PBOW - AR
Groundwater

Responses to Comments
Technical Memorandum
"Use of Groundwater Analytical Data in the
Groundwater Baseline Human Health Risk Assessment"
Plum Brook Ordnance Works, Sandusky, Ohio,
May 23, 2005

The May 23, 2005 Technical Memorandum was written in response to OEPA Comment No. 1 on the January 31, 2005 Baseline Human Health Risk Assessment for Groundwater (BHHRA) Work Plan. These Comments on the BHHRA Work Plan were sent to the U.S. Army Corps of Engineers (USACE) Nashville District on March 3, 2005. Work Plan Comment No.1 is included in this same submittal.

Comments by Ohio Environmental Protection Agency (OEPA), Division of Emergency and Remedial Response (DERR) on the Technical Memorandum
Reviewer: Ron Nabors

Ohio EPA has reviewed the technical memorandum and corresponding ground water dataset evaluation and have the following comments. For clarification, the shallow overburden saturated zone will not be quantitatively evaluated in the baseline human health risk assessment; only the bedrock (shale/carbonate) zone.

Comment No 1a: Filtered and unfiltered ground water analytical results should not be pooled into one dataset for the purpose of developing a ground water exposure point concentration (EPC). The two types of data are inherently different due to sample collection techniques (i.e., use of a 0.45 micron filter) and potential differences in exposures to receptors (e.g., filtered ingestion of ground water by an adult and unfiltered dermal contact by a construction worker). USACE/Shaw should develop ground water datasets at each well that are comprised totally of unfiltered ground water analytical results for use in the risk assessment.

Response 1a: It is recognized that low-flow sampling is generally regarded as superior to a bailer method because of the turbidity that may be generated through use of a bailer. We also recognize that unfiltered analytical data are generally preferable, unless excessive turbidity associated with the sampling method is encountered. That is why the second bullet on page 2-2 of the Work Plan recommended that filtered bailer data be used rather than unfiltered as a starting point, and that the unfiltered bailer data be considered if the filtered bailer concentrations are obviously less than the unfiltered low-flow concentrations. OEPA responded with the excellent suggestion that a table be developed to compare data so that all team members can agree on a data set prior to performing risk calculations. The Technical Memorandum and accompanying tables were prepared responsive to the OEPA suggestion.

There was apparently a miscommunication between USACE/Shaw and OEPA on the issue of combining data. USACE/Shaw did not understand the OEPA comment to

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indicate that filtered data could not be combined with unfiltered data under any circumstance, but rather that the data should be evaluated individually to make this determination. The conclusions of the Technical Memorandum recommended the inclusion of only two filtered samples in the BHHRA. These are the 1998 filtered sample from IT-MW10 and the 1997 filtered sample from BED-MW14. The Technical Memorandum well-by-well comparison gives the reasoning behind these recommendations.

Based on OEPA Comment No. 1a on the Technical Memorandum, USACE/Shaw will remove the unfiltered samples from IT-MW10 collected in 1998 and the unfiltered sample from BED-MW14 collected in 1997 without replacement by the associated filtered samples.

Comment No 1b. Ohio EPA is amenable with pooling unfiltered ground water analytical results collected using bailer and low-flow sampling techniques. Ohio EPA supports this decision due to the fact that many of the wells (both overburden and bedrock) display minimal recharge thus prohibiting the use of low-flow sampling techniques. The amount of time, funding, and other resources necessary to collect a database entirely of unfiltered low-flow ground water analytical results at each area of concern does not appear to be justified for the purposes of the sitewide ground water investigation (GWI) at the NASA Plum Brook Station (NPBS).

Response No. 1b: Comment noted.

Comment No. 1c: Ohio EPA is unclear as to why the shallow overburden saturated zone will not be quantitatively evaluated in the risk assessment. Ohio EPA requests that Shaw provide them with the rationale for excluding this zone from the *(sic)*.

Response No. 1c: Groundwater in the overburden is very continuous and seasonal. During the 2001 groundwater remedial investigation the installation of 135 temporary piezometers were planned. After the installation of only 32 piezometers, the USACE and OEPA agreed that further installation of temporary overburden piezometers was not required because of a paucity of groundwater. Note that groundwater was encountered during drilling in only 1 (TNTA-GW21) of the 32 piezometers that were installed. After letting the temporary piezometers stand for up to 7 days, 26 of these wells were dry and 1 piezometer had only a few inches of water in it (TNTB-GW02).

Even though perched groundwater is present in some areas and potentially could be contacted by construction workers, such exposure would be limited. The limited extent and seasonality of the groundwater would result in any groundwater exposure to be of a very short term. Because of the temperature conductance of water and the temperate climate of northern Ohio, a worker would not be expected to have prolonged contact with water during most of the year. The majority of the warmer months, when worker contact would otherwise be more plausible, are dry months (e.g., July, August, September) at PBOW when little water would typically be expected in the overburden. Generally, at

PBOW the water table is several feet below ground surface, even during wet months. Therefore, because of safety concerns (i.e., wall collapse) at these depths, it is expected that time spent in an excavation, where groundwater may be present, would be minimal. Any exposure to site-related chemicals via groundwater contact (if present) would be accordingly minimal in comparison to risks associated with direct contact of site soils.

Based on potential site-related human health risks associated with direct contact with soil, soil removal and remediation has largely been completed at TNTB and the Pentolite Road Red Water Pond Area, and is planned for TNTA and TNTC. Such removal and remediation is being performed following the site health and safety plan to minimize human health risks. Removal of the soil represents a removal of a potential source to groundwater contamination in the overburden groundwater where it exists. Thus, post-remediation contact with overburden groundwater should minimize risks even further. Analytical results from the overburden groundwater are being used in a site-wide groundwater transport model to determine the potential impact of site-related chemicals in the overburden groundwater on future concentrations in the bedrock aquifer.

Comment No. 1d: In summary, Ohio EPA is amenable with the ground water datasets proposed in the technical memorandum with the modifications noted in items a. and b. above.

Response No. 1d: See responses to 1a and 1b.

2. Once the ground water datasets for each well have been established, Ohio EPA is unclear as to how the datasets will be used in the risk assessment. For example,

Comment 2a. Will a statistical upper confidence limit be developed for each well at each area of concern (AOC) for use as a ground water exposure point concentration (EPC)?

Response 2a: Sufficient data are not available to perform a statistical evaluation at each well.

Comment 2b. Will the datasets for all the wells at a particular AOC be pooled to calculate a single statistical value for use as an EPC?

Response 2b: Section 3.2.1 of the Work Plan states that a 95th percent upper confidence limit on the mean will be calculated for each data set having at least five samples. This protocol is the same as that used for previous human health risk assessments and work plans associated with PBOW (IT, Corporation, 1998a,b; 2000a,b; 2001). For groundwater, there are no identified plumes, so the USACE considers it appropriate to pool all of the data for each AOC; for the overburden, this includes both monitoring well and direct-push results for organics. As stated in the Work Plan, the overburden and bedrock units will be evaluated separately.

Comment 2c. Will a maximum contaminant concentration or a statistical upper confidence limit be used as an EPC at each well, whichever is higher, or will the corresponding EPC be obtained from pooling all data from all wells at a particular AOC?

Response 2c: As stated in the response to Comment No. 2b., it is the intention of the USACE to pool all appropriate data for each water bearing unit.

Comments 2d. Is the risk assessment going to be completed at each well individually at each AOC or will the wells be 'pooled' in some manner as to evaluate each AOC as a whole?

Response 2d: The risk assessment will be based on the EPC of the pooled data of all appropriate analytical data for each AOC. This EPC will either be a UCL of the arithmetic mean concentration or the maximum detected concentration, whichever is lower.

Comment 2e. How will the risk associated with the downgradient boundary wells be compared or evaluated against the risk associated with the AOCs located further upgradient at the NPBS?

Response 2e: The Scope of Work for the groundwater risk assessment includes a single evaluation of all combined downgradient locations to determine whether the potential exists for adverse human health effects at any downgradient well. The Work Plan will be revised to specify that the maximum detected concentrations will be used in the determination of the EPCs for the downgradient wells.

Comment 2f: The items noted above (i.e., 2a through 2 e) should be clarified in some form of sitewide GWI risk assessment work plan.

Response 2f: Based on the contract between Shaw and the USACE, the current Work Plan pertains only to the three TNT manufacturing, the two red water pond areas, and wells downgradient of these areas at the facility boundary.

Comment No. 3: For reference, Ohio EPA has developed an approach for the calculation of ground water EPCs for use in risk assessments for portions of facilities subject to the requirements of a RCRA/Ohio EPA Division of Hazardous Waste Management closure. The EPC is calculated using the 95% upper confidence limit (UCL) of the mean where the dataset consists of 12 samples from three monitoring wells over four quarters of sampling at each well. These wells should be located within the center of the contaminant plume. If less than 3 wells are contaminated, then the maximum concentration (taken from the well with the highest concentration of the contaminant) should be used as the ground water EPC. If the maximum contaminant concentration is lower than the 95% UCL, then the maximum contaminant concentration should be used as the EPC.

For inorganic constituents of concern (COCs), the type of ground water data (filtered vs. unfiltered) to be used in the risk assessment is based upon an evaluation of turbidity. If the turbidity of the ground water can be reduced to a level below 5 nephelometric turbidity units (NTUs) by using low flow purging and sampling techniques, then the inorganic background database shall consist of total metals results. If the turbidity of the shallow ground water cannot be reduced to a level below 5 NTUs, then the facility may generate an inorganic background database based upon filtered metals results.

Response No. 3: Each organic compound with a maximum detected concentration (MDC) exceeding the U.S. Environmental Protection Agency Region 9 Preliminary Remediation Goal (PRG) for tap water (EPA, 2004), based on a hazard quotient of 0.1 or incremental lifetime cancer risk of 1×10^{-6} (whichever results in a lower concentration), will be selected as a chemical of potential concern (COPC). Groundwater risks associated with each organic COPC in the BHHRA will be based on the exposure point concentration (EPC). Either the 95th percent upper confidence limit of the arithmetic mean (UCL) or the maximum detected concentration (MDC) of the data set, whichever is less, will represent the EPC for that COPC. Consistent with the human health risks assessments performed for other media at TNTA, TNTB, TNTC, and the Red Water Pond Areas, the MDC will be used as the EPC for all data sets with fewer than five samples.

For the BHHRA, only unfiltered groundwater data will be evaluated. Groundwater risks associated with inorganics will be assessed as described above for organic compounds, except that the MDC of each unfiltered inorganic will also be screened against the background screening concentration (BSC) (Shaw, 2005). Only an inorganic whose MDC exceeds the BSC will be further evaluated in the BHHRA.

With respect to the first paragraph of Comment No. 3, quarterly sampling was not performed in any of the former TNT or red water pond areas. A brief review of the nitroaromatics analytical results reveals no plumes in bedrock groundwater among the TNT manufacturing areas and the red water pond areas. With respect to the overburden, either no plume is apparent or too few wells are present to identify a plume (e.g., only one overburden well is present in TNTB). It is also noted that groundwater may be too intermittent in the overburden to identify a plume.

In addition to monitoring wells, groundwater samples were collected from temporary piezometers that were installed using direct-push technology. With respect to organics in overburden groundwater, one-time samples have been collected from numerous temporary piezometers. For organics, the USACE plans to use these along with the monitoring well samples for risk evaluation. Note that because only a qualitative screening evaluation is planned for overburden groundwater, the MDC for each organic analyte would be used in the screening evaluation.

The second paragraph of Comment No. 3 presents the possibility of screening filtered site data against filtered background data for those unfiltered samples or wells in which NTU readings cannot be reduced to a value below 5 NTUs. The USACE will consider screening of filtered site data against filtered background data, as appropriate, in the uncertainties analysis. For instance, if the MDC of unfiltered arsenic were to exceed the BSC and PRG, arsenic would be carried through the risk assessment. However, if it were shown that the observed concentrations of arsenic in unfiltered groundwater were associated with excessive turbidity (based on a comparison of filtered data for the site versus the filtered data for the background samples), then it might be stated that, in this case, arsenic is unlikely to be truly site related and should not be regarded as a COC.

Comment No. 4. Shaw should be preparing responses to the remainder of the Ohio EPA letter dated March 3, 2005 on the January 2005 Baseline Human Health Risk Assessment for Groundwater Work Plan for submittal and review by the agency.

Response No. 4: Shaw has prepared responses to the remainder of the March 3, 2003 letter. These are included in this same submittal.