KEY ENVIRONMENTAL INCORPORATED

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ALACHUA
COUNTY

MAY 21 2007

ENVIRONMENTAL
PROTECTION
DEPARTMENT

May 11, 2007

Mr. Scott Miller
Remedial Project Manager
U.S. Environmental Protection Agency
Region IV, Superfund North Florida Section
61 Forsyth Street, SW
Atlanta, Georgia 30303

Re: Revised Submittals
Pilot Study Work Plan and Underground Injection Control Information
Upper Hawthorn Group DNAPL Recovery
Koppers Portion of the Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

Dear Mr. Miller:

On behalf of Beazer East, Inc. (Beazer), Key Environmental, Inc. (KEY) hereby provides the U.S. Environmental Protection Agency (U.S. EPA) with revised copies of the Pilot Study Work Plan (PSWP) for the above-referenced Site. The PSWP was prepared to conduct non-aqueous phase liquid (NAPL) recovery from the Upper Hawthorn Group at the Site. The U.S. EPA April 2005 comments to the PSWP and the subsequent Beazer May 2005 responses have been incorporated. In addition, the revised Florida Department of Environmental Protection (FDEP) Underground Injection Control (UIC) submittal is also attached, which includes the FDEP February 2007 comments and the Beazer May 2007 responses.

In accordance with the project schedule, KEY is moving forward with the implementation of the field activities at the Site. If you have any questions regarding this transmittal, please contact Mr. Mitchell Brourman at (412) 208-8805 or the undersigned at (412) 279-3363.

Sincerely,

Key Environmental, Inc.

NJMisquitta

Neale J. Misquitta
Project Manager

cc:\ Mr. Richard Dueling - FDEP
Ms. Kelsey Helton, FDEP
Mr. John Mousa, ACEPD
Ms. Jill Blundon, Beazer
Mr. Mitch Brourman, Beazer
Ms. Linda Paul, KI

1658

UPPER HAWTHORN GROUP DNAPL RECOVRY PILOT STUDY WORK PLAN

Koppers Inc. Facility
Gainesville, Florida

Prepared for:

Beazer East, Inc.
One Oxford Centre, Suite 3000
Pittsburgh, PA 15219

Prepared by:

Key Environmental, Inc.
1200 Arch Street
Carnegie, PA 15106

And

GeoTrans, Inc.
46010 Manekin Plaza, Suite 100
Sterling, VA 20166

May 2, 2007

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1.0 INTRODUCTION AND OBJECTIVES

This Work Plan for the dense non-aqueous phase liquid (DNAPL) recovery pilot study (the Pilot Study Work Plan [PSWP]) was prepared by Key Environmental, Inc (KEY) and GeoTrans Inc. (GeoTrans) on behalf of Beazer East, Inc. (Beazer). The PSWP is prepared for submittal to U. S. Environmental Protection Agency (U.S. EPA) Region IV, Florida Department of Environmental Protection (FDEP), Alachua County Environmental Protection Department (ACEPD) (the agencies), and the Gainesville Regional Utilities (GRU). The PSWP is prepared regarding the Koppers Portion of the Cabot Carbon/Koppers Superfund Site in Gainesville, Florida (Site). Figure 1 presents a Site location map.

The PSWP is prepared to address the comments provided to Beazer by the U.S. EPA in their September 8, 2004 comment letter regarding Beazer's August 4, 2004 letter regarding interim measures at the Site. Additionally, in their October 28, 2004 letter to the agencies and GRU, Beazer committed to providing the agencies and GRU with a plan to perform the Hawthorn Group DNAPL Recovery Assessment. Submittal of this plan will address the agencies and GRU comments regarding the evaluation of source removal at the Site. The original PSWP was submitted to U.S. EPA and FDEP on December 23, 2004. Subsequently, in April 2005, U.S. EPA provided Beazer with comments on the submittal. Responses to the U.S. EPA comments on the PSWP were provided by Beazer on May 2, 2005. Subsequently, following U.S. EPA approval of the responses, a request for Groundwater Injection was provided to FDEP on February 23, 2007, which was approved by FDEP on April 25, 2007. U.S. EPA and FDEP requested that the PSWP be revised to incorporate the May 2, 2005 responses to comments and the items requested in the FDEP Groundwater Injection approval.

The DNAPL removal assessment, anticipated as a result of the implementation of the PSWP, is an assessment of DNAPL removal (i.e., constituent source) at the Site, and will be used to evaluate the feasibility of DNAPL removal, resultant degree of environmental risk reduction achieved, and the corresponding costs associated with the DNAPL recovery efforts. The focus of the DNAPL removal for the pilot study is the Upper Hawthorn Group. Ultimately, the results of the PSWP implementation will be incorporated into an overall Site Feasibility Study (FS) to be provided to the agencies and GRU at a later time.

This PSWP is organized into the following four sections:

- **Section 1.0 - Introduction and Objectives** – this section provides introductory comments and the objectives of the PSWP. The organization of the PSWP is also described.

- **Section 2.0 - Description of Pilot Study Area** – this section provides a detailed description of the Site conditions in the vicinity of the Pilot Study. The geology, hydrogeology, and the DNAPL conditions are inextricably linked to the successful recovery of DNAPL, i.e., source removal.

- **Section 3.0 - Pilot Study Scope of Work** – this section presents the DNAPL recovery scope of work. The major tasks, their objectives, methodologies, etc. are described in this section.

- **Section 4.0 - Project Schedule** – this section presents the project schedule including the initial planning and mobilization tasks, implementation of field activities, and submittal of the required reports.

Supporting these four sections are seven figures.

2.0 DESCRIPTION OF PILOT STUDY AREA

The Site conditions, as summarized in the Conceptual Site Model (CSM) (GeoTrans, September 15, 2004), in conjunction with the creosote DNAPL properties control the occurrence of, distribution of, and ultimately, the recovery of DNAPL at the Site. Figure 2 depicts the Site Plan, including major Site topographical and physical features, potential source areas, and major operational areas. This section provides a summary understanding of the Site conditions with a focus on their impact on potential DNAPL recovery at the Site.

As discussed in Section 1.0 and pursuant to the October 28, 2004 Beazer responses to the comments provided by the agencies and the GRU, the source removal pilot study will be completed within the Upper Hawthorn Group. This source removal evaluation approach is appropriate because, based on the CSM; none of the Lower Hawthorn Group wells indicate the presence of mobile DNAPL.

Passive DNAPL recovery (via manual weekly bailing), is currently ongoing at five monitoring wells (HG-9S, HG-10S, HG-11S, HG-12S, and HG-15S) screened within the Upper Hawthorn Group. Figure 3 depicts the locations of these wells. Based on the current ongoing passive DNAPL recovery efforts, approximately 2 gallons of DNAPL is recovered at the Site from the above-listed Upper Hawthorn Group monitoring wells at the Site on a weekly basis. Of the five Upper Hawthorn Group monitoring wells with recoverable DNAPL, HG-10S indicated the highest volume of DNAPL recovered. Accordingly, the area in the vicinity of HG-10S is selected as the best candidate area for the potential recovery of DNAPL in the Upper Hawthorn Group at the Site. As depicted in Figure 3, HG-10S is in the Former North Lagoon and in a potential DNAPL source zone.

The Source Delineation Report (GeoTrans, September 15, 2004) provides a detailed evaluation of Site conditions, relevant facets of which are summarized briefly in the following paragraphs:

2.1 SOURCES OF DNAPL

- Creosote DNAPL, as a result of former operations at the Site; enters into the subsurface from four primary source areas: the former North Lagoon, former South Lagoon, former Cooling Pond, and former Drip Track (Figure 2). DNAPL enters the Upper Hawthorn Group and is being recovered at HG-10S and HG-16S in the former North Lagoon, at HG-11S and HG-15S in the former Cooling Pond and at HG-12S in former Drip Track Area. No mobile DNAPL has been indicated below the Upper Hawthorn Group.

2.2 DNAPL CHARACTERISTICS

- Average Site-specific creosote DNAPL specific gravity is reported to be 1.09 g/cc and the kinematic viscosity is 12.69 centistokes. The density is on the higher end typical of creosote wood treating sites and the viscosity is in the range of typical creosote.

- These parameters are important because: a) density differences (even at 9%) will influence the DNAPL flow in the subsurface; and b) the medium range viscosity will tend to have lower viscosity ratios resulting in slightly slower migration in the subsurface.

2.3 GEOLOGIC CONDITIONS

- Figure 4 presents the Site cross section which is focused on the former North Lagoon Area. The Site is underlain by a Surficial sand unit, 20 to 30 feet thick which primarily comprises fine to medium grained quartz sand with trace amounts of silt and clay interbedded with laterally discontinuous clayey sands and sandy clay zones.

- The Hawthorn Group is approximately 125 feet thick and comprises three (upper, middle, and lower) low-permeability clay units of increasing thickness with depth. Between the clay units are clayey sand units of approximately uniform thickness (30 feet). The clayey sand units are comprised of interbedded and intermixed clays, silty clayey sand, sandy clay, and occasional carbonate beds (limestone nodules and moderately indurated sands).

- The Upper Floridan Ocala Limestone underlies the Lower Hawthorn Group clay unit. The limestone unit is the major water-bearing unit of interest at the Site.

2.4 HYDROGEOLOGIC CONDITIONS

- Corresponding to the above-described geologic units, the hydrogeology entails the Surficial Aquifer, the Hawthorn Group (upper and lower), and the Floridan Aquifer. Of these, the primary focus of this PSWP is on the Hawthorn Group.

- Depth to water in the Surficial Aquifer ranges from 3 to 15 ft-bgs. The average horizontal hydraulic conductivity of the low permeability clay units that comprise the Hawthorn Aquifer Group is 6.7×10^{-8} cm/sec.

- The most notable feature of the Hawthorn Aquifer Group is vertical hydraulic gradient distribution. Between the Surficial Aquifer and the 34 to 42 foot thick Upper Hawthorn Aquifer (across the 0.5 to 7 foot thick upper Hawthorn low permeability clay unit) the vertical hydraulic gradient is on the order of 1 to 2 feet vertically downwards. Below the Upper Hawthorn Group is a second hard plastic clay layer 2 to 15 feet thick termed the Middle Hawthorn Clay. Below the Middle Hawthorn Clay is the Lower Hawthorn Group clayey sand. Hydraulic heads in the Lower Hawthorn Group are nearly 30 feet deeper than the Surficial Aquifer. A third 20 to 32 foot thick low-permeability clay unit is found below the Lower Hawthorn Group., which overlies the Ocala Limestone of the Upper Floridan Aquifer. The hydraulic head difference across the Lower Hawthorn Clay is approximately 90 feet, indicating a very high degree of confinedness.

- Figure 4 presents a Site cross section depicting the above-described subsurface geological and hydrogeological conditions.

2.5 DNAPL OCCURRENCE AND MIGRATION

- DNAPL migration at the Site is controlled by the DNAPL properties (i.e., the specific gravity), subsurface media properties (capillary versus viscous forces), and hydrodynamic forces (hydraulic gradients).

- Vertical migration of DNAPL from the source areas to the subsurface is a result of the density difference between the DNAPL and surrounding groundwater. Once the Surficial Aquifer capillary pressures have been overcome, the vertical hydraulic gradients, in conjunction with the DNAPL density difference act together to promote vertical DNAPL migration to the Hawthorn Group.

- DNAPL migration within the Hawthorn Group is controlled by small-scale heterogeneities. In the confining clay units at the Site, small, more permeable lenses and vertical pathways such as brittle-clay fractures are responsible for the heterogeneities. In addition, the clays contain sand and/or sand and gravel stringers and seams that can serve as preferential pathways of vertical and horizontal DNAPL migration.

- No defined pooling of DNAPL is observed at the interfaces of any of the three low permeability clay units.

- Within the clayey sand units between the three low permeability clay units, random fingering of DNAPL occurs likely as a result of relatively smaller scale grain size differences. In addition, the clayey sand contain sand and/or sand and gravel stringers and seams witch can serve as preferential pathways of vertical and horizontal DNAPL migration. These deposits contain thin interbedded clays, silts, and gravelly sand deposits with typical well yields of a few tenths of a gpm.

- The increasing vertical hydraulic gradients between the first and third low-permeability clay units of the Hawthorn perceptively increase the vertical hydrodynamic forces for the migration of DNAPL into the Hawthorn. However, as discussed earlier in this section, the degree of confinedness increases with depth, further limiting DNAPL migration with depth.

- Figure 5 depicts the boring log for Monitoring Well HG-10S, which is also the proposed PSWP Upper Hawthorn Group DNAPL recovery location. The boring log depicts the typical surficial aquifer and Upper Hawthorn Group. The upper clay unit, the underlying sand and gravel, and the middle clay unit are clearly presented. DNAPL measurements at HG-10S indicate measurable and recoverable quantities of DNAPL at this location, migrating into HG-10S from the Upper Hawthorn Group, which make this location an ideal location for the pilot testing of DNAPL recovery from the Upper Hawthorn Group.

3.0 DNAPL RECOVERY PILOT STUDY SCOPE OF WORK

This section describes the DNAPL recovery pilot study tasks that will be implemented to evaluate mass removal of DNAPL from the Upper Hawthorn Group at the Site. This scope is based on Beazer, and KEYs, DNAPL recovery experience at a number of Sites under varying environmental and subsurface conditions.

Based on the ongoing interim measures activities and the CSM, Monitoring Well HG-10S (Figure 2) in the former North Lagoon Area is an appropriate location for the pilot study. The following four tasks comprise the scope of work:

- Task 1 – DNAPL Recovery Well Design and Operational Modeling/Optimization
- Task 2 – Installation of DNAPL Recovery Well
- Task 3 – DNAPL Recovery Well Operation
- Task 4 – Data Evaluation and Reporting

3.1 TASK 1 – DNAPL RECOVERY WELL DESIGN AND OPERATIONAL MODELING/OPTIMIZATION

The objective of this task is to design a recovery well that will maximize the recovery of DNAPL. The DNAPL recovery well will be located proximal to HG-10S (Figure 3). Figure 6 presents a depiction of the conceptual design for the proposed DNAPL Recovery Well UHG-EW01. UHG-EW01 will be designed to remove groundwater and DNAPL from the Upper Hawthorn Group, provide in-well separation of the DNAPL (taking advantage of the density difference between groundwater and DNAPL), and subsequently discharging the coproduced groundwater to the Upper Hawthorn Group, as depicted in Figure 6. Prior to discharge of the co-produced groundwater, the groundwater will be routed through a filter to remove particulates.

UHG-EW01 will be constructed with appropriately sized (approximately 18-inch diameter) high density polyethylene (HDPE) pipe or other appropriate material and screened in such a manner to intersect the lower portions of the Upper Hawthorn Group. The screen slot size will be selected based on the grain size distribution of the Upper Hawthorn Group soils. Groundwater extraction flow rates are expected to be low (<1 gpm) and the UHG-HS10 sump will provide for storage of DNAPL. Design calculation will be completed to evaluate the potential for in-well DNAPL separation at a number of groundwater flow rates.

During this task, the required DNAPL recovery system components/appurtenances will also be sized and designed. Using the existing groundwater numerical model developed for the Site, a number of operational scenarios will be evaluated. The operational scenarios anticipated include recirculation of the co-produced groundwater within the Upper Hawthorn Group, as depicted on Figure 6. Prior to recirculation of the groundwater within the Upper Hawthorn Group, as requested by U.S. EPA, a filter will be added to the discharge train to remove particulates and reduce the potential for clogging of the injection well. Recirculation of the coproduced groundwater will increase the vertical hydraulic gradients, and therefore the pressures, in the vicinity of UHG-EW01, potentially enhancing the migration of DNAPL to the recovery well. The modeling effort will evaluate the groundwater flow rate and the resultant pressure field(s).

To evaluate the operational performance of the UHG-EW01, two additional Upper Hawthorn Group groundwater monitoring wells will be installed at the Site at the approximate locations depicted in Figure 3. The design of these monitoring wells will be included as part of this task. As a result of this task, a letter report will be provided to the agencies and GRU summarizing the design and the proposed DNAPL recovery and management system, including proposed recovery well and monitoring well construction details.

3.2 TASK 2 – INSTALLATION OF DNAPL RECOVERY WELL

The purpose of this task is to complete the installation of the DNAPL recovery system. Following completion of Task 1 and approval of the design submittal, UHG-EW01 will be installed in accordance with the specifications provided therein, and in a manner generally consistent with Figure 6. At this time, it is anticipated that dual tube rotary drilling techniques, such as with a Barber rig, will be utilized for the drilling of the recover well. The DNAPL recovery well will be installed at the location depicted in Figure 3. Prior to well installation, a pilot boring will be completed to confirm subsurface conditions and determine final DNAPL recovery well configuration details. The monitoring wells will also be installed at the proposed locations. Figure 7 presents the proposed monitoring well construction details. The monitoring wells will be used for the evaluation of the capture zone during the hydraulic monitoring, at an initial frequency of at least twice daily. The frequency of monitoring will be based on the results of the initial testing observed, including the capture zones developed and the DNAPL recovered. Investigative-derived wastes will be containerized and temporarily stored on Site to be managed by Beazer in the future.

Following installation of the DNAPL recovery and monitoring wells, they will be developed to ensure adequate interconnection with the Upper Hawthorn Group. The development water will be managed in the on-Site groundwater treatment system. The measuring point elevations and other well surface details will be horizontally and vertically surveyed and included in the Site database.

3.3 TASK 3 – DNAPL RECOVERY WELL OPERATION

The objective of this task is to complete the necessary field testing to evaluate DNAPL recovery within the Upper Hawthorn Group at the Site. The following paragraphs summary the field testing:

- The UHG-EW01 will be operated at a minimum of two groundwater recovery flow rates. During the operation of the DNAPL recovery well, groundwater levels and DNAPL levels will be measured at least twice daily within the recovery well; the two newly installed monitoring wells, and HG-10S. Additional Upper Hawthorn Group and Surficial Aquifer monitoring wells will be monitored as necessary.

- At this time, pending completion of the operational modeling presented in Task 1, it is anticipated that groundwater will be recovered at rates of 0.5 and 1 gpm. If higher/additional groundwater recovery rates can be sustained, and if DNAPL recovery is viable at the higher flow rates, additional testing may be conducted at higher flow rates.

- Each groundwater recovery rate will be maintained for a minimum period of two weeks. Based on the ongoing evaluation of the DNAPL recovery testing, the operational period may be modified.

- During each week of testing, recovered groundwater will be sampled for oil and grease. Recovered DNAPL will be analyzed for density and viscosity. During each operation testing rate, one additional sample will be obtained for the measurement of DNAPL interfacial tension.

- DNAPL collected within UHG-EW01 will be periodically removed. An accurate metering of the DNAPL recovered will be maintained during the pilot test. Recovered DNAPL will be periodically managed by Beazer.

- In addition to the testing identified above, as requested by U.S. EPA an approximately one-week long pumping test (without groundwater reinjection) will be completed to quantify aquifer hydraulic properties. The appropriate pumping test flow rate will be determined through completion of the testing described above. Monitoring of pumping and recovery data from the newly installed and existing monitoring wells, the recovery well, and the injection well will be utilized to quantify hydraulic properties.

- Depending on the results of the field testing as the pilot study is being implemented, modifications to the scope of work will be implemented, as necessary.

Details of the groundwater monitoring and post-injection monitoring program, the point of compliance wells, and the well design and operational details are provided within the revised Underground Injection Control (UIC) submittal concurrently provided to FDEP.

3.4 TASK 4 – DATA EVALUATION AND REPORTING

The purpose of the task is to complete the evaluation of the pilot study data and prepare a technical report for submittal to the agencies and GRU. The technical report will summarize the results of the DNAPL recovery evaluation within the Upper Hawthorn Group and will provide recommendations for future operation, if necessary. The report will be in the form of a Technical Memorandum and will include, but not be limited to, the following:

- Text, figures, and tables summarizing the conduct of the pilot study and presenting the results and interpretations;

- Well construction details and boring logs;

- The results/feasibility of the DNAPL/mass recovery efforts from the Upper Hawthorn Group will be detailed; and,

- An evaluation of the effectiveness of DNAPL recovery will be performed. This evaluation will focus on the DNAPL recovery rates observed and the net technical benefit for the recovery of DNAPL at the Site;

- Recommendations, if any, for further activities at the Site will be provided.

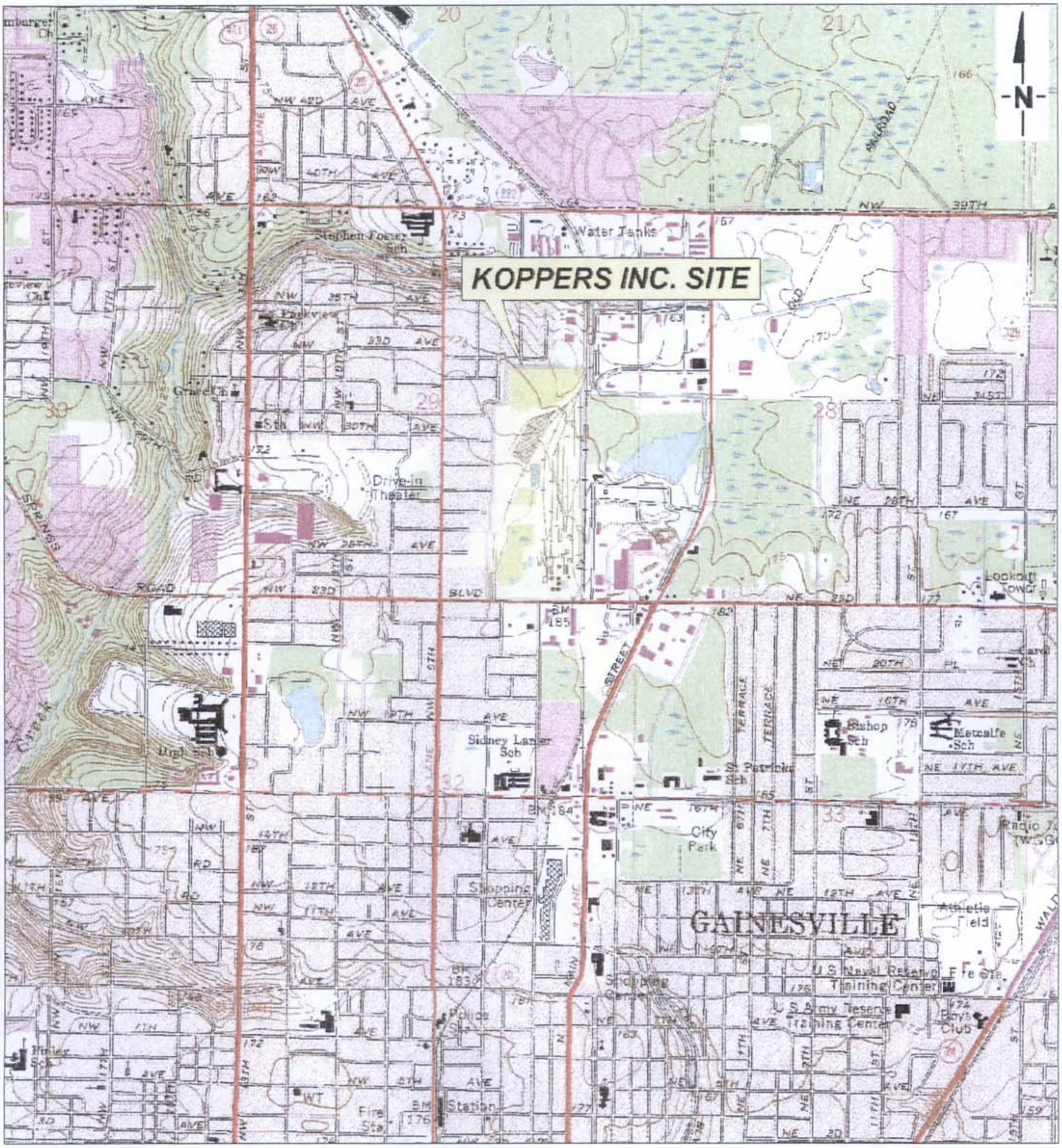
4.0 PROJECT SCHEDULE

This section presents the proposed project schedule for the implementation of the 4 tasks that comprise this pilot study. The durations of these tasks are as follows:

- Task 1 – DNAPL Recovery Well Design and Operational Modeling/Optimization – 6 weeks;
- Task 2 – Installation of DNAPL Recovery Well – 2 weeks (depending upon subcontractor availability);
- Task 3 – DNAPL Recovery Well Operation – 8 weeks; and,
- Task 4 – Data Evaluation and Reporting – 6 weeks.

The project schedule is based on subcontractor availability and assumes no delays due to weather and/or force majeure conditions. Changes in the project schedule, if any, will be communicated to the agencies and GRU.

FIGURES



FLORIDA

QUADRANGLE LOCATION

REFERENCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE:
– GAINESVILLE EAST, FLORIDA

GEO TRANS, INC. DNAPL REMOVAL – FIGURE 1 – DATED 9-14-04

ISSUE DATE:

ROSSLYN FARMS
INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

BEAZER EAST
PITTSBURGH, PENNSYLVANIA

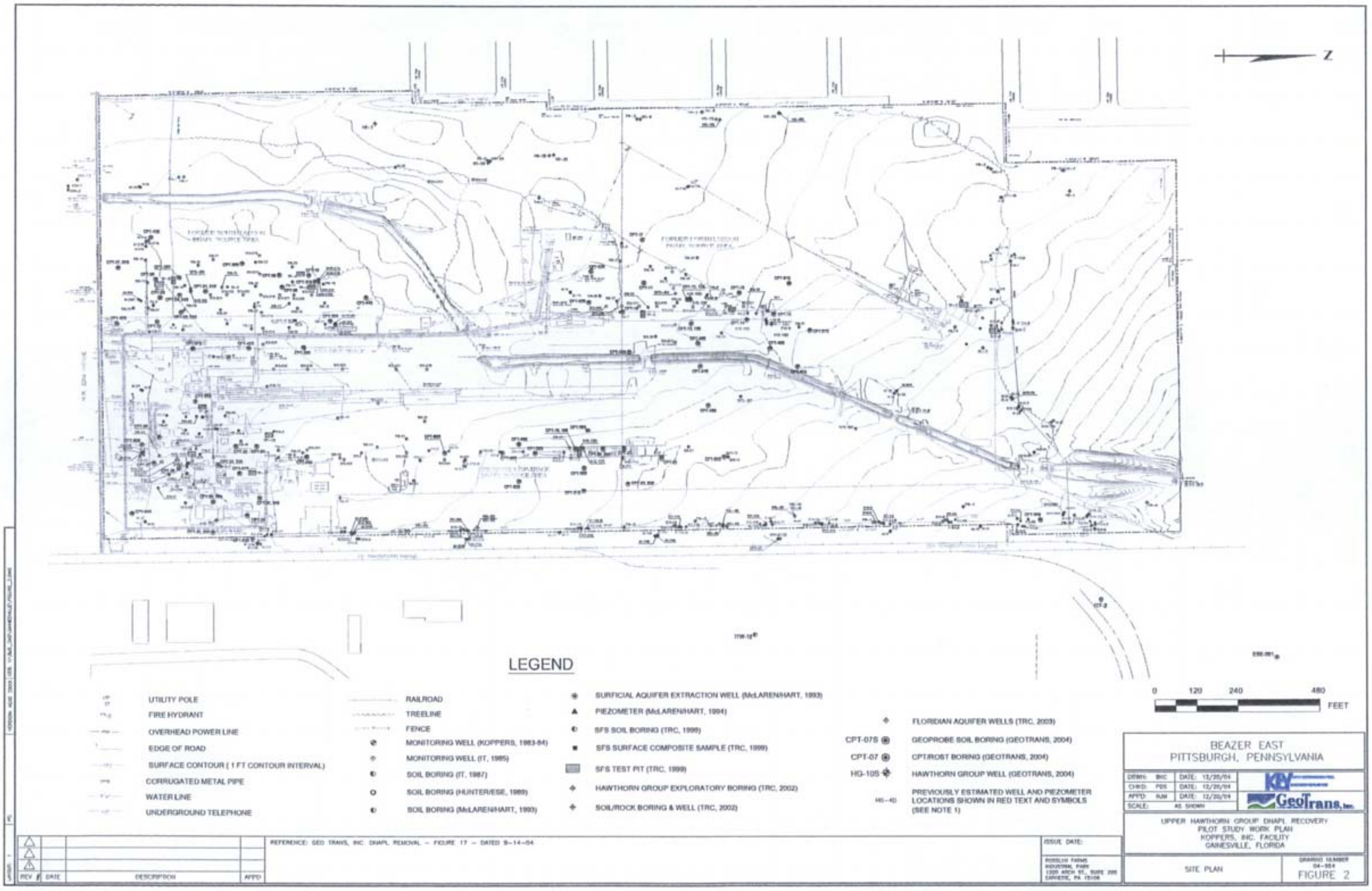
DRWN: BKC	DATE: 12/20/04	KEY ENVIRONMENTAL INCORPORATED
CHKD: PDS	DATE: 10/20/04	
APPD: NJM	DATE: 12/20/04	GeoTrans, Inc.
SCALE:	1" = 2000'	

UPPER HAWTHORN GROUP DNAPL RECOVERY
PILOT STUDY WORK PLAN
KOPPERS, INC. FACILITY
GAINESVILLE, FLORIDA

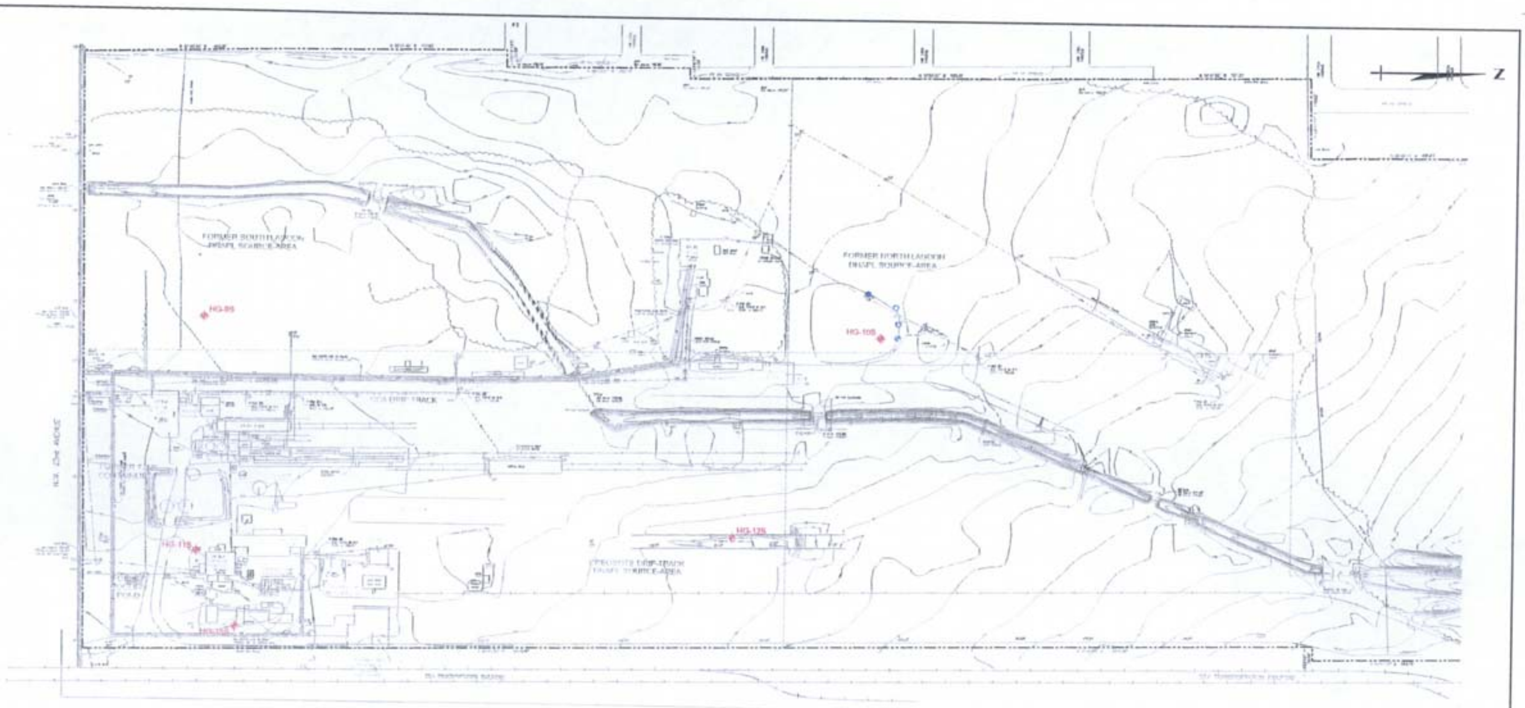
SITE LOCATION MAP

DRAWING NUMBER
04-954
FIGURE 1

CDS: BJS_CAD\GAINSVILLE\FIGURE_2.DWG



LEGEND
UTILITY POLE
FIRE HYDRANT
OVERHEAD POWER LINE
EDGE OF ROAD
SURFACE CONTOUR (1 FT CONTOUR INTERVAL)
CORRUGATED METAL PIPE
WATER LINE
UNDERGROUND TELEPHONE
RAILROAD
TREELINE
FENCE
MONITORING WELL (KOPPERS, 1983-84)
MONITORING WELL (IT, 1985)
SOIL BORING (IT, 1987)
SOIL BORING (HUNTER/ESE, 1989)
SOIL BORING (McLAREN/HART, 1993)
SURFICIAL AQUIFER EXTRACTION WELL (McLAREN/HART, 1993)
PIEZOMETER (McLAREN/HART, 1994)
SFS SOIL BORING (TRC, 1999)
SFS SURFACE COMPOSITE SAMPLE (TRC, 1999)
SFS TEST PIT (TRC, 1999)
HAWTHORN GROUP EXPLORATORY BORING (TRC, 2002)
SOIL/ROCK BORING & WELL (TRC, 2002)
FLORIDIAN AQUIFER WELLS (TRC, 2003)
CPT-07S GEOPROBE SOIL BORING (GEOTRANS, 2004)
CPT-07 CPT/ROST BORING (GEOTRANS, 2004)
HG-10S HAWTHORN GROUP WELL (GEOTRANS, 2004)
HG-4D PREVIOUSLY ESTIMATED WELL AND PIEZOMETER LOCATIONS SHOWN IN RED TEXT AND SYMBOLS (SEE NOTE 1)
0 120 240 480 FEET
REV # DATE DESCRIPTION APPD
REFERENCE: GEO TRANS, INC. DNAPL REMOVAL – FIGURE 17 – DATED 9-14-04
ISSUE DATE:
BEAZER EAST
PITTSBURGH, PENNSYLVANIA
DRWN: BKC DATE: 12/20/04
CHKD: PDS DATE: 12/20/04
APPD: RJM DATE: 12/20/04
SCALE: AS SHOWN
GeoTrans, Inc.
UPPER HAWTHORN GROUP DNAPL RECOVERY
PILOT STUDY WORK PLAN
KOPPERS, INC. FACILITY
GAINESVILLE, FLORIDA
SITE PLAN
DRAWING NUMBER
04-954
FIGURE 2



LEGEND

KOPPERS PROPERTY BOUNDARY	RAILROAD
UTILITY POLE	TREELINE
FIRE HYDRANT	FENCE
OVERHEAD POWER LINE	HG-10S HAWTHORN GROUP WELL (GEOTRANS, 2004)
EDGE OF ROAD	PROPOSED DNAPL RECOVERY WELL
SURFACE CONTOUR (1 FT CONTOUR INTERVAL)	PROPOSED GROUNDWATER MONITORING WELL
CORRUGATED METAL PIPE	UPPER HAWTHORN GROUP RECIRCULATION WELL
WATER LINE	
UNDERGROUND TELEPHONE	

0 100 200 400 FEET

REV #	DATE	DESCRIPTION	APPD

REFERENCE: GEO TRANS, INC. DNAPL REMOVAL – FIGURE 4 – DATED 9-14-04

ISSUE DATE:

BEAZER EAST
PITTSBURGH, PENNSYLVANIA

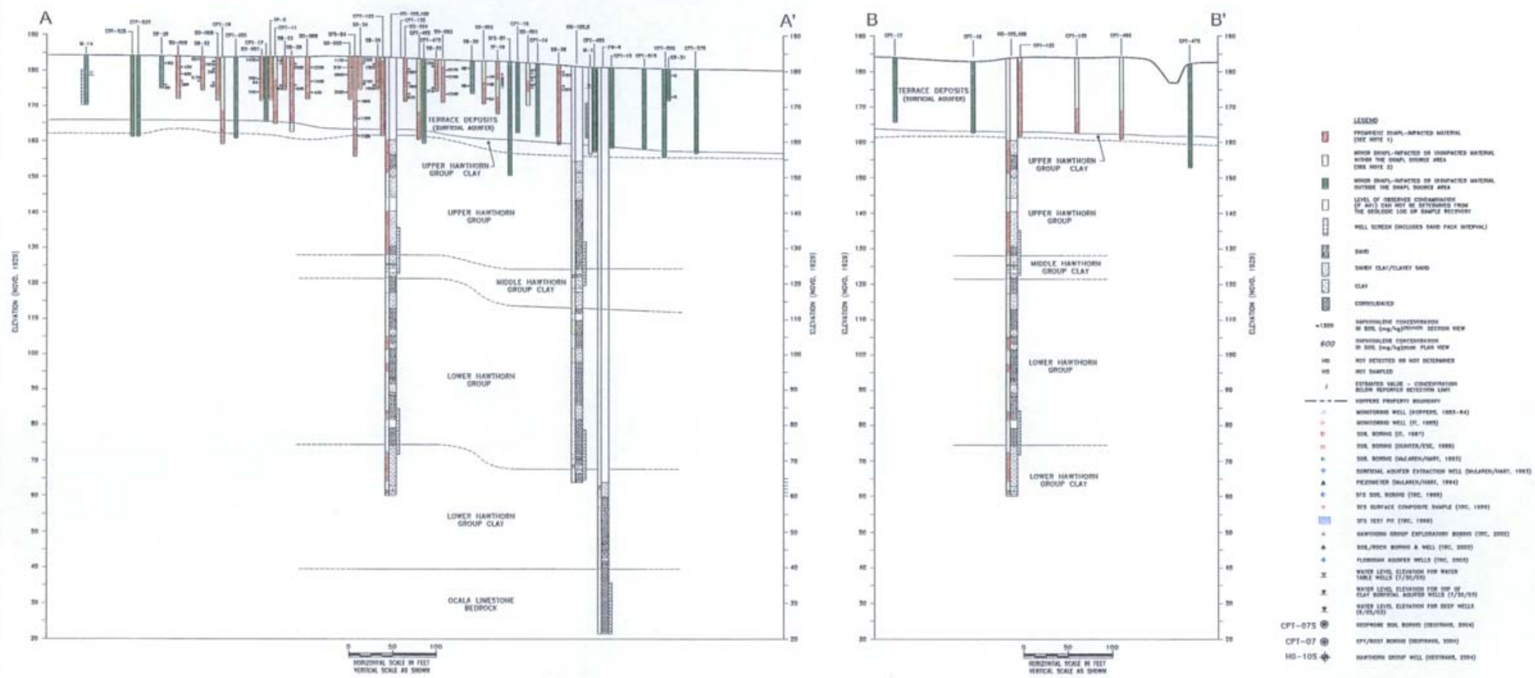
DRWN: BfC	DATE: 12/20/04
CHKD: PDB	DATE: 12/20/04
APPD: RJM	DATE: 12/20/04
SCALE: AS SHOWN	

KEY
GeoTrans, Inc.

UPPER HAWTHORN GROUP DNAPL RECOVERY
PILOT STUDY WORK PLAN
KOPPERS, INC. FACILITY
GAINESVILLE, FLORIDA

UPPER HAWTHORN GROUP WELLS
WITH MOBILE DNAPL

DRAWING NUMBER
04-854
FIGURE 3



NOTES:

1. THE DNAPL SOURCE-AREA DELINEATION INTERPRETATIONS PROVIDED HEREIN ARE BASED UPON WORK PERFORMED TO SUPPORT THE DNAPL SOURCE EVALUATION INVESTIGATION, AS WELL AS HISTORICAL MONITOR WELL, TEST PIT, AND BORING LOGS AND HISTORICAL SOIL SAMPLING RESULTS. INTERPRETATIONS OF PROMINENT DNAPL-IMPACTED MATERIAL MEET AT LEAST ONE OF THE FOLLOWING CRITERION:

   NAPHTHALENE CONCENTRATIONS:

   SOIL ABOVE 1,000 mg/kg INDICATES PROBABLE CREOSOTE SOURCE AREAS.

   HISTORICAL GEOLOGIC LOGS:

   LOGS THAT REFERENCE PROMINENT CREOSOTE STAINING WITH ASSOCIATED ODORS AND PID MEASUREMENTS >10 PPM (CALIBRATION GAS EQUIVALENTS); TARRY SOIL OR HARDENED CREOSOTE; OR FREE PRODUCT, AMBER OIL, BLACK OIL, AND/OR CREOSOTE, INDICATE PROBABLE CREOSOTE SOURCE AREAS.

   DNAPL SOURCE EVALUATION:

   RESULTS, INCLUDING ROST OUTPUT SHOWING SIGNIFICANT VERTICAL PROFILES OF ELEVATED FLORESCENCE WITH TYPICAL CREOSOTE WAVE FORM SIGNATURES, AND OBSERVABLE DNAPL-IMPACTS FROM CONTINUOUS, DIRECT PUSH SOIL SAMPLES (INCLUDING PROMINENT DNAPL STAINING WITH ELEVATED PID MEASUREMENTS AND PROMINENT OIL SHEENS) INDICATE PROBABLE CREOSOTE SOURCE AREAS.

2. THE NON SOURCE-AREA DELINEATIONS PROVIDED HEREIN ARE INTERPRETED FROM THE SAME SOURCES REFERENCED IN NOTE 1, ABOVE. DELINEATED AREAS THAT ARE NOT CHARACTERIZED AS DNAPL SOURCE-AREAS ARE INTERPRETED AS NON SOURCE-AREAS. THIS INCLUDES MINOR OCCURENCES OF DNAPL-IMPACTED SOIL.

3. SO-BORING (SO-XXX) SOIL SAMPLES WERE ANALYZED FOR NAPHTHALENE BY ANALYTICAL METHOD EPA 3540/8270 (HUNTER/ESE, 1989).

   SB-BORING (SB-XX) SOIL SAMPLES WERE ANALYZED FOR NAPHTHALENE BY ANALYTICAL METHOD EPA 8270 (McLAREN/HART, 1993).

   SFS BORING (SFS-BX) AND TP TEST PIT (TP-X) SOIL SAMPLES WERE ANALYZED FOR NAPHTHALENE BY ANALYTICAL METHOD EPA 8270 (TRC, 1999).

4. SO-XXX NAPHTHALENE SAMPLE LOCATIONS ARE SHOWN AT THE MID-POINT OF THE 2-FT COMPOSITE INTERVALS FOR SAMPLE LOCATIONS ABOVE 8 FEET; AND AT THE MID-POINT OF THE 4-FT COMPOSITE INTERVALS BELOW 8 FEET.

5. SB-XX NAPHTHALENE SAMPLE LOCATIONS ARE SHOWN AT THE MID-POINT OF A 2-FT COMPOSITE INTERVAL.

6. AT BORING LOCATIONS WITH MORE THAN ONE NAPHTHALENE ANALYSIS SHOWN IN SECTION VIEW, THE MAXIMUM CONCENTRATION IS SHOWN ON THE PLAN VIEW.

7. SOURCE-AREA STRATIGRAPHY WAS DETERMINED FROM THE GEOLOGIC LOGS SHOWN. DATA FROM BORINGS NOT DIRECTLY ADJACENT TO THE SECTION LINES WERE PROJECTED AT THE SAME ELEVATIONS. AT LOCATIONS WHERE NO BORINGS OR BORING GEOLOGIC LOGS ARE AVAILABLE, THE EXISTING SITE STRATIGRAPHIC MODEL IS USED (TRC, AUGUST 2003).

8. BORING, MONITOR WELL, AND TEST PIT LOCATIONS ARE BASED UPON FIGURE 1.5 "FORMER AND CURRENT SITE FEATURES AND HISTORIC SAMPLING LOCATIONS" (TRC, 1999) AND FIGURE 3.6 "ELEVATION OF THE TOP OF THE HAWTHORN GROUP" (TRC, AUGUST 2003).

9. THE NAPHTHALENE CONTOURS SHOWN ON THE PLAN VIEW HONOR THE MAXIMUM CONCENTRATION VALUES AT EACH BORING PROJECTED TO THE SURFACE.

10. SEE SHEET "FIGURE 3" FOR FULL SITE PLAN.

11. ELEVATIONS OF THE TOP OF GRADATIONAL UPPER HAWTHORN GROUP CLAY ARE PROVIDED FROM THE GEOPROBE BORING LOGS, EXTRAPOLATED AS APPROPRIATE, FOR SAMPLE RECOVERY.

NOTE:

POSTINGS REPRESENT ALL THE RELEVANT DATA IN THE SOURCE AREA - THE VIEWER IS LOOKING ALL THE WAY THROUGH THE DOMAIN SO THAT HIGHER OR LOWER SCREENING LEVELS MAY APPEAR TOGETHER WHEN THEY ARE IN FACT IN FRONT OF OR BEHIND EACH OTHER. STRATIGRAPHY SHOWN IS GENERALIZED FOR THE CROSS SECTION LOCATIONS ONLY, NOT NECESSARILY THE BOREHOLE LOCATIONS. WHEN DEVELOPING CONCLUSIONS FOR THE REPORT, THE TECHNICAL TEAM VIEWED THE DATA FROM MANY ANGLES TO ASSIST IN THE FINAL INTERPRETATION PRESENTED.

BEAZER EAST
PITTSBURGH, PENNSYLVANIA

DRWN: BKC	DATE: 12/20/04	
CHKD: FDS	DATE: 12/20/04	
APPD: HJM	DATE: 12/20/04	GeoTrans, Inc.
SCALE: AS SHOWN		

UPPER HAWTHORN GROUP DNAPL RECOVERY
PILOT STUDY WORK PLAN
KOPPERS, INC. FACILITY
GAINESVILLE, FLORIDA

ISSUE DATE:

FOSSLIN FARMS INDUSTRIAL PARK
1209 ARCH ST., SUITE 200
CARNEGIE, PA 15106

SITE CROSS SECTION

DRAWING NUMBER 04-354
FIGURE 4

REV #	DATE	DESCRIPTION	APPD

FIGURE 5 - HG-10S BORING LOG

CONTINUED

Monitor Well ID: HG-10S Well Location: Former North Lagoon x= 2658572 y= 253393

Project Name: DNAPL Source Area Char Project No.: 2201.040.04 Site/Client: Koppers Ind., Gainesville, FL - Beazer East

Drilling Contactor: Groundwater Protection · Drilled By: R. Wilkie Start Date: 4/28/04 Finish Date: 5/03/04

Drilling Equip.: Diedrich D-120 Drill Method: Mud Rotary Sampling Method: 2' Split Spoon

Well Casing Material: 2" Stain. Steel Conductor Casing Material: 6" Carbon Steel

Screen - Type/Material: Stainless Steel Length: 10-ft Dia.: 2-in Slot Size: 0.010 Sand Pack: 20/30

Elev. (MSL) - Grnd Surf.: 184.2 Well Casing (MP): 186.84 Depth to Water (BMP(ft)): 17.02 Datum: NGVD 1929

Depth (ft bgs) - Top Sand: 49.0 Top Screen: 51.0 Bot Screen: 61.0 Bot Sand: 61.5 Bottom Borehole: 61.5

SUBSURFACE PROFILE / SOIL SAMPLE / AS-BUILT

DESCRIPTOR CONVENTION:
Proportions: TRACE (0-10%); LITTLE (10-20%); SOME (20-35%); AND (35-50%)
Contrast: FAINT; DISTINCT; PROMINENT
Abundance: FEW; COMMON; MANY
Odor: FAINT; SLIGHT; MODERATE; STRONG; VERY STRONG
Color: Munsell Standards (wet)
Headspace measured with a Mini-RAE-2000 by inserting probe tip into gaps created in the sample, sealing out the atmosphere, and recording the maximum reading over a five-second period.

Depth (ft bgs)	Elevation (ft msl)
22	
24	160.2
26	158.2
28	156.2
30	154.2
32	152.2
34	150.2
36	148.2

Sample:

SC (SAND) some clay, little silt, fine- to very fine-grained, slightly compact (soft), well graded, wet, greenish gray [5GY 6/1] with prominent, light brown [5YR 5/6] DNAPL-stained seams. Strong creosote odors.

SC (SAND) little gravel (non calcareous angular to sub angular), little clay, little silt, fine grained, well graded, compact, friable, moist with prominent, DNAPL-stained layers and seams, light brown [5YR 5/6] mottled with very dark red [5R 2/6] in a matrix predominantly greenish gray [5GY 6/1] with many grayish black [N3] grains (salt and pepper coloration). Strong creosote odor.

SM (SAND) little silt, trace clay, trace fine gravel, fine grained, well graded, loose, moist with prominent, DNAPL-stained layers and seams with black iridescent oil sheens and dark yellowish brown [10YR 4/2] DNAPL staining in a greenish gray [5GY 6/1] "salt and pepper" matrix. Strong creosote odors.

Same as above with same prominent, DNAPL-stained layers and seams with prominent oils sheens. Strong creosote odors.

CL (CLAY) some fine- to med- grained sand, little silt, trace gravel, firm, low plasticity, friable, wet, pinkish gray [5YR 8/1] salt and pepper. Prominent DNAPL staining only in a 0.1-ft thick, medium-grained sand layer. Faint diffuse DNAPL staining in clay. Strong creosote odor.

Sample interval (ft bgs)	Recovery (ft)	Blow Counts	PID Organic Vapor Reading (ppm)	Remarks
22-24				6-in black steel conductor casing installed on 4/26/04 from 1.6 ft to 22.8 ft bgs.
24-26	.8	21, 14, 19, 16	4 - 17	VOCs increase w/ depth
26-28	1.3	29, 23, 15, 12	20 - 40; 60 - 80	in greenish gray soil; DNAPL staining
28-30	1.8	7, 2, 3, 5	20 - 40; 60 - 80; 105	0.0 to 1.2' of recov.; DNAPL staining
30-32	1.7	5, 4, 6, 6	15-30; 30 -50; 20	DNAPL staining
32-34	0.8	6, 4, 6, 9	10 - 20	
34-36	2.0	5, 7, 7, 7	8 - 12	

As-Built: 12-in Borehole; 6-in Borehole; 6-in Carbon Steel Conductor Casing; 2-in Stainless Steel Riser; Grout

FIGURE 5 - HG-10S BORING LOG

CONTINUED

Monitor Well ID: HG-10S Well Location: Former North Lagoon x= 2658572 y= 253393

Project Name: DNAPL Source Area Char Project No.: 2201 040 04 Site/Client: Koppers Ind., Gainesville, FL / Beazer East

Drilling Contactor: Groundwater Protection Drilled By: R. Wilkie Start Date: 4/28/04 Finish Date: 5/03/04

Drilling Equip.: Diedrich D-120 Drill Method: Mud Rotary Sampling Method: 2' Split Spoon

Well Casing Material: 2" Stain. Steel Conductor Casing Material: 6" Carbon Steel

Screen - Type/Material: Stainless Steel Length: 10-ft Dia.: 2-in Slot Size: 0.010 Sand Pack: 20/30

Elev. (MSL) - Grnd Surf.: 184.2 Well Casing (MP): 186.84 Depth to Water (BMP(ft)): 17.02 Datum: NGVD 1929

Depth (ft bgs) - Top Sand: 49.0 Top Screen: 51.0 Bot Screen: 61.0 Bot Sand: 61.5 Bottom Borehole: 61.5

SUBSURFACE PROFILE				SOIL SAMPLE				AS-BUILT
Depth (ft bgs)	Elevation (ft msl)	Symbol	Sample	Recovery (ft)	Blow Counts	PID Organic Vapor Reading (ppm)	Remarks	As-Built
38	146.2		Irregularly, and thinly interbedded clayey sand (same as 28-ft to 32-ft, above) and sandy clay (same as 32-ft to 34-ft, above) sharp contacts, phosphates present. Strong creosote odor. DNAPL staining absent. Same as above with 1/2-in lens of clayey silt with distinct light brown [5YR 6/4] DNAPL staining near the base of the sample. Moderate creosote odors.	1.2	5 6 6 11	4 - 10		
-40	144.2		SC (SAND), little clay, little silt, fine grained, compact, well graded, moist, moderate yellowish brown [10YR 5/4] grading into light olive gray [5Y 6/1] salt and pepper. DNAPL staining absent. Moderate creosote odor.	1.0	3 3 7 10	7 - 10		
-42	142.2		No Recovery	0.0	7 8 9 12	NA		
-44	140.2		No Recovery	0.0	7 12 15 16	NA		
-46	138.2		SC (Clayey SAND), some clay, little silt, fine grained, slightly compact, well graded, wet, light olive gray [5Y 6/1] salt and pepper. Moderate creosote odor. DNAPL staining absent.	0.7	9 12 17 17	0.5-1.3		
-48	136.2		SC (Clayey SAND), little clay, little silt, fine grained, slightly compact, well graded, wet, light olive gray [5Y 6/1] salt and pepper with mottled zone of dusky yellowish brown [10 YR 2/2] faint DNAPL staining. Strong creosote odor.	1.7	5 7 11 9	3 - 8 15	DNAPL staining	
-50	134.2		Same as above with trace clay blebs, moderate blue green [5BG 5/6] with prominent DNAPL staining in final 0.2 ft of sample and within full split spoon drive shoe. Iridescent olive black [5Y 2/1] sheen on wet grains.	1.5	9 15 20 28	10 - 15 55	DNAPL staining more vertically continuous than lateral	Bentonite Seal

FIGURE 5 - HG-10S BORING LOG

Monitor Well ID: HG-10S

Well Location: Former North Lagoon x= 2658572 y= 253393

Project Name: DNAPL Source Area Char Project No.: 2201 040 04 Site/Client: Koppers Ind Gainesville FL / Beazer East

Drilling Contactor: Groundwater Protection Drilled By: R Wilkie Start Date: 4/28/04 Finish Date: 5/03/04

Drilling Equip.: Diedrich D-120 Drill Method: Mud Rotary Sampling Method: 2' Split Spoon

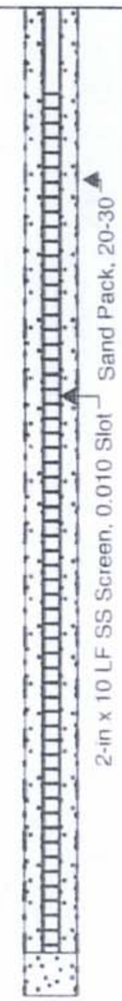
Well Casing Material: 2" Stain Steel Conductor Casing Material: 6" Carbon Steel

Screen - Type/Material: Stainless Steel Length: 10-ft Dia.: 2-in Slot Size: 0.010 Sand Pack: 20/30

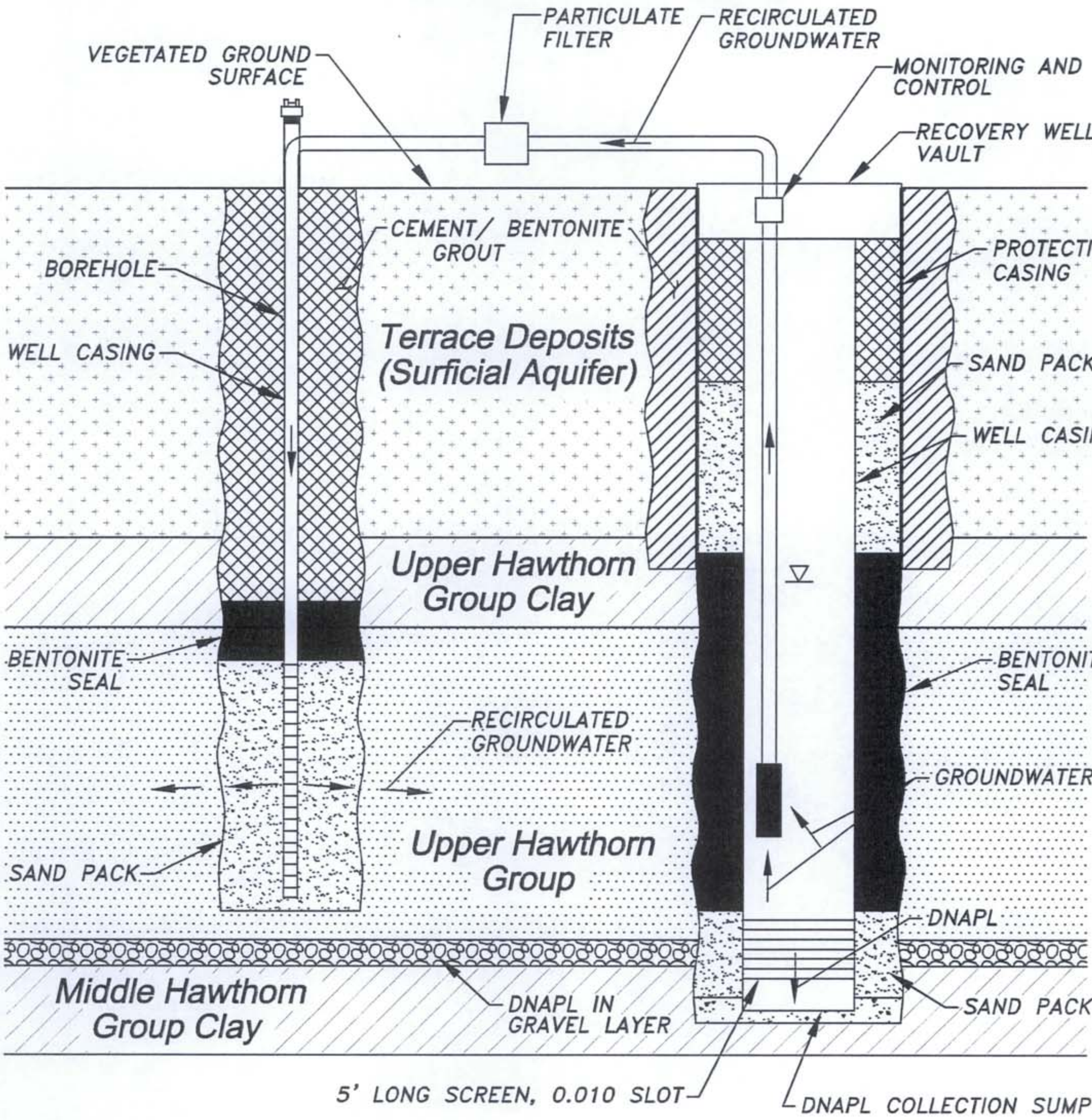
Elev. (MSL) - Grnd Surf.: 184.2 Well Casing (MP): 186.84 Depth to Water (BMP(ft)): 17.02 Datum: NGVD 1929

Depth (ft bgs) - Top Sand: 49.0 Top Screen: 51.0 Bot Screen: 61.0 Bot Sand: 61.5 Bottom Borehole: 61.5

SUBSURFACE PROFILE				SOIL SAMPLE				AS-BUILT
Depth (ft bgs)	Elevation (ft msl)	Symbol	Sample	Recovery (ft)	Blow Counts	PID Organic Vapor Reading (ppm)	Remarks	As-Built
-52	132.2		Same as above. Prominent DNAPL staining in discrete seams and stringers, all orientations.	1.3	16 26 29 28	8 - 11 30	DNAPL staining	
-54	130.2		Same as above with gap graded, gravel lens (siltstone) with prominent product sheens of black, iridescent oil and prominent, mottled, DNAPL staining throughout 50 percent of the sample. Strong creosote odors.	2.0	28 29 29 28	30-110		
-56	128.2		SM (SAND) little silt, trace clay, very fine-grained, compact, poorly graded, moist, light olive gray [5Y 6/1] matrix with 0.3-ft seam of prominent olive gray [5Y 4/1] DNAPL staining. Strong creosote odor.	0.7	9 9 20 30	80 15 - 25	DNAPL staining	
-58	126.2		ML (SILT), little clay, little very fine-grained sand, firm, low plasticity, light bluish gray [5B 6/1] mottled with light brownish gray [5YR 6/1] grading into irregular blebs and discontinuous seams of SILT and CLAY. Faint DNAPL staining. Moderate creosote odor.	1.2	15 19 20 21	3 - 8		
	125.7		CL (CLAY) little gravel, trace fine sand, soft, moist, friable, low plasticity, greenish gray [5GY 6/1] salt and pepper. Faint DNAPL staining. Very strong creosote odor.	1.7	14 15 17 17	40 - 60 120 25 - 40	At least 2 feet of DNAPL accumulated in well below the 56.5' gravel zone	
-60	124.2		SM (SAND and GRAVEL), trace to no clay, angular to sub angular, fine grained gravel, coarse grained sand, loose, gap graded, prominent iridescent olive black [5Y 2/1] DNAPL staining with oily DNAPL (product) on grains. Very strong creosote odor.					
-62 -64			CL (CLAY), trace silt, stiff, low to medium plasticity, massive, common sand strigers (grading down to few stringers) greenish gray [5G 6/1] mottled with laminated light brownish gray [5YR 6/1] with a sharp contact to medium bluish gray [5B 5/1] with few sand stringers. DNAPL staining absent. Faint creosote odor. End of Log				Top of Middle Hawthorn Group Clay is 58 ft bgs TD = 61.5 ft bgs	



GeoTrans Inc., 46010 Manekin Plaza, Sterling, VA 20166 (703) 444-7000 (phone)



BEAZER EAST
PITTSBURGH, PENNSYLVANIA

DRWN: BJS	DATE: 12/20/04
CHKD: PDS	DATE: 10/20/04
APPD: NJM	DATE: 12/20/04
SCALE:	NOT TO SCALE

UPPER HAWTHORN GROUP DNAPL RECOVERY
PILOT STUDY WORK PLAN
KOPPERS, INC. FACILITY
GAINESVILLE, FLORIDA

REFERENCE: GEO TRANS, INC. TYPICAL WELL DIAGRAM

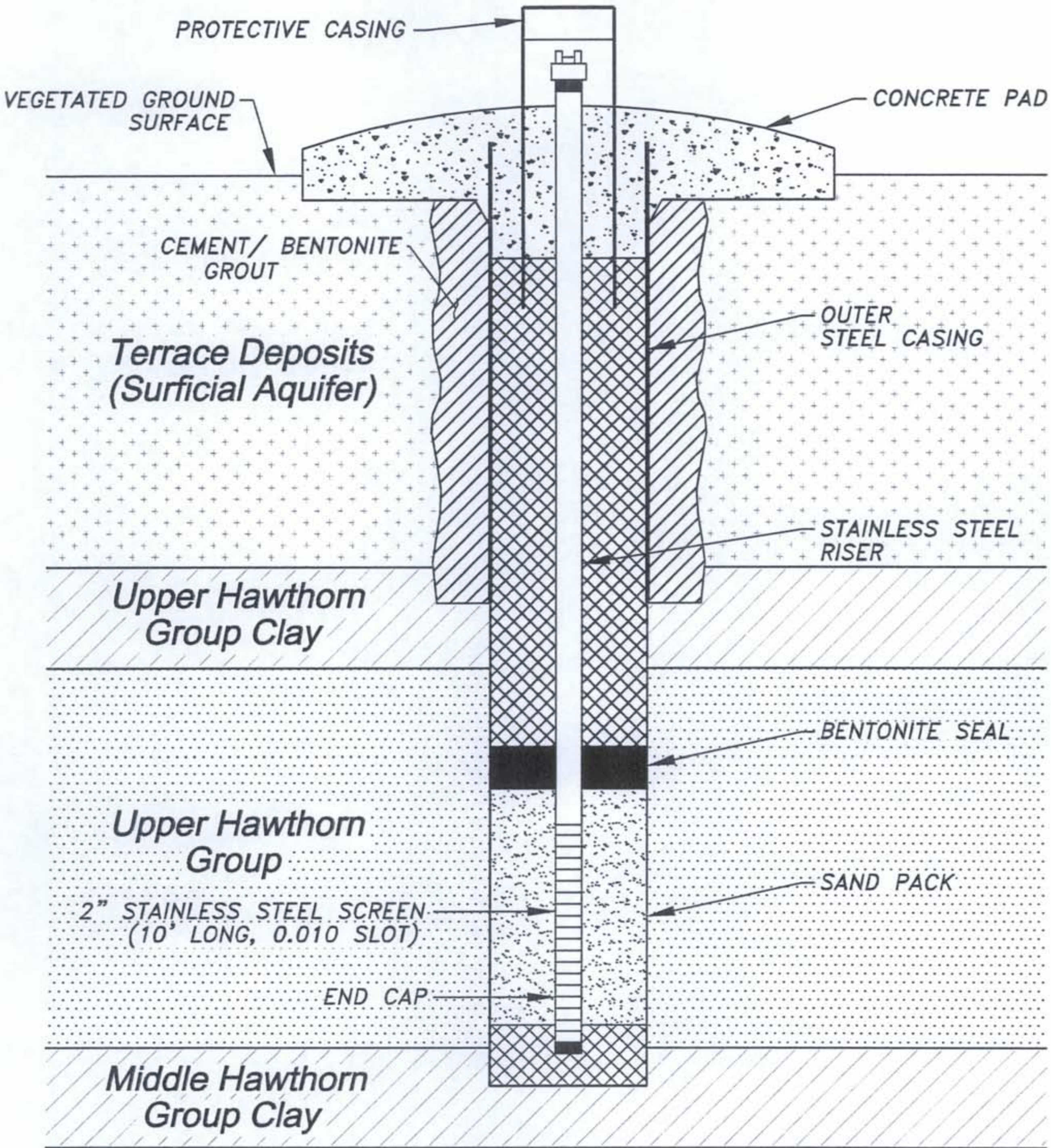
ISSUE DATE:

ROSSLYN FARMS
INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

TYPICAL DESIGN FOR DNAPL RECOVERY WELL – UPPER HAWTHORN GROUP RECIRCULATION

DRAWING NUMBER
06-322
FIGURE 6

y:\gainesville\06-322\cadd\figures\05-02-07\figure_6-7.dwg Last Saved By: Cjameson 5/2/2007 4:12 PM Plotted By: Charles Jameson 5/2/2007 4:17 PM Scale: 1:1



BEAZER EAST
PITTSBURGH, PENNSYLVANIA

DRWN: BJS	DATE: 12/20/04
CHKD: PDS	DATE: 10/20/04
APPD: NJM	DATE: 12/20/04
SCALE: NOT TO SCALE	

KEY ENVIRONMENTAL INCORPORATED
GeoTrans, Inc.

UPPER HAWTHORN GROUP DNAPL RECOVERY
PILOT STUDY WORK PLAN
KOPPERS, INC. FACILITY
GAINESVILLE, FLORIDA

REFERENCE: GEO TRANS, INC. TYPICAL WELL DIAGRAM

ISSUE DATE:

ROSSLYN FARMS
INDUSTRIAL PARK
1200 ARCH ST., SUITE 200
CARNEGIE, PA 15106

TYPICAL MONITORING WELL
CONSTRUCTION DETAIL

DRAWING NUMBER
06-322
FIGURE 7