WORK PLAN
FOR THE INSTALLATION OF ADDITIONAL MONITORING WELLS
AT THE CLAREMONT POLYCHEMICAL SUPERFUND SITE

OLD BETHPAGE, NEW YORK

November 2004

prepared for
United States Army Corps of Engineers, Kansas City District

prepared by
Science Applications International Corporation
Under Contract No. DACW41-02-D-005, Task Order No. 0002

Table of Contents

Acronyms and Abbreviations .... Preceding Text

1.0 INTRODUCTION 1

1.1 BACKGROUND 1
1.2 SCOPE OF WORK PLAN 3
1.3 SITE GEOLOGY 3
1.4 GROUNDWATER CONTAMINANTS OF CONCERN 3

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES 5

2.1 SUBCONTRACTORS 5
2.2 POINTS OF CONTACT 7

3.0 FIELD ACTIVITIES 8

3.1 WELL LOCATIONS AND PROPOSED DEPTHS 8
3.2 ROTARY SONIC DRILLING 8
3.3 CORE SAMPLING 9
3.4 DISCRETE INTERVAL GROUNDWATER SAMPLING 9
3.4.1 Groundwater Sampling Depths 10
3.4.2 Discrete Interval Groundwater Sampling Procedure 10
3.4.3 Sample Collection and Analysis 12
3.5 WELL CONSTRUCTION 12
3.6 DECONTAMINATION 13
3.7 WELL DEVELOPMENT 13
3.8 PUMP INSTALLATION 15
3.9 WASTE MANAGEMENT 15
3.9.1 Soil 15
3.9.2 Water 15
3.10 SURVEYING 15
3.11 SAMPLING OF NEW MONITORING WELLS 15

4.0 HEALTH AND SAFETY 16

5.0 DELIVERABLES 17

6.0 SCHEDULE 18

7.0 REFERENCES 19

Figures

Figure 1. New Monitoring Well Location Map 2
Figure 2. Well Installation Project Organizational Chart 6
Figure 3. Typical Monitoring Well Construction 14

Tables

Table 1. Claremont Screening Levels 2
Table 2. Historical Maximum Concentrations of Volatile Organic Compounds in Groundwater 4
Table 3. Points of Contact 7
Table 4. Rotary Sonic Additional Well Installation Summary 8
Table 5. Rotary Sonic Additional Well Sampling Summary 10

Appendices

Appendix A New York State Drilling and Well Construction Requirements (6 NYCRR 360-2.11)

Appendix B Field Forms

- Daily Activity Report
- USACE Forms MRK55 and MRK55-2 and Guidance (USACE 1998)
- Monitoring Well Construction Log Form
- Groundwater Sampling Log
- Well Development Log

Acronyms and Abbreviations

AMSL	above mean sea level
bgs	below ground surface
DO	dissolved oxygen
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
gpm	gallons per minute
GWTF	groundwater treatment facility
LTRA	Long Term Response Action
MV	millivolts
NTU	nephelometric turbidity units
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
ORP	oxidation reduction potential
OU1	Operable Unit 1
PCE	tetrachloroethene
PG	Professional Geologist
PID	photoionization detector
psi	pounds per square inch
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
ROD	record of decision
SAIC	Science Applications International Corporation
SAP	sampling and analysis plan
SOW	scope of work
SSHP	site safety and health plan
TCE	trichloroethene
USACE	United States Army Corps of Engineers
VOC	volatile organic compound

1.0 INTRODUCTION

This work plan describes activities related to the installation of four additional monitoring wells at the Claremont Polychemical Superfund Site in Old Bethpage, New York. Science Applications International Corporation (SAIC) prepared this work plan in accordance with the U.S. Army Corps of Engineers Kansas City District (USACE CENWK) *LTRA Scope of Work Addendum* (USACE 2004) and SAIC's proposal to USACE (SAIC 2004a).

1.1 Background

Operation of the Groundwater Treatment Facility (GWTF) at the Claremont Polychemical Facility began in February 2000 as part of the remedy for Operable Unit 1 (OU1) for groundwater as identified in the Record of Decision (ROD) dated 1990. The plant pumps and treats contaminated groundwater stemming from the release of hazardous chemicals, primarily volatile organic compounds (VOCs), from a former chemical manufacturing plant. Groundwater is extracted at a rate of approximately 400 gallons per minute (gpm) from three extraction wells. Groundwater is treated to meet discharge requirements in accordance with a New York State Department of Environmental Conservation (NYSDEC) state discharge equivalency permit. Treated groundwater is discharged to groundwater via four groundwater injection wells. Historical site monitoring conducted in support of the Claremont Polychemical treatment program has included quarterly sampling and analysis of approximately 15 to 33 groundwater monitoring wells and extraction wells. Additional groundwater data collected includes groundwater elevations and stabilized water quality data.

There are two other groundwater extraction and monitoring programs ongoing in the area of the Claremont Site. These include a groundwater remediation program being performed by Nassau County in relation to a groundwater plume thought to be originating from the Fireman's Training Center, and a groundwater remediation program being performed by the Town of Oyster Bay in relation to a groundwater plume thought to be originating from the Old Bethpage Landfill.

Interpretations of the data collected under the Claremont Polychemical and Nassau County programs indicate that there may be hydrogeologic interrelationships between the three ongoing groundwater extraction and plume monitoring programs. Groundwater monitoring at additional locations and depths, as described in this work plan, are required to further define regional groundwater plume conditions. Further definition of regional plume characteristics will allow a reevaluation of the adequacy and efficiency of the three groundwater extraction systems. This approach to groundwater management may suggest opportunities for operating the three systems in consideration of the regional picture so that the total effectiveness and efficiency of the three programs are optimized.

Data obtained by Nassau County during investigations conducted for the Fireman's Training center indicate that contamination is present at depths not currently monitored at the Claremont site. Site-specific data at Claremont also suggests the occurrence of groundwater contamination below the maximum depth of site monitoring at monitoring well clusters EW-2 and EW-4. In order to address the need for additional data, four additional upgradient monitoring wells are required to determine if groundwater beneath the site is being impacted by unidentified upgradient sources and to redefine the horizontal and vertical extent of contamination potentially emanating from the site. The new wells will be installed in Levels 4 and 5. The Levels are defined in Table 1.

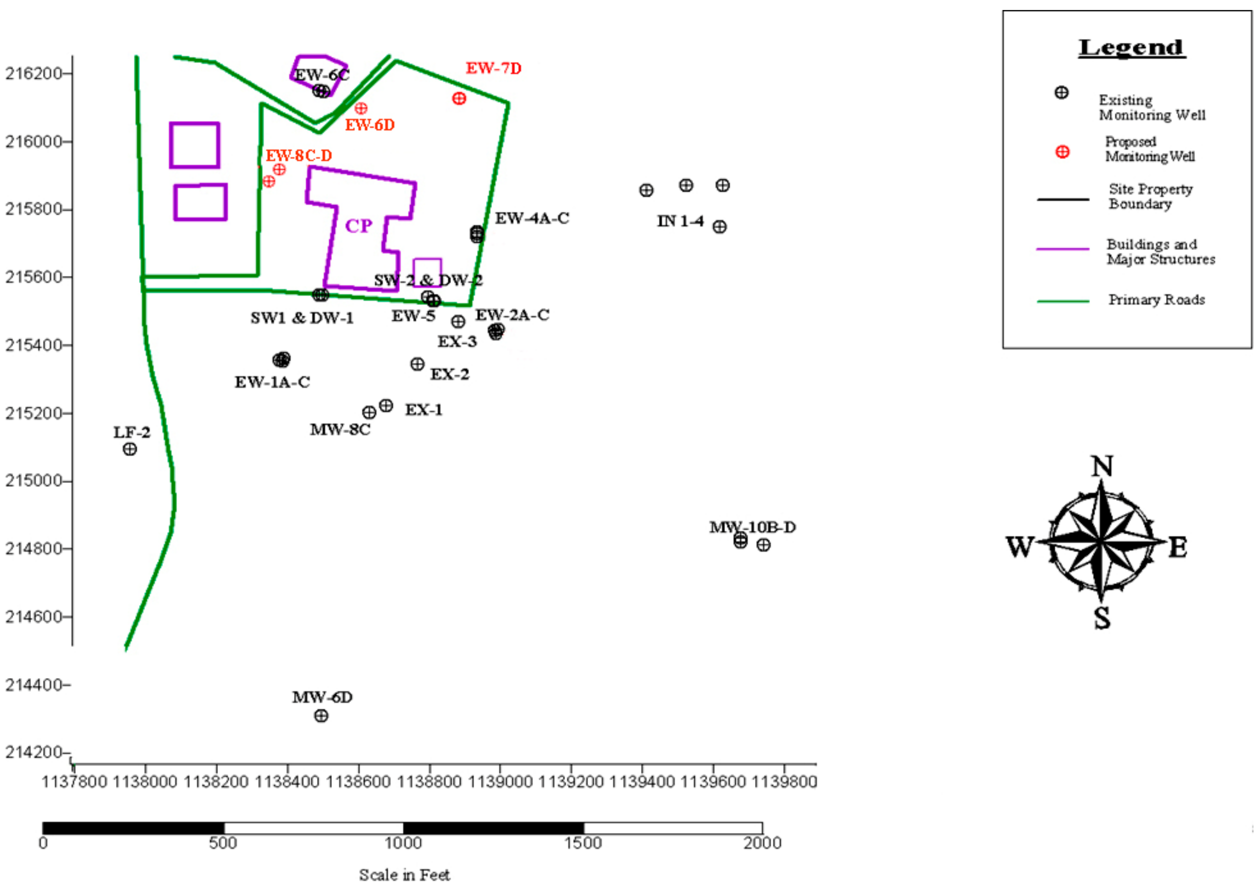
Table 1. Claremont Screening Levels

Level	Screened Interval (ft amsl)
1	75.10 to 44.86
2	42.35 to 22.32
3	20.62 to 2.99
4	-13.99 to -40.99
5	-91.00 to -118.10
6	-149.20 to -176.00

Source: USACE 2003.

The additional upgradient monitoring well clusters will be installed in Level 5 in the northeast corner of the site (EW-7D), Levels 4 and 5 in the northwest corner of the site (EW-8C and EW-8D), and at Level 5 in background monitoring well cluster EW-6 (EW-6D). Levels 4 and 5 (corresponding roughly to Level B in the county well field) were selected to determine if contamination detected at depth during Nassau County investigations is related to sources hydraulically upgradient of the Claremont Polychemical site. The approximate locations of the proposed monitoring wells are indicated on Figure 1.

Figure 1. New Monitoring Well Location Map



1.2 Scope of Work Plan

SAIC will provide oversight for the installation of four additional monitoring wells using rotary sonic drilling methods. During drilling, groundwater samples will be collected at discrete intervals for screening level purposes. The samples will be analyzed by a local analytical laboratory with rapid turn around times. Screening level results will be available in less than two hours to support decision making. These results will be used to determine that rotary sonic drilling has advanced to or below the maximum depth of contamination, and to assure that the screened interval depth is within the zone of maximum contamination for the level being evaluated. After construction, wells will be developed and dedicated bladder pumps will be installed in each monitoring well. The new monitoring wells will be formally sampled and analyzed using standard site monitoring protocols during the quarterly groundwater sampling events. Well locations and elevations will be determined by engineering survey. All work will be done in accordance with the USACE approved *Site Safety and Health Plan* (SSHP) (SAIC 2004b), and the *Sampling and Analysis* (SAP) (SAIC 2003).

1.3 Site Geology

Historical site boring records indicate the generalized site geologic conditions to be as follows:

- The Cretaceous Magothy Formation, a sole-source aquifer for central Long Island, underlies the site.
- The Cretaceous Magothy Formation extends approximately 300 feet below ground surface (bgs) and consists of well-stratified unconsolidated sand, silt, and clay.
- The silt and clay content dominates the northwestern portion of the site, and the proportion of sand increases toward the southern boundary of the site.
- Depth to water is typically 65 to 70 feet bgs and flows to the south-southeast, toward the golf course and Bethpage State Park.
- Organic solvents from historical spills and discharge incidents have contaminated on-site soil and groundwater.

1.4 Groundwater Contaminants of Concern

The primary contaminants of concern affecting groundwater are VOCs including tetrachloroethene (PCE), trichloroethene (TCE), TCE degradation products, and other organics. Table 1 lists the maximum contaminant concentrations detected in the groundwater, as taken from the Remedial Investigation report (Ebasco, 1990).

Table 2. Historical Maximum Concentrations of Volatile Organic Compounds in Groundwater

Volatile Organic Compounds	Groundwater Concentration (Micrograms/L)
Acetone	132
Benzene	150
1,2 Dichloroethylene	3,158
Methyl Ethyl Ketone (2-Butanone)	21
Tetrachloroethylene	6,197
Trichloroethylene	620
1,1,1 Trichloroethane	1,557
Toluene	160
Vinyl Chloride	12
Xylenes (Total)	Not Detected

Source: Ebasco 1990.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

SAIC, on behalf of USACE, has overall responsibility for the installation of the additional monitoring wells at the site. USACE will provide project direction and oversight and will be responsible for reviewing sampling results and field observations, and for making final decisions on the depth and screened intervals of the monitoring wells. The USACE and the U.S. Environmental Protection Agency (EPA) will provide periodic field oversight. Additional information concerning responsibilities for the site is included in Section 2.0 of the SAP (SAIC 2003).

In addition to the positions identified in Section 2.1.2 of the SAP, SAIC has assigned staff personnel to the following key positions for the well installation project:

- **Field Manager and Geologist**: Mr. Todd Eaby, P.G., will function as the Field Manager, Project Geologist, and Project Safety Officer. He will provide direct oversight of the drilling subcontractor, coordinate daily work activities, catalog subsurface materials, conduct field screening for health and safety and analytical purposes, conduct daily tailgate safety meetings, and supervise collection of samples.

- **Field Sample Manager**: Ms. Cathy Huss will function as the Field Sample Manager and be the on-site point of contact with the laboratory. She will collect samples, deliver samples to the laboratory, and manage and distribute/communicate sample results to the appropriate personnel.

The well installation project organization is shown in Figure 2.

2.1 Subcontractors

SAIC has identified the following subcontractors for drilling, laboratory analytical, and surveying services:

- D.L. Maher Drilling & Pump Services, a Division of Boart Longyear Company
  71 Concord Street
  North Reading, MA 01864

- American Analytical Laboratories
  56 Toledo Street
  Farmingdale, NY11735

- AK Associates Professional Land Surveyors
  143 North Long Beach Road
  Rockville Centre, NY 11570

Insert

Figure 2. Well Installation Project Organizational Chart

2.2 Points of Contact

The points of contact for key individuals for the well installation project are shown on Table 3.

Table 3. Points of Contact
Well Installation Project

Name	Address	Telephone/Facimile/e-mail
Richard C. Cronce, Ph.D (SAIC Program/Project Manager)	Science Applications International Corporation 6310 Allentown Blvd. Harrisburg, PA 17112	Ph – 717-901-8852 Fax - 717-901-8105 Richard.C.Cronce@saic.com
Todd Eaby, P.G. (SAIC Field Manager and Project Geologist)	Science Applications International Corporation 6310 Allentown Blvd. Harrisburg, PA 17112	Ph – 717-901-8823 Fax - 717-901-8102 Todd.D.Eaby@saic.com
Rodney Myers (SAIC CQCM/Laboratory Manager)	Science Applications International Corporation 6310 Allentown Blvd. Harrisburg, PA 17112	Ph – 717-901-8836 Fax - 717-901-8102 Rodney.G.Myers@saic.com
Cathy Huss (SAIC Field Sample Manager)	Science Applications International Corporation 6310 Allentown Blvd. Harrisburg, PA 17112	Ph – 717-901-8806 Fax - 717-901-8102 hussca@saic.com
Steve Davis, CIH (SAIC Health and Safety Manager)	Science Applications International Corporation 151 LaFayette Drive Oak Ridge, TN 37831	Ph – 865-481-4755 Fax - 865-481-8797 Stephen.L.Davis@saic.com
Todd A. Daniels (USACE Project Manager)	USACE, Kansas City District 601 East 12th Street Kansas City, MO 64106	Ph - 816-983-3584 Fax – 816-426-5550 todd.a.daniels@usace.army.mil
Krista McGowan, Ph.D. (USACE Project Chemist)	USACE, Kansas City District 601 East 12th Street Kansas City, MO 64106	Ph - 816-983-3884 Fax – 816-426-5550 Krista.I.McGowan@usace.army.mil
Julius Calderon (USACE Project Engineer)	USACE, Kansas City District 601 East 12th Street Kansas City, MO 64106	Ph - 816-983-3550 Fax –816-426-5550 Julius.C.Calderon@usace.army.mil
Bradley Brink (USACE Project Geologist)	USACE, Kansas City District 601 East 12th Street Kansas City, MO 64106	Ph - 816-983-3883 Fax – 816-426-5550 Bradley.J.Brink@usace.army.mil
Maria Jon (EPA Project Manager)	USEPA Region II 290 Broadway, 20th Floor New York, NY 10007	Ph - 212-637-3967 Fax - 212-637-4282 Jon.Maria@epamail.epa.gov
Kevin P. Mayer (D.L. Maher Project Manager)	D.L. Maher Drilling & Pump Services 71 Concord Street North Reading, MA 01864	Ph – 781-933-3210 Fax – 978-664-3299 kmaher@dlmaher.com
Remo Gigante (American Analytical Project Manager)	American Analytical Laboratories, Inc. 56 Toledo Street Farmingdale, NY 11735	Ph – 631-454-6100 Fax – 516-644-6703 rgigante@american-analytical.com

3.0 FIELD ACTIVITIES

3.1 Well Locations and Proposed Depths

One of the objectives of the work will be to construct groundwater monitoring wells in such a manner to evaluate groundwater conditions at target elevations at each location. The proposed new monitoring well locations are shown in Figure 1 and a summary of the proposed depths of the screened intervals is included in Table 4.

Table 4. Rotary Sonic Additional Well Installation Summary

Proposed Well ID	Location	Level	Proposed Depth of Screened Interval (feet bgs)	Proposed Elevation of Screened Interval (feet amsl)
EW-6D	EW-6 cluster	5*	236 to 246	-108 to –118
EW-7D	NE corner of site	5*	267 to 277	-108 to –118
EW-8C	NW corner of site	4	158 to 168	-30 to –40
EW-8D	NW corner of site	5*	236 to 246	-108 to –118

*Well interval can be adjusted based on analytical contamination screening results
bgs – below ground surface
amsl – above mean sea level

As noted in Table 4, the depth and screened intervals of wells EW-6D, 7D and 8D may be adjusted based on field observations and analytical contamination screening results. Analytical results will be reviewed by the USACE and SAIC and a conference call will be convened. USACE will make final decisions as to the depth of the screened interval and email the decision to SAIC.

Before starting field activities, SAIC will stake the proposed well locations in the field, and the drilling subcontractor will complete a New York City & Long Island One Call to identify underground utilities.

3.2 Rotary Sonic Drilling

Rotary sonic drilling is a multi-cased system that simultaneously uses high-frequency vibration and low-speed rotational motion coupled with downward pressure to advance the cutting edge of the circular drill string. This action produces a uniform borehole while providing relatively continuous, undisturbed core samples of both overburden and most bedrock formation. For this project, rotary sonic drilling will use a four-inch diameter core barrel with six-inch diameter over ride casing to advance the borehole. If subsurface conditions result in elevated casing surface friction a seven-inch override casing may be used. Continuous core samples from the ground surface to the bottom of the deepest borehole at each monitoring location will be collected for logging purposes.

Monitoring wells will be installed in accordance with the LTRA SOW Addendum (USACE 2004) and the NYSDEC State Requirements for Drilling and Well Construction (6 NYCRR 360-2.11) included in Appendix A. The senior driller on the rig will be certified and licensed to operate in the State of New York.

SAIC will be on-site during all drilling and well installation activities to provide well installation oversight, catalog subsurface materials, conduct field screening for health & safety and analytical purposes, and manage sampling and delivery of samples to the analytical laboratory.

The drilling subcontractor will provide all equipment in first-class working order, clean, and free from oil, hydraulic, or other leaks. The drill rig and all down-hole equipment will be free of any contamination (radiological, organic or inorganic) from previous work. All drilling equipment will be inspected for contamination prior to beginning down-hole work.

Upon mobilization to the site, SAIC will verify that equipment is acceptable and operable, and will require the drilling subcontractor to demonstrate that all drill rig safety devices and equipment are operable. At a minimum, three operable kill switches must be on each rig. The SAIC Field Manager will complete a Drill Rig Operational Checklist at the beginning of each 10-day shift. The Daily Drill Rig Inspection Checklist will be completed each day. Copies of these forms are available in Appendix C of the SSHP (SAIC 2004b).

3.3 Core Sampling

Continuous core samples from the ground surface to the bottom of the deepest borehole at each monitoring location will be collected as follows:

1. The four-inch core barrel is advanced to the desired depth. The depth inside the core barrel is measured to determine recovery.
2. The six-inch over ride casing is advanced to the same depth as the core barrel. The top of the core barrel and rods are sealed before driving the casing to prevent flushing of the core barrel if water is required.
3. The core barrel is retrieved to the surface. A second measurement is taken inside the core barrel and the recovery is compared to the first measurement to determine if any of the core was lost during retrieval.
4. The core barrel is raised and the sample vibrated out into plastic sleeves and labeled. The first material out of the core barrel is the bottom of the core.
5. Retrieved soils will be screened immediately with a photoionization detector (PID) and logged in the field by SAIC's field geologist using USACE Forms MRK55 and MRK55-2 in accordance with the USACE borehole logging guidance (Appendix B).
6. If appropriate, a water sample is collected (see Section 3.4). Otherwise, the core barrel is put back in the casing and the process repeated.

The use of water and drilling fluid to assist in drilling will be avoided or minimized if possible unless determined to be necessary due to encountered subsurface conditions. Below the water table, heaving sand conditions can occur during retrieval of the core barrel. If these conditions are encountered, actions will be taken to minimize heaving by adding potable water to the inside of the drill string in an attempt to maintain positive hydrostatic pressure within the drill string. If heaving sands are identified, a minimal quantity of water will be used to remove the sand from the drill string. Drill cuttings and fluids will be containerized and processed as discussed in Section 3.9.

3.4 Discrete Interval Groundwater Sampling

Groundwater samples will be collected during advancement of the boreholes using discrete interval groundwater sampling protocols. These screening level samples will be analyzed with rapid turn around times by American Analytical Laboratories, a local analytical laboratory. The results will be used to determine that rotary sonic drilling has advanced to or below the maximum depth of contamination, and to assure that the screened interval depth is within the zone of maximum contamination for the level being evaluated.

All sampling, equipment, containers and preservatives, sample handling, and documentation will be in accordance with the SAP (SAIC 2003). Groundwater samples will be analyzed for VOCs by Method 8260B by American Analytical Laboratories with analytical results provided within 2 hours of receipt of samples, or within a timeframe as otherwise necessary to not slow the progress of the work.

3.4.1 Groundwater Sampling Depths

At deep well locations EW-6D, EW-7D and EW-8D, groundwater samples will be collected at 20-foot intervals beginning at the apparent water table surface, and continuing to the bottom depth of the borehole. The final well construction of well EW-8C will be based on the groundwater sampling results of adjacent well EW-8D, with one confirmatory groundwater sample collected from the identified screen depth. A groundwater sampling summary is included in Table 5.

Table 5. Rotary Sonic Additional Well Sampling Summary

Proposed Well ID	Level	Proposed Depth of Screened Interval (feet bgs)	Anticipated No. of Groundwater Samples
EW-6D	5*	236 to 246	10
EW-7D	5*	267 to 277	10
EW-8C	4	158 to 168	1
EW-8D	5*	236 to 246	10

*Well interval can be adjusted based on analytical contamination screening results
bgs – below ground surface

3.4.2 Discrete Interval Groundwater Sampling Procedure

The following discrete interval sampling procedure for rotary sonic drilling was adapted from D.L. Maher (Maher 2002). Water samples will be collected using an electric submersible pump in combination with a packer system to collect water from the bottom of the casing. Stabilized water quality parameters will be used to determine when purging is complete.

The following materials and equipment are required for discrete interval groundwater sampling:

- Means to measure amount of water injected.
- Source of potable water.
- Pump and packer equipment.
- Hose line and reel for pump discharge.
- Generator to run pump.
- Screen and K-packer (a K-packer is a rubber seal attached to the top of the lead rod to prevent heaving sands from entering the bottom of the drill casing during purging of water).
- Means to measure amount of water purged.

Prior to sampling, the following pre-measurements will be taken:

- Measure the length of the screen section, the position of the K-packer, and the length of the lead rod. The purpose of this is to know where the screen is and where the pump will rest on top of the lead rod.
- Measure the pump and packer set up. The length from the bottom of the pump to the pump intake, and the distance from the bottom of the packer to the bottom of the pump will be made

and recorded. The information will be used to calculate the amount of water to be purged and to determine the position of the pump relative to the water table.

- Measure the length and diameter of hose to calculate volume.
- Both inside and outside casing diameters will be measured and recorded.

Once the outer casing is at the sampling depth and the core sample has been retrieved (see Section 3.3), the following steps will be followed:

1. Measure the depth to the bottom of the casing to ensure there is no heave. If heave exists additional water will be used to force the solids from the casing. (One to two feet of heave may remain in the casing after addition of water.)
2. Attach the quick connect to the wireline and lower the screen and lead rod with K-packer assembly.
3. Retract the casing a predetermined length to expose the screen.
4. Re-measure to the top of screen assembly to determine depth of screen. The screen may have moved when the casing was retracted. If the screen remains inside the casing, the purge rate may be lowered.
5. Attach pump and packer assembly to wireline wench and lower to depth.
6. Inflate packer. Nitrogen gas or compressed air is generally used to inflate packer to proper pressure, or pounds per square inch (psi) (psi = 0.433 x height of column of water). It is not necessary to inflate packer if the first zone is at the water table.
7. Turn pump on to begin purging. The initial purge rate will be as low as possible given the limitations of the pump, the amount of head, and the aquifer conditions. Water will flow from the pumping zone unless: (1) the screen is in a no-yield zone; (2) the screen is obstructed; or (3) the pump is not working properly. The purge water will be discharged into a drum or tank for subsequent transfer to and treatment at the GWTF.
8. Calculate purge rate.
9. The pH, conductivity, temperature, dissolved oxygen (DO), oxidation reduction potential (ORP) and turbidity will be monitored during purging. The purge rate will be adjusted, as necessary, until a stabilized flow rate is achieved. Ideally, a steady flow rate should be maintained that results in a stabilized water level. After the water level has stabilized and all air removed from the tubing, field water quality parameters will be measured and recorded a minimum of once every three to five minutes on the Groundwater Sampling Log included in Appendix B or entered into a field pocket computer. Purging will be considered complete when the field parameters stabilize after a minimum of three readings at five minute intervals according to the following criteria (SAIC 2003):

   - DO: ± 0.1 milligrams/liter (mg/L) for DO values less than 1 mg/L, or ± 10 % for DO values greater than 1 mg/L
   - Eh (ORP): ± 10 milli-volts (mV)
   - conductivity: ± 20 micro-mhos/centimeter (µmhos/cm), or ± 20 mS/cm (milli siemens/centimeter), or ± 1 percent of full-scale reading (instrument repeatability)
   - temperature: ± 0.5 degrees Celsius (°C)
   - pH: ± 0.1 Standard units (S.U.)
   - turbidity: < 50 nephelometric turbidity units (NTU)

10. The collection of groundwater samples will begin immediately after determination of stabilized readings. The pump tubing will be disconnected from the flow through cell and checked to make sure that no air is entrapped in the lines prior to sample collection. Samples will be transferred directly into pre-preserved laboratory sample containers from the pump tubing.

11. Once the sample has been collected, the pump can be turned off, packer deflated, and pump assembly reeled in.
12. Lower the quick connect on the wireline and retrieve the screen assembly.
13. Decontaminate the pump and hose line by washing with an Alconox solution and rinsing with deionized water. The screen assembly and packer will be decontaminated with a pressure washer at the decontamination pad (see Section 3.6).
14. Advance casing to next interval.
15. Repeat process.

If geologic conditions cause slow recharge through the screened interval during the purging process, the purge volumes may be altered to allow sample collection and boring advancement to continue at an efficient rate.

3.4.3 Sample Collection and Analysis

As shown in Table 5, approximately 31 groundwater samples will be collected for analysis. In addition, 2 samples of drilling water, 2 duplicate groundwater samples, and 1 purge water (casing water) samples will be collected for quality assurance/quality control (QA/QC) purposes in accordance with the SAP (SAIC 2003). A maximum of 4 groundwater samples is anticipated per day (excluding QC samples). Samples will be analyzed for VOCs in accordance with EPA Method 8260B with reporting levels in accordance with the SAP.

Samples will be immediately transported by SAIC to American Analytical Laboratories. The laboratory will contact the field sample manager via telephone with screening level results within two hours of sample collection, or within a time period short enough to not impede the progress of the work. Electronic data deliverables (EDD) will be prepared in accordance with the SAP and emailed daily to personnel identified by SAIC. The VOC results are being used for screening level data only to support immediate decision making, and no data validation is required. Final hard copy deliverables as specified in the SAP (SAIC 2003) will be submitted within two weeks of completion of analysis.

3.5 Well Construction

Well construction will be in accordance with the New York State requirements (6 NYCRR 360-2.11) included in Appendix A. A typical monitoring well construction diagram is included in Figure 3. Monitoring wells screens will be nominal 2.5 inch inside diameter, Schedule 80 polyvinyl chloride (PVC) and 10 feet in length. Slots will be 0.010-inches (or sized in accordance with the formation materials encountered). Monitoring well riser pipe will be 2.5-inch inside diameter schedule 80 PVC. Stainless steel centralizers will be installed at the top and bottom of the screen.

Selection of the filter pack will be made in the field based on the observed grain size distribution of subsurface materials. It is anticipated that a sand pack consisting of Morie No. 0 silica sand will be selected. The sand pack will be installed to a minimum of two feet above the top of the well screen and six inches below the bottom of the screen. The sand pack will be installed at a uniform rate and will be closely monitored to ensure even placement and prevent bridging. The sonic casing will be vibrated in order to settle and set the filter pack. The sand pack will than be sounded again and additional sand will be added as needed to maintain the minimum of two feet above the top of the well screen. Six inches of a finer grained sand pack material (100 percent passing the No. 30 sieve and less than two percent passing the No. 200 sieve) will be placed at the top of the sand pack between the sand and the bentonite seal [6 NYCRR 360-2.11(ii)(c)].

Following the placement of the filter pack a bentonite pellet seal of at least three feet will be placed above the sand pack in a manner that will prevent bridging. If pellets or chips are used, sufficient time should be allotted to allow for full hydration of the bentonite prior to emplacement of overlying materials [6 NYCRR 360-2.11(ii)(d)]. If a bentonite slurry is used the slurry will be allowed to hydrate per manufacturers recommendation. The top of the bentonite seal will be verified using a weighted tape. A six to twelve inch fine grained sand pack must be placed above the bentonite seal to minimize grout infiltration.

An annular seal consisting of a cement-bentonite grout will placed above the sand overlying the bentonite seal using a side discharge tremie pipe. The annular seal will be installed in one continuous operation from the top of the sand overlying the bentonite seal to the ground surface. The tremie pipe will be closed ended with side discharging openings along the bottom portion of the pipe. The side discharge application of the annular seal will allow the grout to be placed into the annular space without disturbing the bentonite seal.

A locking above ground protective steel casing will be placed over the well casing and secured with a concrete anti-percolation collar. A drain hole will be drilled at the base of the protective casing and a vent hole near the top. The annulus of the protective casing will be filled with gravel. The concrete surface seal will extend to 3.5 feet, the normal maximum frost depth, to prevent potential well damage. The anti-percolation collar will be constructed by pouring concrete into a pre-built form with a minimum of three-foot long sides. The anti-percolation collar is designed to prevent surface runoff from ponding and entering the well casing [6 NYCRR 360-2.11(ii)(f-g)]. Protective posts (bollards) will not be required. Well construction specifications for each monitoring well will be documented on the Well Construction Log found in Appendix B.

3.6 Decontamination

A temporary decontamination pad will be constructed adjacent to the treatment plant building, and the drilling equipment will be decontaminated upon mobilization to the site, between wells, and upon demobilization in accordance with the site SAP. Sampling equipment will be decontaminated between sampling intervals. Decontamination fluids generated will be handled in accordance with the procedures detailed in the Section 3.10 and in accordance with the SAP (SAIC 2003).

3.7 Well Development

The wells will be developed by pumping until pH, conductivity, DO, and ORP are stable (see Section 3.4.2) and turbidity is less than 50 NTUs. If the pump rate required for proper development is greater than the capacity of the flow through cell and prevents its use, stabilization of DO may be impractical. In addition, a minimum of three well volumes and 3-times the volume of water lost during drilling within the screened interval will be removed. Well development will continue for a maximum of 4 hours, at which time USACE will be contacted to determine additional development requirements. Development activities will be documented on the Well Development Log included in Appendix B. Development water will be transported to the treatment plant as discussed in Section 3.10.

Insert

Figure 3. Typical Monitoring Well Construction

3.8 Pump Installation

Dedicated bladder pumps will be installed in each monitoring well. PVC construction bladder pumps will be installed in the new wells less than 250 feet deep. Wells deeper than 250 feet will require stainless steel bladder pumps to overcome buoyancy, and assure placement of the pumps at the proper depth. Poly tubing will be used for the bladder pump airline and Teflon® tubing will be used for the discharge line. Pump intakes will be set 5 feet from the bottom of the well.

3.9 Waste Management

3.9.1 Soil

Drill cuttings generated at each boring location will be placed into 55-gallon drums, labeled, and stored in a central location for off-site disposal. Drill cuttings will be transported from the soil boring locations to the central staging area upon completion of each borehole or on a daily basis if requested. It is assumed that a total of 12 drums of cuttings will be disposed of off-site at the Chemical Waste Management hazardous waste facility in Model City, NY, as non-hazardous waste.

3.9.2 Water

Drilling water, purge water, development water and decontamination water will be transported to the outside subsurface sump of the GWTF for subsequent treatment by the plant. Sediment will be removed from the drilling water prior to transfer to the GWTF.

3.10 Surveying

Prior to drilling, SAIC will use an auto level and known elevations (monuments or surveyed wells) to determine the elevation at each of the boring locations. These elevations will be used during drilling to convert depths to feet amsl.

Following the completion of field activities, a State certified surveyor will determine the elevations and positions of the newly installed monitoring wells. All monitoring well locations will be surveyed horizontally to the nearest 0.1 foot and tied into the State Plane System (NAD27). The ground surface elevation of the locations will be measured to the nearest 0.1 foot relative to mean sea level (NGDV29). For all monitoring wells, a notch cut in the top of the riser pipe and the brass tab located on the well pad will be surveyed to the nearest 0.01 foot relative to mean sea level.

3.11 Sampling of New Monitoring Wells

The new monitoring wells will be sampled during the January 2005 quarterly groundwater sampling event and will be included in subsequent quarterly sampling events. The new wells will be sampled and analyzed in accordance with SAP in the same manner as all other site monitoring wells (SAIC 2003).

4.0 HEALTH AND SAFETY

All work will be completed in accordance with the SSHP (SAIC 2004b). Daily health and safety tailgate meetings will be required during the performance of the work. All fieldwork is expected to be conducted in Level D personal protective equipment (PPE). Clothing and equipment required to comply with this level of worker protection shall include the following:

- leather overgloves
- steel-toed boots
- chemical resistant overboots covers [as required by the Health & Safety Officer]
- hard hats
- safety eyewear
- hearing protection

Due to the potential for encountering materials with elevated concentrations of VOCs, provision for upgrading health and safety protection to Level C will be available for this project. The decision to upgrade to Level C will be in accordance with criteria provided in the SSHP, and as agreed by the Project Health and Safety Officer.

5.0 DELIVERABLES

A monitoring well installation report will be prepared to document the details of the monitoring well installation. The report will include: detailed description of all field activities and protocols; copies of daily activity logs; well boring and construction logs; well development forms; and supporting photographs. Copies of these forms are included in Appendix B. The drilling subcontractor will submit a Long Island Well Completion Report to the NYSDEC Regional Headquarters office in Stony Brook, NY.

6.0 SCHEDULE

The drilling program will be completed in 10-day cycles (10 days on and 4 off) with the first 10 day shift beginning on November 15, 2004. A total of 23 field days are planned. The estimated number of days per well is as follows:

- 6 days for EW-6D
- 7 days for EW-7D
- 4 days for EW-8C
- 6 days for EW-8D

Anti-percolation collars will be installed soon after the installation of each monitoring well. Development of the monitoring wells will be performed after all wells are constructed.

7.0 REFERENCES

Ebasco, 1990. *Remedial Investigation Report, Claremont Polychemical Superfund Site, Old Bethpage NY*, Draft, July.

Maher, D.L. Drilling & Pump Services (Maher), 2002. *Procedure for Water and Soil Sampling with the Sonic Rig*.

Science Applications International Corporation (SAIC), 2003. *Sampling and Analysis Plan for Groundwater Treatment O&M at the Claremont Polychemical Superfund Site*, June.

Science Applications International Corporation (SAIC), 2004a. *Modification No. 11 – Installation of Additional Monitoring Wells*, Revision 2, August 27.

Science Applications International Corporation (SAIC), 2004b. *Site Safety and Health Plan for Groundwater Treatment and Operations and Maintenance Activities at the Claremont Polychemical Superfund Site, Old Bethpage, Nassau County, New York, Revised November 2004.*

United States Army Corp of Engineers (USACE), 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous Toxic, and Radioactive Waste Sites*, EM 1110-1-4000, available at http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-1-4000/toc.htm, November.

United States Army Corp of Engineers (USACE), 2003. *Data Report July 2003, Claremont Polychemical Superfund Site Long-Term Groundwater Monitoring Old Bethpage, New York*, prepared for the United States Environmental Protection Agency, Region II, New York, New York, July.

United States Army Corp of Engineers (USACE), 2004. *LTRA Scope of Work Addendum, Installation of Additional Monitoring Wells, Claremont POlychemical Site, Old Bethpage, NY*, for Science Applications International Corporation, August 23 (revised from May 16).

APPENDIX A

TECHNICAL SPECIFICATIONS
DRILLING AND WELL CONSTRUCTION
New York State Requirements 6 NYCRR 360-2.11

TECHNICAL SPECIFICATIONS
DRILLING AND WELL CONSTRUCTION
New York State Requirements 6 NYCRR 360-2.11

(8) Monitoring wells and piezometers.

<u>(i) Construction in general</u>.

(a) Monitoring wells and piezometers must define the three-dimensional flow system within the critical stratigraphic section to justify the interpretations and conclusions of the hydrogeologic report.
(b) Construction techniques must be appropriate to ensure that groundwater samples and head level measurements characterize discrete stratigraphic intervals; and to prevent leakage of groundwater or contaminants along the well annulus. If leakage is detected, it must be corrected or the well abandoned.
(c) Monitoring wells and piezometers may be placed individually or as well clusters. Well clusters consist of individual wells at varying depths in close proximity, each installed in its own boring. Multiple wells placed into one large borehole are prohibited unless prior department approval in writing is obtained.
(d) Soil borings, soil samples, and rock cores must characterize each stratigraphic unit within the critical stratigraphic section to justify the interpretations and conclusions of the hydrogeologic report.
(e) Every precaution must be taken during drilling and construction of monitoring wells to avoid introducing contaminants into a borehole. Only potable water of known chemistry may be used in drilling monitoring wells or piezometers unless otherwise approved by the department.
(f) All equipment placed into the boring must be properly decontaminated before use at the site and between boreholes. The initial cleaning at the site must ensure that no contaminants from the last site drilled will be introduced into the borings. All equipment must be steam cleaned between holes. Where possible, upgradient wells should be drilled first.
(g) Use of drilling muds is to be avoided unless prior department approval in writing is granted. If drilling muds are used, the material used must avoid the introduction of stray contaminants. Drilling muds must not be used within 10 feet of the screened interval.
(h) Air systems and drilling lubricants must not introduce contaminants into the borehole.
(i) Well borings must have an inside diameter at least two inches larger than the outside diameter of the casing and screen to ensure that a tremie may be properly used.
(j) Wells and borings must not be placed through or into waste unless prior department approval has been granted and sufficient safety precautions are employed. If waste is encountered unexpectedly during drilling, drilling of that boring must cease, the hole properly abandoned with cuttings properly disposed of and the department notified.

<u>(ii) Construction of monitoring wells and piezometers.</u>

(a) Well screens and risers must be constructed of materials selected to last for the required monitoring period of the facility without contributing contaminants to, or removing contaminants from, the groundwater. All materials used are subject to department approval. Joints, caps, and end plugs are to be secured by welds, threads with teflon tape, or force fittings. Solvents and glues or other adhesives are prohibited. Caps must be vented to allow for proper pressure equalization. The inside diameter of each well screen or riser pipe must be nominally two inches in diameter and must allow for proper development, survey and sampling equipment to be used within the screen and casing. A permanent mark should be made at the top of the riser pipe to provide a datum for subsequent water level measurements.
(b) Unless otherwise approved by the department, well screens are required for all wells and

piezometers. All screens used must be factory constructed non-solvent welded/bonded continuous slot wire wrap screens of a material appropriate for long-term monitoring without contributing contaminants to or removing contaminants from the groundwater. The slot size of the screen must be compatible with the sand pack. Water table variations, site stratigraphy, expected contaminant behavior, and groundwater flow must be considered in determining the screen length, materials, and position. Where existing contamination is suspected or known, down-hole geophysical techniques may be required by the department to aid in selecting well screen elevations.

(c) The sand pack surrounding the well screen must consist of clean, inert, siliceous material. Grain size must be based upon a representative sieve analysis of the zone to be screened. The sand pack must minimize the amount of fine materials entering the well and must not inhibit water inflow to the well. The sand pack must be placed in the annular space around the well screen and extend two feet or 20 percent of the screen length (whichever is greater) above the top, and six inches below the bottom, of the screen. The sand pack material must be placed using the tremie method or another method approved by the department and must avoid bridging. The sand pack must be checked for proper placement. A finer grained sand pack material (100 percent passing the No. 30 sieve and less than two percent passing the No. 200 sieve) six inches thick must be placed at the top of the sand pack between the sand and the bentonite seal.

(d) Bentonite must be placed above the sand pack using the tremie or other approved method to form a seal at least three feet thick. A 6 to 12 inch fine grained sand pack must be placed above the bentonite seal to minimize grout infiltration. If pellets or chips are used, sufficient time should be allotted to allow for full hydration of the bentonite prior to emplacement of overlying materials.

(e) Grout of cement/bentonite, bentonite alone, or other suitable, low permeability material, if approved by the department, must completely fill the remaining annular space to the surface seal. The grout mixture must set up without being diluted by formation water, and must displace water in the annular space to ensure a continuous seal. The grout mixture must be placed under pressure using a tremie or other method approved by the department. Auger flights or casing must be left in the hole before grouting to prevent caving. The cement used must be appropriate for the groundwater chemistry of the site.

(f) A protective steel casing, at least two inches larger in diameter than the well casing, must be placed over the well casing or riser pipe and secured in a surface well seal to adequately protect the well casing. A distinctive, readily visible marker must be permanently affixed to the protective casing or near the well to identify the well number and ensure visibility even in periods of high snow cover. A drain hole must be drilled at the base of the protective casing. A vent hole must be located near the top of the protective casing to prevent explosive gas build up and to allow water levels to respond naturally to barometric pressure changes. The annulus of the protective casing should be filled with gravel. A locking cap must be installed with one to two inches clearance between the top of the well cap and the bottom of the locking cap when in the locked position and a weather resistant padlock must be placed on the protective casing and duplicate keys provided to the department.

(g) A concrete surface seal designed to last throughout the planned life of the monitoring well must be constructed. The surface seal must extend below the frost depth to prevent potential well damage. The top of the seal must be constructed by pouring the concrete into a pre-built form with a minimum of three foot long sides. The seal must be designed to prevent surface runoff from ponding and entering the well casing. In areas where traffic may cause damage to the well, bumperguards or other suitable protection for the well is required. Any damaged or deteriorated surface seals must be reported to the department and repaired or replaced in an appropriate manner. The department may allow alternate designs when documentation is presented which demonstrates the intent of the regulations.

(h) Where under the circumstances of a particular situation the department believes that the methods identified in this section are inadequate, it may require that additional measures be taken

to prevent migration of contaminants along the annulus of the well or to protect the well.
(i) Alternative construction methods for piezometers and wells which are not to be part of the environmental monitoring plan may be approved by the department if those methods meet the requirements set forth in clause (i)(b) of this paragraph.

(iii) Well and piezometer development.

All wells and piezometers must be developed as soon as possible after installation, but not before the well seal and grout have set. Water must not be introduced into the well for development, except with approval of the department. Any contaminated water withdrawn during development must be properly managed. Development must not disturb the strata above the water-bearing zone or damage the well. The entire saturated screened interval must be developed. The department may require multiple attempts at well development to increase the likelihood that sediment free water can be obtained. Development methods should be appropriate for conditions/stratigraphy encountered. Placement of screens in a fine grained strata may require gentle development techniques to avoid pulling sediment into the well. The selected method must minimize to the greatest extent possible the amount of turbidity in the well.

(iv) Survey.

The locations and elevations of all existing and abandoned test pits, soil borings, monitoring wells, and piezometers must be surveyed to obtain their precise location and plotted on a map in the hydrogeologic report. The vertical location of the ground surface and the mark made on the top of the monitoring well and piezometer risers must be accurately measured to the nearest 100th foot.

(v) Replacement of wells.

All wells must be properly protected to ensure their integrity throughout the active and post-closure period of the facility. If, in the opinion of the department, water quality or other data show that the integrity of a well is lost, the well must be replaced and sampled within a time period acceptable to the department (but not to exceed 120 days) after written notification by the department. The initial sample for the replacement well must be analyzed for baseline parameters in the Water Quality Analysis Tables in this section.

(vi) Abandonment of wells.

All soil borings or rock cores which are not completed as monitoring wells or piezometers and other abandoned wells must be fully sealed in a manner appropriate for the geologic conditions to prevent contaminant migration through the borehole. Generally, such sealing must include:
(a) Overboring or removal of the casing to the greatest extent possible, followed by perforation of any casing left in place. All casing and well installations in the upper five feet of the boring, or within five feet of the proposed level of excavation, must be removed.
(b) Sealing by pressure injection with cement bentonite grout, using a tremie pipe or other method acceptable to the department, must extend the entire length of the boring to five feet below the ground surface or the proposed excavation level. The screened interval of the borehole must be sealed separately and tested to ensure its adequacy before sealing the remainder of the borehole. Where the surrounding geologic deposits are highly permeable, alternate methods of sealing may be required to prevent the migration of the grout into the surrounding geologic formation. The upper five feet must be backfilled with appropriate native materials compacted to avoid settlement.
(c) The sealed site must be restored to a safe condition. The site must be inspected periodically after sealing for settlement or other conditions which require remediation.

(9) Geologic sampling.

(i) All borings and rock cores must be sampled continuously to the base of the critical stratigraphic section. For well clusters, continuous samples must be collected from the surface to the base of the deepest well. Other wells in the cluster must be sampled at all stratigraphic changes, and at the screened interval. At sites where the geology is not of a complex nature the department may allow a reduction in the number of wells requiring continuous sampling. Soil borings must be sampled using the split spoon method and bedrock or boulders must be sampled by coring with standard size NX or larger diameter core bits. Samples must be retained in labeled glass jars or wooden core boxes. All samples must be securely stored and accessible throughout the life of the facility. The location of the storage area must be designated in the operation and maintenance plan for the facility.
(ii) A representative number of undisturbed samples must be collected from test pits and soil borings using appropriate methods to identify the soil characteristics of all cohesive soil units. Such samples must be analyzed in the laboratory for: Atterberg limits; gradation curves by sieve or hydrometer analysis or both, as appropriate; undisturbed permeabilities; and visual descriptions of undisturbed soil structures and lithologies.

(10) Logs.

(i) Complete and accurate drilling logs must be provided to the department for all soil borings. These logs must provide detailed soil classification according to the Unified Soil Classification System (USCS). The USCS visual method must be used on all samples supplemented by the USCS laboratory tests on a representative number of samples from each stratigraphic unit and each screened interval. Logs also must contain a description of matrix and clasts, mineralogy, roundness, color, appearance, odor, and behavior of materials using an appropriate descriptive system. A clear description of the system used must be included with the logs. When undisturbed samples have been taken, the interval tested and the test results must be clearly shown on the logs. All well logs must contain drilling information as observed in the field including: moisture content, location of the water table during drilling, water loss during drilling; depth to significant changes in material and rock; sample recovery measured in tenths of a foot; hammer blow counts, and other pertinent comments; the method of drilling, anomalous features such as gas in the well, and the use and description of drilling fluids or additives, including the source, and calculated and actual amounts of materials used.
(ii) Rock core logs must describe the lithology, mineralogy, degree of cementation, color, grain size, and any other physical characteristics of the rock; percent recovery and the rock quality designation (RQD); other primary and secondary features, and contain all drilling observations and appropriate details required for soil boring logs. A clear photograph of all labeled cores must also be taken and submitted with the logs.
(iii) Well completion logs must contain a diagram of the completed well, all pertinent details on well construction, a description of the materials used, and elevations of all well features.
(iv) Copies of original field logs must be submitted to the department upon request.

APPENDIX B

FIELD FORMS