Surficial Aquifer Interim Remedial Measure (IRM) and Soil Solidification/Stabilization Pilot Test Work Plan

Koppers portion of the Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

Revision 1
January 16, 2009

Prepared for Beazer East, Inc.

GeoTrans, Inc.
A TETRA TECH COMPANY

1080 Holcomb Bridge Road   Building 100, Suite 190   Roswell, GA 30076
www.geotransinc.com   770-642-1000   FAX 770-642-8808

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1 INTRODUCTION

Since 1995, a groundwater extraction system has been operating at the Koppers, Inc. part of the Cabot Carbon/Koppers Superfund Site (the Site[1]) in Gainesville, Florida. This system is effective in limiting the majority of the lateral migration of Site-related constituents in the Surficial Aquifer. However, Beazer recognizes that the system can be improved to more effectively capture vertical migration from the Surficial Aquifer to lower hydrogeologic units (GeoTrans, 2006).

This work plan presents a revised Surficial Aquifer extraction system that will be installed and operated as an Interim Remedial Measure (IRM) at the Site to hydraulically contain constituents in the Surficial Aquifer. The plan involves the installation of horizontal groundwater collection drains near the four identified source areas within the Surficial Aquifer. The details of the revised extraction system are provided in **Section 2** of this work plan.

This work plan also presents a planned pilot study for soil solidification/stabilization (S/S). The S/S pilot will use soils derived from the horizontal groundwater collection drain installation to evaluate the applicability of this technology for Site soil management. Details of the pilot test are provided in **Section 3** of this work plan.

To accommodate the proposed IRM, the existing on-Site groundwater treatment facility will need to be expanded and upgraded to handle additional flow. Additionally, modifications will be made to remove arsenic in a more cost-effective manner. Details of the planned treatment plant expansion are provided in **Section 4** of this work plan.

This work plan is a follow-up to Beazer's evaluation of Surficial Aquifer extraction effectiveness (GeoTrans, 2006) and also fulfills Recommendation #1 of the April 2006 Five Year Review (USACE, 2006):

> *The Koppers surficial extraction system should be re-evaluated to determine optimum well locations, optimum well spacing, and well pumping rates. An evaluation for adding wells near source areas and laterally, as necessary, should be performed to maintain hydraulic capture of the surficial groundwater.*

1.1 Background

The Site is an active wood-treating facility covering approximately 90 acres in northern Gainesville, Florida (**Figure 1**). The Site was first used to treat wood with creosote in 1916. Beazer East, Inc. (Beazer) is a former owner of the facility which is now owned and operated by Koppers, Inc.

Current and former wood-treatment facilities are located within the southeastern portion of the Site (**Figure 2**). This includes an active process building and adjacent drip tracks. Site investigations (GeoTrans, 2004) have identified four main chemical constituent source areas related to former Site operations and facilities. The Former Process Area and the Former Drip Track were located east of the current process area and drip tracks (**Figure 2**). Two former wastewater lagoons (the Former North Lagoon near the center of the Site and the Former South Lagoon in the south-central portion of the Site) were used to manage process wastewater. Creosote, chromated copper arsenate (CCA), and pentachlorophenol were used in prior wood-treatment operations at the Site. Both former lagoons have been closed, covered, and graded.

[1] In this document, "Site" refers to the Koppers portion of the Cabot Carbon/Koppers Superfund Site unless otherwise stated.

Figure 2 also shows the location of the perimeter wells that make up the current Surficial Aquifer extraction system. These fourteen extraction wells are located along the eastern and northern Site boundaries.

In recent years, numerous studies and pilot tests have been performed and the Site Conceptual Model has been updated significantly. In one of the recent studies, Beazer reevaluated capture effectiveness of the existing Surficial Aquifer extraction system (GeoTrans, 2006). The evaluation was made using a calibrated three-dimensional groundwater flow and particle tracking model of the Site. The analysis indicated that capture of impacted Surficial Aquifer groundwater could be improved using extraction wells or drains in the more immediate vicinity of the four source areas, as identified in the Source Delineation Report (GeoTrans, 2004). The modeling indicated that a total extraction rate of 41 gpm would provide capture of Surficial Aquifer groundwater flowing through the four source areas.

Beazer and USEPA are presently working on a Feasibility Study that will aid selection of an appropriate, comprehensive final remedy for the Site.

1.2 Site Hydrogeology

The Site terrain slopes gently downward toward the north-northeast. Topographic elevations range from approximately 165 to 185 feet above mean sea level. The conceptual block diagram in **Figure 3** depicts the Site geology. The hydrogeologic units at the Site consist of the Surficial Aquifer, the Hawthorn Group, and the Upper Floridan Aquifer.

The Surficial Aquifer consists of 20-30 feet of fine- to medium-grained sand with trace amounts of silt and clay. The water table is within the Surficial Aquifer; the depth to water ranges seasonally and spatially from 3 to 15 feet below ground surface. Groundwater flow in the Surficial Aquifer is toward the northeast. The flow is controlled by land surface topography; nearby discharge points such as wetlands, creeks, and drainage ditches; and the existing Surficial Aquifer groundwater extraction system. The Surficial Aquifer has low yields (less than 4 gpm per well) and is not a significant source of potable groundwater in the vicinity of the Site.

The Hawthorn Group deposits underlie the Surficial Aquifer. This unit is 115 to 125 feet thick and is comprised of interbedded and intermixed clays, silty-clayey sands, sandy clays, and occasional carbonate beds. Five persistent layers have been identified within the Hawthorn Group at the Site. The upper layer in the unit is a hard, plastic, clay layer called the Hawthorn Group upper clay; below that is a layer of clayey sand called the Upper Hawthorn; next there is another plastic clay layer called the Hawthorn Group middle clay; below that is another clayey sand unit called the Lower Hawthorn; the bottom layer in the sequence is a thick, hard, plastic clay called the Hawthorn Group lower clay. The Hawthorn Group is an effective upper confining unit for the underlying Upper Floridan Aquifer. The Hawthorn Group also has low yields and is collectively not a significant source of groundwater in the vicinity of the Site.

The Upper Floridan Aquifer underlies the Hawthorn Group. This aquifer is a regional source for drinking water. The Upper Floridan Aquifer is further divided into two transmissive zones separated by a lower-permeability zone. The Upper Transmissive Zone (UTZ) consists of the uppermost portion of the Ocala Limestone. The thickness of the UTZ ranges from 50 to 100 feet. Approximately 100 feet of lower-permeability carbonate deposits separate the UTZ from the Lower Transmissive Zone (LTZ). The LTZ is located at the contact of the Ocala Limestone and Avon Park Formation and ranges in thickness from 20 to 100 feet. The LTZ is generally more transmissive than the UTZ.

1.3 Groundwater Concentrations in the Surficial Aquifer

A Site-wide investigation of groundwater quality in the Surficial Aquifer was conducted in August 2007 (GeoTrans, 2007). This study was performed to obtain a current snapshot of concentrations in the Surficial Aquifer. Additionally, extraction wells and select Surficial Aquifer wells have been sampled annually as part of ongoing monitoring. Analytes include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals.

The predominant organic compound detected in groundwater at the Site is naphthalene. Naphthalene is used as the indicator compound that represents the presence of Site-related constituents in groundwater. **Figure 4** presents the naphthalene concentrations detected in the Surficial Aquifer in August 2007 (December 2007 for extraction wells).

Monitoring wells along the southern, western, and northwestern Site boundaries had either no detection of naphthalene or measured/estimated naphthalene concentrations below the Florida default groundwater cleanup target level (GCTL) of 14 μg/L. The highest measured naphthalene concentrations were in the southeastern portion of the Site.

2 SURFICIAL AQUIFER EXTRACTION SYSTEM MODIFICATIONS

In response to Recommendation #1 of the 2006 *Five-Year Review of the Cabot Carbon/Koppers Superfund Site* (USACE, 2006), Beazer reevaluated capture effectiveness of the existing Surficial Aquifer extraction system (GeoTrans, 2006). The evaluation was made using a calibrated three-dimensional groundwater flow and particle tracking model of the Site. The analysis indicated that capture of impacted Surficial Aquifer groundwater could be improved using extraction wells or drains in the vicinity of the four source areas, as identified in the Source Delineation Report (GeoTrans, 2004). The modeling indicated that a total extraction rate of 41 gpm would provide capture of Surficial Aquifer groundwater flowing through the four source areas.

The modification to the Surficial Aquifer extraction system provided in this work plan incorporates the recommendations of the effectiveness evaluation. It also incorporates subsequent recommendations of USEPA, including (1) the continued operation of the existing perimeter extraction wells and (2) the location of drains near the Former Process Area and Former South Lagoon. The proposed IRM modification will involve installation of four horizontal groundwater collection drains (functioning as horizontal wells) near the base of the Surficial Aquifer. Groundwater recovered from these collection drains will be pumped to the existing groundwater pretreatment system located on the eastern property boundary. Initially, the new source-area drains will operate along with the existing perimeter extraction wells, providing a total estimated flow through the pretreatment system of 48 gpm (**Table 1**), which is larger than the current average flow. After some period of time, it may be appropriate to discontinue use of the perimeter wells and the system flow rate would be reduced for the remainder of IRM operation.

2.1 Target Capture Zone

The purpose of the new source-area extraction systems will be to capture Surficial Aquifer groundwater emanating from the four source areas (GeoTrans, 2004), which are shown in **Figure 2**. This will effectively contain, both horizontally and vertically, any ongoing groundwater impacts resulting from these identified sources. Additionally, the extraction system should continue to limit off-Site horizontal migration of groundwater from impacted areas in the Surficial Aquifer to the north and east of the source areas, as identified by elevated naphthalene concentrations in **Figure 4**.

2.2 Horizontal Drain Design

Four horizontal groundwater collection trenches, each approximately 20-foot deep (maximum), will be constructed using a one-pass trencher. The trench locations are shown in **Figure 5**. The approximate lengths and locations are: (1) a 260-foot long drain located northeast of the Former South Lagoon; (2) a 200-foot long drain located north-northwest of the Former Process Area; (3) a 250-foot long drain located east of the Former Drip Track; and (4) a 350-foot long drain located east of the Former North Lagoon.

Figure 6 shows cross-section conceptual details for the North Lagoon Trench (#4), which is typical of the four trenches. Each trench will be 18-inches wide and will have a 6-inch diameter HDPE slotted horizontal pipe along the bottom with a vertical HDPE 8-inch diameter sump installed at one end of the trench. Electric submersible pumps will be installed in each sump with a pressure gauge, valves, and a flow meter below ground level. The pumps will be operated from a common control panel at the existing groundwater treatment plant located southwest of well EW-16. Groundwater collected in each sump will be pumped to the treatment system at the design rates indicated in **Table 1**.

Prior to installing each one-pass trench, a chain trencher will be used to dig to approximately six (6) feet deep along the proposed route to check for obstructions. Also, a large excavator and loader will assist with the one-pass trench construction. Excavated soil will be placed at a designated location and used as soil solidification material (discussed in **Section 3**). Any observed evidence of DNAPL will be noted.

Imported granitic gravel will be used to backfill the trenches for permeability augmentation to 3 feet below the ground surface (bgs). The upper 3 feet will be filled with solidified/stabilized soil from the pilot test plot prior to curing (see **Section 3**). Installation of the trench drains will take about 2 weeks.

Groundwater pumped from each drain will be carried through 2-inch HDPE conveyance pipes to the on-Site groundwater treatment plant, as indicated in **Figure 5**. The pipes and co-located conduit/wires will be buried 2 feet below the ground surface for protection. Conveyance piping from the two southern trenches and southernmost wells will not be joined with piping from the other Site areas. It is likely that the water extracted from southern areas will require an additional treatment step for metals, as described in **Section 4**.

2.3 Withdrawal System Operation and Predicted Capture

The estimated capture zones shown in **Figure 5** are the model-predicted Surficial Aquifer capture zones resulting from 48 gpm of total extraction from extraction wells and proposed drains. The details of the simulated extraction rates are provided in **Table 1**. These capture zones were generated using the model described in GeoTrans (2006). The planned horizontal groundwater collection drains were simulated using drain (head-dependent outflow) boundary cells in model layer 4 (approximately the bottom third of the Surficial Aquifer); the drain elevation was set to approximately 5 feet above the top of the Hawthorn Group upper clay. Particles were started in the Surficial Aquifer cells one-fourth of the way up from the aquifer bottom (Hawthorn Group upper clay) to show capture for the lower half of the Surficial Aquifer.

The capture zones for the upper portion of the Surficial Aquifer are slightly more extensive, as indicated in **Figure 7**, which shows capture of particles released at the water table surface. **Figure 8** shows capture zones for particles released 1 foot above the top of the Hawthorn Group upper clay. This figure indicates complete capture of source-area groundwater near the bottom of the Surficial Aquifer. The predicted capture zones fully encompass the target capture-zone areas (i.e., the source areas).

The groundwater model simulates the maximum withdrawal rate from the groundwater collection drains; any additional withdrawal would cause the drains to go dry in the model. However, post-construction start-up testing will be conducted to determine the actual maximum sustainable rates from each source-area groundwater collection drain. In order to minimize the potential for downward vertical migration from source areas through the Hawthorn Group upper clay, the four groundwater collection drains will be operated at their maximum sustainable withdrawal rates.

Also, prior to full start-up, the sump at the end of each drain will be checked for the presence of DNAPL. If present in any drain sump, the DNAPL depth will be noted and DNAPL will be bailed and the volume measured. This process will be repeated each day, with no water pumping, until no DNAPL reports to the drain or until the DNAPL thickness becomes consistent from day to day. At that time, the drain pump will be started in continuous operation. If a significant volume of DNAPL is encountered, then a DNAPL separation step may be incorporated into the treatment plant design (see **Section 4**).

2.4 IRM Effectiveness Monitoring

The effectiveness of the Surficial Aquifer groundwater IRM will be evaluated using groundwater head and concentration data. The comprehensive groundwater monitoring sampling and analysis plan (FTS and GeoTrans, 2008) specifies semi-annual sampling of monitoring wells M-9BR, M-16B, M-17, M-20B, M-23BR, M-25B, M-33B, and ITW-22. Wells M-3BR, M-32B, MW-12, all Site extraction wells, and the four new groundwater collection drains will be added to the list for purposes of monitoring IRM effectiveness (**Figure 5**) including the effectiveness of each new groundwater collection drain. At each of these performance monitoring wells, semi-annual water-level measurement and sampling will be conducted. All sampling and analysis procedures will be in accordance with the comprehensive monitoring plan (FTS and GeoTrans, 2008). Analytes at these wells will include the selected Site-related constituents specified in the comprehensive monitoring plan (FTS and GeoTrans, 2008).

Based on the monitoring data and subsequent analyses, Beazer may propose modification of the extraction rates at individual extraction wells for optimal containment and optimal recovery of impacted groundwater. Beazer may also propose shutting down some or all of the perimeter extraction wells when certain criteria are met. In particular, a proposal for perimeter-well shutdown will be made when monitoring demonstrates: (1) that source-area containment is effective (determined by mapping capture zones from measurements of head, supplemented by model simulation as appropriate), (2) that Surficial Aquifer groundwater concentrations within the perimeter extraction wells are decreasing or stable at low levels, and (3) that Surficial Aquifer groundwater concentrations between the source areas and perimeter wells have reached levels that are likely to be naturally attenuated on Site.

The source-area extraction system (i.e., the four horizontal collection trenches) will remain active after perimeter-well shutdown. Higher withdrawal rates at the horizontal collection drains may be realized after perimeter-well shutdown. Based on numerical modeling, the total withdrawal rate after perimeter-well shutdown will be approximately 42 gpm (**Table 1**). This extraction system will remain in effect until the long-term remedy is implemented.

Perimeter wells will remain in place after shutdown until the long-term remedy is implemented. Pumping from these wells will be restarted if monitoring data indicate that Site perimeter containment is required. The long-term remedy design will define if and how the Surficial Aquifer groundwater extraction system should be phased out and abandoned.

3 SOIL SOLIDIFICATION/STABILIZATION PILOT TEST

Soil derived from the installation of the horizontal groundwater collection drains will be used in an ex-situ soil solidification/stabilization (S/S) pilot test. Additionally, sediment removed by Koppers from the Site drainage ditch as part of a separate stormwater management action will be used in the S/S pilot test. The S/S soil will be incorporated into soil-cover plots at the Former South Lagoon. Cement S/S results in the following: (1) the binding of Site-related constituents within a stable matrix; and (2) a reduction in hydraulic conductivity. Both of these effects lead to reduction in the leaching of constituents from the soil matrix.

The purposes of the pilot test for S/S are: (1) to evaluate the effectiveness of ex-situ S/S in cover design and (2) to beneficially utilize excess soil from installation of groundwater collection system (approximately 1,300 cubic yards) and sediment removed from the drainage ditch (approximately 1,300 cubic yards). First, a bench-scale test will be conducted to evaluate the efficacy of various binder formulations (e.g., Portland cement and/or fly ash in varying amounts) using representative soils from the Site. Then the S/S pilot test will be conducted using up to three of the most successful mixes determined during the bench-scale test.

The objectives of the ex-situ S/S pilot study include:

- Evaluation of this S/S with Site soils;
- Evaluation of the consistency of mix design performance between bench-scale testing and full-scale construction techniques; and
- Identification of any scaling factors that need to be taken into account (e.g. heterogeneity of the material to be treated, mixing efficiency, etc.).

3.1 Bench-Scale Treatability Test

Prior to installing the trenches described in **Section 2**, a bench treatability test of solidification/ stabilization mixes will be conducted. The test will be conducted in general accordance with USACE (1995) guidance using wet subsurface soils collected near the planned locations of the trenches and sediment from the main drainage ditch. The test soil will be homogenized prior to testing. The main purpose of the treatability test is to identify mix percentages that are likely to be effective in the field.

The bench test will be conducted using five or more test mixes of portland cement, fly ash, and/or other binders. For instance, mixes may include (additives on a wet-weight basis):

- 7% portland cement,
- 10% portland cement,
- 13% portland cement,
- 5% portland cement with 5% fly ash, and
- 7% portland cement with 3% fly ash.

Final choices of test mixes will depend on the physical and chemical properties of the homogenized test soil. Curing is expected to take approximately one month.

Physical and chemical tests will be performed on samples of the homogenized test soil before treatment and on post-treatment soils after curing. These tests will include particle size analysis (ASTM D422), Atterberg limits (ASTM D4318), specific gravity and density (ASTM D5057), moisture content (ASTM D2216), compressive strength (ASTM D2166), hydraulic conductivity (ASTM D5084), the synthetic precipitation leaching procedure (SPLP, EPA 1313), and concentrations of Site-related chemical constituents in the matrix and in the SPLP leachate (by applicable EPA SW-846 methods).

Acceptable mixes for pilot testing will best meet the following criteria:

- Unconfined compressive strength ≥ 50 psi, and
- Hydraulic conductivity ≤ 10^{-6} cm/s.

Due to curing time, the bench treatability test will take approximately six weeks to complete. A report will be prepared to document the bench-scale results. The report will recommend up to three binder mixes for field testing.

3.2 S/S Pilot Test Implementation

Ex-situ S/S involves processing soil after it has been excavated and moved from its original location. Excavated soil will be loaded into approximately 20-cubic-yard trucks and transported to designated pilot test plots at the Former South Lagoon (**Figure 9**). The plots will have clean soil berms at the perimeter to contain excavated material (**Figure 10**). The Former South Lagoon is a delineated source area that has been closed, filled, and covered. Presently, the land surface has a grass cover. This area is not currently used for ongoing plant operations.

The Former South Lagoon area was chosen for this pilot test because: (1) this will cause relatively low interference with plant operations, (2) this area is relatively close to excavation areas as compared to other unused portions of the Site, (3) tree removal will not be required, and (4) this area is already a delineated source area which eliminates the chance of creating a new source of Site constituents. The stabilized/solidified soil plots can be removed in the future if needed. For instance, if the selected long-term remedy requires removal of this material, then such a removal will be performed.

Three S/S plots will be used to conduct the pilot test. Two or three different binder mix compositions determined by the bench-scale study will be used in the three plots. Each plot will have one pre-determined binder mix composition. Mixing will be accomplished using an excavator or backhoe (**Figure 10**).

The typical curing time for ex-situ soil solidification is one to two months.

3.2.1 Soil Volumes and Cover Design

Excavated soil volumes from the trenches at the Former South Lagoon, Process Area, Drip Track, and North Lagoon are approximately 290 cubic yards (CY), 220 CY, 280 CY, and 390 CY, respectively. Koppers, Inc. is also planning to remove approximately 1,300 cubic yards of sediment from the Site drainage ditch for stormwater management. After adding binder materials (10% assumed), the total volume of soil to be treated will be approximately 2,800 CY.

The excavated trenches will be backfilled with granitic gravel to approximately 3 feet bgs, and then filled with soil from the S/S pilot (**Figure 6**). This soil will be transported from the S/S plots to the excavations after mixing but before curing. The total S/S soil volume returned to the excavations will be approximately 200 CY.

The remaining 2,600 CY of soil will be divided into the three test plots depicted in **Figure 9**. The areas are approximately 8,500 ft^2 each, for a total area of 25,500 ft^2. The average thickness of the S/S material in the plots will therefore be approximately 33 inches.

As shown in **Figure 10**, the S/S soil will be graded slightly to promote runoff. Also, once the S/S soil has cured, the perimeter berms will be leveled with the added S/S soil to prevent ponding. A 6-inch thick imported granular cover will be used on top of the S/S soil for temporary cover and promotion of drainage. This cover may later be amended (or the plots may be removed) to be consistent with the final Site remedy.

3.2.2 Verification, Lab Testing, and Analysis

Verification of successful completion of soil S/S pilot test will be performed through quality control inspection and testing of soil S/S samples. Compressive strength and hydraulic conductivity will be the primary verification criteria. Compliance testing will be carried out on cured samples (approximately one month after mixing) to verify that the treated soil meets physical (e.g. strength, permeability) criteria.

Three cylindrical samples will be collected from each of the three pilot test areas before and just after completion of the S/S mixing (i.e., nine pre-treatment and nine post-treatment samples). The treated samples will be allowed to cure in the field for 1 month. Physical and chemical tests of the samples will be conducted as described in **Section 3.1**. A S/S technology effectiveness evaluation will be based on the results of these tests.

A report will be completed to describe the treatability and pilot test results in detail. The report will include a recommended mix and procedure for any future field application of ex-situ S/S at the Site. See **Section 5.2** for other details of project reporting.

4 TREATMENT PLANT IMPROVEMENTS

The current on-Site groundwater treatment system is capable of treating approximately 30 gpm of flow. The current system is effective at removing constituents from groundwater prior to discharge to the Gainesville Regional Utilities (GRU) sewer system. However, the current system does not efficiently remove metals, such as arsenic, which leads to increased operational effort and cost.

Upgrades to the existing treatment plant will be required to accommodate the planned extraction system modifications (**Section 2**). The new extraction system will result in an estimated 48 gpm of flow (**Table 1**), and a significant portion of this flow will require pretreatment for select metals. Based on past measurements of arsenic concentration, it is assumed that flow from the enhanced extraction system near the Former Process Area and Former South Lagoon will require arsenic pretreatment, along with flow from existing extraction wells EW-11 through EW-16.

4.1 Design Components

The treatment plant will be upgraded to accommodate up to 58 gpm of total flow (1.2 factor of safety). A portion of this flow (approximately 26 gpm) will first be treated for metals. All of the flow will pass through a 2-unit granular activated carbon (GAC) system for removal of organics.

Major components for the treatment plant upgrade will include:

- Addition of a small treatment pad north of the existing pad to accommodate new equipment;
- A new clarifier (for coagulation/flocculation/precipitation) or ion exchange unit for arsenic removal;
- Separate piping to segregate flow from areas with measured arsenic impacts exceeding permit limits;
- An additional 2-unit carbon system running in parallel to the existing 2-unit system; and
- Additional/replacement pipes, pumps, and valves within the plant.

Also, if substantial DNAPL is recovered in the new groundwater extraction drains, a DNAPL removal process may be added at the sump(s), or a DNAPL separation step may be added to the treatment train to improve treatment efficiency.

4.2 Permitting and Compliance

An amended permit will be negotiated with GRU to allow discharge of additional flow to the sewer system. Water quality monitoring of influent and effluent will continue under the current protocol. Breakthrough monitoring between the carbon units will also continue.

5 PROJECT SCHEDULE AND REPORTING

5.1 Project Schedule

The entire project described in this work plan will take approximately five months, with operation of the modified extraction and treatment systems beginning approximately 12 weeks after project start. A preliminary schedule is presented as **Figure 11**. The schedule commences upon USEPA approval of this work plan. It includes required activities associated with implementation of the Surficial Aquifer IRM activities and their estimated durations.

5.2 Project Reporting

Following completion of the IRM activities, a completion document will be submitted to EPA. This document will include the following:

- Summary of construction and start-up activities;
- As-built drawings;
- Discussion of any deviations from this work plan;
- Results of soil S/S pilot testing including recommendations for future field implementation of ex-situ S/S;
- Summary and conclusions;
- References; and
- Appendices and supporting documentation (e.g., laboratory reports).

6 REFERENCES

FTS (Field & Technical Services LLC) and GeoTrans, 2008. Comprehensive Groundwater Monitoring and Sample Analysis Plan: Cabot Carbon / Koppers Superfund Site, Gainesville, Florida. October 2008.

GeoTrans, 2004. Data Report for Additional Investigation of Hawthorn Group: DNAPL Source Evaluation for The Koppers Industries Property, Cabot Carbon/Koppers Superfund Site, Gainesville, Florida. September 2004.

GeoTrans, 2006. Surficial Aquifer Hydraulic Containment System Evaluation. Attachment to December 22, 2006 letter from Michael Slenska (Beazer) to Amy McLaughlin (USEPA).

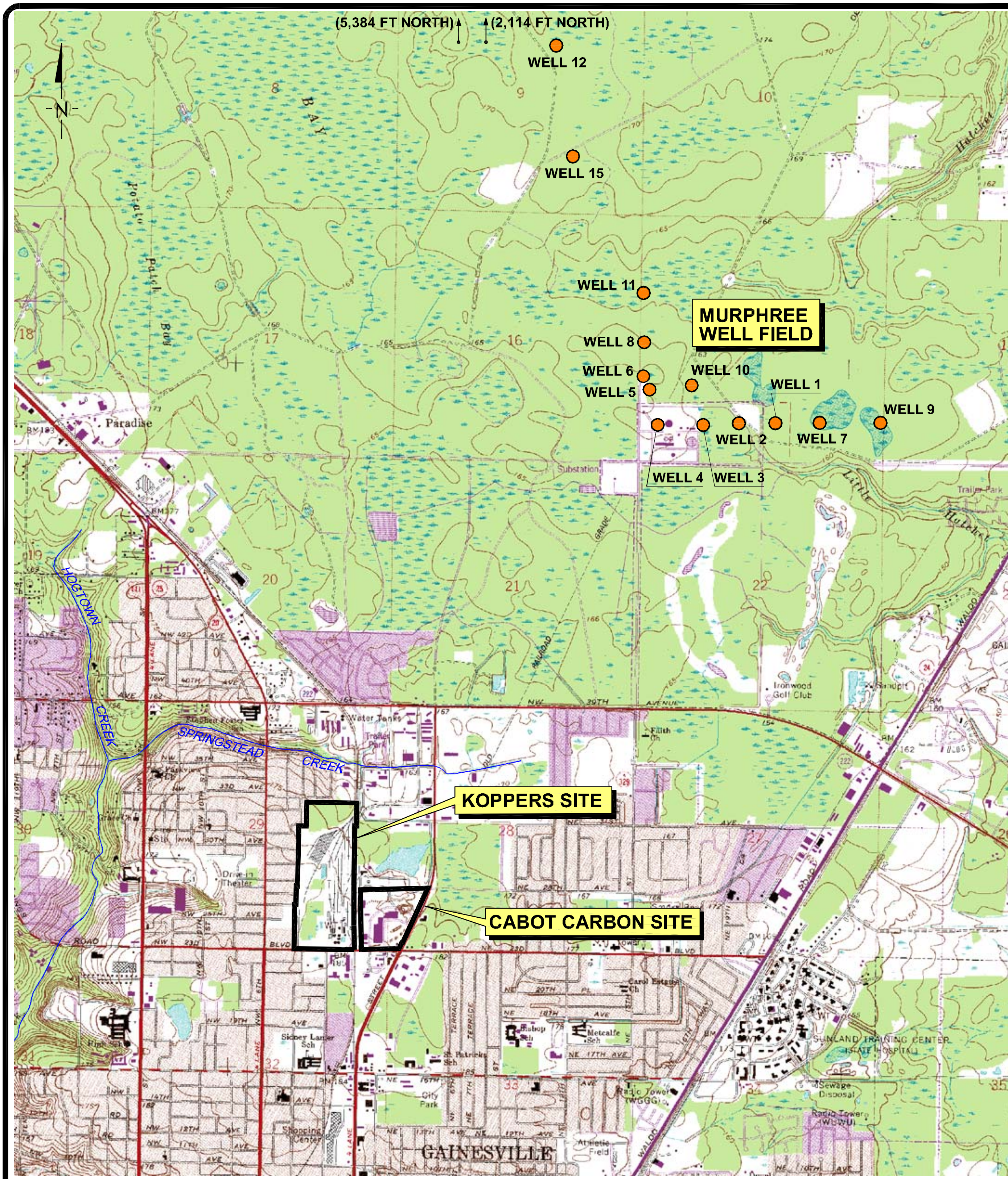
GeoTrans, 2007. Surficial Aquifer Well Redevelopment and Sampling Report, in Response to Five-Year Review Report, April 2006 – Recommendation #9, Cabot Carbon/Koppers Superfund Site in Gainesville, Florida. December 2007.

USACE (United States Army Corps of Engineers), 2005. Engineering and Design: Treatability Studies for Solidification/Stabilization of Contaminated Material. Technical Letter No. 1110-1-158. February 28, 2005.

USACE, 2006. Second Five-Year Review Report for Cabot Cabon/Koppers Superfund Site, Gainesville, Alachua County, Florida. Mobile District. April 2006.

Table 1. Design (Simulated) Extraction Rates

Drain or Well ID	Flow (gpm) with Perimeter Wells	Flow (gpm) after Perimeter Well Shutdown
South Lagoon Drain (#1)	11.63	11.84
Process Area Drain (#2)	9.18	9.62
Drip Track Drain (#3)	8.51	10.30
North Lagoon Drain (#4)	8.38	9.96
Total – Groundwater Collection Drains	*37.70*	*41.72*
EW-01 (off)	0	0
EW-02 (off)	0	0
EW-03	0.70	0
EW-05	2.10	0
EW-06	0.68	0
EW-08	0.78	0
EW-09	1.25	0
EW-10	0.57	0
EW-11	1.74	0
EW-13	0.88	0
EW-14 (off)	0	0
EW-15	1.34	0
EW-16	0.74	0
EW-17 (off)	0	0
Total – Perimeter Wells	*10.76*	*0*
GRAND TOTAL	**48.46**	**41.72**



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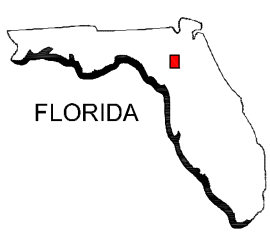

TITLE: SITE LOCATION MAP

LOCATION: Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

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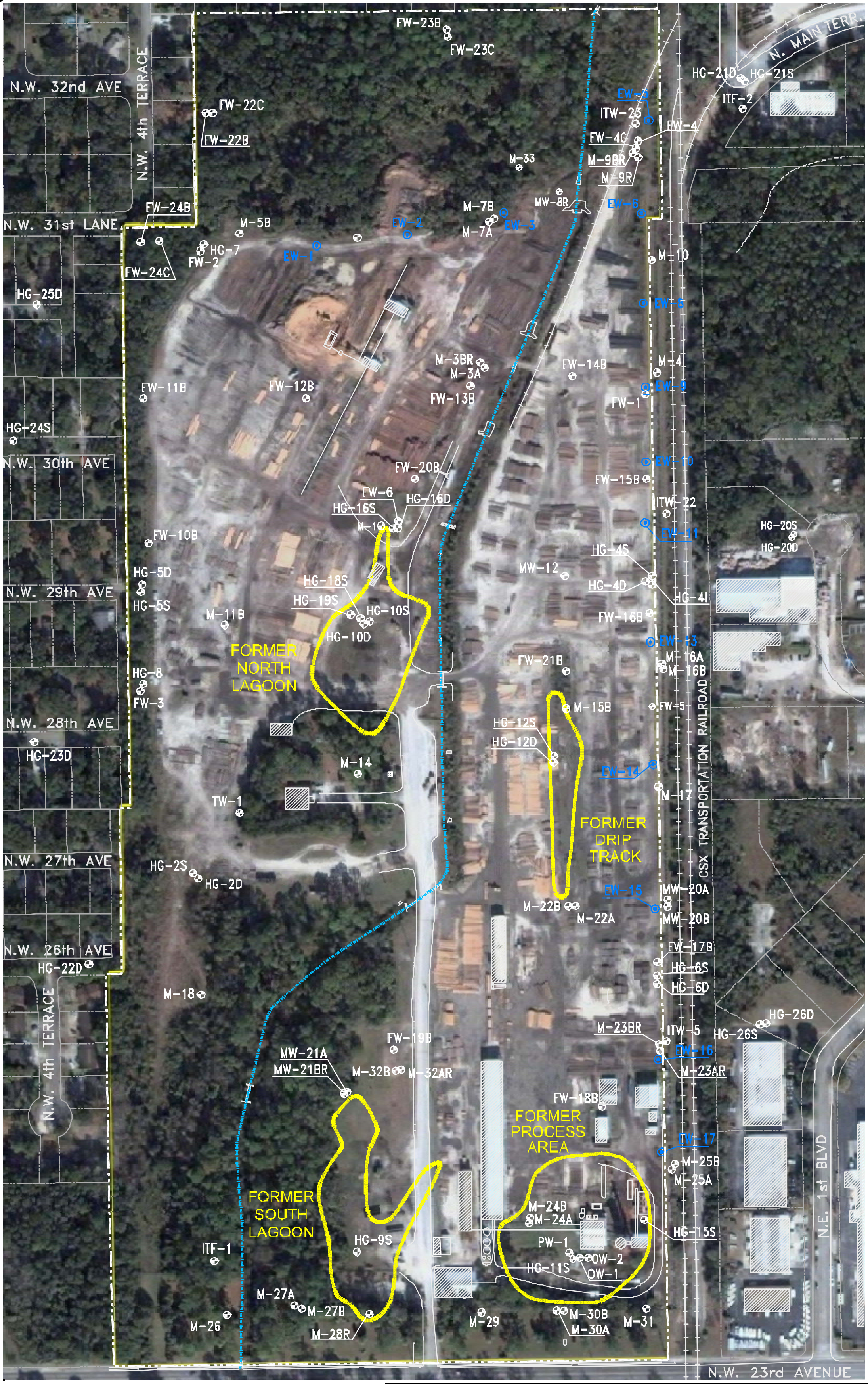

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LEGEND

- SITE BOUNDARY
- RAILROAD
- SURFICIAL AQUIFER EXTRACTION WELL
- MOITORING WELL
- SOURCE AREA
- EXISTING BUILDING STRUCTURE

0 350 700

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LOCATION:	Cabot Carbon/Koppers Superfund Site, Gainesville, Florida			
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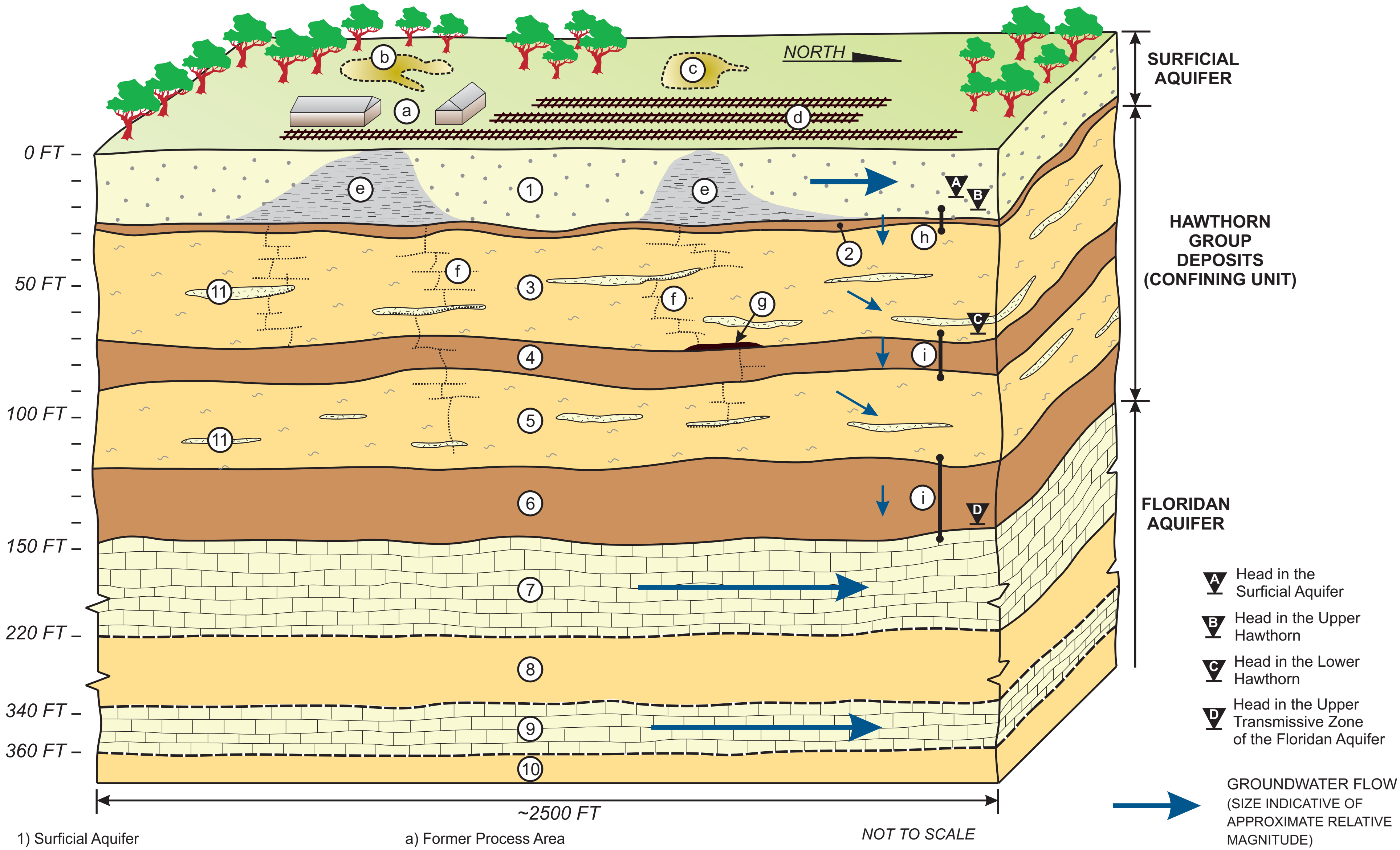


1) Surficial Aquifer
2) Hawthorn Group - Upper Clay
3) Hawthorn Group - Upper Hawthorn
4) Hawthorn Group - Middle Clay
5) Hawthorn Group - Lower Hawthorn
6) Hawthorn Group - Lower Clay
7) Floridan Aquifer - Upper Transmissive Zone
8) Floridan Aquifer - Semi-Confining Zone
9) Floridan Aquifer - Lower Transmissive Zone
10) Floridan Aquifer - Semi-Confining Zone
11) Discontinuous Sandy Interbeds

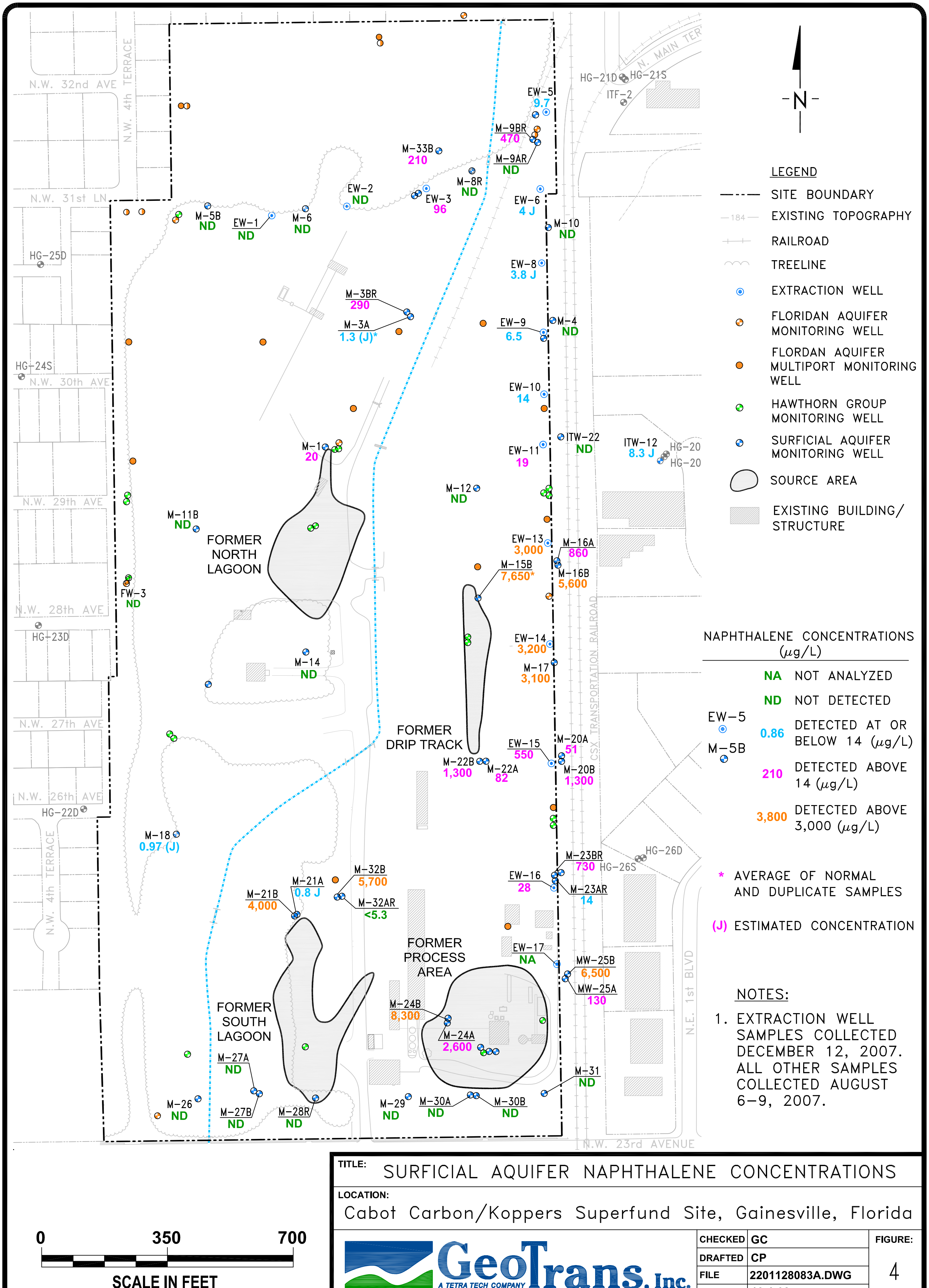
a) Former Process Area
b) Former South Lagoon
c) Former North Lagoon
d) Former Drip Track
e) Soils with Residual DNAPL
f) Sparse Seams of Residual DNAPL
g) Sparse Seams of Locally Continuous DNAPL
h) Moderate Vertical Hydraulic Gradient (~1 ft/ft)
i) Large Vertcial Hydraulic Gradient (~3 ft/ft)

TITLE: CONCEPTUAL BLOCK DIAGRAM

LOCATION: Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

GeoTrans, Inc.
A TETRA TECH COMPANY

CHECKED	GC	FIGURE:
DRAFTED	CP/TS	3
FILE	2201128020A.CDR	
DATE	11-24-08	

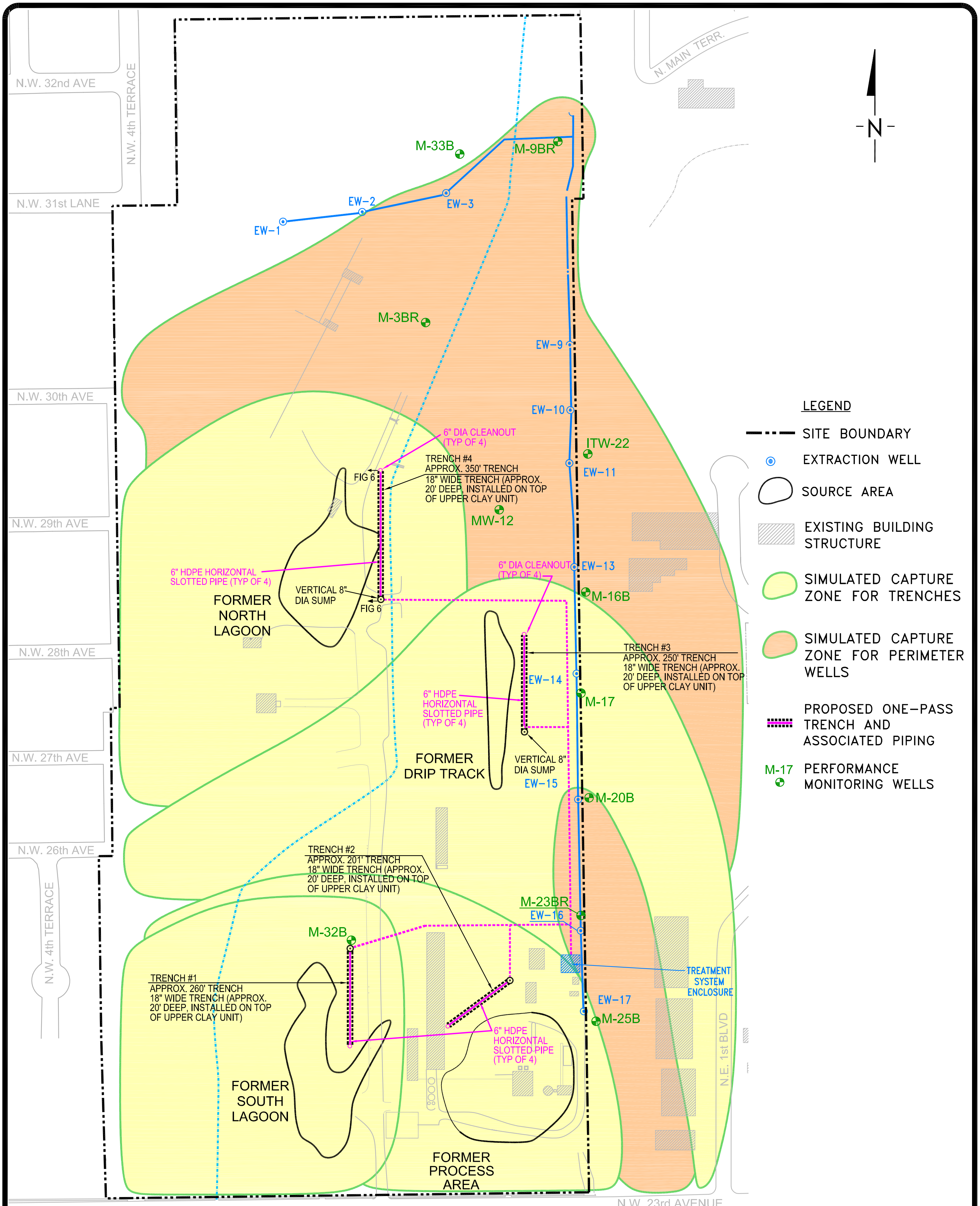


TITLE: SURFICIAL AQUIFER NAPHTHALENE CONCENTRATIONS

LOCATION: Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	GC	FIGURE:
DRAFTED	CP	4
FILE	2201128083A.DWG	
DATE	12-1-08	



0 350 700

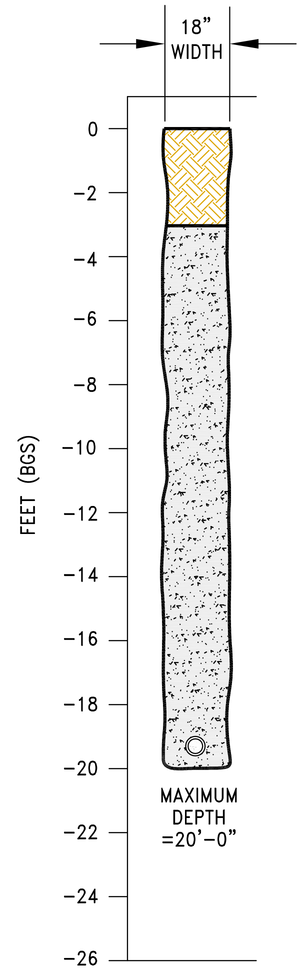
SCALE IN FEET

TITLE: PROPOSED EXTRACTION SYSTEM LAYOUT WITH PREDICTED CAPTURE ZONES FOR THE LOWER HALF OF THE SURFICIAL AQUIFER

LOCATION: Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

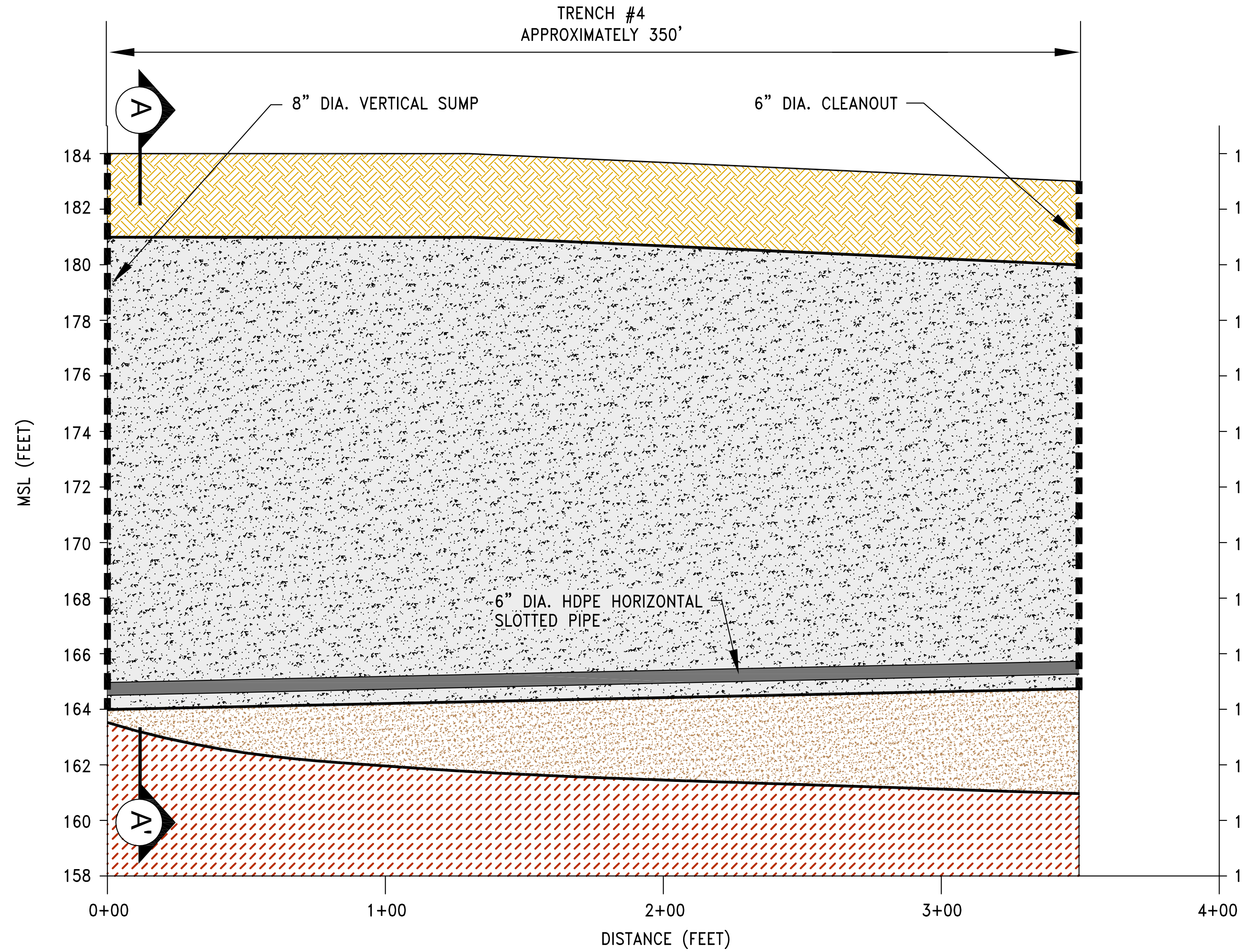
GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	GC	FIGURE:
DRAFTED	CP	5
FILE	2201128084A.DWG	
DATE	12-9-08	



X-SECTION A-A'

NOT TO SCALE



LEGEND

- STABILIZED EXCAVATED MATERIAL
- IMPORTED GRANULAR FILL
- TERRACE DEPOSITS
- UPPER CLAY UNIT

V = 1:5

H = 1:60

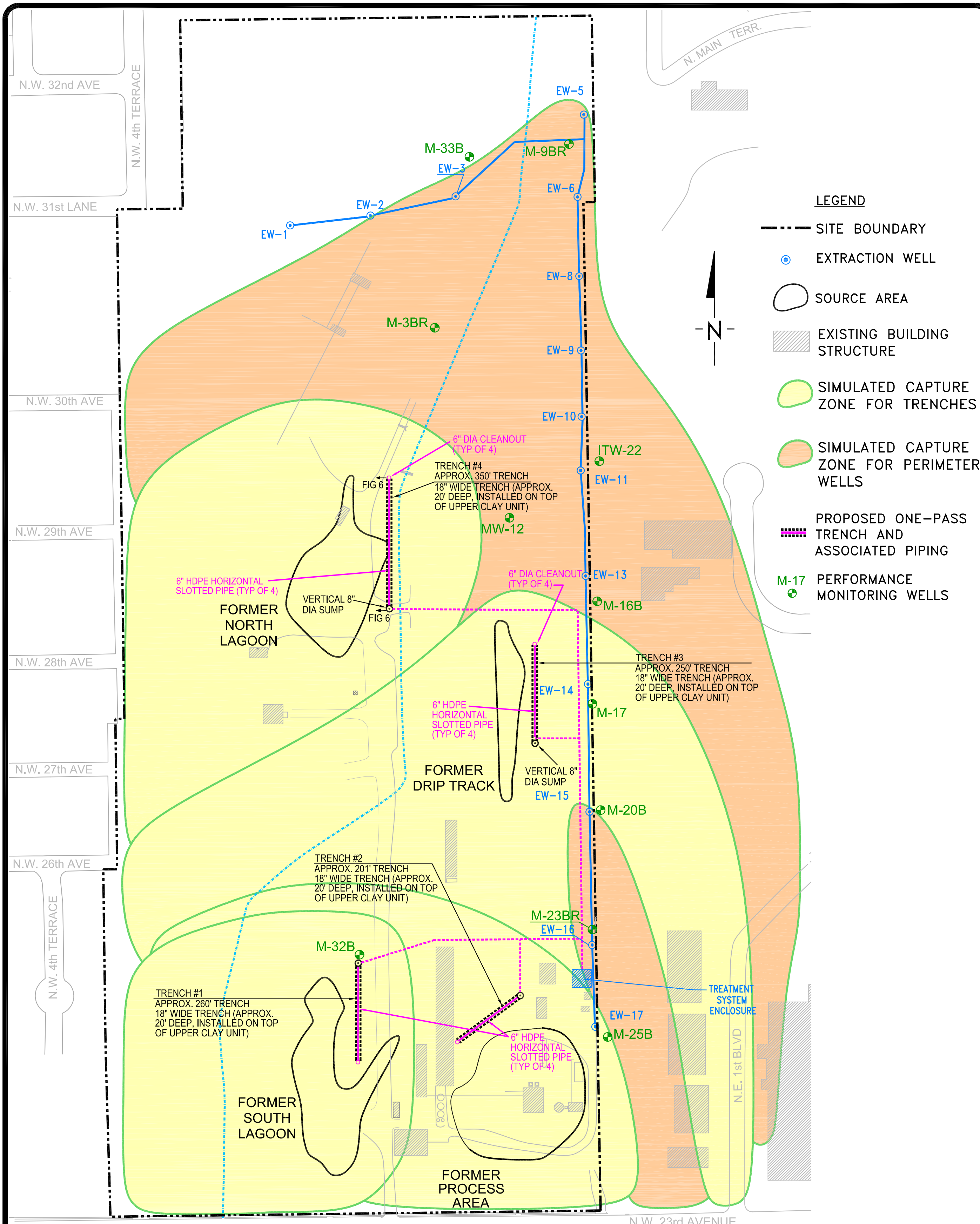
TITLE: CONCEPT PROFILE OF TRENCH #4

LOCATION: Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

GeoTrans, Inc.
A TETRA TECH COMPANY

CHECKED	JH
DRAFTED	CP
FILE	2201128089A.DWG
DATE	12-3-08

FIGURE: 6



0 350 700

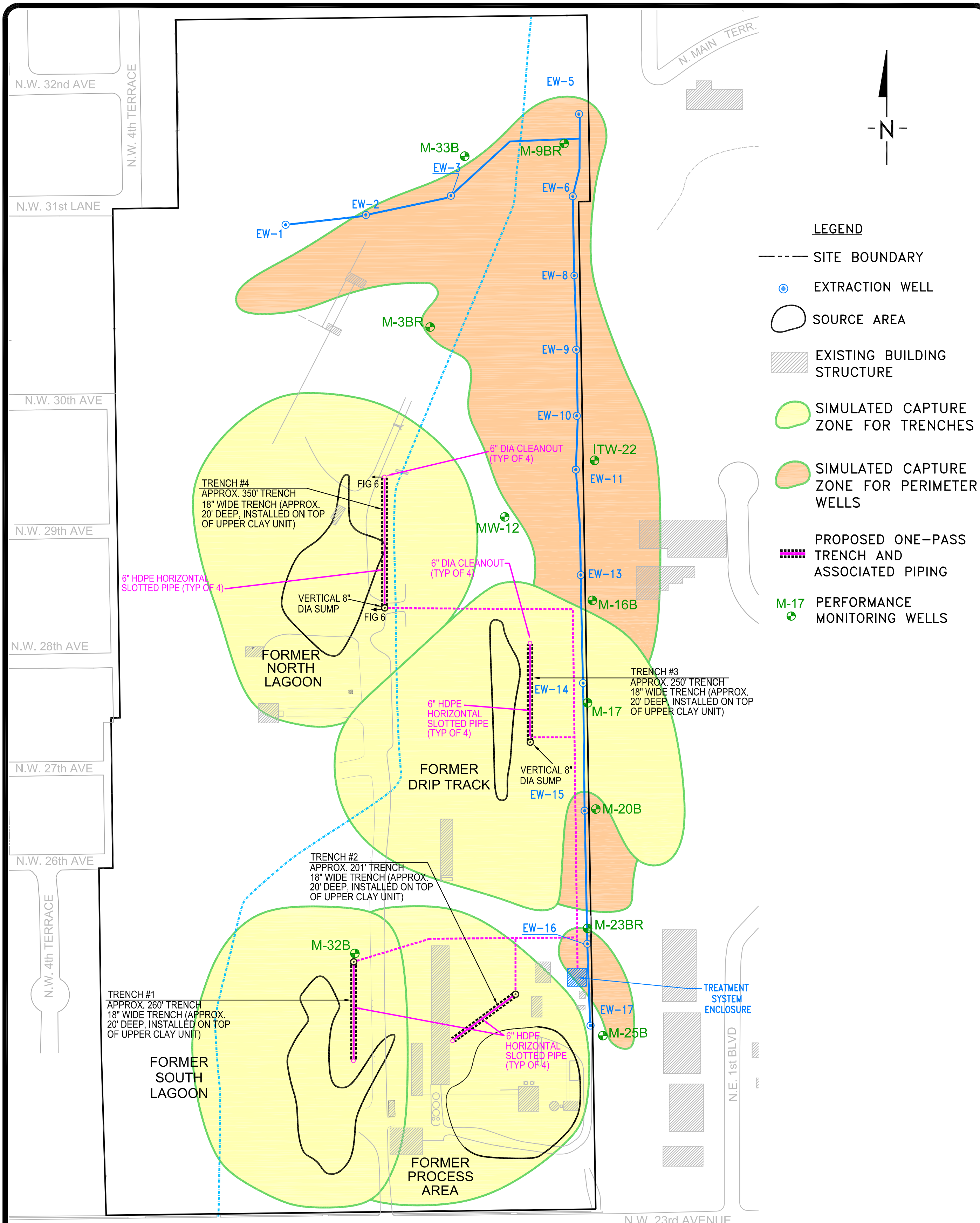
SCALE IN FEET

TITLE: PREDICTED WATER–TABLE CAPTURE ZONES

LOCATION: Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	GC	FIGURE:
DRAFTED	CP	7
FILE	2201128085A.DWG	
DATE	12-9-08	



0 350 700

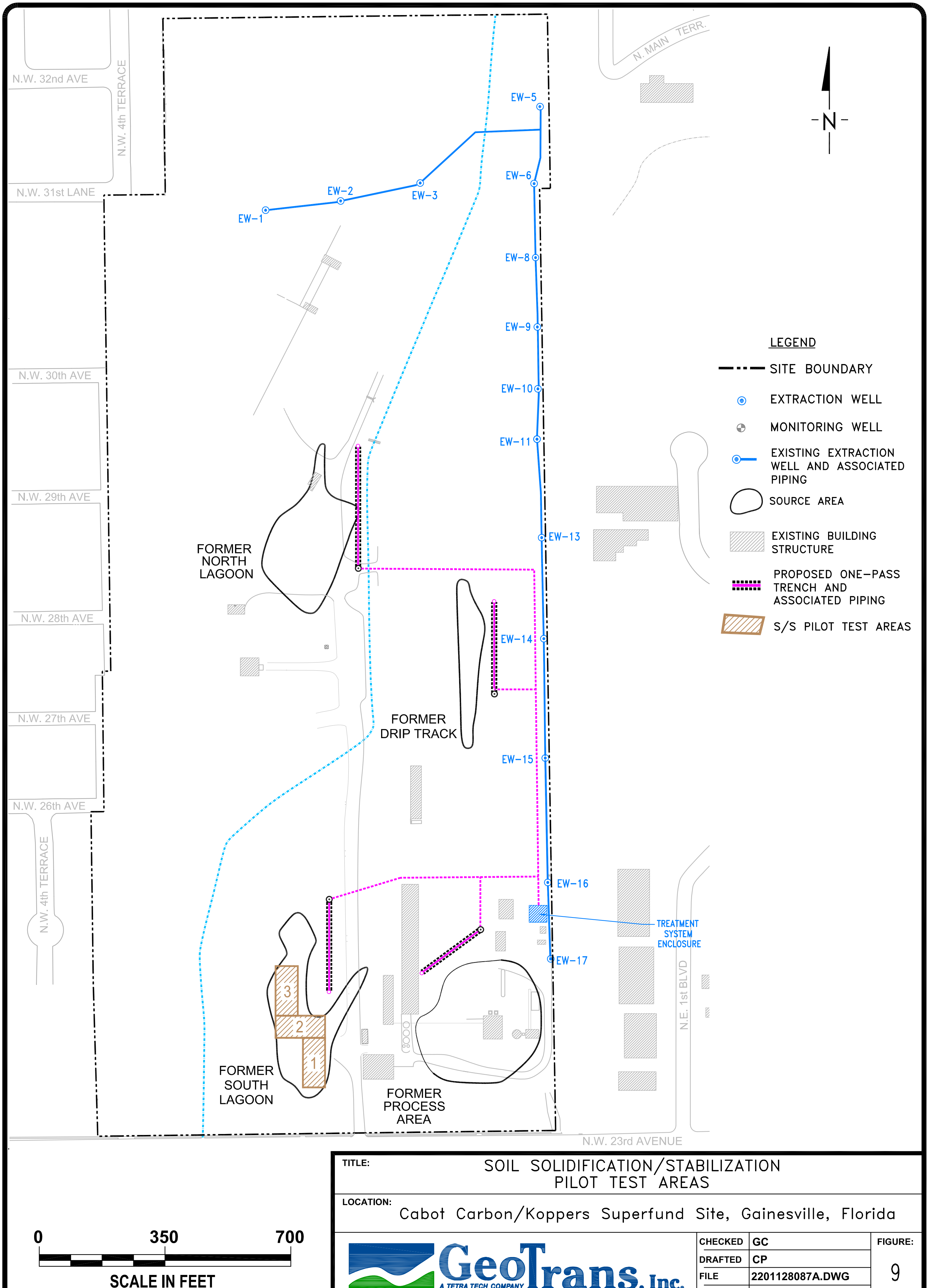
SCALE IN FEET

TITLE: PREDICTED CAPTURE ZONES FOR PARTICLES RELEASED ONE FOOT ABOVE THE HAWTHORN GROUP UPPER CLAY

LOCATION: Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	GC	FIGURE:
DRAFTED	CP	8
FILE	2201128086A.DWG	
DATE	12-8-08	

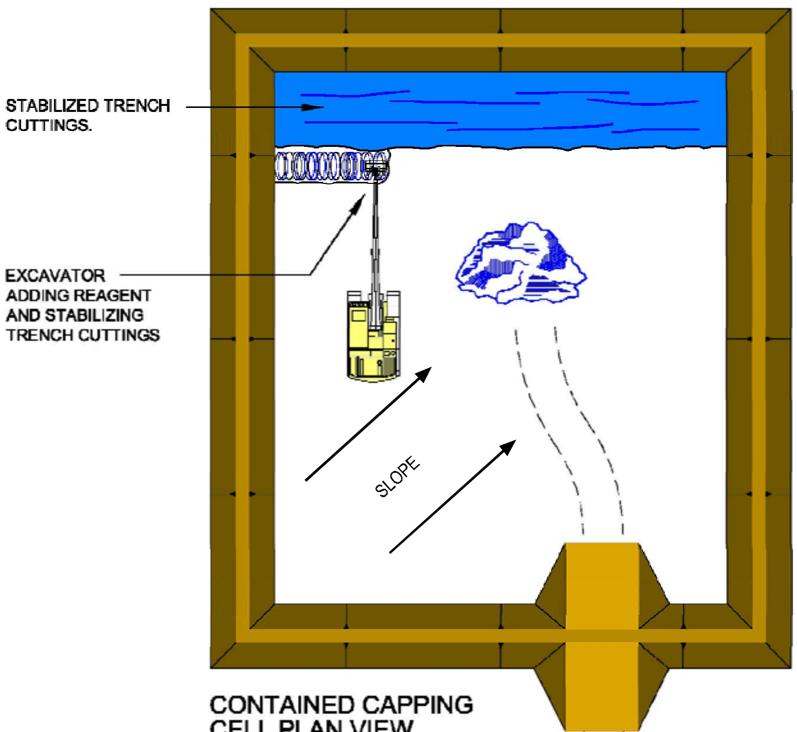


TITLE: SOIL SOLIDIFICATION/STABILIZATION PILOT TEST AREAS

LOCATION: Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

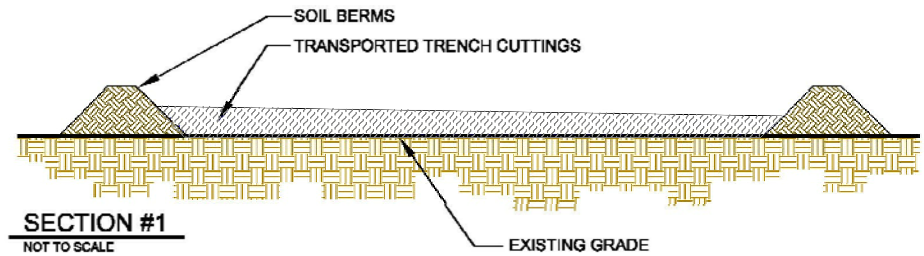
GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	GC	FIGURE:
DRAFTED	CP	9
FILE	2201128087A.DWG	
DATE	12-9-08	



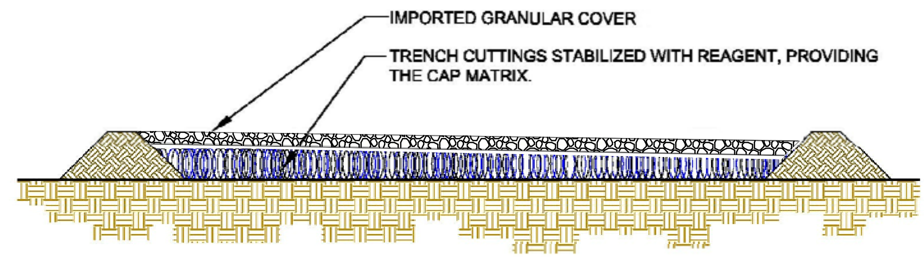
CONTAINED CAPPING CELL PLAN VIEW

NOT TO SCALE



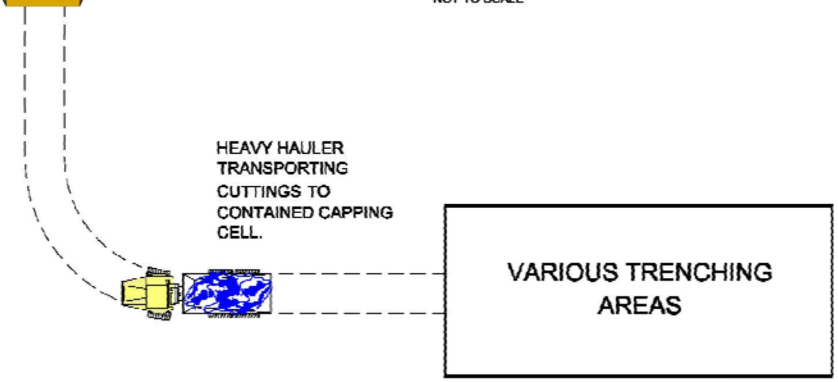
SECTION #1

NOT TO SCALE



SECTION #2

NOT TO SCALE



AS THE ONE-PASS TRENCHING ADVANCES, THE EXCAVATED MATERIAL (CUTTINGS) WILL BE LOADED, TRANSPORTED, AND PLACED INTO THE CONTAINED CAPPING CELL (PLAN VIEW & SECTION #1).

THE CUTTINGS WILL BE BLENDED WITH AN ADEQUATE AMOUNT OF REAGENT BY A HYDRAULIC EXCAVATOR AND/OR LOADER TO PROVIDE THE CAP MATRIX.

ONCE THE BLENDED MATERIAL HAS HAD AMPLE TIME TO REACT, IT WILL BE TRANSPORTED BACK TO THE TRENCH AREAS, PLACED IN THE UPPER 3 FOOT +/- TO PROVIDE A SURFICIAL CAP.

THE REMAINING BLENDED MATERIALS WITHIN THE CAPPING CELL WILL BE LEVELED AND COVERED WITH IMPORTED GRANULAR MATERIAL (SECTION #2).

(PROVIDED BY SEVENSON ENVIRONMENTAL SERVICES, INC.)

TITLE:	CONCEPTUAL DESIGN OF SOIL SOLIDIFICATION/ STABILIZATION AREAS
LOCATION:	Cabot Carbon/Koppers Superfund Site Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	JH	FIGURE:
DRAFTED	CP	10
FILE	2201128090A.DWG	
DATE	12-9-08	

ID	Task Name	Duration
1	**Surficial Aquifer Extraction System Modification**	**60 days**
2	Contracting	10 days
3	Pre-construction activities (e.g., utilities)	5 days
4	Mobilization	2 days
5	Site/Equipment Prep	3 days
6	Trenching	10 days
7	Pipe and pump installation	10 days
8	Decon & disassembly	3 days
9	Demobilization	2 days
10	System testing	5 days
11	Operation commencement	0 days
12		
13	**Soil Solidification/Stabilization Pilot Test**	**87 days**
14	Bench Treatability Test	6 wks
15	Area clearance & berm Building	10 days
16	Soil & cement mixing	15 days
17	Curing period	5 wks
18	Sampling	2 days
19	Testing and Analysis	10 days
20		
21	**Treatment Plant Improvements**	**60 days**
22	Final Design	15 days
23	Equipment procurement & delivery	6 wks
24	Treatment pad expansion	15 days
25	Equipment installation	10 days
26	Testing	5 days
27	Permitting	20 days
28		
29	**Reporting**	**25 days**
30	Report Preparation	20 days
31	Report Review	5 days
32	Report Submittal	0 days

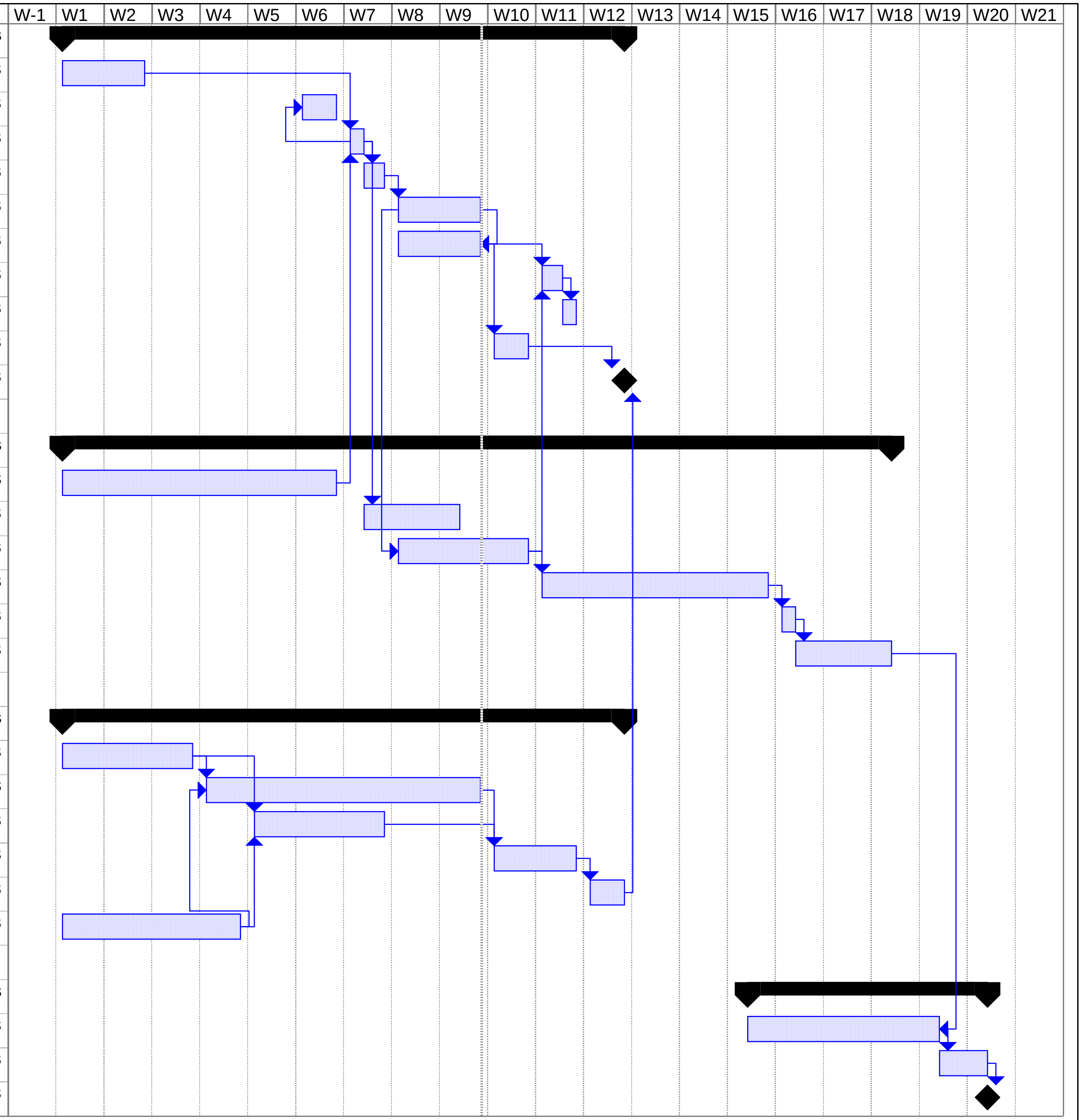


Figure 11
Project Schedule

Task | Milestone | Summary

Note: Schedule commences upon approval of the full IRM and Pilot-Test Work Plan