RESPONSE TO OHIO EPA TECHNICAL REVIEW COMMENTS ON THE TNT AREA B REMEDIAL INVESTIGATION AT THE FORMER PLUM BROOK ORDNANCE WORKS IN SANDUSKY OHIO

Reference: *Ohio EPA Letter dated April 14, 2000 from Ron Nabors to the U.S. Army Corps of Engineers, Nashville District (Linda Ingram)*

Volume II – Human Health Risk Assessment

Comment 1. Please see response to Comments 10 and 11. The statement in question will be revised as follows: "Certain metals were identified as background chemicals at the site. Background chemicals were not eliminated..."

Comment 2. The future use of the site is described in the third paragraph on page ES-1. This paragraph will be added to Section 3.1.1 (page 3-2). The statement in question on page ES-2 will be revised by removing the term "(industrial)" as follows: "The groundskeeper represents a site worker exposed to surface soil in the current and future site-use scenario." The first sentence in Section 3.1.3.1 will be revised as follows: "The groundskeeper scenario was designed to evaluate the upper bound for site worker exposure to surface soil in the current and future site-use scenario."

Comment 3. USACE agrees that construction worker exposure to shallow groundwater (inhalation of airborne VOCs and dermal contact) is plausible and will be developed and evaluated when groundwater data are complete (please see response to Comment 9). The executive summary, however, only mentions the pathways that were evaluated in this risk assessment. The potential for exposure to groundwater was not included in the executive summary for any of the receptors, although it is included in Figure 3-1 and Table 3-1.

Comment 4. The justification for choosing to not quantify this inhalation pathway is intuitive, because validated models for airborne concentrations of VOCs from surface water and sediment are not available. The intuitive justification mentioned in the document includes dilution in the large volume of ambient air. Further intuitive justification that could be cited includes natural air currents, which hasten dispersion in ambient air. The issue, however, is a moot point, because VOCs were not identified as COPC in either surface water or sediment.

The uncertainty analysis will be significantly expanded to include the major sources of uncertainty in the risk assessment. Potentially complete exposure pathways that are not quantified, including this one, will be discussed as a source of non-conservative bias to the risk and hazard estimates.

Comment 5. Please see response to Comment 4.

Comment 6. ILCRs less than 1E-6 will be described as sufficiently protective; an ILCR of 1E-6 will be described as the point of departure, ILCRs within the 1E-6 to 1E-4 range will be described as falling within the risk management range, and ILCRs greater than 1E-4 will be described as clearly unacceptable. The statement in question will be revised as follows: "The total ILCR from all groundskeeper exposure pathways is within the 1E-6 to 1E-4 risk management range requiring further evaluation, and the total HI exceeds the acceptable value of 1."

Comment 7. Please see response to Comment 6. The statement in question will be revised as follows: "The total ILCR from all construction worker exposure pathways is within the 1E-6 to 1E-4 risk management range requiring further evaluation, and the total HI exceeds the acceptable value of 1."

Comment 8. USACE agrees that exposures to hot spots should be evaluated separately from exposures in which random access across the entire site (i.e., across the entire data set) is assumed. The possibility of hot spots arises from two problematic samples that showed high concentrations of TNT but nondetects for the other nitroaromatics of interest. Please see response to Comment 17.

Comment 9. USACE agrees with the reviewer that construction worker exposure to shallow groundwater is plausible and should be evaluated. However, it has been established as a programmatic matter that all evaluation of groundwater, shallow and deep, will be performed at some future date when the groundwater has been adequately characterized. The scenario for construction worker exposure to shallow groundwater will be developed fully at that time. The current document, however, will be revised to include exposure to shallow groundwater as a complete pathway. To this end:

- The sentence in question on page 1-3 ("There are no plausible pathways...") will be deleted.
- Figure 3-1 will be revised to include dermal contact with shallow groundwater and inhalation of VOC emissions from shallow groundwater by the construction worker.
- Section 3.1.2 (page 3-2) will be expanded to include volatilization of VOCs from groundwater to air.
- Footnote "c" of Table 3-1 will be revised as follows: "No groundwater data are available at this writing. Future groundwater exposures will be assessed when data become available."

Comment 10. USACE agrees that "it is difficult to show that such chemicals are present at the site due to operations not related to the site..." However, it is not necessary to unequivocally show that such chemicals were not site related; it is only necessary to show that their concentrations do not exceed natural or anthropogenic

background levels. The presence of organic compounds in soil samples collected as background may or may not suggest that the sample location was influenced by site contamination. For example, the presence of herbicides in agricultural areas used for crop production or PAHs in areas of industrial activity may not reflect site contamination. PAHs are the only chemicals in this assessment whose designation as background is challenged. USACE agrees that the ATSDR background levels are not sufficient to screen the PAHs from the list of site-related chemicals. PBOW-specific background data, which would be sufficient for this purpose, are not and will not be available. Therefore, PAHs will be considered to be site related contaminants.

The statement in question on page 2-2 appears to be consistent with OEPA's position and will not be changed. However, other parts of the document will be revised in response to this clarification (e.g., please see response to Comment 11).

Comment 11. Please see response to Comment 10. The paragraph in question will be revised as follows: "***Organic Chemicals.*** For most organic chemicals, identification at concentrations above levels in blanks (considering the 5x, 10x rule; see Section 2.1.2) is presumptive evidence of site-related activity. Some organic chemicals, however, may occur as a result of activity not associated with site-related releases. Such chemicals, designated anthropogenic background, may include herbicides in agricultural areas where crops are grown, and polynuclear aromatic hydrocarbons (PAH), which form by natural or anthropogenic combustion of organic matter, including fossil fuels. PAHs were detected in samples collected at the site. However, the data are not sufficient to determine whether the concentrations measured represent anthropogenic background or site-related releases. In the absence of sufficient background data, all the PAHs in all media are considered to be site-related chemicals."

Background screening criteria for PAHs will be deleted from Tables 2-1, 2-2 and 2-3; Table 2-7 will be removed.

Comment 12. The USACE respectfully disagrees with the statement that the UTL for normal and lognormal distributions should not exceed the MDC. The numerical value of the UTL is directly related to statistical variability contained within the data set. Defaulting to the MDC essentially ignores the variability that should be taken into account in the calculation of a background statistic. Development of the UTL methodology was one of the issues resolved by collaboration and presented in the RAWP.

Comment 13. Please see response to Comments 10 and 11. The reference to Table 2-6 is unclear; no data regarding PAHs is presented therein. The paragraph in question will be revised as follows: "Metals identified as background were not eliminated from the RA; instead, they were included and evaluated in total site risk and background risk, but not in site-related risk. These designations are described fully in Chapter 5.0."

Comment 14. Implicit, but not clearly articulated in this section, is the assumption that the soil RBSCs, which reflect an ILCR of 1E-7 or an HI of 0.1, are adjusted upward by an order of magnitude when applied to sediment. This adjustment reflects the judgement that exposure to sediment is likely to be an order of magnitude less intensive than exposure to sediment. Similarly, exposure to surface water is likely to be an order of magnitude less intensive than exposure to tap water. The paragraph in question will be revised for clarity as follows: "The mechanisms by which receptors are exposed to sediment are similar to those for soil, but exposure to sediment is likely to be far less intensive. Therefore, the soil RBSCs are adjusted upward by an order of magnitude for application to sediment. In other words, the unadjusted EPA (1998) residential soil PRGs are considered to reflect an ILCR of 1E-7 and an HI of 0.1 when used for screening chemical concentrations in sediment. Similarly, exposure to surface water is likely to far less intensive than exposure to tap water. Therefore, the tap water RBSCs are adjusted upward by an order of magnitude for application to surface water. In other words, the unadjusted EPA (1998) tap water PRGs are considered to reflect an ILCR of 1E-7 and an HI of 0.1 when used for screening chemical concentrations in surface water."

Comment 15. The text in question will be revised as follows: "Essential nutrients such as calcium, iron, magnesium, potassium, and sodium are usually eliminated as COPC because they are generally considered innocuous in environmental media. Other essential nutrients including chloride, iodine and phosphorus may be eliminated as COPC, provided that their presence in a particular medium is judged to be unlikely to cause adverse effects on human health." Please note that only calcium, magnesium, potassium, and sodium were eliminated as COPC based on their status as essential nutrients.

Comment 16. Please see response to Comments 10 and 11; the text in question will be deleted.

Comment 17. USACE believes that a defensible case can be made either for retaining or excluding the questionable samples. Clearly, EPA (1989) states that samples may be excluded from the risk assessment if they have unusually high quantitation limits; however, EPA (1989) also states that one-half the detection limit should be used as a proxy concentration for chemicals believed to be present at a concentrations less than their detection limits. The elevated detection limits for the two samples in question arise from the fact that dilution was required to quantify unusually high levels of TNT. The presence of high levels of TNT raises concern that other nitroaromatics may also be present, probably at levels well above their RBSCs.

The exisiting data set will be reexamined to determine whether concentrations of nitroaromatics other than TNT in locations near those from which the samples in question were taken are comparable to concentrations in samples taken from other areas of the site. Two conditions must be satisfied to establish that concentrations

are comparable across the site: (1) detected concentrations are comparable, and (2) detection limits for the nondetects are comparable and not unusually high (which could mask the presence of high concentrations). If both of these conditions are satisfied, confidence is increased that excluding the questionable samples does not obscure potentially high levels of aromatics. If both of these conditions are not satisfied, considerable doubt remains, in which case it would be wise to re-analyze the samples using techniques that can quantify the nondetected nitroaromatics in the presence of high levels of TNT.

Reinstating the two samples in question requires the following revisions to be made to the document. Tables 2-1, 2-2 and 2-3 would be revised to reinstate the samples in question. The four paragraphs in Section 2.1.6.1 (pages 2-7 and 2-8) describing the exclusion of the two samples would be deleted. The paragraph under ***Frequency of Detection*** in Section 2.1.6.3 would be revised as follows: "The frequency of detection for all chemicals detected in combined surface and subsurface soil samples was greater than 5 percent except for two nitroaromatic compounds (Table 2-3). However, there is reason to believe that nitroaromatics are the primary contaminants associated with the site. Therefore, no chemicals were excluded as COPC because of low frequency of detection." The last paragraph under ***Risk-Based Screening*** in Section 2.1.6.3 (page 2-10) would be deleted.

Comment 18. USACE shares the reviewer's concern regarding excluding samples with large detection limits. Please see response to Comment 17.

Comment 19. The objective of collecting composite soil screening samples was to delineate areas of nitroaromatic contamination within TNT Area B; historical results from the 1994 RI completed by Dames and Moore were used as a base for the screening sample locations. There were detections for nitroaromatic compounds during the field screening effort, and these results were used to place additional screening samples (surface and subsurface) as well as confirmation samples (discrete). Note that confirmation samples were collected at locations that had shown both detections and non-detections during the screening process.

The field screening sampling and analysis as well as confirmation samples are presented in detail in Volume I of the TNT Area B Remedial Investigation Report. Section 2.0 provides an overview of the field investigation, while Section 4.0 presents details of investigation results, both from field screening and confirmation samples. Because these topics are discussed in Volume I, the section has not been expanded to discuss sampling results – instead, a statement that this information is contained in Volume I has been added to the section.

Comment 20. The footnote in question pertains to VOC emissions from surface water and sediment (all receptors), and VOC emissions from groundwater used by the groundskeeper and construction worker as a source of potable water. Please see response to Comment 4 regarding airborne VOCs from surface water and

sediment. Please see response to Comment 9 regarding construction worker exposure to shallow groundwater. The justification for choosing to not quantify this inhalation pathway is intuitive, because validated models for airborne concentrations of VOCs from groundwater used as potable water are not available. The intuitive justification mentioned in the document includes dilution in the large volume of ambient air. Further intuitive justification that could be cited includes a short exposure time, natural air currents, which hasten dispersion in ambient air, and the assumption that inhalation exposure is expected to be far less significant than ingestion of 1 L/day, which is quantified. The footnote for inhalation of VOCs from groundwater will be separated from the similar footnote for the other media and revised to incorporate the further justification described above.

Comment 21. The area around the origin of Ransom Brook at the northwest corner of TNT Area B and north of the site is low and wet (Fig. 1-6 and 2-2 of Volume 1 – Report of Findings) and is not suitable for building, landscaping, bank stabilization/erosion control measures, or maintenance. Exposure to surface water and sediment in this area would not arise from the normal or expected activities of a groundskeeper. Therefore, groundskeeper exposure to surface water and sediment will not be quantified. It is plausible, however, that construction workers could be exposed to these media during short-term projects such as installation of underground utilities. Dermal exposure to surface water and sediment and incidental ingestion of sediment will be included as exposure pathways during the a 1-month construction project. It is assumed that hands and forearms, approximately 2000 cm^2 (EPA, 1992), are exposed to surface water and sediment. Dermal exposure to surface water and sediment is assumed to occur on 4 hours/day, or one-half of the normal work day. A fraction term of 0.5 is assumed for both the soil and sediment pathways to apportion the construction worker's time equally between the two media. The incidental ingestion rate of sediment is assumed to be 480 mg/day. An AF for sediment of 0.24 mg/cm^2 is estimated for hands and forearms using the same method as described for the groundskeeper exposure to soil, using data for construction workers, utility workers and equipment operators. Figure 3-1, Table 3-1 and the description of the construction scenario (Section 3.1.3.2) will be revised accordingly.

Comment 22. Please see response to Comments 4 and 20.

Comment 23. Please see response to Comment 21.

Comment 24. Please see response to Comment 2.

Comment 25. The USACE respectfully disagrees. Dilution by ambient air is an actual phenomenon included in many models used to estimate airborne concentrations of contaminants. Deleting the phrase will not change the risk estimates or their interpretation; thus, the statement will remain as written.

Comment 26. The observation stated is generally true, particularly when much time has elapsed since contamination may have occurred. Deleting the phrase will not change the risk estimates or their interpretation. The statement will be revised as follows: "Generally, surface soil that has been in place for extended periods and has not been recently contaminated is not a significant source of airborne VOCs because infiltration and dissipation over time would have reduced residues at the surface to toxicologically insignificant levels."

Please provide clarification as to the reference to Comment 4.

Agreed, that the statement "...probably because surface soil samples..." is confusing. The second sentence of this paragraph will be revised as follows: "VOCs, however, were detected in surface soil, albeit at concentrations below RBSCs, probably from soil at the bottom of the 0 to 1 ft bgs depth range from which surface soil samples were taken."

Comment 27. Please see response to Comment 21.

Comment 28. Please see response to Comments 4 and 20.

Comment 29. Agreed that many construction activities, such as the examples mentioned by the reviewer, result in intensive contact with soil throughout their duration. The assumption accepted in the approved RAWP is that these activities would not last for more than 3 months. Construction activities such as building would result in less intensive exposure to soil because they do not require constant contact with the soil or earth-moving or grading equipment. The assumption accepted in the approved RAWP is that these activities would not last for more than 3 months. The statement in question will be revised to clarify the distinction between intensive and less intensive exposure to soil as follows: "Excavation, grading, installation or repair of underground utilities and similar activities requiring constant contact with the soil or earth-moving or grading equipment result in intensive exposure to soil and were assumed to last for 3 months. Construction activities such as building erection result in less intensive exposure to soil and were also assumed to last for 3 months."

Comment 30. The assumptions are conjectures compiled, in collaboration with OEPA, to create a plausible scenario to evaluate residential exposure to surface water and sediment. Conjecture is necessary because there are no residents on site from which site-specific data can be obtained, and there is no known OEPA, EPA or other regulatory guidance for development of this exposure scenario. The scenario in the risk assessment is taken verbatim from the approved RAWP. Subsequent to the risk assessment, it was learned that pools of surface water are present, possibly as a result of groundwater discharge. Therefore, the exposure frequency for residential exposure to surface water will be increased from 26 to 52 days/year.

Comment 31. Please see response to Comment 4.

Comment 32. USACE agrees that segregation of HI values by mechanism of toxicity must be done carefully. Insufficient care can result in either over or underestimating hazard. This is a moot point in this risk assessment because HI values greater than 1 are estimated for single chemicals (TNT, and in some cases other nitroaromatics as well), and there is no reason to segregate chemicals by mechanism of toxicity.

Comment 33. Please see response to Comment 6. The statement in question will be revised as follows: "The total ILCR from all exposure pathways is within the 1E-6 to 1E-4 risk management range requiring further evaluation."

Comment 34. The first paragraph in Section 5.3.4 shows that the source-term and exposure-point concentrations developed in the risk assessment reflect the most highly contaminated parts of the site. No further hot-spot analysis is necessary unless questionable data excluded because of unusually high detection limits are reinstated, or unless additional data analysis or sampling reveals higher levels of nitroaromatics other than TNT in the northeast quadrant.

Comment 35. Agreed; a complete data dump, including detections, nondetections and detection limits will be provided.

Comment 36. Agreed!

Comment 37. A Summary and Conclusions will section will be added following the Uncertainty Analysis section. It will consist of the human health risk assessment information summarized in the Executive Summary.

Comment 38. Agreed; it is inappropriate to compare site sediment concentrations with soil background concentrations for the purpose of selecting sediment COPC. Tables 2-5, 5-7 and 5-8 will be revised as requested. There is, however, some similarity between sediment and soil, and comparison of site sediment concentrations with soil background may be discussed in the Uncertainty Analysis or Summary and Conclusions Sections. Please see response to Comments 10 and 11 regarding PAH background.

Comment 39. Several tables were found in which "NA" was not defined. The definition of NA as "not applicable" will be added to Tables 5-1, 5-2, 5-3, 5-6, 5-9, 5-13 and 5-14.

Comment 40. Several tables were found in which "ND" was not defined. The definition of ND as "no data" will be added to Table 4-1. ND in Tables 5-3, 5-4, 5-5, 5-7, 5-8, 5-11 and 5-12 will be changed to "NA" (please see response to Comment 39).

Volume III – Ecological Risk Assessment

Comment 1. Text will be revised to refer to the Site as PBOW.

Comment 2. The most common cause of elevated SQL is sample dilution, usually necessitated because one or more chemicals are present at concentrations exceeding the range of the method calibration curve. SQLs are typically designated as unusually high when they are considerably above the highest positive detection. Their use in the data set may result in the 95% UCL exceeding the maximum detected concentration (MDC), which would impart a bias to the RA. Unusually high SQL results such as these are typically deleted from the data set. A list of samples where judgement criteria were applied are provided in the report (footnotes to Tables 2-9 and 2-10).

Comment 3. The USACE respectfully disagrees with the statement that it is necessary to "...conclusively show that...chemicals are present at a site due to operations not related to the site..." in order to designate them as anthropogenic background. It is only necessary to show that their concentrations do not exceed anthropogenic background levels. Granted, the ATSDR Toxicity Profile on the PAHs is not the most relevant data set for background for PBOW. Furthermore, site-specific background data are not available and there are no plans to generate such data for the future. Therefore, the document will be revised so that PAHs are not screened against background. PAHs selected as COPECs will be carried through the ecological risk assessment. Should PAHs be identified as risk drivers, arguments will be developed in the uncertainty section for their presence, including vehicular traffic, annual burning of grasslands, etc. associated with post-DOD activities.

Comment 4. Essential nutrients were not eliminated from the ERA, unless they were below background. As shown in summary tables 5-4 and 5-5, some essential nutrients were found to be hazard drivers for ecological receptors (e.g., iron). The sentence in question will be revised to avoid the impression that nutritional essentiality for humans is somehow involved in COPEC selection for ecological receptors.

Comment 5. A discrete soil sample was not collected from the bare spot itself. The chemical analytical results from the surface soil sample collected closest to the "one bare soil area" are discussed in the text in Section 5.1. In addition, the text discusses why the presence of the bare soil area is not believed to be related to site-related chemicals. As shown in Photo No. 8, the substrate appears to be gravel, and this may be the reason vegetation is not growing at the "one bare soil area."

Comment 6. The cited discussion of uncertainties will be moved to the "Uncertainties Section" of the report.

Comment 7. The report states "[Based on this information].... no remedial actions are warranted at this time." The report does not recommend that no remedial actions are warranted at any future date. This information was presented in the report to

add risk management decisions, and to discuss the point that even though hazards were estimated to be above 1.0 for some ecological receptors, the weight-of-evidence, including consideration of the significant uncertainties, did not support remediation at the present time. Further sampling for additional background data is recommended.

Comment 8. Table 5-1 will be revised. Where no benchmark is available, the "Benchmark Exceeded?" column will present "NBA" and will be defined in a new footnote as "NBA = no benchmark available." It should be noted that Table 5-1 is not a screening table for selection of constituents to retain and carry through the ERA (this screening was done in Table 2-9 for surface soil).

FAX

Date 25 April 2000

Number of pages including cover sheet 11

NASHVILLE DISTRICT CORPS OF ENGINEERS

TO: Mikael Spangberg
IT Corporation

Phone (860) 688-1151
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FROM: Linda S. Ingram
CELRN-ED-R-M

Phone (615) 736-7122
Fax Phone (615) 736-7676

CC:

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please Comment

Attached are the comments on the Draft TNT Area B Report, Former Plum Brook Ordnance Works from Ohio EPA.

THANKS,
LINDA

OhioEPA
State of Ohio Environmental Protection Agency

Northwest District Office
347 North Dunbridge Road
Bowling Green, Ohio 43402
(419) 352-8461 FAX (419) 352-8468

Bob Taft
Governor

RE: U.S. NASA PLUM BROOK
ERIE COUNTY
OHIO ID#: 322-0552
TNT AREA B REMEDIAL
INVESTIGATION COMMENTS

April 14, 2000

Department of the Army
Nashville District, Corps of Engineers
Ms. Linda S. Ingram
P.O. Box 1070
Nashville, Tennessee 37202-1070

Rec'd 17 April 2000 LSI

Dear Ms. Ingram:

The Ohio Environmental Protection Agency (EPA), Division of Emergency and Remedial Response (DERR), has reviewed the draft "TNT Area B Remedial Investigation, Volume I - Report of Findings, Volume II - Human Health Risk Assessment, and Volume III - Ecological Risk Assessment" for the former Plum Brook Ordnance Works, Sandusky, Ohio. This document was submitted to the Ohio EPA by the International Technology Corporation (ITC) on behalf of the Corps of Engineers, July 2, 1999, for review and comments.

I wish to apologize for the delay in the completion of the review of this document. The Ohio EPA, DERR finds Volume I, the Report of Findings, acceptable and does not require any corrections. However, revisions may be necessary to address the risk assessment comments. Ohio EPA, DERR is providing the attached comments concerning the human health and ecological risk assessment sections.

Please review these comments and incorporate them in the revised version of this document. I believe there may be a need for a meeting or conference call to discuss these risk assessment comments. Should you desire a meeting, or have questions and comments regarding these comments, feel free to contact me at (419) 373-3147 or Laurie Moore at (937) 285-6457.

Sincerely,

for

Ron Nabors
Site Coordinator
Division of Emergency and Remedial Response
Northwest District Office

/sw

Attachment

cc: Richard L. Meadows, USACE
Laurie Moore, OFFO, SWDO
DERR File

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The following comments are for the human health (Volume II) and ecological risk assessment (Volume III) sections found in the Draft TNT Area B Remedial Investigation, Former Plum Brook Ordnance Works, Sandusky, Ohio, dated June 1999. In an effort to clarify the context of the comment, text from the concept paper is identified by *italics*.

Comments for Volume II Human Health Risk Assessment:

1. **Executive Summary, page ES-2:** *"Certain metals and polycyclic aromatic hydrocarbon chemicals were identified as natural or anthropogenic background constituents at the site. Background chemicals were not eliminated, but were included in an evaluation of background risk"*

   In general, comparison with naturally occurring levels is applicable only to inorganic chemicals because the majority of organic chemicals are not naturally occurring, even though they may be ubiquitous. Do not eliminate anthropogenic chemicals from the site risk evaluation because it is extremely difficult to conclusively show that such chemicals are present at a site due to operations not related to the site or surrounding area. The presence of anthropogenic background chemicals can be discussed in the uncertainties section, however, these constituents should be retained and evaluated in the site-related risk. Compounds evaluated in background risk should include only those constituents detected in the samples collected from background locations. Background locations are classified as unimpacted areas that are not influenced by site activity.

2. **Executive Summary, page ES-2:** *"The groundskeeper represents a site worker exposure to surface soil in the current and future (industrial) land-use scenario."*

   There are no restrictions on this property to prevent future residential land use. Clarify this sentence to indicate that current land-use is industrial and future land use is residential, for example: "The groundskeeper represents a site worker exposure to surface soil in the current (industrial) and the future (residential) land-use scenario."

3. **Executive Summary, page ES-3:** *"The construction worker.....Relevant pathways evaluated were incidental ingestion and dermal contact with soil and inhalation of volatile organic compound (VOC) vapor and dust."*

   There is potential for the construction worker to have exposure to contaminated groundwater during excavation activities, utility repair, etc. Include this pathway or justification for excluding it.

4. **Executive Summary, page ES-3:** *"Inhalation of VOC emissions from surface water and sediment is possible, but the large volume of ambient air is assumed to dilute airborne concentrations to toxicologically insignificant levels, and this inhalation pathway was not quantified."*

   Documentation is needed to support this statement. If justification for this statement cannot be provided, this pathway will be evaluated in a quantitative risk assessment.

5. **Executive Summary, page ES-3:** *"It is assumed, however, that the large volume of outdoor air would effectively dilute airborne concentrations to toxicologically insignificant levels, and this inhalation pathway was not quantified."*

   See comment #4.

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6. **Executive Summary, page ES-3:** *"The total ILCR from all groundwater exposure pathways is within the 1E-6 to 1E-4 range considered acceptable by Ohio EPA ....."*

Ohio EPA evaluates risk within the range of 1E-6 to 1E-4, with a point of departure at 1E-6. Risks at or greater than 1E-6 are to be reported in the Remedial Investigation report. Risks falling in this range will be evaluated in the feasibility study. Revise this statement to clarify that Ohio EPA evaluates risks within the range of 1E-6 to 1E-4.

7. **Executive Summary, page ES-4:** *"The total ILCR from all construction worker exposure pathways is within the 1E-6 to 1E-4 range considered acceptable by Ohio EPA ....."*

See comment #6.

8. **Executive Summary, page ES-4:** *"The above risk assessment for hypothetical future residents and construction workers is based on the assumption that the exposures would occur at any randomly selected location within TNT Area B. Examination of the soil sampling data shows that the above risk estimates are based primarily on samples obtained from the northeast quadrant of the site."*

Contamination may be unevenly distributed across a site, resulting in hot spots (i.e., areas of high contamination relative to other areas of the site.) If a hot spot is located, exposure to the hot spot should be assessed separately (RAGS Volume I, USEPA, 1989).

9. **Section 1.0, Introduction, page 1-3:** *".....groundwater is transient and not considered a potential source of potable water. There are no plausible pathways by which the receptors would be continually exposed to shallow groundwater."*

The construction worker is a receptor for both the current and future land use scenarios. It is possible for the construction worker to contact shallow groundwater during excavation activities, utility repairs, and other construction activities. Revise the text to include this pathway or justification for excluding it.

10. **Section 2.1.3, Identifying Site-Related Chemicals, page 2-2:** *"Chemicals that were detected at the site, but were also detected at locations not affected by site operations are termed background chemicals."*

The background screen is applicable only to naturally occurring, inorganic constituents because the majority of organic constituents are not naturally occurring, even though they may be ubiquitous in the environment. Naturally Occurring Background is defined as ambient concentrations of chemicals that are present in the environment and have not been influenced by humans and the concentrations have not been increased by anthropogenic sources. (RAGS Volume I, USEPA 1989). The presence of organic chemicals in background samples may indicate that the sample was collected in an area influenced by site contamination and thus does not qualify as a true background sample. Such samples should be included with site samples in the risk assessment. Ubiquitous, anthropogenic background is often from nonpoint sources. Do not eliminate these constituents from the quantitative risk assessment for site risk because it is difficult to show that such chemicals are present at the site due to operations not related to the site or surrounding area.

11. **Section 2.1.3, Identifying Site-Related Chemicals, page 2-2 to 2-3:** *"PAHs generally are ubiquitous in the environment, and background levels in urban, rural and agricultural soil have been compiled (ATSDR, 1995). Organic chemicals identified as anthropogenic background were not eliminated from the RA; instead, they were included and evaluated in Total Site Risk and Background Risk, but not in site-related risk."*

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Remove this statement and reference from this section of the report. Discussion of this source (i.e., ATSDR, 1995) with respect to site conditions is more appropriately placed in the uncertainties section. Evaluate PAHs in the quantitative risk assessment for site-related risk. See comment #10. Remove background values for PAHs from ATSDR (1995) in Table 2-6.

12. **Section 2.1.3, Identifying Site-Related Chemicals, page 2-4:** *"Therefore, the MDC of the background data set is conservatively selected as the BSC for nonparametric background data sets."*

This methodology should be used when the calculated UTL value for a constituent exceeds the maximum detected concentration for that constituent, independent of the statistical distribution. Therefore, when the calculated UTL value for a constituent exceeds the maximum detected concentration for that constituent, default to the maximum detected concentration. For example, in Table 2-6, For Aluminum the 95% UTL = 26,900 ppm and the maximum detected concentration = 15,500 ppm, therefore the Background Screening Criterion (BSC) should be conservatively selected as 15,500 ppm. Make the necessary corrections to Table 2-6 and sections of the text with respect to defaulting to the maximum detected value.

13. **Section 2.1.3, Identifying Site-Related Chemicals, page 2-5:** *"Metals and organic chemicals identified as anthropogenic background were not eliminated from the RA; instead they were included and evaluated in total site risk and background risk, but not in site-related risk.....Anthropogenic background concentrations of PAH compounds are shown in Table 2-7."*

See comment #10 & #11.

Remove Table 2-7 from this section. The information in this table and the ATSDR reference is more appropriately discussed in the uncertainties section. Remove background values for PAHs from ATSDR (1995) in Table 2-6.

14. **Section 2.14 Risk Based Screening, page 2-5 to 2-6:** *"The mechanisms by which receptors are exposed to sediment are similar to those for soil.....The residential soil PRGs are not adjusted downward when applied to sediment.....In other words, the unadjusted residential soil PRGs are considered to reflect an ILCR of 1E-7 and HI of 0.1 when used for screening chemical concentrations in sediment. Similarly the EPA tap water PRGs are adopted for surface water....."*

Revise text for agreement between adjusting PRGs and the ILCR risk level that the adjustment reflects. For instance, USEPA Region IX PRGs reflect an ILCR of 1E-6 when they are not adjusted. The text, as written, is confusing because the text states that the PRGs were not adjusted for surface water and sediment screens, but reflect an ILCR of 1E-7.

15. **Section 2.1.5 Evaluating Essential Nutrients, page 2-6:** *"Essential nutrients such as calcium, chloride, iodine, magnesium, phosphorus, potassium and sodium were eliminated as COPC....."*

Using the essential nutrient status as the basis for the COPC screen should be limited to calcium, iron, magnesium, potassium, and sodium. Without consideration of the levels that may be associated with toxicity for these other inorganics, it is not appropriate to screen them out.

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16. **Section 2.1.6.1 Surface Soil, Background COPC, page 2-7:** *"The following PAH COPC were detected at maximum concentrations consistent with background soil concentrations reported by the ATSDR....."*

See comments #10-13. Revise text.

17. **Section 2.1.6.1 Surface Soil, Risk Based Screening, page 2-7:** *"When such elevated detection limits are encountered, EPA (1989a) guidance provides for removal of the values from the data set if they are greater than the maximum quantitated concentration."*

RAGS Volume I part a (USEPA, 1989) states "If there is reason to believe that the chemical is present in a sample at a concentration below the sample quantitation limit (SQL), use one-half of the SQL as a proxy concentration. The SQL value itself can be used if there is reason to believe the concentration is closer to it than to one-half the SQL. Do not simply omit results from the risk assessment.

Throughout Section 2.1.6 Summary of COPC Selection, page 2-6 to page 2-11, constituents with elevated detections limits appear to have been thrown out or removed from the data set simply because the detection limits were elevated, without further evaluation or justification. The methodology used to justify dropping these data points is inappropriate during the screening process. RAGS part a (USEPA, 1989) states "If the SQLs cannot be reduced by re-analyzing the sample, exclude the sample from the quantitative risk assessment if they cause the calculated exposure point concentration to exceed the maximum detected concentration for a particular sample set." As stated in the text of section 2.2.1, *"Unusually high values are included in the calculation of the UCL because high values seldom appear as statistical outliers in the environmental data and may identify areas that require evaluation as hot spots. Inclusion of outliers increases the overall conservatism of the risk estimate."* Revise Section 2.1.6 Summary of COPC Selection and all subsections from page 2-6 to page 2-11 to include data with elevated SQLs until a formal review of the data can be completed.

18. **Section 2.2.1 Soil, Surface Water, and Sediment, page 2-13,** *"Judgement is used in those cases where dilution drove the SQL unusually high."*

RAGS Volume I part a (USEPA, 1989) states "If there is reason to believe that the chemical is present in a sample at a concentration below the sample quantitation limit (SQL), use one-half of the SQL as a proxy concentration. The SQL value itself can be used if there is reason to believe the concentration is closer to it than to one-half the SQL. Do not simply omit results from the risk assessment without further evaluation.

19. **Section 2.2.1 Soil, Surface Water, and Sediment, page 2-13,** *"To ensure that areas of potentially high concentrations were not overlooked, USACE (1998a) specified that approximately 400 composite surface soil samples would be analyzed on the site for explosives by IMS."*

Was the purpose of collecting composite samples to screen the area for explosives? Were there any detections for explosives in the composite samples? How were detections of explosives in the samples handled? Were discrete samples collected when there were detections?

Expand the text in this section to state the results of composite sampling and state the purpose for collecting composite samples.

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20. **Figure 3-1, footnote 3:** *"Although theoretically complete, large dilution of ambient air is assumed to render exposure point concentrations toxicologically insignificant."*

See comment #4. Remove this footnote and assess this pathway, unless documentation for excluding it can be provided and justified.

21. **Figure 3-1, footnote 4:** *"Contact with this medium, although plausible, is not part of this receptors normal or expected activities; therefore contact would be sporadic and is not quantified."*

Exposure to both surface water and sediment could, at times, be significant to construction worker and/or groundskeeper, if the receptors activities involve the installation or repair of utility lines that cross Ransom Brook or any bank stabilization/erosion control projects.

22. **Table 3-1: Receptor Exposure Scenarios, footnote d:** *"Although theoretically complete, this pathway was not quantified because the large volume of ambient air would effectively dilute concentrations to toxicologically insignificant levels." ....."*

See comment #4 and #20.

23. **Table 3-1: Receptor Exposure Scenarios, footnote b:** *"Although contact with this medium is possible, exposure would be sporadic, rather than continuous....."*

See comment #21.

24. **Section 3.1.3.1 Groundskeeper, page 3-3:** *"The groundskeeper scenario was designed to evaluate the upper bound for site worker exposure to surface soil in the current and future (industrial) land use scenario."*

See comment #2.

25. **Section 3.1.3.1 Groundskeeper, page 3-3:** *"It was assumed that relatively high dust concentrations would be produced within the groundskeeper's breathing zone, with little opportunity for dilution by the large volume of ambient air."*

Remove *"with little opportunity for dilution by the large volume of ambient air."*

26. **Section 3.1.3.1 Groundskeeper, page 3-3:** *"Generally, surface soil that has been in place for extended periods is not a significant source of airborne VOCs because dissipation over time would have reduced the residues at the surface to toxicologically insignificant levels. VOCs were detected in surface soils.....probably because surface soil samples may have included soil from a depth as great as 1 ft bgs."*

See comment #4.

Remove *"Generally, surface soil that has been in place for extended periods is not a significant source of airborne VOCs because dissipation over time would have reduced the residues at the surface to toxicologically insignificant levels."*

Revise the statement *"probably because surface soil samples may have included soil from a depth as great as 1 ft bgs."* This statement gives the reader the impression that you are not sure what depth defines surface soil. As stated in the work plan, surface soil is defined

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by the 0-1 ft. bgs. interval. Therefore, surface soil did include soil from the 0-1 foot bgs depth. Revise text without using "probably" or "may have included" since surface soil is clearly defined as the interval 0-1 ft. bgs.

27. **Section 3.1.3.2 Construction Worker, page 3-4:** *"Exposures to surface water and sediment are not plausible for the construction worker at TNT Area B, because Ransom Brook,....,is located off the site and is not expected to be the site of future development."*

See comment #21.

28. **Section 3.1.3.2 Construction Worker, page 3-4:** *"Inhalation of airborne VOC emissions form surface water and sediment is possible, but the large volume of outdoor air is expected to dilute concentrations to toxicologically insignificant levels, and this pathway was not evaluated."*

See comment #4 and #20.

29. **Section 3.1.3.2 Construction Worker, page 3-4:** *"Excavation and soil grading activities resulting in intensive soil contact were assumed to last for 3 months; for the remaining 3 months, construction activities were assumed to result in less intensive soil contact."*

Define "intensive soil contact."

Many construction activities involve contact with soil for extended time periods, such as the installation or repair of utility lines, cable lines, sewer lines, water lines or if the construction worker is involved with the excavation and removal of contaminated soil, then the exposure would be "intense" for the duration of the removal activity.

30. **Section 3.1.3.3 on-Site Resident, page 3-5:** *"The resident could have access to Ransom Brook and could be exposed to surface water and sediment.....It is assumed that the resident would visit the brook for 8 hours/day, 2 days/week during the warmer half of the year (i.e., 52 days/year).....However, because of the intermittent nature of the brook, it was assumed that surface water would be available for wading only 26 days/year.....assumed to wade for 3 hours/day on 26 days /year.....Incidental of surface water in a wading scenario is assumed to be negligible."*

What are these assumptions based on? Does this stream go completely dry for a continuous period of time? If there is a trickle of water, then there will be surface water exposure.

31. **Section 3.1.3.3 on-Site Resident, page 3-5:** *"Inhalation of airborne VOCs emitted from surface water or sediment .....It is assumed, however, that the large volume of outdoor air would effectively dilute airborne concentrations to toxicologically insignificant levels....."*

See comment #4

32. **Section 4.3 Target Organ Toxicity, page 4-5:** *"When total HI for all media for a receptor exceeds 1 due to the contributions of several chemicals, it is appropriate to segregate the chemicals by route of exposure and mechanism of toxicity (i.e., target organ) and estimate separate HI values for each."*

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Segregation of hazard indices by effect and mechanism of action can be complex and time-consuming because it is necessary to identify all of the major effects and target organs for each chemical and then to classify the chemicals according to target organ or mechanism of action. This analysis is not simple and should be performed by a toxicologist. If segregation is not carefully done, an underestimate of the true hazard could result. A strong case is required to indicate that two compounds which produce adverse effects on the same organ system, although by different mechanisms, should not be treated as dose additive (RAGS Volume 1, USEPA, 1989).

33. **Section 5.3.1 Groundskeeper, page 5-4; Section 5.3.2 Construction Worker, page 5-5; Section 5.3.3 On-Site Resident, page 5-5:** *"The total ILCR from all exposure pathways falls within the 1E-6 to 1E-4 range considered acceptable by EPA (1990)."*

Ohio EPA currently operates within the risk range of 10^{-6} to 10^{-4}, with the point of departure at 10^{-6}. Risks in the range of 10^{-6} to 10^{-4} must be acknowledged and discussed in the report. Risk less than 10^{-6} is considered to be protective and risk greater than 10^{-4} are considered not protective; however, risk falling within the range will need to be evaluated. The point at which to take remedial action and the final clean-up level will be a risk management decision. The use of the 10^{-6} point of departure, does not reflect a presumption that the final remedial action should attain such goals.

34. **Section 5.3.4, Alternate On-Site Residential and Construction Site Locations, page 5-6:**

With respect to future land use, deed restrictions or other restrictions are not in place to designate which areas a resident could or could not develop. Therefore, the assumption that a future resident would randomly select a building site within the TNT Area B boundary is appropriate and the "alternate on-site residential and construction site locations" sections and associated risk assessment on the modified data sets is not necessary and should be removed. However, if the contractor feels that the concentrations in the northeast quadrant are indicative of a hotspot, then a separate quantitative hotspot analysis should be performed on this portion of the site.

35. Please provide the contents of Appendix A: Analytical Results for review.

36. Include the contents of Appendix C in the draft final.

37. Include a Summary/Conclusions section at the end of Volume II Human Health Risk Assessment.

38. **Table 2-1 through Table 2-5, Table 5-10,**

Remove footnote b - background screening criteria for soil (Table 2-6) and references to background soil values. It is not appropriate to compare sediment concentrations to soil background concentrations as a "background screen." Sediment and soil are separate media. For a background comparison, sediment samples should be collected from a background sediment location. Also remove PAH background values shown in Table 2-7.

39. **Tables 5-5 and 5-6 and 5-9:**

Include a footnote defining NA.

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40. **Table 5-8:**

Include a footnote defining ND.

Comments for Volume III - Ecological Risk Assessment:

1. **Section 2.1.1 General Site Background, page 2-1:** *"PBS, approximately 6,453 acres in size...."*

   To avoid confusion for the reader, use consistency when referring to the site name. Previously in this report, the site has been referred to as Plum Brook Ordnance Works (PBOW) and in this section is called the Plum Brook Station (PBS). Revise text for consistency.

2. **Section 2.2.2 Descriptive Statistical Calculations, page 2-11:** *"Nondetects are assumed to be present at one-half the SQL, although judgement may be used in those cases where matrix interference or other phenomena drive the SQL unusually high."*

   Define the judgement criteria that is used when evaluating data with unusually high SQL and how the data is handled in the risk assessment. Provide a list of the samples where judgement criteria was applied.

3. **Section 2.2.4 Natural Site Constituents (Background and Essential Nutrients), page 2-12:** *"This comparison is generally valid for inorganic chemicals, but not for organic chemicals, because inorganic chemicals are naturally occurring and most organic chemicals, besides PAHs, are not."*

   This statement gives the impression that PAHs are only from natural sources. As defined in RAGS, part a (EPA, 1989), naturally occurring levels are ambient concentrations of chemicals present in the environment that have not been influenced by humans, and anthropogenic levels are concentrations of chemicals that are present in the environment due to human-made, non-site sources. PAHs are anthropogenic and ubiquitous, although these chemicals may be present in the environment from natural sources (e.g., forest fires).

   In general, comparison with naturally occurring levels is applicable only to inorganic chemicals because the majority of organic chemicals are not naturally occurring, even though they may be ubiquitous. Do not eliminate anthropogenic chemicals because it is extremely difficult to conclusively show that such chemicals are present at a site due to operations not related to the site or surrounding area. The presence of anthropogenic background chemicals can be discussed in the uncertainties section, however, these constituents should be retained and evaluated in the site-related risk.

4. **Section 2.2.4 Natural Site Constituents (Background and Essential Nutrients), page 2-13:** *" Essential nutrients such as calcium, chloride, iodine, magnesium, phosphorus, potassium and sodium may be eliminated as COPEC,....."*

   It is not appropriate to apply the essential nutrient methodology, which is used in the human health risk assessment, to ecological risk assessments considering that recommended daily allowances have not been established for ecological organisms. Without consideration of the levels that may be associated with toxicity for these inorganics to the receptor, it is not appropriate to screen them out.

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5. **Section 5.1 Terrestrial Plant Impact Assessment, page 5-1:** *"Although one bare soil area was noted during the site reconnaissance....."*

   Were discrete samples taken from the bare spot and analyzed?

6. **Section 5.3 Predictive Risk Estimation for Terrestrial and Aquatic Wildlife, page 5-3:** *"It should be noted that the maximum 2,4,6-TNT concentration in surface so (6,900 mg/kg) was used as the source-term concentration (due to the unmodified data distribution), while the arithmetic mean concentration was 261 mg/kg. This estimate of central tendency is 26 times lower than the maximum concentration and the suggests that using the maximum concentration is overly conservative. It should also be noted that the maximum aluminum and iron concentrations measured in surface water were used as the source-term concentrations due to the limited number of samples and additional sampling effort could potentially reduce the hazard estimate."* **Page 5-4:** *It should be noted that the maximum concentrations of many of the COPECs measured in surface water and sediment were used as the source-term concentrations due to limited number of samples, and additional sampling effort could potentially reduce the hazard estimate. It should also be noted that there are significant uncertainties....."*

   Statements regarding the uncertainties associated with calculating hazard indices and HQs should be removed from this section of the text and discussed in the "Uncertainties" section of the report.

7. Section 5.5 Risk Description, page 5-6: *"Based on uncertainties of toxicity, and on the fact that no RTE species have been confirmed at the site, remedial actions may not be warranted at this time for soil" ....."Based on uncertainties of toxicity, estimating concentrations in aquatic insects, and limited sample size, no remedial actions are warranted at this time for surface water or sediment."*

   This is a risk management decision. CERCLA and the NCP state *"protection of human health and the environment"* this is not limited only to the protection of threatened and endangered species.

   Statements should be limited to recommendations for more investigations or justification supporting that a thorough ecological risk assessment has been completed. Considering that there are HI>1 at this site for several of the ecological receptors, recommending that no remedial actions are warranted is inappropriate.

8. **Table 5-1 Terrestrial Plant Impact Assessment:**

   It is not appropriate to assume that the benchmark was not exceeded, when a benchmark concentration is not available. In this situation (i.e., when a benchmark concentration is not available for a specific constituent), the constituent should be retained and carried through the ecological risk assessment. In this table, please remove the "No" from the last column titled "Benchmark Exceeded" when a benchmark concentration for a constituent is not applicable. A footnote could be added in place of the "No" which states something to the effect "Constituent Retained Due to Lack of Benchmark Information."

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