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February 28, 2005

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

Subject: Transmittal of Workplan Addendum to the Floridan Aquifer Monitoring Plan, Koppers Inc. Site, Gainesville, Florida

Dear Ms. Williams:

On behalf of Beazer, attached is a copy of the Draft workplan entitled "*Addendum to the Floridan Aquifer Monitoring Plan Supplemental Upper Floridan Aquifer Monitoring Well Installation, Koppers Inc. Site, Gainesville, Florida*". We welcome your comments on the enclosed draft workplan. Please feel free to contact me at (303) 665-4390, if you have any comments or questions.

Sincerely,

James R. Erickson

James R. Erickson, P.G.
Principal Hydrogeologist

James R. Erickson

For: James W. Mercer, Ph.D., P.G.
Executive Vice President
Principal Hydrogeologist
Professional Geologist FL #275

Enclosure

Cc: Kelsey Helton, FDEP
John Mousa, ACEPD
Brett Goodman, GRU
Mike Slenska, Beazer East
Tim Basilone, Koppers

ADDENDUM TO THE FLORIDAN AQUIFER MONITORING PLAN SUPPLEMENTAL UPPER FLORIDAN AQUIFER MONITORING WELL INSTALLATION

KOPPERS INC. SITE GAINESVILLE, FLORIDA

Prepared For:

Beazer East, Inc.

Prepared by:

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February 28, 2005

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1.0 INTRODUCTION

This addendum to the Floridan Aquifer Monitoring Plan (TRC, June 2004) presents the proposed monitor well installation for the Upper Floridan Aquifer monitoring network at the Koppers Inc. portion of the Cabot Carbon/Koppers Superfund Site in Gainesville, Florida (the Site). The locations of these monitoring wells were determined, in part, based on discussions with the Agencies at a meeting in Gainesville, Florida on January 19, 2005. The objective of the proposed well installation plan is to develop a monitoring well network for the Upper Transmissive (UT) and Lower Transmissive (LT) zones of the Upper Floridan Aquifer. This workplan will address the issue of the installation of monitoring wells into the lower portion of the UT zone to augment the existing 11 wells that are currently completed in the upper 30-feet of the UT zone. In addition, wells will be installed into the LT zone to monitor groundwater quality within this zone.

The proposed well installation program presented in this report is based on Site reconnaissance and review of available documentation of regional/Site hydrogeology, and previous Upper Floridan Aquifer monitoring data. Results of the recently completed groundwater Site Model (GeoTrans, 2004b) were also used to help guide the proposed locations of wells.

1.1 SITE DESCRIPTION

The Site is located in the City of Gainesville, in Alachua County, Florida (Figure 1). The Site encompasses approximately 90 acres and has been used as an active wood-treating facility for approximately 89 years. Adjacent properties include the former Cabot Carbon portion of the Superfund site to the east, private residences to the west and northwest, and commercial facilities and private residences to the north and south.

Detailed descriptions of the Site historical source areas are provided in the GeoTrans (2004a) report and the Site hydrogeologic conceptual model is provided in groundwater flow and transport modeling report (GeoTrans, 2004b).

1.2 HYDROGEOLOGY OF UPPER FLORIDAN

The Upper Floridan Aquifer underlies the Hawthorn Group at the Site. The two primary formations that comprise the Upper Floridan Aquifer are the Ocala Limestone and the Avon Park Formation (Figure 2). The LT zone is the major water-producing zone for the Murphree Wellfield and Alachua County. The LT zone is located at the contact of the Ocala Limestone and Avon Park Formations and is highly variable in thickness ranging from 20 to 100 feet (GeoSys, Inc., 2000). The UT zone is a secondary water-producing zone for the Upper Floridan Aquifer and is the uppermost portion of the Ocala Limestone. The UT zone is also highly variable ranging from 50- to 100-feet in thickness. Approximately 85 percent of the Murphree Wellfield production is derived from the LT zone and 15 percent is derived from the UT zone. The UT and LT zones are separated by approximately 100 feet of dense, low-permeability carbonate deposits that produce limited quantities of water. The regional groundwater flow direction in the Upper Floridan Aquifer is to the west and northwest; however, groundwater withdrawals at the Murphree Wellfield has changed groundwater flow directions across a large area of the county. Because of Murphree Wellfield withdrawals, the Upper Floridan Aquifer average groundwater flow direction at the Site is to the northeast.

1.3 EXISTING UPPER FLORIDAN WELLS

Currently, there are 11 Upper Floridan Aquifer wells (Figure 3) completed at or near the Site in the upper 10 to 30 feet of the UT zone (Table 1); however, GRU sentinel well MWTP-MW2 is located approximately 4,500 feet to the east-northeast of the Site and is not shown in Figure 3. Nine of these monitoring wells (FW-2 through FW-9, and GRU well MWTP-MW1) are part of the existing Floridan Aquifer Monitoring Plan (TRC, 2004). GRU monitoring well MWTP-MW2 is completed in the UT zone and is included in the GRU/County monitoring program. Monitoring well FW-1 was installed to a depth of 310 feet, with an uncased hole from 151 to 310 feet. Because of concerns that this well could act as a future conduit for the migration of constituents at the Site to the LT zone, this well was recently backfilled to a depth of approximately 166 feet (i.e., upper portion of UT zone).

The existing Upper Floridan Aquifer well construction details and screen depths in the UT zone are provided in Table 1**.**

2.0 PROJECT OBJECTIVES AND APPROACH

2.1 OBJECTIVE

The primary objective of the proposed well installation plan is to develop a monitoring well network for the Upper Transmissive (UT) and Lower Transmissive (LT) zones of the Upper Floridan Aquifer. A total of 11 monitoring wells have been installed into the upper 10 to 30 feet of the UT zone. No wells are currently completed into the lower portion of the UT zone or the LT zone. This current workplan addresses the installation of six additional wells into the lower UT and LT zones to augment the existing monitoring network. The newly installed monitoring wells, in conjunction with the existing monitoring wells will address the requirement for a comprehensive monitoring network for the Upper Floridan Aquifer.

A second objective of this program is to further investigate potential groundwater impacts downgradient of the North Lagoon and other former source areas. Monitoring well FW-6 detected elevated concentrations of Site related constituents. Four potential conceptual models for the presence of these organic constituents are: 1) Residual NAPLs, mixed with drilling fluids, were dragged-down during well installation; 2) On-going dissolved-phase transport of constituents through the lower Hawthorn clay; 3) NAPL migration through the lower Hawthorn clay, acting as an on-going source to a dissolved-phase plume; and 4) A combination of conceptual models 1 through 3. No investigative program will indisputably resolve which of the four conceptual models is correct. Additional wells in the source areas will not resolve this issue, because there is no way to distinguish dissolved-phase concentrations resulting from “drag-down” versus natural migration. In addition, the potential future harm that could result from boreholes penetrating the lower Hawthorn clay unit far outweighs any benefits of attempting to resolve the FW-6 issue. Therefore, the second objective is to address the issue of potential source area impacts to the Upper Floridan Aquifer, without compromising the lower Hawthorn clay unit in the more highly-impacted areas of the Site.

The technical challenge to the implementation of this program is to prevent new wells and boreholes from inadvertently providing future vertical conduits for the downward migration of Site constituents. One of the lessons learned from FW-6 is that even with extraordinary precautions to prevent “drag down” of constituents from overlying deposits, it is difficult to completely eliminate the potential for “drag down”. The hydraulic-head differential across the Hawthorn Group deposits is difficult to over come during well installation at the Site. All existing wells drilled into the Upper Floridan Aquifer at the Site have lost circulation upon penetrating this aquifer. Similarly, it will be difficult to ensure long-term integrity of the grout seal outside of the casing, where the possibility exists for the wells to become direct conduits for Site constituents to the Upper Floridan Aquifer. Because of these very real issues, no wells or boreholes are proposed to be drilled through the most highly-impacted source areas of the Site.

2.2 WELL LOCATIONS AND COMPLETIONS

Monitoring wells in the County indicate a downward flow component from the UT to the LT zone, with a vertical hydraulic-head difference between these zones ranging from 0.4 to 4.9 feet (GeoLogic Information Systems, 1990). Groundwater flow modeling indicates that constituents that enter the UT zone will flow laterally towards the northeast, with a potential for constituents to migrate vertically downward within this zone. The 11 existing Upper Floridan Aquifer monitoring wells at the Site are completed in the upper portion of the UT zone. Because of the potential for Site constituents to migrate to the lower portion of the UT zone, four of the new Floridan wells are proposed to be completed in the lower portion of the UT zone. Although fate and transport analyses predict that Site constituents will not migrate into the LT zone, two new wells are proposed for the LT zone to verify these analyses and to provide long-term future monitoring points. The LT zone wells will be located downgradient of the Site to maximize the potential to intercept Site-related constituents.

The thickness of the UT zone is estimated to vary from 50 to 100 feet and the thickness of the LT zone is estimated to vary from 20 to 100 feet. Both the UT and LT zones are post-depositional, secondary permeability features. The principal permeability features for the UT and LT zones are a result of secondary features such as fractures, weathering, and dissolution of carbonate rocks. Hence, the thickness of the water producing zones is highly variable over short distances. Because the thickness of the water-producing zone will be unknown prior to the installation of each well, well depths and completion intervals will be established based on geologic contacts in the Ocala Limestone and Avon Park Formations. Approximately continuous core will be collected in the Upper Floridan Aquifer to identify the top of the Ocala Limestone and the contact with the Avon Park Formation. The well completion depth and open intervals will be based on the depths to these geologic contacts. The well open-hole intervals will be based on the assumption that the water-producing interval for the UT zone is 90 feet thick and that the water-producing interval for the LT zone is 80 feet thick at the Site. The proposed well completions attempt to minimize the open interval length while trying to ensure that the well straddles the water-producing zones.

The screen intervals for the UT and LT zones will be completed as open holes, such that higher permeability pathways within these zones can be identified, sampled and monitored, if needed. The wells will be installed downgradient of the source areas on the eastern and northern areas of the Site. Wells will also be installed off-Site to the north and northeast of the Site-property boundary.

Four UT and two LT wells are proposed as part of this supplemental well installation program. The approximate well locations are shown in Figure 4; however, the final locations are dependent on accessibility and permission from off-property landowners. The following is a list of the proposed wells and completion zones for the proposed supplemental Upper Floridan Aquifer monitoring wells:

- MW-1C LT Zone
- FW-10C LT Zone
- FW-10B UT Zone
- FW-4B UT Zone
- FW-11B UT Zone
- FW-12B UT Zone

Monitoring wells with the letter attachment "B" will be completed in the lower 60 feet of the UT zone and wells with the designation "C" will be completed across the entire LT zone, assumed to be approximately 80 feet thick. Two of the wells (FW-4B and MW-1C) will be located adjacent to (paired with) existing UT wells FW-4 and MWTP-MW-1. Well FW-11B will be located along the eastern property boundary between existing wells FW-5 and FW-1. Well FW-12B will be located downgradient of FW-6 and wells FW-10B and -10C will be located about 800 feet to the north of the Site. A more thorough discussion of well locations and depths is provided below.

<u>Off-Site Floridan Wells</u>

Three of the six new wells (MW-1C, FW-10B and FW-10C) will be completed off-property to the north of the Site, aligned with the average groundwater flow direction from the Site to the Murphree Wellfield. Well MW-1C will be completed in the LT zone adjacent to GRU well MWTP-MW1, which is completed in the UT zone. The location of this nested well pair is approximately aligned with groundwater flow paths from Site source areas. These wells will serve as sentinel wells for potential impacts to the UT and LT zones originating from the eastern and southern areas of the Site, and the Cabot Carbon site. The estimated depth of well MW-1C is approximately 380 feet (Table 2). The open interval for the well will straddle the Avon Park Formation contact and will extend from about 300 to 380 feet bgs. Because MW-1C will be completed in an area that is assumed to be non-impacted, only one isolation casing will be installed prior to drilling into the Upper Floridan Aquifer. An isolation casing will be grouted into the lower Hawthorn Group clay to minimize the potential of vertical flow of groundwater from overlying deposits during the construction of the well. Design and installation of wells into the LT zone are described in Section 3.

Wells FW-10B and FW-10C will be installed approximately 800 feet to the north of the Site on the City of Gainesville Maintenance Yard. The wells will be located on the Maintenance Yard eastern property boundary approximately 1,000 feet to the west of well MW-1C. These wells will also serve as sentinel wells for the UT and LT zones monitoring potential groundwater flow paths from the northern and western areas of the Site. Well FW-10B will be completed in the UT at an estimated depth of 220 feet and well FW-10C will be completed in the LT zone at an estimated depth of 370 feet. The open interval for well FW-10B will extend from about 5 feet below the top of Ocala Limestone (approximate depth of 135 feet) to the base of the UT zone (approximate depth of 225 feet). The open interval for well FW-10C will straddle the Avon Park Formation contact extending from 290 to 370 feet. Groundwater in the vicinity of wells FW-10B and -10C is assumed to be non-impacted. Therefore, each well will have an isolation casing grouted into the lower Hawthorn clay unit prior to drilling into the Upper

Floridan Aquifer. Well FW-10B will be drilled and completed prior to drilling FW-10C. A groundwater sample will be collected from well FW-10B immediately after its completion to verify that groundwater impacts are not present in the UT zone. If the UT zone is non-impacted, well FW-10C will be drilled with one isolation casing completed in the lower Hawthorn clay. If impacts to the UT zone are deemed unacceptable for completing FW-10C, a second isolation casing will be installed into the semi-confining unit separating the UT and LT zones prior to drilling into the LT. Design and installation of wells into the UT and LT zone is further described in Section 3.

On-Site Floridan Wells

One concern associated with the installation of on-Site wells into the Upper Floridan Aquifer is the potential for compromising the integrity of the middle and lower Hawthorn clay units. Although extensive precautions will be taken to help ensure isolation of impacted areas from the Upper Floridan Aquifer, the potential for developing future pathways via these wells still exists. The approximately 120-foot hydraulic-head difference from the Surficial Aquifer to the Upper Floridan Aquifer allows for even small pathways along a well casing to transmit significant quantities of groundwater over time. A complete and uniform cement grout outside of the well casings cannot be guaranteed, especially at depths of 150 to 250 feet. The channeling of grout outside of well casings is extensively documented in the well-drilling industry. There are techniques such as casing centralizers to help minimize this problem; however, the potential for grout channeling cannot be completely eliminated. Recognizing that there are no guarantees on the final integrity of the well construction, the installation of additional Upper Floridan Aquifer monitoring wells in the vicinity of known source areas and in areas with elevated dissolved-phase concentrations in the Lower Hawthorn is not proposed. Each borehole and well completed into the Upper Floridan Aquifer represents a potential future pathway for constituents to enter this aquifer system. Given this likely possibility and concern, the number of future on-Site Upper Floridan Aquifer wells should be kept to a minimum and these wells should be located outside of the more highly impacted areas.

Three Upper Floridan Aquifer wells will be installed on Site into the UT zone. One of the wells will be nested with an existing Upper Floridan Aquifer well and the remaining two wells will be installed downgradient of source areas, midway between existing Upper Floridan Aquifer wells. All on-Site wells will be completed with telescoping casings to minimize the potential introduction of Site constituents from overlying deposits into the Lower Hawthorn and Upper Floridan Aquifer. No surface casing will be installed to isolate the Surficial Aquifer from the Upper Hawthorn. Previous investigations have demonstrated that impacts to the Upper Hawthorn are present beneath most of the Site; therefore, the need to isolate the Surficial Aquifer from the Upper Hawthorn is not justified. Isolation casings will be installed into the middle Hawthorn clay unit prior to drilling into the Lower Hawthorn and a telescoping second isolation casing will be installed into the lower Hawthorn clay unit prior to drilling into the Upper Floridan Aquifer. It is anticipated that the first isolation casing will be completed approximately 3 feet into the middle clay unit and the second isolation casing will be completed approximately 10 feet into the lower clay unit. The second isolation casing will be set deeper into the lower clay unit than the isolation casing was set in

FW-6, to minimize the potential of encountered residual NAPLs beneath the isolation casing and carrying impacted drilling fluid into the Upper Floridan Aquifer.

Well FW-4B will be paired with existing well FW-4 on the eastern side of the Site and will monitor the lower portion of the UT zone. This location was chosen to monitor water quality in the lower portion of the UT zone and is downgradient of the former North Lagoon. Well FW-4B will be completed at an estimated depth of 236 feet. The top of the open-hole interval for well FW-4B will start approximately 10 feet below the bottom of FW-4 and will extend from about 176 to 236 feet bgs. Design and installation of on-Site wells is further discussed in Section 3.

Well FW-11B will be located between existing Floridan wells FW-5 and FW-1 along the eastern property boundary. Wells FW-5 and FW-1 are completed in the upper portion of the UT zone; well FW-11B will be completed in the lower portion of the UT zone to compliment well FW-4B along the eastern property boundary. Consideration was given to locating well FW-11B adjacent to well FW-5; however, the close proximity of this location to potential residual NAPL source areas by the former Drip Track and the former Cabot Carbon separation lagoons resulted in well FW-11B being moved further to the north. The risk associated with installing a second well in the vicinity of source areas, and potentially compromising the lower Hawthorn clay unit, did not justify locating FW-11B in this area. The current location of well FW-11B places it downgradient of the former Drip Track and North Lagoon areas. Well FW-11B will be drilled to an estimated depth of 232 feet and the open-hole interval will extend from approximately 172 to 232 feet bgs, corresponding to the lower 60 feet of the UT zone.

Well FW-12B will be completed in the lower portion of the UT zone. It is located approximately 450 feet downgradient of FW-6 and midway between wells FW-1 and FW-2. The location of well FW-12B was chosen to further investigate the potential impacts beneath and downgradient of the former North Lagoon. The new well location was not placed adjacent to well FW-6 because of concerns associated with compromising the lower Hawthorn clay unit adjacent to a known source area. In addition, the loss of NAPL-impacted mud during the drilling of FW-6 could potentially impact the water quality of any new wells in the vicinity of FW-6. The location of well FW-12B will provide evidence of potential impacts to the Floridan Aquifer beneath the former North Lagoon. Well FW-12B will be drilled to a total depth of 233 feet, and the open-hole interval for this well from 173 to 233 feet, corresponding to the lower 60 feet of the UT zone.

The addition of these six Upper Florida wells combined with the 11 existing Floridan wells will provide a comprehensive monitoring network for the UT and LT zones. The average groundwater flow direction is to the northeast. All of the new wells are located downgradient of the potential source areas at the Site. The combination of existing wells and new wells results in a total of five wells located along the eastern property boundary of the Site. Two wells are located along a groundwater flow path in the immediate vicinity of the North Lagoon, with a third well located on the Site northern property boundary. A total of five wells will be located off-Site to the north and northeast along a groundwater flow path from the Site to the Murphree Wellfield. The off-Site wells will monitor both the UT and LT zones and will provide a second line of defense for detecting impacts to the Upper Floridan Aquifer. In addition, two wells are located upgradient of the Site along the western and southern property boundaries. The combination of these 17 Upper Floridan Aquifer wells in addition to the 25 Hawthorn Group wells and the more than 100 Surficial Aquifer wells provides a comprehensive monitoring system for the Site constituents in groundwater at the Site.

3.0 WELL CONSTRUCTION

Monitoring wells will be installed in the Upper Floridan Aquifer using a combination of mud-rotary and rotosonic-drilling methods. The rotosonic-drilling method employs the use of high-frequency, resonant energy to advance a core barrel or casing into subsurface formations. The resonant energy is transferred down the drill string to the bit face at various sonic frequencies, while simultaneously rotating the drill string. This method advances both an inner and outer casing as the borehole is drilled. The inner casing is typically a core barrel for the collection of samples and the outer casing prevents borehole collapse. The large-diameter outermost isolation casing required for the three on-Site wells exceeds the maximum casing size for rotosonic drilling. The maximum standard-size permanent casing that can be installed by local rotosonic drilling contractors is 8 inches within a 12-inch ID retractable override casing. Therefore, standard a mud-rotary method will be used to install the outermost 12-inch ID isolation casings. All remaining casings will be installed with rotosonic drilling.

3.1 DRILLING AND WELL COMPLETION

Continuous 3-inch to 4-inch diameter soil/rock core will be collected from all rotosonic borings and logged by the oversight geologist/engineer to characterize lithology and observable creosote impacts, if any. Select sediment and rock samples will be collected for laboratory analysis during the well installation for geochemical and physical properties analysis of arsenic containing minerals. Core will be collected, photographed and stored. No other physical or chemical analyses are planned for the soil/rock core, although this may be modified based on the naturally-occurring arsenic study.

On-Site Wells

Monitor wells FW-4B, FW-11B and FW-12B will be installed on Site in the lower portion of the UT zone. Because these wells will be installed in potentially impacted areas, they will require a telescoping triple-cased completion. The telescopic installations will begin by drilling a nominal 16-inch diameter hole from land surface to approximately 3 feet into the middle Hawthorn clay unit. A 12-inch ID isolation casing will be set in the middle clay and grouted to land surface. After an appropriate grout set-up period, a nominal 11.5-inch hole will be advanced through the center of the 12-inch casing into the upper portion of the lower Hawthorn clay using a 10-inch ID rotosonic override casing. A permanent, 8-inch ID conductor casing will be set approximately 10 feet into the lower Hawthorn clay unit and grouted to land surface. After a grout set-up period, a nominal 8-inch diameter hole (created with a 7-inch ID override casing) will be extended 30 feet into the Ocala Limestone, where a permanent 4-inch ID, well casing will be set and grouted to land surface. After a final grout set-up period, a 4-inch hole will be installed 60 feet below the bottom of the casing and completed as an open-hole monitoring well. A typical, triple-cased, on-Site well completion schematic is shown in Figure 5a.

Off-Site Wells

Monitor wells FW-10B, FW-10C and MW-1C, will be completed off property to the north and northeast of the Site. Because these wells will be installed in non-impacted areas, they will be installed with a double-cased telescoping method that isolates the Surficial and Hawthorn Group deposits from the underlying Upper Floridan Aquifer. Monitor well FW-10B will be completed in the UT zone and wells FW-10C and MW-1C will be completed in the LT zone. Well FW-10B will have a 90-foot open interval straddling the estimated thickness of the UT zone and wells FW-10C and MW-1C will have an 80-foot open interval straddling the estimated thickness of the LT zone. For the installation of all three wells, the double-cased, telescopic installations will begin with a nominal 12-inch diameter hole advanced into the lower Hawthorn clay. An 8-inch ID isolation casing will be set 10 feet into lower Hawthorn clay unit and grouted to land surface. After a grout set-up period, an 8-inch diameter hole (created with a 7-inch ID override casing) will be extended to the completion depths of each of the wells. The borehole for well FW-10B will extend approximately 5 feet into the Ocala Limestone where a 4-inch ID well casing will be set and grouted to land surface. After another grout set-up period, a 4-inch diameter boring will be installed approximately 90 feet below the bottom of the casing to a target depth interval 130 to 220 feet bgs. After the completion of well FW-10B, a groundwater sample will be collected and analyzed for Site constituents to determine if FW-10C will require a triple casing to isolate the UT zone from the LT zone.

Continuous core will be collected from the base of the isolation casing to the Avon Park Formation contact to establish completion depths for the well casing and open interval. The boreholes for wells FW-10C and MW-1C will be advanced through the majority of the Ocala Limestone to a depth of approximately 40 feet above the contact with the Avon Park Formation. The total target depths for these wells are 290 and 300 feet, respectively. A 4-inch ID well casing will be set and grouted to land surface. After a grout-curing period, a 4-inch boring will be installed approximately 80 feet below the bottom of the casing. Well FW-10C will have an open interval of 290 to 370 feet bgs and well MW-1C will have an open interval of 300 to 380 feet bgs. A typical, double-cased, off-Site well completion schematic is shown in Figure 5b.

In the unlikely event that a triple-casing installation will be required for well FW-10C, the 8-inch ID isolation casing will be replaced by a 12-inch ID casing and an 8-inch ID casing will be installed approximately 20 feet into the semi-confining unit below the UT zone and grouted to lands surface. The remainder of the well will be completed as described above.

All wells will be completed with the nominal 4-inch diameter open hole. If borehole permanence is questionable, well screens can be installed inside the open hole at a later date.

3.2 BOREHOLE AND CASING GROUTING

The grout slurry 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 8.3 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. Consideration will be given to the addition of a calcium chloride additive to reduce grout-curing times for the completion of the wells. The annular spacing outside of all telescoping casings will be filled from the bottom up via a tremmie pipe. Casing centralizers will be installed at appropriate distances on the outside of all casings to help minimize grout channeling and to help ensure a complete grout seal. The grout will be allowed to cure a minimum of 12 hours prior to additional work being performed inside of the casing.

3.3 EQUIPMENT DECONTAMINATION

All drilling equipment, rods, bits, tools and rotosonic casing that enter the borehole during the drilling and installation of each of the telescoping casings will be decontaminated prior to advancing the borehole to the next surface/well casing completion depth. Similarly, all drilling equipment and tools will be decontaminated prior to drilling the open hole beneath the lowermost casing and prior to starting a new borehole.

3.4 WELL SURFACE COMPLETION AND DEVELOPMENT

The 4-inch diameter well casing will extend approximately 2.5 ft above grade and be converted into a protective cover. A protective locking cap will be placed over the casing. The stickup will be spray painted safety yellow with the well ID stenciled with black paint. A 3-foot by 3-foot by 6-inch thick concrete pad will be constructed around the stickup. The pad will be completed 3 inches above existing grade with the apron tapered 2 inches lower such that precipitation runoff will flow away from the well. Bollard poles will be located around the stickup for surface protection, as needed. All locks for the wells will be keyed alike. After installation, the ground surface, and the top of the inner casing will be surveyed to within 0.01-foot vertical accuracy. As-built well diagram will be constructed for each of the wells.

The wells will be developed no sooner than 24 hours after installation to remove fine material from around the monitored interval of the well. Wells will be developed by bailing and surging, or by pumping, as determined by the field geologist. Well development shall consist of over-pumping of the well until the discharge water appears to be visibly clear. It is anticipated that a pumping rate of as much as 10 gpm may be achievable during well development. The purge water will be monitored for pH, temperature, specific-conductance, and turbidity. Wells will be developed up to a maximum of 1 hour or until the water quality field measurements become stable and the purge water is visibly free of sand, as documented by the field geologist.

Data collection and recording will follow procedures used in previous fieldwork. A real-time evaluation of the data and field notes from the drilling of the borehole will be conducted to determine if there is a potential for cross-contamination during construction. The review will include all well-construction field notes, core examination (including FID headspace measurements), and any downhole logs.

3.5 GEOPHYSICAL LOGGING AND SAMPLING

The installation of monitoring wells in consolidated rock deposits eliminates the need for a well screen and sand pack. Wells completed in the Floridan Aquifer system are typically completed as an open hole. The only reason to install a screen in a well is to prevent collapse of the borehole and to prevent the influx of fine-grained sediments. Neither of these issues are a concern for the Upper Floridan Aquifer.

One of the primary advantages to completing the Floridan monitoring wells with an open hole in the UT and LT units is that it will allow greater flexibility in the analysis/investigation of permeable section of the UT and LT zones. In addition, an open borehole will allow for the isolation of specific intervals of the borehole for sample collection, if needed. Finally, should mobile NAPLs be present within the UT and LT zones, an open borehole will also make it easier for NAPLs to migrate into the well.

Geophysical Logging

After completion and development of the wells, a static-temperature log will be run inside of the open-hole interval in an attempt to identify and quantify water-producing zones. Temperature differentials between producing zones have been successfully used to identify water-producing zones within open boreholes. The identification of producing zones will require that the temperature gradient within the well be sufficient for the logging tool to detect a change in gradient. One potential issue is that sufficient temperature differentials may not exist over the 60 to 90 foot open-hole interval for these wells. In addition, this technique is dependent on vertical flow within the open hole from zones of higher hydraulic head to lower zones. It is unclear at this time how much vertical flow is expected to occur within the open intervals.

A caliper log will also be run in the open section of the borehole to determine variation in borehole diameter within the open-hole interval. The caliper log can be used to qualitatively identify highly fractured and vugy zones. This log will also be needed if a straddle-packer system is used in the well for sample collection, as described below.

If investigations warrant, a video-log can be run in the open hole to view the condition of the hole. The use of a video-log will be dependent on the stability of the open hole and the well-specific data required. At this time video logging is not proposed for the new Floridan wells, but will be retained as an option if warranted.

Groundwater Sampling

Groundwater samples will be collected through the use of low-flow sampling methods. Samples from discrete zones within the open interval will be collected by positioning the sample tube/pump opposite the interval of interest. Various depth intervals within the well can be sampled by lowering the sample tube/pump to a depth opposite the interval of interest. Although some mixing will occur within the open hole, the samples should be primarily representative of the more permeable zones within the sampling interval. Depending on the well-specific results from the temperature logging, samples will be collected from approximately two intervals for the UT zone wells and from two to three zones in the LT zone wells. Sample collection procedure and collection criteria will be similar to the existing monitoring program at the Site described in the Soil and Ground Water Sampling Plan (TRC 2002a) and Floridan Aquifer Monitoring Plan (TRC 2004).

After the first round of sampling, it may be determined that additional discrete samples of the open interval are required. In the event that isolated discrete samples are required, an inflatable packer system can be used to more fully isolate the zones of interest prior to sample collection. At this time it is not anticipated that a straddle-packer system will be required for groundwater sample collection.

The long-term groundwater monitoring program and sampling frequency will be determined after the initial round of groundwater sampling results has been evaluated. A reevaluation of the current Floridan monitoring plan and wells included in this program will be performed once a complete analysis of the recent Floridan Aquifer data is completed. The reevaluation will include recommendations for future sampling locations and frequency.

3.6 INVESTIGATIVE DERIVED WASTE

All wastewater and mud generated during the activities described in this Work Plan, 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 from the Surficial Aquifer groundwater extraction system and treated on-Site, prior to discharging to the permitted POTW. Soils and rock cuttings will be staged in sealed roll-off containers for characterization and off-Site disposal.

3.7 PROJECT MANAGEMENT PLANS

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);
2) Sampling and Analysis Plan (SAP); and
3) Quality Assurance Project Plan (QAPP).

A HSP and QAPP were previously prepared (TRC, 2002b; TRC, 2002c) and incorporated the items listed below:

Health and Safety Plan

A project-specific Health and Safety Plan (HASP) (TRC 2002b) has been prepared to define the health and safety requirements for this project. 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". The HASP includes a discussion of the following:

- Health and safety responsibilities;
- Hazard analysis;
- Personnel training requirements;
- Medical surveillance program;
- Site control procedures;
- Decontamination requirements; and
- Safety procedures and emergency procedures.

Quality Assurance Project Plan

Quality assurance/quality control activities and requirements, including project quality objectives, field data reduction, data validation, and quality assurance objectives for measurements for all groundwater samples collected under this Work Plan, will be performed as specified in Quality Assurance Project Plan (TRC 2002c). The QAPP plan includes the following:

- Quality assurance (QA) objectives;
- Sampling procedures;
- Sampling custody;
- Analytical procedures;
- Calibration and controls and frequency;
- Data reduction validation and reporting;
- Quality Control (QC) procedures;
- Performance and system audits;
- Assessment procedures for data acceptability;
- Preventive maintenance;
- Corrective action;
- QA reports to management;
- SOPs for laboratory sampling control and custody;
- Data validation in analytical reports; and
- Analysis for pentachlorophenol.

Sampling and Analysis Plan

A SAP will be amended to accommodate new procedures needed for this fieldwork. The relevant SAP sections deal with the following:

- Collection procedures;
- Sampling procedures;
- Field measurement procedures;
- Sampling handling;
- Chain-of-Custody procedures;
- Field analytical procedures;
- Sample control; and
- Sample analysis.

4.0 REPORTING AND SCHEDULE

4.1 REPORTING

A letter report documenting the results of activities described in this Workplan will be submitted for Agency review after the completion of the well-drilling program and the results of the groundwater samples are obtained. The letter report will include a description of well completion activities, problems encountered, borehole logs and as-built well completion diagrams.

Groundwater samples will be collected approximately 1 week after the development of the wells. The laboratory results of these analyses will be submitted to the stakeholders as part of the final completion report.

4.2 SCHEDULE

The schedule for implementation of this workplan will be dependent on the time required for stakeholders review, comment and approval of the workplan. In addition, the schedule for the well installation will be dependent on obtaining access agreements from off-property landowners and on driller availability. Once stakeholder approval of the workplan is received, it will require approximately 2 months for a driller to mobilize to the Site and approximately 3 weeks to complete the wells. The following is a list of major tasks and estimated time to complete following approval of the workplan:

1) Develop bid documents, solicit bids and contract driller (4 weeks);
2) Schedule driller and mobilize to field (8 weeks);
3) Mobilize to field, well installation and development (11 weeks);
4) Report well completion and groundwater sample results (18 weeks)

5.0 REFERENCES

GeoLogic Information Systems, 1990, Summary of Geophysical Data and Analysis of the Hydrogeologic Setting of the Kelly Well Field, prepared for Gainesville Regional Utilities, April, 1990.

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.

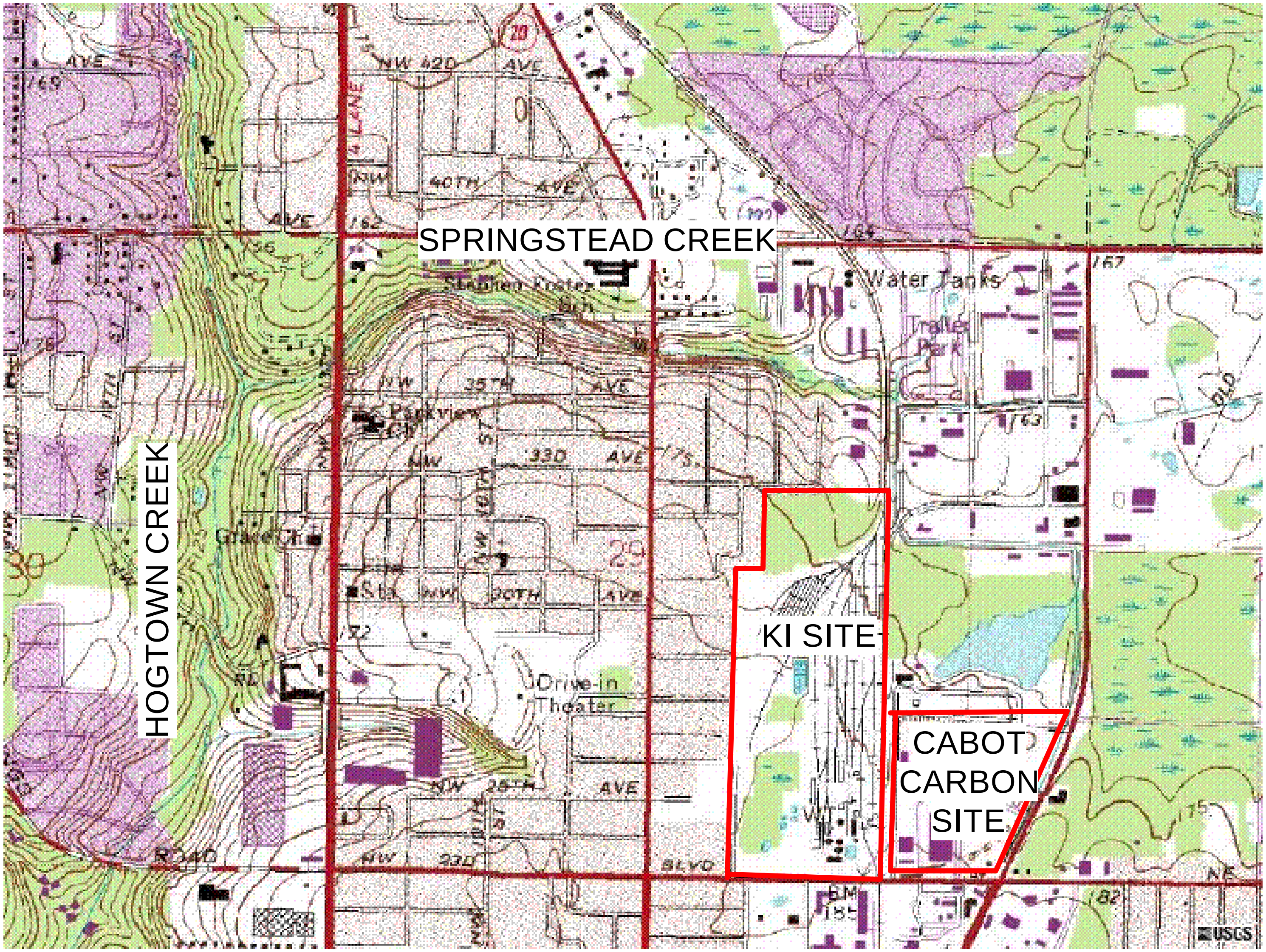
TRC, 1997, Proposed Stage 2 Groundwater Monitoring Program, Initial Groundwater Remedial Action, August 1997.

TRC, 2002a. Soil and Ground Water Sampling Plan. Cabot Carbon/Koppers Superfund Site, Gainesville, Florida. January 2002.

TRC, 2002b. Health and Safety Plan. Cabot Carbon/Koppers Superfund Site, Gainesville, Florida. January 2002.

TRC, 2002c. Quality Assurance Project Plan for the Additional Characterization of the Hawthorn Group Formation Workplan. Cabot Carbon/Koppers Superfund Site, Gainesville, Florida. January 2002.

TRC, 2004, Floridan Aquifer Monitoring Plan, Cabot Carbon / Koppers Superfund Site, Gainesville, Florida, June 2004.



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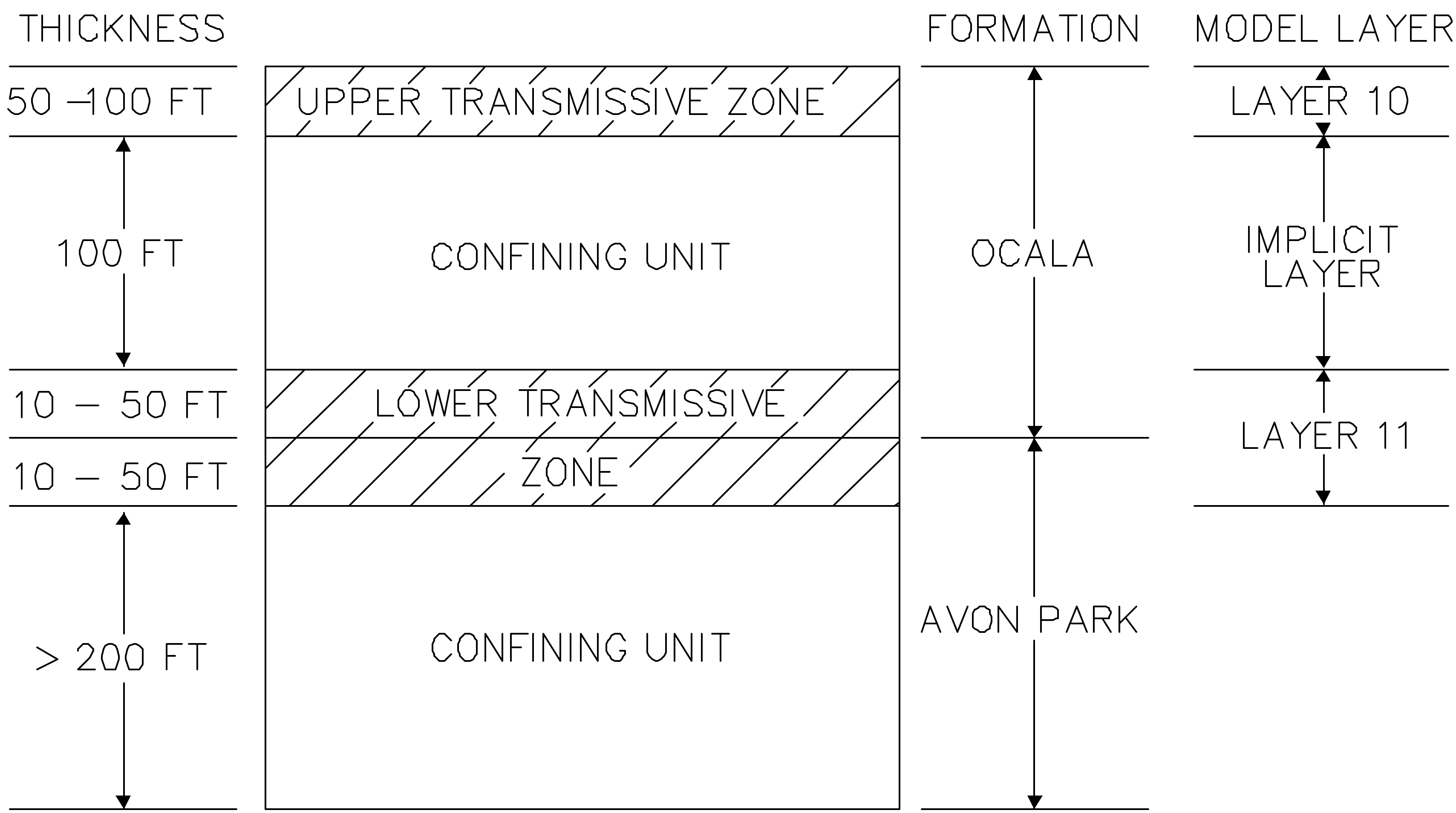
SCALE IN MILES

TITLE:

Site Location Map

GeoTrans, Inc.
A TETRA TECH COMPANY

FIGURE:
1



KOPPERS, INC. SITE GAINESVILLE, FLORIDA	DATE:	06/30/04
GENERALIZED CROSS SECTION SHOWING UPPER FLORIDAN AQUIFER WATER–PRODUCING ZONES	DESIGNED:	GR
	CHECKED:	GR
	APPROVED:	GR
	DRAWN:	DJB
	PROJ.:	2201.049
GeoTrans, Inc. A TETRA TECH COMPANY	Figure 2	

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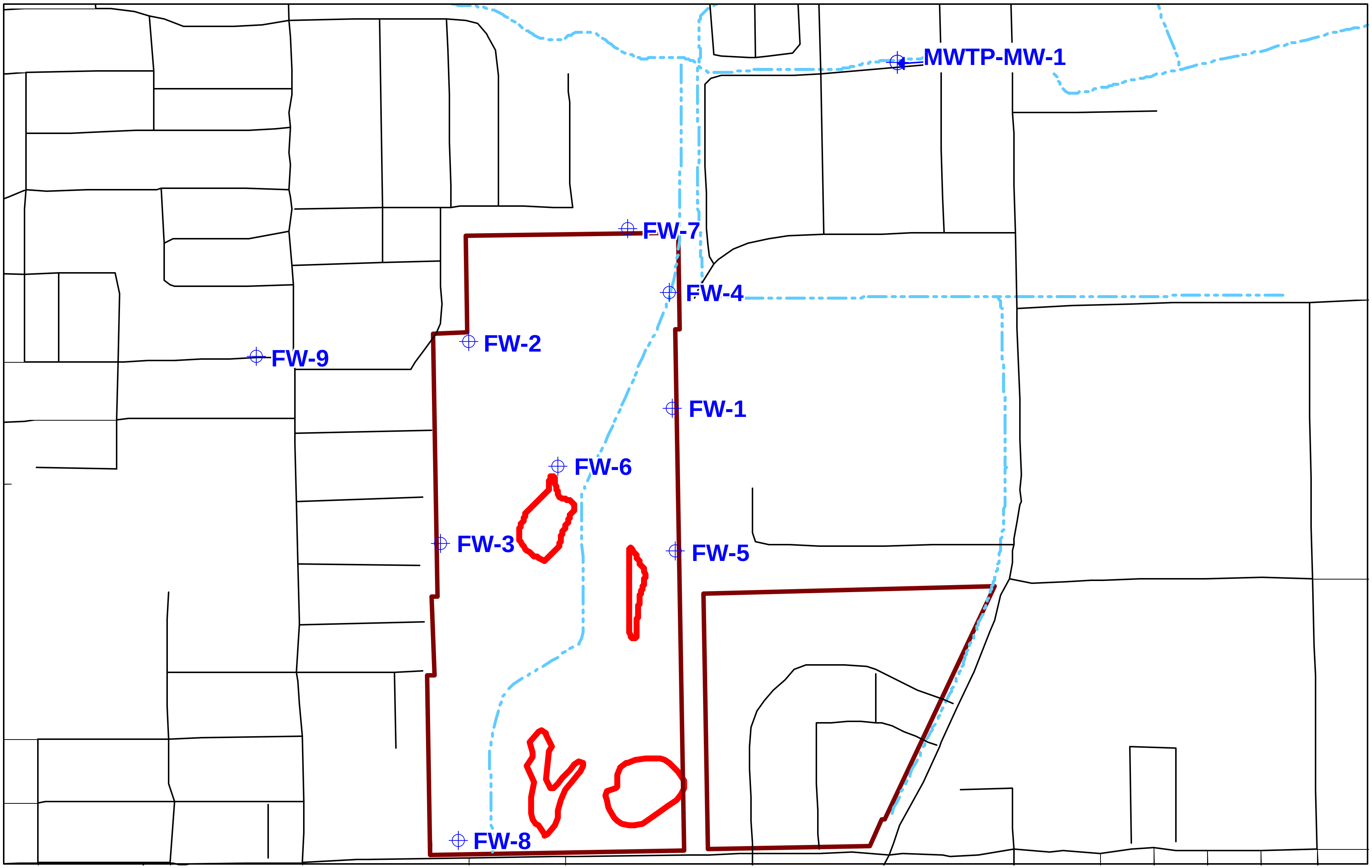

Explanation

Current wells

Streets

Source areas

Drainage Ditches

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SCALE IN FEET

TITLE:

Location of current Upper Floridan Aquifer monitoring wells.

GeoTrans, Inc.

FIGURE: 3

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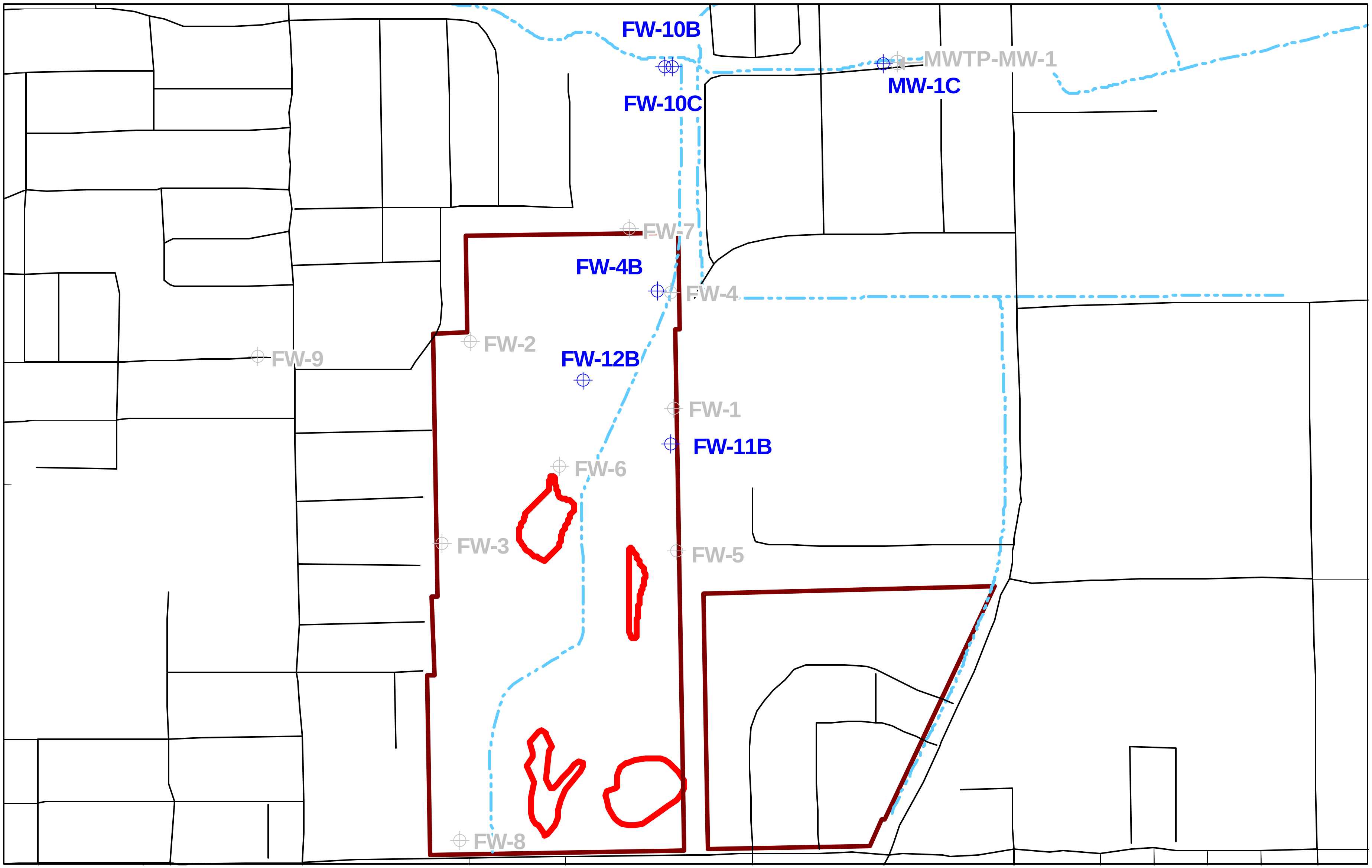

Explanation

Proposed wells

Streets

Source areas

Drainage Ditches

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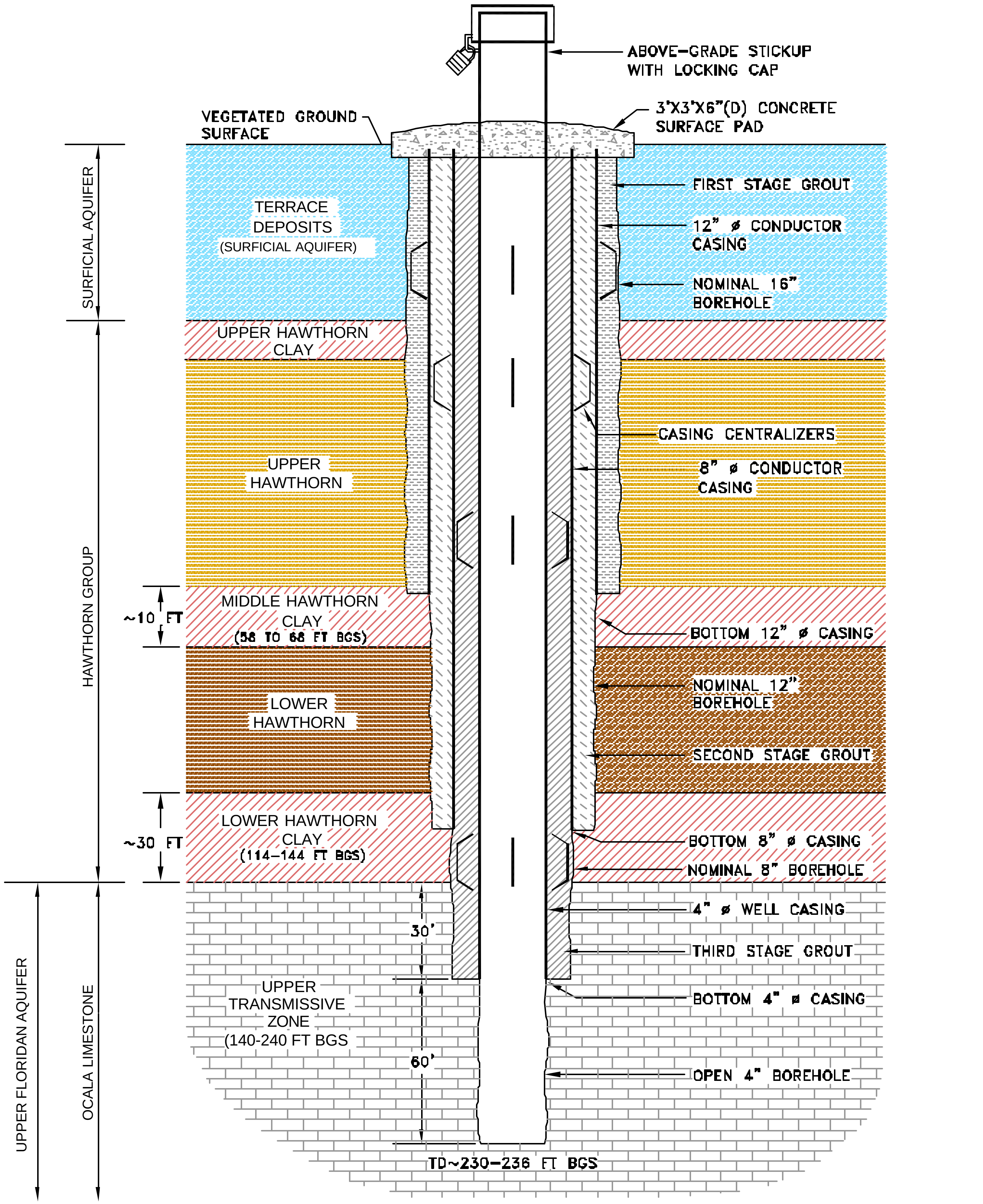
SCALE IN FEET

TITLE:

Location of proposed Upper Floridan Aquifer monitoring wells.

GeoTrans, Inc.

FIGURE: 4



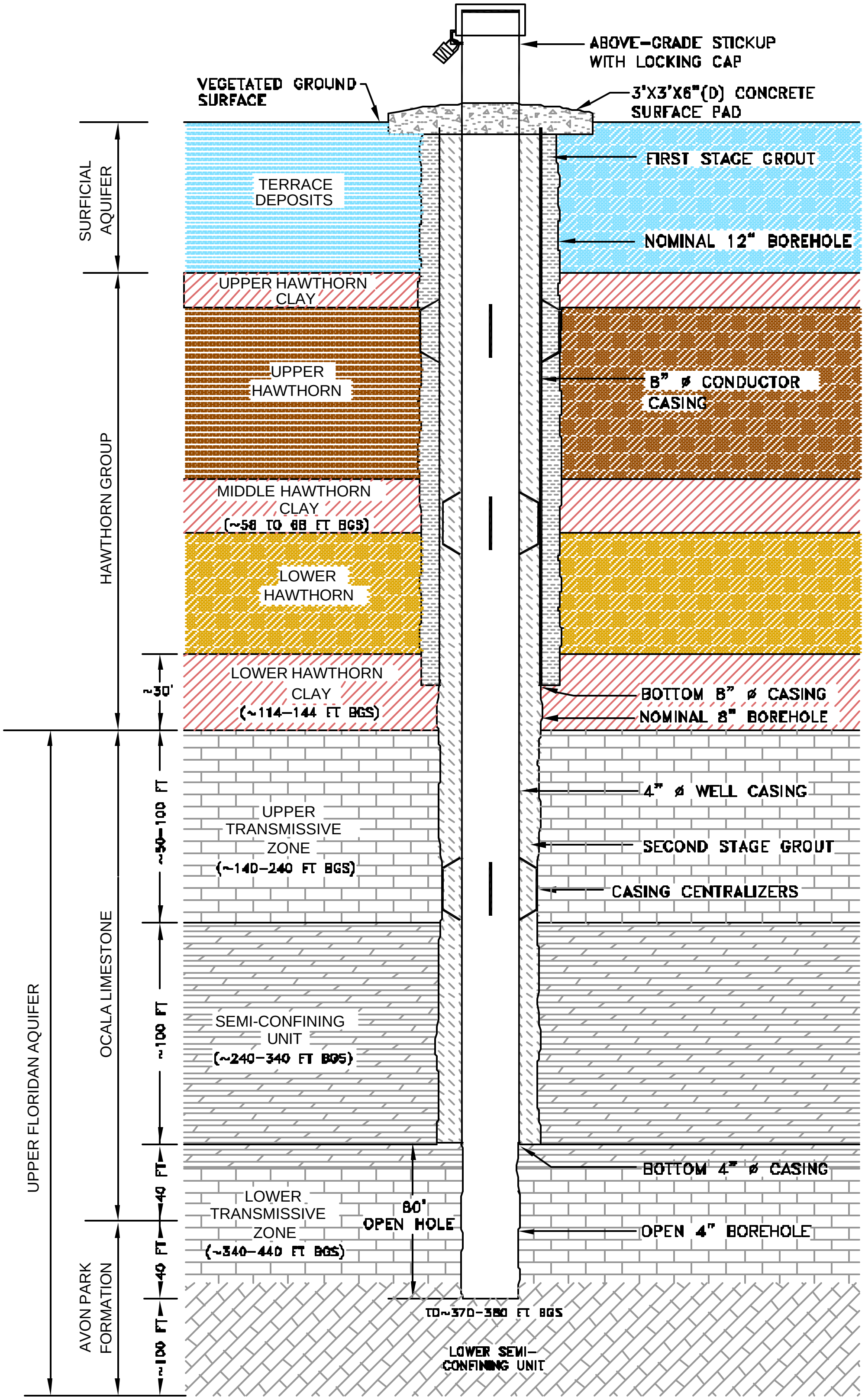
NOT TO SCALE

TITLE: TYPICAL PROPOSED FLORIDAN AQUIFER WELL FOR THE LOWER PORTION OF THE UPPER TRANSMISSIVE ZONE

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

GeoTrans, Inc.
A TETRA TECH COMPANY

CHECKED	JT	FIGURE:
DRAFTED	CP	5a
FILE	22010400568.DWG	
DATE	2–9–05	



NOT TO SCALE

TITLE: TYPICAL PROPOSED FLORIDAN AQUIFER WELL FOR THE LOWER TRANSMISSIVE ZONE

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

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	JT	FIGURE:
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FILE	2201040057B.DWG	
DATE	2-9-05	

Table 1. Existing Upper Floridan Aquifer monitoring well construction details.

WELL ID	DATE INSTALLED	GROUND SURFACE ELEVATION (ft)	TOP OF CASING ELEVATION (ft)	ISOLATION CASING DEPTH (ft bgs)	DEPTH TO OCALA (ft bgs)	TOTAL WELL DEPTH (ft bgs)	SCREENED INTERVAL (ft bgs)	WELL DEPTH BELOW TOP UT ZONE (ft bgs)
FW-1	12/9/1992	173	175.08	136	136	165.7	151-165.7[2]	29.7
FW-2	5/5/2003	181.48	184.56	116	144	156	146 to 156	12.0
FW-3	5/12/2003	186.41	189.31	116	144	156	146 to 156	12.0
FW-4	4/29/2003	171.91	174.63	116	146	155.5	145.5 to 155.5	9.5
FW-5	5/20/2003	180.15	182.94	116	142	156	146 to 156	14.0
FW-6	6/25/2004	181.8	185.23	117.5	142	160.5	150 to 160	18.5
FW-7	11/8/2004	166	168.55	130	145	155	145 to 155	10.0
FW-8	11/4/2004	184	186.96	130	140	150	140 to 150	10.0
FW-9	10/30/2004	184.6	184.55	130	140	155	145 to 155	15.0
MWTP-MW-1	10/3/2003	158[1]	160.935	137.5	144	169	149 to 169	25.0
MWTP-MW-2	10/3/2003	??	169.083	162	163	189	169 to 189	26.0

(1) Ground surface elevation estimated from USGS topographic map.

(2) Completed as an open hole

Table 2. Proposed Upper Floridan Aquifer monitoring well completion depths.

WELL ID	GROUND SURFACE ELEVATION[1] (ft)	TOTAL DEPTH (ft bgs)	APPROXIMATE CASING DEPTHS (ft bgs)			OPEN HOLE/SCREEN INTERVAL (ft bgs)		COMMENTS
			Surface (12")	Surface (8")	Well (4")	Top	Bottom	
MW-1C	160	380	N/A	102	300	300	380	Well monitoring entire LT zone (80')
FW-10C	150	370	N/A	100	290	290	370	Well monitoring entire LT zone (80')
FW-10B	150	225	N/A	100	135	135	225	Well monitoring entire UT zone (90')
FW-4B	172	236	70	118	176	176	236	Well monitoring middle to lower UT zone (60')
FW-11B	177	232	65	132	172	172	232	Well monitoring middle to lower UT zone (60')
FW-12B	178	233	61	125	173	173	233	Well monitoring middle to lower UT zone (60')