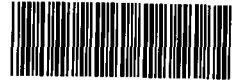




O'BRIEN & GERE



SDMS DocID 2105015

December 14, 2006

Charlie Root, Remedial Project Manager
U.S. Environmental Protection Agency, Region 3
1650 Arch Street
Philadelphia, PA 19103-2029

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Response to USEPA/PADEP Comments
Main Plant Area Revised Ground Water
Investigation Work Plan (July 2006)

File: 12261/37558 (#2)

Dear Mr. Root:

O'Brien & Gere. is pleased to transmit, on behalf of the Chemcene Site Defense Group, the following responses to comments provided by the U.S. Environmental Protection Agency (USEPA) and Pennsylvania Department of Environmental Protection (PADEP) on the *Main Plant Area Ground Water Investigation Work Plan (Revised)* for the Malvern TCE Superfund Site (O'Brien & Gere July 2006). These comments were received on September 18, 2006.

Should you have any questions or wish to discuss these responses, please contact Chris Young at (610) 435-1151 at your convenience. As you are aware, the CSDG has already proceeded with the monitoring well installations described in the *Revised Work Plan* with your verbal concurrence.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Michael S. Kozar, PG
Sr. Managing Scientist

Enclosures:

Response to Comments Document
Revised Table 4
Figures 1 and 2

cc: April Flipse - Pennsylvania Department of Environmental Protection
CSDG Technical Committee
Chris R. Young, CPG - *de maximis, inc.*
Thomas A. Nowlan, P.E. - O'Brien & Gere

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

Note: Agency comments are italicized below followed by responses.

RESPONSES TO CDM COMMENTS (PROVIDED BY CHARLIE ROOT/ USEPA)

General Comments

- 1. The Conceptual Site Model (CSM) described in the work plan is the same as was presented in Accelerated In Situ Bioremediation Pilot Report Addendum, Main Plant Area, Malvern TCE Superfund Site, March 2006. CDM provided comments on the report in our review dated May 16, 2006, and those comments and concerns are still valid. Our primary concern is that the high groundwater flow velocities and historic contaminant levels imply that the primary plume migration route has not yet been discovered, and that the extent of contamination is undefined both laterally and vertically. Only one (GW-13) of the six proposed groundwater wells described in this work plan is located in an area that will significantly add to understanding the CSM, and it is likely too shallow to provide much information. It will be very difficult to substantially add to the understanding of horizontal and vertical contaminant flow and extent with this well.*

As noted, the CSM section is the same as presented in the March 2006 *AISB Report Addendum*. The CSM section was purposely repeated in the *Revised MPA Ground Water Investigation Workplan (Revised Work Plan)* such that the revised plan would be a “stand-alone” document.

As previously discussed and as stated in the *Revised Work Plan*, the overall objective of these particular well installations is to facilitate the completion of the remedial design. More specifically, the objectives are to confirm the CSM and to ensure that the source area and VOC plume are sufficiently delineated so that the remedy can be designed to address the core plume allowing for the natural attenuation of the remaining VOC plume. The location and depths of the proposed additional monitoring wells are expected to achieve these objectives. The Work Plan also provides for the evaluation of the data provided by these additional wells and, if necessary, the installation of additional wells to define the area for source treatment.

CDM’s characterization of ground water velocities at the Site as “high” is a relative term and the postulated relationship between these velocities and the primary groundwater flow path at the MPA is too vague to provide a specific response. It is also not clear how the presence of “high” ground water velocities and historic VOC levels implies anything specific about the degree of characterization of the primary plume migration pathway. The purpose of a CSM is to bring together and articulate those Site-specific aspects that affect the nature and migration of contamination. The foundations for the CSM at the MPA include the geologic setting, historic groundwater potentiometric elevations and analytical results. The CSM considers the hydrogeologic features (i.e., the orientation of bedding and or/or joint planes) that likely provide the more significant control on contaminant transport, given the historic analytical data. For the MPA, the CSM illustrates how the source area VOC concentrations are related to the migration of VOCs and, in particular, the orientation of the VOC plume in the direction of GW-8 (the newly installed monitoring well adjacent to GW-6) and GW-1. The additional monitoring wells proposed in the *Revised Work Plan* (including new well GW-8) are intended to confirm the orientation and generally narrow configuration of the core plume area as predicted by the CSM, which will allow the design of a groundwater remediation system.

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

It has already been demonstrated by prior MPA investigations that the highest VOC concentrations are present in water-bearing fractures that are within the upper portion of the bedrock (i.e., "shallow bedrock" for the purpose of characterization). The ground water VOC concentrations detected in the shallow zone at the MPA property are indicative of source area concentrations, while the concentrations in deeper and high yielding fractures are two to four orders of magnitude less, even approaching MCLs.

It is also noted that GW-8 has already been installed and ground water has been sampled and analyzed from this well as summarized in the *Bioaugmentation Plan Letter* (O'Brien & Gere October 9, 2006). Ground water VOC concentrations in the deeper well paired with GW-8 (GW-6) were over an order of magnitude lower than the VOC results from GW-8. The results from this well support the CSM conclusion that the core plume area is predominantly shallow and oriented generally along an axis proximal to GW-7, CC-6, GW-8 and GW-1 (well locations are shown in Figure 1).

- The location of well screens have been defined on Table 4. The work plan does not describe any mechanism to gather or incorporate any information obtained during well installation to evaluate various fracture intervals encountered during drilling, including their location, orientation, yield or contaminant level. There is also no provision to conduct geophysical logging of the holes. CDM believes that the plan as presented loses an opportunity to better understand the complex fractured bedrock geology and enhances the CSM. Additional down hole investigation and communication with EPA regarding the final well screen locations should be added to the work plan.*

As noted above and in the *Revised Work Plan*, the investigation work has a focused objective to better delineate the source area ground water VOC concentrations, particularly the orientation of the plume axis, as requested by the USEPA. As detailed in the CSM section of the *AISB Report Addendum* and the *Revised Work Plan*, while preferential flow paths are present in the bedrock aquifer, the vertical interval with the highest ground water VOC concentrations and the monitored intervals of the pilot test wells (primarily GW-7, CC-6, GW-8 and GW-1) are within the same elevation range. The vertical occurrence of fractures/voids, the initial VOC distribution (i.e., prior to AISB effects), the results of the bromide tracer study, the distribution of electron donor from AISB efforts, drilling observations, and VOC results from GW-6/GW-8 and CC-6/CC-13 all demonstrate a shallow bedrock zone of preferential VOC migration for the highest VOC concentrations.

One of the most useful tools to assess potential fracture zones/yields in bedrock is careful observation of drilling conditions and inspection of drill cuttings. Based on the observations from the numerous wells drilled at the Site and downhole geophysical studies, rock coring, packer testing/pump testing, the occurrence of water-bearing fractures vertically in the bedrock is sparse. Most recently, O'Brien & Gere's observations in drilling the GW-8 borehole confirmed the scarcity of water bearing fractures. Further, these observations confirmed the depth of the fracture zone at GW-8 consistent with the CSM and the results from sampling at this well confirmed that the screened zone intercepted the primary groundwater pathway for contaminant movement, also consistent with the CSM and the results for CC-6 and GW-1.

While the use of downhole geophysics, and, in particular, Acoustic Televiewer (ATV) logging, may provide some additional or confirmatory information, its use at the Site is limited by the observed

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

drilling conditions at many locations where borehole collapse has been problematic. However, the CSDG is proposing the initial use of this downhole testing method not previously used at the Site, where drilling conditions permit. Assuming that drilling conditions are favorable, the CSDG will log new well bores using ATV technology. Prior borehole testing did not include this more recent technology, which most directly measures the downhole orientation of fractures, joints and other features. In addition, existing MPA wells that have an open-hole construction will be logged with the ATV. The CSDG will provide recommendations regarding the continued use of ATV during any subsequent investigations, based on an evaluation of the well logs from the initial tests.

Specific Comments

- 1. Page 18, Section 3.2.2 Sample Collection.*** *Sampling protocol that describes how the 15-foot piece of tubing will be purged should be included. If components of the sampling effort of Section 3.3.2 will be followed, then those components should also be described in Section 3.2.2.*

The tubing (Teflon[®] rather than polyethylene, tubing will be used) will be purged using an gas-tight polyethylene 60 cubic centimeter (cc) syringe to withdraw one to three tubing volumes of purge gas at a rate no greater than 0.2 liters per minute (lpm). One purge volume will be calculated based on the actual length of tubing and the manufacturer-supplied inside diameter of the tubing and will be documented in the field.

- 2. Page 21, Section 4.1 Groundwater Delineation Overview, 4th Paragraph.*** *This section states that the objective of the new monitoring wells is to monitor bedrock groundwater quality and potentiometric elevations in the shallow bedrock. CDM believes that this objective is too narrowly defined, and that the new data will not be sufficient to improve the CSM. Deeper wells should be installed to define the vertical extent of contamination and help understand the migration route of the contaminated ground water plume.*

As noted in the response to *General Comment 1* and in Section 1.2 (page 3), the *Revised Work Plan* was designed to further delineate the MPA ground water VOC source area and core plume area sufficient for completion of the remedial design of the MPA remedy. In addition, the EPA required more information to better understand the potential effectiveness of bioremediation and to address several data gaps in the CSM, as outlined in the USEPA's November 2, 2005 and June 16, 2006 letters, prior to completing the remedial design. As stated on page 3 of the *Revised Work Plan*, the specific objectives of the ground water investigation are:

- further define the VOC source area in bedrock ground water
- further define the VOC plume configuration downgradient of the source area
- further characterize bedrock ground water flow conditions in the MPA area and VOC plume
- investigate the potential presence of VOCs in soil vapor due to the MPA VOC plume and assess the potential vapor intrusion pathway.

The proposed depths of the wells were selected based on the CSM and the specific objectives of this investigation as stated above. Existing well pairs (e.g., CC-6/CC-13 and more recently GW-8/GW-6) and deeper wells have been evaluated with regard to vertical groundwater gradients and VOC migration. The results of this evaluation have been presented and incorporated in the CSM. A

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

specific purpose of this plan, consistent with EPA's request, is to confirm that the primary VOC migration pathway from the source area is sufficiently understood. The results from this program will confirm or expand on the existing CSM and to provide the information required to design the active groundwater remedial system. This requires the CSDG to understand the nature and extent of the core plume area in both a vertical and lateral direction. Once this area has been confirmed and contained/remediated, the periphery of the plume will attenuate consistent with the ROD objectives.

The *Revised Work Plan* also specifically provides for the possible installation of additional wells should the results from the initial well installation indicate potential remaining data gaps critical for remedial design. This includes using the results from the initial phase of work to locate a deeper well, as already specified in the Work Plan, Section 4.1, page 22:

“As described below, the need for a second phase of well installations will be considered, based on the ground water sampling results from these new and existing MPA wells, if the additional VOC plume data do not address the CSM data gaps sufficient for remedial design. If additional wells are necessary, well locations would be identified in an addendum to this Work Plan.

In addition, an appropriate location and construction design for an additional well(s) to further define the vertical ground water VOC concentrations in the bedrock, as requested by the USEPA, will be selected based on these new data and after the VOC plume axis is confirmed or better defined. This will allow the location to be more optimally selected after refinement of the CSM.”

The additional data will certainly refine and therefore improve the CSM, even if these data do not address all potential data gaps.

3. **Page 22, Section 4.2. Monitoring Well Installation.** *The description of monitoring well installation does not include any information on evaluating various fracture intervals encountered during drilling, including their location, orientation, yield or contaminant level. It also does not include any geophysical logging of the holes, or provide for any discussion with EPA prior to selecting the final screen location. Groundwater flow and plume migration in the fractured bedrock aquifer is complex, and the presence of fractures, water bearing zones, or contaminant levels cannot be predicted in advance. As much information as possible should be obtained from the borehole before the depth and length of well screens are determined.*

See response to *General Comment 2*.

The CSM and the specific data gaps identified by the USEPA and are addressed by the *Revised Work Plan*, are based on all the prior RI and pre-design investigation (PDI) studies of the MPA, which are referenced in the plan. The body of scientific data regarding the MPA is significant and includes work by the USGS. The work has included borehole geophysics, televideo analysis, packer testing, and pump testing. As an example of the detailed work, the following is excerpted from page 130 of the *Hydrogeologic Investigation of the Malvern TCE Superfund Site, Chester County, Pennsylvania*, USGS Water-Resources Investigation Report 96-4286, December 1996:

“The plant area is underlain by dolomite of the Elbrook formation. The dolomite at the plan area is less fractured than the dolomite at the disposal area. The mean thickness of the weathered

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

(clay) zone overlying bedrock determined from natural-gamma logs is 55 ft., which is similar to that of the disposal area (58 ft.). Five wells (CC-19, CC-20, CC-21, CC-22, and CC-23) were drilled at the plant area for this investigation. In the three wells that did not collapse, only one water-bearing zone in two wells (CC-20 and CC-22) and two water-bearing zones in one well (CC-19) were penetrated to a depth of 303 ft bls. The dolomite at the plant area does not yield as much water as the dolomite at the disposal area because it is less fractured. Yields of 9 wells at the plant area range from 1 to 200 gal/ min; the median yield is 6 gal/min. Specific capacities and the transmissivities are lower at the plant area than at the disposal area. Specific capacity for wells at the plant area ranged from 0.08 to 2 (gal/min)/ft.

Well CC-19 was originally drilled to a depth of 303 ft bls. Water-bearing fractures were penetrated at 145 ft and 166 ft bls. Borehole geophysical logging and heat-pulse-flowmeter measurements show that water enters the well through fractures at 177 ft (0.09 gal/min) and 166 ft bls (0.12 gal/min), flows upward at 0.2 gal/min, and exits the well through the fracture at 145 ft bls. An aquifer-isolation test using an inflatable packer was conducted to determine the yield and VOC concentration of water from each zone. Water levels measured in both zones after water levels had stabilized showed that the water level was 0.15 ft higher in the lower zone than in the upper zone, indicating flow from the lower to the upper zone; this confirmed the heat-pulse-flowmeter measurements. VOC concentrations were similar for each zone.”

With the RI completed, the additional work proposed represents a further refinement on the prior pre-design studies regarding the CSM of the source area and zone of highest VOC concentrations. As such, the suggestions in this comment have already been addressed in prior work and the current work is focused on completing the remedial design. While it is generally presumed that “*Groundwater flow and plume migration in the fractured bedrock aquifer is complex,*” the process of understanding the source area characteristics in the MPA has been advanced well beyond this general concept and is now appropriately focused, as noted by the USEPA, on the remaining data gaps relevant to the remedial design.

As noted above for recently-completed well GW-8, the fracture interval with the highest VOC concentrations was encountered within a few feet of what was predicted based on the CSM. Therefore, CDM’s comment “*the presence of fractures, water bearing zones, or contaminant levels cannot be predicted in advance.*” is not necessarily correct, as the hydrogeologist’s ability to make such predictions within reasonable accuracy is Site-specific and objective-specific. Further, GW-8 was successfully screened across the fracture zone with the highest VOC concentrations in this area based on the CSM and drilling observations (i.e., drilling rate, percussion level, the occurrence of water bearing fractures, and PID screening). While the orientation of the water bearing fracture was not directly evaluated in the subsurface during drilling of GW-8, its relationship to the core plume was confirmed by the analytical results, which exhibit good correlation with the results from CC-6, GW-1 and the CSM. Confirmation and further delineation of the orientation of the VOC core plume axis to the north of CC-6 and GW-1 is one of the objectives of the *Revised Work Plan*.

As noted in the *Revised Work Plan*, the actual depths and lengths of the well screens are subject to field observations of fracture occurrence, yield, PID readings and potential DNAPL observations if encountered (the latter particularly for MPA property wells; no indications of DNAPL were observed at GW-8). The focused nature of the investigation on the shallow bedrock and zones with highest

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

potential VOC concentrations lends itself to relatively straightforward decision-making on screen placement. Therefore, the CSDG is not proposing nor has USEPA or PADEP requested, based on its review of the December 2005 work plan or this *Revised Work Plan*, that the well installation process be suspended for discussion of screen placement or lengths. While the CSDG will notify EPA and PADEP of the proposed screen placement depth at each well location, the drilling procedure does not account for maintaining an open-hole in bedrock while the agencies and CSDG collectively decide on the screen placement depth.

However, O'Brien & Gere will send daily (or as frequently as practical) updates via electronic mail to USEPA, PADEP and CDM. These updates will summarize field work and observations and will provide updates on planned screen placements.

4. *Page 23, Section 4.2 Monitoring Well Installation. 1st and 2nd Paragraphs. The second half of the first paragraph and the first half of the second paragraph include several incomplete sentences that make the drilling description difficult to understand. The sentences should be revised to complete the descriptions.*

The sentences were revised to correct this and the revised portions of the paragraphs noted should have read as follows:

“...If borehole friction prevents its removal, the 10-inch diameter casing will remain and will be grouted in place with a cement-bentonite (95%-5%) mixture (minimal annular space will be present between the casing and borehole wall with ODEX drilling).

Alternatively, conventional air-rotary drilling may be employed to advance a 14-inch diameter borehole approximately 5 ft into weathered or competent bedrock, which is anticipated to be at depths between 55 to 90 ft bg...”

However, as previously documented (via email) to USEPA, PADEP and CDM, the drilling procedure was further modified based on final planning with our drilling subcontractor, Talon Drilling, and field conditions. Eight (8) inch diameter casing was advanced (drill and drive) in the GW-8 borehole into bedrock, and four (4) inch diameter PVC well riser and screen were installed within the 8-inch diameter casing. These details are noted on the GW-8 well log. GW-8 was successfully installed without the need for multiple steel casings. This procedure will be followed for the remaining wells if possible. However, extremely difficult drilling conditions have been encountered at some locations (e.g., borehole collapse, silt-filled voids) and the ultimate drilling procedure will be modified as necessary to successfully complete well installation and screen placement across the target zones.

5. a) *Table 4 Summary of New Well Construction Specifications. Estimated well screen elevations should be provided in addition to well depth information*
- b) *In general, the six new wells will provide locations where data can be collected for the site. However, as a group, the wells are not sufficiently distributed (horizontally and vertically) so that the data set collected from them will significantly add to understanding the CSM. Additional wells in downgradient areas and wells installed into bedrock below the shallow bedrock zone should be considered. Specific comments on individual proposed well locations are given below.*

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

The first part this comment is addressed above under the responses to *General Comments 1 and 2* and *Specific Comment 1*.

Based on access negotiations since completion of the *Revised Work Plan*, one of the well locations (GW-13) has been revised after USEPA discussion and concurrence. Location GW-13 was moved further downgradient, from 12 James Thomas Road to 10 James Thomas Road, after the owner of 12 James Thomas Road refused to grant access for drilling. The attached Figure 1 shows the current, planned MPA monitoring well locations with the revised GW-13 location. Note that as of the date of this letter, no access has been granted for GW-12.

Approximate well screen elevations are included in the attached revised Table 4, which was also revised from the *Revised Work Plan* version to reflect the new location of GW-13.

CDM repeats the same comment multiple times below, which is their opinion that the well locations will not appreciably add to the CSM or the understanding of the downgradient plume. The CSDG trusts that this concern has been addressed at length in the above responses and only responds to the more specific comments in the responses below.

- c) *GW-8: This well is essentially duplicate of GW-6, presumable to preserve the monitoring history of GW-6 when injecting into GW-8. It does not enhance the CSM or understanding of the downgradient plume. It is also shallower than GW-6, screened in the weathered bedrock, and may not be representative of the most highly contaminated groundwater in the area.*

GW-8 is not a duplicate of GW-6. As discussed and shown in cross-sections in the *AISB Report Addendum* and both MPA work plans, GW-6 monitors a deeper interval than upgradient well CC-6 and downgradient well GW-1 and has significantly lower ground water VOC concentrations due to its deeper screen interval. GW-8 was installed to provide a monitoring point in the shallow bedrock aquifer, comparable to CC-6 and GW-1, where similar ground water VOC concentrations were expected and detected consistent with the CSM. Also, it was hoped that GW-8 would provide more favorable conditions for bioaugmentation as an injection well, upgradient of GW-1.

As the bromide tracer study had already demonstrated, a predominant ground water flow pathway from the bedrock zones monitored by GW-7 and CC-6 to the deeper zone monitored by GW-6 is not present; as such, preservation of the monitoring history at GW-6 during AISB injections is not a concern.

GW-8 was installed with screen in competent bedrock and across a distinct fracture zone. One of the geologic cross-sections for the Site was updated to include GW-8 and is attached as Figure 2. As noted above and presented in the *Bioaugmentation Plan Letter*, ground water VOC concentrations in GW-6 were over an order-of-magnitude lower than the VOC results from GW-8. These results at GW-8 were as predicted in the CSM. Rather than VOC concentrations increasing with depth as suggested by this comment, VOC levels dropped off significantly with depth as observed in GW-6 and other wells in the area having deeper screen intervals (e.g., CC-6/CC-13 results).

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

- d) *GW-9: This well is to further define the lateral plume edge north of highly contaminated well CC-6, near the cap area. It may help define the source area, and add information concerning the apparent bedrock mound at CC-6. It will not appreciably add to the CSM and the downgradient plume.*

See response above.

- e) *GW-10: This well is to further define water quality west/northwest of the source area and northern edge of the cap, and help understand the upgradient relation between CC-2 and CC-6. Information from this location can help understand the potential for spreading of injected groundwater prior to treatment, but will not appreciably enhance the understanding of the CSM or the extent of the downgradient plume. This well should be drilled into competent bedrock below the shallow bedrock zone.*

See response above.

- f) *GW-11: This well is to help understand groundwater quality west of the cap end upgradient of CC-2, and investigate if a source is near CC-2. It does not enhance the understanding of the downgradient plume. The planned screen depth from 285 to 265 feet mean sea level (msl) is shallow. Consideration should be given to drill this well into competent bedrock below the shallow bedrock zone.*

See response above.

- g) *GW-12: This well is to help understand groundwater quality north/northwest of GW-1. It may help understand the northern extent of contamination near the source. The planned screen depth from 285' to 265' msl is shallow. Consideration should be given to drill this well into competent bedrock below the shallow bedrock zone.*

See response above.

- h) *GW-13: This well is to understand groundwater quality downgradient of GW-1 and upgradient of GW-5. This is the only well that is positioned in a location that is likely to help appreciably enhance the CSM. However, the planned screened depth from 285' to 265' msl is much too shallow, likely to be screened in the overburden. This well should be drilled to competent bedrock below the shallow bedrock zone and any encountered fractures evaluated for flow, orientation, and contaminant level.*

See response above. As noted above, this well location has been moved further downgradient with USEPA's concurrence (Figure 1).

For the GW-13 location, the geologic materials where the well screen will be placed will be identified based on drilling observations. As shown on the attached Figure 2, the geologic material present at depths equivalent to the shallow bedrock zone targeted at the MPA may be overburden or weathered bedrock (possibly fault gouge). Based on drilling observations, the

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

shallowest water-bearing zone exhibiting the greatest PID responses or other indications (e.g., odor) of potential VOC contamination will be targeted for screen installation.

RESPONSES TO USEPA/MINDY SNOPARSKY COMMENTS

1. *3.2 Soil Gas Sampling Page 18 – the justification for one sampling event is vague.*

As noted, soil vapor monitoring by O'Brien & Gere and others at other project sites has shown that seasonal variations in soil vapor concentrations are generally negligible. The soil gas survey is being conducted to investigate the potential vapor pathway as a result of the MPA ground water plume. As the depth to ground water (over 70 ft below grade) is significant and the VOC plume is contained in water-bearing fractures within the weathered or competent bedrock, seasonal conditions (i.e., barometric pressures, depth to water variations) are not expected to factor significantly in this investigation. Therefore, only one sampling event is specified by this *Revised Work Plan*.

As noted in the *Revised Work Plan*, if the soil vapor sampling results for these locations indicate the potential for a complete vapor intrusion pathway, additional characterization may be required.

2. *DNAPL Investigation – It is unclear how “elevated” the readings from the PID should be before drilling cuttings will be tested for DNAPL. If there is a reason to believe that DNAPLs exist at the site, then this should be investigated as part of the well installation, not as an afterthought. Refer to DNAPL Site Characterization (9/1994) EPA/540/F-540/019 and Cohen and Mercer (1993) DNAPL Site Evaluation.*

The screening provision of the *Revised Work Plan* is to ensure that the field team is cognizant and prepared for potential DNAPL, and is not an afterthought. The decision to specifically screen for DNAPL will be based on PID readings, odors, staining/discoloration of drill cuttings, and/or observations of sheen or potential free phase on water. If there are any indications of DNAPL, the field geologist will screen for DNAPL, which is a routine activity when drilling at Sites where VOCs are present near solubility limits.

RESPONSES TO USEPA/KATHY DAVIES COMMENTS

1. *Section 3.2 Soil Gas Sampling – 3.2.2. Sample Collection – It is recommended that if only one sample is to be withdrawn from each location, the sample depth should be immediately above the water table/capillary fringe (unless in the bedrock and if so, then at the interface with the competent rock) and not at a predetermined 10-15 ft bgs. It is recommended that Teflon tubing is used to prevent sorption of organics to the tubing. If bentonite chips are used to fill the annular space, they should be allowed to hydrate completely before sampling is conducted. The bentonite chips should not be used in the annular space above the water table; bentonite slurry or cement grout should be used.*

The proposed sampling depth of 10 to 15 ft is consistent with applicable guidance and evaluation procedures for the potential ground water to soil vapor pathway. As potential future development of the Township parcel might include basement structures, this is the deepest depth interval where

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

VOCs, if present, would represent a vapor intrusion risk to future development. Deeper samples will not add to the evaluation of this potential. It is also noted that basement sub-slab sampling at residences along James Thomas Road is part of the scope of the vapor intrusion investigation and these proposed soil gas results are not being used for the purpose of evaluating the potential nexus between the MPA plume and the existing homes on James Thomas Road.

Based on MPA wells drilled to date, ground water with VOCs at concentration posing a potential vapor risk is present in weathered or competent bedrock fractures (e.g., at 102.5 below grade at GW-8), below the overburden. The ground water is under some pressure as the ground water elevations are higher than the elevation of the bedrock fracture (e.g., the depth to water at GW-8 is approximately 90 ft below grade). As such, the collection of soil vapor samples at the competent bedrock interface would be equivalent to depths of 60 to 70 ft below grade and maybe as much as 30 ft above the VOC containing water bearing fractures¹. Therefore, the technical basis supporting the assertion that these deeper samples would be more representative of the potential risk for basement vapor intrusion than vapor samples collected at 10 to 15 ft below grade, just beneath the basement slab, is unclear.

Teflon tubing will be used, as noted above, and bentonite slurry will also be used.

2. *Section 3.3 Sub-Slab Air Sampling – 3.3.1. Locations – because of the spatial variability experienced in other sub-slab investigation, it is recommended that at least 3 sub-slab samples are located at each residence.*

Please provide further reference or basis for the number of sub-slab samples for review.

Given the general size of these residential buildings, one sub-slab sample should provide the necessary information to identify whether a potential nexus exists between Site groundwater and shallow soil vapor in the area of James Thomas Road. This approach is consistent with practices employed at other Sites.

To date, only one resident (10 James Thomas Road) has agreed to collecting even a single sub-slab vapor sample. other than at 10 James Thomas Road, and it is not likely that multiple locations would be approved by any residence.

- 3a. *Section 3.3. Sub-Slab Air Sampling – 3.3.2. Samples Collection – Please provide additional information regarding the size of the hole and removal of cuttings.*

The size of the hole will be approximately 2 to 3 inches in diameter. Cuttings will be removed for the residence by hand/buckets and staged at the MPA with other drill cuttings, for off-site disposal.

- 3b. *It is unclear how the tubing will be purged, the basis of the purge volume, what will happen to the vapor in the syringe, and what criteria will be used to end purging. Additionally, please describe how the tubing will be connected to the sample canister.*

¹ As of the date of this letter, the GW-13 borehole (on residential property) has been drilled and weathered bedrock was identified at 42 ft bg, with the first water-bearing fracture encountered at 90-91 ft bg.

Site: Malvern TCE Superfund Site
East Whiteland Township, Pennsylvania

Re: Main Plant Area Ground Water Investigation Work Plan (Revised), July 2006

The tubing (Teflon[®] rather than polyethylene, tubing will be used) will be purged using an gas-tight polyethylene 60 cubic centimeter (cc) syringe to withdraw one to three tubing volumes of purge gas at a rate no greater than 0.2 liters per minute (lpm). One purge volume will be calculated based on the actual length of tubing and the manufacturer-supplied inside diameter of the tubing and will be documented in the field. Collected purge gas will be injected into a Tedlar bag for off-site disposal. Soil vapor samples will be collected through the Teflon[®] tubing connected via 2-ferrule Swagelok fittings to Summa canisters.

Table 4
(Revised November 2, 2006)
Summary of New Well Construction Specifications
MPA Ground Water Investigation Work Plan
Malvern TCE Superfund Site, East Whiteland Township, Pennsylvania

New Monitoring Well Installations

New Well No.	Total Depth (ft bgs)¹	Screened Interval (ft bgs)²	Approximate Screen Interval Elevations (msl)³	Bedrock Well Purpose
GW-8	110	95-110	286.5 – 271.5	Bedrock ground water quality downgradient of CC-6 and upgradient of GW-1 (at shallower interval than GW-6 well screen)
GW-9	115	95-115	286.5 – 266.5	Bedrock ground water quality northwest of source area well CC-6, and up-strike from GW-1
GW-10	115	95-115	285.6 – 265.6	Bedrock ground water quality west/northwest of source area wells CC-6, CC-7, and GW-7; potential relationship between CC-2 and CC-6
GW-11	98	78-98	288.8 – 268.8	Bedrock ground water quality immediately west of cap and upgradient of CC-2 to investigate for potential source area near/at the CC-2 well location.
GW-12	118	98-118	284.25 – 264.25	Bedrock ground water quality north/northwest of GW-1 to confirm plume axis and downgradient of the MPA and GW-8
GW-13	118	98-118	286.5 – 266.5	Bedrock ground water quality and ground water flow characterization downgradient of GW-1 and upgradient of GW-5

Notes:

1. Well depths and screen intervals are approximate for planning purposes; the final well depths and screened lengths will be based on drilling observations.
2. ft bgs = feet below ground surface.
3. msl = mean sea level.

Dec 12, 2006 - 3:31pm

I:\Projects\12261 - Malvern TCE\37558\dwg\37558013.dwg

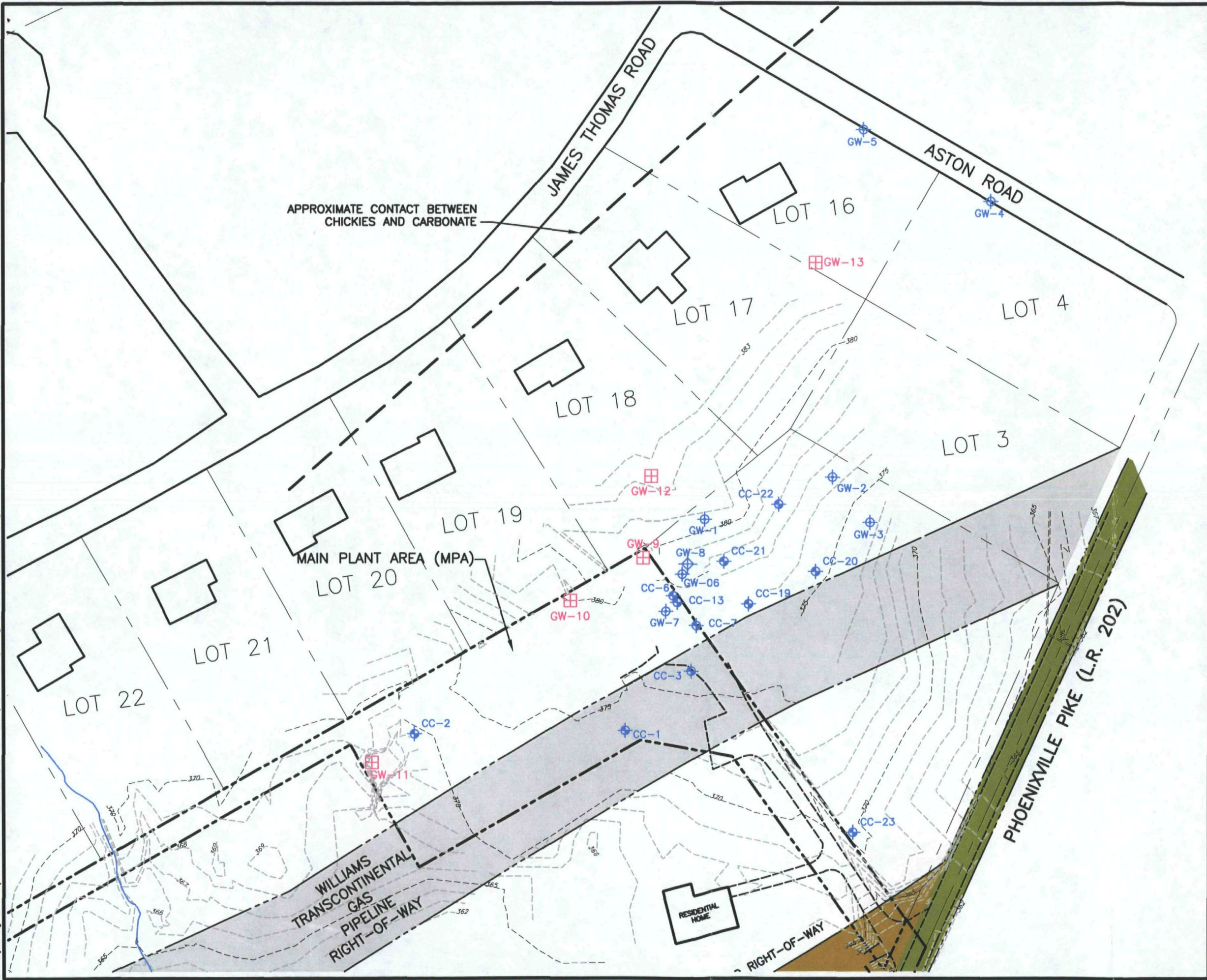


FIGURE 1



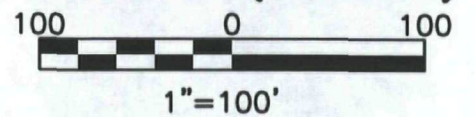
LEGEND

- SITE BOUNDARY
- x-x-x- FENCE
- GW-3 MONITORING WELL (INSTALLED DURING PRE-DESIGN INVESTIGATION)
- CC-14 MONITORING WELL (INSTALLED PRIOR TO PRE-DESIGN INVESTIGATION)
- GW-9 APPROXIMATE LOCATION OF PROPOSED WELL
- NEW MONITORING WELL APPROXIMATE LOCATION OF NEW BEDROCK MONITORING WELL (INSTALLED AUG. 2006)

NOTE:
 SITE TOPOGRAPHIC CONTOURS SHOWN ARE PRE-CAP CONSTRUCTION

**CHEMCLENE
 SITE DEFENSE GROUP
 MALVERN TCE
 SUPERFUND SITE**
 EAST WHITELAND TWP.,
 PENNSYLVANIA

**PROPOSED MPA
 BEDROCK
 MONITORING WELL
 LOCATIONS (UPDATED)**

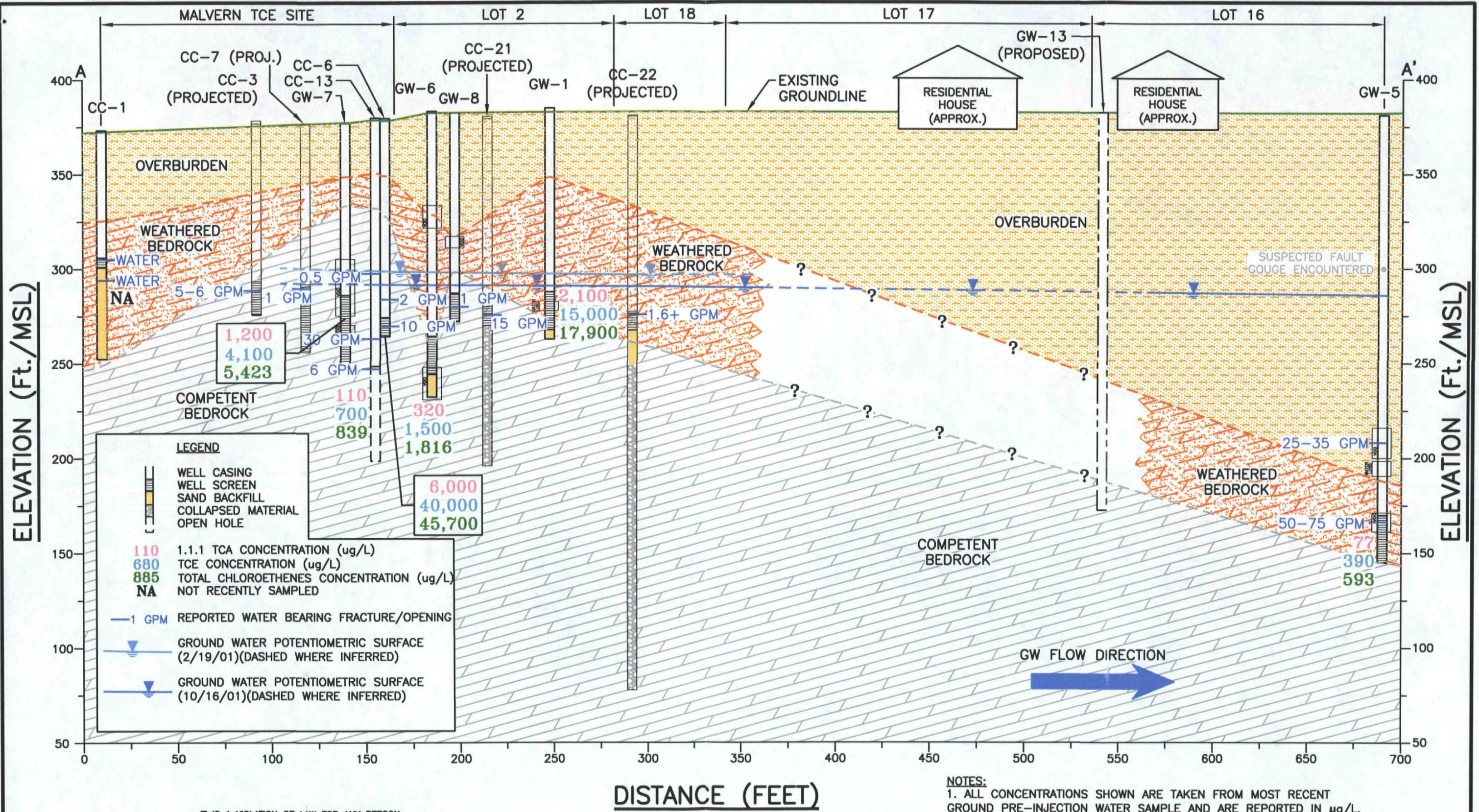


FILE NO. 37558.004-13
 NOVEMBER 2006



Dec 12, 2006 - 3:30pm

I:\Projects\12261 - Malvern TCE\37558\dwg\37558010.dwg



IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED ENGINEER, TO ALTER THIS DOCUMENT.



IN CHARGE OF	TAN				
DESIGNED BY	MLB	CHECKED BY	MSK		
DRAWN BY	RJD				
NO.	DATE	REVISION	INIT.		



CHEMCLENE SITE DEFENSE GROUP
MALVERN TCE SUPERFUND SITE
EAST WHITELAND TOWNSHIP, PA.
**HYDROGEOLOGIC
CROSS-SECTION A-A'**

FILE NO.	37558.001-10	2
DATE	NOVEMBER 2006	

AR305138