TETRA TECH

October 29, 2018

Mr. Scott Miller
Remedial Project Manager
U.S. Environmental Protection Agency
Region IV, Superfund North Florida Section
61 Forsyth Street, SW
Atlanta, GA 30303-3104

RE: **Transmittal of the Report "*Former North Lagoon & Drip Track Preliminary Design and Design Investigation Workplan, Former Cabot Carbon / Koppers Inc. Site, Gainesville, Florida*"**

Dear Mr. Miller:

On behalf of Beazer East, Inc. (Beazer), attached is a revised final copy of the workplan entitled "*Former North Lagoon & Drip Track Preliminary Design and Design Investigation Workplan, Former Cabot Carbon / Koppers Inc. Site, Gainesville, Florida*". This workplan describes the activities to be performed for characterizing dense nonaqueous phase liquid (DNAPL) impacts and distribution beneath the former North Lagoon & Drip Track at the former Koppers Inc. (KI) site in Gainesville, Florida. Beazer will implement this workplan upon approval from the U. S. Environmental Protection Agency (EPA).

Should you require additional information, please feel free to contact me at (303) 664-4630.

Sincerely,

James R. Erickson,
Vice President
Principal Hydrogeologist

Miguel Garcia, P.G.
Project Hydrogeologist
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Enclosure

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Former North Lagoon & Drip Track Preliminary Design and Design Investigation Workplan, Former Cabot Carbon/Koppers Inc. Site Gainesville, Florida

Version 1
Operable Units Two and Three (Koppers)
Gainesville, Florida
EPA ID: FLD980709356

Version 1
October 29, 2018

Prepared on behalf of Beazer East, Inc.

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APPROVAL

________________________________ Date: 10/29/2018

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________________________________ Date: 10/29/2018

James R. Erickson
Project Manager for Beazer East, Inc.
Tetra Tech, Inc.

CERTIFICATION

This report has been reviewed and approved by the undersigned Florida Registered Professional Geologist. Tetra Tech prepared this report in a manner consistent with sound geology practices. Furthermore, either I or engineering staff working under my supervision completed all work described herein (except as otherwise noted) and I have expertise in the discipline used in the production of this document.

MIGUEL ANDRES GARCIA
LICENSE
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STATE OF
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PROFESSIONAL GEOLOGIST

____

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Date: 10/29/2018

REVISION HISTORY

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ABBREVIATIONS AND ACRONYMS

Beazer	Beazer East, Inc.
bgs	Below Ground Surface
CGMSAP	Comprehensive Groundwater Monitoring Sampling Analysis Plan
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	U. S. Environmental Protection Agency
EVS©	Environmental Visualization System
gpm	gallons per minute
HASP	Health and Safety Plan
HG	Hawthorn Group
ID	Inner Diameter
IDW	Investigation-Derived Waste
ISGS	*In-Situ* Geochemical Stabilization
KI	Koppers Inc.
LFA	Lower Floridan Aquifer
LH	Lower Hawthorn
msl	Mean Sea Level
OSHA	Occupational Safety and Health Administration
OUs	Operable Units
PID	Photoionization Detector
PVC	Polyvinyl Chloride
POD	Record of Decision
Site	Koppers portion of the Cabot Carbon/Koppers Superfund Site
SA	Surficial Aquifer
SJRWMD	Saint Johns River Water Management District
TIPs	Temporary Investigation Points
TOC	Top of Casing
UFA	Upper Floridan Aquifer
UH	Upper Hawthorn
USCS	Unified Soil Classification System
U. S.	United States
VOCs	volatile organic vapors

1.0 INTRODUCTION

On behalf of Beazer East, Inc. (Beazer), Tetra Tech has prepared this workplan describing the proposed detailed subsurface characterization of the Koppers Inc. former North Lagoon and Drip Track areas to support implementation of the final remedy at these two source locations.

The Cabot/Koppers Superfund Site is located within the City of Gainesville in Alachua County, Florida. The Superfund Site includes areas that have been environmentally impacted by activities at the former Koppers wood-treatment facility and at the adjacent former Cabot Carbon pine-tar products facility (**Figure 1**). The 86-acre land parcel that contained the former Koppers facility is currently owned by Beazer. This document pertains to areas that are on the Beazer property and hereafter "Site" refers to the Beazer-owned property that contained the former Koppers facility.

The Site was used continuously as an active wood-treating facility from 1916 to 2009 when wood-rating operations ceased. The Site was sold to Beazer in 2010; Beazer is the current owner of the Site. The Site is in an area of the City that is zoned industrial, with surrounding commercial and residential zoned properties. The adjacent property to the east of the Site is the former Cabot Carbon Superfund Site. The adjacent property to the north is the City of Gainesville vehicle/equipment maintenance facility. The properties to the west are private residences, and the properties to the south are a mixture of commercial and residential properties.

1.1 OBJECTIVES

The objective of the investigation activities described in this workplan is the detailed characterization of DNAPL impacts in the Surficial Aquifer (SA) and the Upper Hawthorn (UH) deposits beneath the former North Lagoon and Drip Track areas. This detailed characterization of DNAPL impacts beneath the source areas will allow for targeted remedy implementation to immobilize free-phase DNAPL impacts.

A primary concern of the U.S. Environmental Protection Agency (EPA) and Stakeholders is the potential for vertical migration of free-phase dense nonaqueous liquid (DNAPL) into the Upper Floridan Aquifer (UFA). Consequently, a primary short-term objective of the remedy is to contain and stabilize free-phase DNAPLs in the SA and UH beneath the Site's former North Lagoon and Drip Track areas (**Figure 2**).

1.2 REGULATORY FRAMEWORK

The EPA is the lead agency for the Cabot Carbon/Koppers Superfund site. The remedy for the former North Lagoon and Drip Track is part of the remediation plan for the Site, as described in the February 2011 Record of Decision (ROD) (U. S. EPA, 2011). A Consent Decree between Beazer and the United States government was entered in the United States District Court for the Northern District of Florida on July 9, 2013. The Consent Decree requires Beazer to conduct certain Remedial Design and Remedial Action activities at the Site.

The Cabot/Koppers Superfund Site consists of five Operable Units (OUs):

- OU1: The former Cabot Carbon facility and sediment impacts in Hogtown and Springstead Creeks attributable to the Cabot Carbon facility;
- OU2: Soil and the SA at the former Koppers facility property;
- OU3: The Hawthorn Group (HG) geologic sequence which lies below the SA;
- OU4: The UFA which is below the HG; and
- OU5: Soils and sediments outside of the former Koppers facility property.

This report describes the completion of pre-design investigation activities for the SA and UH deposits in the former North Lagoon and Drip Track areas that are part of OU2 and OU3.

2.0 HYDROGEOLOGY AND DNAPL DISTRIBUTION

Creosote DNAPLs were released to the subsurface during the historical operation of the former wood-treating Site. Creosote-treatment operations at the Site ceased in the early 1990s. The majority of DNAPL releases are believed to have occurred before 1980 when creosote usage was greater. In the later years of operation (1990 to 2009), other wood preservatives were used in place of creosote at this facility.

Creosote DNAPL impacts have been found within and beneath four former operational areas: 1) Process Area; 2) Drip Track; 3) North Lagoon; and 4) South Lagoon (**Figure 2**). Creosote DNAPL impacts have been detected in the SA and underlying HG deposits in these former areas of operation. DNAPL impacts have not been detected in the deeper UFA and appear to be vertically contained by the middle clay unit (10-15 ft thick) and lower clay unit (30-35 feet thick) at the base of the HG deposits. Field investigations in the former Process Area reveal that DNAPL impacts are present in the SA and UH, with the majority of free-phase DNAPL impacts present in the UH at a depth range of approximately 45 to 55 feet. Similarly, field investigations in the former South Lagoon area reveal that DNAPL impacts are primarily present from approximately 5 to 45 ft below land surface; there were two isolated locations at the former South Lagoon where DNAPL impacts extended to approximately 65 ft below land surface.

Most of the HG deposits beneath the former source areas do not contain free-phase or residual DNAPL impacts. DNAPL impacts within the HG deposits are restricted to thin higher permeability deposits, 1-to 12-inches thick, with thick sequences (2 to 10 feet) of non-impacted deposits separating them. Most of these HG impacts are within the UH; the low-permeability middle clay unit limits vertical migration of DNAPL impacts to the underlying Lower Hawthorn (LH) where only relatively thin zones of residual DNAPL impacts have been historically observed along the eastern property boundary.

One SA DNAPL recovery well (M-38BE) in the former Process Area started to accumulate a small amount of DNAPL after the *In-Situ* Geochemical Stabilization (ISGS) reagent injections in late 2015 (less than 0.3 gal/ 2-weeks); no DNAPL has been detected in this well since in March 2018. Two SA TIP/wells (SL 260N 260E and SL 500N 220E) in the former South Lagoon started recovering a small amount of DNAPL (less than 0.6 gal/2-weeks) in September 2018, post-ISGS reagent injections.

The former North Lagoon is in the central area of the Site and the former Drip Track is located near the east-central Site property boundary. Although there is no history of buildings or other structures in the former North Lagoon area, a possibility exists that underground structures may be present. Underground structures are expected to be present in the former Drip Track area. The former Drip Track area historically contained railroad tracks and subsurface concrete pads.

Detailed descriptions of the Site historical source areas are provided in a 2004 report on subsurface investigations in these areas (GeoTrans, 2004a). The Site hydrogeologic conceptual model is provided in a groundwater flow and transport modeling report (GeoTrans, 2004b) and a depiction of the Site conceptual model is provided in **Figure 3**. In addition, DNAPL characterizations performed in the former Process Area (Tetra Tech, 2013) and the South Lagoon (Tetra Tech, 2018a; and 2018b) provide insight into potential DNAPL distributions beneath the former source areas at the Site.

Much of the work described in this workplan involves intrusive subsurface investigations. To effectively and safely perform this work, confirmatory investigation into the status of possible subsurface features in the former North Lagoon and Drip Track areas are needed. Numerous changes to the wood-treating operations over the 93 operational years have resulted in subsurface structures in the operational areas of the Site. The use of the Site at the former North Lagoon and Drip Track areas leaves a possibility of the existence of abandoned subsurface structures that may slightly impact borehole locations. DNAPL investigations have been performed in the former North Lagoon and Drip Track areas in 2004 and 2013 (Tetra Tech, 2004a; and 2013); however, the level of detail resulting from these investigations alone is insufficient to implement soil and groundwater remedies. A summary of the current understanding and potential challenges associated with remedy implementation are provided below.

2.1 Subsurface Structures

There is no documentation to indicate the existence of buildings, footers or slabs in the former North Lagoon; however, railroad tracks and concrete pads are present in the Drip Track areas. One of the first tasks associated with implementation of the characterization program will be to verify the locations of subsurface structures for these two source locations.

Wood-treating operations at the Site ceased in 2009 and the property was sold to Beazer East, Inc. (Beazer) in March 2010. Beazer conducted demolition activities of Site structures and buildings from December 2010 through February 2011. Subsurface structures and utilities may remain in place at the North Lagoon and Drip Track areas including concrete slabs/footings and underground piping resulting in potential obstructions; however, one of the first tasks will be to verify the presence or absence of subsurface structures by performing a review of historical documents/photos.

The use of geophysics to identify subsurface structures was performed with limited success in the former Process Area due to interference from the extensive historical disturbances and infrastructure that are present in the former Process Area. Similar to the former Process Area, an attempt will be made to utilize geophysics to locate historical structures that may impact borehole locations at the former North Lagoon and Drip Track areas.

2.2 Hydrogeology

The Site is located on a gently sloping plain at an elevation of approximately 180 feet above mean sea level (msl). The ground surface immediately around the Site has low relief and slopes gently to the northeast. In general, the ground surface at the Site slopes gently to the north. From the southern property boundary to the northern property boundary (approximately

3,000 ft), the land-surface elevation decreases from approximately 190 feet to 170 feet above msl. A stormwater drainage ditch bisects the Site and flows in a north to northeasterly direction.

The hydrogeology of the Site has been thoroughly investigated and analyzed over the past several decades by numerous investigations with more recent, detailed investigations of the Hawthorn Group (TRC, 2003; GeoTrans, 2004a; 2004b; 2005; and 2009; Tetra Tech, 2013; 2014; 2018a; and 2018b; Adventus, 2009). Over 200 wells have been installed at this Site where geologic cores have been collected to characterize subsurface impacts and deposits. In addition, the former Process Area had 105 borings and Temporary Investigation Points (TIPs), 9 monitoring wells, and 10 DNAPL recovery wells installed in 2013 as part of the characterization of this source area. Similarly, the former South Lagoon had 74 borings and 33 TIP/wells installed in 2017 and 2018 (Tetra Tech 2018a; and 2018b) to characterize this source area. A simplified hydrostratigraphic model of the local geology consists of approximately 20 feet of unconsolidated surficial deposits, which overlie approximately 120 feet of unconsolidated HG deposits, which overlie greater than 300 feet of the Ocala Limestone and Avon Park Formations (**Figure 4**).

Surficial Aquifer

The SA consists of approximately 16 to 22 feet of marine terrace deposits, primarily consisting of unconsolidated, fine- to medium-grained sand with thin layers of interbedded silt and clay deposits. Groundwater flow in the SA is primarily controlled by surface topography and localized discharge points such as wetlands, creeks and drainage ditches. The SA is not a source of potable groundwater on or around the Site; however, in other parts of the State, wells have been installed in this aquifer for residential irrigation purposes.

The local groundwater flow direction for the SA at the Site is from southwest to northeast. A hydraulic-containment system was installed in the SA system at the Site in 1995 to capture impacted groundwater prior to it flowing off Site. Groundwater extraction is occurring from a series of shallow downgradient extraction wells along the eastern and northern property boundary. In addition, four approximately 250 to 300-foot long horizontal drains (wells) were installed in 2009 adjacent to each of the former source areas to recover impacted SA groundwater in proximity to the sources. Total groundwater extraction from the wells and horizontal drains average approximately 54 gallons per minute (gpm) in 3rd quarter (July-September) 2018.

Hawthorn Group Deposits

The HG deposits underlie the SA and consist of a thick sequence of low permeability, unconsolidated sedimentary deposits. The HG deposits are approximately 115 to 125 feet thick at the Site consisting of low-permeability clay, clayey sand and silt deposits interbedded with moderate-permeability sand, silty sand and carbonate deposits. Three major clay units are present in the HG deposits termed the upper clay, middle clay and lower clay units. The upper clay unit is approximately less than 1 foot to 5 feet thick, the middle clay unit is approximately 5 to 20 feet thick and the lower clay unit is approximately 25 to 40 feet thick at the Site. Moderately permeable sedimentary deposits that lie between the HG upper and lower clay units have been termed the UH and moderately permeable sedimentary and carbonate deposits that lie between the HG middle and lower clay units have been termed the LH (**Figure 3**).

The HG deposits effectively separate the overlying SA from the underlying UFA as indicated by the approximately 120 feet of hydraulic-head difference between these two aquifers. Most of the hydraulic-head loss is across the lower clay unit, with a hydraulic-head difference of approximately 90 feet. Hydraulic-head difference across the upper clay unit is about 2 feet and the head difference across the middle clay unit is about 30 feet. Hence, each of the clay units provides some level of protection, with the upper clay unit acting as the first of three hydraulic traps mitigating vertical DNAPL migration.

Lateral groundwater flow within the UH is generally to the northeast at the Site mirroring the groundwater flow direction in the SA. Lateral groundwater flow in the LH changes from east to west across the Site. A groundwater divide is present in the LH, which is oriented southeast to northwest. Groundwater flow in the LH on the eastern half of the Site is to the north-northeast and groundwater flow on the western half of the Site is to the north-northwest.

The HG deposits are not locally used for potable water due to the low permeability of the formation in this area; however, this unit has reportedly been used as a limited source of potable water in other parts of Florida.

<u>Upper Floridan Aquifer</u>

The Floridan Aquifer underlies the HG deposits and is subdivided into two aquifers, the UFA and the Lower Floridan Aquifer (LFA). The UFA is the most widely used aquifer in this area and locally consists of the Ocala Limestone and Avon Park Formations. The LFA is typically not utilized in this area due to its greater depth.

The UFA is at a depth of approximately 140 to 150 feet at the Site. Regional groundwater flow within this aquifer is to the northeast towards the Murphree wellfield. The cone of depression resulting from the Murphree wellfield encompasses the Site resulting in the northeastern flow direction. The groundwater flow direction at the Site generally mimics the regional flow direction toward the wellfield; however, secondary permeability features in this aquifer result in some localized variations from the average northeastern flow direction.

2.3 DNAPL Distribution

Most of the free-phase (i.e. potentially mobile) DNAPL impacts detected at the Site are restricted to deposits in the UH above the HG middle clay unit. No free-phase/mobile DNAPL has been detected in any of the monitoring wells installed in the underlying LH and limited DNAPL recovery is occurring in the SA.

Residual DNAPL impacts (*i.e.,* non-mobile) have been previously noted in cores collected from the SA, and to a lesser degree, LH deposits. Once DNAPL reaches residual saturation it is immobile and can no longer flow/migrate in the subsurface. DNAPL impacts (mobile and residual) have never been observed in the Floridan Aquifer at this Site, indicating that the vertical extent of DNAPL migration is limited to HG deposits.

In 2004, a comprehensive effort was undertaken by Beazer to characterize the lateral and vertical extent of DNAPL-impacts in the surficial and HG deposits at the Site. Because of this study, the approximate lateral and vertical extent of DNAPL impacts at the source areas were defined. The results of this study are documented in a 2004 report on subsurface investigations in these areas (GeoTrans, 2004a). Site features and the approximate extent of DNAPL occurrence in the former North Lagoon and Drip Track resulting from this study are depicted in **Figures 5 and 6**. Based on the 2004 investigation, the areal extent of potential DNAPL impacts to be targeted in the former North Lagoon and Drip Track area occurs in an irregularly shaped footprint covering approximately 1.7 and 0.5 acres, respectively.

The 2004 investigation included the installation of DNAPL recovery wells in the four source areas at the Site. Four UH DNAPL recovery wells (HG-10S, HG-10D, HG-16S and HG-16D) were installed in the former North Lagoon and two UH DNAPL recovery wells (HG-12S and HG-12D) were installed in the former Drip Track area. The wells were installed to monitor/recover DNAPL. Only one of the six wells (HG-10S) in the two source areas has DNAPL accumulation. DNAPL recovery well HG-10S is recovering approximately 0.5 gallons of DNAPL every 2 weeks.

A second DNAPL investigation was performed in April 2013 at the former North Lagoon and Drip Track area. A total of 17 borings were installed to help characterize DNAPL impacts in the former North Lagoon; 12 borings were installed in the former Drip Track area to characterize impacts at this source location. Two of the borings were converted to TIPs in each of these source areas to monitor for free-phase DNAPL. The results of this investigation demonstrated that free-phase DNAPL impacts were not wide-spread within these source areas. Only one of the four TIPs (960N 160E) installed in the two source areas to monitor for free-phase DNAPL is recovering low volumes (less than 0.5 gal per 2 weeks) of DNAPL. The remaining three TIPs have never contained recoverable DNAPL. The Environmental Visualization System (EVS©) model projected DNAPL distribution resulting from the 2004 and 2013 characterizations are shown in **Figures 7 and 8**.

Attempts to monitor DNAPL accumulation in wells and to recover DNAPL have been on-going since 2004 at the Site. One conclusion that can be established from these investigations and historical DNAPL recovery efforts is that free-phase DNAPL impacts within the UH appear to be restricted to thin, discrete and potentially discontinuous sand lenses. Recovered volumes tend to be relatively low in the former North Lagoon and Drip Track areas. The reason for these low recovery rates is DNAPL saturations are close to residual levels (i.e. immobile) and the impacts are restricted to thin zones.

Based on these data, one of the first tasks associated with implementing a remedy within the former North Lagoon and Drip Track areas is to determine the extent of DNAPL impacts in these areas.

3.0 PROJECT IMPLEMENTATION

This project scope consists of: 1) Installing boreholes through the SA and UH; 2) Collecting continuous cores for DNAPL and lithologic characterization; and 3) Installation of TIP/wells in the former North Lagoon and Drip Track areas. The implementation will be similar to the characterization scope of work implemented in the former South Lagoon and Process Area, incorporating lessons learned into this workplan.

3.1 NORTH LAGOON AND DRIP TRACK CHARACTERIZATION

This DNAPL characterization program will include a detailed evaluation of free-phase DNAPL distribution followed by installation of additional DNAPL recovery TIP/wells. During characterization activities, an emphasis will be placed on defining zones of free-phase (potentially mobile) DNAPL that will be targeted during the remediation phase. Investigation data will be gathered to better design the remediation implementation. Specific tasks to be performed are the following:

- Locate subsurface structures in the investigation area;
- Characterize free-phase and residual DNAPL impacts;
- Install DNAPL recovery TIP/wells; and
- Project the distribution of DNAPL impacts using the EVS© model.

A discussion of each of these tasks is provided below.

3.1.1 LOCATING SUBSURFACE STRUCTURES

The former North Lagoon and/or Drip Track may contain historical subsurface structures. Attempts will be made to identify subsurface structures by utilizing historical basemaps, aerial photos and conducting field reconnaissance. If possible, the borehole locations will be adjusted slightly to avoid structures. The locations of subsurface structures will be surveyed and plotted on a Site basemap for future reference.

3.1.2 DNAPL DISTRIBUTION CHARACTERIZATION

The current understanding of DNAPL impacts beneath the former North Lagoon and Drip Track area is based on the TIP/wells and borings advanced in this area over the past 14 years (**Figures 7 and 8**). To identify free-phase and residual DNAPL impacts, a detailed characterization of subsurface impacts in the North Lagoon and Drip Track area will be performed during this investigation.

Continuous cores will be collected in the SA and HG deposits using a sonic rig to characterize subsurface DNAPL impacts. The sonic-drilling method is efficient at drilling through unconsolidated deposits at this Site and has previously demonstrated success at collecting intact, continuous geologic cores for visual identification of DNAPL impacts.

Core Descriptions/Characterization

A detailed description/evaluation of geologic cores collected from boreholes will be performed. The description of the cores will include the following: 1) Measure volatile organic vapors (VOCs) using a photo-ionization detector (PID); 2) Describe lithologies based on the Unified Soil Classification System (USCS); 3) Classify relative permeabilities and DNAPL saturations. The data obtained from the cores will be analyzed for the 3-dimensional spatial extent of DNAPL using visualization software (see Section 3.1.4). Real-time results of the spatial analysis will be used to locate additional boreholes, if needed, to further delineate the vertical and horizontal extent of DNAPL in the former North Lagoon and Drip Track areas.

Relative DNAPL impacts will be evaluated using the following numerical rating used in the former Process Area and South Lagoon characterizations:

1 -- “DNAPL not observed” – no evidence, such as staining or liquid DNAPL, is observed in the core. Low PID readings possible;

2 -- “Elevated PID measurements observed” – PID measurements taken from the core are elevated above baseline values; often accompanied by creosote-like odors;

3 -- “Limited residual DNAPL Staining observed” – the sediments are discolored consistent with contact with DNAPL; staining is often accompanied by creosote-like odors;

4 -- “Heavy residual DNAPL Staining observed” – minimal or no staining on core sleeve; and

5 -- “DNAPL present above residual saturation” – DNAPL flows freely from the core material.

Boring Locations

Preliminary boring locations will be established by first surveying the corner points of the grid lines shown in **Figures 9 and 10** and setting temporary metal or wooden stakes at the corners and every 60 feet along the perimeter of the grid, using the southwestern corner as the starting point. In addition, a north-south transect will be run through the middle portion of the former North Lagoon area to assist with locating investigative borings for this source area. The end points of this middle transect line will be surveyed, and temporary metal and wooden stakes will be installed every 60 feet along the center line. These surveyed stakes will be used to determine the locations of the borings, with a target accuracy of +/- 2.5 feet. Individual boring locations will be established by measuring distances from the survey lines with a tape measure.

Phase 1 Borings

The investigation/characterization program will be conducted in a phased approach to reduce the number of unnecessary borings. It is anticipated that a total of approximately 56 borings will be installed in the former North Lagoon and a total of approximately 35 borings will be installed in the former Drip Track area (**Figures 9 and 10**). Initially, approximately 25 Phase 1 boring will be installed in each of these two source areas to delineate DNAPL impacts horizontally and vertically from land surface to the top of the HG middle clay unit (**Figures 9 and 10**). Data collected from these borings will be combined with existing boring data and incorporated into the EVS© model to project DNAPL distributions. The model projected DNAPL distributions will be utilized to locate the Phase 2 characterization borings (approximately 31 borings in former North Lagoon and 10 borings in former Drip Track area). **Figures 9 and 10** show preliminary locations of potential Phase 2 characterization borings that may be revised after the Phase 1 results have been analyzed.

The initial approximately 25 borings in each of the source areas will be drilled to the top of the HG middle-clay unit. Depending on the depth of DNAPL impacts observed in the initial borings and DNAPL distributions projected by the EVS© model, a request may be made to limit the depth of future borings in select areas. If DNAPL impacts are consistently shallow in select areas of the source, there is no technical reason to extend borings below the impacted depths and potentially open future preferential pathways for constituent migration.

Phase 2 Borings

The Phase 2 boring installations will be performed during the same field mobilization immediately following the completion of the Phase 1 borings. The locations of the Phase 2 borings shown in **Figures 9 and 10** will be revised based on updated DNAPL distributions established from Phase 1 and the EVS modeling. Beazer will provide the EPA with an updated figure showing proposed locations for Phase 2 borings prior to starting the Phase 2 borings.

It is currently assumed that approximately 31 borings will be installed in the former North Lagoon and approximately 10 borings will be installed in the former Drip Track area during the Phase 2 installations. The limited 2013 characterization of the former North Lagoon indicated that DNAPL impacts extended to approximately the top of the HG middle-clay unit (65 to 70 feet below ground surface (bgs)) near the center of the former North Lagoon and extend to less than 45 feet in depth near the source area periphery. The majority of the potentially mobile DNAPL in the former Drip Track area is believed to be restricted to the Surficial Aquifer on the southern end of this source area. The central and northern portions of this source area have isolated pockets of potentially mobile DNAPL in the UH at depths of less than 45 to 50 feet. Depending on the results of the Phase 1 investigation, a request may be made to the EPA to limit the depths of Phase 2 borings to 10 feet below observed DNAPL impacts.

After all geologic descriptions, field measurements and photographs are completed on the cores, they will be disposed as Investigative Derived Waste (IDW).

3.1.3 Temporary Investigation Point Installation

The TIP/wells will be installed in the former North Lagoon and Drip Track area at locations where core samples with DNAPL characterization ratings of 4 or 5 are present over vertical distances of several feet, or as otherwise determined by the field geologist/engineer as likely to yield recoverable DNAPL in a TIP. The depth for completing the TIP/wells will be based on depth of observed DNAPL impacts. The actual TIP/well completion depths and screened intervals will be based on observed DNAPL in the core but will not exceed the depth to the top of the HG middle clay.

It is anticipated that only one TIP/well will be installed at a location. However, if mobile DNAPL is believed to be present over an interval longer than 10 feet, the field geologist/engineer may determine that more than one TIP/well (at different depths) should be installed at a specific location.

The TIP/wells will be installed by advancing a nominal 6-inch diameter borehole to total depth. The TIP/wells will be constructed with open-ended, 1-inch inside diameter (ID), schedule-80 polyvinyl chloride (PVC) casing. The lower 8 feet of casing will be perforated by cross drilling 3/32-inch diameter holes through the casing approximately every 6 inches. The TIP/wells will be installed inside of the sonic override casing to ensure borehole integrity during TIP/well construction. The 1-inch ID TIP/wells will be constructed by assembling the flush-joint, threaded casing together as it was lowered inside of the override casing.

After the well screen and casing are installed inside of the override casing, annular backfill material will be poured between the well casing and override casing. A tremie pipe is not needed for the placement of the filter sand because the override casing acts as an effective tremie pipe. The filter pack will consist of 1/8- to 1/4-inch pea gravel that will be placed from the bottom of the borehole to approximately 2 feet above the top of the cross-drilled holes in the casing. Approximately 2 feet of coarse sand will be placed above the filter pack, and approximately 2 feet of fine sand will be placed above the top of the coarse sand. A 2-foot bentonite seal will be installed above the fine sand and allowed to hydrate for a minimum of 30 minutes. The remainder of the borehole annulus from the top of the bentonite seal to ground surface will be backfilled with cement-bentonite grout pumped through a tremie pipe placed immediately above the upper bentonite seal. Grouting will be completed to ground surface by incrementally removing sections of the override casing as the grouting progresses to the bentonite seal. After grout returns are noted at land surface, the override casing will be completely removed from the borehole and additional grout will be added, as necessary.

The 1-inch ID TIP/well casings will extend approximately 1 foot above grade. The top of the casing will be fitted with a threaded cap. After installation, the TIP/well locations will be surveyed, and the elevation of the TIP casings will be surveyed to within 0.01-foot vertical accuracy.

Borings not completed with a TIP/well will be abandoned by backfilling with a cement-bentonite grout mixture (6.5 gallons per 94 lbs sack of cement with 3 to 5 percent bentonite). The grout mixture will be placed starting at the bottom of the boring using a tremie pipe or equivalent.

<u>Development TIP/Wells</u>

The development of TIP/wells will be limited to a gentle removal of fine-grained material via surging and pumping with a peristaltic pump. It is important that the development of the

TIP/wells not result in piping of fine-grained material from the formation into the TIP/well. Alternatively, a disposable bailer can be used in place of the peristaltic pump during development.

3.1.4 EVS© Model Development

Utilizing data and observations collected from the North Lagoon and Drip Track characterization, the 3-dimensional distribution of DNAPL in both the SA and the UH will be evaluated using the EVS© model. The DNAPL relative saturations (See Section 3.1.2) will be utilized by the model to project DNAPL impacts.

The model will be used to display relative DNAPL impacts in 3-dimensions. An example of the data collected during the 2013 DNAPL characterization of the North Lagoon and Drip Track, and a 3-dimensional schematic of the investigation boreholes is presented in **Figures 7 and 8**. Borehole major lithologies and relative permeability data will be utilized by the EVS© model to help in the identification of potential "geologic traps" for DNAPL accumulation. These data will assist in the identification of free-phase DNAPL impacts requiring remediation.

3.1.5 DNAPL Recovery TIP/Wells

The primary objective of the new/existing DNAPL recovery TIP/wells is to provide baseline and DNAPL recovery data as a metric for DNAPL mobility reduction assessment. The TIP/wells will also help reduce easily recoverable DNAPL mass prior to the remedy implementation. DNAPL recovery TIP/well installation details and procedures are provided in Section 3.1.3 and **Appendix A** of this workplan.

DNAPL will be removed from the TIP/wells on a bi-weekly basis using the DNAPL recovery procedures detailed in the Comprehensive Groundwater Management and Sampling Analysis Plan (CGMSAP) (FTS and Tetra Tech, 2010; revised 2018). All pre- and post-removal depths to water and DNAPL will be recorded. In addition, total volumes of DNAPL and water removed from the wells will be monitored. Similar to DNAPL recovery in the former Process Area and South Lagoon, DNAPL will be removed via a peristaltic pump to minimize disturbance of the DNAPL/water column. If the depth to water/DNAPL in the new TIP/wells is too great for the use of a peristaltic pump, disposable bailers will be used to remove DNAPL from the TIP/wells. DNAPL recovery activities will commence approximately 2 to 4 weeks following all TIP/well completion and will continue through the project performance assessment phase.

3.2 Equipment Decontamination and IDW

3.2.1 Equipment Decontamination

A thorough decontamination of downhole equipment between each Geoprobe investigative borehole is not critical given that the investigation will be performed in the former source area. Concern with cross-contamination between boreholes is not a major issue because areas with mobile DNAPL will be treated. All downhole drilling equipment will be thoroughly decontaminated prior to the equipment arriving on Site and following the investigative boring program. Decontamination between investigative boreholes will be on an as needed basis at the discretion of the on-Site geologist. Gross DNAPL contamination on downhole equipment will be removed; however, a thorough decontamination is not planned or needed during this investigation.

3.2.2 INVESTIGATIVE DERIVED WASTE

All wastewater and soil generated during the activities described in this workplan will be containerized in drums or bulk tanks. The aqueous fractions from drums or bulk tank(s) will be mixed with influent water from the on-going groundwater extraction system and treated on-Site, prior to discharging to the permitted POTW. Soils and rock cuttings will be staged in sealed drums for off-Site disposal.

4.0 PERMIT REQUIREMENTS

All necessary permits will be obtained prior to the implementation of this project. The only permit required for this work will be from the St. Johns River Water Management District (SJRWMD) for the TIP/well construction.

The SJRWMD is responsible for the issuance of permits for TIP/well construction at the Site. All forms and associated fees associated with obtaining permits from SJRWMD will be completed by the drilling contractor prior to mobilizing to the Site.

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5.0 PROJECT MANAGEMENT

The project management plans that will be utilized to guide the work outlined in this section will include the following documents:

1) Health and Safety Plan (HASP); and
2) CGMSAP.

Health and Safety Plan

A project-specific HASP was prepared by Tetra Tech (2017); the HASP will be updated to reflect the scope of work detailed in this workplan. This HASP establishes the procedures and requirements used to minimize health and safety risks to persons working on the project. The HASP meets the requirements of the Occupational Safety and Health Administration (OSHA) Standard, 29 CFR 1910.120 and 29 CFR 1926.65, “Hazardous Waste Operations and Emergency Response”.

In addition to the plan prepared or amended under this workplan, subcontractors will be required to prepare HASPs that are specifically focused on their specialized activities. These plans will include Job Hazard Analyses and MSD forms for any materials that may be required to complete the specified task.

Comprehensive Groundwater Management and Sampling Analysis Plan

The CGMSAP will be used for monitoring data collection and handling. This plan will be amended, if necessary, to accommodate any new sampling procedures required for this fieldwork (FTS and Tetra Tech, 2010; revised 2018).

6.0 REPORTING, SCHEDULE AND COMMUNITY RELATIONS

6.1 REPORTING

The former North Lagoon and Drip Track Characterization report will detail the investigations and EVS© model results. This report will be submitted prior to a meeting and/or call with the EPA and Stakeholders to discuss results.

6.2 SCHEDULE

The schedule assumes that fieldwork will begin in late November 2018. The field investigation will require approximately 2 months to complete.

The schedule for implementation of this work plan will be dependent on regulatory approval and subcontractor availability.

7.0 REFERENCES

Adventus, 2003, Final Report, Phase One Field Demonstration of In Situ Biogeochemical Stabilization (ISBS) For Creosote/Penta Residuals (NAPL), Koppers Inc., Denver, Colorado, October 8, 2003.

Adventus, 2008, Adventus Americas, Inc., Phase I ISBS Field Pilot Study Report, Cabot Carbon/Koppers Superfund Site, Gainesville, Florida, March 31, 2008.

Adventus, 2009, Adventus Americas, Inc., Final Report ISBS Pilot Study – Field Performance Assessment, Cabot Carbon/Koppers Superfund Site, Gainesville, Florida, January 30, 2009.

FTS and Tetra Tech, 2010, Comprehensive Groundwater Monitoring and Sample Analysis Plan, Cabot Carbon/Koppers Superfund Site, Gainesville, Florida, Revision 6, August 20, 2018.

GeoTrans, 2004a, 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, 2004b, Addendum 6: Groundwater Flow and Transport Model, Draft Report, Koppers, Inc. Site, Gainesville, Florida, October, 2004.

GeoTrans, 2005, Addendum to the Floridan Aquifer Monitoring Program, Supplemental Upper Floridan Aquifer Monitoring Well Installation, Koppers, Inc. Site, Gainesville, Florida, February 28, 2005.

GeoTrans, 2009, Supplemental 2009 Hawthorn Group Investigation and Monitoring Well Installation Report, Koppers Inc. Site, Gainesville, Florida, August 14, 2009.

Tetra Tech, 2012, Former Process Area In-Situ Geochemical Stabilization Remediation Demonstration Project Workplan for Hawthorn Group Deposits, Former Koppers Inc. Site, Gainesville, Florida, February 14, 2012.

Tetra Tech, 2013, Former Process Area In-Situ Geochemical Stabilization Remediation Demonstration Project: Phase I Characterization, Former Cabot Carbon/Koppers Inc. Site, Gainesville, Florida, November 13, 2013.

Tetra Tech, 2014, Pre-Final Design for Former Process Area In-Situ Geochemical Stabilization Remediation, Former Cabot Carbon/Koppers Inc. Site, Gainesville, Florida, September 26, 2014.

Tetra Tech, 2018a, Phase 1 Results for the Former South Lagoon Preliminary Design and Design Investigation Workplan Implementation, Former Cabot Carbon/Koppers Superfund Site, Gainesville, Florida, January 9, 2018.

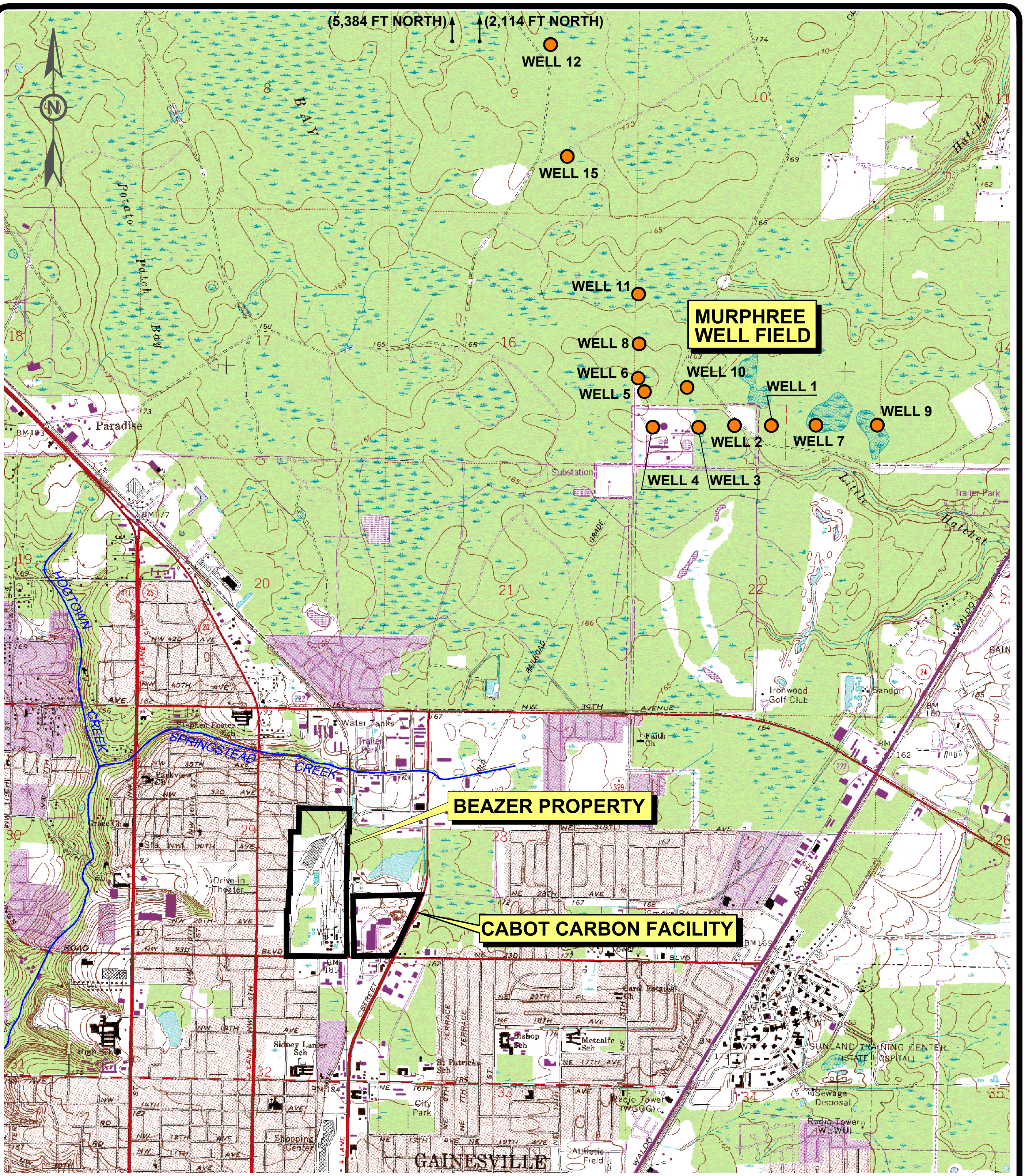
Tetra Tech, 2018b, Phase II Results for the Former South Lagoon Preliminary Design and Design Investigation Workplan Implementation, Former Cabot Carbon/Koppers Inc. Site Gainesville, Florida, February 23, 2018.

Tetra Tech, 2017, Health and Safety Plan for Cabot Carbon/ Koppers Superfund Site, Gainesville, Florioda,2016-2017 Site-Wide Activities, Revision 6, July 2017.

TRC, 2003. TRC Environmental Solutions, Inc., Addendum Hawthorn Group Field Investigation Report, Cabot Carbon/Koppers Superfund Site, Gainesville, FL, August 2003

U.S. EPA, 2011. Record of Decision, Summary of Remedial Alternative Selection, Cabot Carbon/Koppers Superfund Site, Gainesville, Alachua County, Florida, February 2011

FIGURES



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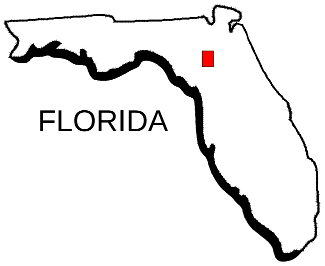

TITLE:

SITE LOCATION MAP

LOCATION:

Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

TETRA TECH

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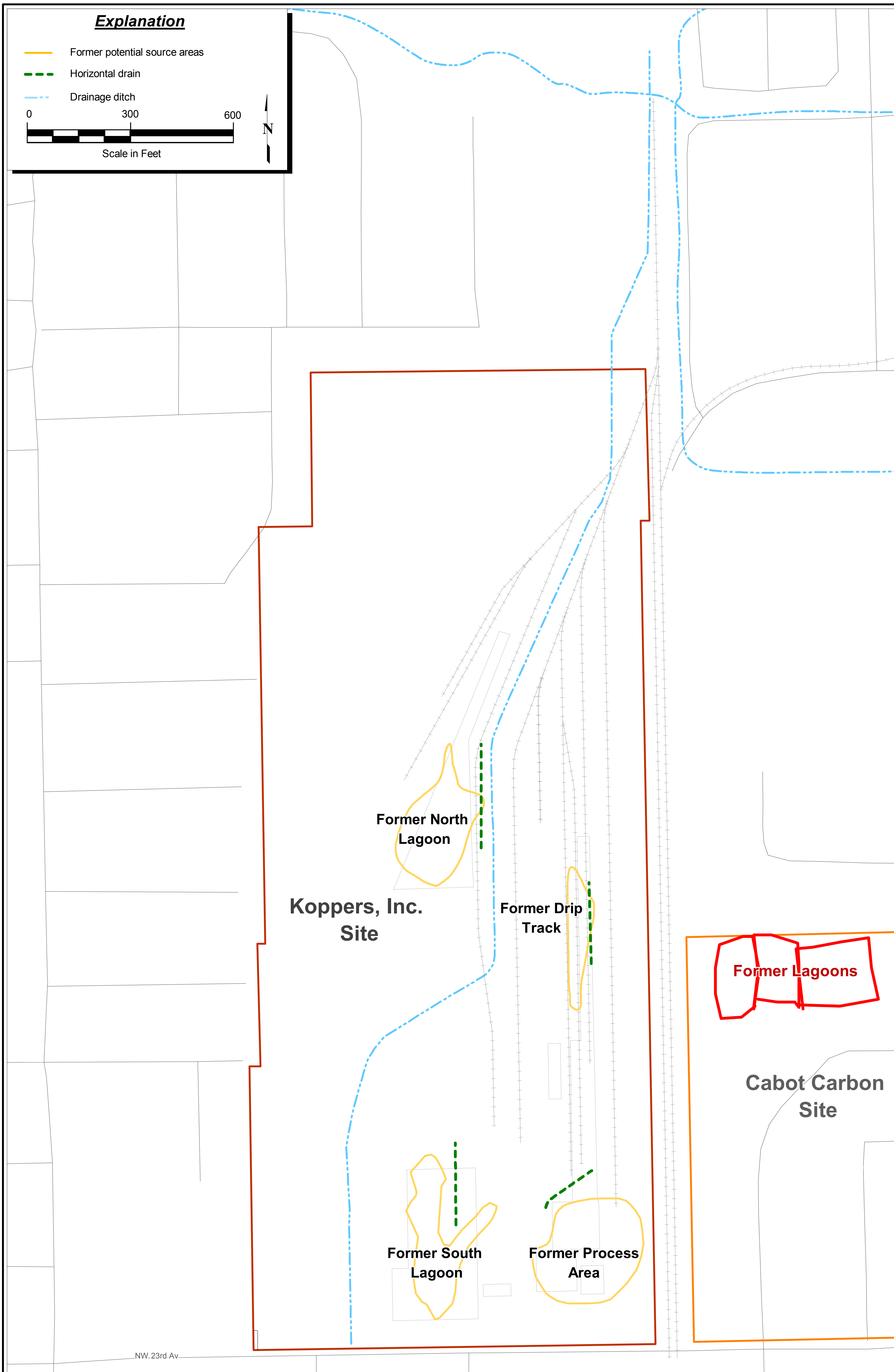

TITLE:	SITE SOURCE AREA LOCATIONS
LOCATION:	Cabot Carbon/Koppers Superfund Site, Gainesville, Florida

TETRA TECH

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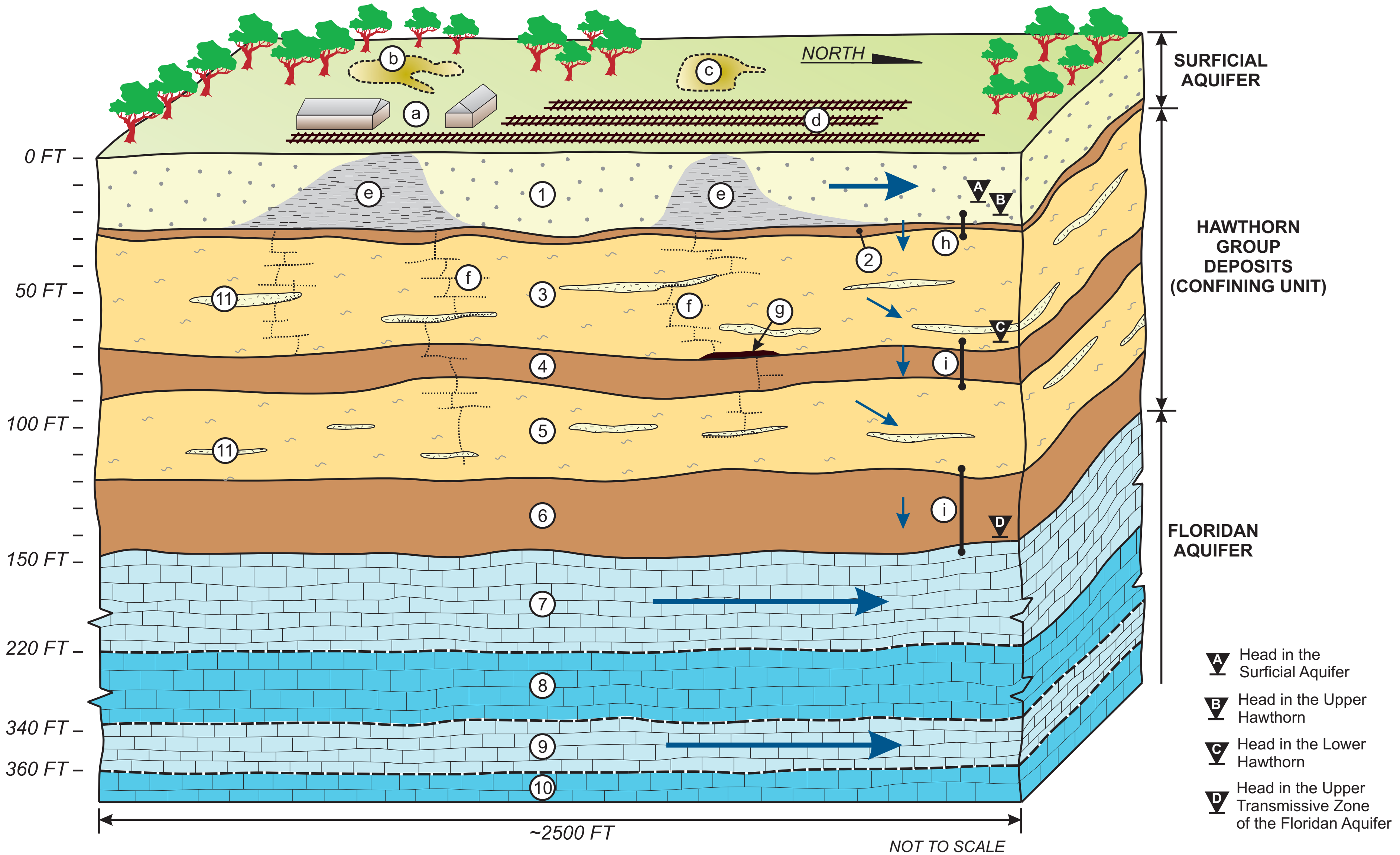


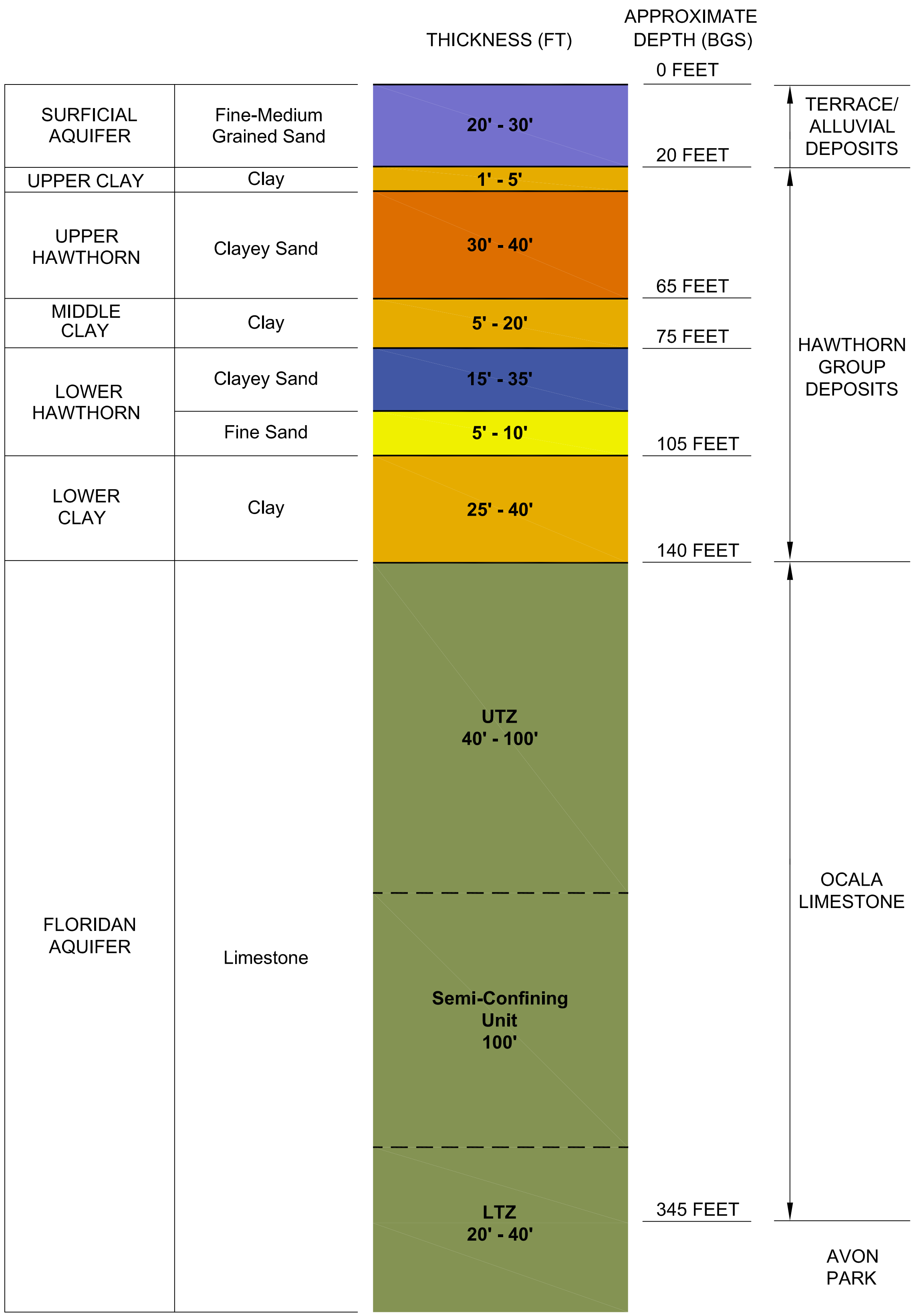
1) Surficial Aquifer
2) Hawthorn Group - Upper Clay
3) Hawthorn Group - Upper Hawthorn
4) Hawthorn Group - Middle Clay
5) Hawthorn Group - Lower Hawthorn
6) Hawthorn Group - Lower Clay
7) Floridan Aquifer - Upper Transmissive Zone
8) Floridan Aquifer - Semi-Confining Zone
9) Floridan Aquifer - Lower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

Note:
There are uncertainties associated with the conceptual understanding presented in this figure.

GROUNDWATER FLOW
(SIZE INDICATIVE OF APPROXIMATE RELATIVE MAGNITUDE)

Figure 3.
Conceptual Block Diagram
Cabot Carbon/Koppers Superfund Site, Gainesville, Florida



TITLE: HYDROSTRATIGRAPHY OF DEPOSITS BENEATH SITE

LOCATION: Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

TETRA TECH

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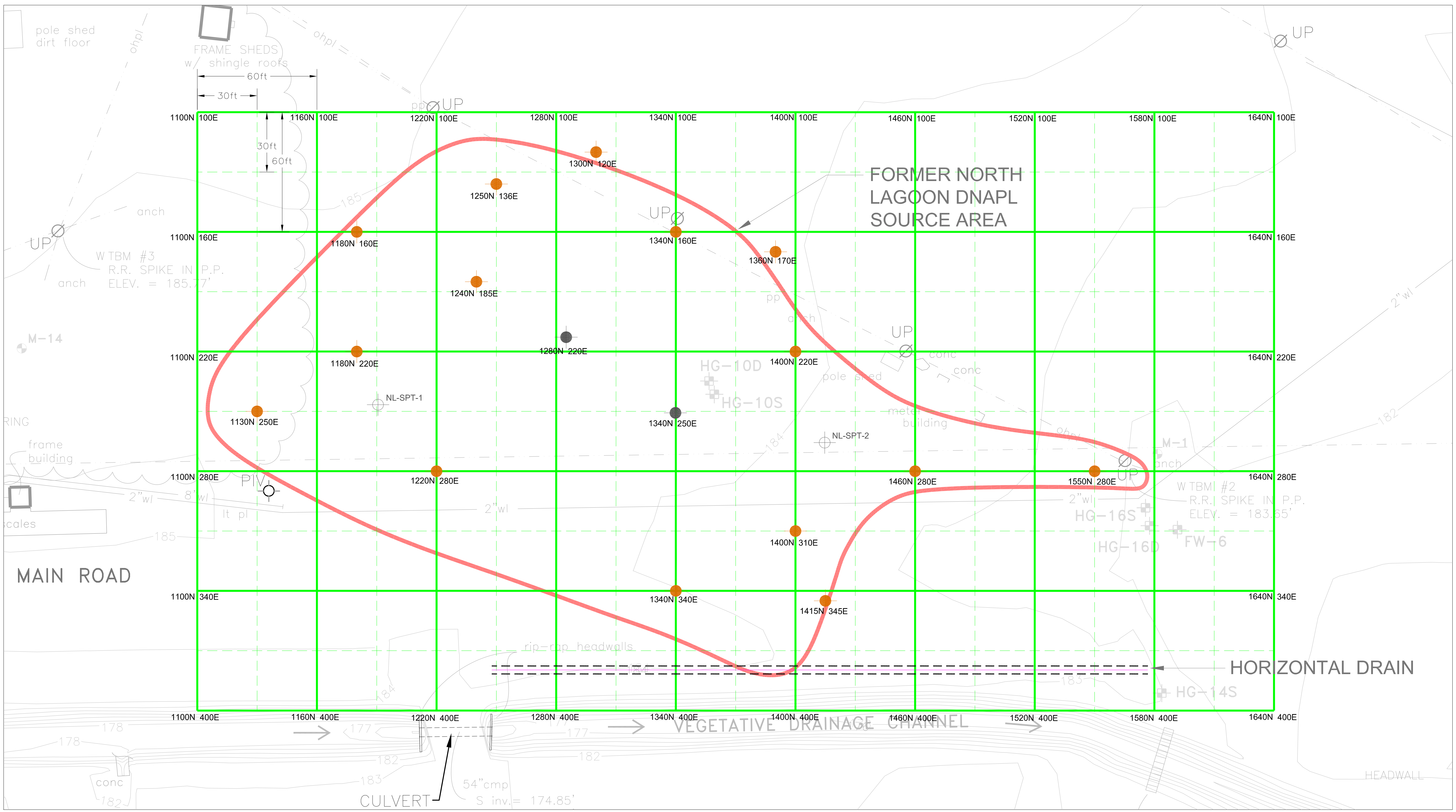

EXPLANATION

- DNAPL CHARACTERIZATION BORING (FIELD LOCATED)
- TEMPORARY INJECTION POINT (TIP) / DNAPL CHARACTERIZATION BORING (SURVEYED)
- GEOTECHNICAL BORING (FIELD LOCATED)
- LATERAL EXTENT OF DNAPL SOURCE-AREAS WITHIN THE SURFICIAL AQUIFER PROJECTED VERTICALLY TO THE SURFACE
- GRID FOR DNAPL CHARACTERIZATION BORINGS

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TITLE: LOCATIONS OF FORMER NORTH LAGOON CHARACTERIZATION BORINGS AND TIPS

LOCATION: Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

TETRA TECH

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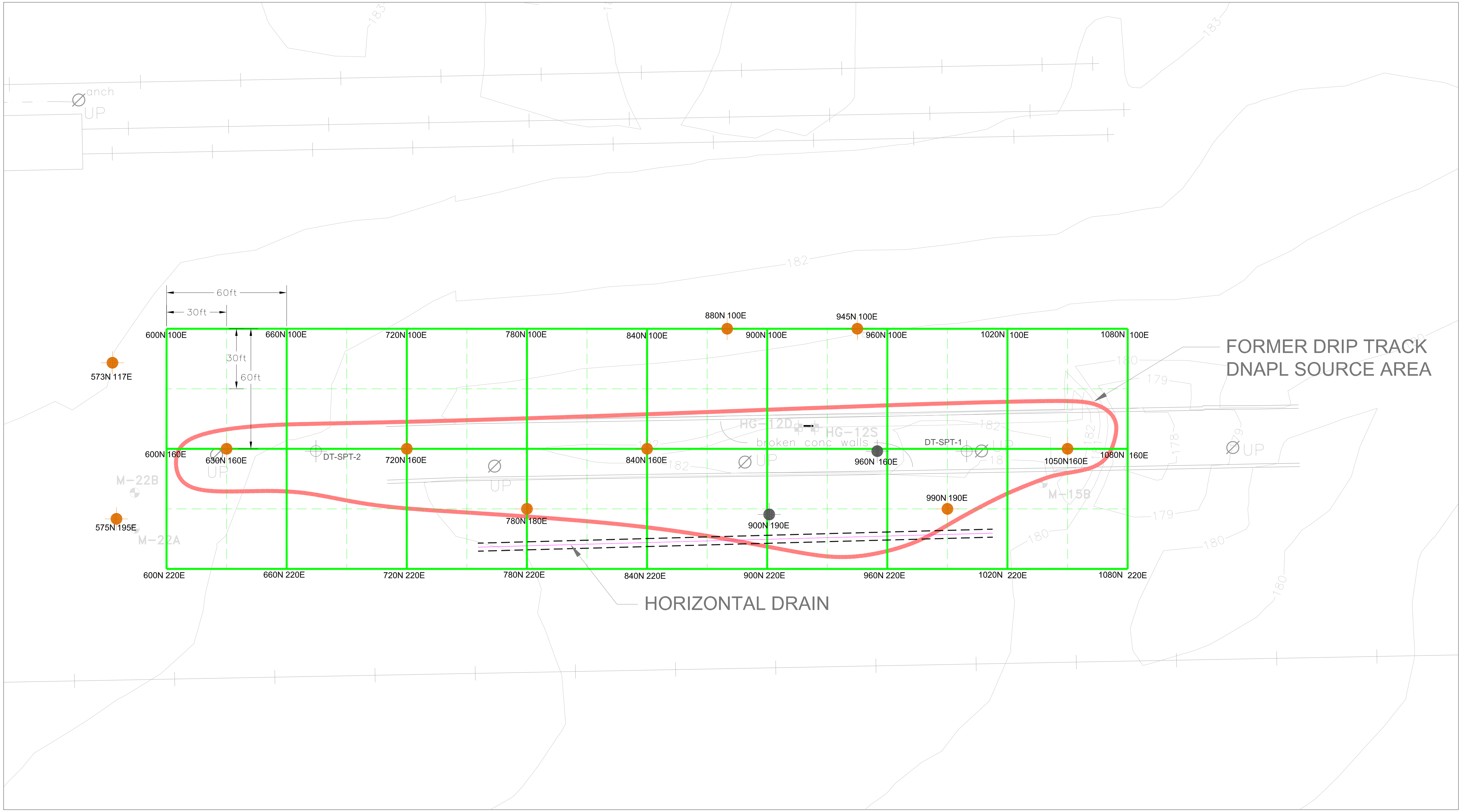

EXPLANATION

- DNAPL CHARACTERIZATION BORING (FIELD LOCATED)
- TEMPORARY INJECTION POINT (TIP) / DNAPL CHARACTERIZATION BORING (SURVEYED)
- GEOTECHNICAL BORING (FIELD LOCATED)
- LATERAL EXTENT OF DNAPL SOURCE-AREAS WITHIN THE SURFICIAL AQUIFER PROJECTED VERTICALLY TO THE SURFACE
- GRID FOR DNAPL CHARACTERIZATION BORINGS

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TITLE: LOCATIONS OF FORMER DRIP TRACK CHARACTERIZATION BORINGS AND TIPS

LOCATION: Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

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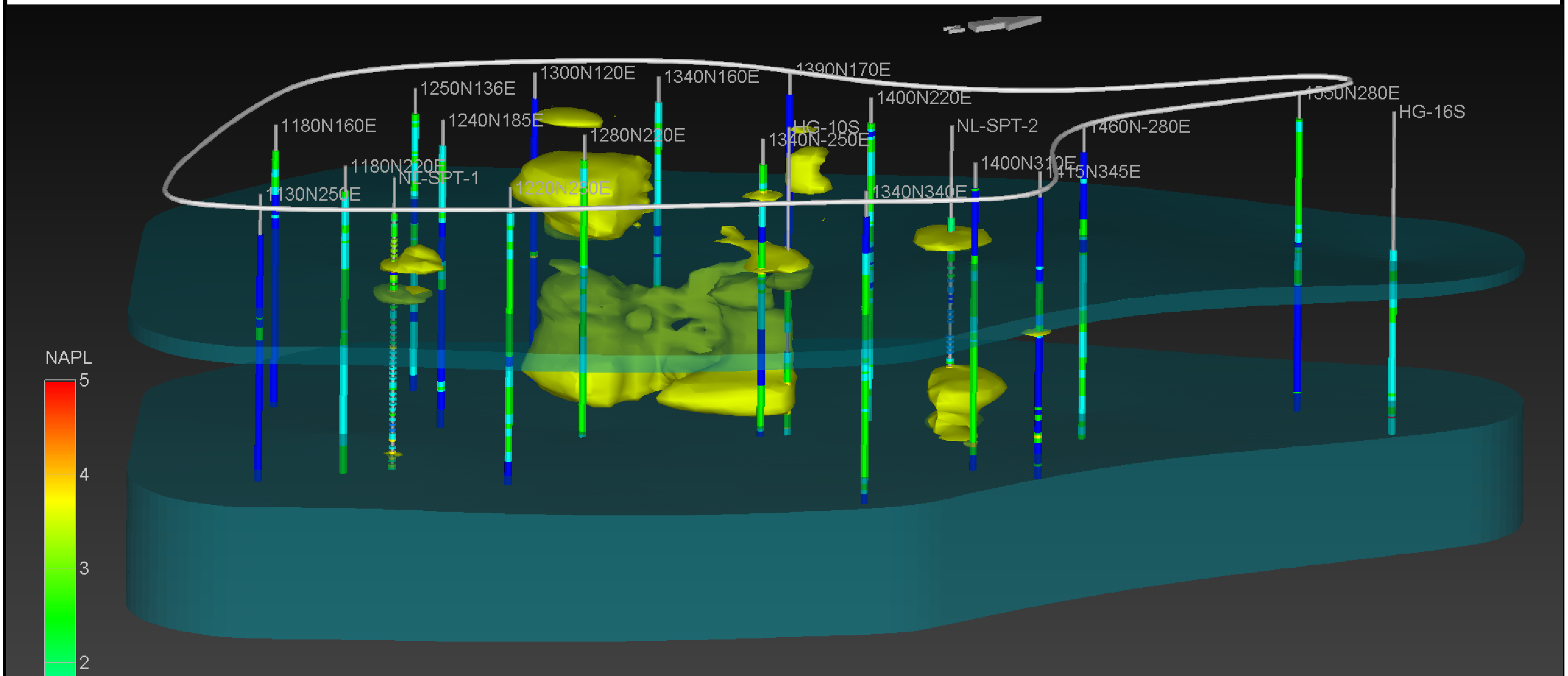

North Lagoon Borings with NAPL Categories
(NAPL Body > 3.6)

Explanation:

- Projected DNAPL Impact
- No Recovery
- DNAPL Rating 1
- DNAPL Rating 2
- DNAPL Rating 3
- DNAPL Rating 4
- DNAPL Rating 5

Notes:
1. DNAPL represented for kriged DNAPL-rating values of greater than or equal to 3.6.
2. DNAPL rating 5 indicates the highest value and DNAPL rating 1 indicates the lowest value.

TITLE:
2013 EVS 3D visualization of DNAPL distribution former North Lagoon

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

TETRA TECH

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PROJECT#	117-2201303
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FIGURE
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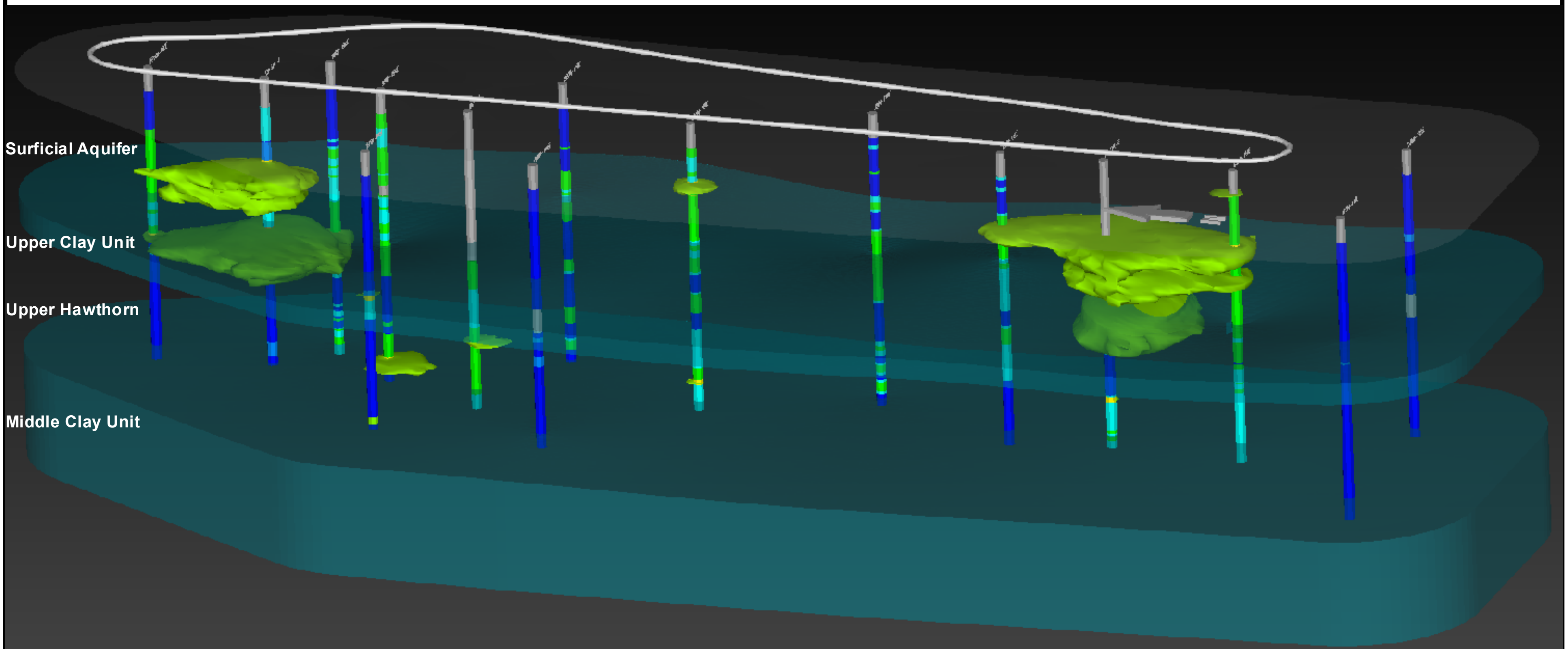

Explanation:

- Projected DNAPL Impact
- No Recovery
- DNAPL Rating 1
- DNAPL Rating 2
- DNAPL Rating 3
- DNAPL Rating 4
- DNAPL Rating 5

Notes:
1. DNAPL represented for kriged DNAPL-rating values of greater than or equal to 3.6.
2. DNAPL rating 5 indicates the highest value and DNAPL rating 1 indicates the lowest value.

TITLE:
2013 EVS 3D visualization of DNAPL distribution former Drip Track

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

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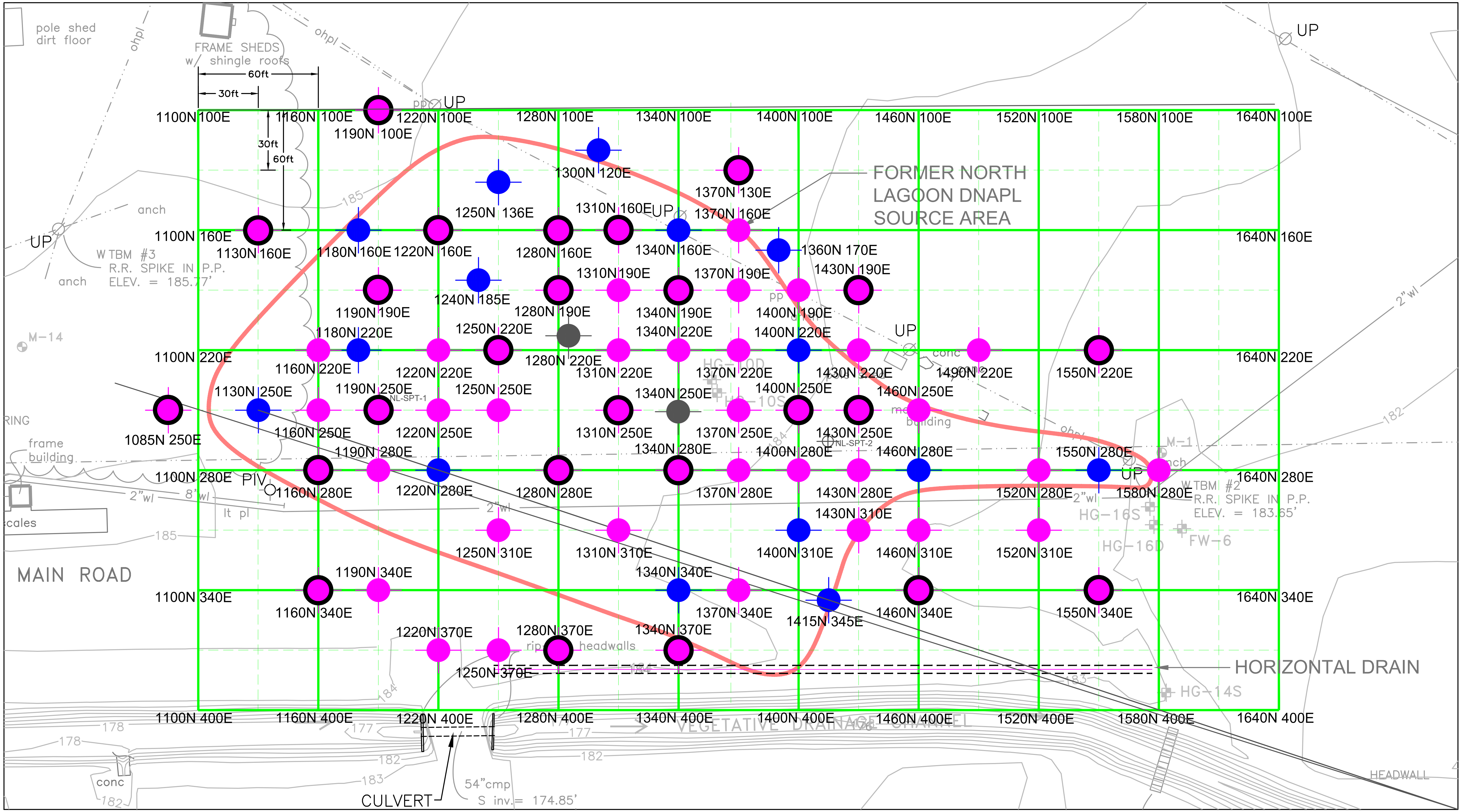

EXPLANATION

- 2013 DNAPL CHARACTERIZATION BORING
- 2013 TEMPORARY INVESTIGATION POINTS (TIPS)/ DNAPL CHARACTERIZATION BORING
- 2013 GEOTECHNICAL BORING
- PROPOSED 2018 PHASE 1 BORING LOCATIONS
- PROPOSED 2018 PHASE 2 BORING LOCATIONS*
- LATERAL EXTENT OF DNAPL SOURCE-AREAS WITHIN THE SURFICIAL AQUIFER PROJECTED VERTICALLY TO THE SURFACE
- GRID FOR DNAPL CHARACTERIZATION BORINGS

*PHASE 2 BORING LOCATIONS MAY BE ADJUSTED BASED ON RESULTS FROM PHASE 1 CHARACTERIZATION BORINGS AND INTERIM EVS MODEL RESULTS

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TITLE: PROPOSED CHARACTERIZATION BORINGS AND TIPS FOR THE FORMER NORTH LAGOON

LOCATION: Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

TETRA TECH

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DATE	10/5/2018		

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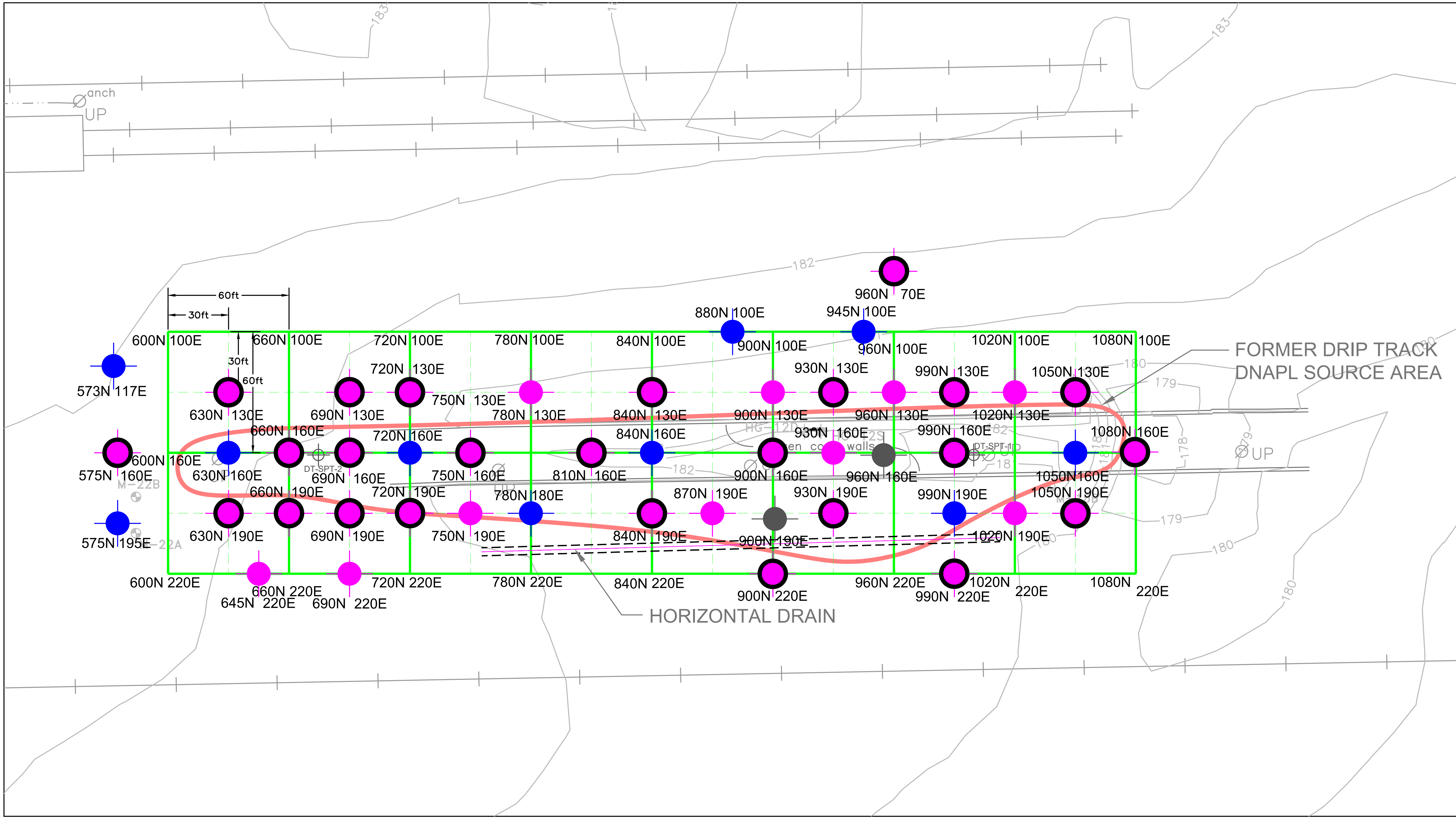

EXPLANATION

- 2013 DNAPL CHARACTERIZATION BORING
- 2013 TEMPORARY INVESTIGATION POINTS (TIPS)/ DNAPL CHARACTERIZATION BORING
- 2013 GEOTECHNICAL BORING
- PROPOSED 2018 PHASE 1 BORING LOCATIONS
- PROPOSED 2018 PHASE 2 BORING LOCATIONS*
- LATERAL EXTENT OF DNAPL SOURCE-AREAS WITHIN THE SURFICIAL AQUIFER PROJECTED VERTICALLY TO THE SURFACE
- GRID FOR DNAPL CHARACTERIZATION BORINGS

*PHASE 2 BORING LOCATIONS MAY BE ADJUSTED BASED ON RESULTS FROM PHASE 1 CHARACTERIZATION BORINGS AND INTERIM EVS MODEL RESULTS

N

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SCALE IN FEET

TITLE: PROPOSED CHARACTERIZATION BORINGS AND TIPS FOR THE FORMER DRIP TRACK AREA

LOCATION: Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

TETRA TECH

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FIGURE: 10

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APPENDIX A

TEMPORARY INVESTIGATION POINT INSTALLATION PROCEDURES

APPENDIX A

TEMPORARY INVESTIGATION POINT/WELL INSTALLATION PROCEDURES

FORMER KOPPERS INC. SITE
GAINESVILLE, FLORIDA

TABLE OF CONTENTS

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2.3 EQUIPMENT DECONTAMINATION.......... 3
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LIST OF FIGURES

Figure 1. Temporary investigation points/wells conceptual design.

1.0 INTRODUCTION

This document provides procedures for the installation of the temporary investigation points (TIPs)/wells for ISGS reagent injection at the former Koppers Inc. portion of the Cabot Carbon/Koppers Superfund Site in Gainesville, Florida (the Site).

The objective of the TIP/well installation is to facilitate injection of the ISGS reagent. These wells will allow longer-term injections and/or recurring injections. The use of these points will be fully explored during Phase I site characterization when injection tests will be used to determine whether formation characteristics are suited to the use of these points or other methods of injection. Upon program completion they will be abandoned by grouting.

2.0 TEMPORARY INVESTIGATION POINT/WELL CONSTRUCTION

2.1 DRILLING AND TIP/WELL COMPLETION

Prior to drilling, the TIP/well locations will be staked, and the necessary permits will be obtained. Sunshine State One Call (SSOC) will be contacted (as required by law) for utility clearance of the site. The SSOC will locate utilities coming into Site; however, they will not have located utilities on the Site. Because historic subsurface structures are known to exist at the Site, the on-Site subsurface structures will be located by a private locating service. Additionally, the borings will be advanced by hand auger or vacuum drilling to a depth of 4 to 5 feet to help ensure that shallow subsurface utilities are not present in the TIP/well locations.

Continuous approximate 4-inch diameter soil/rock core will be collected from all TIP/well borings and logged by the oversight geologist/engineer to characterize DNAPL impacts and lithology. Core will be described and photographed before disposing of the core with the drill cuttings. Core samples will not be saved and stored, since sufficient on-Site core currently exists for the deposits. The TIP/well completion depth and screened intervals will be based on depth of observed DNAPL impacts, but TIP/well depths will not exceed the depth to the top of the HG middle clay. Because the TIP/wells will be installed as part of a program to immobilize DNAPLs, they will not be constructed using isolation casings.

The TIP/wells will be installed by advancing a nominal 6-inch diameter borehole to total depth. The TIP/wells will be constructed with no cap on the bottom of the casing (i.e.open-ended), 1-inch, schedule-80 PVC casing. The lower 8 feet of casing will be perforated by cross drilling 3/32-inch diameter holes through the casing approximately every 6 inches. The TIP/wells will be installed inside of the sonic override casing to ensure borehole integrity during TIP/well construction. The 1-inch diameter TIP/wells will be constructed by assembling the flush-joint, threaded casing together as it was lowered inside of the override casing.

The TIP/well screen and casing will be installed inside of the override casing. Annular backfill material will be poured between the well casing and override casing. A tremie pipe will not be used for the placement of the filter pack because the override casing acted as an effective tremie pipe. The filter pack will consist of 1/8- to 1/4-inch pea gravel placed from the bottom of the borehole to approximately 2 feet above the top of the cross-drilled holes in the casing. Approximately 2 feet of coarse sand will be placed above the filter pack, and approximately 2 feet of fine sand will be placed above the top of the coarse sand. A 2-foot bentonite seal will be installed above the fine sand. The remainder of the borehole annulus from the top of the bentonite seal to ground surface will be backfilled with cement-bentonite grout pumped through a tremie pipe placed immediately above the upper bentonite seal. Grouting will be completed to ground surface by incrementally removing sections of the override casing as the grouting progresses. Once grout returns are noted at land surface, the remainder of the override casing will be removed from the borehole and additional grout will be added to top it off at land surface. The conceptual TIP/well design is provided in **Figure 1**.

2.2 CASING GROUT

The grout slurry to be used in TIP/well casing installation will consist of ASTM Type I Portland cement, powdered bentonite, and potable city water. The cement will first be mixed into a smooth slurry using 6 to 7 (per ASTM) gallons of water for each 94-pound bag of cement; 5 pounds of powdered bentonite will be added to the cement mixture to minimize cement shrinkage during the curing process. The grout will be allowed to cure a minimum of 12 hours prior to additional work being performed inside of the casing.

2.3 EQUIPMENT DECONTAMINATION

A thorough decontamination of downhole equipment between each investigative borehole is not critical given that the investigation will be performed in the former source area. Concern with cross-contamination between boreholes is not an issue since areas with mobile DNAPL will be treated. All downhole drilling equipment will be thoroughly decontaminated prior to the equipment arriving on Site and following the investigative boring program. Decontamination between investigative boreholes will be on an as needed basis at the discretion of the on-Site geologist. Gross DNAPL contamination on downhole equipment will be removed; however, a thorough decontamination is not planned or needed during this investigation.

2.4 TIP/WELL SURFACE COMPLETION AND DEVELOPMENT

The 1-inch diameter TIP casings will be completed by allowing the casing to stick up approximate 1 foot above grade. The top of the casing will be threaded with standard threads and a screw cap will be placed on top of each TIP casing. As-built diagrams will be constructed for each of the TIP/wells.

The development of TIP/wells will be limited to a gentle removal of fine-grained material via surging and pumping with a peristaltic pump. It is important that the development of the TIP/wells not result in piping of fine-grained material from the formation into the TIP/well. Alternatively, a disposable bailer can be used in place of the peristaltic pump during development.

2.5 TIP/WELL ABANDONMENT

After it has been determined that the TIP/wells are no longer of use to the program, they will be abandoned by backfilling with grout mixed to the specifications described above. The grout will be placed by pouring it down the inside of the 2-inch casing. All materials, wastewater and soil generated will be disposed as Investigative Derived Waste (IDW).

2.6 INVESTIGATIVE DERIVED WASTE

All wastewater and soil generated during the activities described in this workplan, including wastewater generated from drilling, development, and sampling will be containerized in drums or bulk tanks. The aqueous fractions from drums or bulk tank(s) will be mixed with influent water to the on-Site system, prior to discharging to the permitted POTW. Soils and rock cuttings will be staged in sealed drums for characterization and off-Site disposal.

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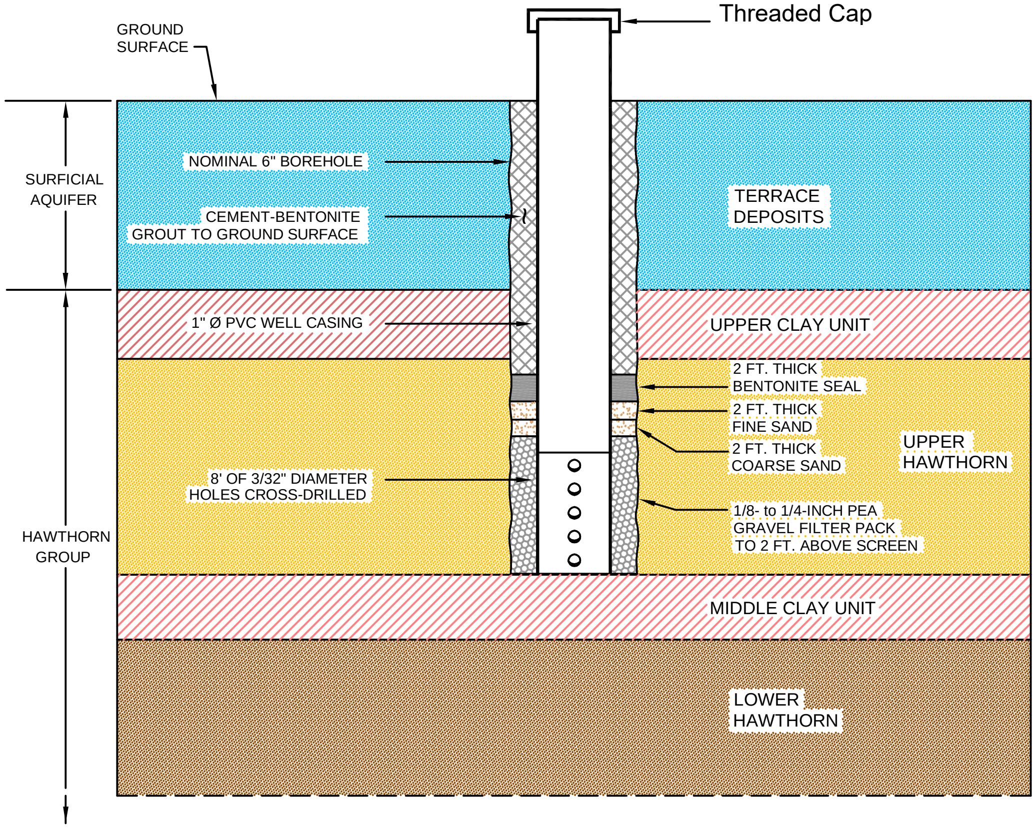

NOT TO SCALE

TITLE: CONCEPTUAL DESIGN FOR TEMPORARY INVESTIGATION POINTS/WELLS

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

TETRA TECH

CHECKED	JE	FIGURE: 1
DRAFTED	CP, DB, HF, ES	
PROJ. #	117-2201303	
DATE	11/13/13	