MEMORANDUM

TO: Mark Bohne, PBOW RAB Co-chair and RAB members

FROM: Julie Weatherington-Rice, Ph.D., RAB TAPP Coordinator

RE: Draft Baseline Human Health Risk Assessment and Draft Screening Level Ecological Risk Assessment Work Plans Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio – JE Jacobs

DATE: May 21, 2009

Per our current contractual arrangement with US ACE which require both a technical memorandum for each report and an educational explanation to the RAB, this memorandum constitutes the educational review of the J E Jacobs March 2009 "Draft Baseline Human Health Risk Assessment and Draft Screening Level Ecological Risk Assessment Work Plans Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio" documents. Please forward these comments to the other RAB members.

General Comments

These documents, like most of the documents developed for the Plum Brook Ordnance Works (PBOW) site are rift with acronyms and abbreviations. While these documents contain the typical "List of Acronyms and Abbreviations" in the Table of Contents, there are a number of terms that are not in common usage (such as OEPA or VOC) which are easily recognized at this point in the process by the lay reader. I had to check the list to find that "RTE" stood for "rare, threatened, or endangered". While I can appreciate that the authors are so acclimated to writing these types of documents that the use of these less common acronyms and abbreviations are second nature to them that is not the case with the lay reader. All documents for this site, especially the more arcane risk assessments, would greatly benefit from a final edit that replaced the less common acronyms and abbreviations with the actual phrase. This could be achieved simply by using the "Find All" and "Replace All" editing tool in their word processing program. For instance, all locations where the term "RTE" has been entered could be searched and replaced with the actual term "rare, threatened, or endangered". If for some reason, there is a compelling need to keep the abbreviation, the replacement could be "RTE (rare, threatened, or endangered)". I am certain that many readers would appreciate that courtesy.

These documents are a continuation of the numerous draft baseline human health and ecological risk assessments that we have been reviewing for the site. I have developed more substantive comments describing the "Risk Assessment" process in previous memos and so those comments will not be repeated here. By their very nature,

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these risk assessments are for the most part "boilerplate" or "cut and paste" documents, based on previous reports generated for the Reservoir No. 2 Burning Ground, for the PBOW site as a whole and/or for other sites where Jacobs has undertaken Human Health and Ecological Risk Assessments in the past. The documents benefit from all the strengths of the previous documents, such as the excellent background description of historical activities at the site located in section 1.2 "Background" (2.1.2 General Site Background in the Ecological Risk report) of each of these documents and the excellent graphics. However, since this is simply a rehashing of historical documents, new information, such as the research on the properties of the carbonate bedrock formations under the PBOW site, is not incorporated into the documents.

For instance, all of the information presented in the Human Health Risk Assessment in Section 1.3.2 "Groundwater Use" resubmits the historic conclusions that the limestone wells in the area of the Reservoir No. 2 Burning Ground are incapable of sufficient yields of ground water for a potable ground water source. In this report, ground water is considered a source of potable water. This section notes the locations of the closest private water wells (page 1-5, 2nd full paragraph) as being 3,800 feet (recorded log - 6115 Schenk Rd.) and 2,250 feet (no well log - 1810 Schenk Rd.) away on Schenk Road exactly as it was referenced in the Acid Area 1 document reviewed last February. A search on Google Earth locates the center of the Reservoir No. 2 Burning Ground at approximately 41^0 22' 27.65" North Latitude and 82^0 42' 06.62" West Longitude which creates a significantly greater distance to the local private water supply wells of approximately 8,388 feet for the 1810 Schenk Rd site. The distance to 6115 Schenk Rd. is approximately 2,850 feet. The SAIC reference must be to the boundary of the property and not to specific locations on the site.

Another limitation to using a "boilerplate" risk assessment document is that it is not clear the last time Jacobs undertook a comprehensive literature review to determine the most current considerations in human health and ecological risk assessments. This review seems to have included several more recent references (two for 2007 related to US EPA's ProUCL statistical program) since the risk assessment work plan prepared for Acid Area 1. I am pleased to see that my earlier comments may have resulted in updating the reference materials for this process. Again, however, it would be extremely helpful if a section was included in these documents that noted the date of the last thorough literature review on these topics.

For some reason, I found the Human Health Risk Assessment harder to follow than usual. Possibly this was because the report evaluated both the burn area and the area outside the burn area. I found it difficult to determine which parameters created risk issues for each human class. For my own understanding, I created the attached two tables, Burn Area – Human Health Risk Assessment Reservoir # 2 Burning Ground (Table # 1) and Outside Burn Area – Human Health Risk Assessment Reservoir # 2 Burning Ground (Table # 2) from sections 7.2.1 *Risk Results for the Burn Area* and 7.2.2 *Outside Burn Area Risk Results*, pages 7-2 through 7-4. I have included them in this memo because I found them a helpful summary. However, I am not absolutely certain that they are completely accurate as I struggled with the language, order of comments,

and the limitation of using abbreviations as I worked through these two sections. The sections would be greatly improved if there was a uniform presentation of the order of the parameters and the risk types for each of the human classes evaluated. I am not certain if Indoor Workers have no non-cancer threats from surface soil and ground water in the burn area or if the authors and reviewers simply forgot to list them. They do have a non-cancer risk from ground water in the area outside the burn area.

Relating to the Ecological Risk Assessment document, several general and specific comments and/or questions arise that may or may not have been asked and answered over the years. I raise them here as much to jog memories if they have been addressed as to add them to the lists of objectives that need to be addressed if they have not been. In the fourth paragraph of the Executive Summary, the following comment has been made, "Vegetative stress attributable to chemicals was not observed". Has anyone run tissue samples from plants, especially grasses and forbs at this site and/or other contaminated sites at Plum Brook, for contaminant uptake, especially heavy metals? Because of the root uptake process of plants, vegetative portions of the plants can be high in heavy metals without negative impact noted by observation. Over time, the plants can be higher in heavy metals than the soils they are grown in as they bioaccumulate the metals out of the soils. When this happens, the animals grazing on the vegetation are exposed to higher levels of heavy metals than would be expected which can result in sickness and/or even death. In fact, the first documented case of heavy metal toxicity in vegetation occurred from a grass pasture uptake of naturally occurring selenium which resulted in death to the cattle that grazed on the grass, even though the pasture appeared to be acceptable. It was this experience that led to the whole field of phytoremediation.

Specific Comments – Draft Baseline Human Health Risk Assessment Reservoir No. 2 Burning Ground

Page 1-3, Section 1.2 Background, 7th paragraph

1. "Organic concentrations are significantly higher at the location upstream of the site, adjacent to the service road, suggesting that contaminants are related to a source other than the burning ground." Has this/these other source(s) been identified yet? What land uses are upstream of the drainage ditch sampling location, both historical and present, that could be contributing these "organic concentrations'? This statement needs additional clarification and/or documentation to support it.

Pages 2-9 and 2-10, Section 2.3 Results of the Data Evaluation beginning with "Surface Soil Within Burn Area"

2. This section would be helped with a link to a previous document that explains why not every sample was tested for every parameter and/or a short discussion here RE: the reasons for selective testing parameters.

Page 3-2, Section 3.1.1 Physical Setting: Geology, 2nd paragraph

3. "Rock cores collected during the monitoring well installation showed few fractures, low porosity, and occasional zones with naturally occurring oil and

hydrogen sulfide gas which are common in the Columbus Limestone (Shaw, 2005b). The Shaw report is incorrect regarding the statement that "hydrogen sulfide gas" is "common in the Columbus Limestone". In point of fact, here in Ohio, hydrogen sulfide gas is typically found emanating from bedrock formations deposited in a reducing atmosphere, such as the black shales. Any hydrogen sulfide gas emanating from a Columbus Limestone well is probably coming from the underlying Detroit River formation which is exposed at the Wagner Limestone Quarry. The gas can move up through bedrock fractures in the overlying Columbus Limestone and vent from the well casing, but the gas does not originate in the Columbus Limestone formation. Please either correct this section and/or remove the incorrect portion of the quotation.

Page 3-3, Section 3.1.1 Physical Setting: Surface Water, 1st paragraph

4. Is there a culvert and/or a field tile under the road to join the two parts of the drainage ditch? If so, which way is it sloping? How do you know?

Page 3-9, Section 3.1.3.4 Subsurface Soil: Future On-Site Resident

5. Don't forget gardening as a land-use activity of the future on-site resident. Vegetables will be grown in the subsurface soil for at least three possible reasons: 1) the subsoil is exposed at the earth's surface because of excavation and construction of the property when building the new residence, 2) the garden plot has been deep tilled and/or double dug, and 3) the vegetable has a deep rooting system. Many vegetables will bioaccumulate metals in the plant tissues which are then eaten by the resident family. See note 6.

Page 6-4, Section 6.0 Uncertainty Analysis: Selection of Hypothetical Receptors and Potential Exposure Pathways, 1st full paragraph

6. "However, experience has shown that risk from ingestion of home-grown grains, fruits, meat, poultry, eggs, or milk is generally insignificant." But NOT green, leafy vegetable parts. In fact, the broccoli family is used for the uptake of heavy metals as a form of phytoremediation on Superfund and Voluntary Action Plan clean-up sites.

<u>Specific Comments – Draft Screening Level Baseline Ecological Risk Assessment Reservoir No. 2 Burning Ground</u>

Page 2-2, Section 2.1.1 General Site Background, 1st paragraph

7. "However, since the Trojan Power Company operated the site in the early 1940s and agricultural production on the land ceased, undeveloped portions of the former PWOW have become second generation forest and open fields. In fact, just about anything that has re-grown into forest at the PBOW is at least third generation growth. By the 1940's there was almost no virgin forest left in Ohio. Almost all of the state had been logged over at least once and woodlots on farmsteads were already second and third growth. So if an area that had been cleared for development by the Trojan Power Company has now

reestablished itself as forest, we are several generations of growth past "second generation". I expect that repeated clear-cutting of woodlots and regeneration will have an impact on the numbers of varieties that come back with each successive clearing. I would expect that the diversity of the tree stands would be reduced and/or altered with the invasion of non-native species. Perhaps John Blakeman can expand on this.

Page 2-4, Section 2.1.4 Vegetative Communities, Successional Woods

8. "Successional woods are comprised of small and moderate sized trees, primarily *Fraxinus pennsylvanica* (green ash),…" Has Erie County been invaded by the Emerald Ash Borer? If so, is this impacting the woodlot stands at PBOW? Are there plans, either ongoing or future to remove ash trees from the stands to manage the spread of the insect? Again, this is probably a question for John Blakeman.

Page 2-4, Section 2.1.5 Species Inventory, 4th paragraph

9. "The 15 most abundant bird species recorded at the former PBOW by the ODNR included….. indigo bunting;… common yellowthroat; …and cedar waxwing." These three birds in the list are NOT "abundant" in Ohio. In fact, I've seen them very uncommonly in all my years of "birding" in the state. If they are abundant at PBOW, this opens up another possible land-use for the site, organized and led bird walks. Given the undisturbed nature of much of the facility, it makes sense that the site would serve as a refuge for less than common bird species. Again a question for John Blakeman, has there been thought to opening up the site for controlled nature studies for both birds and special plants?

Page 2-16, Section 2.4.1 Terrestrial Receptors, top of page

10. "For the deer and hawk, the area use factor was set at 0.02 (2%) and 0.01 (1%), respectively, based on these two species' relatively large home ranges (518 and 842 hectares, or 1,280 and 2,081 acres, respectively), compared with the size of the site (25 acres)." There is a serious problem with using this approach of screening each site separately at PBOW. While it is true that this site is only 25 acres, it is NOT the only 25 acres that are contaminated at PBOW. So when a major grazer or hunting bird is screened against just one site, it does not take into consideration the cumulative effects of all of the contaminated sites in that animal's or bird's natural range. To date most, if not all, of the clean-ups have been driven by human health exposure limits. If each clean-up site was placed in the middle or at the edge of a circle encompassing the typical large home ranges of grazing animals and hunting birds, it might be found that the cumulative exposures to all the contaminated locations in their home range resulted in an ecological risk driven clean-up. It would be useful information to try that broader screening approach when new ecological risk assessments are undertaken.

Pages 5-2 and 5-3, Section 5.3 Predictive Risk Estimation for Terrestrial Wildlife

11. There is a table on pages 5-2 and 5-3 that summarizes the "HQ" (Hazard Quotient) for each of the screening animals and birds at the site. This summary table lists the compounds of concern found in the soil and subsoil of both the burned area and outside the burned area that have a value higher than 10 ("HQs from 10 up to but less than 100 represent a significant potential that effects could result from greater exposure.") as they affect each of the receptors. The table includes deer mouse, short-tailed shrew, marsh wren, raccoon, eastern cottontail, white tailed deer, and red tailed hawk. I had considered trying to scan this table and attach it. However, since the conclusion in Section 6 was that each of these values was overestimated and that ecological risks would not be driving the clean up, the summary table, while helpful for understanding the calculated values, does not appear to be useful in determining if an ecological risk-based clean up is warranted.

Page 6-2, Section 6.0 Summary and Conclusions, 1st paragraph

12. "Based on uncertainties associated with estimates of EPCs *(exposure-point concentrations)* and potential COPEC toxicity *(chemicals of potential ecological concern)*, and on the fact that no wildlife RTE *(rare, threatened, or endangered)* species have been confirmed at the site, remedial actions solely to address ecological concerns do not appear to be warranted at this time. However, a removal action within the burn area is anticipated based on the results of the human health risk assessment. If completed, calculated cleanup goals in support of the removal action will be protective of both human health and ecological receptors." While I applaud that the site scores high enough in the human health risk screening to warrant clean-up, I find I have a basic, fundamental problem with this analytical approach. According to the summary Hazard Quotient table on pages 5-2 and 5-3, the chemical 2,4-Dinitrotoluene creates a 19,010 hazard quotient for the deer mouse and a 10,460 hazardous quotient for the marsh wren ("HQs greater than 100 represent the highest potential for expected effects.") However, since the deer mouse and the marsh wren are NOT rare, threatened, or endangered species, their right to a clean and safe habitat is not as important as the right of a hypothetical resident who may or may not move to the site some time in the future. We are predicating our responsibilities to restore the site to a safe location on some future human usage at the expense of the needs of the biota that currently call the location home. While it may be the best cost-effective choice, I'm not certain that it is the best ethical choice. Had the numbers for future human health risks for groundskeepers and future residents not triggered the cleanup level, the current biota would be expected to go it alone.

This concludes my educational comments on these Draft Baseline Human Health Risk Assessment and Draft Screening Level Ecological Risk Assessment Work Plans Reservoir No. 2 Burning Ground, Former Plum Brook Ordnance Works, Sandusky, Ohio documents. If you have any questions and/or need further clarification on any point discussed in this memorandum, please feel free to contact me.