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Bennett & Williams Environmental Consultants Inc.

Memo

To: Mark Bohne & Members of the Plum Brook Ordnance Works RAB

From: Julie Weatherington-Rice, TAPP Support to the PBOW RAB

CC:

Date: February 3, 2006

Re: Review of the Draft Interim Soil Removal Action (ISRA) Report for the PBOW TNT Area B, October 2005

We have reviewed the Draft Interim Soil Removal Action (ISRA) Report for the PBOW TNT Area B, October 2005. For the most part, we concur with the decisions and recommendations made in this document.

This Draft document, prepared by WTI, Poca, West Virginia, discusses the investigations of contamination in soils in and around historical building sites in the TNT B area. The document discusses the site investigations and remediation held there over the last several years. The site activities included the removal of contaminated soils and building materials already identified as contaminated, the expansion of those removal areas and the further identification of additional areas that will have to be removed and/or treated at a later period of time.

The techniques for investigation are appropriate. The contractors used field sampling techniques to determine if the sites were contaminated with Nitroaromatics and in some cases, Lead. If the sampling pit indicated presence of contaminants, the contractor then backed off and dug another sampling pit. This process continued until samples no longer reacted to field sampling techniques. When this happened, samples were collected for the laboratory and if they were determined to be clean, then the contamination area, now further defined, was excavated and clean fill was installed to replace the excavated voids. In some cases, the areas determined to need excavation were larger than had been planned for so only partial excavations were completed with recommendations to continue the contaminated soils removal at a later point in time. The activities reported in this document are summarized on our Table 1 of this review.

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Table 1
Soil Excavation Efforts TNT Area B

Location* & Depth (In Feet)	Contaminant	Expected Area Vol. (Cubic Yds)	Actual Area Vol. (Cubic Yds)	Completed?	Further Excavations Planned-yd^3
Bldg 417 (1.5)	Nitroaromatics	300.0	1,531.86	yes	no
Bldg 453 (~5.0)	Nitroaromatics	71.0	61.53	yes	no
Bldg 456 (2.5)	Nitroaromatics	141.0	522.51	yes	no
Bldg 456 (1.9)	Nitroaromatics	15.0	14.71	yes	no
Bldg 462 (4.9)	Nitroaromatics	67.0	87.58	yes	no
Bldg 466 (7.5) & (4.5)	Nitroaromatics	753.0	1,466.78	yes	no
NW Nail (3.5)	Nitroaromatics	78.0	83.55	yes	no
Bldg 472 (5.0)	Nitroaromatics	190.0	341.11	yes	no
Bldg 473 (10.0)	Nitroaromatics	83.0	93.17	yes	no
Bldg 476 (3.0)	Nitroaromatics	83.0	96.09	yes	no
Bldg 452 (10.0)	Nitroaromatics Lead	500.0	409.77	no	2,053.46
Bldg 463 (10.0)	Nitroaromatics Lead	296.0	379.18	no	2,657.98
Bldg 456 (4.0)	Nitroaromatics Lead	85.0	85.0	no	1,108.46
NE Nail (8.0)	Nitroaromatics Lead	33.0	31.46	no	250.0
Bldg 412 (6.0)	Nitroaromatics Lead	266.0	44.0	no	646.52

Notes: Bldg 417 (1.5) – Wastewater Disposal Settling Tanks areas A, B, C & D
Bldg 453 (~5.0) – Fortifier House
Bldg 456 (2.5) – Wash House Areas A, C, D, E, & F
Bldg 456 (1.9) – Wash House Area G
Bldg 462 (4.9) – Bi-Tri House
Bldg 466 (7.5) – Wash House Areas A & B
Bldg 466 (4.5) – Wash House Areas C & D
NW Nail (3.5) – Northwest Nail House
Bldg 472 (5.0) – Bi-Tri House
Bldg 473 (10.0) – Fortifier House
Bldg 476 (3.0) – Wash house Line 7
Bldg 452 (10.0) – Bi-Tri House
Bldg 463 (10.0) – Fortified House
Bldg 456 (4) – Wash house Area B
NE Nail (8.0) – Northeast Nail House
Bldg 412 (6.0) – D. N. T. Sweating & Graining House

The Draft Report is well documented. There are a series of pictures for each site. The results of the laboratory analyses are included in the text portion of the report which makes it easy to verify the readings for the final samples at each site. The report includes good summary tables, such as Table 5 "Summary of Hazard Index and Closure Recommendation" which summarizes the sites that still need further work to reach closure. The plan sheets are easy to follow and they explain the efforts at each of the locations. The appendices are on a CD to save space in the printed volume.

Since these areas are historical construction sites that have been subsequently demolished and filled with soils materials that are now also contaminated and have to be removed, a review of the natural soils for the area is not particularly useful. In some cases removal goes some distance beyond the original building sites but with multiple histories of soil disturbance and removal with soil replacement fill, it would be difficult to determine from the soils mapping, what historical soils properties still remain in the area of each excavation site.

Removed soils were disposed of at the Erie County Landfill, disposed of at the BFI Ottawa County Landfill, and/or treated and then composted on site before disposal. "Clean" limits were Risk–Based which is typical for this type of a clean-up effort.

Concerns Regarding the Clean-Up Efforts

While we stated above that the sites were historically demolished and left as "clean" before this effort, we note that some of the excavations reach 5.0 feet in depth or greater, which increases the potential of sampling "in-situ" soils that have historical fracture patterns already established. The field testing and collecting of samples for laboratory testing in naturally occurring "in-situ" soils requires some care and consideration here in Ohio, especially in the Ohio Lake Plains area where fracture flow can become not only the dominant method of contaminant transport, but in some settings, the only method of transport. In this type of a setting, it is critical to insure that field sampling and the collection of samples for laboratory samples include fractured areas, as opposed to matrix sampling only.

This situation was discussed at some length by Michael Dalton, Ohio EPA, Division of Emergency and Remedial Response, Central District Office at the 1994 Ohio Academy of Science Annual Meeting Fracture Flow Symposium held in Toledo, Ohio that year. Dalton discussed sites where pit walls considered "clean" at the end of the day, would be found to be contaminated the next morning as contaminants moving with ground water flow, seeped into the pits over night through fractures, making it necessary to expand remediation areas significantly in some situations. The potential for sampling

"matrix only" materials can be reduced by taking samples of materials where the iron in the glacially-derived parent materials is in the oxidized state, or "brown" in color. That way, the potential of sampling only "clean" matrix (iron in reduced or "gray" color) while contaminants continue to move through fractures is reduced.

An abstract of Dalton's presentation is found in the 1994 Annual Abstracts Issue of the Ohio Journal of Science. The Symposium for the Annual Meeting was video-taped and, we remember that Ohio EPA was given a copy of the tape for their library and training programs. If there is interest in reviewing the Ohio EPA findings, we still have a copy of the tape at Bennett & Williams that we could make available to ACOE for this project review, assuming the tape is still viewable.

Concerns Regarding the Report

The other issue that raised concern when reviewing the DRAFT report was the set of comments on page 5, sections 1.3.4 and 1.3.5 referring to "background" surface and subsurface soil samples that had been collected for Plum Brook. In section 1.3.5, the statement is made and we quote:

> "In 1998, background soil samples (both surface and subsurface) were obtained to determine background concentrations of metals in the soil at the PBOW site (IT, 1998). The surface soil sample analyses detected 18 metals present, including 8 metals detected above the RBCs *(Risk Based Concentrations- our addition for clarification)*. These 8 metals detected above the RBCs included aluminum, antimony, arsenic, barium, beryllium, iron, manganese, and thallium. The subsurface sample analyses detected 16 metals present in the subsurface soil, including 7 metals detected above the RBCs. These 7 metals detected above the RBCs included aluminum, antimony, arsenic, beryllium, iron, manganese, and thallium."

It was the thallium that got our attention. Ohio clays are basically aluminum silicates. Most of our water is over the iron limits, arsenic continues to be a specific problem is areas of Ohio, barium is a common contaminant in areas of oil & gas extraction and/or natural petroleum seeps such as the Delaware Limestone in Erie County, and high manganese oxide levels have been reported other places in Ohio, but reports of thallium are extremely rare and, to our knowledge, limited to areas where coal is found and/or areas where coal and/or coal ash are stored. Thallium has an extremely low Maximum Contaminant Level (MCL) for Public Water Supplies of only 2 ug/l, a number often close to the detection level, so it is carefully watched for by those of us working with Public Water Supplies.

We checked the information on Table 1A "Summary Table Total Metals For the Borrow Area" and noted that NONE of the ten "Borrow Area" samples showed a detection for thallium even though the detection level was placed at 1 mg/kg. The column labeled "Background Soil Concentrations Average Levels" gave a thallium level of 2.846 mg/kg. This column indicated that the source of these metal averages was:

> "Metal Concentrations in Background Soils, former Plum Brook Ordnance Works, data taken from the Final Report for the Site Investigation of the Reservoir #2.2 burning grounds, Additional Burning Grounds Wastewater Disposal Plan #2, and the Power House #2 Ash Pit at PBOW, December 1997."

The reference to "Power House #2 Ash Pit" correlated with our experiences in finding thallium associated with in-situ coal and/or coal and/or ash stockpiles and disposal sites. That being the case, we downloaded the 1997 report from the ACOE Plum Brook Web Site to see if there was additional information that clarified the presence of thallium.

A quick reading of the 1997 report indicated that the metals analyses results came from a series of sampling investigations around three contaminated sites, including an old coal ash site. As expected, the highest thallium readings were found in and around the "Power House #2 Ash Pit". It was the statements in Section 6.0 "Conclusions and Recommendations" however that have created our current puzzlement as to the actual source and, more importantly, the validity, of the "background" metals used as a screen for the TNT B clean-up effort. Section 6.1.1 Reservoir No. 2 Burning Ground-Surface Soil makes the following statement:

> "Seven of 18 detected metals exceeded the respective RBCs. The comparison against background data indicate that arsenic and manganese concentrations appear to be at background levels while lead may be due to site contamination. Background data are not available for aluminum, beryllium, iron, and thallium."

That same statement is made throughout the conclusions every time that thallium is mentioned. If this is the case and the data from this 1997 report cannot be used for background soils metal data because the samples are from contaminated sites, how do we get to the point that this 1997 report is now used as the authoritative source for "background metals" at Plum Brook?

This is not a critical issue for settings where the contaminants of concern are Nitroaromatics and lead, but what if the contaminant of concern was aluminum, beryllium, or iron or any of the other metals that were studied in

the 1997 report and found to be a contamination as opposed to a naturally occurring background level. We don't know where the error and/or confusion in text explanations begin to enter the reporting chain. It may be with this report but we expect that it may well have been an earlier application and that a "de facto" background metals list got developed where no such information may have been originally contained. Perhaps this question is all clarified in an earlier document that is not referenced in these report tables. Perhaps this confusion can be clarified by simply citing another report where background levels were developed from sites considered "clean". It is our recommendation that ACOE review this issue and try to rectify the situation if the real answers are not contained within earlier reports. ACOE can remediate the situation either by establishing a "real" background metals list for the site from "clean" site analyses and/or including such an effort in an upcoming "Scope of Work" to be undertaken at some future point in time.

This concludes our comments on this Draft Report. For the most part, it is a useful, well organized research and clean-up effort for the TNT B area of Plum Brook. If you need further information and/or clarification, please feel free to contact us.