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THE MEMPHIS DEPOT
TENNESSEE

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 906

Final

Memphis Depot

BRAC Cleanup Team

Meeting Minutes

9 August 2007

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Previous Meeting Minutes and Action Items

The BRAC Cleanup Team (BCT) approved and signed the minutes from the 14 June 2007 meeting. The team welcomed Mr. Woods on board as the new TDEC representative.

AI: Continue including Mr. Spann in the distribution of data/information as he will continue to be involved with the project for several months.

Source Areas Remedial Action (SA RA)

Mr. Holmes provided an update on the SA RA. The Fluvial Soil Vapor Extraction (SVE) system start up occurred on 25 July. e^2M collected vapor samples after the system start up and made photo-ionization detector (PID) measurements for SVE wells and effluent daily.

Initially, the system had problems with one of the blowers shutting off. The total system airflow was restricted because of system adjustments made to equalize the flow from each individual well. e^2M increased the total air flow and made other adjustments to correct the problem. The air flow rates from individual wells ranged from 80 to 120 cubic feet minute (cfm). The system operated until 1 August when air samples collected from the effluent indicated the two granular activated carbon (GAC) filters had reached operational capacity.

Since the PID does not measure 1,1,2,2-Tetrachloroethane (PCA) very well and thus the mass could not be accurately estimated, e^2M turned off the system while emissions were well below the permit limits in order to replace the GAC. The BCT was notified of the system shut-down by email with an attached memo. Mr. Holmes anticipates e^2M will replace the filter on 9 August and then re-start the system.

According to Mr. Herrera, the initial mass of VOCs was removed at system start up which used the available system capacity. Mr. Holmes reported that VOC levels in the influent decreased an order of magnitude during the week of operation. Mr. Perlmutter interjected that the Source Areas Remedial Design (RD) indicated the need for the GAC filters for the initial VOC mass. The design then indicated discontinuing use of the filters after system start up when the team was confident of the PID measurements and that VOC levels in the treatment system effluent are below the emission levels allowed in the air permit issued by the Memphis/Shelby County Health Department.

Mr. Dobbs asked if the filters will continue to quickly reach operational capacity and if e^2M is prepared for the next filter replacement. Mr. Holmes indicated that with the VOC levels measured just prior to shut off, the filters will not reach operational capacity as fast. Mr. Turney said that e^2M has made arrangements with the filter supplier to have another filter available in any case.

Based on the PID measurements, the VOC levels in the treatment system effluent are well below the air permit emission levels. PID samples collected at the perimeter of the treatment compound did not indicate measurable levels of VOCs.

Mr. Holmes reported that e^2M collected soil samples from the top, middle, and bottom of the vadose zone during the installation of the SVE wells and vapor monitoring points and analyzed them for VOCs. Using the soil sample results, e^2M calculated that the CVOC mass within the radius of influence for the SVE wells was approximately 900 pounds of VOCs per year. This assumes the SVE wells have an 80-foot radius of influence and uses an average of all the soil sample VOC concentrations, not just the samples exceeding the remedial goals. Mr. Holmes reported that the total VOC mass extracted during the week of operation was approximately 360 pounds, and that the PID readings and estimated CVOC mass decreased each day of operation.

Mr. Holmes presented results from the groundwater baseline sampling conducted in May 2007 and compared them to results from the sampling event in November 2005. Mr. Ballard remarked that results from wells installed under the Source Areas had been declining but are now rebounding. Mr. Holmes opined that the ZVI injected in 2004 has been depleted while

contamination continues to move into the fluvial aquifer. Mr. Lawson asked about the water levels in that area. Mr. Holmes reported that water levels have decreased due to lack of rainfall.

Mr. Holmes reported that groundwater sample results from TA1 indicate that ZVI injections may not be necessary in one of the identified areas. In the other Treatment Areas, the Loess/Groundwater RAWP will call for additional monitoring wells to further define the area where contamination levels meet/exceed 1,000 parts per billion (ppb) and, therefore, require ZVI treatment. Mr. Holmes reported that MW135 in Treatment Area (TA) 2 was determined to be damaged and could not be sampled. The well was abandoned.

As reported in the June BCT, e^2M encountered some crushed drums containing a thick black substance as well as empty drums during installation of the SVE wells and conveyance piping in TA3 under the soil pile removed prior to construction. Mr. Holmes reported that sample results indicated the black substance to be primarily heavy hydrocarbons.

When asked what analysis had e^2M ordered for the sample of the black substance from the drums. Mr. Turney reported that e^2M order a complete TCL/TAL analysis. Mr. Ballard requested the sampling results. e^2M removed the drums and the affected soil from the SVE well location and the conveyance pipe trench only, placed the waste materials and soil in a roll-off container, and collected samples for waste characterization. e^2M is awaiting the soil sample analytical results for waste disposal.

Mr. Holmes said that removal of the remaining materials will be incorporated into the excavation work scheduled for the Loess/Groundwater portion of the SA RA, for which e^2M is preparing the RAWP. e^2M will define the excavation limits during the Loess/Groundwater RA field work. Mr. Holmes indicated the materials were not identified during earlier magnetic and other geophysical surveys because it was under the soil pile that has since been removed in preparation for the Fluvial SVE RA field work.

AI: e^2M to provide the BCT with sample results from the materials encountered during installation of the SVE well and conveyance piping.

Loess/Groundwater Remedial Action Work Plan (RAWP)

Mr. Holmes indicated that e^2M received EPA and TDEC comments on the Rev. 0 RAWP and provided the responses to comments. One issue will be resolved with the addition of an appendix to the RAWP and all other comments are resolved. e^2M is awaiting statistical data in order to complete the RAWP.

Mr. Ballard indicated that the RAWP should include a note regarding the additional excavation. Mr. Holmes responded that since the RAWP is scheduled for BCT submittal on 25 August, he had intended to present an addendum later after discussions with AFCEE and DDC regarding an additional geophysical survey of the area.

Dunn Field Land Use Control Implementation Plan (LUCIP)

Mr. Nelson reported that CH2M Hill has finished the LUCIP, but is still working the protocol. He plans to submit the LUCIP and protocol to Mr. Rick Wirsing of the Department of Army by 30 August.

AI: Mr. Nelson is to notify Mr. John DeBack and Mr. Rick Wirsing of the upcoming LUCIP and protocol and to indicate that their review shall be within the timeframe allowed in the Federal Facilities Agreement.

Main Installation

3rd Quarter LTM Report

Mr. Holmes indicated that he distributed figures and trends to the internal team prior to the BCT meeting and will distribute the LTM Report to the BCT next week. He reported that MW203 through MW219 have been installed and sampled. The sampling data successfully delineate the plumes, and Mr. Holmes presented figures showing the plumes.

Based on Tetrachloroethene (PCE) concentrations in MW-64, MW-217 and MW-218, the Bldg 360 plume is a downgradient extension of the Target Treatment Area (TTA) 2 plume.

Mr. Spann asked about sampling results for the monitoring well up gradient of TTA1. Mr. Holmes indicated that MW-219 contained PCE at 16 ppb. He pointed out the two plumelets at MW-52 and MW-25A in the golf course area that the team has previously discussed and noted they contained low levels of PCE, less than 11 ppb. He reported that at this time there is no plan to further investigate or treat these two areas.

Sample results from the newly installed MW-216, up gradient of MW-97 and west of Building 690, indicated it is clean.

The team then discussed the geology of the area with respect to the clay unit separating the fluvial from the intermediate aquifer based on data obtained during installation of the new wells.

Mr. Holmes indicated e^2M is still developing a plan to address the west-central plume including MW-39 and MW-39A.

Miscellaneous

Environmental Indicator Status

Mr. Ballard spoke with the staff responsible for Environmental Indicator (EI) regarding what constitutes "plume controlled" for use in the EPA's database. He reported that "plume controlled" means that the team knows the plume boundary and that the plume is stable. Mr. Ballard indicated that the remedy does not have to be in place to change the database to "plume controlled," but that he must have information that plume migration is under control.

Mr. Holmes asked what must be shown to confirm the plume boundary and that it is stable. Mr. Ballard responded that the team must show that there is no vertical migration. Mr. Dobbs asked the team what actions are needed to provide Mr. Ballard with the necessary data. Mr. Holmes responded that the Intermediate Aquifer Study should be sufficient.

Wabash Avenue Investigation

Mr. Ballard reported that a local resident filed a complaint with EPA regarding lack of communication of results obtained from the installation and sampling of monitoring wells as part of the Wabash Avenue Investigation conducted by EPA and TDEC. The resident had received a fact sheet distributed as part of the investigation that stated the information would be forthcoming, but she has received none.

Mr. Woods has contacted the EPA's project manager to obtain the resident's address. Mr. Woods and Mr. Ballard agreed that EPA and TDEC will resolve the complaint and that it is not an issue for the DLA and DDC to resolve.

Mr. Woods reported that the EPA project manager and the contractor distributed a fact sheet to the neighbors where work was to occur. Mr. Dobbs indicated he had not seen the final fact sheet. He asked if data were available to be provided

Mr. Woods indicated contractors recently installed groundwater monitoring wells and collected groundwater samples as part of the Cintas Site Groundwater Investigation being conducted by EPA and TDEC. He anticipates receiving the sample results within the next 30 days. Mr. Holmes asked if the contractors measured the groundwater levels. Mr. Woods responded that they did measure water levels and that he anticipates the sample package will contain the results. Mr. Woods also reported that the driller encountered the confining unit clay in all the wells.

Dunn Field FOST 4 Property

e^2M has abandoned the wells located on the Dunn Field FOST 4 property. Mr. Holmes distributed the groundwater sampling results for MW49, the existing well sampled prior to abandonment. He reported that sampling results indicated PCE levels below the reporting limit as in 1998. e^2M installed the replacement for MW36 in the intermediate aquifer in the siltier sands that they encountered. e^2M installed the replacement without problem.

e^2M will sample the new monitoring wells for VOCs during the next round of sampling and will sample the replacement well for MW36 as part of the Dunn Field Long Term Monitoring (LTM) program.

Mr. Holmes reported that he received guidance from Mr. Dobbs and Mr. John DeBack regarding the new Dunn Field gate and road. e^2M's subcontractors will install the gate and road in August.

Revised Proposed Plan

Mr. Holmes reported that on Monday he received EPA's comments on the Rev. 0 Dunn Field Revised Proposed Plan. He has briefly reviewed the comments and said they were straightforward. He is working the responses to comments. Mr. Ballard offered to host a conference call with Ms. Martha Brock, EPA general counsel, if Mr. Holmes has any issues to resolve based on her comments. Mr. Woods indicated that TDEC has no comments on the document and that he will provide a letter to Mr. Dobbs stating such.

AI: Mr. Woods to provide Mr. Dobbs with a letter stating that TDEC has no comments on the Dunn Field Revised Proposed Plan.

Dunn Field Record of Decision (ROD) Amendment

Mr. Holmes reported that e^2M distributed the Rev. 0 Dunn Field ROD Amendment to the BCT on 23 July for 60-day review. Comments are due 21 September.

Five-Year Review

Mr. Holmes reported that e^2M distributed the Rev. 0 Five-Year Review to the BCT on 30 July for 60-day review. Comments are due 28 September.

Off Depot Groundwater

Confining Unit Discussion

Mr. Lawson spoke with the University of Memphis Groundwater Institute regarding water level data for the Depot area. They have the data, and Dr. Brian Waldron will provide it upon his return from vacation. Mr. Lawson requested the team's approval to provide the Groundwater Institute with the Intermediate Aquifer Study results and, on behalf of Dr. Waldron, also

requested the team's approval to allow some University of Memphis students to observe the installation of the Intermediate Aquifer Study wells. The BCT agreed to both requests.

Mr. Nelson indicated that CH2M Hill has still not received the data that TDEC requested from Memphis Light Gas and Water (MLGW). Mr. Spann reminded the team that he complied with MLGW's direction to request the data via letter. Mr. Nelson said he would speak with Mr Fred Van Hoff again to obtain the data.

AI: CH2M Hill will communicate with the Groundwater Institute and with MLGW to obtain the necessary data.

Off-Depot Groundwater Remedial Design (RD)

Mr. Perlmutter presented the most recent results of the Enhanced Reductive Dechlorination (ERD) Microcosm Study. As presented at the June BCT meeting, degradation of daughter products, such as trans-1,2-Dichloroethene (DCE), in some of the microcosms was proceeding slowly.

SiREM recently raised the pH to slightly alkaline conditions and made sure there was sufficient Lactate to sustain adequately reducing conditions. Increasing the pH resulted in faster trans-1,2-DCE degradation rates in the lactate and WBC-2 microcosms.

In the EOS with WBC-2 microcosms, all three bottles reacted differently. Bottle 18 appeared to have a problem with viability of the microbes after the first 3 months, so CH2M Hill deleted it from the data set. Bottle 17 had good results early on; however, after SiREM spiked it, the TCE levels decreased but the PCA did not respond well and cis-DCE was not reduced. Bottle 16 had better results with a rather rapid TCE decrease and a slightly slower PCA decrease. Cis-DCE is declining, albeit, slowly and trans-1,2-DCE is accumulating.

Mr. Perlmutter reported that CH2M Hill and SiREM are concerned about the effectiveness of EOS as a long-term carbon source for WBC2. SiREM is conducting a microbial analysis on the microcosms to provide additional data for consideration in reviewing the overall results.

According to Mr. Perlmutter, the format of the Off-Depot Groundwater RD and the methods used to implement the remedy will remain the same. However, CH2M Hill is reviewing different carbon sources such as Hydrogen Reducing Compound (HRC) or HRC-Advanced (HRC-A). In SiREM's laboratory, WBC-2 has responded favorably to HRC during previous experiments. HRC-A is currently being marketed by Regenesis as a long-term carbon source that can be a substitute for EOS. CH2M Hill is also considering the use of high fructose corn syrup (HFCS).

Mr. Perlmutter indicated that CH2M Hill believes that if HRC is effective then HRCA will also be effective. Mr. Ballard and Mr. Miller asked if CH2M Hill will test the HRC or HRCA as part of the Microcosm Study. Mr. Perlmutter indicated that CH2M Hill did not feel it was necessary due to the existing data that indicate HRC is effective.

Mr. Perlmutter then presented comparisons of several injection designs that included the number of injections, the number of injection trailers, the capital costs and the annual costs. Lactate at all four transects is much more expensive than Lactate at Transect 1 and EOS at Transects 2, 3 and 4. The cost of Lactate at Transect 1 and HRCA at Transects 2, 3 and 4 is almost half of Lactate at all four transects.

The Injection Study will enable CH2M Hill to evaluate other cost impacts such as number of people needed to staff the injection trailers. Currently, the injection staff cost assumes two people

per trailer. CH2M Hill will determine if one person can staff each trailer. Mr. Turney stated e^2M's concern about one person working alone with a mechanized unit. He also indicated that the Main Installation injection trailer requires two people to properly operate.

Mr. Perlmutter noted the substrate selection and its associated injection frequency is the key impact to the remedial costs. CH2M Hill is evaluating whether high fructose corn syrup (HFCS) may be a cost-effective alternative to Lactate. HFCS is cited in the RD and it costs about half of what Lactate costs, at present.

Lactate is very soluble and will require almost constant injections to maintain sufficient levels to create the necessary conditions. HFCS injections would be about every three months. EOS will last the longest. Other carbon sources such as whey and ethanol could also be considered. Mr. Spann suggested that CH2M Hill also consider substrate combinations to include a soluble substance with a slow release substance.

Mr. Perlmutter reported that CH2M Hill is proceeding with the bioremediation concept in the Off-Depot Groundwater RD. The existing trailer system will work with whatever substrate is selected. The RD indicates that the substrate will be mixed with water and WBC2 via an inline mixer.

Mr. Ballard voiced concern that after completing the Microcosm Study and touting Lactate and EOS as effective carbon source substrates, CH2M Hill does not want to use Lactate because it is too expensive and EOS is not effectively reducing the daughter products. And now CH2M Hill is discussing the use of another substrate without testing. He suggested starting the Off-Depot Groundwater Remedial Action with Lactate and EOS, as previously discussed.

Mr. Perlmutter suggested that the RD documents continue using the generic term "substrate" since the remedy will not be implemented until next year and, during the interim, initiate a study of HRCA. Mr. Miller supported that idea of conducting a pilot study of HRCA before spending several million dollars to implement a remedy that may not be as effective in the field as in the laboratory.

Mr. Holmes suggested that the team resolve the question of which substrate to use before completing the Dunn Field ROD Amendment and the Revised Proposed Plan. He feels an additional review of carbon source substrates is necessary to develop the most cost-effective remedy.

Mr. Perlmutter asked if the Injection Study should become an HRCA pilot study. Mr. Holmes indicated it depends upon the scope of the Injection Study.

Mr. Dobbs asked if the team felt there was enough information about the plume in order to make decisions regarding the Remedial Action injection locations. Mr. Lawson indicated that the team information about the leading edge of the plume was not necessary before treating the areas of higher concentrations.

In response to Mr. Spann's question, Mr. Perlmutter indicated that Injection Study included a couple of monitoring wells and a few injection wells. He suggested conducting the Injection Study in the Early Implementation of Selected Remedy area (south of the MLGW substation on E. Person Rd.) as monitoring wells are already in place there.

The BCT agreed that CH2M Hill shall expand the Microcosm Study to include HFCS and HRCA. CH2M Hill shall also review the Injection Study objectives as it may become a pilot study of the alternative carbon source substrates.

Mr. Ballard indicated that EPA will review the 90% Off-Depot Groundwater RD received on 20 July and will assume that the document cycle will move forward because the data are there to use Lactate and EOS as the substrates. If the team has not identified a new substrate by the time to implement the RA, then Mr. Ballard can accept starting with Lactate and then amending the Off-Depot Groundwater RAWP with the alternative substrate.

He reminded the team the target dates to finalize the RD and to implement the RA should be met as there is an effective treatment to start the RA. If the questions raised at the meeting can be resolved prior to distribution of the Rev. 0 RAWP, then that document can identify the carbon source substrate. The BCT has started the RD review, and Mr. Ballard feels they should continue with that review process.

AI: CH2M Hill will review other substrates and include them in the ERD Microcosm Study.

AI: CH2M Hill will distribute the latest ERD Microcosm Study data (the graphs) for use in the BCT review of the 90% Off-Depot Groundwater RD.

Groundwater Modeling

Mr. Lawson presented results from the latest groundwater modeling effort. He indicated that the revised groundwater modeling simulations were performed to support the on-going Off-Depot Groundwater RD efforts.

To evaluate groundwater flow and contaminant transport at the site, Mr. Lawson developed a three-dimensional flow and transport model using MODFLOW the flow modeling platform linked with MT3DMS to perform the solute transport calculations.

The groundwater flow model grid is 4700 feet by 3500 feet (approximately 380 acres). The model layers represent the site stratigraphy to include the fluvial aquifer, the intermediate aquitard, the intermediate aquifer, the Memphis aquitard and the Memphis aquifer. Mr. Lawson suggested extending the model boundary out to MLGW's Allen Well Field to include the stresses imposed by the well field.

Mr. Lawson then presented information regarding the site stratigraphy. Groundwater levels and flow directions in the vicinity of Dunn Field are strongly influenced by local stratigraphy. Portions of the confining clay beneath the fluvial aquifer are absent west of the site. These permeable pathways, combined with a strong downward hydraulic gradient, channel groundwater flow to deeper units. Similar conditions may exist in the intermediate aquifer.

According to Mr. Lawson there are different studies of the site stratigraphy conducted by U.S. Geologic Survey (USGS) and others that link the fluvial aquifer with the Memphis Sands aquifer, but they do not include the intermediate aquifer. He said there is reason to believe the intermediate aquifer is connected to the Memphis Sands aquifer, but there are no strong data to confirm it.

The hydraulic conductivity models derived from data collected from deeper aquitards illustrated two windows from the fluvial aquifer to the Memphis Sands aquifer - one northwest of the MLGW substation on E. Person Rd. and one near MW43 along the rail road line.

Mr. Lawson reviewed the hydraulic conductivity between each stratigraphic unit presented by the model. The assumed hydraulic conductivity of the model layers reflects the complex stratigraphy at the site. Higher permeability conduits exist within the intermediate aquitard and

Memphis aquitard. He presented several figures showing the hydraulic conductivity in feet per day for each of the stratigraphic units.

Mr. Lawson then presented contaminant transport simulations. MT3DMS was linked with the groundwater flow system defined by the MODFLOW model to simulate contaminant movement from the Source Areas on Dunn Field. The groundwater contaminant plumes on Dunn Field were input to the model as boundary conditions. Simulations were also performed to assess the fate and transport of the plumes after implementation of the Source Areas RA.

Mr. Lawson described the changes from the original flow model. The original model had the intermediate aquitard beneath the fluvial aquifer as a single layer that led to projections of mass transport from the high concentration Source Areas into the intermediate aquifer due to numerical dispersion as opposed to actual data. To more accurately depict the vertical transport beneath the Source Areas, Mr. Lawson subdivided model layer 2 (intermediate aquitard) into 8 sub-layers with the same properties.

The original model showed the Source Areas disappearing within one to two years. Mr. Lawson did not believe that was going to happen in reality. He said that the original model predicted that plume migration and flushing from the Source Areas would happen more quickly than has been observed in the field. One reason for this is that the previous model assumes a plug flow through the Source Areas. To achieve a more realistic depiction of contaminant transport, a Mr. Lawson employed a dual-domain contaminant transport model.

Under this transport model, Mr. Lawson divided the aquifer pore space (0.3) into mobile (0.1) and immobile (0.2) regions. The mobile regions are readily flushable by advective flow, while contaminants in the immobile regions flush based on a specified mass transfer coefficient. The results more accurately depict longer-term "stable" Source Areas.

Mr. Lawson also modified this model to reflect the new Off-Depot RD strategy. The original RD strategy assumed ZVI injections and the installation of a Permeable Reactive Barrier (PRB). Mr. Lawson revised the simulations to reflect the refined RD approach of ZVI injections in the Source Areas coupled with down gradient in-situ treatment at multiple transects.

The November 2005 groundwater contaminant data were contoured and digitized to provide initial conditions to the MT3DMS model. For the Source Area RA, Mr. Lawson used the following assumptions: concentrations in the ZVI injection areas are reduced instantaneously to 1000 ppb; contaminant concentrations in the source areas were then assumed to be reduced from 1000 ppb to 100 ppb over 5 years. He then presented the new contaminant transport simulations.

Mr. Lawson discussed the impact of the enhanced bioremediation treatment (EBT) transect treatment rates on the new model. He also indicated that he may have to rethink the emulsified vegetable oil (EVO) degradation rates based on the ERD Microcosm Study info. The influence of the in-situ treatment that occurs at the groundwater transects is simulated in the model by assigning contaminant half-lives at that location. The half-lives assigned to the degradation reaction are based on the lab-derived degradation rates. The EVO and Lactate treatment rate is assumed to persist for 1 full injection cycle following cessation of active injections (EVO – 3 years, Lactate – 60 days)..

He then presented figures showing the model results starting with the initial conditions followed by model results for each aquifer showing both with the EBT transects and without. The time projected in the model results starts after the ZVI injections within the Source Areas.

Mr. Lawson indicated that the key result of the simulations, if the transects operate as predicted, is that concentrations within the Memphis Sands aquifer will not exceed the remedial goals.

Mr. Lawson also performed additional simulations to investigate the effects of the following on plume transport: lower horizontal hydraulic conductivity in the fluvial aquifer; higher vertical hydraulic conductivity in the intermediate aquitard near the plume stagnation zone; and a higher then expected contaminant degradation rate throughout the aquifer.

The results of this simulation suggest that when the assumed hydraulic conductivity of the fluvial aquifer is reduced by 50% then the plume migration rate is also reduced by approximately 50%. Therefore the effect of the uncertainty of aquifer hydraulic conductivity on the rate of plume migration is linear with K.

Mr. Lawson then presented model simulations of the higher vertical hydraulic conductivity in intermediate aquitard between windows in confining unit clay. He took the area between the windows and assumed that the area between was a fluvial channel. The model indicates that if the mass is being lost vertically, then the plume is thinner in that area. After 5 years, concentrations within the intermediate are higher than with the other model.

To investigate the implications of higher vertical K on contaminant transport behavior, Mr. Lawson performed a simulation with the Kv of the intermediate aquitard between the windows increased from 10^{-7} to 10^{-6} cm/s. The results suggest that an order of magnitude higher vertical hydraulic conductivity of the aquitard does increase mass flux to the intermediate aquifer. This mass flux was not high enough to significantly change the plume configuration in the fluvial aquifer. The higher vertical conductivities will be tested in future simulations with the specific values to be obtained by the aquifer testing.

Mr. Lawson reviewed simulations he performed assuming higher TCE degradation rates. The objective of this simulation was to investigate the behavior of the plume if anaerobic degradation was occurring throughout the contaminated area. Mr. Lawson assumed a degradation half-life of 1200 days, which is the value published by USGS for anaerobic conditions.

Under this simulation the plumes persist for about 10-12 years as opposed to a few years in the previous models. For the predicted simulations, the dense non-aqueous phase liquid (DNAPL) levels are significantly reduced. The results suggest that anaerobic degradation does limit the movement of the contaminant mass from the Source Areas into the lower aquifers. However, these processes also tend to reduce concentrations near the Source Areas more quickly than historic data suggests. Mr. Lawson indicated that the limited field observations available do not suggest that anaerobic aquifer conditions exist.

Mr. Lawson revised the contaminant transport model with a dual-porosity system that better replicates the observed transport behavior of the plumes. The models still predict a more rapid decline in the source zone concentrations than have been observed in the field. He believes this is likely due to continuing DNAPL sources that are not accounted for in the model and that this is more of an impediment to forecasting past plume behavior than in predicting future plume behavior as the remedial actions are planned to greatly diminish the extent of the DNAPL sources.

According to Mr. Lawson the next steps for groundwater modeling are to obtain information from the Intermediate Aquifer Study; estimate Kv of the intermediate aquitard materials; reassess the extent of VOC contamination in the intermediate aquifer, if any; expand the numerical model to include hydraulic stresses imposed by the MLGW's Allen Well Field; and incorporate new

information into a revised fate and transport model and investigate implications on current and future contaminant migration at the site.

Mr. Miller asked if the information to be gathered during the Intermediate Aquifer Study will include more recent water levels. He indicated that if seasonal data imply that there are some real features that will impact the flow field, then the appropriate assumptions should be included in the model. Another option is to review seasonality and select the worst case scenario for calibration of the model.

In response to Mr. Woods' question if the 10:1 horizontal vs. vertical ratio is a generic value or if it is specific to this area, Mr. Lawson responded it is a generic value.

Off-Depot Intermediate Aquifer Study

Mr Nelson reported that due to the contract delay and the driller's schedule, monitoring well installation will begin the week of 13 August. Since the BCT has not yet seen the Intermediate Aquifer Study Work Plan, Mr. Nelson presented the basic elements of the Work Plan and conducted an on-board review.

The Work Plan calls for installation of six intermediate aquifer wells and up to four wells for use in the groundwater model. CH2M Hill will perform two aquifer tests that will run for 72 hours. Groundwater sampling of the new wells will occur after all the wells are installed and coincide with the next round of Dunn Field Interim Remedial Action semi-annual sampling. CH2M Hill will collect split spoon samples for geophysical evaluation.

Mr. Nelson indicated the plan is to locate intermediate sand that is greater than 10 feet in thickness. The injection wells (IW) will be installed using mud rotary in order to install a 10-inch surface casing into the clay at the base of the fluvial aquifer; rotasonic rigs can not drill a 14-inch hole.

The mud rotary will only be used for setting the casing, so it will only drill into the uppermost intermediate clay. Then the driller will use rotosonic to drill through the intermediate clay and set the well in a deeper sand. Mr. Nelson said the plan is to stop drilling around 60-70 feet and collect split spoon samples to confirm presence of the clay and then set the outer casing. The plan is to drill 10 feet into the clay and then set the casing in the clay.

CH2M Hill's scope of work indicates collecting up to 10 clay samples. Mr. Nelson anticipates the field crew will collect the clay samples from each of the intermediate aquifer wells. Some clay samples can also be collected from wells drilled into fluvial aquifer. Mr. Lawson said it will be helpful for groundwater modeling to know if the clay has a uniform permeability as opposed to a location specific permeability.

IW2 will be an observation well for IW3, which is about 40 feet away. The field team will then position a fluvial well about 20 feet from IW3. Intermediate well MW37 is about 60 feet from IW3. Mr. Nelson indicated that CH2M Hill wants to place the new well near MW37. CH2M Hill will install the pumping well prior to installing the monitoring wells to ensure appropriate spacing.

Mr. Nelson continued that CH2M Hill will work to position IW1 up gradient from MW70 near the Fluvial SVE treatment area. All these wells will have an outer casing set in the uppermost clay to prevent cross contamination from the Source Areas into the lower aquifers. CH2M Hill will position IW5 near MW159 with IW4 about 40 feet from IW5 and IW6 about 75 feet away.

Once the injection and monitoring wells are installed, the drillers will move to install the fluvial aquifer and groundwater model verification wells. Wells installed in the area north of E. Person Rd along Ragan St. on the MLGW substation property indicate a sloping clay, so CH2M Hill plans to install a well northwest of there on Gold Street. The plan is to collect water levels from this well to provide more data for the groundwater model and to provide more data about the window in this area. With this well, CH2M Hill also hopes to gather data to determine if there is any groundwater reaction in the fluvial aquifer to the window.

In order to better understand the model and the southern window near MW42, Mr. Nelson proposes installing a monitoring well behind homes on Meadowhill St. along the rail road tracks. Mr. Nelson said he will meet with Mr. Steve Ledford of MLGW to inspect the well locations near the substation and under the power lines.

Mr. Nelson identified IW5 as a pumping well with IW4 and IW6 as observation wells along with others in area. He also reported that CH2M Hill has requested and received from the City of Memphis publicly owned treatment works the letter approving disposal of the water from the pump test into the sanitary sewer.

Regarding the aquifer pump test, Mr. Nelson reported that CH2M Hill will employ the standard testing method. They will set transducers in the wells more than 72 hours in advance of the step draw down test. Once finished, they will allow the aquifer to recover and then start the 72-hour pump test. He estimates pumping at 20 gallons per minute. Mr. Lawson requested that the test employ the highest possible pumping rate.

CH2M Hill provided the Rev. 0 Intermediate Aquifer Study Work Plan to the internal team in May and has revised the Work Plan with their comments. Mr. Nelson anticipates submitting the Rev. 0 Work Plan to the BCT the week of 13 August.

Mr. Ballard asked what effect the Intermediate Aquifer Study will have on the final Off-Depot Groundwater RD. Mr. Nelson indicated that BCT comments on the 90% RD are due 18 September. CH2M Hill then has 60 days to respond to and resolve comments. The Rev. 0 Final (100%) RD is scheduled for BCT submittal on 17 November. CH2M Hill intends to complete the Intermediate Aquifer Study field work by mid-October.

Mr. Ballard indicated that if the data gathered during the study are significant and cause changes to the RD, then the data report should become an addendum to the Final RD. If the data are not significant, then the data report should be a stand-alone technical memorandum.

Mr. Ballard asked if CH2M Hill has contacted the neighbors in the area regarding the upcoming activities. Mr. Nelson responded the field crew has spoken with some residents. Mr. Holmes indicated a fact sheet should be prepared and distributed. Mr. Nelson requested assistance from e^2M to prepare the fact sheet. CH2M Hill will distribute the fact sheet.

Schedule Review

The team did not identify any delays for the documents on the deliverables matrix.

Next Meeting

The next BCT meeting is scheduled for 20 September 2007 in Memphis, TN. The Project Team meeting is scheduled for the morning of 19 September with the RAB presentation dry run scheduled for that afternoon.

MICHAEL DOBBS — DATE
Defense Distribution Center
BRAC Environmental Coordinator
BRAC Cleanup Team Member

TURPIN BALLARD — DATE
Environmental Protection Agency
Federal Facilities Branch
Remedial Project Manager
BRAC Cleanup Team Member

JAMIE WOODS — DATE
Tennessee Department of Environment and Conservation
Memphis Field Office
Division of Remediation
Environmental Project Manager
BRAC Cleanup Team Member

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