KEY ENVIRONMENTAL INCORPORATED

May 2, 2005

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

Mr. Chris Byrd
Environmental Protection Director
Alachua County Environmental Protection Department
201 S.W. 2nd Avenue, Suite 201
Gainesville, Florida 32601

Mr. Brett Goodman, P.E.
Senior Water/Wastewater Utility Engineer
Gainesville Regional Utilities
Gainesville, Florida 32601

Re: Responses to Comments – Pilot Study Work Plan
Upper Hawthorn Group DNAPL Recovery
Koppers Portion of the Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

Dear Ms. Williams, Mr. Byrd, and Mr. Goodman:

On behalf of Beazer East, Inc. (Beazer), Key Environmental, Inc. (KEY) hereby provides the U.S. Environmental Protection Agency (U.S. EPA), the Alachua County Environmental Protection Department (ACEPD) (collectively the Agencies), and the Gainesville Regional Utilities (GRU) with one copy of the Beazer responses to the respective comments provided by the Agencies and GRU on the Dense Non-Aqueous Phase Liquid (DNAPL) Recovery Pilot Study Work Plan (PSWP). These responses were prepared by KEY and GeoTrans, Inc. (GeoTrans) for the above-referenced Site. If you have any questions regarding this transmittal, please contact Mr. Michael Slenska (Beazer) at (412) 208-9967.

Sincerely,

Key Environmental, Inc.

N J Misquitta

Neale J. Misquitta
Project Manager

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cc:\ Michael Slenska – Beazer
Randall Chaffins – U.S. EPA
Bryan Myers – U.S. EPA
Kelsey Helton – FDEP
John Mousa – ACEPD
Jill Blundon – Beazer
Linda Paul - KI

RESPONSE TO GRU DNAPL CONSULTANT TEAM COMMENTS ON UPPER HAWTHORN GROUP DNAPL RECOVERY PILOT STUDY WORK PLAN
May 2, 2005

Beazer East, Inc. (Beazer) has prepared responses to the GRU DNAPL consultant team comments on the Upper Hawthorn Group DNAPL Recovery Pilot Study Work Plan[1] (Work Plan). Each GRU comment is repeated followed by the respective response thereto.

General Comments:

Comment 1 - The Work Plan is focused on the discovery of a thin (5 cm thick?) DNAPL-contaminated sand and gravel zone at about 59 feet bgs beneath the former North Lagoon that has produced mobile DNAPL in HG-10S (and also apparently in HG-11S next to PW-1 and at HG-15S). This zone may be particularly important because it appears to be somewhat continuous at the former North Lagoon and perhaps beneath the Process Area. We recommend that Beazer proceed with this pilot test but to undertake an analysis of what the capture zone is for the well so that the number of such wells can be estimated for each DNAPL source zone.

Response 1 - The above GRU comment and interpretation regarding DNAPL migration is generally consistent with Beazer's conceptual model. One goal of the pilot study is to evaluate the potential capture zone developed in response to pumping. The Work Plan identified two additional monitoring wells to be installed during the pilot study. Data from the recovery well, newly installed and existing monitoring wells, and the injection well will be utilized to develop an understanding of the capture zone as a result of pumping the pilot study DNAPL recovery well. The referenced stratigraphy at HG-10S at about a depth of 59 ft was found in the former North Lagoon source area and immediately down gradient at FW-6, HG-16S and HG-16D only. This sand-and-gravel seam was noted not to be laterally continuous beneath other source areas.

Comment 2 - We are skeptical that DNAPL recovery wells would be very effective at removing mobile DNAPL mass from the Hawthorn and that it would require a large number of these wells to have a significant impact.

Response 2 - Beazer has utilized DNAPL recovery wells at a number of sites to remove significant mass of DNAPL. The purpose of the pilot test is to validate the DNAPL recovery approach at this site. The pilot test will demonstrate the effectiveness of wells as a means of recovering DNAPL from the Upper

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1 KEY and GeoTrans, December 23, 2004, Upper Hawthorn Group DNAPL Recovery Pilot Study Work Plan, submitted to U.S. EPA, FDEP, ACEPD, and GRU on behalf of Beazer.

Hawthorn Group, and also the practicality of DNAPL recovery using enhanced hydraulic gradient techniques in general. Following completion of the pilot test, Beazer will be in a better position to fully address this comment.

Notwithstanding the above response, the commenter has identified a critical issue related to addressing DNAPL at the Site. The Site conditions and the DNAPL properties make it challenging to remediate DNAPL at the Site, regardless of the remedial technology utilized. The subsurface conditions (large-volume source), hydrogeologic conditions (low permeability and heterogeneities), and DNAPL properties (immobile residual saturation) are a factor/challenge to overcome in Site remediation for any remedial scenario. The National Research Council (1994, Alternatives for Ground Water Cleanup, National Academy Press, Washington, D.C.) indicate that these conditions are the most difficult to remediate.

Comment 3 - Why was the well casing diameter specified to be 18-inches? The large diameter will make it more difficult to identify and recover small volumes of DNAPL at the bottom of the well compared to a more typical 4-inch or 6-inch well casing. The bottom sump in an 18-inch well would contain about 12 gallons per foot versus about 0.6 gallon per foot in a 4-inch well.

Response 3 - Beazer has considerable experience with large-diameter DNAPL recovery wells. Pumping of groundwater from within the DNAPL recovery wells mobilize groundwater and DNAPL to the well casing through the screened interval. Strategic placement of the groundwater recovery pumps prevent the emulsification of the groundwater and DNAPL. With a large-diameter well, upflow velocities of the groundwater to the pump intake are significantly less than the DNAPL droplet velocity, thereby allowing the well to function as an in-well physical separator, with the DNAPL settling at the bottom of the well within the sump. These wells do provide accurate accounting of DNAPL recovery rates over time, as DNAPL is captured/contained in the well sump over a sufficient period of time. Approximately one gallon of DNAPL would occupy approximately 0.1 foot of sump capacity, which is well within the ability of the interface probes to measure. This diameter is the practical optimum to achieve adequate separation for accurate measurement. Also, the large-diameter wells provide increased well efficiency, increased groundwater flow rate and the corresponding increased radius of influence/capture zones, all of which will assist in critically evaluating this remedial approach.

Comment 4 - Recovered water that is re-injected should be treated to remove particulates to reduce the potential for clogging of the injection wells.

Response 4 - As necessary, a particulate filter (bag filter) will be added to the treatment train to reduce potential clogging of the injection wells.

Comment 5- Consideration should be given to conducting specific hydraulic tests during pumping of the upper Hawthorn. This would involve pumping of the recovery well for some period of time (several days) without reinjection of the water to allow monitoring of the drawdown in existing monitoring wells and the two new monitoring wells. Consideration should be given also to installing several additional monitoring wells for the purpose of determining hydraulic properties (available drawdown, radius of influence, hydraulic conductivity) of the upper Hawthorn. This information will be essential for further evaluation of DNAPL recovery, but also for evaluation of any other remedial measures the involve withdrawal of groundwater or injection of fluids (pump-and-treat, surfactant/alcohol flooding, chemical oxidation, enhanced biodegradation, etc.).

Response 5 - In response to this comment, an approximately one week long pumping test (without injection) will be conducted to quantify hydraulic properties. Monitoring of pumping and recovery data from the newly installed and existing monitoring wells, the recovery well, and the injection well will be adequate to quantify hydraulic properties.

Comment 6 – Based on our experience with creosote/coal tar recovery at other sites, monitoring of DNAPL levels twice a day is probably more frequent than necessary especially with a large diameter 18-inch well in which small volumes of DNAPL accumulation will be difficult to identify) and the two-week duration of the test for each pumping rate is probably too short because DNAPL recovery will be slow due to its high viscosity and its migration through small-area flow pathways (i.e., sand lens, fissures, bioturbations).

Response 6 - Beazer will adjust the monitoring frequency and duration of each pumping rate based on the results of the testing. In the interim, the current program will be retained as the default program, as it provides more frequent measurement than is likely required and allows for rapid progression of the testing if recovery rates have been quantified.

Specific Comments:

Comment 1 - Section 1.0 (pg 1-1), second bullet states that "The geology, hydrogeology, and the DNAPL conditions are inextricably linked to the successful recovery of DNAPL (i.e., source removal)." Comprehensive site characterization is required to determine the variables implied in this statement and to support successful remediation. Comprehensive site characterization, especially in the Hawthorn Group, has not been completed.

Response 1- The above statement was a general statement placed in the Work Plan indicating that there are a number of Site-specific factors that relate to the occurrence, migration, and recovery of DNAPL. Review of the available site-specific data is sufficient to design and perform a pilot study at the Site to indicate whether DNAPL recovery from the Upper Hawthorn Group is viable. Data (such as from the pumping test) will be continually incorporated/updated and evaluated to refine the conceptual site model. All this information, in conjunction with the currently available characterization data, ongoing characterization/monitoring related to the Upper Floridan aquifer[2], results of other pilot studies, etc, will be continually utilized to develop/update the comprehensive Site characterization. In addition, comprehensive site characterization of a confining bed needs to be balanced against the risks of further confining bed integrity loss and the needs of potential remedial considerations.

Comment 2- Section 2.5 (page 2-3), fourth bullet. The lack of observed DNAPL pooling on top of the three low permeability clay units may be due to a lack of observations (insufficient data) rather than the absence of the pools, or that the DNAPL may have all through the clays into deeper sediments including the Floridan Aquifer.

Response 2- With the number of borings completed at the Site, including those borings that encounter DNAPL, there have been no observations of DNAPL pooling on the defined clay low permeability units. The HG borings were installed through the center of mass of creosote within the fully characterized Surficial Aquifer at each of the four source areas with the sole intent of delineating the presence/absence of free product. During this process, there was evidence of historical lateral migration on top of the Hawthorn clay layers. Further, with the exception of FW-6 (discussed in previous response to comments), data from existing Floridan wells do not support the presence of DNAPL in the Floridan Aquifer.

Comment 3- This analysis does not appear to account for the fact that creosote is probably wetting the Hawthorn and has high viscosity (average = 14 cp) and consequently

2 GeoTrans, February 28, 2005, Addendum to the Upper Floridan Monitoring Plan, submitted to U.S. EPA, FDEP, ACEPD, and GRU on behalf of Beazer.

many such wells may be required to intercept DNAPL in the Upper Hawthorn Group. Therefore, mobile DNAPL may only migrate to close-by wells and may otherwise tend to continue to migrate downwards through wormholes, etc.

Response 3- If the creosote is wetting, recovery will remove a lower percentage of DNAPL present given the presence of fine-grained materials (i.e., clays), which would produce significant capillary trapping forces. These forces are reversed from the typical water-wetting conditions, resulting in capillary forces favoring entrance into tighter grained soils and resisting entrance into larger pore spaces such as well gravel packs and bore holes. Preliminary results using Site creosote and sediments indicate that Site conditions are water wetting or weakly water wetting when creosote is advancing. As indicated in our response to General Comment 1, the target of this recovery effort is a sand-and-gravel seam that contains mobile DNAPL. The fact that this coarse-grained seam contains mobile DNAPL is consistent with a water-wet system. The issue of wettability also was addressed in previous response to comments and will be covered further in a forthcoming report.

Note that capture radius is not a function of viscosity, although velocity of DNAPL flow and resulting transit times are dependent on viscosity. Finally, note that if DNAPL is wetting, it will tend to avoid larger-grained, secondary permeability features and will instead preferentially flow into fine-grain materials, i.e., clays.

Comment 4- The recirculation well shown in Figure 7 will be ineffective if it is not positioned into the gravel layer. The re-injected water will have a viscosity at least ten times less than the creosote DNAPL, so it will never be very effective in displacing and mobilizing creosote because of viscous fingering.

Response 4- We agree that the well needs to connect hydraulically to the higher permeability zone were DNAPL is present. However, viscous fingering is more of an issue for secondary / tertiary petroleum production where long distance, high pressure drives are possible. Given the limited DNAPL saturation and low pressure differentials that can be obtained, hydraulic finger / bypassing is in effect always dominant in DNAPL recovery from shallow unconfined aquifers, with the result that "displacement" of DNAPL is not effective. However, increased DNAPL recovery can be obtained if enhanced hydraulic gradients towards a recovery well can be achieved at a greater distance through groundwater recirculation.

Comment 5- The submersible pump shown in Figure 7 should be at the bottom of the well in the well screen interval, otherwise they will not effectively recover NAPL.

Continuous pumping will be better than occasional bailing that seems to be implied by this Work Plan.

Response 5- Beazer has utilized periodic removal of DNAPL from the well sump at numerous sites and finds it to be far superior to continuous pumping of DNAPL with groundwater. This approach prevents the emulsification of the DNAPL with groundwater and allows for the quantification of DNAPL recovery rates through monitoring accumulation.

Comment 6- If this is deemed a suitable means of recovering DNAPL from the UHG, why is it not being considered—except at PW-1—for use throughout the surficial aquifer?

Response 6- Pumping at PW-1 is a pilot test. As pointed out in Beazer's letter to Amy Williams dated August 4, 2004 (p. 6), "If results from this effort [pilot test at PW-1] are successful (i.e., creosote is recovered), enhanced creosote recovery may be expanded to other source areas at the Site." Evaluation of the PW-1 pilot will be provided in a subsequent document.

Comment 7- Section 2.2 (page 2-2), first bullet, should Beazer design the DNAPL recovery system based on "average" creosote characteristics or on the more difficult end of the creosote spectrum that is identified at this site? What is the range of values observed for the physical properties of creosotes identified at the Koppers Site?

Response 7- The design of the pilot test allows for a wide range of creosote properties. However, the properties of the DNAPL will affect the performance of the system, which is one reason the pilot test is necessary. Data from the pilot study will provide additional information on the physical properties for the creosote at this Site. In addition, physical properties of Site creosote were provided in the DNAPL Source Delineation Report and in the March 8, 2005 meeting in Gainesville, FL.

RESPONSE TO ACEPD COMMENTS ON UPPER HAWTHORN GROUP DNAPL RECOVERY PILOT STUDY WORK PLAN

Each ACEPD comment is repeated followed by the respective Beazer response thereto.

Comment 1- Sources of DNAPL – ACEPD does not agree with the statement that "No mobile DNAPL has been indicated below the Upper Hawthorn Group." DNAPL was reportedly found in well HG-10D during and subsequent to well development.

Response 1- Although DNAPL observations were made in the log for HG-10D, it is believed that these observations are indicative of residual DNAPL and not mobile DNAPL. In addition, well drilling disturbances caused DNAPL to accumulate in HG-10D shortly after construction. However, from 7/20/2004 to 3/29/2005, HG-10D has been monitored weekly and there has been no DNAPL observed in this well during this 8-month period.

Comment 2- Task 1 – DNAPL Recovery Well Design and Operational Modeling/Optimization – Contaminated (untreated) "coproduced" groundwater must not be discharged to the surficial aquifer or recirculated in the intermediate aquifer (Hawthorn Group formations). The "coproduced" groundwater must be treated on-Site and discharged to the municipal wastewater system, or treated (to drinking water standard levels) prior to use for recirculation in the Hawthorn Group. ACEPD does not recommend discharge of recirculation water (treated or untreated) to the surficial aquifer. Explain the purpose for the two proposed monitoring wells.

Response 2- Beazer believes that the in-well separation of the DNAPL provides a level of groundwater treatment. Beazer will evaluate the feasibility of recirculation of groundwater within the Hawthorn Group following treatment to applicable standards. The two monitoring wells are required for hydraulic monitoring of the capture zones, etc.

Comment 3- Section 3.3 Task 3 – DNAPL Recovery Well Operation – ACEPD recommends monitoring water levels in all intermediate aquifer wells in proximity, including those completed in the Lower Hawthorn, during DNAPL recovery. No discussion of how DNAPL will be removed from the recovery well was provided.

Response 3- The requested water level monitoring will be completed during the pilot study. DNAPL will be removed periodically using an electrical pump, such as a Linear Pump.

RESPONSE TO U.S. EPA COMMENTS ON UPPER HAWTHORN GROUP DNAPL RECOVERY PILOT STUDY WORK PLAN

Each U.S. EPA comment is repeated followed by the respective Beazer response thereto.

Comment 1- The proposed location of the Upper Hawthorn Group DNAPL recovery testing is at the North Lagoon. This is the same area as the proposed pilot testing of the grouting that will attempt to control the migration of DNAPL out of the surficial aquifer. While this is not necessarily a concern, any problems that might be encountered during implementation of either pilot test due to activities of (or results from) the other pilot test need to be acknowledged and addressed to the extent possible in the appropriate pilot test work plan(s), rather than during actual implementation or testing.

Response 1- Beazer has relocated the grouting pilot testing in response to this comment.

Comment 2- Section 3.1 proposes operation of a recirculation well to deal with the coproduced groundwater. Disposal of the ground water via this method, even into ground water that is already contaminated, would possibly constitute the operation of an illegal Class IV injection well, particularly if there is a measurable amount of free product contained in the water that would be injected. There has previously been a determination made in EPA Region 4 that at another Superfund Site in the Region, injection of moderately contaminated ground water recovered during an aquifer test would, in fact, constitute operation of a Class IV injection well and would therefore be illegal, even if it was reinjected into the same contaminated zone from which it was removed.

The extracted ground water would have to be treated in order to meet the requirements of 40 CFR Part 144 Subpart B Section 144.13(c), which states:

> Wells used to inject contaminated ground water that has been treated and is being reinjected into the same formation from which it was drawn are not prohibited by this section if such injection is approved by EPA, or a State, pursuant to provisions for cleanup of releases under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601-9657, or pursuant to requirements and provisions under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 through 6987.

Other options for treatment and or/disposal of this water should be considered and presented in this work plan. If addition of water into the upper Hawthorn Group will enhance product recovery then extracted water that is either treated or other water that is uncontaminated by the Site needs to be added to the aquifer, if the injection well operation is acceptable to both EPA and the State of Florida. EPA would consider this option favorably as a part of enhanced performance of the DNAPL extraction well, provided that the injected water quality is acceptable.

Response 2- Beazer is familiar with the UIC requirements for the injection of treated groundwater. Note that the separation of DNAPL from the groundwater provided by the large-diameter well proposed will provide primary treatment of the recirculated groundwater that will significantly reduce the mass of the constituents currently present within the aquifer. Note that the primarily treated groundwater will then be reinjected into the aquifer in an area with significantly higher constituent mass. In order to conduct the underground injection, a variance will be requested from the FDEP in accordance with the requirements of the Florida Administrative Code and in accordance with the existing U.S. EPA guidance related to underground injection associated with the in-situ treatment of groundwater.

Comment 3- Sections 3.1 and 3.3 indicate that the DNAPL recovery well will be operated such that essentially ground water will be removed by the actual pumping, while the DNAPL will separate out of the water and be trapped at the bottom of the well in a collection sump, then periodically removed. If this approach requires operating the well at a pumping rate lower than what could be achieved (and lower than the pumping rate that would yield the most DNAPL), then a higher pumping rate should be selected and the DNAPL should be managed on the surface if necessary, rather than being managed in the well. It is likely that some surface management (treatment) of the extracted water will be required, regardless of the pumping rate. Also, it is unclear why there would be two flow rates tested. The goal of this test is to determine the potential of a well to recover DNAPL, which should be a function of the sustainable pumping rate for the well. Thus, it would seem that if a variable pumping rate is used, it would only be during system start up to evaluate the maximum sustainable pumping rate that would be used over most of the pilot test.

Response 3- The groundwater pumping rate will be optimized to maintain laminar flow conditions in the aquifer and to maximize the in-well separation of the DNAPL. Based on experience at the PW-1 pilot study and at other Beazer DNAPL recovery Sites, higher groundwater flow rates will emulsify the DNAPL with the groundwater rather than maintaining the DNAPL as a separate phase, and would require additional above-ground treatment. At PW-1, increasing the pumping rate above 2 gpm decreased the DNAPL recovery rate. Operation of the proposed DNAPL recovery well at varying/incremental rates will provide the necessary data to determine the optimum DNAPL recovery rate.

Comment 4- Figure 6 and Figure 7 show a bentonite seal that apparently extends from above the upper Hawthorn extraction zone to near the base of that zone. The text needs to explain why the bulk of this zone should be sealed off in the extraction well. This approach would seem to reduce the yield of the extraction well to the point that an extraction rate that may be less than the maximum potential sustainable rate would result.

Response 4- The length of the screen and bentonite seal is based on maximizing the pressure on the DNAPL within the aquifer and forcing the DNAPL to enter into the well from the areas/zone where the DNAPL is present within the aquifer. Although the yield would be lowered, the benefit of concentrating on the zone where the DNAPL is present is a larger factor for the recovery of DNAPL.

Comment 5- The work plan needs to explain the function of the proposed monitoring wells, including a comprehensive statement about monitoring frequency and conditions or constituents that will be monitored during the test. Additionally, Figure 8 shows a cross-hatched pattern of material that will be placed in the well bore outside the casing from near the surface, through the surficial aquifer and upper Hawthorn clay and into the target monitoring zone (and at the base of the well). This material needs to be identified on the figure and described in the text. The same comment generally applies to the same pattern shown on Figure 6 and Figure 7.

Response 5- The monitoring wells are for the evaluation of the capture zone during the hydraulic monitoring. The frequency of the monitoring will be based on the results of the initial testing, including the capture zones developed and the DNAPL recovered at a specific groundwater flow rate. The work plan will provide specific information regarding this issue. The cross hatch indicates the presence of a cement-bentonite grout seal and will be clarified within the referenced figures.