Prepared for

Olin Corporation
Charleston, Tennessee

CLEANUP PLAN
OLIN NAZARETH FACILITY
NAZARETH, PENNSYLVANIA

Prepared by

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Project Number 6300-03-0018

AUGUST 2005
DECEMBER 2005 (Revision 1)

CLEANUP PLAN

Pursuant to Section II.C.8.a.viii of the Pennsylvania Department of Environmental Protection (PADEP) Land Recycling Program Technical Guidance Manual (June 2002), this Cleanup Plan presents a strategy to ensure that the Olin Nazareth Facility, Nazareth, Pennsylvania (Site) continues to comply with:

- the risk-based screening criteria for soil as presented in the Risk Assessment Report for the Olin Nazareth Facility (RAR, November 2004);
- Statewide Health Standards for ammonia, chloride, and nitrite in groundwater; and
- Site-Specific Standards for fluoride, nitrate, and sulfate in groundwater as presented in the RAR.

This plan is based on data presented in the Remedial Investigation Report for the Olin Nazareth Facility (RIR) and the RAR, which was filed with PADEP in November 2004 under the Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2) of 1995. Both the RIR and RAR were approved by PADEP in June 2005.

SUMMARY OF SITE CONDITIONS

In the PADEP-approved RAR, the maximum detected soil concentrations from three previous soil investigations at the Site were compared to risk-based screening criteria protective of human health under industrial land use. The detected concentrations were less than the risk-based screening criteria developed in the site-specific risk assessment. The risk assessment concluded that soil exposures would not pose a threat to human health under industrial land use conditions and that no further action was required for soils at the Site.

Six existing wells and one former well did not attain the Statewide Health Standard for one or more constituents:

- Overburden well H-1 – nitrate
- Overburden well H-2 – nitrate
- Fractured bedrock well H-5 – nitrate
- Fractured bedrock well H-6 – fluoride and nitrate
- Fractured bedrock well H-7 – fluoride
- Bedrock well PW-1 – fluoride

- Bedrock well PW-2B – fluoride, nitrate, and sulfate

Except for the detections of fluoride, nitrate, and sulfate listed above, groundwater within the Site attains the Statewide Health Standard.

The 95 percent upper confidence limit (UCLs) of the arithmetic mean concentrations for the H-series wells, MW-1, and PW-1 were calculated for fluoride, nitrate, and sulfate. The sampling data collected from 1990 through 2005 were used to calculate the UCLs. The UCLs are listed in Table 1. Three wells (H-6, H-7, and PW-1) have UCLs that exceed both the Statewide Health Standards (i.e., the media-specific concentrations) and the Site-Specific Standards (SSS) for fluoride in groundwater that were developed in the RAR. The concentrations in all other on-site wells are less than the SSS. In addition, there are no currently complete exposure pathways at the Site.

IDENTIFICATION OF REMEDIAL ALTERNATIVES CONSIDERED

Three remedial alternatives were considered for groundwater at the Site:

Remedial Alternative	Notes
No Action	Although there are no complete exposure pathways at the Site, this alternative was rejected because fluoride exceeds the SSS.
Land Use Restrictions	Although there are currently no complete exposure pathways, this alternative was rejected because fluoride has historically exceeded the SSS.
Land Use Restrictions with Groundwater Monitoring	Because on-site and off-site exposure pathways are currently incomplete, this alternative was selected as the preferred alternative. The Site can be monitored to evaluate whether groundwater quality and/or land use hydraulically downgradient of the Site changes significantly in the future.
Land Use Restrictions, Groundwater Monitoring, and	Because exposure pathways for groundwater are currently incomplete, no active remediation of groundwater was deemed

Groundwater Treatment of Potable Water	necessary at this time. However, the groundwater treatment alternative may be selected to allow flexibility in future resource uses.
Land Use Restrictions, Groundwater Monitoring, and Groundwater Treatment of Groundwater (potable and non-potable)	Because exposure pathways for groundwater are currently incomplete, no active remediation of groundwater was deemed necessary at this time in order to protect human health and the environment.

ANNUAL GROUNDWATER AND SURFACE WATER MONITORING

The following actions are planned in the management of the Site to ensure protection of human health and the environment. One additional sampling event will be conducted in which five wells (H-1, H-5, H-6, H-7, and MW-1) are sampled for all current analytical criteria by the sampling procedures detailed in Appendix A (Sampling and Analysis Plan). Well H-1 is hydraulically upgradient of the Site. Wells H-5, H-6, H-7, and MW-1 encircle the hydraulically downgradient portion of the Site (Figure 1). Appendix A lists procedures to sample the overburden and bedrock wells and the surface water sampling locations. The purpose of this sampling event is to confirm previous sampling results presented in the RIR and Final Report for the Olin Nazareth Facility (August 2005, revised December 2005).

Wells will be purged in accordance with USEPA's low-flow sampling procedures. Redox potential, dissolved oxygen, and turbidity will be measured as indications of groundwater stability during purging and prior to sampling of each well. Per PADEP's request, the sampling pump will be set as low as possible within the screened section of each well, but not at a point that would cause sediment to be drawn into the pump. Analytes for this confirmation event will include ammonia as nitrogen, chloride, fluoride, nitrate, nitrate, sulfate, pH, total dissolved solids (TDS) and specific conductivity.

After the first event is completed, five on-site wells (H-1, H-5, H-6, and H-7, and MW-1) will be used as sentinel wells for continued annual monitoring of fluoride, nitrate, sulfate, pH, and specific conductivity to demonstrate no increased hydraulically downgradient migration of site constituents: .In addition, PW-1 or any of the existing monitor wells that may be used by the property owner will be sampled annually.

In addition to the groundwater samples, two surface water samples, at the approximate locations of SS-1 and SS-2 shown on Figure 1, will be collected annually from Little Bushkill Creek, the natural discharge point for shallow groundwater. As discussed in the Final Report, surface water samples collected to date show no indication of adverse impact from groundwater discharges.

The groundwater and surface water sampling program will continue until the Statewide Health Standards or asymptotic conditions are achieved in the groundwater sampling results. When enough data have been collected to show that the relevant standards are met (i.e., eight quarterly events), Olin will submit a supplement to the Final Report and request termination of groundwater sampling. When asymptotic conditions show no statistically significant variation between sampling episodes, Olin will request that the monitoring program be reduced. During the annual sampling program, these wells will be sampled between April 1 and June 30 of each calendar year with annual reporting submitted to PADEP no later than September 30 of each calendar year.

ANNUAL SITE RECONNAISSANCE

To ensure that the assumptions concerning no complete exposure pathways applicable to the SSSs for groundwater remain in place, a site reconnaissance will be performed annually. The site reconnaissance will confirm that the Site and areas hydraulically downgradient of the Site are still non-residential and that groundwater is not used for drinking water unless undergoing pretreatment to reduce site-related inorganic compounds to levels equal to or less than industrial Statewide Health Standards. If a change in land use or groundwater use is noted at the Site or in hydraulically downgradient areas east of the Site but west of the Little Bushkill Creek, PADEP will be notified and the Site status will be re-evaluated. In addition, PADEP will be notified upon intention to sell the property.

ANNUAL SITE REPORT

Upon completion of each annual site reconnaissance and sampling, a report will be prepared that tabulates the sampling results and compares the results to the Statewide Health Standards and the SSSs. The results of the annual site reconnaissance will be provided in the form shown in Table 2. The report will include a certification by Olin. The annual report with signed certification and annual groundwater and surface water sampling results will be submitted to PADEP during the third quarter of each year (July 1 through September 30).

PROPERTY NOTICE

Upon receipt of PADEP's approval of the revised Final Report, a deed notice for non-residential groundwater use will be applied to the Site in accordance with Section 303(g) and 304(m) of the Act 2 regulation.

STATISTICAL REPORTING FOR ATTAINMENT CERTIFICATION

As future groundwater data indicate that data are approaching compliance with either a Statewide Health or Site-Specific standard for groundwater that is not currently met, additional sampling events may be performed so that: 1) the number and frequency of events required under Section 250.704 of the Pennsylvania Code of Regulations are completed and 2) a statistical test consistent with the specifications of Section 250.707(b)(2)(ii) can be completed and submitted to PADEP in order to verify attainment with a groundwater standard.

The Final Report presents the calculation of 95 percent upper confidence limits (UCLs) of the arithmetic mean for sulfate, nitrate, and fluoride in the seven H-series wells, MW-1, and PW-1 (Table 1). The 95 percent UCLs were calculated using USEPA's ProUCL software, Version 3.0. This software calculates UCLs in accordance with the USEPA's guidance document, Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (OSWER 9285.6-10, December 2002). This methodology or an equivalent method will be followed when UCLs are recalculated at a future date.

In accordance with Section 250.704 of the Pennsylvania Code, the demonstration of attainment for groundwater shall be based on at least eight consecutive quarters of groundwater data. As an alternative, PADEP may accept four consecutive quarterly sampling events or less with written approval from PADEP under the following conditions:

- There is adequate spatial monitoring of the plume upgradient which indicates a decreasing concentration trend toward the downgradient property boundary;
- Parameters affecting the fate and transport of regulated substances within the plume have been fully evaluated;
- Concentrations of regulated substances in the plume at the point of compliance monitoring wells along the downgradient property boundary are all less than or equal to the groundwater standard or the limit relating to the Practical Quantitation Limit, whichever is higher, in all samples collected during the quarters of monitoring; and

- One of the following requirements are met:
    - The age of the plume is sufficiently well known to permit a judgment to be made regarding its stability or
    - The remediation includes source removal or containment actions which would reduce the chemical flux into the plume.

PADEP will be advised in advance if Olin attends to collect additional data in support of the attainment demonstration and consult with PADEP concerning the frequency of data collection events in support of the statistical testing for attainment.

TABLES

TABLE 1

**Comparison of Upper Confidence Limits of Arithmetic Mean
to Medium-Specific Concentrations and Site-Specific Standards for Groundwater Constituents of Concern**

		Fluoride	Nitrate	Sulfate	
Statewide Health Standard (MSC)	=	2	10	500	(a)
Site-Specific Standard	=	6.1	160	730	(b)

Parameter and Location	Data Distribution	Type of UCL	UCL Value	Units	Greater than MSC?	Greater than SSS?	Attainment Method for SSS
Shallow Groundwater (mg/L):							
Fluoride - H-1	Non-parametric	95% Chebyshev (Mean, Sd)	0.45	mg/L	No	No	
* Nitrate - H-1	Non-parametric	99% Chebyshev (Mean, Sd)	25.2	mg/L	Yes	No	Deed Restriction
Sulfate - H-1	Gamma	Approximate Gamma	46.8	mg/L	No	No	
Fluoride - H-2	Non-parametric	95% Chebyshev (Mean, Sd)	0.53	mg/L	No	No	
* Nitrate - H-2	Non-parametric	95% Chebyshev (Mean, Sd)	12.6	mg/L	Yes	No	Deed Restriction
Sulfate - H-2	Non-parametric	99% Chebyshev (Mean, Sd)	228	mg/L	No	No	
Fluoride - H-3	Non-parametric	95% Chebyshev (Mean, Sd)	0.79	mg/L	No	No	
Nitrate - H-3	Normal	Student's T-test	4.0	mg/L	No	No	
Sulfate - H-3	Normal	Student's T-test	76	mg/L	No	No	
Fluoride - H-4	Normal	Student's T-test	0.45	mg/L	No	No	
Nitrate - H-4	Normal	Student's T-test	4.4	mg/L	No	No	
Sulfate - H-4	Normal	Student's T-test	40	mg/L	No	No	
Fluoride - H-5	Non-parametric	Student's T-test	1.12	mg/L	No	No	
* Nitrate - H-5	Normal	Student's T-test	22.2	mg/L	Yes	No	Deed Restriction
Sulfate - H-5	Non-parametric	95% Chebyshev (Mean, Sd)	136	mg/L	No	No	
* **Fluoride - H-6**	Gamma	Approximate Gamma	46	mg/L	Yes	Yes	Deed Restriction
* Nitrate - H-6	Gamma	Adjusted Gamma	70.4	mg/L	Yes	No	Deed Restriction
Sulfate - H-6	Gamma	Approximate Gamma	397	mg/L	No	No	
* **Fluoride - H-7**	Normal	Student's T-test	16.6	mg/L	Yes	Yes	Deed Restriction
Nitrate - H-7	Normal	Student's T-test	6.3	mg/L	No	No	
Sulfate - H-7	Gamma	Approximate Gamma	65	mg/L	No	No	
Deeper Bedrock Wells (mg/L):							
Fluoride - MW-1	Non-parametric	95% Chebyshev (Mean, Sd)	0.76	mg/L	No	No	
Nitrate - MW-1	Normal	Student's T-test	0.75	mg/L	No	No	
Sulfate - MW-1	Gamma	Approximate Gamma	328	mg/L	No	No	
* **Fluoride - PW-1**	Non-parametric	Student's T-test	6.5	mg/L	Yes	Yes	Deed Restriction
Nitrate - PW-1	Gamma	Approximate Gamma	3.8	mg/L	No	No	
Sulfate - PW-1	Normal	Student's T-test	341	mg/L	No	No	

UCL Upper Confidence Limit
MSC Media Specific Concentration
SSS Site Specific Standard
mg/L milligrams per liter
(a) Table III-4
(b) Risk Assessment Report for the Olin Nazareth Facility, November 2004.
* UCL exceeds MSC
For Bolded Locations, UCL exceeds SSS.
Deed Restriction = the use of site groundwater will not be allowed unless the groundwater is first pretreated to reduce to groundwater concentrations to less than applicable risk-based standards.

PREPARED/DATE: MKB 11/21/05
CHECKED/DATE: LMS 11/28/05

TABLE 2

ANNUAL LAND USE CONFIRMATION FOR ACT 2 SITE
Olin Nazareth Facility

		YES	NO
LAND USE	• Does this Act 2 Site meet the definition of non-residential property as defined in PADEP Act 2 Rule of 1995, Section 103? *"Non-residential property means any real property on which commercial, industrial, manufacturing or any other activity is done to further either the development, manufacturing or distribution of goods and services, intermediate and final products, including, but not limited to, administration of business activities, research and development, warehousing, shipping, transport, remanufacturing, stockpiling of raw materials, storage, repair and maintenance of commercial machinery and equipment, and solid waste management. This term shall not include schools, nursing homes or other residential-style facilities or recreational areas."* If "no" is answered to the land use questions, provide written explanation (attach) to Pennsylvania DEP within 30 days.		
EXPOSURE	• Is onsite water from deep potable well(s) being used without treatment and/or meeting a fluoride standard? • Are hydraulically-downgradient receptors present east of the Olin site and west of Little Bushkill Creek that are using groundwater resources? • Is there evidence of a water supply well in the area east of the Olin site and west of Little Bushkill Creek? If "yes" is answered to this exposure question, provide written explanation (attach) to Pennsylvania DEP within 30 days.		

CERTIFICATION

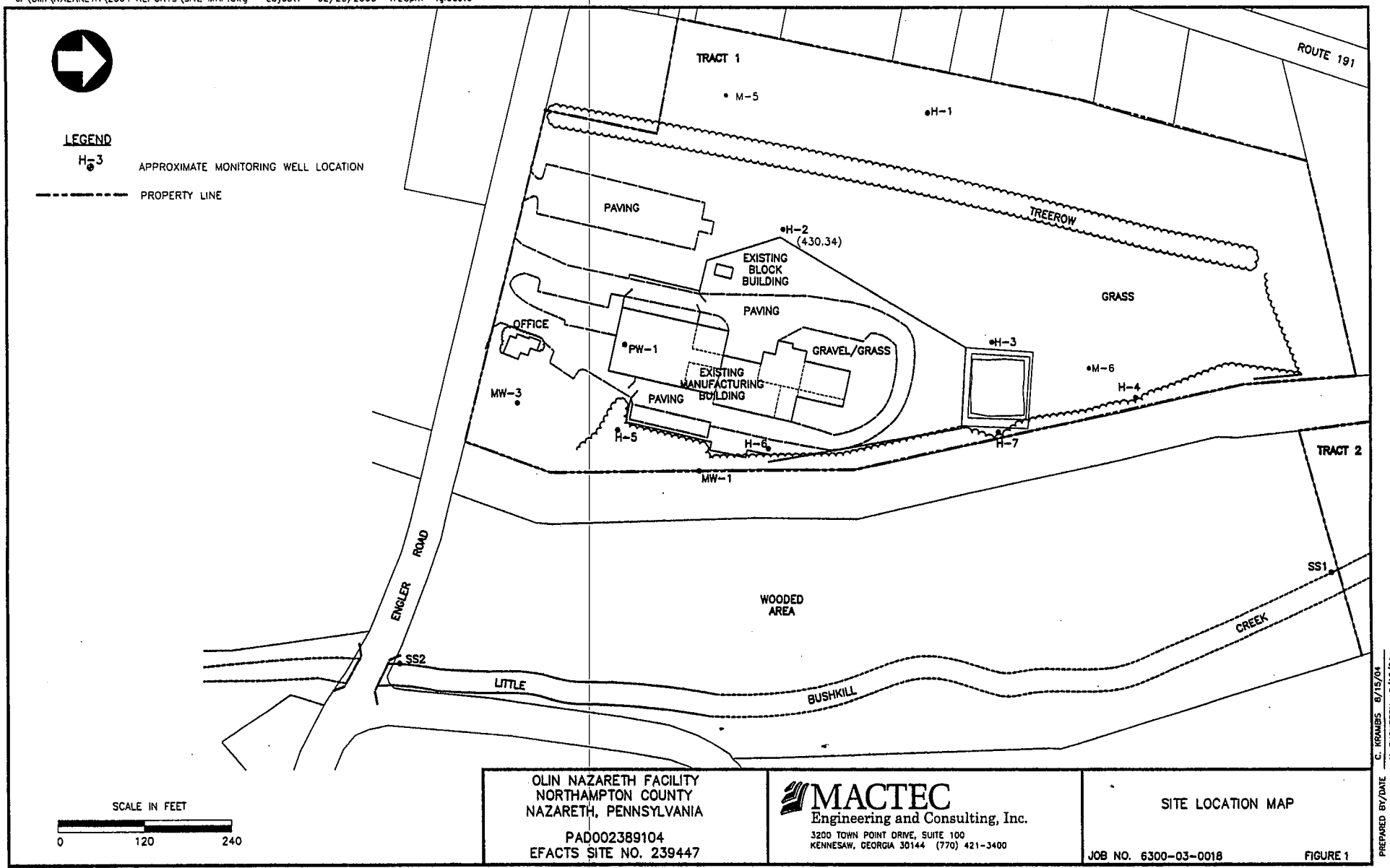
I certify that I have personally examined and am familiar with the information in this evaluation form and any attachments and that based on my inquiry of those persons immediately responsible for completion of this evaluation, I believe the information is true, accurate, and complete.

Name and Official Title

Signature and Date

FIGURE

J:\Olin\NAZARETH\2004 REPORTS\SITE MAP.dwg - Layout1 02/23/2005 4:28pm lgladsto



OLIN NAZARETH FACILITY
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SITE LOCATION MAP

JOB NO. 6300-03-0018 FIGURE 1

PREPARED BY/DATE C. KRAMBS 8/15/04
CHECKED BY/DATE N. THOMPSON 8/16/04

APPENDIX A
SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER AND SURFACE WATER

Prepared for

Olin Corporation
Charleston, Tennessee

SAMPLING AND ANALYSIS PLAN FOR GROUNDWATER AND SURFACE WATER OLIN NAZARETH FACILITY NAZARETH, PENNSYLVANIA

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DECEMBER 2005

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1.0 INTRODUCTION

Olin has prepared this Sampling and Analysis Plan (SAP) for the property located at 731 Engler Road in Nazareth, Pennsylvania, also known as the former Olin Microelectronics Materials, Inc. site (Site).

The SAP is designed as a compliance document to document criteria for monitoring, inspections and progress toward attainment of health based standards. It will ensure that all data obtained from monitoring are of acceptable quality and meet the requirements of the Pennsylvania Department of Environmental Protection (PADEP). The SAP describes the field sampling procedures and methods and the inspections that will be performed.

For ease of review, the report is organized into the following major sections:

Section 1.0	Introduction
Section 2.0	Objectives
Section 3.0	Field Activities
Section 4.0	Decontamination Procedures
Section 5.0	Documentation, Sample Handling and Shipment
Section 6.0	Quality Assurance/Quality Control Samples
Section 7.0	Annual Site Reconnaissance
Section 8.0	Statistical Reporting for Attainment Certification

Site Description

The Site consists of two tracts. Tract 1 is 13.2 acres and is bordered to the south by Engler Road and to the east by a community bicycle path and Little Bushkill Creek. The process facility and associated operations were located on Tract 1. Tract 2 is 2.6 acres in size and is located east of Little Bushkill Creek. Tract 2 has no history of use, industrial or otherwise. Farmland is located to the north and south, and residential areas are located to the west.

2.0 OBJECTIVES

The overall objective of the SAP is to serve as a compliance document to define protocols for monitoring, data development, inspections and data evaluation.

Data development: Established and approved sampling protocols, Quality Assurance/Quality Control (QA/QC) protocols, sample documentation, and COC protocols to ensure consistency during the sampling activities are described in this document.

The following field activities will be conducted as part of the remedial activities:

- The collection and laboratory analysis of groundwater monitoring samples to document groundwater quality to determine compliance with Statewide Health Standards and Site-Specific Standards.
- The collection and laboratory analysis of surface water samples in Little Bushkill Creek to document surface water quality hydraulically downgradient of the Site and to determine compliance with the Statewide Health Standards.
- Collection of field QA/QC samples to monitor field sampling performance and field and laboratory analytical performance.
- In addition to the collection of groundwater and surface water samples, an annual site reconnaissance will be conducted for the site and for the hydraulically downgradient area east of the property boundary to assess whether land use remains unchanged and whether any drinking water wells have been installed.
- The collected groundwater data will be reviewed to assess whether or not groundwater monitor wells that do not currently meet a Statewide Health and/or Site-Specific Standard could be certified for attainment using an approved USEPA statistical method.
- An annual report of monitoring results and inspections will be submitted to PADEP

The following sections address the field sampling strategies that can be applied to the groundwater and surface water monitoring program at the Site.

3.0 FIELD ACTIVITIES

This section describes the field activities that will be performed during the groundwater and surface water monitoring programs. USEPA's Low-Flow Ground-Water Sampling Procedures (EPA/540/S-95/504, April 1996) and PADEP's Groundwater Monitoring Guidance Manual (383-3000-001/Volume 26/Tab 01F, December 1, 2001) were utilized during the preparation of the SAP. The purpose of both the groundwater monitoring program and the surface water monitoring program are to ensure the protection of human health and the environment.

Groundwater Monitoring Program

Upon PADEP's approval of the site-specific Cleanup Plan (submitted August 2005 and revised December 2005), groundwater monitoring will commence. An initial (confirmatory) groundwater sampling event will be conducted to confirm previous sampling results presented in the Remedial Investigation Report (RIR) for the Olin Nazareth Facility (submitted November 2004 and PADEP-approved June 2005) and Final Report (submitted August 2005 and revised December 2005). Following the initial sampling round, annual groundwater sampling events will be conducted until the Statewide Health Standards or asymptotic conditions are achieved in the groundwater sampling results. Annual groundwater sampling events will be conducted between April 1st and June 30th of each calendar year.

Groundwater Sampling Methodology

During the initial confirmatory sampling round and the annual groundwater sampling events, groundwater samples will be collected from four overburden monitor wells (H-1, H-5, H-6 and H-7), one bedrock monitor well (MW-1), and production well PW-1 or any other existing well that is used by the property owner.

Groundwater samples will be collected from locations with the lowest known concentrations of contaminants first, progressing toward the areas of highest known concentration. This procedure will minimize the potential for cross contamination of samples. Previous groundwater data from the RIR and initial confirmatory sampling event will be utilized to determine the monitor well sampling order (i.e., H-1 prior to H-6 and H-7).

Decontaminated or new disposable sampling equipment will be used to minimize the potential for cross contamination. Field personnel will use new disposable nitrile gloves for personal protection and to

minimize the potential for cross contamination. The disposable gloves will be changed prior to handling decontaminated equipment and the collection of each groundwater sample. Equipment decontamination procedures are described in Section 4.0.

Equipment Calibration

Prior to sampling, all sampling devices and monitoring equipment (e.g., water quality measurement device) will be properly calibrated according to manufacturer's recommendations. Calibration data will be recorded for documentation purposes.

Water Level and Well Depth Measurement

Prior to initiating purging activities in the groundwater monitor wells at the Site, the depth to water in the wells will first be measured with an electronic water level indicator probe and referenced to the top of the well riser or any other well point surveyed relative to ground elevation.

Well depth will be obtained from the well construction logs. Measuring to the bottom of the well prior to purging and sampling may cause re-suspension of settled solids from the geologic formation and require longer purging times for parameter stabilization. A confirmatory well depth may be measured after the groundwater sample is collected. Table 1 provides the well depths for the wells included in the groundwater sampling events. Attachment 1 provides copies of the monitor well installation logs for H-1, H-5, H-6, H-7, and MW-1. The locations of the wells to be sampled and the two surface water sampling locations are shown on Figure 1..

Low-Flow Purging and Sampling of Monitoring Wells

After water-level measurements have been recorded in all wells, groundwater purging and sampling will be performed with low-flow sampling methods described in USEPA's guidance document listed above. Due to the purging requirements described in the following paragraphs, a bladder pump (e.g., QED MicroPurge Sampling Pump™) or electric submersible pump (e.g., Grundfos Redi-Flo2™) will be used to meet the low-flow purging rates described in the guidance document (<0.5 L/min). Note that any deviations from this protocol that is necessitated by field conditions will be documented in field notes:

Overburden Wells (H-1, H-5, H-6, and H-7)

First, the low-flow pump will be slowly and carefully lowered into the well and set as low as possible within the screened section of the well, but not at a point that will cause sediment to be drawn into the pump from the bottom of the well. This will ensure minimal disturbance of water and solids in the well casing during purging and sampling.

Following the setting of the pump within the well, a water quality meter with a flow-through cell will be connected in-line to monitor water quality indicator parameters during purging (i.e., to determine parameter stabilization). Indicator parameters monitored and recorded during the purging of each well will include pH, temperature, specific conductivity, dissolved oxygen (DO), turbidity, and oxidation-reduction potential (REDOX). Finally, before the commencement of pumping, the electronic water level probe will be lowered into the well to monitor water level during the purging and sampling of each well.

Once the setup on the well has been completed, purging will begin with the flow rate ranging between 0.1 to 0.5 L/min. The water level will be checked and recorded periodically (e.g., about every three to five minutes) to monitor the drawdown in the well as a guide to flow rate adjustment. The goal will be to minimize the drawdown when possible to <0.1m when purging.

As stated above, indicator parameters will also be monitored and recorded during the well purging at the same frequency as water level monitoring. Purging of the well will continue until these indicator parameters have stabilized. The stabilization of these parameters provides an indication of when representative groundwater enters the well. Parameter stabilization will be considered achieved when three successive readings for indicator parameters meet the following criteria:

± 0.1 for pH
± 3% for specific conductivity
± 10 mV for REDOX potential
± 10% for turbidity and DO

Following the stabilization of indicator parameters, sampling of the well will be initiated. The in-line water quality meter will first be either removed or bypassed for sampling. The flow rate will not be adjusted during the sampling and will remain <0.5 L/min. Groundwater samples will be placed into appropriately labeled, pre-preserved sample containers provided by the off-site laboratory. Following the filling of the required bottle-ware, all samples will be stored inverted at 4°C in supplied coolers. Samples will be handled, labeled, preserved, and tracked using COC forms described in Section 6.0.

Bedrock Well (MW-1)

In comparison to the sampling method described above, the only difference in sampling the bedrock well will be the location for setting the low-flow pump. Because the bedrock well does not have a screened section, the pump will be set as close to the bottom of the well as possible, but not at a point that will cause sediment to be drawn into the pump from the bottom of the well. The remaining sampling procedures for the bedrock well will be consistent those used for the overburden wells.

Production Well (PW-1)

Current site conditions and access allow the bedrock well sampling method to be utilized for purging and sampling production well PW-1. Future plans for the Site may include the installation and connection of a submersible pump system to supply water from this well to a facility structure(s). If this installation does occur at the Site, procedures will need to be set into place with the new owner to ensure the production water supply can be sampled annually. In the event this occurs, section 6.3.6 of the PADEP Groundwater Monitoring Guidance Manual (383-3000-001/Volume 26/Tab 01F, December 1, 2001) provides the following procedure to utilize.

First, locate the closest access point (e.g., water spigot or faucet) to the well for sampling. The sampling point should be prior to any holding tank, treatment system, or filtering device if possible and practical. If it is not possible or practical to avoid these devices, document this for record purposes.

Prior to sampling the production water supply, purge the water from the access point at a low-flow rate for a sufficient time to clear out any stagnant water in the lines. It is important to keep the flow rate low to ensure the water is not aerated and remains representative of the source aquifer being sampled. Immediately before collecting the production water sample, indicator parameters (pH, temperature, specific conductivity, DO, turbidity, and REDOX) will be collected and recorded by the sampler. The production water sample will then be placed into appropriately labeled, pre-preserved sample containers provided by the off-site laboratory. Following the filling of the required bottle-ware, the sample will be stored inverted at 4°C in supplied coolers. The sample will be handled, labeled, preserved, and tracked using COC forms as described in Section 6.0.

Purge Water Disposal

Consistent with past procedures, all purge water from the monitor wells will be containerized prior to being discharged to the ground surface in the area of the spray fields on the northwest side of the Site.

Groundwater Sampling Analysis

During the initial confirmatory sampling round of the monitor wells listed above, Olin will analyze the groundwater samples for chloride (Method MCAWW 300.OA), nitrite (Method MCAWW 300.OA), nitrate-nitrogen (Method MCAWW 300.OA), ammonia-nitrogen (Method MCAWW 350.3), fluoride (Method MCAWW 300.OA), sulfate (Method MCAWW 300.OA), total dissolved solids (TDS) (Method MCAWW 160.1), pH (field), and specific conductivity (field).

Following the initial sampling event, if there does not appear to be a substantial difference between the results obtained from the initial confirmatory sampling round and historical data collected at the Site, then chloride, nitrite, ammonia-nitrogen, and TDS will be eliminated from the annual groundwater sampling parameter list.

During the annual groundwater sampling event conducted between April 1st and June 30th, Olin will analyze the groundwater samples collected from the monitor wells listed above for fluoride (Method MCAWW 300.OA), nitrate-nitrogen (Method MCAWW 300.OA), and sulfate (Method MCAWW 300.OA). Indicator parameters pH and specific conductivity will be collected as field measurements during low-flow sampling procedures.

The laboratory analyses for all samples collected will be performed by Severn Trent Services Laboratory (STL) of North Canton, Ohio.

Surface Water Monitoring Program

Upon PADEP's approval of the site-specific Cleanup Plan (submitted August 2005 and revised December 2005), surface water monitoring will commence. Annual surface water sampling events will be conducted between April 1st and June 30th of each calendar year.

Surface Water Sampling Methodology

Surface water samples will be collected from two locations along Little Bushkill Creek (SS-1 and SS-2 on Figure 1). Surface water samples will be collected starting from the downstream location, then moving to the upstream location. This procedure will ensure that sediment disturbed during sampling are not collected in the specified bottle-ware.

During sampling, field personnel will use new disposable nitrile gloves for personal protection and to minimize the potential for cross contamination. The disposable gloves will be changed prior to the collection of each surface water sample. Surface water samples will be collected from flowing water and not from stagnant water in slow-flowing pools.

Immediately before collecting the surface water sample at each location, indicator parameters will be collected and recorded by the sampler. Utilizing the off-site laboratory supplied, pre-preserved bottle-ware, the sampler will then dip the bottles by hand or with a sample-bottle holder under the water's surface to collect the surface water sample. In order to not spill the preservative in the bottle-ware, the sampler will only fill the bottle-ware nearly full and not completely full. Following the filling of the required bottle-ware, all samples will be stored inverted at 4°C in supplied coolers. Samples will be handled, labeled, preserved, and tracked using COC forms as described in Section 6.0.

Surface Water Sampling Analysis

During annual surface water sampling, Olin will analyze the surface water samples for fluoride (Method MCAWW 300.OA), nitrate-nitrogen (Method MCAWW 300.OA), and sulfate (Method MCAWW 300.OA). Indicator parameters pH and specific conductivity will be collected as field measurements prior to sampling at both creek locations.

4.0 DECONTAMINATION PROCEDURES

The following sub-sections describe the decontamination of groundwater sampling equipment and other materials. The decontamination procedures will be conducted at the location of the work activity.

Environmental Sampling Equipment

Proper decontamination of sampling equipment will be conducted to prevent cross contamination of sample locations and samples. Decontamination of the analytical devices, sampling tools, water level indicator, and equipment that may come into direct contact with a field sample will be performed to achieve analytical results that are representative of true field conditions. Sample containers will be pre-cleaned in accordance with US EPA protocol and will be supplied by STL-North Canton.

The portable, submersible, or bladder pumps used to purge and sample groundwater from monitor wells will be decontaminated before use and between each well. Disposable tubing will be used at each well location to minimize cross contamination. The disposal tubing will be removed from the pump prior to decontamination. Once the decontamination of the pump is completed, new, dedicated tubing will be attached.

All handling of decontaminated equipment will be performed using clean disposable gloves. Care will be exercised in the storage of decontaminated equipment, so as to not re-contaminate what has been cleaned. Sampling personnel will also avoid solvents, greases, oils, gasoline, water, dusts, and other potential sources that might contaminate the equipment before its use. Sampling personnel handling such materials will wear protective gloves when doing so.

5.0 DOCUMENTATION, SAMPLE HANDLING AND SHIPMENT

This section describes the procedures that will be followed for the documentation of field activities, sample handling, and shipment.

Field Data Sheets and Logbook

Field data sheets and logbook will provide the means of recording data during the sampling events. All field data sheets and the logbook will be kept in the possession of field personnel responsible for completing the datasheets and logbook, or in a secure place when not being used during fieldwork. Upon completion of the field activities, all datasheets and the logbook will become part of the project file.

- Datasheet and logbook entries will be made in ink and contain information including: Date, start time, field observations, weather conditions, names of all the sampling team members present, level of personal protection being used, and the signature of the person making the entry.
- Names of visitors to the Site and the purpose of their visit.
- Measurements made and samples collected, including the equipment used to make measurements, along with the date of calibration and record of results.
- Detailed description of the location of each sampling station.
- Time of sampling, sample description, depth or location at which the sample was collected, its type, volume, and number of containers.
- QA/QC samples collected.
- Deviations from the approved procedures during collection, preparation, documentation, or transportation.
- Bottle lot numbers, reagent information, and any waste produced.

Refer to the attached Groundwater Sampling Form (Table 2) for an example of what data will be collected on the field data sheet.

Sample Identification

Sample identification numbers will be used on all sample labels or tags, field data sheets, COC records, and all other applicable documentation used during the project. A listing of all sample identification numbers will be maintained in the field logbook.

The sample numbering scheme used for field samples will be employed for duplicate samples and other field QC such that they will not be readily discernible by the laboratory.

Sample Labeling

Immediately after a sample has been collected, a self-adhesive identification label will be completed in indelible ink and neatly affixed to the outside of the bottle-ware. The following information will be legibly entered on all sample labels:

- Contractor name
- Sample type
- Analysis/method to be performed
- Type of chemical preservative present in the bottle-ware
- Site name
- Date and time of sample collection
- Sample identification number
- Sampler's name or initials

Sample logbooks, datasheets, and COC records will contain the same information as the labels affixed to the sample bottle-ware. These records will record all information related to the sampling effort and the process employed.

Chain-of-Custody Records

The primary objective of COC procedures is to provide an accurate record that can be used to trace the possession and handling of a sample from collection to completion of all required analyses. Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they can not be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they are deemed to be in the custody of such authorized personnel.

Each cooler sent to the laboratory will contain a COC record(s) listing the samples contained therein. The purpose of these forms is to document the transfer of a group of samples traveling together from the field to the laboratory. The original of the COC always travels with the samples and the sampler keeps a copy with the Site sampling records. The COC record must be fully completed by the person who has been designated as responsible for sample shipment to the laboratory for analysis. When transferring the samples, the individuals relinquishing and receiving them must sign, date, and note the time on the COC record.

Sample Destination

Project samples for chemical analysis will be shipped to STL-North Canton, or appropriate alternate laboratory. Site environmental samples will be delivered by overnight service (except for those samples collected on Friday, which will be held under appropriate conditions for shipment the following Monday) via courier to the laboratory. If a courier service (e.g., Federal Express) is used for sample shipping, the Air Bill number must be recorded on the COC record, which will be placed in a Zip-Loc type bag before being taped inside the sample cooler lid. When the laboratory signs the courier service's delivery form and the COC record inside the sample cooler (i.e., "Received By"), they have assumed responsibility of the samples. The laboratory will be responsible for maintaining proper sample receipt protocols or identifying any sample receipt abnormalities as per their appropriate laboratory standard operating procedures.

Documentation Corrections

Only the individual entering the information/data will make corrections to field logbook and datasheet entries, sample labels, sample COCs, cooler custody seals, and/or calibration and maintenance logs. A single solid line (in indelible ink) will be made through the errant entry. Under no circumstances shall a correcting fluid (e.g., White-Out®) be used or any erasures made. Each correction shall be dated and initialed by the individual making the correction.

6.0 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA measures are associated with each sampling and analysis event to ensure that the sample collection and delivery to the laboratory for analysis is representative of site conditions. QA/QC samples will be collected and analyzed as a check of field measurements, and to verify the laboratory's performance on chemical samples. All QA/QC samples that are collected during the sampling program will be identified in the field logbook and datasheets as to which environmental sample the sample is associated.

The following sub-sections describe the QA/QC samples that will be analyzed during the sampling program.

Duplicates

A field QC duplicate sample is a second sample collected at the same location as the original sample and is used as an indicator of overall measurement (sampling and analytical) precision. Duplicate samples are collected using identical sampling techniques and treated in an identical manner during storage, transportation, and analysis. QC samples will be collected as one sample, homogenized, and split into two samples, separately containerized, preserved, and shipped as independent samples in the same manner as environmental samples. Duplicate samples will be collected at a rate of one duplicate sample per sampling event.

Equipment Blanks

The equipment blank is used to check that the decontamination procedure has been adequately performed and that cross contamination of samples will not occur due to the sampling equipment. Following the equipment decontamination procedures, equipment blanks will be collected by pouring laboratory-supplied ASTM Type II water (analyte-free water) over or through the sampling devices utilized on site and then directly into the laboratory-supplied sample bottles. The intent is for the water making up the blank to follow the same path, and therefore, come into contact with the same equipment as the samples. Equipment blanks will be collected at a rate of one duplicate sample per sampling event.

7.0 ANNUAL SITE RECONNAISSANCE

To determine that the assumptions concerning no complete exposure pathways are still applicable to the Site-Specific Standards for groundwater, a site reconnaissance will be performed annually. During the site reconnaissance, the Site and areas hydraulically downgradient of the Site will be observed to identify non-residential property uses and that groundwater is not used for drinking water unless undergoing pretreatment to reduce site-related inorganic compounds to levels equal to or less than industrial Statewide Health Standards. If a change in land use or groundwater use is noted at the Site or in hydraulically downgradient areas east of the Site but west of the Little Bushkill Creek, PADEP will be notified and the Site status will be re-evaluated. In addition, PADEP will be notified upon intention to sell the property. The Annual Land Use Confirmation checklist in provided in Table 3. This completed form will be submitted annually to PADEP, along with the annual groundwater and surface water data report.

TABLES

Table 1

Well Installation Data
Olin Nazareth Facility
Nazareth Pennyslvania

Well ID	Installation Date	Total Depth (ft. bgs)	TOC Elevation (ft. AMSL)	Comments
H-1	11/28/1984	56	472.45	
H-5	12/5/1984	60	451.96	
H-6	12/2/1984	60	453.34	
H-7	11/30/1984	60	446.25	
MW-1	7/29/1996	216.5	440.57 (a)	
PW-1	~1976	~200	452.44 (a)	Sampled if used.

ft. bgs	Feet Below Ground Surface
ft. AMSL	Feet Above Mean Sea Level
NR	Not Reported
TOC	Top of Casing
~	Approximately
(a)	Estimated based on an average 43.5-foot correction calculated from the July 2004 survey of wells using an estimated benchmark (center of west dock) of 500.00 ft. AMSL.

PREPARED/DATE: CMB 11/28/05
CHECKED/DATE: LMS 11/30/05

Table 2

Groundwater Sampling Form

Site:

Project Number: _____ Phase/Task: _____ Well ID: _____

Date: _____ Sampled By: _____

Sampling Time: _____ Recorded By: _____

Weather: _____ Coded Replicate No.: _____

Instrument Identification

Water Quality Meter(s): _____ Serial #: _____

Purging Information

Casing Material: _____ Purge Method: _____

Casing Diameter: _____ Screen Interval (ft bmp): _____

Total Depth (ft bmp): _____ Pump Intake Depth (ft bmp): _____

Depth to Water (ft bmp): _____ Purge time Start: _____

Field Parameter Measurements Taken During Purging

Time	Minutes Elapsed	Rate (mL/min)	Volume Purged	Temp (°C)	pH (SI Units)	Conductivity (mS/cm)	REDOX (mV)	DO (mg/L)	Water Table (ft bmp)	Turbidity (NTU)	Comments

Sample Condition Color: _____ Odor: _____ Appearance: _____

Sample Collection

Parameter:	Container:	No.	Preservative:

Comments _____

_____

TABLE 3

ANNUAL LAND USE CONFIRMATION FOR ACT 2 SITE
Olin Nazareth Facility

		YES	NO
LAND USE	• Does this Act 2 Site meet the definition of non-residential property as defined in PADEP Act 2 Rule of 1995, Section 103? *"Non-residential property means any real property on which commercial, industrial, manufacturing or any other activity is done to further either the development, manufacturing or distribution of goods and services, intermediate and final products, including, but not limited to, administration of business activities, research and development, warehousing, shipping, transport, remanufacturing, stockpiling of raw materials, storage, repair and maintenance of commercial machinery and equipment, and solid waste management. This term shall not include schools, nursing homes or other residential-style facilities or recreational areas."*		
EXPOSURE	If "no" is answered to the land use questions, provide written explanation (attach) to Pennsylvania DEP within 30 days.		
	• Is onsite water from deep potable well(s) being used without treatment and/or meeting fluoride standard? • Are hydraulically-downgradient receptors present east of the Olin site and west of Little Bushkill Creek that are using groundwater resources? • Is there evidence of a water supply well in the area east of the Olin site and west of Little Bushkill Creek? If "yes" is answered to this exposure question, provide written explanation (attach) to Pennsylvania DEP within 30 days.		

CERTIFICATION

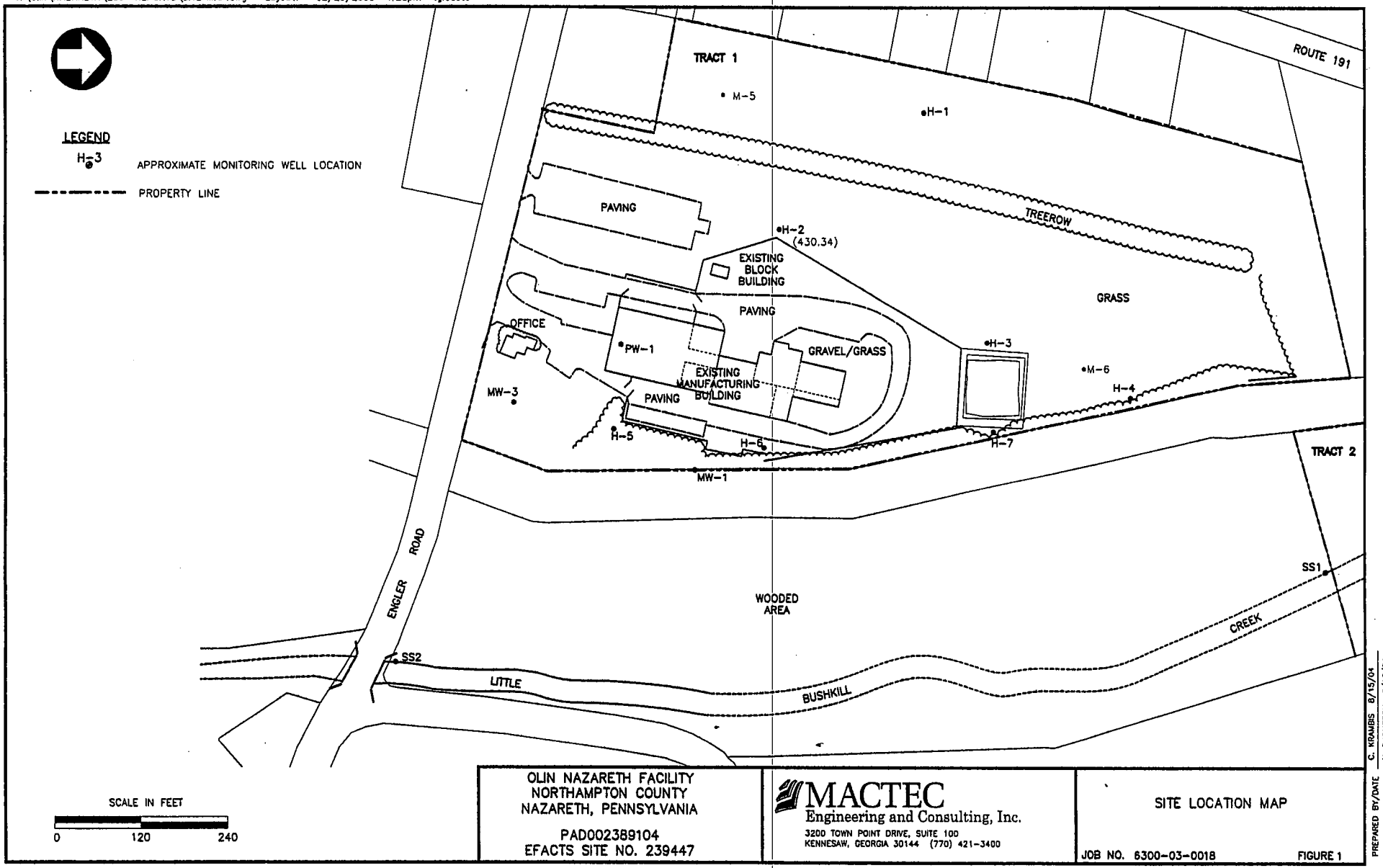
I certify that I have personally examined and am familiar with the information in this evaluation form and any attachments and that based on my inquiry of those persons immediately responsible for completion of this evaluation, I believe the information is true, accurate, and complete.

Name and Official Title

Signature and Date

FIGURE

J:\Olin\NAZARETH\2004 REPORTS\SITE MAP.dwg - Layout1 02/23/2005 4:28pm tgladsto



OLIN NAZARETH FACILITY
NORTHAMPTON COUNTY
NAZARETH, PENNSYLVANIA

PAD002389104
EFACTS SITE NO. 239447

MACTEC
Engineering and Consulting, Inc.
3200 TOWN POINT DRIVE, SUITE 100
KENNESAW, GEORGIA 30144 (770) 421-3400

SITE LOCATION MAP

JOB NO. 6300-03-0018 FIGURE 1

PREPARED BY/DATE C. KRAMBIS 8/15/04
CHECKED BY/DATE N. THOMPSON 8/16/04

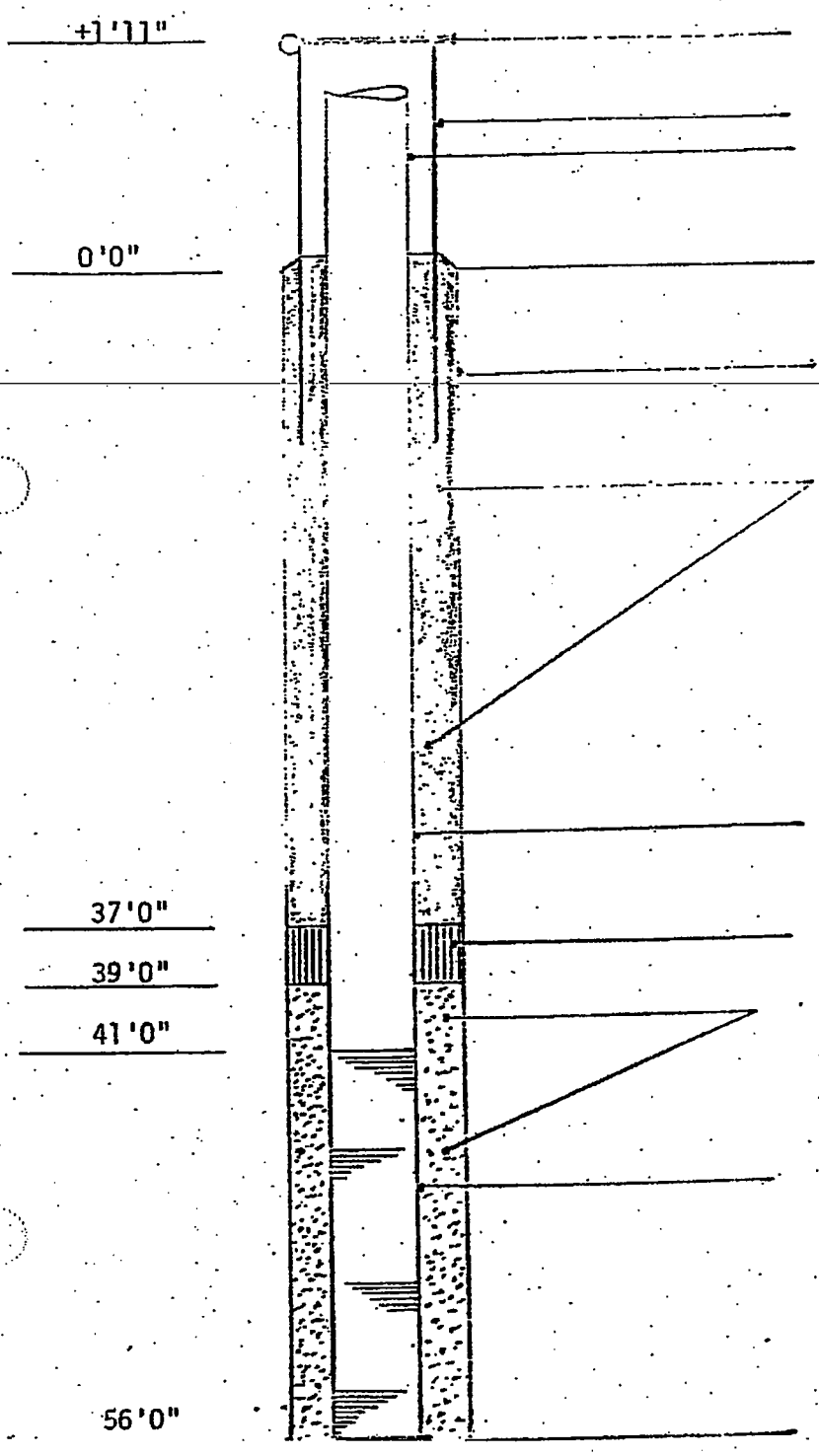
ATTACHMENT 1
WELL INSTALLATION LOGS

Rochester Drilling

WELL DETAIL SUMMARY

PROJECT: Hi Pure Company
LOCATION: Nazareth, PA
DRILLER: J. Kemp
DEPTH TO BEDROCK: Approx. 56'0"

DATE OF INSTALLATION: 11/28/84
BORING NUMBER: H-1
ELEVATION: 472.45
COORDINATES: N. 331.0
W. 352.30

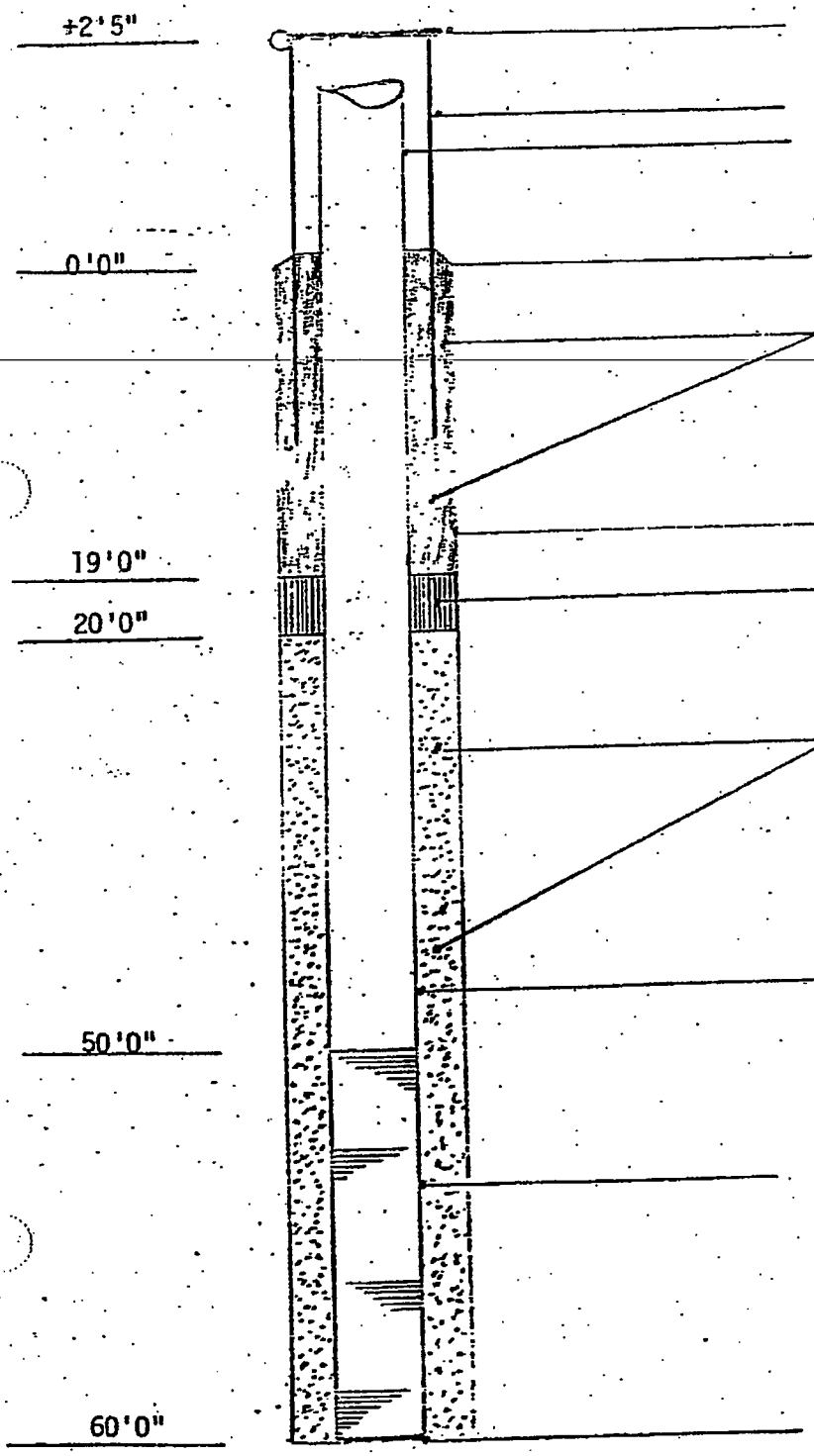


Rochester Drilling

WELL DETAIL SUMMARY

PROJECT: Hi Pure Company
LOCATION: Nazareth, PA
DRILLER: S. Dyer
DEPTH TO BEDROCK: Approx. 13'0"

DATE OF INSTALLATION: 12/5/84
BORING NUMBER: H-5
ELEVATION: 451.96
COORDINATES: N. 4.0
E. 166.5

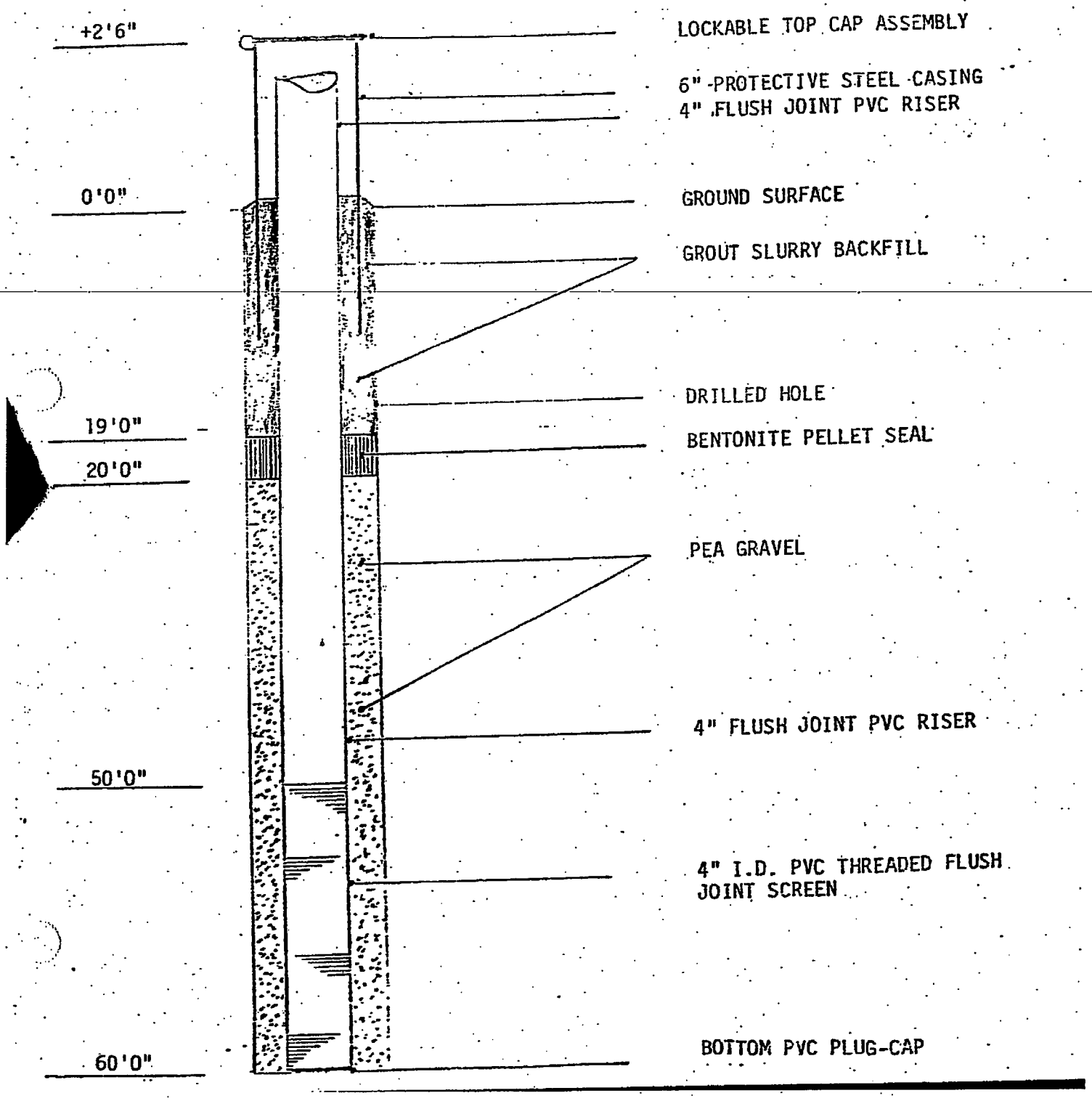


Rochester Drilling

WELL DETAIL SUMMARY

PROJECT: Hi Pure Company
LOCATION: Nazareth, PA
DRILLER: J. Kemp
DEPTH TO BEDROCK: Approx. 16'0"

DATE OF INSTALLATION: 12/2/84
BORING NUMBER: H-6
ELEVATION: 453.34
COORDINATES: N. 213.15
E. 147.0

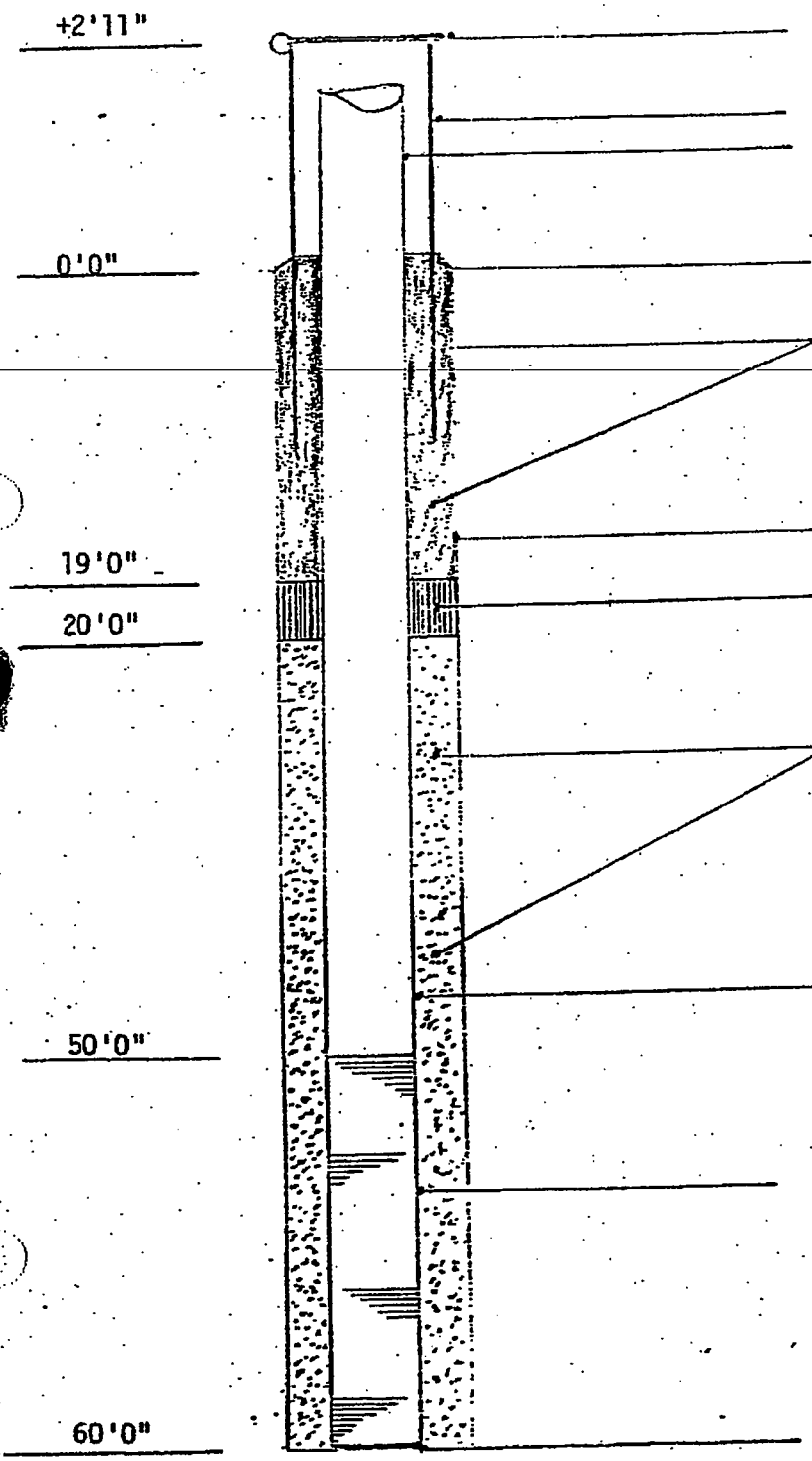


Rochester Drilling

WELL DETAIL SUMMARY

PROJECT: Hi Pure Company
LOCATION: Nazareth, PA
DRILLER: S. Dyer
DEPTH TO BEDROCK: Approx. 13'0"

DATE OF INSTALLATION: 11/30/84
BORING NUMBER: H-7
ELEVATION: 446.25
COORDINATES: N. 517.90
E. 57.75



Smith Environmental Technologies Corp. — Subsurface Log

Project: OLIN CORPORATION
Project No.: 00-7074-0302
Well/Boring Location: Downgradient of pumping well #1 and #2
Drilling Method: 8" AIR ROTARY
Depth to Groundwater: ~80'
Elevations - Ground Surface:
Water Table:
Remarks: CASING installed after hole advanced to ~150' bgs.

Well/Boring No.: MW-1
Sheet: 1 of 1
Date(s):
Logged By: P. NEWDECK
Drilling Contractor: ADVANCED DRILLING
Date: 7/29/96
Inner Casing:
Date:
Reference: GROUND SURFACE.
Outer Casing:
Reference:

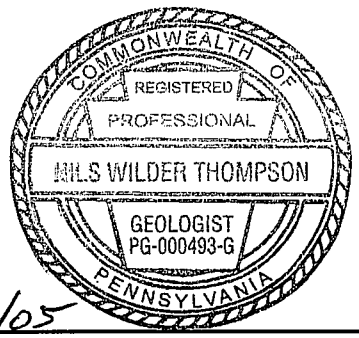
Depth of Samp.(ft)	Sample No.	Blows	Lithologic Description (Material, USCS, Color, Density, Consistency, Other Modifiers, Hardness, Moisture)	Graphical Logs: Strata	Graphical Logs: Well Construction	Organic Vapor Headspace Analysis (ppm)	Comments	Elevation
			0-1 MEDIUM BROWN SILT AND CLAY W/ ORGANIC MATTER				0-10' 12" BOREHOLE.	
			1-216.5' BGS BEDROCK MEDIUM GRAY SHALE				0-10' BGS 10" DIAM STEEL CASING W/ 17" STICKUP ABOVE GROUND SURFACE	
			NO WATER BEARING FRACTURES ENCOUNTERED DURING DRILLING.				▽ GW LEVEL	
							10-216.5' BGS 8" DIAM OPEN BEDROCK HOLE	

Note: Numbers on this form are applicable to all projects

SIGNATURES

PROFESSIONAL GEOLOGIST STATEMENT

I certify that I am a qualified professional geologist who has received a baccalaureate or post-graduate degree in the natural sciences and have sufficient training and experience in geology and related fields, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments regarding soil and groundwater conditions and contaminant fate and transport. I further certify that this report was prepared by me or by a subordinate working under my direction.



12/16/05

Nils W. Thompson, P.G, CPG
Professional Geologist
Commonwealth of Pennsylvania
Registration No. PG-000493-G

Certification by Owner Representative

I acknowledge that this report and its attachments were prepared under my direction. The information submitted is, to the best of my knowledge, is accurate and complete.

Michael J. Bellotti - Principal Remediation Specialist

Name and Title

Michael J. Bellotti 12/21/05

Signature and Date