WORK PLAN

Horizontal DNAPL Extraction Well

Ft. Edward, New York

June 16, 2004

O'BRIEN & GERE

GE Industrial Systems
Power Equipment Business

Transmission, Distribution & Industrial Systems
General Electric Company
381 Broadway, Fort Edward, NY 12828

June 16, 2004

Mr. Kevin L. Farrar
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway, 11th Floor
Albany, New York 12233

Dear Mr. Farrar:

Please find attached four copies (3 bound – 1 unbound) of the Construction Work Plan for the Fort Edward facility OU-3 Remedial Design – DNAPL Collection System.

If you should have any questions, please do not hesitate to call me at (518) 746-5560.

Sincerely,

Dave West (CMS)

David L. West
Manager, Environmental, Health & Safety

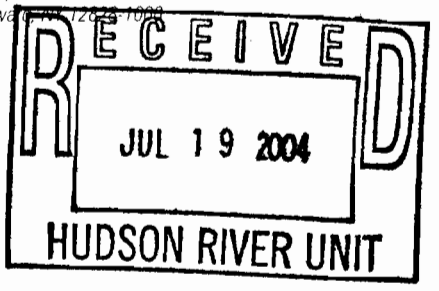
cc: Director, BEEI – NYSDOH (w/ 1 copy)
Region 5 Director – NYSDEC (w/ 1 copy)
Edward Jamison, GE, Energy (w/ 1 copy)
Edward LaPoint, GE CEP (w/ 1 copy)
Bob Gibson, GE CEP (w/ 1 copy)

Attachments

GE Industrial Systems
Power Equipment Business

Transmission, Distribution & Industrial Systems
General Electric Company
381 Broadway, Fort Edward, NY 12828-1099

July 16, 2004



Mr. Kevin L. Farrar
Hudson River Unit, 11th Floor
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7010

Re: GE Ft. Edward Plant Site #558004

Subj: OU-3 Construction Work Plan
Horizontal Well Installation

Dear Kevin:

In response to your July 2, 2004 comment letter on the OU-3 Horizontal Well Installation Construction Work Plan, General Electric (GE) provides the following:

NYSDEC Comment 1: The construction work plan should include a description of how the "entry pit" will be designed and constructed to ensure that the borehole fluids and drilling cuttings will be contained and recovered.

Response: **The "entry pit" will be constructed to contain borehole fluids and cuttings by utilizing the drilling muds to line the pits. The drilling muds are designed to contain the cuttings and fluids within the pit, preventing these materials from extending beyond the pit walls. Once the well is completed, the pit area will be excavated to remove the drilling muds and any soils which appear discolored as a result of the contact with the muds. The excavated pit materials will be containerized and disposed off site.**

The drilling contractor has previously utilized this "lining" method on a number of remediation programs, including one presently being conducted at a US Department of Energy site.

NYSDEC Comment 2: The language in the construction work plan related to the PCB air monitoring should be modified. The text in Section 7 (on p. 13) should include statements that:

- The wind direction shall be monitored to ensure that the downwind air monitoring stations are in the appropriate locations. Sampling locations will be modified to account for changes in wind direction.
- Documentation of the sample results will be provided to NYSDEC and NYSDOH for immediate review.

TABLE OF CONTENTS

ATTACHMENTS

Attachment 1 Job Safety Analysis (Amendment to September 2002 Health & Safety Plan) (09/02 HASP included with original Work Plan submittal only)

Attachment 2 Horizontal DNAPL Extraction Well Installation and Operation Plan (Directed Technologies Drilling, Inc.)

Attachment 3 Project Schedule

DRAWINGS

G-5 HRW-1 and HRW-2 Plan and Profiles (December 2003 Remedial Design Report, OU-3 Remedial Design for DNAPL Collection System)

G-6 Miscellaneous Details (December 2003 Remedial Design Report, OU-3 Remedial Design for DNAPL Collection System)

1. INTRODUCTION

This Work Plan has been developed in accordance with the Remedial Design Report (RDR) for the OU-3 Remedial Design - DNAPL Collection System, prepared by O'Brien & Gere Engineers, Inc., dated December 22, 2003, at the General Electric Company (GE) Fort Edward, New York facility. O'Brien & Gere has been contracted by GE to perform the site activities, including:

- Perform site surveying to establish control points, locate utilities, locate the horizontal well manholes and well heads, and develop as-built survey drawings.
- Perform site preparation activities to establish work zones and stockpile areas, setup temporary facilities, and install drilling spoils handling and dewatering facilities.
- Perform work activities in accordance with the site-specific Job Safety Analysis (JSA) to the Health and Safety Plan.
- Conduct weekly construction progress meetings to review completed and/or ongoing construction activities, planned construction activities, health and safety activities, action items, and schedule.
- Design and install two, horizontal DNAPL recovery wells (HRW-1, HRW-2).
- Install new DNAPL pumping and conveyance systems from the two recovery wells. The conveyance piping will direct recovered DNAPL to the transfer building installed during the OU-3 transition wells construction activities.
- Install instrumentation and controls to monitor systems operations, and to allow for fully automatic operation of the DNAPL recovery systems.
- Perform air sampling and monitoring for contaminants of concern during intrusive activities.
- Coordinate activities to minimize disturbance of facility operations.
- Collect drill cuttings and development water for on site pre-treatment, amendment, and/or off-site disposal.
- Restore the work areas back to pre-construction condition.

This Work Plan has been developed to describe construction procedures to be implemented during installation of the DNAPL remedial system. If necessary, measures beyond those described in this Work Plan will be utilized to meet the intent of the design and protect workers and the surrounding community.

Contract Drawings G-5 and G-6 from the DNAPL Collection System RDR provide an overview of the work areas anticipated for the construction activities.

2. KEY PERSONNEL

Below is a table summarizing key personnel and their responsibilities for the site work and waste handling activities during installation of the DNAPL remedial system at the GE Fort Edward facility.

CONTACT	CONTACT INFORMATION	RESPONSIBILITIES
GE		
Site Manager – David L. West	Office: 518-746-5560	1. Confirming site utility locations 2. Signing waste manifest/bills of lading 3. Coordinating disposal w/ on site Contractor reps. 4. Overall facility environmental health & safety responsibilities.
O'BRIEN & GERE		
Project Manager – Paul Mazurkiewicz, PE	Office: 315-437-6400 x2826 Cell: 315-254-4710	1. Overall responsibility for prime contract and subcontract administration. 2. Overall responsibility for project health and safety and quality control. 1. Contractor contact for Owner, Engineer, & regulatory agencies. 2. Attend progress meetings, as needed.
Managing Engineer – Steve Anagnost, P.E.	Office: 315-437-6100 x2259	1. Overall responsibility for design. 2. Developing final certification report. 3. Engineering contact for regulatory agencies and Owner.
Designer- Marvin Hull	Office: 315-437-6100 x2290	3. Review daily reports, confirm quantities, review submittals . 4. Respond to Contractor questions.
Managing Geologist – Ralph Morse, CPG	Office: 518-452-9392 x 12	1. Overall responsibility for installation and development of recovery wells. 2. Coordinate utility locations and horizontal well routing.

Construction Supervisor - Charles W. Hall	Office: 315-437-6100 x2857 Cell: 315-729-7673	1. Schedule weekly progress meetings, develop agenda, meeting minutes. 2. Coordinate activities, deliveries with Superintendent & Foreman. 3. Coordinate site security requirements with Owner. 4. Maintain daily reports for construction activities. 5. Coordinate changes to design with Engineer, Owner, regulatory agency(s). 6. On site rep. for maintaining quality control. 7. Coordinate waste handling with Owner representatives.
Site Foreman – John Baker	Cell: 315-440-9514	1. Coordinate field activities with subcontractors and O'BRIEN & GERE field personnel. 2. Responsible for construction quality control. 3. Coordinate field activities with on site H&S monitoring personnel. 4. Measure daily quantities. 5. Maintain drill spoils handling and dewatering system(s), as needed. 6. Attend progress meetings. 7. Coordinate site activities with on-site Health and Safety Monitor.
Health and Safety Monitor – Garrett Sleeman (during drilling) John Baker (during site work)		1. Oversee site activities to confirm work performed according to site-specific HASP and GE plant policies. 2. Personnel toolbox safety meeting and prework safety briefings. 3. Maintain daily records of work activities. 4. Define exclusion & support zones for work activities, coordinate with Owner rep. 5. Responsible for personnel and community air monitoring. Maintain daily weather data for site.

As indicated on the above table, the Project Manager will be responsible for the overall quality control on the project with the Construction Supervisor acting as the on site quality control

representative. The Project Manager will review all work and confirm that the work is performed in accordance with the technical specifications.

3. MOBILIZATION, SITE PREPARATION AND TEMPORARY FACILITIES

O'Brien & Gere will mobilize personnel and equipment to the Fort Edward facility and setup temporary facilities. As part of the mobilization/site preparation activities, O'Brien & Gere will perform the following:

- A licensed NYS land surveyor will layout the proposed horizontal well locations.
- All utilities will be marked and necessary contacts made regarding working in the parking lot. Anticipated daily activities will be coordinated with designated GE personnel and work areas will be clearly marked daily.
- Equipment and material lay down and stockpile areas will be established. These areas will be selected to minimize interfering with facility activities and will be approved by GE.
- Erosion controls will be installed, if needed, along the southern property line along Park Ave. Catch basins/storm sewers which are in the work zone will have temporary erosion controls installed to prevent sediment from entering the basin.
- Setup community air monitoring equipment for intrusive activities. It is anticipated that the community air monitoring activities will be performed during drilling and development activities to monitor dusts and odors. It is anticipated that the community monitoring will be installed for measuring dusts during the other site activities. Air sampling locations for PCBs will be established at upwind and downwind locations from the work area, and at another location at nearby occupied structures.
- Temporary collection and pretreatment measures will be installed for the well development water/product. Drill cuttings will be collected, containerized, dewatered and/or solidified (if necessary), and disposed by GE.

4. HORIZONTAL DNAPL RECOVERY WELLS

Two new horizontal DNAPL recovery wells will be installed in the southeast portion of the GE Fort Edward facility. The locations of the new recovery wells (HRW-1 and HRW-2) are shown on Contract Drawing G-5 (O'Brien & Gere Engineers, December 2003). The well installation details are shown on Contract Drawings G-5 and G-6 (O'Brien & Gere Engineers, December 2003) and described in the DNAPL Collection System RDR. Construction details of the recovery wells are described below:

- A licensed well driller, familiar with similar environmental well installations, will be subcontracted to perform the work. Based on GE requirements and the site-specific HASP, barricades and/or safety fence/tape will be placed around the work zone to prevent unauthorized personnel entry in or around work area. O'Brien & Gere has subcontracted Directed Technologies Drilling, Inc. to install the horizontal wells.

- A geologist from O'Brien & Gere will be on site to oversee the well drilling activities to confirm techniques, screen and well depths, and ensure the well is installed in accordance with the remedial design. Additionally, O'Brien & Gere personnel will be on site to monitor the drilling/well installation health and safety activities and perform required community air monitoring and sampling.

- The horizontal DNAPL recovery wells will be constructed of Amine based fiberglass reinforced epoxy (Amine FRE) with a 4-inch nominal diameter. The well screens will also be Amine FRE continuous slot. The final entry and exit points for each of the wells will be determined based on the well drillers design, equipment limitations, and utility locations.

- HRW-1 will be screened in the shallow, unconsolidated sand and gravel unit along the long axis of the DNAPL pool. The anticipated length of HRW-1 is approximately 450 feet with 260 feet of screen interval. The HRW-1 screen in the sand and gravel unit shall have a slot size of 0.020-inches.

- Horizontal DNAPL recovery well HRW-2 is approximately 450 feet long, with 210 feet of screen running along the northeast-southeast trending direction. It is anticipated that approximately 60 feet of 0.020-inch slot screen will be installed in the sand and gravel unit, and 150 feet of 0.010-inch slot will be installed in the transition zone portion of HRW-2.

- The 4-inch diameter DNAPL recovery wells will be installed using a 5 or 6-inch diameter drill bit to advance the well bore hole at a shallow entry angle until it reaches the screened interval where the drill bit will level off. After the screened interval is completed, the drill bit will be angled to the ground surface.

  The drill rig will be installed adjacent to the well entry point and an entry pit will be installed to accommodate collection of drilling muds and fluids. Biodegradable drilling fluids (CETCO Cleandrill) will be used to cut and stabilize the borehole until the well casing and screen are installed. The recovered fluids and muds will be collected in the entry pit and pumped to the collection containers staged nearby. The drilling fluid/mud collection container will be covered to control odors.

  The driller will be responsible to ensure the well depth and horizontal accuracy meets the remedial design requirements. The design intends on the well having a 1-foot vertical and horizontal accuracy. The driller will utilize a non-intrusive guidance and navigation system (DCI Digitrack) to provide continuous monitoring of the borehole progress. The on site technician will be able to locate the borehole pitch and allow the driller to navigate the boring along the desired profile. Should the technician discover that the boring is deviated from the desired path, then the drill head can be re-directed along the intended route. Should the borehole deviate substantially from the desired profile, then the hole will be re-drilled. Once the pilot hole is completed, the drill head will be removed and an 8-inch diameter reamer attachment installed for the pullback operations.

  Similar to the well entry, an exit pit will be installed to collect drilling fluids and muds during the reaming operations. The recovered fluids and muds will be pumped to a staging area nearby.

Once the well is adequately reamed, the driller will pull the casing and screen through the borehole to install the well. Once the well is installed, the space between the outside of the pipe and the borehole will be sealed to prevent infiltration of surface water. Multiple shale packers or other similar devices will be utilized to fill the annular space. Within 10 feet of the surface, grout will be installed to the surface. Once all sealing is completed, the well will be developed to confirm product recovery.

An on-site representative from O'Brien & Gere and the driller will complete a drilling log for each well, with detailed descriptions of: the overall well depth and length; the installed vertical and horizontal profiles, soil strata; length(s) of the well screen(s).

- The new recovery wells will be developed by the well driller in four steps: flushing the well; injection of breaking solution; jetting the well; and pumping the well. Each screened interval shall be developed separately.

The well will be initially flushed with water to clean out any sediment that has entered the screen during installation. A pump will be connected at each end to flush the well screen. Following the flushing, a mud-breaking agent will be used to fill the well and break any chemical bonds remaining from the drilling fluids. The breaking agent will be allowed to remain in the well for at least 24 hours, then water will be used to flush the well. Subsequently, a jetting tool will be pulled through the well to further clear the screen openings, and finally a pump will be installed to confirm the well is yielding adequately.

The well development water and DNAPL will be collected on site for either on site treatment or off site disposal. Any water collected will be ultimately treated at the on site water treatment facility, with pretreatment equipment available to reduce suspended solids from the water prior to introduction to the facility treatment system. Any DNAPL recovered during well development activities will be placed in DOT-approved containers for characterization and off site disposal by GE.

5. DNAPL COLLECTION

The DNAPL Remedial System collection activities include the following:

- Equipment for the DNAPL pumping and collection system instrumentation and controls, power feeds, and collection drums will be installed in the transfer building. The equipment installed in the transfer building includes:

  - A 60-gallon, single-stage air compressor which will supply the air to the product pumps in the horizontal wells.

  - The controllers for the product pumps. These controllers are designed to control the pump fill and discharge cycles.

  - The process piping for the DNAPL pumping and collection systems. The process piping will include the following:

    - DNAPL conveyance piping – stainless steel or Teflon. Product piping installed outside the transfer building will be double contained.

  - Installation of a trench across the facility parking lot for installation of the DNAPL force mains, and associated compressed air and electrical conduit from the new recovery wells to the transfer building. To the extent practical, the OU-3 transition zone forcemain and conduit trenching will be followed to minimize additional disturbance to the parking lot. The trench will be approximately four feet wide and 5½-feet deep. The existing asphalt will be saw cut, removed, and stockpiled on site for off site debris disposal. Once the asphalt is removed, the trench will be excavated to the required depth, with the excavation soils temporarily staged adjacent to the trench for reuse as backfill above the pipe (see details on Contract Drawing G-5). Initially, approximately 4 inches of the specified borrow material (Type D) will be installed in the bottom of the trench, and the force main piping installed atop the bedding. Once placed, the force

main piping will be covered with a minimum of one foot of bedding material. The stockpiled trench excavation soils will then be placed over the bedding material up to approximately 15-18-inches below grade. The force main portion of the trench will include the product tubing which will convey the recovered DNAPL from HRW-1 and HRW-2. The specified product recovery system includes a ½-inch diameter product line and 3/8-inch air supply line for each pump. The product and air supply lines tubing bundle will be supplied to run from the transfer building to the product recovery pump without joints. The product recovery tubing bundle will be installed inside 4-inch, Sch 40 PVC containment pipe. Up to two tubing bundles will be installed in each 4-inch containment pipe.

Electrical conduit will be installed approximately 24-inches below existing grade immediately adjacent to either side of the force main trench. The control wiring for the wells (thermal conductivity sensor) will be installed in one conduit that does not contain any of the pump power feeds. The conduits will be bedded with off site borrow material (Type D), with six inches of bedding material above and below the conduit.

A 12-inch thick layer of subbase material (NYSDOT No. 304.04 or approved equal) will be placed and compacted (90%) above the conduit bedding and native soils placed in the force main trench. Once the trench is completed, the asphalt will be replaced to existing grade.

During the trench installation, care shall be taken to delineate the work area with temporary fencing and/or barricades to prevent authorized personnel entry into the work zone. Additionally, work activities shall be performed to minimize the amount of trench open each day.

- Installation of a recovery well manhole at HRW-1 and HRW-2. The manhole will consist of a precast concrete slab (min. 4-foot diameter) with a 18-inch to 24-inch gasketed steel frame and cover (H-20 rated). The manhole cover will include a skirt

that extends approximately 18-inch to 24-inch below grade. Pump cables, electrical junction boxes will be secured to the manhole skirt.

- Installation of a product recovery pump that will be installed at the lowest elevation in the new recovery wells (HRW-1 and HRW-2). A QED pneumatic displacement, product recovery pump (QED Model LP 1650) will be connected to the nylon tubing bundle (product and air lines) and stainless steel cable used for removing the pump for maintenance. A conductivity sensor (Emerson-Rosemount Solu Comp II Sensor and Analyzier) will be installed in the recovery wells sump to detect the presence of product in the well and actuate the product pump controller.

6. SOLID AND LIQUID WASTE MANAGEMENT

It is anticipated that solid (drill cuttings) and liquid (water and DNAPL) waste materials will be generated during the OU-3 DNAPL Collection System construction activities. O'Brien & Gere will be responsible for collecting and/or containing the wastes generated during the activities, with GE being responsible for the on site treatment and/or off site disposal of the materials.

The sources of construction related liquids that are to be collected and managed in accordance with this Section are as follows:

- Well development water and DNAPL – It is anticipated that this will represent the largest volume of liquid to be managed during the construction activities. The liquids generated during these activities will be containerized (temporary tank) in the vicinity of the work area, pretreated if necessary, and subsequently introduced to the on-site water treatment facility. Temporary pretreatment may include separation of any free product, and/or filtration (bag filters) to remove high concentrations of suspended solids. If utilized, any pretreatment system wastes will be containerized, characterized and disposed off site by GE.

- Personnel and equipment decontamination wash waters – Personnel and equipment will be decontaminated in a temporary decontamination area located on the concrete pad behind the on-site waste water treatment plant. Rinsewater will be collected and containerized.

- Precipitation for surface runoff – As necessary, erosion and sediment control measures will be installed in areas where runoff can enter and/or exit work areas. Hay bales and/or silt fence will be installed around work areas and around nearby catch basins to control runoff.

Based on the elevation of the excavations being performed during the horizontal well DNAPL collection system activities, it is not anticipated that ground water will be encountered and not be managed. If ground water is encountered, temporary pumping systems and containers will be provided to accommodate the anticipated flows.

In areas where water is collected and/or temporarily containerized, temporary bermed staging areas will be established. Polyethylene sheeting (minimum 20-mil or equivalent) will be placed under containers, and berms (soil or hay bales covered with the poly) will be placed around the perimeter of the temporary staging area.

It is also anticipated that some solid wastes will be generated during the construction activities, including:

- Drill cuttings/drilling mud – this material will be containerized in the vicinity of the drilling area, away from highly trafficked areas, and the cuttings stabilized with Portland cement or similar. Polyethylene sheeting (20-mil or equivalent) will be placed under the containers, building temporary berms around the area to contain the waste within the lined area.

- Asphalt and excavation spoils – asphalt removed during the construction activities will be containerized and disposed off site as construction debris. Excavation spoils from the force main trench will be either placed back in the trench as backfill or containerized for off-site site disposal.

7. HEALTH AND SAFETY

Attached at the end of this Work Plan is a Job Safety Analysis (JSA) for the proposed site activities. The JSA for the site activities is an amendment to the September 2002 site-specific Health and Safety Plan for the OU-3 Foil Mill Remediation Activities. O'Brien & Gere will perform the necessary air monitoring, personnel, PCB air sampling and work zone monitoring during intrusive activities. Similar to the CAMP monitoring conducted during the OU-3 Foil Mill construction activities conducted at the site, the CAMP monitoring will be conducted at the downwind perimeter of the work area(s) during intrusive work activities. It is anticipated that the CAMP monitoring conducted for the horizontal well DNAPL collection system installation will include:

- Particulate Monitoring – conducted during all intrusive activities, including drilling and excavation work.
- Volatile Organic Monitoring – conducted during drilling activities and any other site activities where the potential that contaminated ground water and/or DNAPL will be encountered.

The response levels and actions required by NYSDEC and utilized for the OU-3 Foil Mill activities will also be administered for the horizontal well collection activities.

In addition to the CAMP monitoring data, on site weather/wind direction information will be recorded, with the field records of the monitoring maintained on site by O'Brien & Gere.

PCB air sampling will be performed daily at one upwind, one at the downwind perimeter of the work zone, and at one location near local occupied structures. A sample will be collected and submitted to a laboratory for 24-hour analysis (from time of receipt by the lab). Lab analysis must yield a detection limit of 10 nanograms/cubic meter (ng/m^3). A threshold of 100 ng/m^3 of PCBs has been established for the work, with engineering controls to be utilized to control emissions over the threshold value. Engineering controls may include a temporary structure over the entry/exit pit, dust suppressing agents, or controlling production rates.

8. SCHEDULE

The anticipated project schedule for the Transition Zone Ground Water Collection construction activities is attached as Attachment 3. As indicated on the schedule, O'Brien & Gere plans on performing a number of tasks concurrently to minimize interruptions of any ongoing production facility activities.

Client:	GE	**OGINA Project manager:** **OGINA Project Superintendent:** **OGINA Site Foreman:**	**Paul Mazurkiewicz, P.E.** Work: (315) 437-6400 x2826 Cell: (315) 254-4710 **NA** **John Baker** Cell: (315) 440-9514	**Date of JSA:** **Revision:**	June 14, 2004 0
Project Name:	OU-3 Horizontal Drain Recovery System Construction	**Client Site Manager:**	David L. West Work: (518) 746-5560	**CHS Review on:**	June 14, 2004
Project Location:	Ft. Edward, NY	**OGINA SSHC:**	John Baker	**OU-3 TRANSITION ZONE GROUND WATER COLLECTION JSA** **This JSA is to be utilized in conjunction with the existing site safety plan dated 9/10/02 and the OGINA Corporate H&S Manual.**	
Job No.:	34994.010.070	**OGINA CHS Review by:**	Jeffrey R. Parsons, CIH Work: (315) 437-6400 x2871 Cell: (315) 391-0638		
Project Phone No.:	Baker Cell: (315) 440-9514	**JSA Conducted by:**	OGINA		
Project Fax No.:	tbd	**JSA Prepared by:**	Jeffrey R. Parsons, CIH		

BACKGROUND & SCOPE

This Hazard Identification and Control or JSA document is intended specifically for OGINA's scope of work and is intended to supplement existing site safety procedures and the OGINA Corporate Health & Safety (CHS) Manual. OGINA personnel are required to follow the more stringent (conservative) safety requirements when there is a difference between site safety requirements and OGINA corporate requirements. The Site Supervisor and OGINA Corporate H&S Manager should be consulted if requirements remain unclear. This OU-3 HORIZONTAL DRAIN RECOVERY SYSTEM JSA must be reviewed with the affected personnel prior to conducting activities specified in this JSA. This JSA covers the following tasks and may be amended as necessary to reflect changes to the scope of work.

- **Project Planning, Mobilization, and Site Preparation** – Site survey, mark utilities, establish equipment lay down areas and soil staging areas, and other necessary pre-work support activities.
- **Well Installation & Development** – Installation of two (2) new horizontal recovery wells (HRW-1 and HRW-2).
- **Mechanical and Electrical Installations** – Install pneumatic pulse pump and conductivity sensor in each recovery well. Installation of force main, containment pipe, electrical conduit, control wiring, and air supply lines to the Transfer Building. Piping and conduit will be installed in a trench, most of which was excavated during previous phases of work.

All individuals reviewing this JSA must sign a **Pre-Work Briefing form** that references this JSA (and other relevant safety requirements) prior to performing covered activities. The Pre-Work Briefing form is in the OGINA CHS Manual or is available online.

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
PROJECT MOBILIZATION & PLANNING **Mandatory PPE: LEVEL D** - hard hat, safety glasses, safety shoes, leather/cut resistant gloves **As needed PPE**- hearing protection **Covered tasks:** *Subcontractor Safety Prequalification*- If subcontractors are used, have subcontractors complete a pre-qualification form and submit it to Corporate Safety for review. Authorized subcontractor representatives are required to review and sign the "CHS Manual Overview." **NOTE – Only subcontractor anticipated at this point is a drilling subcontractor, Directed Technologies Drilling.** *New/Temp Employee & Contract Labor Safety Training* – Site Supervisor must ensure that new employees receive and complete a New Hire Safety Orientation Manual which is available from OGINA Corporate H&S or Human Resources. *Obtain and Stage Safety Equipment* - fall protection harnesses, face shields, hard hats, safety glasses, hearing protection *Site Orientation* – When required by the site owner or client, all site personnel will be required to attend a site orientation by the site owner/client. *Project Kickoff Safety Meeting* - Document project safety meeting and orientation on a "Toolbox Meeting Form". Review site HASP and/or JSAs. Review any client-specific safety rules if no Site Orientation was conducted. Review MSDS for ethanol. *Mobilization of Tools & Equipment* - Transporting tools and equipment, inspecting	Well Installation Crew Site Engineer/Geologist	A. Slip, trips, and falls B. Manual lifting C. Noise- during operation of power tools D. Electrical- • overhead/buried utilities, • set-up of temporary power • using power tools. E. Heat/cold stress F. Exposure to poisonous plants, insects, and snakes	A. Prevention of slips, trips, and falls includes: 1. Maintain housekeeping daily. 2. Place equipment and materials in designated areas. Maintain clear walkways between pallets and containers. 3. De-ice work areas with excessively slippery work surfaces. B. Safety controls for manual lifting primarily include the use of proper lifting technique: 1. Keep load in close to the body; 2. Keep hips and shoulders aligned (no twisting); 3. Maintain stability (keep a balanced position); and 4. Think and plan difficult lifts. 5. Use mechanical devices when possible: forklift, pallet jack, lull, hoist/chainfall, etc. C. Hearing protection safety controls include: Wear hearing protection while operating heavy equipment (unless with enclosed cab) or noisy power tools. Wear hearing protection if you have to raise your voice talking to someone 5 feet away. D. Electrical safety controls include: 1. Locate an verify all utilities with owner representative. 2. Use GFCIs on all power tools and extension cords. 3. Inspect all extension cords and power tools prior to use and ensure outer insulation is not cut through. 4. Discard damaged cords and remove defective tools from service. 5. Special consideration shall be given when working near any overhead power lines for which 20' clearance must be maintained. Work closer than 20' requires implementation of the OGINA Power Line Safety Procedure. E. Review symptoms and controls for heat/cold stress: 1. Drink fluids regularly (NOT coffee, tea, soda, etc.); 2. Take breaks periodically to prevent heat/cold stress; and 3. Look for symptoms of heat/cold stress in coworkers. F. Safety controls for biological hazards include: 1. Be able to identify hazardous plants, insects, and snakes commonly found in the area. 2. Perform a personal inspection of extremities when leaving the work area. 3. Insect repellant may be utilized during warm-weather.

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
condition of equipment and making repairs as necessary. In particular, inspect all power tools, electrical cords, ladders, fall protection equipment, rigging equipment, and fire extinguishers on a monthly basis.			
WELL INSTALLATION & DEVELOPMENT ***(Intrusive)*** **Mandatory PPE:** • *Level D PPE* consists of hard hat, safety glasses with rigid side shields, safety shoes and leather/cut resistant gloves. Level D PP may be used for non-intrusive work where contaminated materials will not be handled. • *Lightweight Modified Level D PPE* consists of nitrile gloves (or equiv), boots or boot covers, hard hat, safety shoes, safety glasses. Drillers must wear cut resistant gloves over nitrile gloves. Lightweight Modified level D is necessary when minimal contact with contaminated materials in anticipated and contamination control must be maintained. • *Full Modified Level D PPE* consists of is similar to Lightweight Modified Level except coveralls or rain-suit must be used. Full Modified Level D PPE is necessary when extensive contact with contaminated materials is anticipated, such as the manual-excavation of contaminated soils **As needed PPE-** • *Level C PPE* consists of Modified Level D PPE plus a half or full-face respirator with organic vapor cartridges and P95 or P100 pre-filter. Use when air monitoring action levels are exceeded. • *Hearing Protection* during operation of drill rig, • *Face shield* if there is a potential for splashes of contaminated groundwater. **Intrusive tasks:**	Site Supervisor Drill Crew Site Geologist	A. Drill rig stability problems associated with setting up on uneven or unstable surface. B. Unsafe relocation of drill rig when moving between drill sites. • Damaged equipment from contact with overhead obstructions (i.e., trees) • Electric shock from contact with power lines • Contact with, or crush by, drill rig C. Exposure to rotating machinery • Loose clothing or hair caught in equipment • Hand injuries D. Slip, trips, and falls E. Manual lifting of drill rods and heavy equipment	A. Safety controls to maintain drill rig stability include: 1. Inspect proposed drilling areas for depressions, manholes, ditches, and other uneven or unstable surfaces that may be hidden by vegetation. 2. Avoiding uneven or unstable surfaces whenever possible. 3. Use cribbing, outriggers, guy wires etc. to improve stability as long as such devices are used in accordance with drill rig manufacturer recommendations. B. Safety controls associated with relocating the drill rig from one drill site to another include: 1. Do not move the rig with a raised mast (unless moving on a level pit floor or when special precautions have been implemented) 2. Do not operate drill rig within 20' of power lines at any time during the movement and setup process. 3. Do not setup drill rig when lightning has been spotted or when the potential for lightning is high. 4. Inspect the path of travel for hidden depressions and overhead obstructions prior to moving the drill rig. 5. Ensure all project persons are clear from the drill rig during the setup and relocation process. 6. Allow only experienced and qualified persons to move the drill rig. C. Safety controls for rotating machinery and moving parts include: 1. Persons working within 10' of rotating machinery must not wear loose clothing or jewelry or have loose shop rags on them. 2. Long hair must be tied back and tucked under a hard hat. 3. Do not operate machinery without all machine guards in place. 4. Do not start the drill rig motor when the drill bit is not secure. 5. Do not touch a revolving drill pipe. D. Prevention of slips, trips, and falls includes: 1. Maintain housekeeping daily. 2. Place equipment and materials in designated areas. Maintain clear walkways between pallets and containers. 3. De-ice work areas with excessively slippery work surfaces. 4. Cover exposed or open bore holes immediately after completion. E. Safety controls for manual lifting primarily include the use of proper lifting technique: 1. Keep load in close to the body;

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
• Drilling two (2)horizontal DNAPL recovery wells • Develop wells • Containerize well cuttings and fluids • Installing well piping and equipment		F. General operation and maintenance of drill rig • Exposure to rotating motion • Exposure to stored energy sources (hydraulic, air) • Exposure to hot surfaces • Struck by falling components from mast as a result of poor maintenance or operational abuse. G. Noise- during operation of power tools H. Electrical shock - • overhead/buried utilities, • set-up of temporary power • pumps for well development • using power tools. I. Heat/cold stress J. Exposure to poisonous plants, insects, and snakes	2. Keep hips and shoulders aligned (no twisting); 3. Maintain stability (keep a balanced position); and 4. Think and plan difficult lifts. 5. Use mechanical devices when possible: forklift, pallet jack, lull, hoist/chainfall, etc. F. Additional safety controls for drill rig operation and maintenance include: 1. Only qualified persons may operate a drill rig 2. Only qualified mechanics may repair and service a drill rig. No major modifications or structural repairs may be made without approval from the manufacturer 3. Equipment must be inspected daily 4. All machine guards must be in place. 5. Ensure project personnel are kept clear of hot surfaces associated with mufflers, mud pumps, and drill rig engines. 6. Do not touch revolving drill pipe or work on machinery that is moving. 7. Do not start drill rig motor until drill pipe is fully secure. 8. Do not use excessive down pressure while drilling. G. Hearing protection safety controls include: 1. Wear hearing protection while operating heavy equipment (unless with enclosed cab) or noisy power tools. Wear hearing protection if you have to raise your voice talking to someone 5 feet away. H. Electrical safety controls include: 1. Locate an verify all utilities with owner representative as required for safe operation of the drill rig. 2. Use GFCIs on all power tools and extension cords. 3. Inspect all extension cords and power tools prior to use and ensure outer insulation is not cut through. Discard damaged cords and remove defective tools from service. 4. Special consideration shall be given when working near any overhead power lines for which 20' clearance must be maintained. Work closer than 20' requires implementation of the OGINA Power Line Safety Procedure. I. Review symptoms and controls for heat/cold stress: 1. Drink fluids regularly (NOT coffee, tea, soda, etc.); 2. Take breaks periodically to prevent heat/cold stress; and 3. Look for symptoms of heat/cold stress in coworkers. J. Safety controls for biological hazards include: 1. Be able to identify hazardous plants, insects, and snakes commonly found in the area.

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
		K. **Exposure to VOCs), PCBs, and dust** released from soil/groundwater • Contact with contaminate ground water and soil • Vapors/Odors released during driling and well development.	2. Perform a personal inspection of extremities when leaving the work area. 3. Insect repellant may be utilized during warm-weather. K. Safety controls to minimize exposure to VOCs include: 1. Initial PPE for well drilling and development is Level D PPE or Modified Level D PPE as outlined in this JSA. 2. Monitor for organic vapors and upgrade to level C if required based on air monitoring results (sustained readings of 1 minute). Safety Plan VOC action levels are summarized below. • 5 ppm – Half or Full-face Level C PPE • 10 ppm – Full-Face level C PPE • 50 ppm – Stop Work, Notify GE Representative and the OGINA Manager of Corporate H&S 3. Monitor for dust with direct reading dust meter. Follow action levels and responses listed in Table 4.3 of the Site Safety Plan which are summarized below: • <1 mg/m3 – Level D PPE and maintain dust suppression • 1 mg/m3 – Level C PPE. Monitor fence line per Community Air Monitoring Plan. • 5 mg/m3 – Stop Work. Re-evaluate dust controls in work area. 4. Sample for PCBs using NIOSH 5503 method and submit for 24 hour laboratory analysis. • Sample at 3 locations during each day of intrusive work. • One upwind location, One downwind location, and one location to nearest off-site receptor. • Sampling results will be forwarded to the NYSDEC for review. 5. Setup an exclusion zone with a minimum of 20' diameter radius around the well during drilling and well development. 6. Use water as necessary to control dust. 7. Control and containerize contaminated water and cuttings during drilling and well development.
MECHANICAL & ELECTRICAL INSTALLATIONS *(intrusive)* **Mandatory PPE:** • *Level D PPE* consists of hard hat, safety glasses with rigid side shields, safety	Field Technicians Operators Laborers	A. **Unexpected exposure to energy sources related to mechanical systems:** • **Release of contaminated water** from treatment system piping or equipment during construction or line breaking activities. • Rotating or moving parts associated with pumps, blowers, etc.	**A.** All persons exposed to potential injury from the unexpected energization of system components must have perform work under a **lockout/tagout (LOTO) program** with their own lock(s) in place. Ensure pumps and fans are in a safe condition and piping is purged and blanked when necessary. **When tieing in electrical power and air supply piping, ensure equipment is properly locked out to prevent injury from unexpected releases of energy (i.e., electric shock and compressed air.** 1. OBG SSHC (with support from GE if necessary) will identify lockout boundaries and operate necessary valves, breakers, etc.

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
shoes and leather/cut resistant gloves. Level D PP may be used for non-intrusive work wear contaminated materials or equipment will not be handled. • *Lightweight Modified Level D PPE* consists of nitrile gloves (or equiv), boots or boot covers, hard hat, safety shoes, safety glasses. Lightweight Modified level D is necessary when minimal contact with contaminated materials in anticipated and contamination control must be maintained such as collecting air and soil samples and general oversight and inspection activities. • *Full Modified Level D PPE* consists of is similar to Lightweight Modified Level except coveralls or rain-suit must be used. Full Modified Level D PPE is necessary when extensive contact with contaminated materials is anticipated, such as the manual-excavation of contaminated soils. **As needed PPE-** • *Level C PPE* consists of Modified Level D PPE plus a half or full-face respirator with organic vapor cartridges and P95 or P100 pre-filter. Use when air monitoring action levels are exceeded. • *Hearing Protection* during operation of drill rig, • *Face shield* if there is a potential for splashes of contaminated groundwater. ***Covered Intrusive Tasks:*** • *Excavation of trench that may exceed 5'* • *Sloping trench or use trench box whenever persons must enter trench.* • *Installation of piping, conduit, and control wiring to the Recovery Building.* • *Backfill trench and restore area.* ***Covered Non-Intrusive Tasks:*** • *Piping or electrical work in the Recovery Building where there is no risk of contacting contaminated equipment, water, or soil.*		*NOTE: If the contaminated water is not pumped into newly installed equipment during construction and mechanical systems are not otherwise energized, then mechanical LOTO is not anticipated* B. **Heavy Equipment** hazards (backhoe) • turnover due to slope angle and/or stability • struck by injuries (counterweight swing or run-over) • Hydraulic fluid leaks C. **Excavation Hazards** • Excavation of 5.5' trench for conveyance piping, air lines, and electrical conduits. • Any general grading activities that create vehicle or fall hazards due to trenches, pits, or other excavations.	necessary to install injection tubing. 2. *Purge and drain piping* if appropriate. 3. The site owner will place a lock onto each device or authorize the OGINA site foreman or supervisor (or designated subcontractor) to place a lock on each device. 4. OGINA (or designated subcontractor) shall keep a list of locks and tags placed on each equipment or system that is locked out. An *Equipment-Specific LOTO form* may be used. 5. Keys to all locks will be placed in a lock box 6. Each person working on a system or equipment that is locked out must place their lock and tag on the lock box. 7. **Locks and tags must be removed from lock boxes at the end of each shift.** B. Heavy equipment safety precautions include: 1. Ensure **slopes** in designated work areas do not exceed slopes allowed by manufacturer's safe operating guidelines. 2. Keep **non-essential personnel** out of areas in which manlifts and cranes will be operating. *NOTE – barricades should not be necessary since work is not conducted in a high traffic area.* 3. Ensure all operators are qualified and familiar with the **manufacturer's safe operating guidelines** for the equipment they are operating. 4. **Inspect heavy equipment daily** prior to use. Immediately repair any leaks. 5. Operators must wear **seatbelts** at all times unless seat belts are not provided by the manufacturer. 6. Equipment operators must ensure workers are kept clear from **crush points** created by counterweight swings and fork/boom movement. 7. Never lift or suspend a load over people. **8.** Inspect all rigging materials prior to use. **9.** Ensure **spill cleanup equipment** is available for hydraulic fluid leaks, fuel spills, and similar materials. C. At a minimum, implement the following safety requirements work areas in **excavations:** *1.* **Excavations >4'** are handled as Permit Required Confined Spaces unless downgraded in accordance with a Confined Space Entry Procedure. 2. A **competent person** must be on-site during all excavation activities where employees will enter the excavation. Excavations must be sloped or shored when >5' deep OR when there is a cave-in hazard to workers. 3. A competent person must document daily excavation inspections using the *Daily Excavation Checklist* on all days during which persons must enter excavations. 4. Soil sloping must be based on Type C classification unless a Competent Person has determined a different classification on a

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
			Soil Analysis Checklist. 5. Manufacturer's data for trench boxes, shields, and aluminum hydraulic shoring must be on site. 6. When trench boxes or manhole boxes must have the ends closed off, a sketch showing the location and size of bracing/shoring materials must be attached to this JSA. Bracing must be in accordance with OSHA Subpart P. 7. If possible, do not backfill completely to the top of trench boxes. Let the top of the trench box or shoring act as a guardrail to minimize falls into the excavation. 8. Do not excavate more than 2' below the bottom of a trench box. 9. If excavations are to be left unattended, then secure with barricades. In high traffic areas, use only portable chain-link fence, saw horses, or other solid barriers. Safety fence may be used in low traffic areas. Use **flashing lights** for excavations left open overnight that obstruct plant roads. 10. Operators must have training and experience sufficient to demonstrate safe operation of the equipment they will be operating. Operators must ensure site workers are kept clear of potential crush points between pieces of equipment or fixed structures. 11. Assume all lines and pipes encountered during excavation activities are live until field inspections indicate otherwise. **12. Hand dig** and use a spotter when **within 3 feet** of an anticipated utility location.
		D. Confined Space Hazards • Excavations may be classified as permit-required confined spaces due to airborne VOC concentrations >5 ppm.	D. **Confined space hazards** must controlled as follows: 1. Evaluating entry into confined spaces in accordance with the OGINA confined space entry procedure. Excavations and manholes >4' deep are potential permit-required confined spaces. 2. Verifying that off-site rescue support is available. 3. Determine if there are serious hazards present. Refer to paragraphs 6.1 and 6.2 of the OGINA Confined Space Entry procedure for additional guidance. Serious hazards are defined as LEL >10%, carbon monoxide >35 ppm PEL, and VOCs >5 ppm action level based on a sustained reading. **(NOTE – The primary confined space hazard of concern is VOCs for this project.)** 4. If no serious hazards are present, then **downgrade** to a non-permit space per paragraph 4.4B of the OGINA Confined Space Entry procedure. 5. If serious hazards are potentially present AND can be controlled with forced mechanical ventilation (e.g., explosion-proof blowers), then enter using **Alternate Entry** procedures outlined in paragraph 4.5 of the OGINA Confined Space Entry procedure. 6. If serious hazards cannot be eliminated or controlled with ventilation, then **full permit-required** entry procedures must be implemented. An on-site confined space rescue team may have to be established prior to using this type of entry 7. Regardless of confined space classification, air monitoring for

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
			VOCs must be conducted and feasible mechanical ventilation must be provided. **(NOTE – Mechanical ventilation is not required for excavations where VOCs are <5ppm.)**
		E. **Pressure testing** and **leak checks**	E. Pressure testing is inherently dangerous activity. It only takes a small amount of pressure to be hazardous depending on pipe diameter. Implement the following safety controls: 1. Read the Safety/Toolbox Meeting Topic on Pressure Testing Safety and Corporate Safety Procedure #2.35 prior to conducting pressure tests/leack checks. 2. Do not test with process chemicals. 3. Do not exceed test pressures in Corporate Safety Procedure #2.35 unless authorized in another test procedure approved by a professional engineer. 4. Secure/block all inflate-type pipe plugs
		F. **General fall hazards** when working above 6' or are within 6' of a leading edge • Working from a ladder in a manner where all of the above safety precautions cannot be implemented. • Entering or exiting a manbasket to an elevated work surface which is not protected by guardrails. • Working on top of the air stripper when guardrails are not available.	F. Safety controls for general **fall hazards** include: 1. Install temporary guardrails (if possible) which can support 200 pounds of lateral force. 2. Install a warning line system at least 6 feet from an exposed edge (if possible) 3. Use personal fall arrest equipment: • Use 6' lanyard and shock absorber above 15' • Use a non-shock absorbing lanyard and/or adjustable length lanyard between 6-15 feet. • Anchor points must be able to withstand 5,000 pounds of force • Use D-straps to wrap around beams or similar anchor points with sharp edges. Attach lanyard to the D-strap
		G. **Ladder** hazards: • Ladders kicking out or tipping over during use. • Users fall from a ladder • Falling objects strike workers or pedestrians on lower work surfaces.	G. **Ladders** must be used in accordance with OSHA guidelines or fall protection must be implemented above 6 feet. Ladder safe use guidelines include, but are not limited to: 1. Ensure all ladders are inspected and properly labeled 2. Maintain 3 point contact while working on step ladders and extension ladders. (Work requiring the use of both hands when on a ladder will require the worker to tie-off.) 3. Keep your torso between the rails of the ladder 4. Do not use a step ladder as a straight ladder 5. Do not stand on the top two steps of a step ladder 6. Extend extension ladders 3 feet above the upper level 7. Secure the top and base of extension ladders 8. Extension ladders should have a 4:1 height to base ratio 9. Do not use metal ladders within 20' of exposed conductors or overhead powerlines
		H. **Power Tools** • Shock	H. Perform the following to ensure that tools are in good working order. 1. Inspect tools for visible damage. 2. Inspect all flexible extension cords and power tool cords. Discard

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
		• Hand cuts • Eye injuries from flying debris	all flexible cords without a ground plug or outer insulation that is cut through. Tool cords must be in similarly good condition. Do not repair flexible cords smaller than 12 guage. 3. Wear faceshield during grinding in addition to safety glasses. 4. Ensure grinding wheels are properly rated for the grinder. 5. Do not operate tools without guards and use only in accordance with manufacturer's operating instructions.
		I. **Material Handling** (Back Strain)	I. Follow **proper lifting guidelines** (IMPORTANT): 1. Keep load close to the body. 2. Keep hips and shoulders aligned (no twisting) 3. Maintain stability (keep a balanced position) 4. Think and plan difficult lifts (get a second person or use mechanical devices when possible.) 5. Avoid lifting more than **75 lbs**. If weights exceed 75 lbs, use mechanical lifting devices (e.g., backhoe) or use 2 people.
		J. Slips, Trips, and Falls	J. Safety controls for slips trips and falls include: 1. Maintain housekeeping daily. Remove all trash daily. 2. Ensure aisles, walkways, and roads are kept clear. 3. Do not obstruct building exits. 4. Secure extension cords and hoses so they do not represent a tripping hazard.Establish material laydown areas. Remove only those materials that will be used or consumed during a single day. Return tools, equipment, and unused materials to laydown areas at the end of the day.
		K. Noise	**K.** Hearing protection is required while operating noisy equipment or when noise interferes with talking when persons are <5 feet away.
		L. **Contact** with contaminated water or soil. • Dermatitis/rash • Eye irritation	**L.** Safety controls for contact hazards include: 1. Don LIGHTWEIGHT MODIFIED LEVEL D protective equipment when there is a potential for contact with contaminated groundwater. 2. Review MSDS. 3. Identify the nearest emergency shower/eyewash.
		M. Exposure to atmospheric hazards - VOCs, PCBs, and dust. • Nuisance VOC odors to project personnel and to persons working in adjacent areas. • PCB aerosols and dusts during excavation and backfilling of trench	**M.** Safety Controls for **atmospheric hazards** include: 1. Monitor for organic vapors and upgrade to level C if required based on air monitoring results (sustained readings of 1 minute) • 5 ppm – Half or Full-face Level C PPE • 10 ppm – Full-Face level C PPE • 50 ppm – Stop Work, Notify GE Representative and the OGINA Manager of Corporate H&S 2. Monitor for dust with direct reading dust meter. Follow action levels and responses listed in Table 4.3 of the Site Safety Plan which are summarized below: • <1 mg/m3 – Level D PPE and maintain dust

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
			suppression • 1 mg/m3 – Level C PPE. Monitor fence line per Community Air Monitoring Plan. • 5 mg/m3 – Stop Work. Re-evaluate dust controls in work area. 3. Sample for PCBs using NIOSH 5503 method and submit for 24 hour laboratory analysis. • Sample at 3 locations during each day of intrusive work. • One upwind location, One downwind location, and one location to nearest off-site receptor. • Sampling results will be forwarded to the State for review. 4. Measure combustible gases and oxygen with a gas meter prior to conducting any work which will cause a spark inside confined or enclosed spaces which contain VOC contamination. If **explosive vapors are >10%LEL** then work may not continue until the system is purged. 5. Use non-sparking work methods such as a portaband saw in place of a cutting disk if flammable atmospheres are potentially present 6. Coordinate work with other site activities to minimize the impact that nuisance odors may have on persons in adjacent areas.
DECONTAMINATION *(intrusive)* **Mandatory PPE:** • *Full Modified Level D PPE* consists of is similar to Lightweight Modified Level except coveralls or rain-suit must be used. Full Modified Level D PPE is necessary when extensive contact with contaminated materials is anticipated, such as the manual-excavation of contaminated soils. **As needed PPE-** • *Hearing Protection* during operation of pressure washer/steam decon, • *Face shield* when using pressure washing equipment. *Intrusive Tasks:* • Discard disposable PPE upon exiting Exclusion Zones. • Remove gross contamination from PPE prior to doffing.	Drilling crew Excavation Crew Sampling Technician Surveyor Scientist	A. Slips, trips, & falls B. Manual lifting C. Noise – while deconning heavy equipment and equipment is operating. D. Electrical shock during installation of site/office utilities and/or using power tools E. Contact with contaminated soil & groundwater	A. Maintain housekeeping daily B. Follow proper lifting technique. Review primary precautions below: • Keep load in close to the body; • Keep hips and shoulders aligned (no twisting); • Maintain stability (keep a balanced position); and • Think and plan difficult lifts. C. Wear hearing protection while operating heavy equipment (unless with enclosed cab) or noisy power tools. Wear hearing protection if you have to raise your voice talking to someone 5 feet away. D. 1. Use GFIs on all tools and extension cords. 2. Inspect all electrical cords prior to use and discard damaged ones. 3. Do not use aluminum ladders within 20' of overhead power lines. 4. De-energize and lockout electrical equipment. Do not perform live-connects. E. 1. Initial PPE is Modified Level D with the potential to intermittently upgrade to Level C base on air monitoring results. 2. Wear or modify PPE as required in this HASP to minimize contact with contaminated soil. 3. If it is raining or soil is excessively wet from groundwater, wear

ACTIVITY and Tasks	Affected Personnel	Safety Hazards	Safety Hazard Controls
• Setup temporary decon areas to remove contamination from tools and equipment. • Use water rinse. Containerize rinse water.			Saranex (or equivalent) coveralls in place of standard Tyvek. 4. Follow proper decontamination procedures to remove gross contamination from protective clothing, especially boots.

Horizontal DNAPL Extraction Well Installation and Operations Plan

for

General Electric Company
Fort Edward, New York

Prepared for:

O'BRIEN & GERE OF NORTH AMERICA

Prepared by:

Directed Technologies Drilling, Inc.
2224 Marine View Drive
Tacoma, WA 98422

June 2004

The objective of this project is to install two horizontal DNAPL groundwater extraction wells (HRW-1 and HRW-2) to recover mobile DNAPL from the DNAPL pool in the southeastern portion of the General Electric Company's (GE's) plant site. Horizontal recovery well HRW-1 will be screened in the shallow unconsolidated sand and gravel unit. Horizontal recovery well HRW-2 will be screened in both the shallow unconsolidated sand and gravel unit and the transition zone. The well screens will be located approximately 26 to 34 feet below ground surface.

1. SCOPE OF WORK

DTD will design and install the horizontal wells. OBG has identified the depths and lengths of the wells. DTD will drill and install the well materials, and will provide all other materials for well completion and development, including drilling mud, cement grout, and miscellaneous parts and fittings. OBG will provide and install vaults for the well ends and associated pumps and piping to convey the DNAPL to the transfer building.

2. WELL DESIGN

Horizontal DNAPL recovery well HRW-1 will be installed along the long axis of the DNAPL pool at the base of the sand and gravel unit. Horizontal DNAPL recovery well HRW-2 will be installed in a northeast-southwest trending direction. The northeast end of HRW-2 is initiated in the sand and gravel unit, while the southwest end of HRW-2 terminates at the base of the transition zone.The ground water table is located approximately 13 to 17 feet below ground surface and the recovery wells will be about 10 to 17 feet below that.

Each well will be constructed using horizontal recovery well drilling techniques at the locations shown on Sheet G-5 of the Final Design Drawings. The final entry and exit points for each borehole will be determined prior to the start of drilling based on the horizontal well drilling contractor's approved design submittal. At a minimum, the horizontal well drilling contractor's design submittal will be based on the following:

We have analyzed the two bore paths and have developed our preliminary bore profiles (see Attachment 1). These plans are preliminary in that we are not certain at this time about the utilities in the way of our proposed bore paths. The final entry and exit points and bore profiles for each borehole will be determined after we mobilize to the site, but prior to the start of drilling. The final bore profile will be determined after confirmation of the locations of underground obstructions. Based on the site walk and as-built drawings provided by OBG, the adjustments to the profiles, if any, will be minor.

The well materials, amine based fiberglass reinforced epoxy, are capable of making the bends as shown in the profiles. We have a letter from the pipe manufacturer showing that the amine based pipe is chemically compatible with the chemical characteristics of the DNAPL.. Given the nature of the contamination and the desired bend radii for the wells, the FRE pipe selected is

appropriate for the site. We have included a cut sheet for the well materials and the letter discussing the chemical compatibility of the amine FRE pipe in Attachment 2.

The finished extraction well screens will be approximately 260 and 210 feet long, for HRW-1 and HRW-2, respectively. Figure 2-1 shows the plan view of proposed bore paths with the screened sections. Figure G-5 shows the profile view of the two wells.

Based on the particle size data currently available, and the performance of the vertical piezometers and monitoring wells at the site, we have elected to use 0.020-inch lengthwise slots for the entire screened length of HRW-1 and for the 60 foot section of HRW-2 that is located within the sand & gravel unit. The remaining portion of the well screen in HRW-2 that is located within the transition zone will be lengthwise slotted with 0.010-inch slots.

The screen should be open to the formation as much as possible without compromising the tensile strength of the well materials. Table 3.1 shows the slotting configuration for the wells with the two slotting options. We have included the flow capacity per lineal foot assuming an entrance velocity of 0.1 ft/sec.

Table 3.1

Slot Size	Slots per foot	Slot Length	Open Area (sq in/ft)	Percent Open Area	Q/ft at V_e 0.10 ft/sec
0.020"	60	2.9"	3.48 in^2	2.32	1.1 gal/min/ft
0.010"	60	2.9"	1.74 in^2	1.16	0.56 gal/min/ft

Using the assumptions above, the well screen in HRW-1 is capable of passing 308 gallons per minute of water with an entrance velocity of 0.10 ft/sec. The flow capacity of HRW-2 is 134 gallons per minute. This is what the screen is capable of passing, not the expected flow rate of the formation.

The flow rate from the formation is difficult to calculate. Based on discussions with OBG personnel and past experience with horizontal wells, we would expect the water discharge from a well with 280 feet of screen as described above in a sandy aquifer would be about 30 gpm. However, the objective of these extraction wells is to recover DNAPL. Given the viscosity of the DNAPL and field observations, the expected flow of DNAPL into the well is expected to be an order of magnitude less than the 30 gpm. The well screen specified above is more than capable of passing this volume of flow with no danger of entraining formation materials into the well.

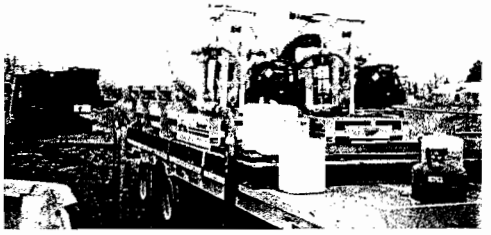
3. DRILLING PLAN

3.1 Drilling Equipment and Crew

Drilling operations will begin immediately upon the final visual identification of utility lines. The drilling crew will set up the drilling equipment, consisting of three primary units: 1) the directional drill, 2) a mud mixing system, and 3) a spoils/cuttings pit. The drilling crew will

consist of four people, including a driller, a locator, a fluids-management technician, and a field supervisor. Depending on the schedule, an additional laborer will be on site to assemble pipe and operate equipment.

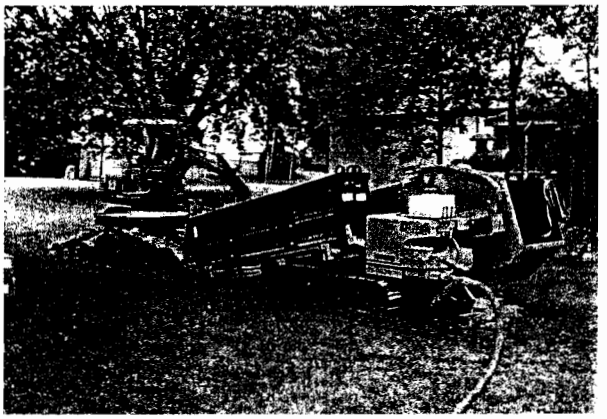
Drilling fluid is mixed and supplied from a separate module, a self-contained unit comprising one or more mud tanks, mixing jets, pumps, and associated fluid conveyance lines. This unit can be located up to 200 feet away from the drill unit (although no traffic may travel over the conveyance lines connecting the unit to the drill). Drilling mud is used once and is then collected for disposal. Additional fluid is mixed as required to make up for fluid losses within the borehole.



Spent drilling fluids will be stored in containers provided by OBG. The containers will be staged at the entrance pit upon completion of drilling operations. We understand the spent drilling fluid and cuttings must pass a paint filter test prior to OBG accepting them. DTD proposes to stabilize the fluid and cuttings with cement or other inert material provided by OBG.

DTD will not take responsibility for treating or transportation of drill cuttings, development fluid or other investigation-derived wastes outside the plant boundaries. We recommend OBG consider using roll offs for disposing drill cuttings and spent drilling fluid. The roll offs can be easily treated to break down the drilling fluid and makes it easier to segregate the solids from the liquids for disposal.

We propose to use a Vermeer 24 x 40 drill rig to install the well. Based on our understanding of the site conditions and the length of the required well, the D 24 x 40 has the proper characteristics for a successful completion. These include high rotational torque (4,000 lbs.), large mud capacity, sufficient pullback capacity (24,000 lb. pull and thrust) and ease of maneuver. DTD has range of drill rigs, from a 24,000-lb. machine to an 65,000-lb. machine.



a

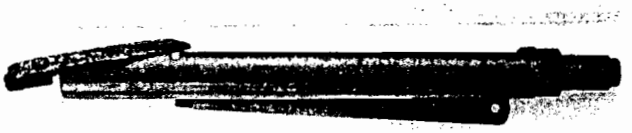
Additional support equipment will include the following:

- Backhoe, for excavation needs that may occur as well as pipe handling;
- Centrifugal trash pumps and/or diaphragm pumps for fluid handling;
- Pressure washer, for equipment decontamination.

3.2 Pilot Hole Installation

Entry and exit pits will be excavated to temporarily contain drilling fluids as they flow from the borehole during the drilling process. These pits will also be used to contain the decon water that will result from the rod cleaning operation.

The trajectory of the well and casing will be established by an initial pilot hole drilled from surface-to-surface using a 5 or 6-inch diameter drill bit. The drill rig will be set up in an area located approximately 100 to 120 ft from beginning of the screened interval. The pilot hole will be drilled with a shallow entry angle, entering the ground in an entry pit excavated to collect spent drilling fluids for disposal.



The drill bit will be directed downward until it reaches the appropriate depth below ground surface. The drill will then level off and proceed for approximately 260 or 210 ft, the length of the screened intervals. After passing through the screened interval, the drill will be directed back to the surface.

3.2.1 Borehole Accuracy

Guidance and navigation of the pilot bore will be accomplished with a DCI Digitrack walkover guidance system. A walkover system will require fairly continuous surface access (minor gaps are acceptable) for tracking.

Under normal conditions, the Digitrack system is sufficient to give accurate positioning data to depths of up to 70 feet. However, local magnetic anomalies, whether natural or induced by man-made structures, can cause the tool to stray from the design borehole path that is programmed into the system microcomputer. These anomalies can be the result of electrical fields, large masses of ferrous metals, or other perturbations.

The RFP calls for a locating system capable of achieving a vertical and horizontal accuracy of 1% of the depth of penetration. A 26 ft deep well would have to be placed within 3 inches +/- of the designed depth or slightly more than the diameter of the drill rods. There is no system on the market today that can achieve that degree of accuracy.

We propose to use the Digital Control Eclipse locating system. This system is the most sophisticated walkover locating device on the market today. It is capable of locating the drillhead accurately at depths greater than 50 feet. It provides the locating technician pitch measurements on the sonde in tenths of percent. We can integrate our pitch measurements and compare the results with the direct measurements from the locator to provide an accuracy of +/- one foot at the depths desired.

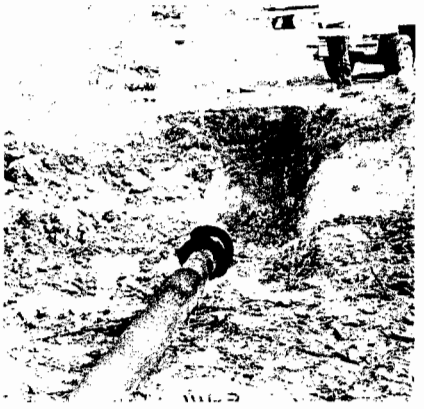
Electronic drill guidance and tracking systems have been successfully employed in directional drilling for many years. Our system was designed to accurately navigate boring tools at substantial depth and is relatively immune from magnetic or RF interference that can adversely

affect some other types of tracking systems, particularly those designed for use at shallower depths. The most accurate of tracking systems, however, cannot overcome the fact that no near-surface directional drilling equipment can prevent a deviation in the path if a rock or a pocket of very loose material is encountered. A rock can cause the drill head to deflect onto a new path, and a pocket of loose material can prevent the drill head from responding to steering commands.

For practical purposes, this means that a given segment of borehole (and thus the final borehole) could deviate from the ideal path by as much as the minimum bend radius of a drill rod in the length between measurements. The maximum probable deflection in soil with good drilling characteristics is quite small. If any deflection is detected, the drill head can be re-directed to cancel the deviation and to get the borehole back to its planned position (within the tolerance of the tracking equipment). If major, uncorrectable deviations occur, the pilot drill is pulled back and the borehole segment is re-drilled.

3.3 Back Reaming and Materials Installation

Once the pilot hole has been completed, the drill head will be removed and a reamer attached for the pullback operation. We plan to use an 8-inch reamer to pull back the four-inch diameter well materials.



3.4 Decontamination While Drilling

The nature of the contamination at the site is such that we have to decontaminate our equipment as soon as possible after contact with the soil and groundwater. We have built a drill rod wiper and washer unit that will clean the drilling equipment as it is pulled from the borehole. The cleaning unit consists of a hot water/steam cleaner attached to an integrated rod cleaner. The drill rods will be wiped clean of surface materials as they are pulled into the cleaner. Four steam jets will then spray off the rods as they are pulled through the cleaner. Cleaning fluid will flow through the bottom of the cleaner into the pit. The rods will then be wiped a second time to remove water from the surface.

The development tools will also have to be cleaned as they are pulled from the hole. We propose to use this steam cleaning tool to decontaminate the development tools.

3.5 Drilling Fluids Management Plan

Drilling fluid will be used for cutting the borehole and stabilizing the tunnel wall until the well material is pulled in. We anticipate the use CETCO Cleandrill as the drilling mud for this installation. A data sheet on the CETCO drilling mud is included as Attachment 1.

3.5.1 Fluid Recovery

Drilling fluids will be passed from the cutting tool into the borehole and will emerge at the surface at either the entrance pit (during pilot hole drilling), the exit pit (beginning of reaming process), or a combination of the two (near the end of the reaming pass). The drilling fluids will be collected at the respective pits and will be pumped into containers provided by OBG for treatment and disposal.

3.6 Well Development and Sealing

3.6.1 Well Sealing

After the well screen and casing have been pulled through the borehole, the space between the outside of the pipe and the tunnel wall must be sealed to prevent infiltration of surface water into the well. DTD will install multiple shale-trap packers or other suitable sealing device approximately 10 feet from the surface and will fill the annular space to the surface with grout using a standard pressure-grouting system.

3.6.2 Well Development

We will initiate well-development action after letting the breaking solution work for 24 hours. Well development will consist of four steps: 1) flushing the well to remove residual drilling mud, 2) injecting a breaking solution, 3) jetting the well, and 4) pumping the well.

3.6.2.1 Flushing the Well

We will begin the development process by flushing the well with fresh water to clean out the drilling fluid and sediment that entered when the screen was installed. We will connect a high-volume water source to one end of the well and another discharge pump at the other end of the well and flush as much fluid as possible through the well.

3.6.2.2 Breaking the Drilling Mud

We fill the well with an approved mud-breaking agent to break the chemical bonds of the drilling fluid. This will cause the drilling fluids to lose viscosity and make the well much easier to develop. We propose to use an enzyme breaker specifically designed to break the chemical bonds of the drilling mud.

After the breaking solution has been injected, a 24-hour period will be allowed for the residual mud viscosity to break down, the well will be pumped using a centrifugal pump connected at the

surface. Fresh water may be introduced to the other end of the well to facilitate removal of sediments and residual drilling fluid. The pumping rate will be adjusted to remove more water than is introduced, assuring that contamination is being removed from the well.

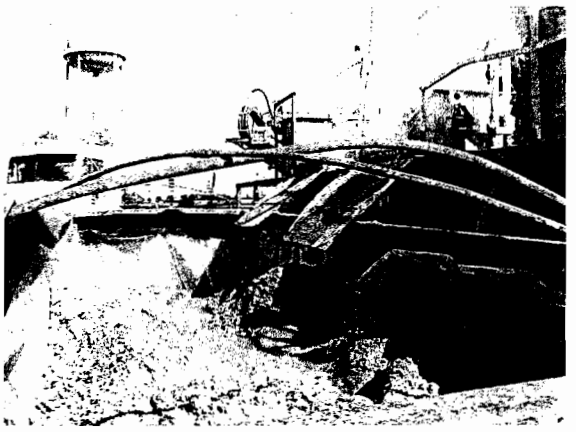
3.6.2.3 Jetting the Well

We propose to force water through the well screen openings using a jetting process. We propose installing a cable through the well materials as we thread the pipe together Once the well is installed we will use this cable to pull a jetting tool through the screened portion of the well. We have found this process works well in groundwater extraction wells. Fluid generated from the jetting process will be pumped to the appropriate containers for treatment and disposal.

3.6.2.4 Pumping Residuals

After the flushing process has been completed, we will pump the well with an appropriate pump to confirm flow of DNAPL from each well. Given the viscous nature of the contaminant, we are not certain at this time which pump will be appropriate for this phase. We will be prepared to use a air/vacuum assist pump, a diaphragm pump, and a submersible pump. Any residual material will be removed at this time.

3.6.3 Managing Well-Development Fluids



Well development water will be pumped into containers provided by OBG. We typically recommend using rolloff containers for both the drill cuttings and the development water. We can work with OBG to greatly reduce the volume of cuttings and water to be disposed from the drilling operations. The waste materials derived from development (dewatered solids and fluids) are assumed to be contaminated. We have assumed that OBG will handle all characterization and disposal of these materials. While every well is different, it is anticipated that approximately 7,000 gallons of drill cuttings and development water will be generated.

4. SITE HEALTH AND SAFETY

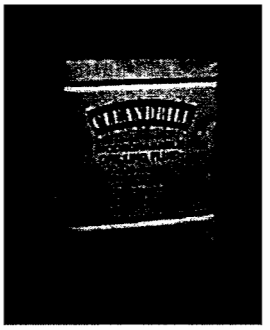
DTD will provide personnel with appropriate OSHA training and medical monitoring. Personnel will perform drilling tasks in accordance with the site-specific HASP and facility safety

requirements. Medical and training records of DTD personnel will be maintained on site for the duration of the drilling program.

drilling fluids • grouts & sealants • polymers & additives • well rehabilitation chemicals

CETCO DRILLING PRODUCTS

TECHNICAL DATA



PureGold® CleanDrill

Biodegradable Drilling Fluid

Description:

PureGold® CleanDrill is a clay-free powder designed for special conditions associated with drilling horizontal directional recovery wells for groundwater remediation. PureGold® CleanDrill maintains formation permeability and porosity.

Recommended Use:

PureGold® CleanDrill is designed for use in drilling operations where clay-based drilling fluids are restricted and a biodegradable drilling fluid is recommended.

Characteristics:

- Enhanced viscosity for efficient borehole cleaning.
- Elevated yield point and gel strength for efficient cutting suspension and transport.
- Increases recovery rate of contaminants during remediation.
- Preserves porosity and permeability of formation.
- Decreases filtration rate in unconsolidated formations.
- Improved borehole stability for easy well installation.
- Soluble in water, and disperses easily with moderate shear.

Mixing and Applications:

CleanDrill is compatible with a wide range of make-up waters. Add slowly and uniformly through a high shear jet-type mixer over one or more cycles of the volume of slurry. Continue to mix and agitate the slurry until all ingredients are dispersed. CleanDrill breaks down chemically by adding calcium hypochlorite or LEB-CD.

Normal consolidated formations:
8 to 15 pounds per 100 gallons water (3.5 to 6.5 lbs/bbl)
Unconsolidated formations:
12 to 27 pounds per 100 gallons water (5 to 9 lbs/bbl)

Properties:

Appearance:	Tan powder, odorless
Density:	35-45 lbs./ft^3
pH (2%slurry in water):	7.0 - 7.5
Specific gravity:	1.2

Packaging:

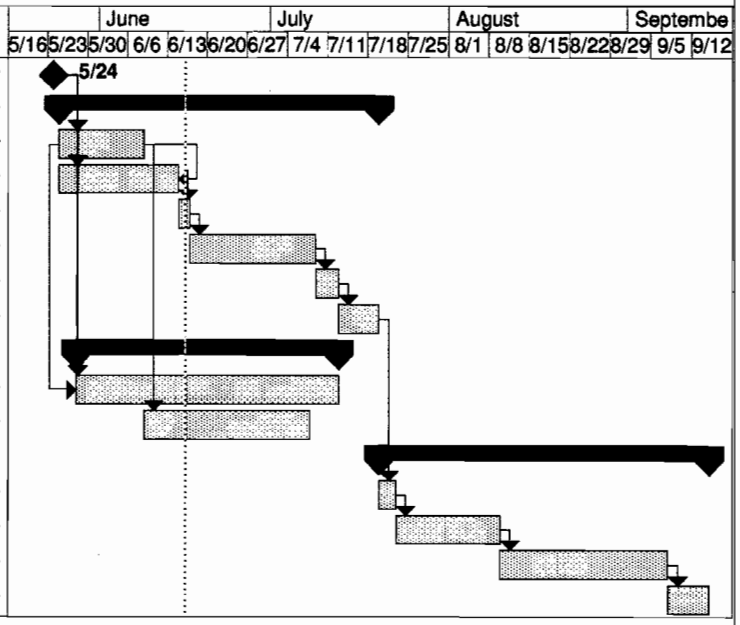
50 lb. multiwall, water-resistant bags, 40 bags per pallet. All pallets are plastic wrapped.

1500 West Shure Drive • Arlington Heights, IL 60004 • PH 847.392.5800 • FX 847.506.6150

OU-3 DNAPL Collection System
GE - Ft. Edward, NY

Construction Schedule

ID	Task Name	Duration	Start	Finish
1	**Contract Award**	**1 day**	**Mon 5/24/04**	**Mon 5/24/04**
2	**Work Plan Submittal**	**38 days**	**Tue 5/25/04**	**Mon 7/19/04**
3	Driller Design/Work Plan	10 days	Tue 5/25/04	Tue 6/8/04
4	OBG/GE Develop Work Plan	14 days	Tue 5/25/04	Mon 6/14/04
5	Submit Work Plan to NYSDEC for Review & Comment	2 days	Tue 6/15/04	Wed 6/16/04
6	NYSDEC Review & Comment on Construction Work Plan	15 days	Thu 6/17/04	Thu 7/8/04
7	GE/OBG Revsie/Resubmit Construction Work Plan	2 days	Fri 7/9/04	Mon 7/12/04
8	NYSDEC Review/Approve Contruction Work Plan	5 days	Tue 7/13/04	Mon 7/19/04
9	**Procurement**	**30 days**	**Fri 5/28/04**	**Mon 7/12/04**
10	Driller Materials Procurement/Delivery	30 days	Fri 5/28/04	Mon 7/12/04
11	Mechanical/Electrical Procurement	20 days	Wed 6/9/04	Wed 7/7/04
12	**Site Work**	**40 days**	**Tue 7/20/04**	**Tue 9/14/04**
13	Mobilization/Site Preparation/Utilities Layout	3 days	Tue 7/20/04	Thu 7/22/04
14	Horizontal Well Drilling/Development	12 days	Fri 7/23/04	Mon 8/9/04
15	Mechanical/Electrical Tie-Ins	20 days	Tue 8/10/04	Tue 9/7/04
16	Startup/Testing	5 days	Wed 9/8/04	Tue 9/14/04

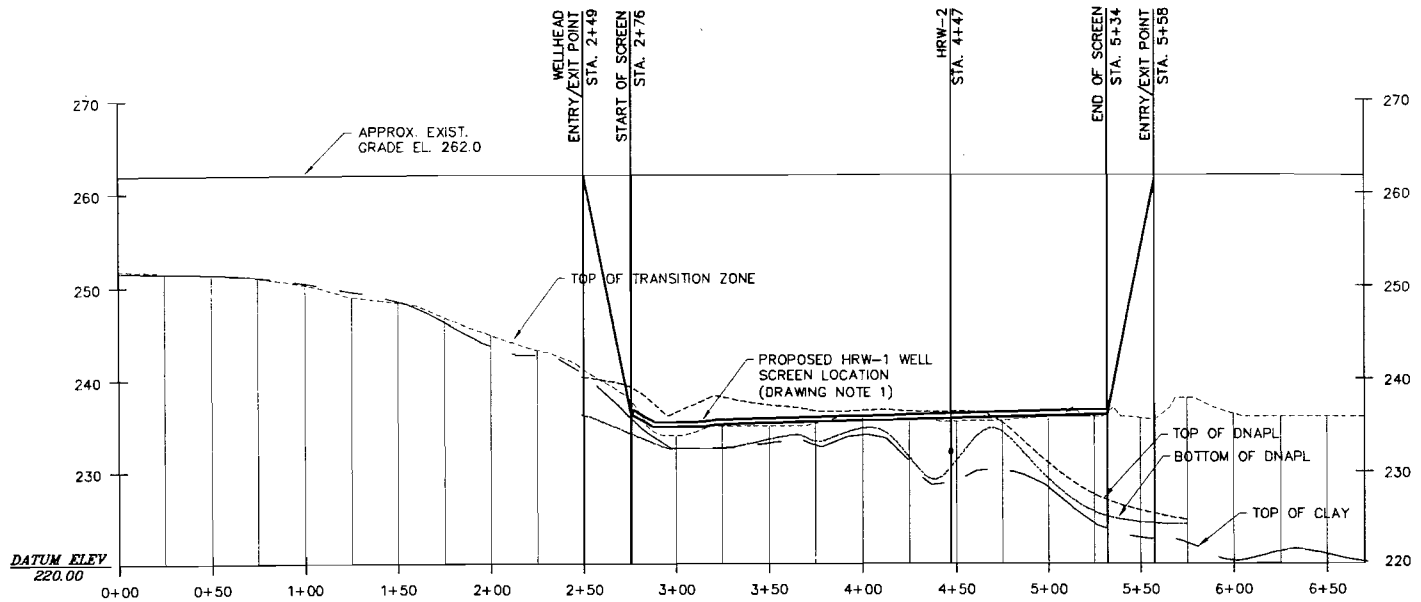


Project: OU-3DNAPL061404
Date: Wed 6/16/04

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

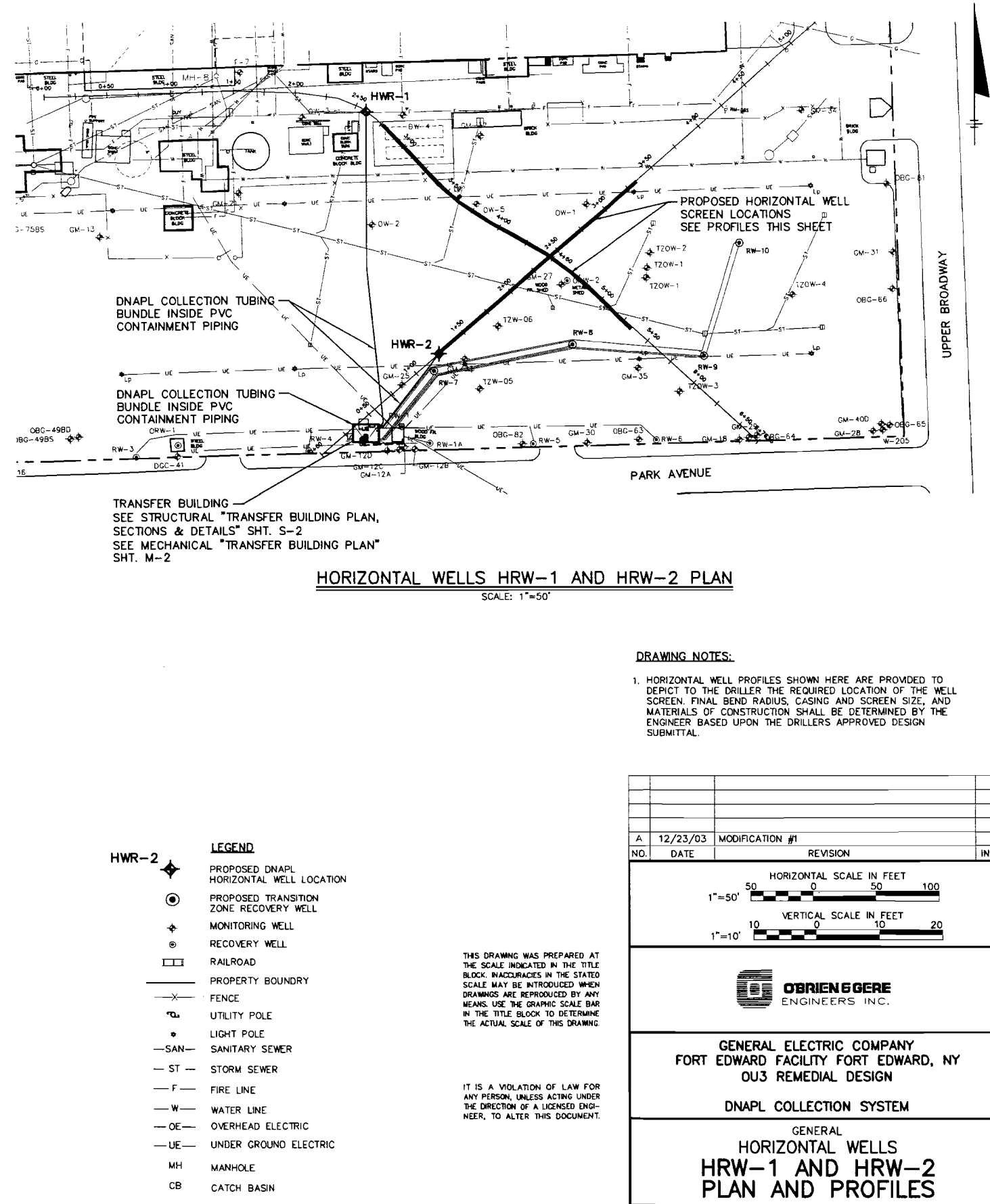
O'BRIEN & GERE

Attachment 3



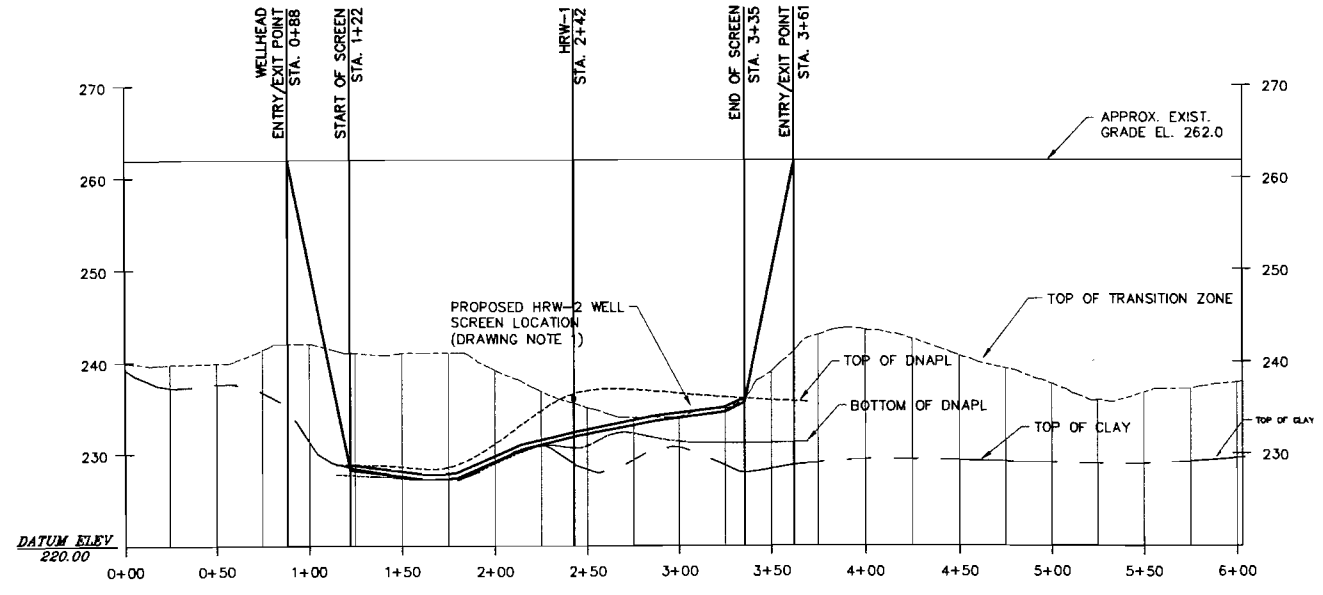
PROFILE (HRW-1)

SCALES: HORIZ. 1"=50'
VERT. 1"=10'



HORIZONTAL WELLS HRW-1 AND HRW-2 PLAN

SCALE: 1"=50'



PROFILE (HRW-2)

SCALES: HORIZ. 1"=50'
VERT. 1"=10'

DRAWING NOTES:

1. HORIZONTAL WELL PROFILES SHOWN HERE ARE PROVIDED TO DEPICT TO THE DRILLER THE REQUIRED LOCATION OF THE WELL SCREEN, FINAL BEND RADIUS, CASING AND SCREEN SIZE, AND MATERIALS OF CONSTRUCTION SHALL BE DETERMINED BY THE ENGINEER BASED UPON THE DRILLERS APPROVED DESIGN SUBMITTAL.

LEGEND

- HWR-2 — PROPOSED DNAPL HORIZONTAL WELL LOCATION
- PROPOSED TRANSITION ZONE RECOVERY WELL
- MONITORING WELL
- RECOVERY WELL
- RAILROAD
- PROPERTY BOUNDRY
- —X— FENCE
- UTILITY POLE
- LIGHT POLE
- —SAN— SANITARY SEWER
- — ST — STORM SEWER
- — F — FIRE LINE
- — W — WATER LINE
- — OE — OVERHEAD ELECTRIC
- — UE — UNDER GROUND ELECTRIC
- MH MANHOLE
- CB CATCH BASIN

NO.	DATE	REVISION	INIT.
A	12/23/03	MODIFICATION #1	

HORIZONTAL SCALE IN FEET
1"=50' 50 0 50 100
VERTICAL SCALE IN FEET
1"=10' 10 0 10 20

O'BRIEN & GERE ENGINEERS INC.

GENERAL ELECTRIC COMPANY
FORT EDWARD FACILITY FORT EDWARD, NY
OU3 REMEDIAL DESIGN

DNAPL COLLECTION SYSTEM

GENERAL
HORIZONTAL WELLS
HRW-1 AND HRW-2 PLAN AND PROFILES

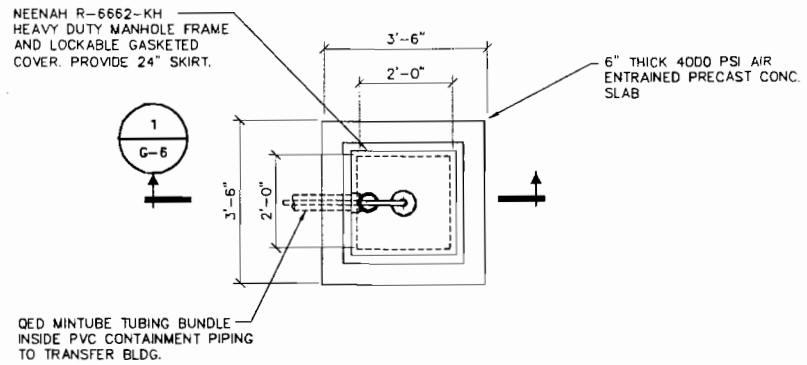
IN CHARGE OF _____
DESIGNED BY ____ CHECKED BY ____
DRAWN BY _____

FILE NO. 5731.30137.048
DATE DEC. 2003

G-5

PLOT DATE:

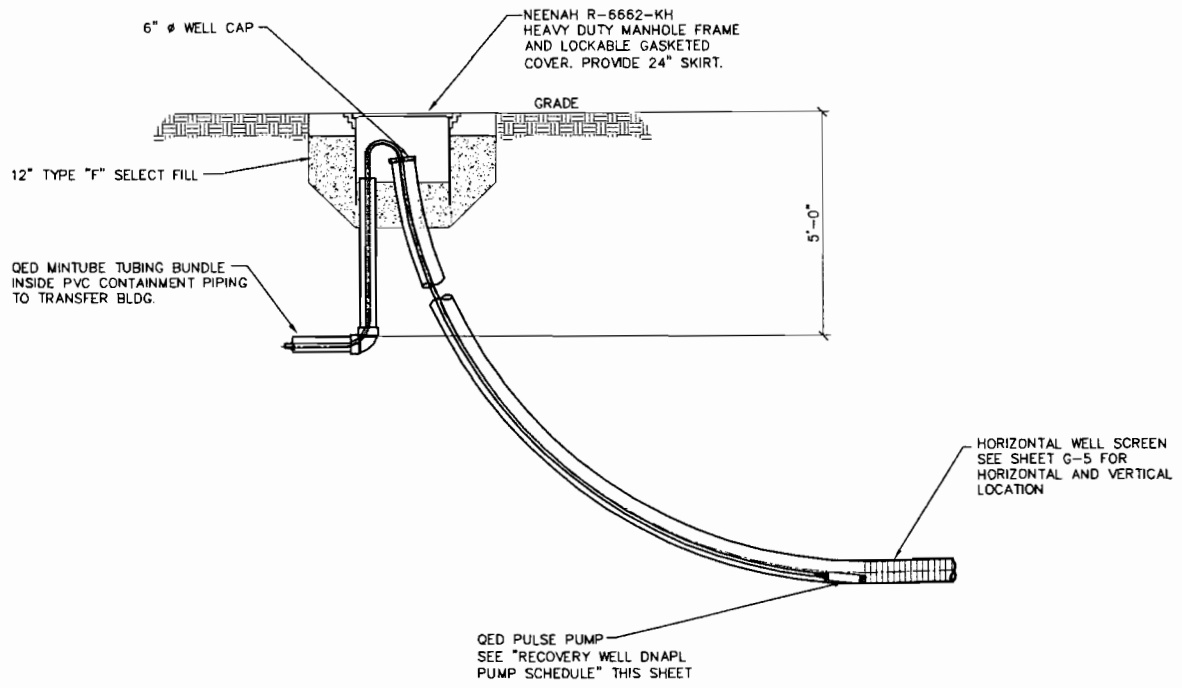
I:\DIV71\PROJECTS\5731\30137\DWG\TRANSITION ZONE\GEN\30137-048-G54.DWG



TYPICAL HORIZONTAL RECOVERY WELLHEAD PLAN

(TYPICAL FOR HRW-1 & HRW-2)

SCALE: 1/2"=1'-0"



HORIZONTAL RECOVERY WELL DNAPL PUMP SCHEDULE			
RECOVERY WELL	MANUF.	MODEL #	TYPE
HRW-1	QED	LP1301	PNEUMATIC DISPLACEMENT
HRW-2	QED	LP1301	PNEUMATIC DISPLACEMENT

NOTES:

1. HORIZONTAL WELL PROFILES SHOWN HERE ARE PROVIDED TO DEPICT TO THE DRILLER THE REQUIRED LOCATION OF THE WELL SCREEN. FINAL BEND RADIUS, CASING AND SCREEN SIZE, AND MATERIALS OF CONSTRUCTION SHALL BE DETERMINED BY THE ENGINEER BASED UPON THE DRILLERS APPROVED DESIGN SUBMITTAL.
2. PROVIDE S.S. LIFTING CABLE (NOT SHOWN HERE) CONNECT TO UNDERSIDE OF WELL CAP AND QED PULSE PUMP FOR PUMP REMOVAL.

SECTION (1 / G-6)

SCALE: 1/2"=1'-0"
UNLESS OTHERWISE NOTED

NO.	DATE	REVISION	INIT.
A	12/23/03	MODIFICATION #1	

1/2"=1'-0" (1 0 1 2 3 4 5)

O'BRIEN & GERE ENGINEERS INC.

GENERAL ELECTRIC COMPANY
FORT EDWARD FACILITY FORT EDWARD, NY
OU3 REMEDIAL DESIGN

DNAPL COLLECTION SYSTEM

GENERAL

MISCELLANEOUS DETAILS

IN CHARGE OF _____
DESIGNED BY ____ CHECKED BY ____
DRAWN BY _____

FILE NO. 5731.30137.049
DATE DEC. 2003

G-6

I:\DIV7\PROJECTS\5731\30137\DWG\TRANSITION ZONE\GEN\30137-048-G54.DWG

PLOT DATE: