well will be constructed similar to the monitoring wells described in Section 2.6.3. The screen will be placed at the depth from which the sample that contained the highest concentration of VOCs was taken. If VOCs are not detected, the boring will be abandoned by plugging with bentonite cement grout pumped down the borehole using a tremie pipe.

All ground-water samples collected during the vertical profiling activities will be analyzed using the on-site portable GC for VOCs according to the methodologies outlined in Section 2.3.4 of this Work Plan. The samples will also be checked for pH, temperature, and conductivity. If ground-water impacts are identified during the vertical profiling activities, the analytical results obtained from the GC will be reviewed to determine the optimal screen placement for the proposed monitoring well installations.

2.6 Monitoring Well Installation

2.6.1 Purpose

Two additional wells (IW-6 and IW-7) will be installed in areas hydraulically downgradient of the Hi-Mill facility to evaluate the ground-water quality of the intermediate aquifer. Three more additional wells (VP-1, VP-2, and VP-3) may be installed if ground-water impacts are identified during the installation of the vertical profile borings. During the drilling activities, particularly close attention will be paid to the screened interval elevation of monitoring well SW-1, which showed concentrations of both trichloroethene (TCE) and dichloroethene (DCE). TCE was also periodically identified in ground-water samples collected from a former (since abandoned) production well in the same area.

Additional replacement wells may also be installed during the Phase II Investigation if the data collected from Piezometers P4, P5 and P6 show the integrity of the bentonite seals in Monitoring Wells SW-12 and SW-15 are incompetent. If the bentonite seals are determined to be incompetent, the wells will be abandoned or replaced. The wells will only be replaced if the shallow ground water is determined to be flowing from the former potential source areas towards the monitoring wells.

2.6.2 Monitoring Well Locations

According to the July 25, 1991 EPA dispute resolution ruling, one (IW-6) of the two monitoring wells to be installed in the Phase II investigation will be located adjacent to Intermediate Well IW-1 on the westside of the Hi-Mill facility in an area hydraulically downgradient of the former potential sources of contamination (Figure 2.0). The position of the second well (IW-7) was selected based on the westward flow direction of the intermediate aquifer, the constituents of concern detected in the soil around the former tank location on the south side of the facility, the former lagoon locations, and the volatile compounds detected in ground water from monitoring well SW-1.

2.6.3 Monitoring Well Construction

Both monitoring wells installed will be constructed with a 5-foot, 0.01-inch slot, continuous strand, wire wrap, 304 stainless steel screen. The intermediate wells will be constructed with 10-inch ID, Schedule 80, PVC surface casing to minimize the possibility of cross contaminating the intermediate aquifer. Boreholes for both monitoring wells will be advanced using hollow stem augers (HSA).

2.6.4 Monitoring Well Installation

Boreholes for each monitoring well will be initially advanced using 12.25 inch ID hollow stem augers. Soil samples will be collected continuously using a CME continuous 5-foot split-spoon sampling device. Non-beveled steel liners will be utilized in the continuous sampler to reduce disturbance. If the unconsolidated deposits are not conducive to recovering 5-ft cores, the drilling rig will be converted to perform sample collection with 2-ft stainless steel split spoons. The 2-ft split spoon will be driven and continuous amples collected in accordance with ASTM Method D1586-84, "Standard Method for Penetration Test and Split-Barrel Sampling of Soils."

The July 25, 1991, EPA dispute resolution ruling specified that one of the monitoring wells (IW-6) should be installed in the intermediate aquifer with its well screen set at a depth equal to 2/3's of the thickness of the aquifer. Therefore this soil boring will continue until the lower confining layer of the intermediate aquifer is reached. The depth of the screened interval will then be calculated from the actual measurements of the aquifer thickness. The portion of the soil boring below the screen will be plugged back by backfilling with either untreated angular bentonite chips or a bentonite slurry. If a bentonite slurry is used, it will be placed into the boring using a tremie pipe. Approximately one foot of additional sand pack material will be placed between this backfill material and the bottom of the well screen to prevent the bentonite from reaching the screen.

The second monitoring well (IW-7) is also planned to be installed downgradient of the site, off of the Hi-Mill property (Figure 2.1). Construction of Monitoring Well IW-7 will be similar to that of IW-6. Both wells will be constructed with a 2-inch diameter, 5-foot stainless

steel screen and a PVC riser. Based on information obtained from the boring logs of Monitoring Wells SW-1 and SW-2, and the gamma log of the abandoned production well on the south side of the facility, it is likely that the proposed Monitoring Well IW-7 could be installed in an geologic setting which contrasts that of the east side of the facility. Geraghty & Miller suspects that there might be a saturated sand seam present within the brown clay that is unrelated to the shallow or intermediate flow systems previously defined by Techna. The additional geophysical activities proposed to be implemented by the MDNR should help delineate this horizon, if it exists.

If a saturated sand seam is encountered at a depth similar to the screened elevation (12 to 17 feet below grade) of monitoring well SW-1, it is anticipated that IW-7 would be installed as a shallow monitoring well. The field decision on whether a shallow monitoring well is set will be based on the discretion of the on-site geologist, the associated HNU readings, the portable GC analytical results, gamma logging and the concurrence of the USEPA representative. If the on-site geologist and the EPA representative feel the saturated unit is of sufficient water bearing capacity or the saturated horizon shows any indications of VOC contamination, Monitoring Well IW-7 will be set in the shallow saturated zone.

If a saturated sand seam is not encountered, the 12.25-inch augers will be advanced an additional 5 feet to ensure that significant sand seams are not detected and that the augers are seated in a clayey formation suitable for double casing. The double casing will consist of sufficient length of 10-inch ID, Schedule 80 PVC casing grouted in place to effectively seal off the shallow saturated zone from the intermediate aquifer. After adequate curing time, drilling will continue with 4.25-inch ID augers until the depth of the interval that is to be screened is reached. A monitoring well will then be constructed.

The sand pack will extend from approximately 0.5 ft. below the screen to 2 ft. above the screen. 1 ft. to 2 ft. of untreated bentonite pellets will be placed above the sand pack. If the depth of standing water above the sand pack is greater than approximately 15 ft, 1 ft to 2 ft of fine sand will be substituted for the bentonite pellets. The reason for this is the bentonite pellets may swell and bridge over in the annular space between the riser and formation before reaching the top of the sand pack. The fine sand will serve the same purpose; to keep the bentonite grout that will be placed above it from reaching the sand pack.

Once the sand pack and bentonite pellets (or fine sand) are installed, a bentonite grout will be pumped down the borehole through a tremie pipe. Grout will continue to be pumped through the 4.25-inch augers as the augers are retrieved. After the 4.25-inch augers are removed, additional quantities of grout will be pumped between the 10-inch ID PVC casing and the monitoring well riser pipe. Well completion procedures for the monitoring wells completed in the Phase II investigation will be identical to those outlined by Techna in Section 2.5.2 of Techna's Hi Mill Manufacturing Company Remedial Investigation Feasibility Work Plan, Site Safety Plan, Quality Assurance Project Plan. (October 26, 1989).

During any portion of the investigation where the drill rig must occupy part of the highway, traffic control measures which comply with the Michigan Department of Transportation (MDOT) specifications will be initiated.

2.6.5 Monitoring Well Soil Sampling

To ensure that any existing sand seams are identified by the on-site geologist, the borehole for each monitoring well will be continuously sampled using a CME, continuous, five-foot, stainless steel, split-spoon sampler. With the high clay content of the underlying soils, the 5-ft split-spoon sampler will recover superior samples and should provide superior geologic correlation efforts in the RI report. All soil sample cores will be screened for volatile organic compounds (VOCs) using a portable photoionization detector (HNU). It is anticipated that the two soil samples with the highest HNU reading from each borehole will be submitted to the selected laboratory for VOC and metals analysis. It is also anticipated that a sample of the brown clay horizon from each hole will be submitted to the Materials and Testing Company of Grand Rapids for a falling head vertical permeability analysis and a soil classification analysis according to the Unified Soil Classification System. Soil samples being submitted for a CLP VOC and metals analyses will be transferred from the split spoon directly into the appropriate sample container provided by the laboratory. All other sample collection methodologies will be performed according to Section 2.4.5 of Techna's Site Sample Plan.

If constituents of concern are detected in ground-water in either of the wells installed during phase II, additional well installation may be necessary to determine the extent of the constituents of concern. All additional work would be subject to approval by the USEPA. If

the additional work required field activities on State property, access and drilling permits would have to be obtained from the State of Michigan or MDOT.

Upon completion of the monitoring well installation procedures, a site survey will be conducted to collect ground surface and top of casing elevations for each piezometer, staff gauge, Phase II monitoring well, and all existing shallow monitoring wells. These standing elevations will be referenced to a USGS benchmark and recorded to the nearest one-hundredth (.01) of a foot. Some of the existing, pre-Phase II wells will be resurvey at this time to provide a check of the accuracy of the surveying.

2.7 Monitoring Well Sampling

Based on an inventory of raw materials which Hi-Mill has utilized during past and present plant operations, Geraghty & Miller recommends that the sample analysis plan for the project be modified. This modification is also suggested after reviewing the limited distribution of constituents detected in the first round of ground-water samples collected at the site.

The Phase I analytical suite for ground-water samples included a short list metals analysis, an expanded inorganics analysis, a volatile organic analysis, a polynuclear aromatic hydrocarbon analysis, a pesticide and PCB analysis, and an ammonia, nitrate, and nitrite analysis.

The raw materials inventory performed at the site indicated that the parameters contained in several of the above analyses were never used on-site. Based upon the inventory the only hazardous substances Hi-Mill potentially would have released to the surrounding environment were heavy metals and/or volatile organic compounds. The first round of sampling confirmed the presence of only these two particular types of constituents. Results from Phase I also confirmed the absence of any PCBs, pesticides, or polynuclear aromatic hydrocarbons on-site. These Phase I sampling results were verified in laboratory validation procedures which documented their integrity. Therefore, due to the fact that PCBs, pesticides, and polynuclear hydrocarbons were never known to have been utilized at the site and the fact that they were all non-detectable in the first round of sampling, Geraghty & Miller has

proposed eliminating them from the analytical suite of Phase II. The first round of sampling also indicated that nitrogen compound levels in the ground water should not be a concern; therefore, analyses for nitrates, nitrites, and ammonia nitrogen are not being included. The scheduled analysis for the Phase II investigation is now limited to the parameters of concern at the site: metals and VOCs.

Due to the former plant processes and associated disposal practices, the shallow soils and ground water pose the greatest potential for contamination and routes of migration (Figure 2.7-1). It is therefore recommended that all the shallow monitoring wells be sampled for both metals and VOCs. The Phase II results of the metals and VOC analyses will help confirm the impacts detected in the Phase I sampling event.

Constituents of concern were not detected in any of the Phase I laboratory analysis for the intermediate wells and according to the geologic interpretation presented in the Hi-Mill Technical Memorandum, the only documented migration pathway for the constituents of concern is by seepage through Target Pond. Based on the up-gradient location of wells, IW-5, SW-17, SW-18, and SW-19, the relatively long migration pathway from the source, and the thickness of the underlying clay layer, it is very unlikely that metals or VOCs from the Hi-Mill facility would be present in those up-gradient wells. However, at the request of the MDNR, all four of those wells will be sampled for metals. Monitoring well IW-5 will also be sampled for VOCs.

Intermediate wells IW-1, IW-2, IW-3 and IW-4 are located downgradient from Hi-Mill or located in areas underlying surficial contamination. It is therefore recommended that these wells be sampled for both metals and VOCs. The two or more additional wells installed west of the facility during Phase II activities will also be sampled for metals and VOCs.

If VOCs are detected by the gas chromatograph field screening of ground-water samples collected during the vertical profiling (VP-1, VP-2 and VP-3) of the intermediate aquifer, a monitoring well will be installed in the vertical profile boring from which the sample of contaminated water was taken. Any monitoring wells installed in a vertical profile borehole will be sampled for VOCs and the short list of dissolved metals.

The Phase I sampling results indicated no constituents of concern are present in the deep monitoring wells on-site (Figure 2.7-3). Although the potential source for direct vertical migration has been eliminated, the MDNR has requested all the wells be sampled. Therefore, following the sampling plan initiated in Phase I, monitoring wells DW-1, DW-2, AND DW-3 will be sampled for metals and VOCs.

A laboratory analysis for total metals (unfiltered) will be performed on ground-water samples collected from seven monitoring wells at the site. The seven wells selected include shallow Monitoring Wells SW-1 and SW-7; Intermediate Monitoring Wells IW-1, IW-2, IW-3, and IW-6; and Deep Monitoring Well DW-3.

In summary, Phase II of this investigation will entail collecting ground-water samples from at least 31 monitoring wells (This number will increase if wells are constructed in any vertical profile boring). Present and proposed well locations are anticipated to provide information on water quality up-gradient, adjacent to, and downgradient of the facility. At least 31 wells identified in Table 2.7-1 will be analyzed for the six short list metals (Al, Cr, Cu, Ni, Ag, and Zn). At least 27 of the 31 wells will be analyzed for the CLP volatile organic compounds. At least seven monitoring wells at the Hi-Mill facility will be analyzed for total metals on the short list (unfiltered). Also, should a monitoring well be constructed in a vertical profile boring that well will be sampled for VOCs and dissolved metals. With the exception of the analyses that were eliminated, the proposed Phase II analytical suite is identical to the one performed in Phase I. A summary table showing the type and number of samples to be generated is provided in Table 2.7-2. The list of the chemical compounds to be analyzed for, and their respective analytical methods are listed in Table 2.7-3.

2.8 Monitoring Well Sampling Equipment

All monitoring wells will be purged with a dedicated inertial pumping apparatus coupled with a centrifugal pump. The centrifugal pump will only be used to evacuate adequate volumes of ground water from each well prior to sampling. During the actual sampling event, only the inertial pump will be used.

The inertial pumping apparatus consists of a sufficient length of high density polyethylene tubing with an attached foot valve (check valve) at its base. By continuously rising and lowering the rigid tubing, water is injected and trapped in the tubing. Once the entrapped water column equals the height of the tubing, water is expelled from the open end into a container at the top of the well. The dedicated HDPE tubing protects the ground-water sample from exposure to the atmosphere and prevents potential pathways for cross contamination. That is, if low concentrations of organics are detected in the ground-water samples, they would not be attributable to the dedicated, relatively inert HDPE.

A minimum of 3 to 5 well volumes will be removed from each well with the dedicated tubing prior to sampling to ensure a representative sample is being collected. Field parameters (pH, temperature, and conductivity) will also be collected from each well to document formation stability.

3.0 PROJECT SCHEDULE

A copy of the project's proposed task schedule and its associated time frame is included in Appendix C. The chronology of the tasks to be performed should not vary from the schedule. However, if any dramatic deviations should occur, the USEPA will be notified immediately. The time frames listed on the table are, at this point, best estimates and should be considered relative.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Geraghty and Miller's Detroit office will manage all administrative aspects of the project. It will also be responsible for the implementation and management of field activities; monitoring adherence to field QA/QC and Health and Safety protocols; data generation, interpretation, tabulation, and review; and coordinating the transfer of that data to the designated authorities.

Key contacts and personnel involved in the Hi-Mill project are listed below and on the project organization chart (Figure 8.5).

United States EPA
Region 5
Karla L. Johnson
230 South Dearborn Street
Chicago, Illinois 60604
Phone: (312) 886-5993

Butzel Long
Robert C. Davis
150 West Jefferson
Detroit, MI, 48226-4430
Phone: (313) 225-7042

Geraghty & Miller, Inc
Kevin K. Wolka
50 W. Big Beaver Road
Suite 145
Troy MI, 48084
Phone: (313) 524-9030

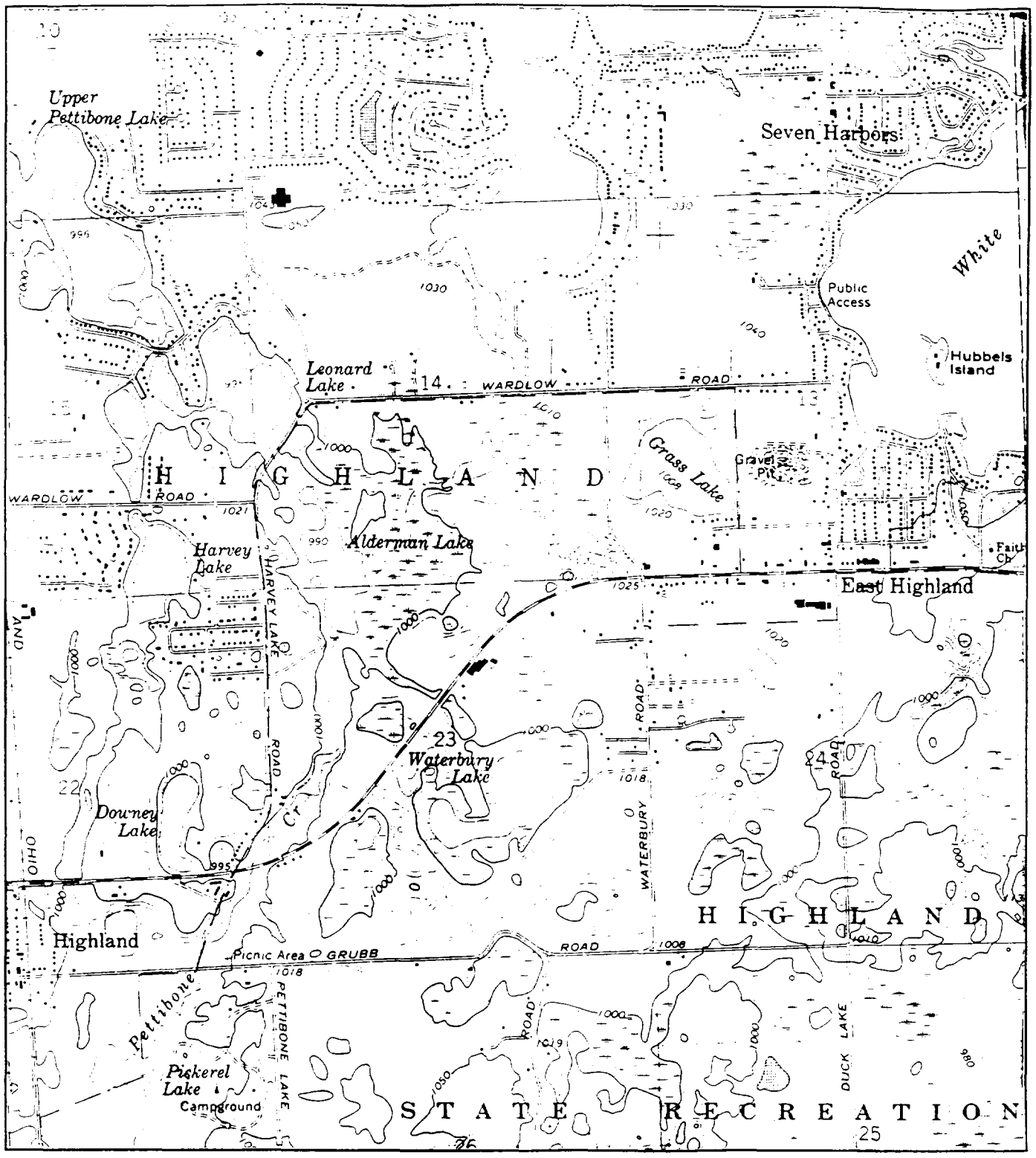
Respectfully submitted,

GERAGHTY & MILLER, INC.

Gordon L. Hotchkiss	Kevin K. Wolka	Edward R. Rothschild
Staff Scientist	Manager, Ground-Water Services	Regional Vice President

KKW

FIGURES



SOURCE: USGS 7.5 Minute Topographic Map, HIGHLAND, MICHIGAN Quadrangle 1983

N

0 1000 2000 4000

SCALE IN FEET

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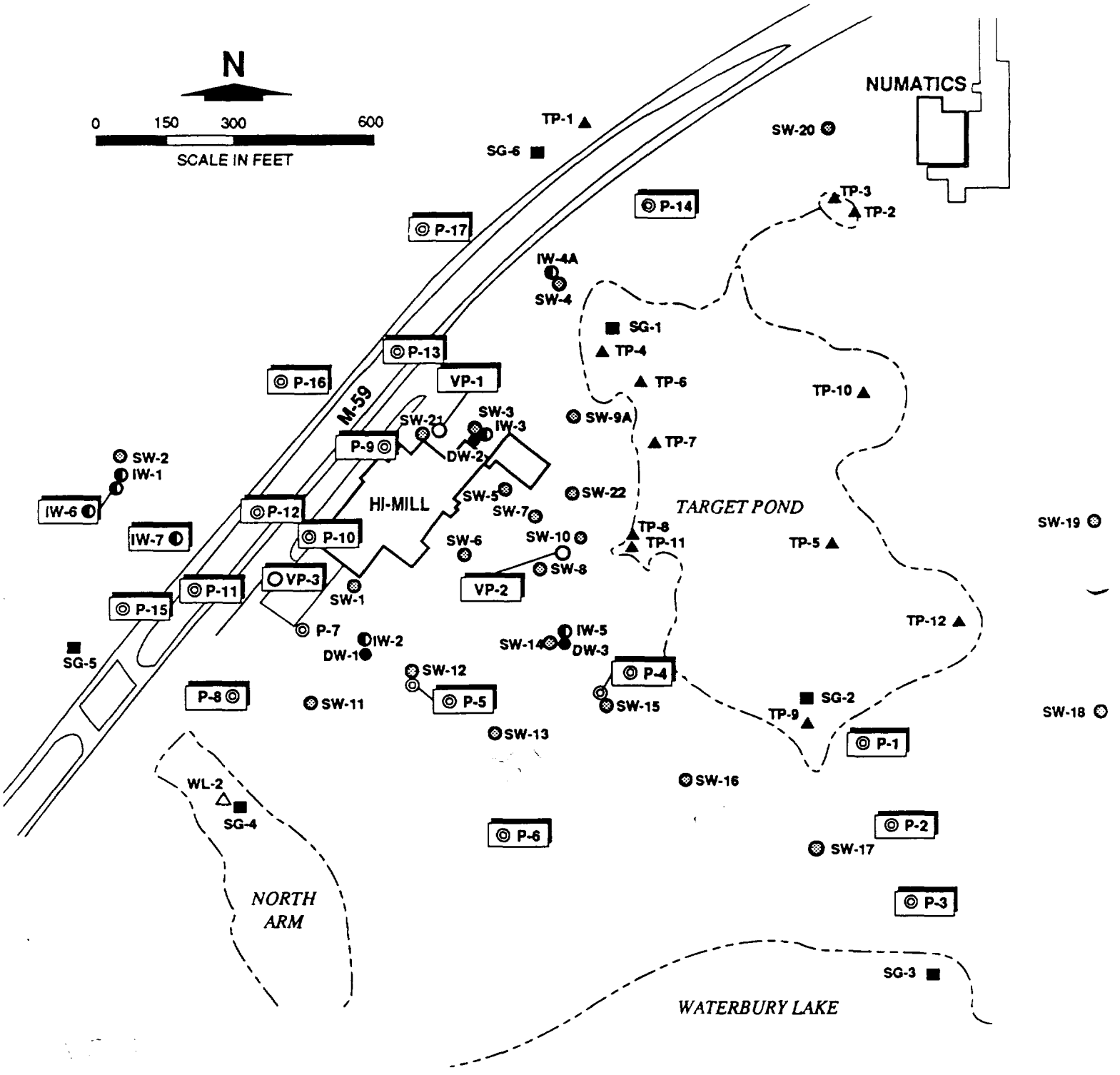
FIGURE 1.0
SITE LOCATION MAP
HIMILL MANUFACTURING
HIGHLAND, MICHIGAN



△ WL-2 WATERBURY LAKE SAMPLE

'ELL ◎ P-6 PIEZOMETER LOCATION

○ VP-1 VERTICLE PROFILE BORING

◎ P-6 PROPOSED PHASE II LOCATIONS

ıPLE *PHASE I SAMPLE LOCATIONS DETERMINED BY THE USEPA & TECHNA CORPORATION*

FIGURE 2.0
PHASE I AND PROPOSED PHASE II GROUND WATER & SURFACE WATER SAMPLE LOCATIONS
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN
MI135.04 - 0150.12

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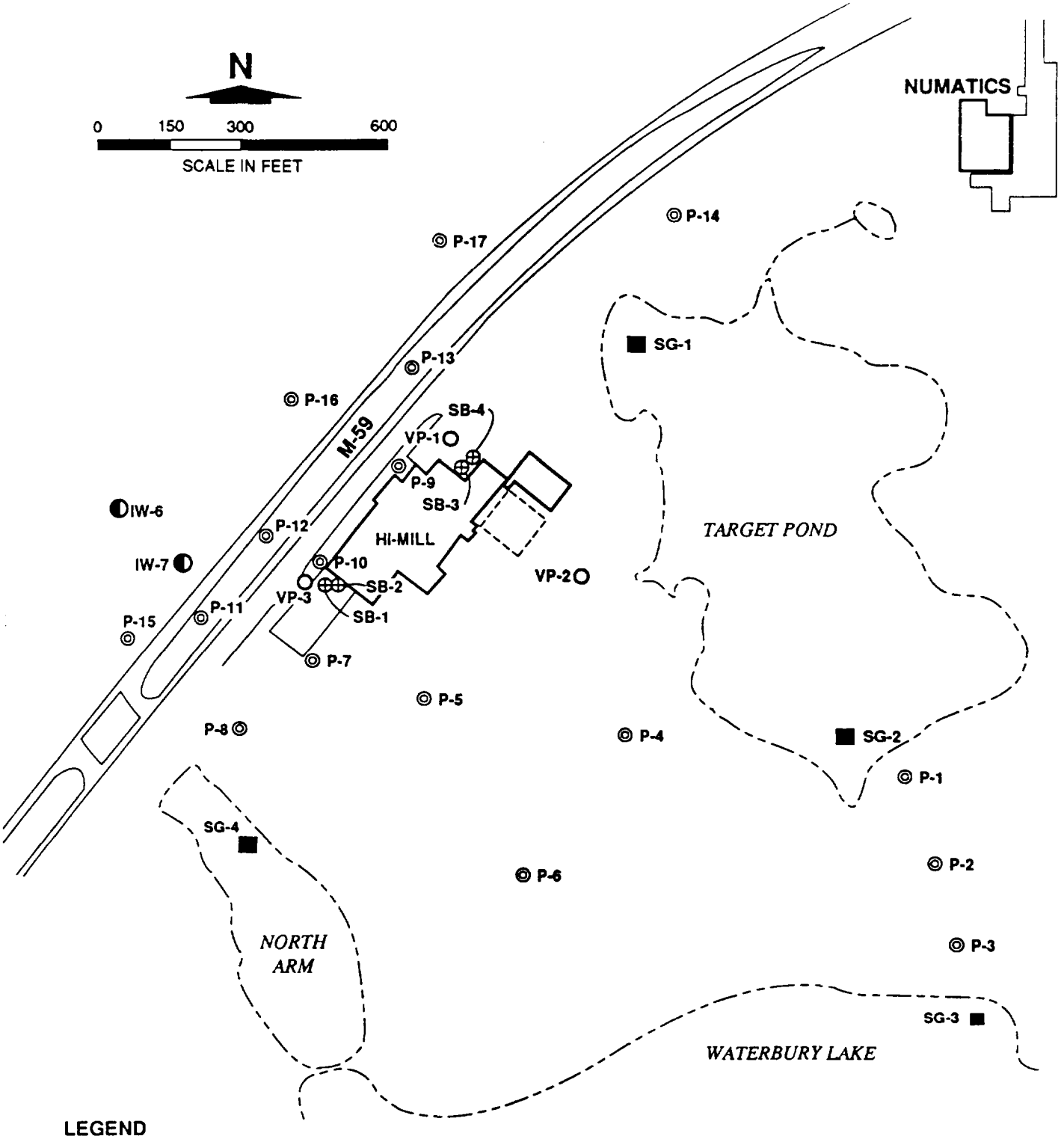

LEGEND

APPROXIMATE LOCATIONS

SW-1	SHALLOW MONITORING WELL	VP-1	VERTICLE PROFILE BORING
IW-1	INTERMEDIATE MONITORING WELL	SB-1	SOIL BORING
SG-1	STAFF GAUGE		
P-6	PIEZOMETER LOCATION		
	FORMER LAGOON		

FIGURE 2.1
PROPOSED PHASE II
PIEZOMETER, STAFF GAUGE,
SOIL BORING AND MONITORING WELL
INSTALLATION LOCATIONS
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN
MI135.04 - 0150.11

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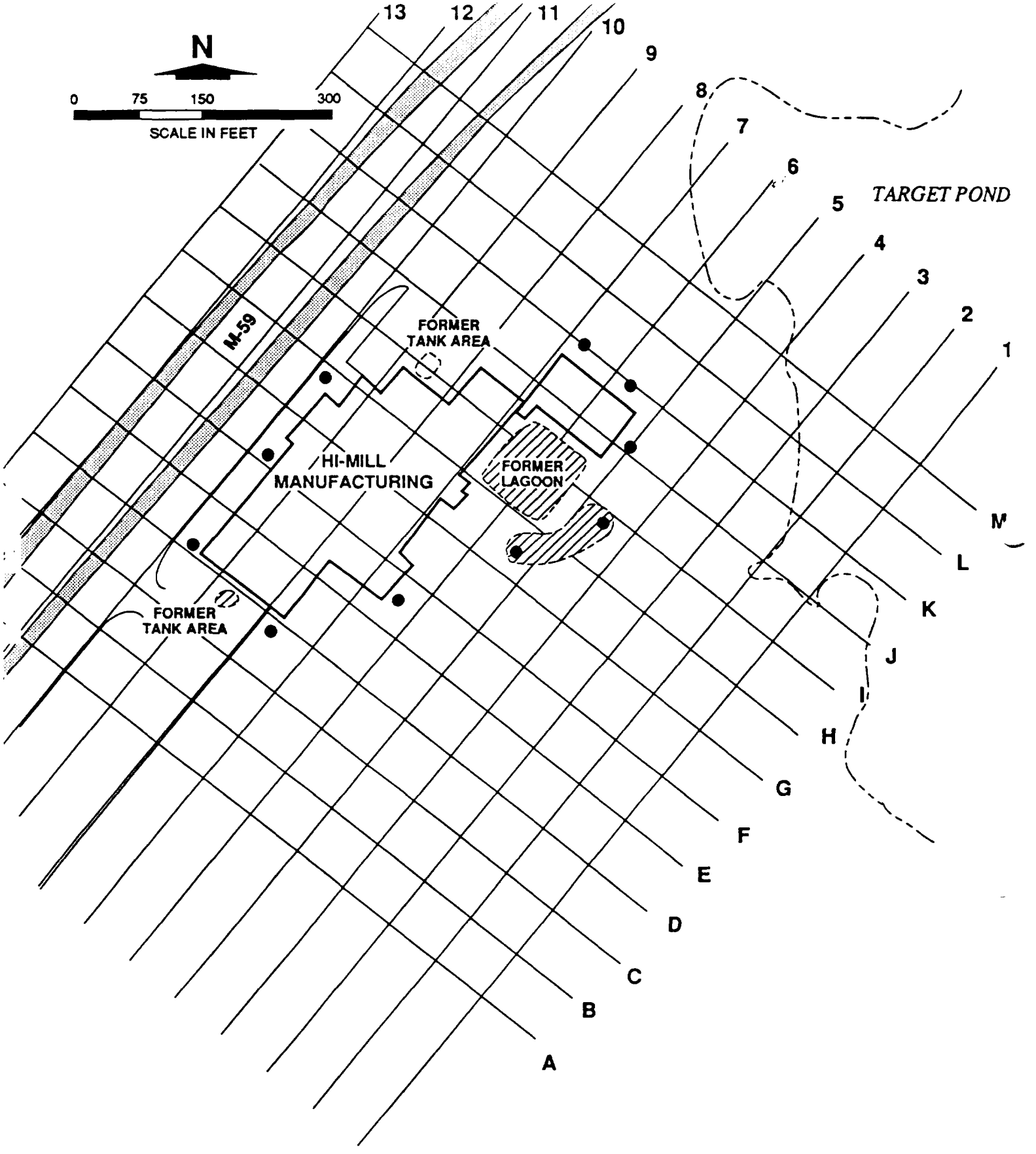

NOTE: Grid established by the Techna Corporation during the Phase I investigation.

LEGEND

● APPROXIMATE LOCATION HAND AUGER BORING

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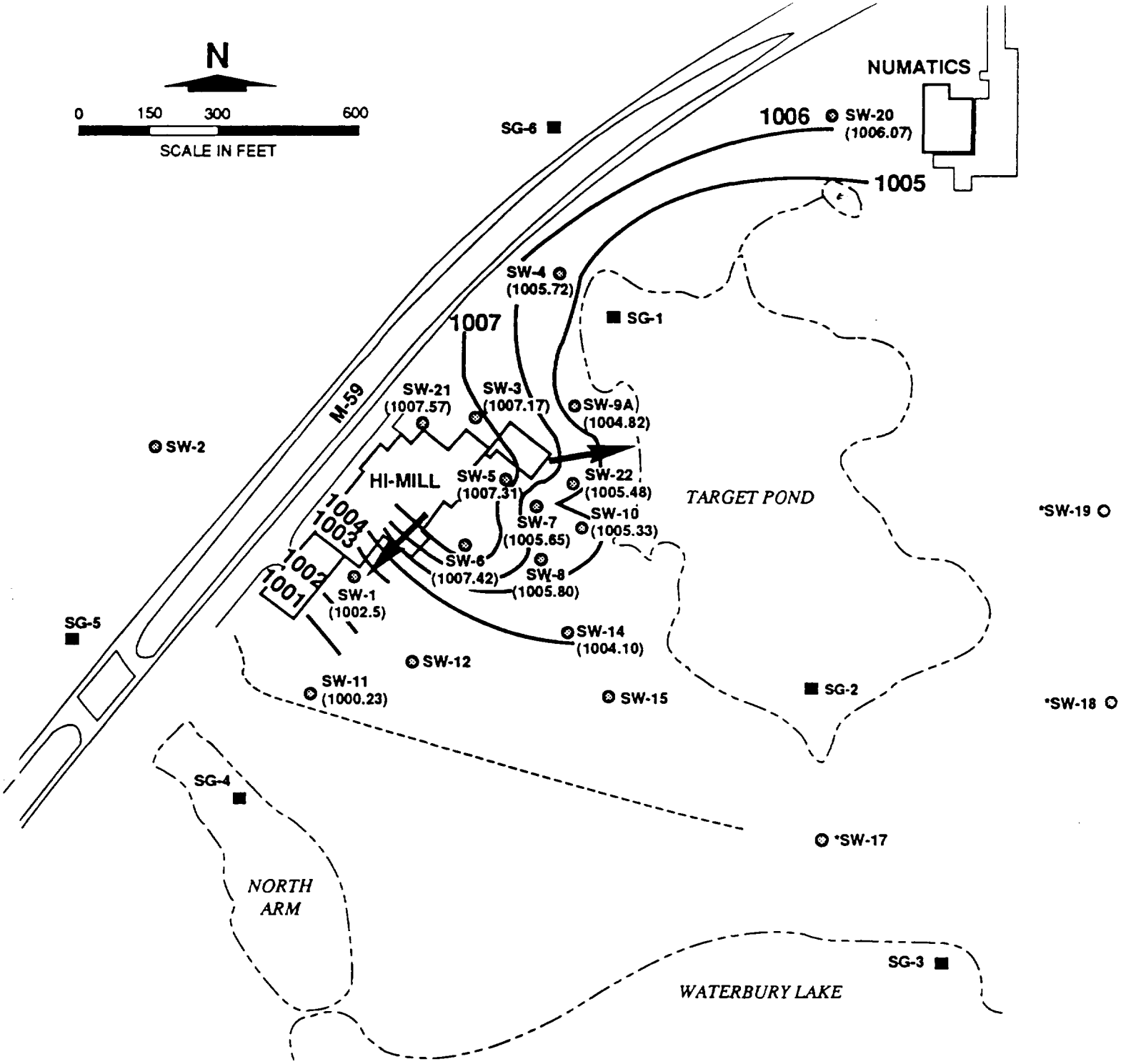
FIGURE 2.3.2
PROPOSED PHASE II HAND AUGER BORING LOCATION
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN
MI135.04 - 0150.07



LEGEND

- SW-1 SHALLOW MONITORING WELL
- SG-1 STAFF GAUGE
- EQUIPOTENTIAL LINE
- GROUNDWATER FLOW DIRECTION

NOTE: *Shallow designation but screened in intermediate aquifer.

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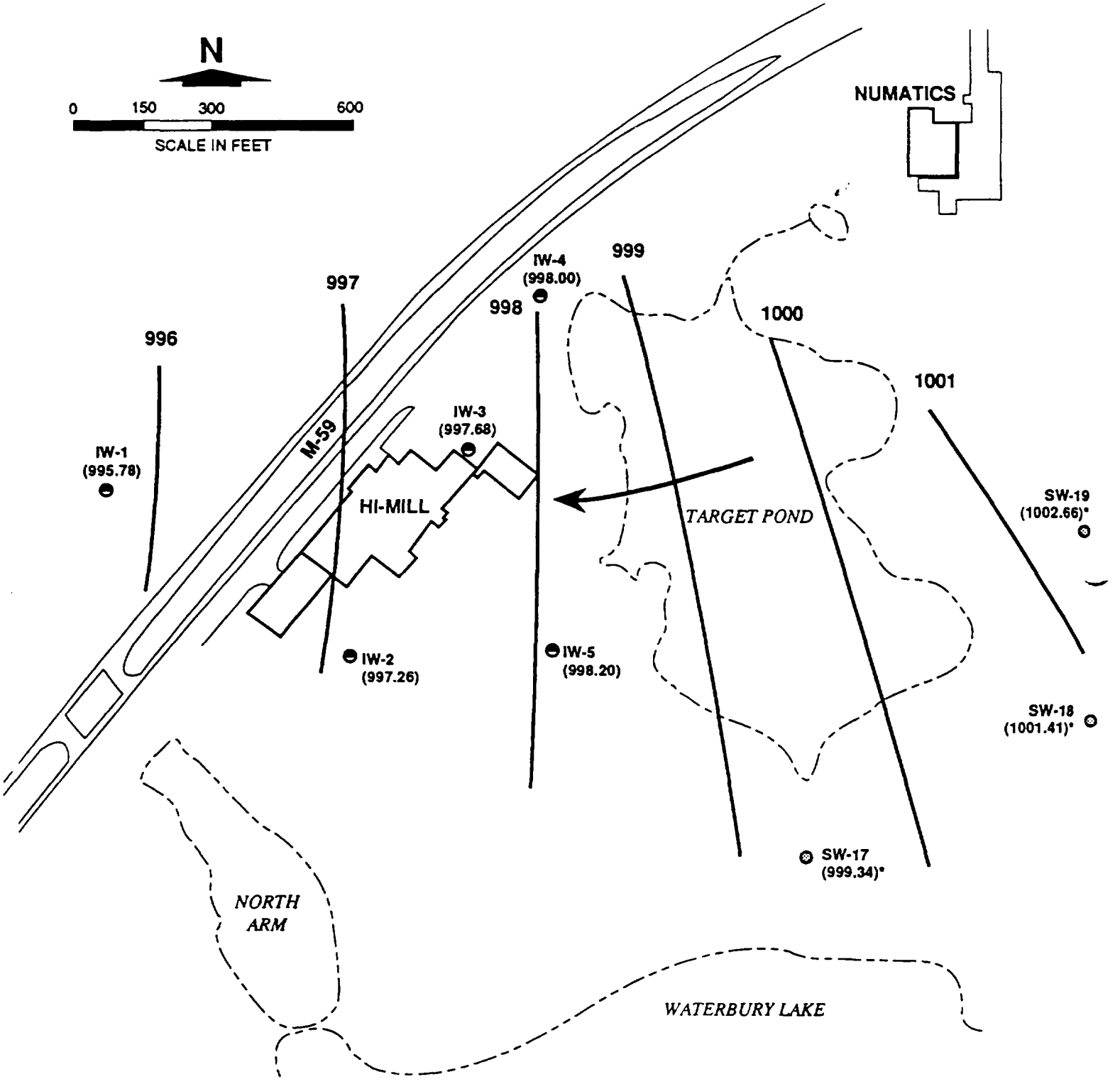
FIGURE 2.7-1
SHALLOW WELLS
POTENTIOMETRIC SURFACE
OCTOBER 31, 1990
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN
MI135.04 - 0150.08



LEGEND

- IW-1 — INTERMEDIATE MONITORING WELL
- GROUNDWATER FLOW DIRECTION
- 996 — EQUIPOTENTIAL LINES

NOTE: * Shallow designation but screened in intermediate aquifer

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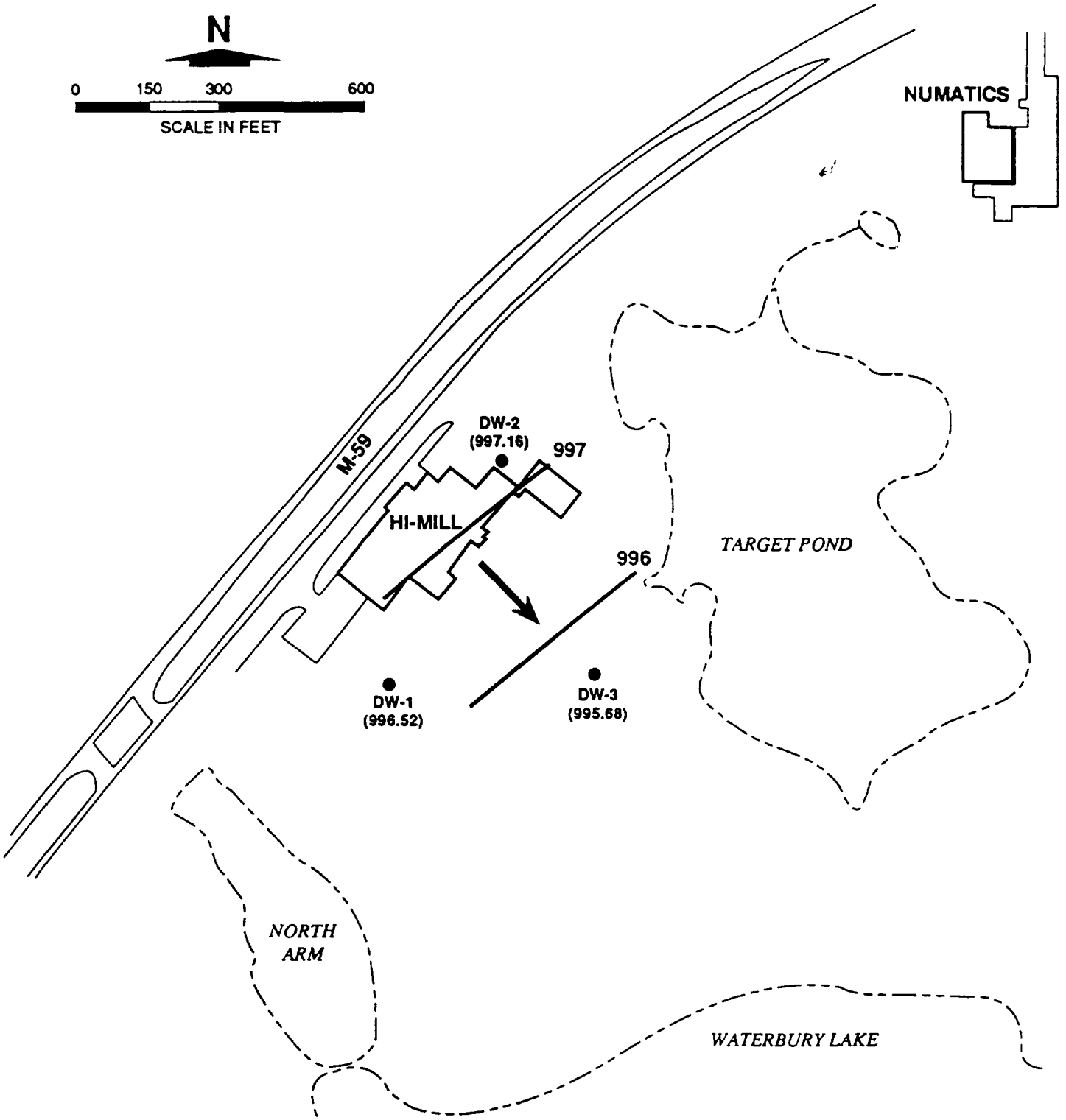
FIGURE 2.7-2
INTERMEDIATE WELLS
POTENTIOMETRIC SURFACE MAP
OCTOBER 31, 1990
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN
MI135.04 - 0150.09



LEGEND

- ● DW-1 DEEP MONITORING WELL
- 997 EQUIPOTENTIAL LINE
- ← GROUNDWATER FLOW DIRECTION

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FIGURE 2.7-3
DEEP WELLS
POTENTIOMETRIC SURFACE
OCTOBER 31, 1990
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN
MI135.04 - 0150.10

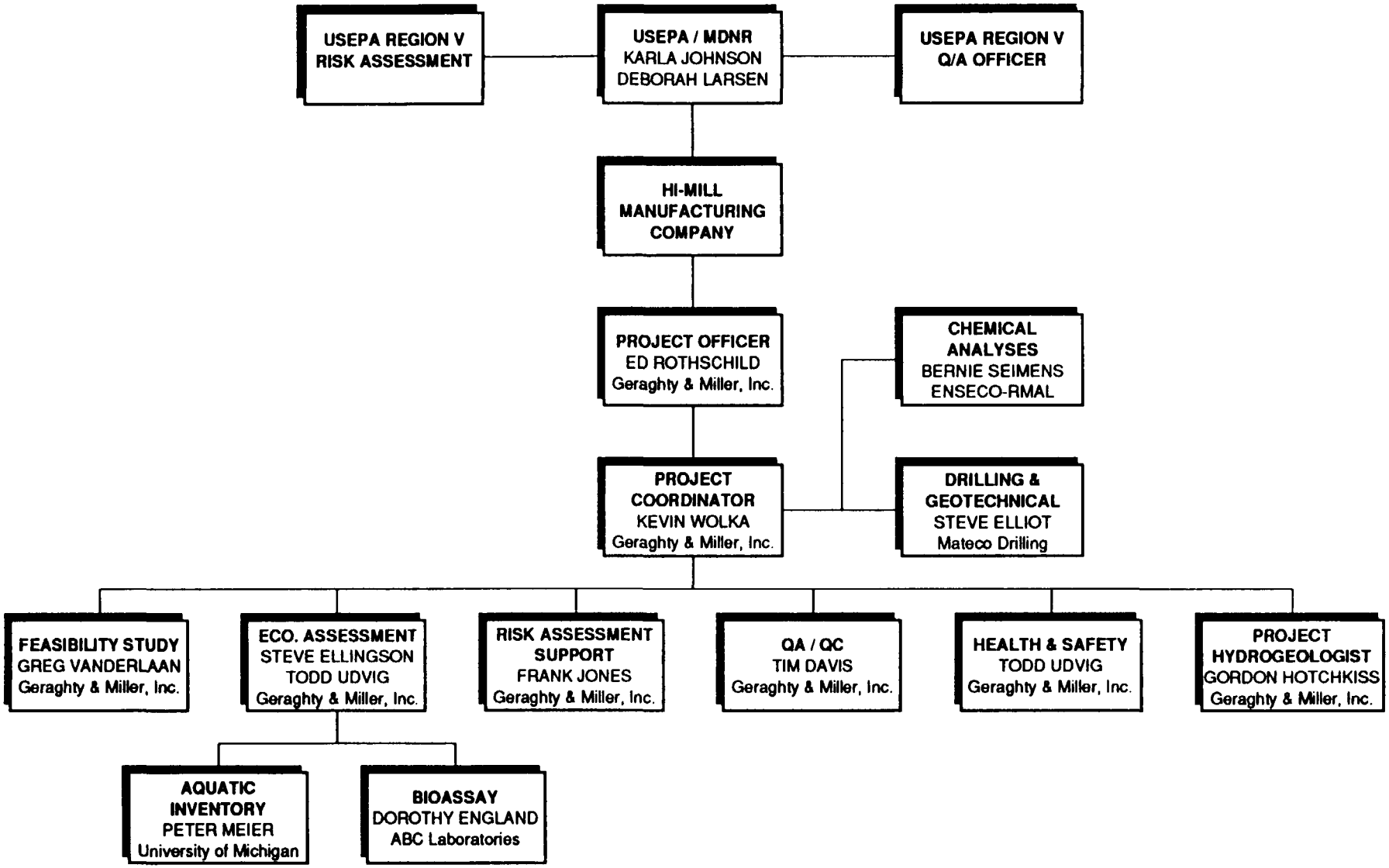

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FIGURE 8-5
(REVISED MARCH 1991)
PROJECT ORGANIZATION CHART
HI-MILL MANUFACTURING COMPANY
HIGHLAND, MICHIGAN
MI135.04 - 0144.01

TABLES

TABLE 2.7-1
GROUND-WATER MONITORING WELL ANALYTICAL SUMMARY
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN

PHASE I ANALYTICAL SUMMARY						PHASE II ANALYTICAL SUMMARY			
WELL #	DISSOLVED METALS	TAL INORGANIC	CLP VOC	B/N/A	NITROGEN	WELL #	DISSOLVED METALS	TOTAL METALS	VOCs
SW-1	X		X		X	SW-1	X	X	X
SW-2	X	X	X	X	X	SW-2	X		X
SW-3	X		X		X	SW-3	X		X
SW-4	X		X		X	SW-4	X		X
SW-5	X	X	X	X	X	SW-5	X		X
SW-6	X		X		X	SW-6	X		X
SW-7	X				X	SW-7	X	X	X
SW-8	X	X	X	X	X	SW-8	X		X
SW-9						SW-9	X		X
SW-9A						SW-9A	X		X
SW10	X		X		X	SW10	X		X
SW-11	X		X		X	SW-11	X		X
SW-12	X		X		X	SW-12	X		X
SW-13	*	*	*	*	*	SW-13	*		*
SW-14	X				X	SW-14	X		X
SW-15	X				X	SW-15	X		X
SW-16	*	*	*	*	*	SW-16	*		*
SW-17	X				X	SW-17	X		
SW-18	X				X	SW-18	X		
SW-19	X				X	SW-19	X		
SW-20	X		X		X	SW-20	X		X
SW-21	X				X	SW-21	X		X
SW-22	X	X	X		X	SW-22	X		X
IW-1	X	X	X	N/A		IW-1	X	X	X
IW-2	X		X			IW-2	X	X	X
IW-3	X	X	X			IW-3	X	X	X
IW-4	X		X			IW-4	X		X
IW-5	X	X	X			IW-5	X		X
						IW-6	X	X	X
						IW-7	X		X
DW-1	X		X			DW-1	X		X
DW-2	X		X			DW-2	X		X
DW-3	X		X			DW-3	X	X	X
EW-1	X				X	VP-1**	X		X
EW-2	X				X	VP-2**	X		X
EW-3						VP-3**	X		X
EW-4	X				X				
EW-5									
EW-6	X				X				

* Wells dry upon completion and wells abandoned.

** Wells will be constructed only if contaminants are detected during vertical profiling.

TABLE 2.7-2
SUMMARY OF PHASE II SAMPLING PROGRAM
HI-MILL MANUFACTURING
HIGHLAND, MICHIGAN

Project Task	Field Measurements	Soil or Ground water	Laboratory Parameters	Number of Samples	Field Duplicates	Field Blanks	Trip Blanks	Number of MS/MSD	Matrix Total
1. Piezometer Installation	Top of Casing Elevation Static Water Elevation								
2. Staff Gauge Installation	Elevation Static Water Elevation								
3. Hand Auger Borings	TCL VOCs	GW		10	2	2	0	0	14
4. Soil Boring Installation	Ground Surface Elevation	Soil	Al, Ag, Cr, Cu, Ni, Zn	8	1	0	0	0	9
			& TCL VOCs	8	1	0	0	1	10
5. Vertical Profiling	pH, Conductivity, TCL VOCs	GW		15-18	1	1	0	0	17-20
6. Monitoring Well Installation	Top of Casing Elevation Static Water Elevation Geologic Description	Soil	Vertical Permeability grain size	2	0	0	0	0	2
			Al, Ag, Cr, Cu, Ni, Zn	4	0	0	0	0	4
			& TCL VOCs	4	0	0	0	1	5
7. Monitoring Well Sampling	Static Water Elevation pH/Conductivity/Temp	GW	Total Metals Al, Ag, Cr, Cu, Ni, Zn	7	0	0	0	0	7
			Dissolved Metals Al, Ag, Cr, Cu, Ni, Zn	31*	3	1	0	2	37*
			& TCL VOCs	27*	2	1	4	2	36*

* May be increased if monitoring wells are installed in any vertical profile borings.

TABLE 2.7-3
SUMMARY OF PHASE II ANALYTICAL PROGRAM
HI-MILL MANUFACTURING
HIGHLAND MICHIGAN

PARAMETER	EPA METHOD #	DETECTION LIMITS (mg/l)		CONTAINER MATERIAL or TYPE	MINIMUM VOLUME REQUIRED	RECOMMENDED PRESERVATIVE PROCEDURE	MAXIMUM HOLDING TIME	COMMENTS
VOLATILES								
Acetone	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Benzene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Bromodichloromethane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Bromoform	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Bromomethane	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
2-Butanone	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Carbon disulfide	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Carbon tetrachloride	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Chlorobenzene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Chloroethane	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
2-Chloroethyl vinyl ether	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Chloroform	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Chloromethane	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Dichlorobromomethane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,1-Dichloroethane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,2-Dichloroethane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,1-Dichloroethene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,2-Dichloroethene (Total)	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,2-Dichlorpropane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
cis-1,2-Dichloropropene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
trans-1,3-Dichloropropene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Ethylbenzene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
2-Hexanone	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Methylene Chloride	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
4-Methyl-2-pentanone	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Styrene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,1,2,2-Tetrachloroethane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Tetrachloroethylene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Toluene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,1,1-Trichloroethane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
1,1,2-Trichloroethane	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Trichloroethylene	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Vinyl acetate	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Vinyl chloride	8240	0.010	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
Total Xylenes	8240	0.005	mg/l	VOA	2x40 mL	HCL, Cool to 4 C	14 days	No Air Bubbles
SHORT LIST METALS (FILTERED)								
Aluminum	200.7	85.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Filter
Chromium	200.7	7.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Filter
Copper	200.7	10.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Filter
Nickel	200.7	11.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Filter
Silver	200.7	9.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Filter
Zinc	200.7	5.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Filter
SHORT LIST METALS (UNFILTERED)								
Aluminum	200.7	200.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Unfiltered
Chromium	200.7	20.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Unfiltered
Copper	200.7	20.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Unfiltered
Nickel	200.7	20.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Unfiltered
Silver	200.7	10.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Unfiltered
Zinc	200.7	20.00	ug/l	P,G	500 mL	HNO3, pH < 2	6 months	Unfiltered

APPENDIX A

SECTION 8.0
QUALITY ASSURANCE PROJECT PLAN
ADDENDUM
REMEDIAL INVESTIGATION/FEASABILITY STUDY
HI-MILL MANUFACTURING COMPANY
Highland, Michigan

Prepared by:

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Approved by:

Project Coordinator
Geraghty & Miller, Inc.

Kevin Wolka 9-30-91
Kevin Wolka Date

Quality Assurance Officer
Geraghty & Miller, Inc.

Tim Davis 9-30-91
Tim Davis Date

Quality Assurance Officer
USEPA Region V

_____
Date

Remedial Project Coordinator
USEPA Region V

_____
Karla Johnson Date

HI-MILL MANUFACTURING COMPANY
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PORTABLE GAS CHROMATOGRAPH
QUALITY ASSURANCE/QUALITY CONTROL ADDENDUM

8.0 INTRODUCTION

The following document is an addendum to the Quality Assurance Project Plan (QAPP) generated by the Techna Corporation (Techna) for the Hi-Mill Manufacturing Remedial Investigation/Feasibility Study (RI/FS). The Techna QAPP was part of a United States Environmental Protection Agency (USEPA) approved document titled "Revision 2, Hi-Mill Manufacturing Company Remedial Investigation/Feasibility Study Work Plan, Site Safety Plan, and Quality Assurance Project Plan", dated October 26, 1989. The Techna QAPP presented the procedures, objectives, and specific quality assurance (QA) and quality control (QC) activities for the Phase I field portion of RI/FS.

The QAPP addendum was requested by the USEPA in a letter dated February 20, 1991 after they had reviewed Geraghty & Miller's Phase II Hydrogeologic Investigation Work Plan (Phase II Work Plan) for the Hi-Mill facility. The QAPP addendum details the procedures, objectives, and specific quality assurance (QA) and quality control (QC) activities for work unique to the Phase II hydrogeologic investigation. The purpose of the QAPP addendum is to ensure that the additional field activities proposed in the Geraghty & Miller Phase II Work Plan are suitable for collecting defensible data. The Phase II investigative activities include piezometer installation, staff gauge installation, plume delineation using a portable gas chromatograph, monitoring well installation and monitoring well sampling. All of the above activities except for the plume delineation using a gas chromatograph will follow the QA procedures detailed in the Techna QAPP. The QAPP for the plume delineation investigative procedures is detailed below. It will include the sixteen elements of a QAPP and is based on the Techna QAPP and information supplied by EPA for QAPP preparation. The section numbers outlined in this QAPP addendum correlate to those used by Techna in their approved QAPP (10/26/89).

8.1 PROJECT DESCRIPTION

See Section 8.1 of the Techna QAPP for a project description of Phase I hydrogeologic investigation activities and refer to Section 2.0 of Geraghty & Miller's Phase II Work Plan for Project Objectives, Sampling Network and Rationale, and Project Schedule associated with Phase II of the hydrogeologic investigation.

8.2 PROJECT ORGANIZATION AND RESPONSIBILITY

See Section 3.0 of the Geraghty & Miller Phase II Work Plan.

8.3 QUALITY ASSURANCE OBJECTIVES

The analytical data generated using a field gas chromatograph (GC) during Phase II of the hydrogeologic investigation are to be of such quality as to allow for the semi-quantitative delineation of the vertical and horizontal extent of the volatile contamination of the soils and ground-water in the near surface saturated zone. The purpose of the GC analysis is to determine if the existing wells provide adequate coverage to monitor the impacted areas of the site. Decisions as to whether additional shallow wells are required will be based on the results of the GC analysis and the interpreted groundwater flow directions.

The instrument to be used to analyze VOCs will either be a Photovac 10S50 or 10S70 field portable gas chromatograph with a 10.6 electron volt photo-ionization detector. The instrument is configured with a 10 meter CPSIL-5 wide bore capillary column and isothermal oven capable of maintaining temperatures of either 30, 40, or 50 degrees Celsius. The pertinent information presented above does not cover the detailed specifications outlined in the portable GC manual. However, the 117-page manual will be available to USEPA and Michigan Department of Natural Resources (MDNR) personnel upon request.

8.3.1 Precision

Generally, precision describes a quantitative measure of the variability of a group of measurements compared to their mean value, and is determined by the analysis of field duplicate samples. Field duplicates will be analyzed at a frequency of one duplicate sample per ten samples. These duplicate samples will be reanalyzed to check the reproducibilty of the data.

8.3.2 Accuracy

Accuracy will be determined by the analysis of standard samples. Stock standards will prepared by adding microgram quantities of spectrophotometric grade neat solvents into a known volume of spectrophotometric grade methanol. Fresh stock standards are prepared at no more than weekly intervals. Due to the complexity of the extractions necessary for exact quantitative analysis in soil samples, soil samples are measured relative to an aqueous standard. This procedure, used as a screening process, has proven to be accurate quantitatively when compared to soil samples split for analysis with independent laboratories using extraction procedures. If a more accurate value is required for soil samples in the field, an extraction can be performed, but will limit the number of analyses due to the additional time required for performing the extraction.

For data representativeness, completeness and comparability see the Techna QAPP, Sections 8.3.3, 8.3.4, and 8.3.5, respectively.

8.4 SAMPLING PROCEDURES

The intent of the sampling methodology employed during the volatile organic compound (VOC) delineation survey is to delineate the impacted areas around the site. The purpose of the study is to combine the semi-quantitative analytical data produced from the GC with the CLP analytical data from the monitoring well sampling activities and delineate the horizontal and vertical extent of impact. The portable GC analytical results will cover an area that

extends radially from the suspected sources of contamination and therefore give an indication of the horizontal extent of VOC impact. The CLP laboratory results from samples collected from the existing shallow monitoring wells during well sampling activities will give an indication of the vertical extent of VOC impact. In combining the analytical information from the two separate activities and comparing it to the interpreted groundwater flow direction of the shallow flow system, Geraghty & Miller will be able to assess weather the shallow monitoring well distribution is adequate to monitor the impacted VOC areas.

It must be remembered that the analytical results of the GC survey will only be semi-quantitative. Due to the instrumentation utilized and the sample collection methodology, the analytical results may show a slight bias towards underestimating the actual VOC concentrations. Since the analytical results produced from the portable GC are intended to be for field screening purposes, no duplicate samples are scheduled for a certified CLP analysis.

During the VOC delineation activities Geraghty & Miller will collect ground-water samples from the shallow saturated zone surrounding the site. The sampling effort will focus on the perimeter of the lagoon area and solvent tank areas. Stainless steel hand augers equipped with a 3 inch inside diameter bucket auger will be utilized to install 3 to 5 foot deep boreholes. The depth of the borehole will be dependant upon the depth to the top of the perched water. All borings will extend at least 2 feet below the water table. Based on the high clay content of previous samples collected at the site, it is expected that the boreholes will remain open, allowing them to fill with groundwater. A disposable polyethylene bottom filling bailer will be inserted into the borehole to collect the groundwater sample. The groundwater sample will be decanted from the bailor into a labeled 40 milliliter vial and submitted for a VOC field screening using the portable GC.

The VOC headspace analysis performed on each groundwater sample with the portable GC will help delineate the extent of volatile contamination. A consistent ratio between sample volume and head space will be maintained in each vial to minimize potential sample bias. Since trichloroethene (TCE) is the volatile of primary interest, particularly close attention will be paid to the chromatogram peaks associated with TCE, dichloroehtene (DCE) and vinyl chloride. DCE and vinyl chloride can both be degradation products of TCE.

8.5 ANALYTICAL PROCEDURES

Analytical procedures are stated in Section 2.4 of the Geraghty & Miller Phase II Hydrogeological Investigation.

8.6 SAMPLE AND DOCUMENT CUSTODY PROCEDURES

Refer to Section 8.6 of the Techna QAPP for a description of sample custody procedures in the field and laboratory and final evidence files.

8.7 CALIBRATION PROCEDURES AND FREQUENCY

Calibration of the GC will include the analysis of three standards (detection limit, middle range and upper linear limit) at the beginning of each day. One standard will be used as continuing calibration standard and run at least once every ten samples or more often at the discretion of the operator.

8.8 DATA REDUCTION, VALIDATION, AND REPORTING

Refer to Section 8.8 of the Techna QAPP for Data Reduction, Validation and Reporting procedures. Data reduction for the field GC involves calculations by the operator to provide concentrations in ppb for standards, QA/QC samples and unknown samples. These values may need to be adjusted due to physical interferents (high background and "noise") or special sample preparation (dilutions, adjusted injection volume, etc.) All sample calculations will be provided in worksheet form or within standard data reporting tables and will be submitted with the final report along with raw chromatograms.

8.9 INTERNAL QUALITY CONTROL CHECKS

Refer to Section 8.9 of the Techna QAPP for Internal Quality Control procedures. All data analyses and tabulations will also be checked by a Geraghty & Miller QA/QC Officer or a designated representative.

8.10 PERFORMANCE AND SYSTEM AUDITS

Refer to Section 8.10 of Techna QAPP for Performance and System Audits.

8.11 PREVENTATIVE MAINTENANCE

Specific preventative maintenance procedures and spare parts list are available for reference on-site. It is the responsibility of the Project Manager to ensure adherence to these preventative maintenance procedures and schedules. Preventative maintenance procedures for the field GC are the responsibility of Geraghty & Miller, Inc.

8.12 ASSESSMENT OF DATA PRECISION, ACCURACY, AND COMPLETENESS

Refer to Section 8.12 of the Techna QAPP for procedures for the Assessment of Data Precision, Accuracy, and Completeness.

8.13 CORRECTIVE ACTION

Refer to Section 8.13 of the Techna QAPP for Corrective Actions.

8.14 QUALITY ASSURANCE REPORTS

Refer to Section 8.14 of the Techna QAPP for Quality Assurance Reports.

Respectfully Submitted,

GERAGHTY & MILLER, INC.

Robert Sanborn
Scientist

Gordon Hotchkiss
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APPENDIX B

JULY 22, 1991, AGENCY COMMENTS
JULY 22, 1991, RESPONSE
PHASE II HYDROGEOLOGIC INVESTIGATION WORK PLAN
HI-MILL MANUFACTURING SITE

Below are U.S. EPA comments on Revision #2 of the Hydrogeologic Investigation Work Plan/Sampling Plan/Quality Assurance Project Plan for the Hi-Mill Manufacturing site, Highland, Michigan. Each comment/concern from the Agency is followed by a corresponding response from Geraghty & Miller, Inc.

USEPA COMMENTS

Section 2.1 Piezometer Installation

#	page/paragraph		comment/response
1)	5/2	C:	It is not clear for how long the static water elevation will be collected from the piezometers. Appendix B, Responses to Agency Comments, indicates this duration to be one year. It is also not clear if a quarterly schedule will help to determine seasonal fluctuations in the water levels. It is recommended that static water elevations be collected from the piezometers on a monthly schedule.
		R:	Static water levels will be collected from the site piezometers, staff gauges, and monitoring wells though the submittal of the Hi-Mill Feasibility Study, on a monthly basis. Discussions will be conducted with the USEPA concerning the need for monitoring after the Feasibility Study has been submitted.
2)	5/3	C:	The decision to abandon wells SW-12 and SW-15 will require U.S. EPA concurrence.
		R:	The text of the August 1991 Phase II Work Plan was changed to reflect that EPA concurrence is required on the decision to abandon Monitoring Wells SW-12 or SW-15.
3)	5/3	C:	It is suggested that a piezometer be placed adjacent to wells SW-12 and SW-15. Placing the piezometers in close proximity to the wells will yield better information about the hydraulics at those points. Therefore, move piezometers 5 (P-5) near SW-12 and move piezometer 4 (P-4) near SW-15. In order to compensate for the movement of P-4, move P-1, P-2, and P-3 to the west approximately 100 to 150 feet.
		R:	The installation locations of piezometers P-4 and P-5 have been adjusted in Figures 2.0 and 2.1 according to the EPA suggestion.

#	page/paragraph		comment/response
4)	7/2	C:	If the water is deeper than eight feet from the surface, a piezometer should still be installed in this deeper zone. If no water is encountered, tagging the clay would also yield useful information on its occurrence and topography.
		R:	Based on the shallow water levels observed on the east side of the facility, Geraghty & Miller believes that all hand-auger borings will tag the clay horizon within 8 ft of ground surface. However, under no conditions will the clay horizon be fully penetrated.
5)	7/4	C:	In the sentence "...Since the diameter of the bucket auger...." Change (3.0") and (1.5") to (3.0"OD) and (1.5"OD).
		R:	The outer diameter (OD) abbreviation has been added to the (1.5") and (3.0") references in the Work Plan text.
6)	7/4	C:	Typo: Fourth sentence: "then" should be "than".
		R:	The typographical error in the text has been changed.

Section 2.2 Staff Gauge Installation

1)	8/1	C:	It is not clear if staff gauge water level readings will be taken concurrently with static water elevations in the piezometers. It is recommended that the water level readings be taken concurrently on a monthly schedule for a year.
		R:	Static water levels will be collected from the site piezometers, staff gauges, and monitoring wells through the submittal of the Hi-Mill Feasibility Study, on a monthly basis. Discussions will be conducted with the USEPA concerning the need for monitoring after the Feasibility Study has been submitted.

Section 2.3 On-Site Analysis of Ground Water

1)	10/3	C:	As suggested before, get a ground-water sample, not a soil sample. If ground water in any of these borings, sample it.
		R:	If possible, a ground-water sample will always be collected.

#	page/paragraph		comments/response
2)	11/6	C:	Clarification is needed on how head space will be achieved in completely filled 40ml vials. It seems that volatiles would escape the vial during this procedure. It would seem more reasonable to create the headspace while filling the vial, thus avoiding any volatile loss.
		R:	The text of the August 1991 Phase II Work Plan has been clarified to state that the 20 ml headspace will be created when filling the sample vial.

Section 2.5 Vertical Profiling Boring

1)	13/3	C:	Sentence should read: "...will proceed as outlined in USEPA's final resolution to the dispute."
		R:	The text of the August 1991 Phase II Work Plan has been changed to incorporate the July 1991 USEPA dispute resolution ruling.
2)	14/2.5.3	C:	The methodology described in this section does not adequately address the issue of vertically sampling this intermediate aquifer. One of the main purposes of vertical sampling is to choose the zone of highest groundwater impact for placement of a permanent monitoring well screen. It appears that once the boring has been sampled it will be plugged. From that point on in the text, it is difficult to determine whether a monitoring well will be drilled next to the vertically sampled boring, or if the information gathered will be used for screen placement of the presently scheduled monitoring wells. Further, if a well will be installed based on the information gathered in the vertical profile, it can be done in the same boring as the profile. It is not necessary to drill two borings for one well. A well must be installed at each vertically sampled location. Another problem with the method outlined is that there is no means of describing the soils being drilled through. One split spoon sample is to be taken at the 'designated elevation' of the top of the intermediate aquifer, the rest of the boring will have no well log. There will be no way to correlate these vertical profiles to borings done on the rest of the site. If there are significant geologic changes from the east to the west side of the site, these borings will not allow for this type of determination. Please describe some protocol for logging the geology of these borings. Finally, the sampling interval (10 feet) combined with the very small screen size (5.25 inches) would not allow for proper characterization of the aquifer in question. Too much of the aquifer would remain unknown using these dimensions. The sample interval should be decreased to perhaps 5 feet, or a 2 foot screen should be used. In addition, there is no provision in this plan for sampling ground water at the top of the aquifer.

#	page/paragraph		comments/response
		C:	As it is now written, there will be a gap of about a dozen feet from the top of the aquifer to the first groundwater sample location. This is not acceptable.
		R:	The August 1991 Phase II Work Plan incorporates the number and location of vertical profile borings specified in the July 1991 EPA dispute resolution ruling. The vertical profile sample intervals specified in the Phase II Work Plan are based on the boring logs developed by Techna and the gamma logs produced by the MDNR. The strong correlation between the two logs suggests that the Techna geologic descriptions provide an adequate portrayal of the underlying site geology. Geraghty & Miller, therefore, does not believe it is necessary to collect confirmatory samples in areas of the site which were previously investigated. Alternatively, continuous soil samples will be collected during the monitoring installation activities scheduled in areas west of the site. The test has been clarified: vertical profile samples will be collected at 5 ft intervals.
3)	15/1	C:	Appendix D is missing.
		R:	Appendix D will be incorporated into the August 1991 Phase II Work Plan.
4)	15/3	C:	If the on-site GC detects nothing, there is no other way to tell where the TCE may be in the aquifer. If the vertical profile is taken within sufficiently close intervals, TCE or its breakdown products should not escape detection by the GC. The zone of the field screening techniques which include GC, conductivity, temperature, and pH. If no anomalous results are found, above background levels, no well is necessary in that location (except for IW-1).
		R:	The text of the August 1991 Work Plan has been changed to incorporate the July 1991 dispute resolution ruling.

Section 2.6 Monitoring Well Installation

1)	16/2	C:	This section is written from the perspective that only two wells are being installed during Phase II. This has to be rewritten to reflect the actual number of wells that will be installed during Phase II.
		R:	The monitoring well section in the August 1991 Phase II Work Plan has been rewritten to reflect the July 1991 USEPA dispute resolution ruling.

#	page/paragraph		comments/response
2)	16/2	C:	There are also high levels of TCE (5.7 ppm) in soils at soil boring WV01 (near SW-3). This area warrants further investigation. Based on your rationale, there ought to be a monitoring well placed downgradient of this location too.
		R:	The soil borings proposed in Task 2.4 of the August 1991 Phase II Work Plan will address the extent of soil impacts surrounding the former solvent tanks.
3)	16/3	C:	Since chromium (45.8 ppb) has already been detected in SW-15, it should be replaced if the bentonite seal is bad, not abandoned.
		R:	The decision to replace or abandon Monitoring Well SW-15 will be made with the concurrence of the EPA.
4)	16/4	C:	Sentence should read: "...to be flowing from the former sources..."
		R:	The typographical error in the text of the Phase II Work Plan has been corrected.
5)	16/4	C:	There was soil contamination detected around the former tank location to the north as well. This should be mentioned.
		R:	The soil borings proposed in Section 2.4 of the Phase II Work Plan will address the soil impacts detected in the Phase I investigation.
6)	17/2	C:	Change 4.25 inch to 4 1/4 inch to be consistent with the rest of the text.
		R:	The numerical format has been changed in the August 1991 Phase II Work Plan.
7)	17/4	C:	These wells are to be gamma logged as well. This information should be used to aid in well screen location.
		R:	Geraghty & Miller is anticipating that the MDNR will gamma log each of the vertical profile borings and each of the monitoring wells installed during the Phase II investigation.

#	page/paragraph		comments/response
8)	18/1	C:	There is a statement to the effect that the site geologist will determine whether the saturated zone is of sufficient water bearing capacity to install a well. This decision will require U.S. EPA concurrence.
		R:	The text of the Phase II Work Plan has been changed to state that EPA concurrence is required prior to installing a monitoring well in the shallow saturated zone in that area.
9)	18/2	C:	The proposed method for double casing the intermediate wells (i.e. using 10 1/4 inch augers as temporary casing followed by drilling with 4 1/4 inch casing) is not acceptable because it does not adequately protect the intermediate aquifer from potential cross contamination by waters in the shallow aquifer. Permanent casing and grouting programs must be designed to ensure that no routes for contaminant migration exists between aquifers during the drilling of the borings or in the completed monitoring wells. A hydrogeologist must supervise all monitoring well/boring installations and log all wells/borings.
		R:	The proposed method for double casing a monitoring well has been revised. Permanent 10" ID, Schedule 80 PVC outer casing will be installed in each location that penetrates the clay layer overlying the intermediate aquifer.
10)	18/2	C:	What is the "one exception" mentioned here? Please be specific.
		R:	The sentence has been deleted from the text of the August 1991 Work Plan.
11)	19/1	C:	The criteria for the selection of two samples from each hole for lab volatile analysis is not clear. Would the highest HNu readings be the criteria?
		R:	The text has been clarified to state that the two (2) soil samples collected from each borehole with the highest Hnu readings will be submitted to the EPA-approved laboratory for subsequent analysis.
12)	19/3	C:	Please state that these standing elevations will be from a U.S.G.S. benchmark.
		R:	All static elevations will be correlated to a USGS benchmark.

#	page/paragraph		comments/responses

Section 2.7 Monitoring Well Sampling

1)	20/1	C:	Without any vertical sampling it is incorrect to state that there is a "limited vertical distribution of impacts." This is still unknown.
		R:	The text of the August 1991 Phase II Work Plan has been edited to remove the term "vertical."
2)	20/4	C:	Resampling existing wells will not help confirm the vertical distribution of contamination, only vertical sampling the aquifer will. The sentence should be rewritten to reflect this.
		R:	The text of the August 1991 Phase II Work Plan has been changed to reflect the outcome of the EPA dispute resolution letter.
3)	21/5	C:	IW-1 should be included as one of the wells that will also be analyzed for total metals on the short list (unfiltered).
		R:	Intermediate Monitoring Well IW-1 has been included in the list of wells to be analyzed for total metals.

Section 2.8 Monitoring Well Sampling Equipment

1)	22/2	C:	HDPE is not inert, this is a misnomer. Teflon would be a more appropriate choice (closer to "inert").
		R:	The text of the August 1991 Phase II Work Plan has been changed to state "relatively inert."

APPENDIX C

PHASE II HYDROGEOLOGIC INVESTIGATION
HI-MILL MANUFACTURING
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HIGHLAND, MICHIGAN

TASK	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
1. Submit Revised Geo/Hydro Work Plan					
2. Work Plan Review by USEPA					
3. Install Staff Gauges and Piezometers					
4. Well Installation Phase II Monitoring					
5. Plume Delineation with Portable GC					
6. Vertical Profile Boring					
7. Collect and Analyze Ground-Water Samples					
8. Prepare Results for Draft RI Report					
9. Submit Revised Draft RI Report					*

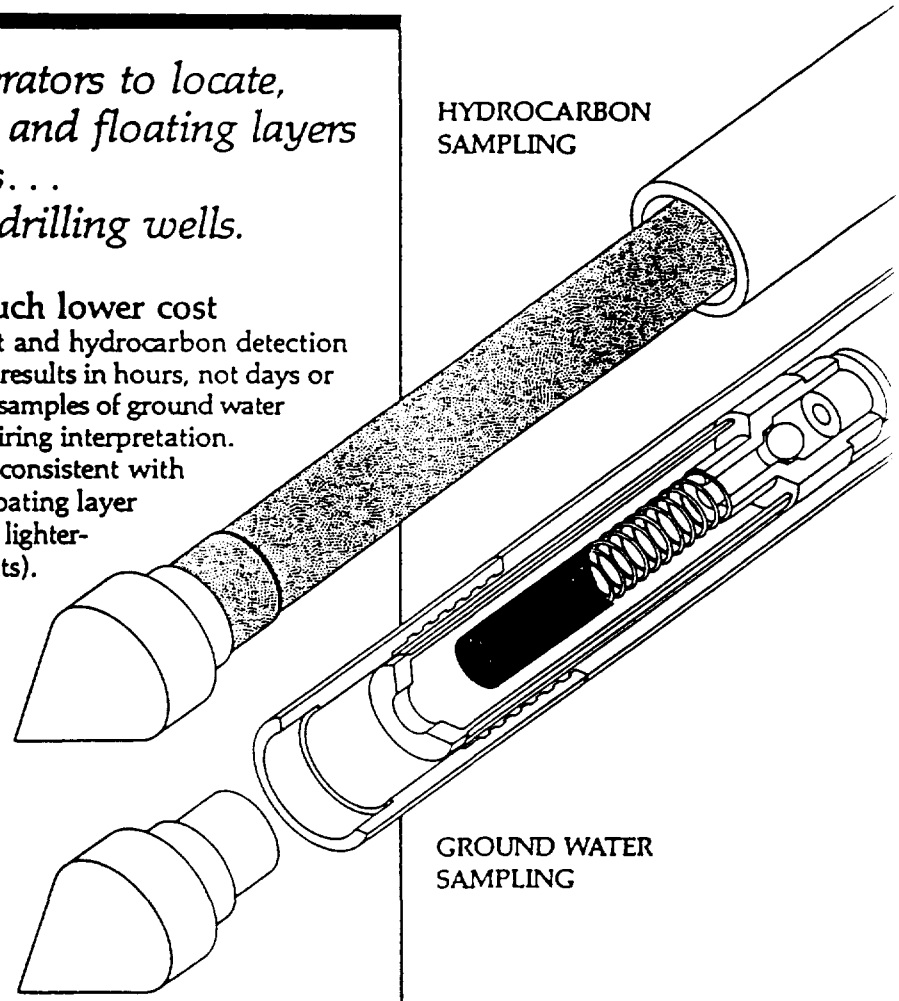
* - Revised Draft RI Report submitted on December 1, 1991.

APPENDIX D

HYDROPUNCH®

Floating Layer and Ground Water Sampler

HydroPunch II enables drill rig operators to locate, measure, and sample ground water and floating layers of gasoline and other hydrocarbons... rapidly and economically, without drilling wells.



Quality samples in an hour or less—at much lower cost

HydroPunch II is a breakthrough in site assessment and hydrocarbon detection technology. Sampling is so rapid, you can have reliable results in hours, not days or weeks. Unlike indirect survey methods, it delivers actual samples of ground water and floating hydrocarbons—not indirect readings requiring interpretation.

Ground water collected with the HydroPunch II is consistent with monitoring requirements *for all priority pollutants*. Floating layer samples accurately identify and estimate the thickness of lighter-than-water hydrocarbons (i.e. gasoline, fuel oil, solvents).

Better yet, HydroPunch II collects these samples at as little as 1/10 the cost of drilling, casing, and developing conventional monitoring wells. Replaceable screens make field cleaning for multiple grabs fast and easy. There's minimal environmental disturbance—with no permanent installation or well development water.

How the HydroPunch II works

The sampling tool is driven to the desired depth in unconsolidated formations. Preliminary grabs or other information help determine the approximate sampling depth. An auger or split barrel sampler is often used to provide a "pilot hole" to the area just above the sampling zone.

For floating layer applications

After inserting the polypropylene screen and attaching the point, the HydroPunch II is fixed to the casing, lowered through the pilot hole, and driven to the proper depth. The tool is then withdrawn approximately 48", leaving the point in the ground and exposing the screen so that ground water and floating product can enter.

A 1" O.D. Teflon® bailer is lowered through the hollow interiors of the drive casing and body of the HydroPunch II to collect the sample.

For ground water applications

Insert the ball check valves and stainless steel screen, then attach the point. The tool is driven to the proper zone (at least 5 foot submergence for ground water sampling), then withdrawn approximately 18" to expose the inlet screen. The interior fills with water. When the HydroPunch II is recovered, the check balls keep the sample from draining. The point remains in the ground.

Discharge to sample containers is easy with the supplied stopcock. Throughout the process, the sample contacts only stainless steel and Teflon.

Specifications

Dimensions:
Length: 55.5" overall (closed)
O.D.: 2" (nominal)
Weight: 24 lbs. (approximate—varies with configuration)
Sample volume: 1 liter (ground water)
unlimited (floating layer)

Materials:
Body and fittings: 304 stainless steel
Drive shoes: hardened carbon steel (std.)
stainless steel (optional)
Adapters: AW drill rod (ground water)
— carbon steel
EW casing (floating layer)
— carbon steel
Check balls: Teflon® or stainless steel

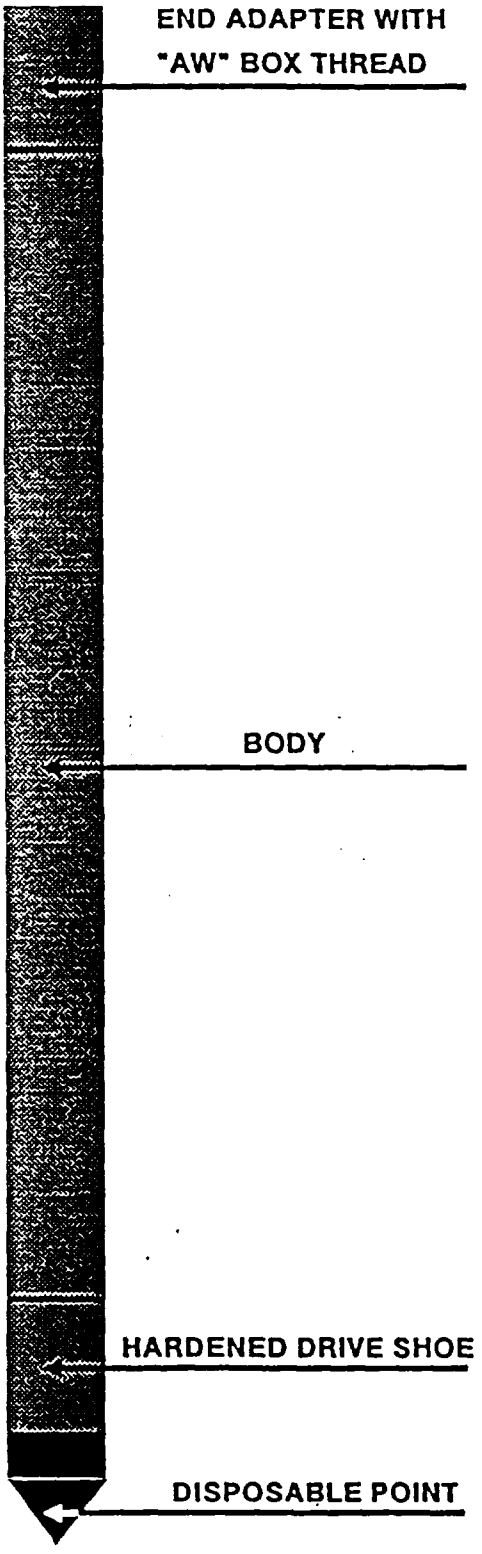
Screens: 5.25" long 125-micron 120 mesh stainless steel (ground water)
48" long x 1.375" O.D. polypropylene (floating layer)
Replaceable points: lead-free carbon steel

Basic kit:
Body, drive shoes, AW and EW adapters, check ball assemblies, cleaning brush set, 10 replaceable points, 5 stainless steel screens, 5 polypropylene screens, in a protective carrying case

Replaceable supplies:
Points (10/cs)
Stainless steel screens (10/cs)
Polypropylene screens (10/cs.)

QED
Ground Water Specialists
P.O. Box 3726, Ann Arbor, MI 48106
800/624-2026 In Michigan 313/995-2547
In California 415/930-7610

flon is a registered trademark of duPont Corp.



ASSEMBLED HYDROPUNCH

SPECIFICATIONS

The HP1000 is equipped with an "AW" box thread as well as a "EW" casing adapter for floating layer applications.

Maximum Diameter:	2.0"
Length:	60"
Weight:	27#
Shipping Weight:	52#
Sample Volume:	1250 ML

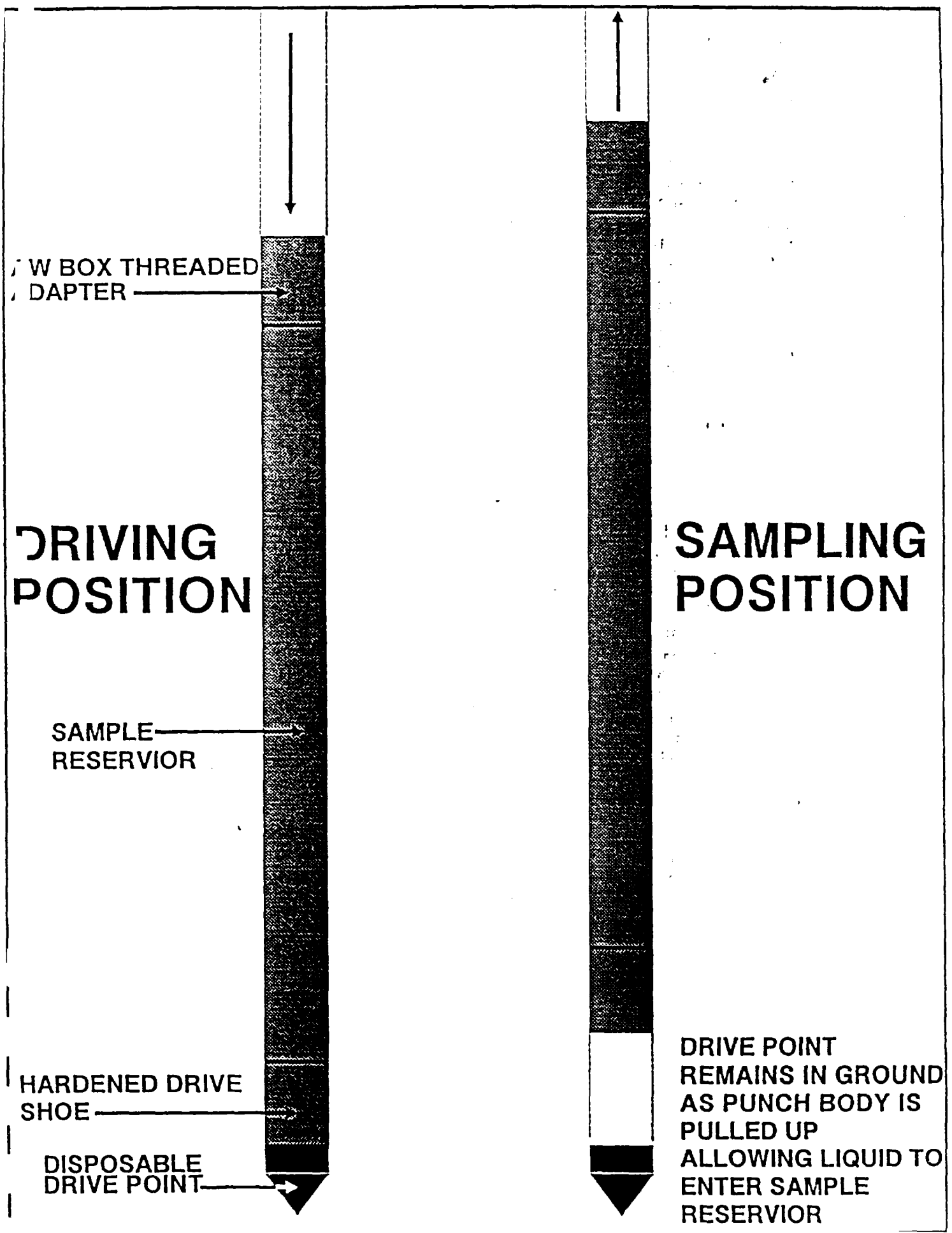
OPERATING THE HYDROPUNCH (R) GROUNDWATER SAMPLING SYSTEM

GENERAL OPERATION

The HYDROPUNCH is used to gather representative groundwater samples without installing complete monitoring wells. The HYDROPUNCH is driven through the undisturbed soil into a water bearing zone, the outer body is retracted slightly to allow liquid to enter into the sample chamber, the HYDROPUNCH is pulled to the surface and the sample is removed for analysis. The HYDROPUNCH is then cleaned and disposable parts are replaced prior to collecting the next groundwater sample. When sampling in floating layer conditions the "EW" adapter is to be used. This allows a 1" bailer to be lowered through the casing, HYDROPUNCH body and into the exposed screen section. The sample is retreived in the same manner as you would in a fully completed well.

USING WITH DRILLING EQUIPMENT

1. Drill the initial hole to just above the water bearing zone.
2. Attach the clean HYDROPUNCH (via the AW box thread at the top) to the drive rods. (See diagram on page 3)
3. Drive the HYDROPUNCH a minimum of 5.5 feet into the undisturbed water bearing zone.
   NOTE The HYDROPUNCH is driven into position in the same manner as a 2" split barrel soil sampler, normally using a 140 LB
4. Retract the HYDROPUNCH approximately 1.5 feet (approximately 3.5 feet if HYDROPUNCH is set up for floating layer sampling) to allow the sample to enter. (See diagram on page 3)
   NOTE: Pulling upward on the drive string should retract the outer body and allow the sample to enter.
5. The fill rate is dependent on the soil's formation and permeability. Fill times of 10 to 40 minutes are normal.
6. Pull the HYDROPUNCH to the surface when filled.
7. Rinse the HYDROPUNCH off before removing the sample.
8. Remove the sample from the HYDROPUNCH using the top discharge device. (See page 8)
9. Rinse any dirt / sand from unit before disassembly for cleaning. Dirt can lock and gall stainless steel threads.


W BOX THREADED
DAPTER
DRIVING
POSITION
SAMPLE
RESERVIOR
HARDENED DRIVE
SHOE
DISPOSABLE
DRIVE POINT
SAMPLING
POSITION
DRIVE POINT
REMAINS IN GROUND
AS PUNCH BODY IS
PULLED UP
ALLOWING LIQUID TO
ENTER SAMPLE
RESERVIOR