Responses to EPA R7 Comments to Draft Remedial Investigation Addendum (RIA) dated July 29, 2016, with additional appendix files received on November 2, 2016 West Lake Landfill OU1.

Primary Comments

I. **Site Definitions -** The term "Site" is not used consistently within the draft Remedial Investigation Addendum (RIA). The term "Site" should be used to specify the overall West Lake Landfill Complex and all associated subareas. It should not be used to specifically refer to the various subareas of the Site, such as Operable Unit 1 (OU1), Operable Unit 2 (OU2), Area 1, Area 2, Bridgeton Landfill, Buffer Zone, Lot 2A2, or others. When discussing subareas, the RIA should specify them by name. The RIA should define the differences between the various landfill cells contained within the Site including the Bridgeton Landfill, both physically and by regulatory authority. Also, the terms for the subareas, including AAA Trailer, Lot 2A2, Ford Property, former Ford Property, Buffer Zone, Crossroads Industrial Park, and Crossroads Property are not used consistently within the text and figures of the document. The RIA should describe the historical use(s) of these terms and better define the specific terms that will be used consistently in the RIA text. If historic names for consolidated properties are needed to describe specific locations, clarify this convention in the text. The RIA should also provide a new or revised figure illustrating these designated areas more accurately. Additionally, text should be added to the RIA to clearly describe the current property owners and provide discussion in the text or a time line documenting property ownership and name changes.

RESPONSE: A new figure (Figure 3-5) has been added to the report that identifies the various areas to differentiate the landfill property from the rest of the Site and to indicate that the Buffer Zone and Lot 2A2 are part of the Site. The text has been revised as necessary to be consistent with this definition of the Site.

II. **Distribution of RIM -** Another subsection should be added to Section 6 of the draft RIA that specifically discusses what is known or can be inferred from other documents regarding the placement, distribution, and general nature of the Radiologically Impacted Materials (RIM) or Leached Barium Sulfate Residues (LBSR) mixed with topsoil. A description of the Latty Avenue "topsoil" and other potential materials that were possibly incorporated into the LBSR should be included and discussed in the RIA. The RIA should better describe and summarize past activities at the Site during the time of placement and shortly after, referencing aerial photographs and other historical records where possible. Additionally, a discussion on any known (or assumed) weathering, degradation, and settling of the landfill that may have affected RIM distribution should be included in the RIA. The RIA must include discussion of how the understanding of RIM distribution at the Site has evolved since the discussion in the early Nuclear Regulatory Commission (NRC) reports based on the results of the additional investigations conducted since 2008. Incorporate this information into the detailed narrative description in an expanded Conceptual Site Model (CSM) and revise the other sections that include descriptions of RIM placement and distribution to be consistent with the CSM. Text sections that may be affected by this comment include 6.1, 6.3, 6.5, 9.3, and 9.5.

RESPONSE: A summary description of what is known or can be inferred about the sources of the material, its transport to West Lake Landfill, and its distribution at West Lake Landfill has been prepared and included in Section 6.1.1 of the revised RIA. Discussions of past activities at the Site are included in Section 6.1.1 and Section 5.5.2. Discussion of the configuration of RIM is included in Sections 6.1.2, 6.5 and 9.4.2.

III. **Groundwater -** Information related to groundwater is to be updated in the RIA by presenting recent groundwater data results collected for OU1 since 2008. Since OU1 is defined based on the presence of radionuclides, groundwater data presented in this document should include any groundwater samples/data that were analyzed for radionuclides, including recent sampling events in and around the perimeter of OU2.

The draft RIA has utilized off-site areas (Weldon Springs, St. Louis Downtown Sites (SLDS), St Louis Airport Sites (SLAPS), etc.) with differing hydrogeology and geologic units to establish a background level for radionuclides in area groundwater. The RIA should be revised to state that background levels will be evaluated further during the OU3 Remedial Investigation/Feasibility Study (RI/FS).

Throughout the draft RIA there are multiple attempts to classify wells as "background," "upgradient," "crossgradient," and "downgradient" without sufficient information on specific groundwater gradients, consideration of whether the wells contain leachate impacts, or whether the wells are monitoring the same geologic unit(s). Wells potentially impacted by leachate will need further evaluation as a part of the OU3 RI/FS before they can be classified. The RIA should not include conclusions based on upgradient and crossgradient well designations with known or potential radiological and leachate impacts. Also, check all section headers and titles of table and figures for well classifications and revise as necessary.

The OU1 Fate and Transport evaluation (Appendix P) was specifically scoped to evaluate the potential for migration (leaching and loading) of RIM into groundwater but was not intended to address specific contaminant transport mechanisms. These items shall be addressed under the OU3 RI/FS in accordance with the requirements of the National Contingency Plan (NCP). The draft RIA states that the leachate collection system affects "groundwater levels, hydraulic gradients, groundwater flow directions, and groundwater flux (Section 5.6.2.2)," and that it appears to have an effect on groundwater levels in the vicinity of the Site (Section 5.6.2.3). The RIA should clearly identify data supporting these statements. Also the RIA needs to fully acknowledge and discuss potential hydrogeologic influences and impacts from the nearby Missouri River.

Some of the groundwater sampling events have analyzed both filtered and unfiltered (total) samples, but when discussed in the text elevated concentrations of unfiltered contaminants are largely dismissed due to turbidity or particulates and colloids present in the water. The RIA needs to acknowledge the uncertainties associated with these data sets including the potential for colloidal and particulate transport of contaminants within the subsurface environment, and to clearly indicate that additional investigation and evaluation of the groundwater system is necessary and will be conducted under the OU3 RI/FS.

The hydrogeologic system of the Site is more complex than the RIA currently presents. The existing monitoring well network, analytical data, and assessment of the leachate collection system are insufficient when considered with other unknowns related to the site-specific hydrology to draw the conclusions as presented in the RIA. The RIA should be revised to remove unwarranted conclusions and to clearly indicate that additional investigation and evaluation of the groundwater system is necessary and will be conducted under the OU3 RI/FS process. Finally, it should be noted the draft RIA extensively references the United States Geological Survey (USGS) 2014 Groundwater Report regarding the Site and Site area. However, the conclusions made in the RIA based upon this report mischaracterize and over-simplify the USGS report and related data sets. For example, the draft RIA does not include the conclusion statements made by the USGS clearly indicating that some of the radium detected in groundwater could have originated from a RIM source in OU1. Revise the RIA to accurately reflect conclusions contained in the USGS 2014 Groundwater Report.

RESPONSE to paragraph 1: The radionuclide data obtained by Bridgeton Landfill in 2015 and 2016 was already included as Appendix F-6, which was provided to EPA in November 2016.

RESPONSE to paragraph 2: The requested addition (that background levels will be evaluated further during the OU-3 RI/FS) has been added to the text.

RESPONSE to paragraph 3: These discussions were intended to describe the locations of the various wells relative to Areas 1 and 2 and not necessarily relative to the entire site. A well could be impacted by leachate but still be upgradient or cross-gradient from Areas 1 and 2 and therefore provide data on possible radionuclide occurrences unrelated to Areas 1 and 2. However, in response to the comment and in recognition of the pending work to be performed for OU-3, discussions of the locations of various wells relative to Areas 1 and 2 will be removed from the report.

RESPONSE to paragraph 4: Additional discussion has been added to the RIA regarding the known or potential effects of the quarry operations and leachate collection system on groundwater levels, flow directions and groundwater flux as well as the influences and potential impacts of the Missouri River on groundwater levels and groundwater flow at the Site. Pursuant to discussions with EPA, discussions of the Site hydrogeology are being deferred to the OU-3 RI/FS.

RESPONSE to paragraph 5: The discussions of unfiltered (total) sample results have been modified to include recognition of the potential for colloidal and particulate transport in groundwater and to state that additional investigations of radionuclide occurrences in groundwater will be performed for the OU-3 RI/FS.

RESPONSE to paragraph 6: The requested revisions have been made. Pursuant to discussions with EPA, discussions of the Site hydrogeology are being deferred to the OU-3-RI/FS.

IV. **Perched Water-** The draft RIA discusses the presence and distribution of perched water in various sections (4.6, 5.6.2.1, 7.4, and 8.5) but does not clearly define the term "perched water" as used in the document. Briefly define the term, and discuss the nature of "perched water" as used in the text of this document. Also generally discuss the limitations related to identification and definition of "perched water" in a landfill environment. Add discussion to the RIA as to why perched water was reported to be present (or identified) only in 1995; include considerations such as weather conditions, drilling techniques, or that perched water has been defined differently by different reports and associated consultants. Re-evaluate the conclusions regarding perched water in section 7.4 after addressing other comments on changes to topographic contours over the history of the Site and potential infiltration. Also include in the RIA a more detailed discussion of the nature of the seeps identified in Area 2. This revised evaluation of perched water and the seeps should also be reflected in the updated CSM discussion.

RESPONSE: The text of Section 4.6 was revised and expanded to respond to this comment. The presence of perched water encountered during drilling of the original OU-1 RI borings in 1995 was discussed in the 1996 McLaren/Hart Soil Boring/Surface Soil Investigation report submitted to EPA in November 1996 and reiterated in the previously approved 2000 RI report. Other than identification of the soil borings where perched water was encountered, the only description of the occurrence of perched water provided by McLaren/Hart was as follows:

Perched water was encountered at the following locations and depths in Areas 1 and 2:

Soil Boring	Depth Encountered	Sample Collected
WL-108	22 feet below grade	Yes (plus field duplicate)
WL-116	8 feet below grade	No
WL-215	6 feet below grade	No
WL-217	12 feet below grade	No
WL-219	25 feet below grade	Yes
WL-220	30 feet below grade	Yes
WL-231	31 feet below grade	Yes
WL-240	5 feet below grade	No

The McLaren/Hart report goes on to state: "Figure 2-6 [reproduced in the draft RIA as RI Figure 4-9] identifies the borings in which perched water was encountered, the borings sampled, and the areal extent of the perched water. As shown on this figure, the presence of perched water is very limited in extent and isolated in nature." No other information regarding the definition or nature of the perched water occurrences was included in the original 1996 McLaren/Hart report.

It is presumed based on EMSI's experience investigating other municipal solid waste (MSW) landfill sites, including Superfund MSW landfill sites, that the presence of perched water results from accumulation of infiltration on layers of relatively lower permeability

waste materials or soil layers. Owing to the overall heterogeneous nature of MSW landfills and the limited extent and continuity of any lower permeability layers within a waste mass, occurrences of perched water typically include only very thin intervals of limited areal extent.

A specific reason as to why perched water was not encountered during subsequent investigations performed 20 years later cannot be identified but may reflect, without limitation, one of more of the following factors:

- Differences in antecedent precipitation conditions between the various soil boring investigations;
- Differences between the drilling and sampling methods used and the resultant samples and information obtained to assess the possible presence of perched water;
- Consumption of moisture within the waste mass in conjunction with decomposition of organic matter;
- The presence of extensive vegetation cover during the later investigations that intercepted precipitation, preventing it from infiltrating and also removing significant amounts of infiltrated precipitation through transpiration;
- Drainage of whatever perched water was present in 1995 down through the boreholes during and/or subsequent to the 1995 soil boring program; and/or
- Effects associated with placement of additional (inert) fill material in low areas in 2006 and 2007 pursuant to the approved 2006 Materials Management Plan.

In contrast to the 1995 soil borings, which were drilled with auger, and in many cases large diameter bucket auger drilling equipment, the soil borings drilled in 2015 and 2016 included collection of soil cores. Detailed examination and geologic logging of the soil cores obtained in 2015 and 2016 did not identify any saturated intervals within the waste mass but only identified actual or potential saturated conditions at or below the base of the waste mass.

V. **Site Topography and Surface/Storm Water -** It is difficult to distinguish in this RIA between historical and current topographical issues at the Site. Include a summary of topographic changes that have occurred at OU1 to aid in the understanding of the Site history and the CSM. This summary should include a chronologic discussion of the relevant topography and infrastructure changes that have occurred at the Site that could potentially affect run-off characteristics and associated outfalls. In addition, include a discussion of historical and current stormwater drainage features and any changes associated with the various "surface water bodies," temporary impoundments, and construction/removal of weirs. The document should include the potential impacts of topographic changes on perched water, seeps, infiltration, and potential impacts to Fate and Transport associated with surface and storm water. The document should include a brief discussion of the ongoing stormwater plans consistent with other text sections regarding stormwater. This comment may be applicable to sections 4.12.1, 4.12.1.1, 4.12.2, 5.3.3.1, 5.3.3.2 and other areas where topography and stormwater are discussed, and should be considered or included when expanding the narrative of the CSM.

RESPONSE: We have prepared figures (see Figures 6-8 through 6-11) of the changes in the topography of Areas 1 and 2 that occurred between 1971 and 1975 and between 1971, 1975, 1977, and the current time (2016). Please recognize that the presence of extensive vegetation cover that developed on Areas 1 and 2 over the years limits the potential accuracy of topographic elevation surfaces derived from aerial flyovers alone. We also reviewed historical aerial photographs relative to changes in surface water bodies over time.

VI. **Conceptual Site Model (CSM) -** Completely re-write the section on CSM to be more comprehensive and place it in one location, with references to the CSM key elements that are located in other sections of the document. The CSM should summarize the following items: the Site location and setting; the geologic and hydrologic conditions; a history of the landfills; the nature of the contaminated material including details and data about the source; the transport of the contamination to the Site; placement of the RIM in the landfill; the actions, both natural and anthropogenic, that have and may have displaced materials over time; and any other details pertinent to the nature, extent, potential migration pathways, and potential exposure pathways associated with the Site and contamination.

RESPONSE: The CSM discussion has been completely revised to include these items, and also incorporates the results of the evaluations included in the updated Baseline Risk Assessment.

VII. **Differentiating historical vs. current discussions and conclusions -** Due to the history of the Site, it is often difficult for readers to readily distinguish historical Site descriptions and conclusions in the draft RIA from current descriptions and conclusions. Add text within the sections to clarify where historical descriptions and conclusions were made but no longer represent current Site conditions. The EPA also suggests that past and present conditions be presented in chronologic order with references provided to each section where the subject is being discussed.

RESPONSE: The requested changes have been made.

VIII. **Peripheral Investigations -** Create a new section in the RIA to present a brief summary of the various peripheral investigations that have been conducted in the vicinity of the West Lake Landfill. Remove detailed discussion related to the Bridgeton Municipal Athletic Complex (BMAC) investigations. This new section should include brief summaries of the BMAC investigation, the Bridgeton Sanitary Landfill Radiological Air Sampling Report (2013) by MDHSS, the West Lake Landfill Radiological Survey (2013) by the MDNR, the Bridgeton/West Lake Landfill Radiological Sampling Report (2015) by the MDHSS, the West Lake Landfill Vicinity Radiological Survey and Sampling Final Report by the MDNR, the DOE and the USACE Haul Road investigation, the MDNR Haul Road Investigation, and other peripheral investigations that are relevant to the CSM for OU1. Include a summary of the purpose of each off-site investigation and an overview of the data/results. Citations for each investigation should be included in the description and included in the Reference Section of the RIA.

RESPONSE: The requested changes have been made. A new Section 2.3 has been added that describes the reports listed in this comment.

IX. **Aerial Photos -** Add an appendix to the RIA containing historical aerial photographs which should, at a minimum, include those that are utilized to create figures 3-7a through 3-7f which depict changes in surface elevation over time. In addition, include any other historical aerial photographs that support the CSM or are otherwise referenced in the RIA.

RESPONSE: The various historical aerial photographs or compilations/interpretative reports of historical aerial photographs have been reviewed and discussed in the text (where appropriate). Aerial photos are included in Appendix O of the revised RIA.

X. **QC Summary -** The discussions throughout the RIA related to data quality concerns or anomalous data that was rejected should be added to a new section related to Quality Assurance/Quality Control. This section should identify any data quality issues, explain the problem(s) and the resolution. Specifically discuss any data that is considered unusable. It appears that data that was re-analyzed is not included on some tables and figures and the original data with quality issues was reported or used to support discussions and figure development. This comment may apply to multiple sections, tables, and figures (ex. Tables 6-4 and 6-5, Figures 5-13, Figure 6-4, and 6-8, Appendix M, Figure M 2.6, Appendix C-2, etc.).

RESPONSE: A Data Usability Memorandum has been prepared relative to the soil/waste sample analytical results. That memorandum addresses specific data quality issues that have been identified, the representativeness of certain data, and which data were used when more than one analytical method was employed. The Data Usability Memorandum has been included as Appendix D-12.

XI. **Consistent Presentation of Data -** Throughout the draft RIA, different text sections on similar topics are presented with varying levels of detail. Revise the RIA to present topics that are presented multiple times for separate areas or at different time periods in as consistent a manner as possible. If a particular type of data or description is not available or applicable for one area or sampling event, state this in the text and explain why. For example, in Section 7.1.1.1, the presentation of radon flux data in one paragraph includes information about square footage, grid sizes, and mean concentrations on specific areas, but other paragraphs do not include the same talking points. In Section 8.6, some data discussions identify the specific well with the highest detected concentration and others do not.

RESPONSE: The discussions in Section 7.1.1.1 and elsewhere (where identified as applicable) have been modified to present consistent levels of detail for both sets of radon flux measurements. The text was reviewed and modified as necessary to present consistent levels of detail.

XII. **Subjective Language -** The discussions and conclusions presented in this document contain a significant amount of subjective language. In general, avoid the use of words such as *significant, generally or most* where possible. Instead, use quantitative language, specific number ranges or supported facts. Instead of using terms such as "well above," simply state "above" and provide the number spread or range, if appropriate. For example, in Section 7.1.2 on page 158, replace text that states gross alpha results are "similar to or only slightly higher than" with "an order of magnitude higher." Refrain from use of terms such as: *all, none, or eliminates* unless it is factually supported.

RESPONSE: The report has been revised to remove the identified wording.

XIII. **Data and Information to be Included in the Next Revision -** Remove text throughout the RIA document referring to items to be provided at a later date and revise the pertinent sections to include the current and complete information. This should include, but is not limited to, items such as references to the updated Baseline Risk Assessment and the Fate and Transport evaluation which were not available at the time of the submission of the first draft of the RIA.

In addition to fixing text that references data and reports that were not available at the time of the submission of this draft of the RIA, also include the following data in the RIA by adding to the appropriate appendix and referencing in the appropriate section:

- Any available, validated stormwater data collected under the Surface Fire Prevention UAO
- Any available, validated surface soil data collected under the Surface Fire Prevention UAO
- Any available georeferenced gamma surveying conducted under the Surface Fire Prevention UAO
- Any available, validated data collected as part of the on-site baseline air monitoring program
- Any available, validated sediment data not included in the first draft of the RIA
- Any available, validated the EPA split data including subsurface soil samples (additional characterization) and sediment samples
- The radiological results of the soil samples utilized for the radon emanation portion of the EPA Pyrolysis Study
- The verification data associated with the reanalysis of Cotter samples by SwRI

RESPONSE: The report has been revised to include the additional data obtained since the draft report was prepared. Please note that additional stormwater and air monitoring samples have been collected but the lab results for these samples have not been received and/or validated at the time this report was prepared. Stormwater data through the end of March 2017 and air monitoring data through the end of Year 2 Quarter 2 (the sixth quarter) have been included in the revised RIA.

XIV. **Non-Combustible Cover/Surface Fire Prevention Removal Action -** Use consistent terminology for the Non-Combustible Cover (NCC) and the Surface Fire Prevention

removal actions. Clarify in the text the references to these terms and ensure consistent terminology is used throughout the RIA.

RESPONSE: The text has been reviewed and revised to ensure the UAO for Removal Action and the NCC construction are cited in a consistent manner.

Specific Comments

List of Acronyms

1. Change "*ethyl*" in EVOH to "*ethylene*," and perform a global check in the document.
2. Delete the acronym "MTG" (Migration to Groundwater), and perform a global check in the document since it is not an established acronym.
3. Replace "*OSWER*" with "*OLEM*," Office of Land and Emergency Management, which is the current acronym and title of this office. Use the same descriptor.

RESPONSE: The requested changes have been made with the exception that when a reference is made to a specific document that was prepared by OSWER, the RIA continues to cite to it as OSWER unless the document has been updated, revised or re-issued as an OLEM document. A notation has been added to the text where appropriate to indicate that OSWER is now identified as OLEM.

Executive Summary

4. Revise the Executive summary in accordance with all comments on the draft RIA.
5. All acronyms throughout the document should be spelled out the first time they are used.
6. Page ES-1, second paragraph, first sentence: Clarify in this sentence and in other locations in the RIA that the Bridgeton portion of the West Lake Complex is no longer accepting waste but is not yet in post-closure monitoring per state requirements.
7. Page ES-1, third paragraph, first sentence: Change "*Services*" to "*Survey*" in the USGS name, and change ACOE abbreviation to "USACE" (global change, including referenced publications).
8. Page ES-1, third paragraph, last sentence: Change "*radiation*" to "*radon*."
9. Page ES-2, first partial paragraph, last sentence: This statement should reference a figure that depicts this information and refers readers to Section 3.1 of the RIA where this information is discussed in further detail.
10. Page ES-2, last paragraph, second sentence: Revise this sentence as follows: "…containment measures, and limited migration of radionuclides from Areas 1 and…"

RESPONSE: The requested changes have been made.

1.0 INTRODUCTION

1.1 Purpose and Scope of the RI Addendum

11. Page 1, last paragraph, first sentence: Add the word "*and*" between "*RI report*" and "*to incorporate*."

RESPONSE: The requested changes have been made.

2.0 SUMMARY OF INVESTIGATIONS

12. For each document listed in this section that has not been approved by the EPA or the MDNR, indicate the date of the submittal that is being cited, the agency or organization to which the document was submitted, and the status of the document as either draft or approved. Only cite draft documents if they are pertinent to OU1 and discussed in another section of the RIA.

RESPONSE: The requested additions have been made.

2.1 Pre-RI Reports

13. Page 6, second-to-last bulleted item: Add the 1991 aerial photographic analysis report in addition to the 1989 aerial photographic analysis report.

RESPONSE: The requested addition has been made.

2.5 Bridgeton Landfill Reports

14. In this section, include a general listing of the documents for the recent North Quarry actions related to the Bridgeton Landfill and the July 2011 AquaTerra Waste Limits Investigation Summary Report. Add documentation related to the Subsurface Smolder Event/Subsurface Reaction (SSE/SSR) to this section.

RESPONSE: The requested changes have been made.

2.7.4 MDNR and MDHSS Reports

15. Page 15: Add these documents to the lists in Section 2:

- National Pollutant Discharge Elimination System (NPDES) stormwater data for the comingled outfall (Outfall 007)
- Missouri Department of Natural Resources historical operating permits
- MDNR Groundwater Investigation Report for 2015
- Investigations related to the OU1 perimeter fence installation
- Department of Energy and USACE Haul Road investigations
- MDNR Haul Road Investigations

RESPONSE: The listed documents have been added to the list of documents in Section 2. No investigations were performed as part of the OU-1 perimeter fence installation work, only health and safety monitoring. A formal report of the fence installation work or summary tables and figures of health and safety monitoring were not prepared or required

as part of that work and thus the requested information is not available for inclusion in the revised RIA.

3.0 SITE BACKGROUND

3.1 Site Description and Location

16. Page 17 and 18: Refer to Primary Comment I above on Site Definition. OU1 includes the Buffer Zone, Lot 2A2 and any areas beyond these subareas where radionuclides have been or could be identified in the soil. The phrase "offsite" should not be used when discussing surface features or potential contamination in these areas. Also, clarify references to fences or fence lines by accurately defining the area or property they enclose with respect to property and Site boundaries.

RESPONSE: The requested changes have been made.

17. Page 18, second paragraph: Revise the first and second sentences of this paragraph to state that an institutional control in the form of a "Declaration of Covenants and Restrictions" was recorded on June 30, 1997 and that a supplemental "Declaration of Covenants and Restrictions" was recorded on January 20, 1998.

RESPONSE: The requested changes have been made. In addition, the text was revised to reflect the additional restrictions that were implemented in 2016.

18. Page 18, third paragraph: Revise the paragraph to add a discussion specifically for OU1 with respect to the separation distance from the runway.

RESPONSE: The requested changes have been made.

3.3 Summary of Site Operations

19. Page 19, last bullet: Expand "*Buffer Zone*" bullet to include Lot 2A (or Crossroads property), or create a new bullet for these areas.

RESPONSE: The requested changes have been made. A new Section 3.4 that includes discussion of the Buffer Zone and Lot 2A2 has been added to the RIA.

3.3.1 Landfill Permit History

20. Page 20, top of page: Areas 2 and 4 of the original six waste areas are cited by an AquaTerra (2011) report to have been "closed" in 1974. Not all of the six waste areas are mapped in figure 3-6. Check and correct figure 3-6.

RESPONSE: The requested changes have been made.

21. Page 20, second paragraph, third sentence: Permit No. 218903 was issued for operation of a demolition fill landfill, not a sanitary disposal landfill, although the area had been previously used for sanitary disposal. Correct the text to reflect this information.

RESPONSE: The requested change has been made.

22. Page 20, fourth paragraph, third and fourth sentences: Permit No. 118912 was issued on 11/18/1985. Permit No. 118912 is permitted for 52 acres but actually covers a larger area (54-59 acres, Herst & Associates, 1995). Confirm and correct text accordingly.

RESPONSE: The text has been amended to describe the variations in the reported areas associated with this permit. See in particular Footnote 23.

3.3.2 West Lake Landfill Areas 1 and 2

23. Page 20, fifth paragraph, second sentence: Delete the text starting with, "…, *but based on visual inspection… in areas 1 and 2*."

RESPONSE: The requested change has been made.

3.3.2.1 West Lake Landfill Radiological Area 1

24. Page 21, first full paragraph, second sentence: Area 1 was historically included under permits 218903, 118906 and 118912. Confirm and correct text accordingly.

RESPONSE: Permit No. 218903, issued on January 27, 1976, addressed the four areas of pre-1974 landfill disposal that were permitted by MDNR for continued landfill operations; it included a portion of Area 1. Although the areas included under Permit Nos. 118906 and 118912 extend over the southern portion of Area 1, these permits more closely correspond with the original permit boundary for the North Quarry portion of the Bridgeton Landfill. They did not permit additional disposal activities in Area 1. Permit No. 118906 was issued in 1979 and, based on the overall area covered by this permit, it appears to have been associated with disposal in the North Quarry portion of Bridgeton Landfill. Similarly, Permit No. 118912 was issued in 1985 and corresponds with the general area covered by the Bridgeton Landfill. As noted above there is an overlap between these two permit areas and the southern portion of Area 1. Therefore, rather than add what we believe would be an incorrect statement that Area 1 was historically included under Permit Nos. 118906 and 118912, a footnote (No. 24) has been added to indicate that the areas included under Permit Nos. 118906 and 118912 for the Bridgeton Landfill overlap the southern portion of Area 1.

3.3.2.2 West Lake Landfill Radiological Area 2

25. Page 22, first full paragraph, second sentence: The number of acres covered by the NCC as required by the Surface Fire Prevention order listed is not current. Update this value.

RESPONSE: The requested change has been made. The current number of acres of NCC is 2.63 acres for Area 1, 17.24 acres for Area 2, and 1.78 acres for the Buffer Zone. Rock material similar to that used for the NCC was also placed on a small portion (0.156 acres) of the AAA Trailer property.

26. Page 21 and Page 22: Add text discussing the significant erosion onto the adjacent property that occurred historically in Area 2.

RESPONSE: This section of the text discusses the landfill permit history. Discussion of the erosion from Area 2 onto the adjacent property is not pertinent to the landfill permit history. The substance of this comment has instead been addressed through revision of Section 2.4 to indicate that the Buffer Zone and Crossroad Lot 2A2 are part of the Site.

3.3.3 Inactive Landfill Operations in OU2

27. Page 22, first paragraph in section: Revise Permit No. 118906 to 118908.

RESPONSE: The requested change has been made.

3.3.4 Bridgeton Landfill

28. Page 23, first full paragraph: The reference to Figures 3-7a through 3-7e appears to be incorrect and should be changed to 3-8a through 3-8e.

RESPONSE: The figure references have been revised.

29. Page 23, second paragraph, last sentence: Add a reference to the appropriate permit number for consistency (Permit No.118912 issued on 11/18/1985).

RESPONSE: The requested change has been made.

30. Page 23, third paragraph: Add language to this paragraph to indicate where wastes were placed in the North Quarry based on the 1979 aerial photograph. Also discuss which portions of the North Quarry were filled first based upon the historical aerial photographs.

RESPONSE: The requested change has been made to Section 3.3.4.

3.4 Activities Adjacent to the Landfill

31. Expand this section to include text describing other significant nearby issues or features (airport, airport easements, surface water bodies including the Missouri River, flood control channels, etc.).

RESPONSE: The requested additions have been included (see new Section 3.5).

32. Page 24, first paragraph of section: Revise in accordance with Primary Comment I above on Site Definition.

RESPONSE: The requested change has been made (see last paragraph of Section 3.4).

4.0 SITE INVESTIGATION ACTIVITIES

4.2 Threatened or Endangered Species Assessment

33. Page 26: Create a reference in the text of this section to Appendix Q Baseline Risk Assessment (BLRA) Ecological (ECO) section, and revise the section, if necessary, to reflect ecological risk as presented in the updated ECO risk assessment.

RESPONSE: The referenced text is a discussion of the various investigations that were conducted as part of the original RI work, including the Threatened and Endangered Species Assessment performed by McLaren/Hart in 1995. Discussing the results of the updated ECO risk assessment would mix a historical investigation with a current evaluation and, as such, is inconsistent with EPA's Primary Comment No. VII. To address the substance of this comment, a sentence was added to the end of the section indicating that potential risks to ecological receptors can be found in the Ecological Risk Assessment.

4.3 Surface Gamma Surveys

34. Page 27, first sentence of section: This section mentions seven gamma surveys but lists only six bullets. Revise the section as appropriate to reflect the correct number of gamma surveys.

RESPONSE: The text has been revised to indicate that there were six gamma surveys. At one time we considered separating the Phase 1 surveys from the Additional Characterization surveys (resulting in seven surveys) but later decided to combine these as one item.

4.3.3 EPA ASPECT Flyover Survey

35. Page 30, second paragraph, first sentence: Change Consequence Management Advisory Team (CMAT) to Consequence Management Advisory Division (CMAD).

RESPONSE: Because the study was performed by CMAT and the correct reference to the study report is to CMAT, the reference name has not been changed; however, a footnote has been added indicating that since the study was completed this entity has been renamed the Consequence Management Advisory Division (CMAD).

4.3.4 Additional Gamma Surveys for OU1 Post-ROD Investigations

36. Page 31, second paragraph, last sentence, and third paragraph: Include a discussion of the data collected during the installation of the NCC.

RESPONSE: The requested change has been made. See also new Appendix A-7.

4.4 Soil Borings and Logging

37. Page 33, first paragraph, first sentence: Confirm the number of soil borings presented in this section as compared to the text provided throughout the document. This should be checked against existing documentation and other portions of Section 4 and Section 6 of the RIA.

RESPONSE: The numbers were checked and verified during preparation of the draft report and were re-checked during preparation of the revised report. In addition, a new table (Table 4-1) has been added to summarize the number of borings associated with each investigation.

38. Page 33, last paragraph of section, last sentence: Since the GIS information in the tables is provided in the local coordinate system, define the local coordinate system or provide the GIS information in a standard/universal coordinate system. Also, apply this change to Section 4.10, page 63, and other similar text where appropriate.

RESPONSE: Additional discussion has been added to the text of Sections 4.4 and 4.10. Specifically, the local (Site) control points were surveyed in November 2016. The surveyor (Weaver Consulting) translated the surveyed points to the state plane coordinates that were surveyed at the same time (see attached spreadsheet). Based on this translation, the Site survey data points need to add 40.97' to the northing, 320174.7' to the easting, and subtract 0.402' from the elevation, to establish state plane coordinates for the local (Site) points that were surveyed last year. State plane coordinates calculated using this method are included on Table 4-1 which summarizes the survey data for the soil borings and GCPT soundings. Similarly, calculated state plane coordinates have been added to Table 4-3 which presents the survey data for the monitoring wells.

4.4.1 RMC Investigation Soil Borings (1981)

39. Page 33, first paragraph of section, first sentence: The text in this section states there are 31 NRC borings in Area 2 but only lists 29 boring numbers in the Area. Figure 4-6 shows 30 NRC boring locations, but two of the borings are labeled "PVC-2." Correct these inconsistencies.

RESPONSE: The text has been corrected. Specifically, the list of borings for Area 2 provided in the text omitted borings No. 39 and 40. This omission has been corrected. However, the more significant inconsistency with the number of borings is the result of the documentation contained in the RMC, 1982 report. Page 14 of the subject reports states: "A total of 43 borings were drilled, (11 in Area 1 and 32 in Area 2) including 2 off-site monitoring wells." However, Figures 9 and 10 only provide locations for 10 borings in Area 1 (Nos. 24-29, 36-38 and 41) and 30 borings in Area 2 (Nos. 2-23, 30-35 and 39-40). The RMC report never specifically identifies the locations of the two off-site monitoring wells; however, based on the data presented in Table 6 of the RMC report, the two off-site monitoring wells appear to be Boreholes 14 and 15 which were drilled in what is today called the Buffer Zone, indicating that only 29 borings were drilled in Area 2. Regardless, although the text of the RMC report states that 43 borings were drilled, the highest boring number listed on the tables and figures is No. 41, suggesting that only 41 were drilled. In addition, although data are provided for boring No. 1 on Table 5 of the RMC report, the location of this boring is not shown on Figure 10 of the RMC report. To more clearly document the number of known borings and the inconsistencies in the available documentation, we expanded the discussion in the first paragraph of Section 4.4.1 to include the above information. Finally, Figure 4-6 correctly identifies the borings;

however, the number "1" associated with boring PVC-21 was located over a line outlining a road on the base map and therefore was difficult to see. We have moved the label for this well so that it can be seen more clearly.

40. Page 33, first paragraph of section, last sentence: The text and Figures 4-5 and 4-6 do not appear to match. The text states there are 10 NRC borings in Area 1 but only lists 12 boring numbers. Figure 4-5 shows only 9 NRC boring locations in Area 1, but one location is labeled PVC-25 twice and PVC-25R once. The symbol for PVC-36 appears to be wrong. Correct these inconsistencies.

RESPONSE: The 10 NRC borings shown on Figure 9 of the RMC, 1982 report are included on Figure 4-6; however, due to re-logging performed during the Phase 1 investigations, it is difficult to quickly identify borings PVC-25, PVC-28 and PVC-36. These borings were re-logged using the GCPT equipment one or more times during the Phase 1 investigations. Figure 4-6 indicates this by showing multiple symbols at these locations, including the green dot for the original RMC boring plus overlying symbols associated with any subsequent re-logging. The presence of the overlying symbols makes it a bit more difficult to locate PVC-25, PVC-28 and PVC-36 on Figure 4-5 and causes the symbols for these three borings to appear different from those shown for the other RMC borings. PVC-25R, GCPT25, GCPT15 and PVC-25 represent re-loggings using the GCPT equipment of existing boring PVC-25. Similarly, GCPT28 and GCPT28A are re-loggings of PVC-28 and GCPT36 is a re-logging of PVC-36. The juxtaposition of the symbols associated with the re-logging of these borings over the top of the symbols for the original PVC borings is what causes the symbols to appear to be different. The symbols on the figure have been revised to the extent possible to better display all of the types of borings/re-logging performed at these locations.

41. Pages 33-34: Borings PVC 28, 39 and 40 are located in Area 2, but the text states they are located in Area 1. Correct these inconsistencies.

RESPONSE: The text states that boring Nos. 24-29 and 36-41 were drilled in Area 1 when it should state that boring Nos. 24-29, 36-38 and 41 were drilled in Area 1 for a total of 10 borings in Area 1. Figure 9 of the RMC, 1982 report indicates that boring No. 28 is located in Area 1, not in Area 2 as stated in EPA's comment.

4.4.3 Supplemental OU1 RI Soil Boring and Logging (1997)

42. Page 36: Revise the section heading to read (1997 and 2000), or add a new section heading after the fifth paragraph for the "*2000*" discussion.

RESPONSE: For simplicity of presentation, the heading has been revised to "(1997 and 2000)" as suggested by the comment.

43. Page 37, second full paragraph: This paragraph states, "In addition, elevated downhole gamma readings were not detected during the geophysical logging of these borings." Revise this section to state that the field team performing this evaluation concluded that downhole gamma readings were not elevated

sufficiently above baseline to require the collection of samples, however, sufficient documentation does not exist to support this decision.

RESPONSE: The requested change has been made.

44. Page 38, first full paragraph: Delete this paragraph and replace with one that describes the investigations and samples collected in this area since the most recent grading work in 2003.

RESPONSE: The text has been revised to indicate that no comprehensive sampling of this area has been performed, that an additional soil/sediment sample (2016-03-16A) was collected from Lot 2A2 in March 2016 and that MDNR collected a soil sample from Lot 2A2 in November 2015.

4.4.5 Thermal Isolation Barrier Phase 1 Investigations (2013-15)

45. Page 38: Revise the title/name of this section to "*Phase I Investigations*."

RESPONSE: The requested change has been made.

4.4.5.1 Gamma Cone Penetrometer (GCPT) Soundings

46. Page 40, first paragraph, first sentence: Revise sentence as follows: "…isolation barrier and determine the extent of RIM in Area 1 at the Site."

RESPONSE: The text has been revised.

4.4.6 Additional Characterization of Areas 1 and 2 (2015)

47. Page 45, second paragraph of section, first sentence: Delete this sentence related to schedule of the sonic drill rig.

RESPONSE: The stated language is factually correct as the work was delayed at the request of EPA, resulting in a loss of availability of the Sonic drill rig followed by a subsequent request by EPA to try to use an alternate drilling method to initiate the work rather than waiting for the Sonic drill rig to become available. Regardless, the requested change has been made.

48. Page 46, second paragraph: The reference to Appendix D-5 seems incorrect Check, and if appropriate, revise to Appendix C-7.

RESPONSE: The requested change has been made.

4.4.7 Borings for Collection of Samples for Fate and Transport Testing (2015)

49. Page 46, second paragraph in section: Add *SSPA* to the acronym list.

RESPONSE: The requested change has been made.

50. Page 46, second paragraph in section, first sentence: Define or explain the term "blind drilling" as used in the sentence.

RESPONSE: The discussion in the text has been expanded. The term "blind drilling" means that rather than collecting and logging samples over the full length of the boring, the boring was rapidly advanced to the targeted depth interval without any logging or sampling being performed, at which point collection of samples and detailed geologic logging was conducted. Use of this procedure was considered appropriate because the borings that were "blind drilled" were offset from prior borings that had been drilled, sampled and logged but from which no recovery was obtained from the interval suspected to contain RIM.

4.4.8 Additional Borings Performed by Cotter Corporation (2015)

51. Page 47: Delete footnote.

RESPONSE: Bridgeton Landfill states that it did not participate in, and specifically objected to, the referenced testing. However, at EPA's direction, the requested change has been made.

52. Page 47, second paragraph, last sentence: Revise sentence to state "In addition to what was prescribed in the work plan…"

RESPONSE: The requested change has been made.

53. Page 47, fourth paragraph, third sentence: Reference to Appendix D-8 seems incorrect. Check, and if appropriate, revise to Appendix C-8.

RESPONSE: The requested change has been made.

4.5.1 NRC Soil Samples (1981)

54. Page 49, first paragraph, sixth sentence: Appendix Reference C-1 appears to be incorrect. Check to determine if it should refer to Appendix D-1.

RESPONSE: The text refers to the results of the downhole logging of the RMC boreholes, which are contained in Appendix C-1. Some of these data are also presented in Appendix D-1 as part of the presentation of the results of soil sample analyses by RMC; however, all of the downhole logging results are presented only in Appendix C-1.

4.5.2 OU1 RI Soil Sample Collection and Analyses (1995-97)

55. Page 51, first paragraph, last sentence: State whether VOC samples were also placed in plastic bags and later transferred to glass containers.

RESPONSE: The text has been revised. The McLaren/Hart Soil Boring Report (p. 2-5) states: "*All priority pollutant samples were immediately placed in appropriate, labeled glass containers...*" This text has been added to the second sentence of paragraph 11 of this section under the discussion of the chemical analyses.

4.5.5 Sample Testing and Analyses for Fate and Transport Evaluations (2015-16)

56. Page 56, Fate and Transport bulleted items: Include a reference to the eH-pH diagrams for iron speciation and other inorganics.

RESPONSE: During our May 10, 2017 discussion with EPA, it was decided to separate the Fate and Transport Evaluation report from the RIA and to only include a brief summary of the leaching test results in the RIA. Therefore, no change has been made to this section.

4.5.6 Additional Testing Performed by Cotter (2016)

57. Page 57, first paragraph: Consistent with previous statements in this paragraph, list the historical borings which Cotter used in its collection of samples.

RESPONSE: The requested change has been made. The samples collected in the first group obtained by Cotter are listed in the text on this page. Listing of the samples included in the other two sets of samples have been added to this paragraph.

58. Page 57: Revise the last paragraph to include a summary of the conclusions from the data validation report by Engineering Management Support, Inc. (EMSI).

RESPONSE: A discussion of the results of the data validation is included as part of the Data Usability Evaluation contained in Appendix D-12.

59. Page 57: Because of concerns with data quality associated with a subset of these samples, the EPA elected to have a third party verify these results. Include the SwRI data in the appropriate appendix of this RIA. Include a reference to this data in the last paragraph of this section. The EPA plans to discuss interpretation of the SwRI data with the Respondents prior to the submission of the revised RIA.

RESPONSE: The requested addition has been made.

60. Page 57: Delete footnote 15.

RESPONSE: Bridgeton Landfill states that it did not participate in, and specifically objected to, the referenced testing. However, at EPA's direction, the requested change has been made.

4.6 OU1 Perched Water Sample Collection and Analyses (1995)

61. Page 59, third paragraph: The text indicates many more borings encountered perched water than are illustrated on Figure 4-9. Explain this discrepancy in the text or correct the figures.

RESPONSE: The parenthetical list of borings in which perched water was encountered in Area 2 that is presented in the text of the 2016 draft RIA (as well as the text of the original 2000 RI) is in error. As indicated in the 2016 draft RIA text and in the response to general comment No. IV, McLaren/Hart reported that perched water was encountered in a total of 8 of the 61 borings drilled in 1995, including WL-108, WL-116 and WL-215, -217, -219, -220, -231 and -240. This is consistent with what is shown on RI Figure 4-9 (and also in the original McLaren/Hart report). The text of the draft RIA has been corrected to reflect occurrences of perched water in these Area 2 borings.

4.7 OU1 Geotechnical Sampling and Testing

62. Page 60, fifth paragraph, last sentence: Delete subjective terms "may have" and "potentially" from this sentence.

RESPONSE: The requested change has been made. Please note that this language was taken directly from the original (2000) OU-1 RI report.

63. Page 61, third paragraph: Explain how this paragraph relates to OU1.

RESPONSE: The text was intended to indicate that additional geotechnical testing was performed for OU-2. These types of data may be necessary for other evaluations, such as fate and transport, engineering calculations of the relationship between the mass and volume characteristics of the soil and waste, BRA evaluations, etc. The text was also intended to indicate that although this type of data was not collected as part of the OU-1 investigation, other studies, in this case the studies performed for OU-2, collected this type of information from other parts of the Site. It is up to the end user of such information to decide whether these data could be useful for other evaluations.

4.9 Hydraulic Conductivity Testing

64. Page 62, second paragraph in the section: While standard for the day, slug tests have limited utility unless they are applied in relatively simple unconsolidated geology or confirmed by longer duration aquifer stress tests. Add a sentence to this section briefly describing the basic limitations of the slug tests performed at the Site.

RESPONSE: The requested change has been made.

4.10.1 OU1 RI Water Level Measurements

65. Page 63, first paragraph in section, last sentence: The reference to Appendix E-2 appears incorrect. Check and, if appropriate, correct this reference to Appendix E-3.

RESPONSE: The requested change has been made.

4.11.1 NRC (RMC) Groundwater Sampling (1981)

66. Page 65, first paragraph: The statement regarding groundwater sampling occurring on- and off-site is misleading, as work off-site has been limited. Clarify in the text the number and nature of the off-site groundwater sampling events.

RESPONSE: The text summarizes what is stated in the RMC, 1982 report. The text already describes the number and nature of the off-site monitoring results, including indicating that the locations of the off-site monitoring wells were not provided in the RMC report. Therefore, we do not believe any changes need to be made to this section 4.11.1 of the text. The text of Section 4.11 has been modified to indicate that limited off-site groundwater sampling has been conducted and that additional testing is anticipated to occur as part of OU-3.

4.11.2 OU1 RI Groundwater Sampling (1994-97)

67. Page 65, second paragraph in section, first sentence: In the text of this section, define the method used to collect the grab sample(s) or include a reference to a section of the RIA that provides this information.

RESPONSE: The McLaren/Hart Groundwater Conditions Report (p. 2-2) states: "*The samples were collected with dedicated disposable bailers from each well prior to their redevelopment. The unfiltered samples were then analyzed for gross alpha. The gross alpha data provided a preliminary indication of whether groundwater in the vicinity of each well was radiologically impacted and if special handling and segregation of the development water was necessary*." Based on this text, it appears that the samples were collected from standing water in each well prior to redevelopment. The requested change has been made to the RIA text.

4.11.3 OU1 FS Groundwater Sampling (2004)

68. Page 67, second paragraph in section: The last sentence states the data is tabulated in Appendix F-2; however, the data in this appendix is submitted as raw laboratory data sheets and not summarized in a table. Data from raw laboratory data sheets must also be presented in data summary table(s), either in the appendix or in the text RIA.

RESPONSE: Appendix F-2 has been revised.

4.11.4 Post-ROD OU1 Groundwater Sampling (2012-14)

69. Page 69: This section states that the results of the additional groundwater sampling are presented in Appendix F-3; however, the appendix does not include the Volatile Organic Compound (VOC) and Semi-Volatile Organic Compound (SVOC) data that the EPA directed to be collected and presented. Revise Appendix F-3 by incorporating the VOC and SVOC data.

RESPONSE: Appendix F-3 has been revised. Specifically, Tables 14 (Trace metals), 15 (VOCs) and 16 (SVOCs) from the December 2012 report of the results of the August 2012 groundwater sampling have been added to Appendix F-3. The VOC and trace metal summary tables from the April, July and October 2013 sampling events have also been added to Appendix F-3.

70. Page 69, first sentence after list of parameters: Add a reference (date) for the SVOC decision as noted in the text.

RESPONSE: The requested change has been made. We believe this change was discussed during a February 14, 2013 conference call with EPA; however, the decision to not require SVOC analysis as part of the 2013 groundwater sampling events is documented in the March 18, 2013, SAP Addendum that was approved by EPA.

4.11.5 Sampling of Private Wells (2013)

71. Page 69-70: Starting in the second paragraph, the two wells Herst & Associates sampled in August 2013 (USGS B4-S and USGS B4-D which were both from the same owner) were actually south of the Site and not part of the six wells to the north sampled by the EPA. Correct this information in the text.

RESPONSE: The requested change has been made.

72. Page 69-70: Clarify some of the details related to the private well sampling. The EPA sampled the six wells to the north and provided contact information to Respondents for sampling of other nearby off-site wells. After attempts to gain access to these wells were unsuccessful, the EPA requested that the USGS obtain access for sampling. The USGS obtained permission to resample four wells, three of which had been previously contacted by the Respondents: alluvial well B4-S (permission also given for deep alluvial well B4-D but it had been winterized and was thus unavailable) and another alluvial well B3. USGS also obtained permission to sample three bedrock wells (A5, D-1, and E-1). Revise section accordingly to account for this information.

RESPONSE: The requested change has been made.

73. Page 70, top of page: Revise to state that the Weldon Spring Well E-1 was a bedrock well, not an alluvial well.

RESPONSE: The requested change has been made.

4.11.6 OU2 Groundwater Monitoring (1995-96 and 2004)

74. Page 70, second paragraph in section, last sentence: Appendix F-6 doesn't appear to contain any data. Populate Appendix F-6 with the missing data.

RESPONSE: The data tables for Appendix F-6 were provided to EPA on November 29, 2016 and have been included in the revised RIA.

4.11.7 Bridgeton Landfill Groundwater Monitoring

75. Include a discussion of the more recent Bridgeton Landfill groundwater sampling events, including corrective actions implemented to address groundwater-related concerns and implementation of the on-site water/leachate treatment operation.

RESPONSE: The radionuclide results obtained by the more recent Bridgeton Landfill monitoring are presented on the data tables included in Appendix F-6 of the revised RIA. These results were previously provided to EPA on November 29, 2016. The text of Section 4.11.7 has been expanded to indicate that Bridgeton Landfill is in the process of implementing Corrective Actions. Assessment of Corrective Actions, including leachate source control, will be addressed in the groundwater (OU-3) RI/FS.

76. Page 70, first paragraph in section, last sentence: Similar to the comment on Section 4.11.6; Appendix F-6 appears to be missing. Populate Appendix F-6 with the missing data.

RESPONSE: The data tables for Appendix F-6 were provided to EPA on November 29, 2016, and are included in the revised RIA.

4.12 Surface Water and Sediment Investigation

77. Page 71, first paragraph: Revise the second sentence of this paragraph by deleting the words "in accordance with" and replacing them with the words "as required by" and update the paragraph to reflect the current status of the required stormwater monitoring.

RESPONSE: The UAO does not include any requirements for stormwater monitoring. Stormwater monitoring was added to the scope of work pursuant to a February 12, 2016 e-mail from EPA (Tom Mahler) indicating that the removal action needed to comply with ARARs. Therefore, the "in accordance with" phrase in the text was changed to "pursuant to". This section of the text was also updated to reflect the fact that beginning in December 2016 the stormwater monitoring program was included as part of the OU-1 RI/FS work (instead of part the NCC work). Additional information regarding both the NCC and the subsequent OU-1 stormwater monitoring program has been added to Section 4.12.2.

4.12.1 OU1 RI Surface Water and Sediment Sampling (1995-97)

78. Page 71, first paragraph in section, second sentence: Figure 4-13 does not appear to clearly show the location of the seep described on the west side of Area 2. Revise the figure to more clearly show the seep location(s). If the seep is no longer believed to exist due to maintenance activities, also include this information in the text.

RESPONSE: The seep is shown and labeled on Figure 4-13 (see label titled "Seep-1") and also on Figure 4-9 (see label titled "Seep-1"). The seep was identified and sampled in conjunction with the soil boring program as part of the evaluation of perched water occurrences as discussed in Section 4.6. Sampling of the seep was not included in, or part of, the rainwater runoff/surface water sampling program conducted as part of the OU-1 RI field work and therefore is not strictly relevant to the discussion in Section 4.12.1. Pursuant to this comment, the OU-1 Respondents tasked the field crew with inspecting the area of the seep, which is located in the heavily vegetated part of the western portion of Area 2. The field crew performed this inspection on May 12, 2017, and determined that seepage was occurring in this area; however, this seepage remains localized and no seepage or flow has ever been observed on the face of the Area 2 slope. This information has been added to Section 4.6 of the RIA where the seep is first discussed.

4.12.2 Post-ROD Sediment and Stormwater Sampling (2016)

79. Page 77, paragraph below bullets: Revise this paragraph to indicate that analytical data sheets are presented in Tables 7.11 and 7.12.

RESPONSE: The requested change has been made.

80. Page 77, last paragraph: The statement regarding the NCC construction being complete is not accurate. Revise the text to discuss the status of this action.

RESPONSE: The requested change has been made.

4.13.1 Fugitive Dust Monitoring

81. Page 80, last paragraph of section, last sentence: Correct the date of the air monitoring conducted as part of the off-site baseline monitoring by the EPA to "*…from May 2014 through July 2015*."

RESPONSE: The requested change has been made.

4.13.1.1 NRC (RMC) Fugitive Dust Sampling (1980-81)

82. Page 80: For clarity, move the majority of this text to Section 4.13.2.1 NRC (RMC) Radon Flux Monitoring (1981). Also, add a description to the text to clarify that Rn222 and Rn220 were also part of the testing wherever Rn219 is mentioned.

RESPONSE: The requested change has been made. Based on review of the RMC, 1982 report, only Rn-219 was analyzed in the fugitive dust samples. Rn-220 and Rn-222 were analyzed as part of the radon flux testing performed by RMC, which is described in Section 4.13.2.1 of the RIA.

4.13.1.3 Particulate Monitoring During the Phase 1 Investigations (2013-2015)

83. Page 81: Clarify the references in paragraphs 2-4 of this section.

RESPONSE: The comment is not clear as to what is meant by "the references in paragraphs 2-4 of this section." Clarification was sought from EPA but was not received prior to submittal of the revised RIA.

4.13.1.4 OU1 Perimeter Air Monitoring (2015-2016)

84. Page 82, third paragraph: This section should include an explanation of the use of non-environmental Thermoluminescent Dosimeters (TLDs) for the first three quarters and that this data has limited use.

RESPONSE: The section has been revised to address EPA's comment.

4.13.1.5 EPA Off-Site Particulate Air Monitoring (2014-2015)

85. Page 82, first paragraph in section, first sentence: Revise this statement to reflect that the EPA off-site air monitoring has now ceased. Include references to the appropriate documents.

RESPONSE: The requested change has been made. The sentence has been amended to read: "EPA set up five off-site monitoring stations near the Site to monitor fugitive dust from May 2014 through July 2015 (TetraTech, 2014a, b, c, d, and e)."

4.13.2.3 OU1 NCC Radon Flux Measurements (2016)

86. Page 88, first paragraph: Revise this section to include sampling details similar to those provided regarding the previous RI sampling, i.e., the length, width and area of each grid.

RESPONSE: The requested change has been made. The sampling grid for the radon canisters deployed as part of the NCC work was a square, 150 feet on each side. The area of each square is, therefore, 22,500 square feet.

4.14.1 NRC (RMC) Vegetation Sampling (1981)

87. Page 89, last sentence: Replace "and" with "nor."

RESPONSE: The requested change has been made.

4.14.2 OU1 Post-ROD Vegetation Sampling (2009)

88. Page 90, first full paragraph: Provide a citation to the report. Delete the last sentence.

RESPONSE: A reference to the Vegetative Sampling Results Summary In Support of Health and Safety Plan For Vegetation Clearing and Grubbing West Lake Landfill Operable Unit 1, Bridgeton, Missouri prepared by T. A. Woodford & Associates, dated March 2009, has been added to this section. The reference to deletion of the last sentence of the first paragraph, which describes collection of two "background" vegetation samples, seems to have been in error and likely was intended to indicate that the last sentence of the second paragraph should be deleted. The last sentence of the second paragraph has been deleted.

5.2 Land Use

89. Page 92, second paragraph in section, second sentence: Replace the phrase "restrictive covenants recorded in May 1997" with "Declaration of Covenants and Restrictions recorded on June 30, 1997."

RESPONSE: The requested change has been made.

90. Page 93, second full paragraph, second sentence: In accordance with the distances cited, revise the text to indicate that the Terrisan Reste mobile home park is the nearest residential development.

RESPONSE: The requested change has been made.

5.3.3.3 Area 2 Drainage During the OU1 RI (1995-97)

91. Page 97, second paragraph, last sentence: The last reference to Area 2 is missing the number 2.

RESPONSE: The requested change has been made.

5.3.3.4 Off-Site Surface Water

92. Page 97, first paragraph in section: This paragraph states that storm water from Area 1 and Area 2 does not enter the North Surface Water Body; however, this statement is inaccurate. Revise the text in this section to account for more recent storm water monitoring documentation.

RESPONSE: The last sentence of the paragraph states that the Bridgeton Landfill stormwater pond does not receive runoff from Areas 1 and 2, which is factually correct, and therefore, no change has been made to the text.

5.3.4 Missouri River Floodplain

93. Page 98, third paragraph in section: Discussion of the 500-year floodplain states that "*…the entire West Lake Site is outside the 0.2 percent.…*" (500-year floodplain). Revise this text to acknowledge that the Buffer Zone and/or Lot2A2 of the Crossroads property are within the 500-year floodplain.

RESPONSE: The requested change has been made.

5.4 Biota

94. Page 99: Include a reference to the ECO risk assessment (in the BLRA) in this section.

RESPONSE: The requested change has been made.

5.4.1 Plant Communities

95. Page 99: Add a new paragraph (or subsection) to describe how the Site's plant community has recently changed due to placement of the NCC.

RESPONSE: The requested change has been made.

5.5 Subsurface Features

96. Page 103: Describe "other wastes."

RESPONSE: This sentence was intended as a general description of the wastes in Areas 1 and 2. Additional details have been included in Section 5.5.2.1 relative to the waste materials in Areas 1 and 2.

5.5.2.1 Waste Materials in Areas 1 and 2

97. Page 108, first paragraph: Include additional details on the specific wastes that may have been disposed in these areas.

RESPONSE: The text has been revised to address this comment.

5.6.1 Regional Hydrogeology

98. Page 112: The first paragraph states that the major bedrock aquifers are the Potosi Dolomite, Gasconade Dolomite, Roubidoux Formation and the St. Peter Sandstone. These units have not been defined as individual aquifers but are

geologic units within a single aquifer system known as the Ozark aquifer. Revise this section accordingly.

RESPONSE: The requested change has been made.

5.6.2.1 Groundwater Occurrences at the Site

99. Page 113, first paragraph: It is unclear what is meant in the first paragraph by "minor groundwater present within the limestone and dolomite bedrock units." Clarify whether this is referring to water yields from specific wells, volume of water pumped, flow rates, or something else.

RESPONSE: This language was included in both the 2000 OU-1 RI and the 2005 OU-2 RI reports; however, to address the comment, the word "minor" has been deleted from the text.

100. Page 113-114 last paragraph starting on page 113: It is unclear what this paragraph is trying to imply. The last sentence regarding "porous (bedrock) medium" should be further explained or revised. Fracture flow will dominate flow in the bedrock on the localized scale of the Site.

RESPONSE: The text has been amended to indicate that on a site-wide scale, groundwater flow within the limestone is expected to be controlled primarily by the hydraulic gradient. The text has also been amended to indicate that any anisotropy associated with fracturing is not expected to exert significant influence or control on groundwater flow directions on a site-wide scale, although such features may exert control on flow directions on a more localized scale.

5.6.2.3 Groundwater Levels and Elevations

101. Page 115: The text in this section indicates that groundwater levels are within the alluvium and not in the landfilled material, however, there is insufficient information to support this conclusion as there are not enough data points at the appropriate locations and depths. Boring 1D-9S and 1D-10S (and others) appear to show RIM intervals located at or very near the base of the waste at an elevation at or below 420 feet which is below the reported water level in the alluvium shown on most figures and near the surface elevation of the Missouri River. There are no wells in this vicinity to measure actual water levels. The closest well, 111-SD, has a water level of approximately 425 to 430 feet indicating that RIM in that area could be saturated. Revise text to remove unsupported conclusions.

RESPONSE: Please note that RIM was not found to be present in boring 1D-10S (see Table 6-4) and review of the boring log and core photographs for boring 1D-9S did not indicate that the intervals containing RIM in this boring were saturated with water. Additional discussion has been added to the text regarding the water level data, including a discussion of the maximum and minimum water levels as suggested in Comment Nos. 333 and 334. Please note that well 111-SD is a Salem Formation, bedrock monitoring well, and therefore the water level in this well is not necessarily reflective of the water level in

the alluvium beneath Area 1. Regardless, conclusions regarding groundwater only occurring in the underlying alluvium at or below the base of the landfill materials have been removed and replaced with a reference to future evaluations to be conducted as part of the OU-3 RI/FS.

102. Page 115, 2nd full paragraph: The last sentence of this paragraph states that the leachate collection activities at Bridgeton Landfill appear to have an effect on groundwater levels in the vicinity of the Site. There are no offsite wells to measure pumping impacts. Provide data or a citation to support this statement or remove it.

RESPONSE: This language relates to the 1995-1996 measurements and was taken directly from the OU-1 RI report previously approved by EPA. It is based on the fact that at the time the measurements were obtained (1995-1996) the quarry landfills were still being filled such that the air space extended below the water table and seepage was observed to occur from the quarry walls. Review of the 1995-1996 water level data indicate that a groundwater divide appears to exist between Area 1 and the South Quarry portion of Bridgeton Landfill, and that water level elevations were lower in the immediate vicinity of the South Quarry (see Appendix K-1). Regardless, the sentence has been deleted in accordance with the comment.

103. Page 117, second paragraph: "Table 5-2 presents a summary comparison of the average daily river stage and the range of alluvial water levels measured at the Site over the last 28 years." Include more text and details regarding the river stage data compared to the on-site water level data included in the RIA. Include which monitoring wells were used in the comparison table and how often they were measured. It appears that during previous Missouri River flood event(s), the measured river stage has exceeded both the minimum and the maximum alluvial water level elevations measured at the Site. Explain in the discussion how on-site water levels were affected by the river stages during historic flood events.

RESPONSE: The water level data used to prepare Table 5-2 are included in Appendix E-3. Alluvial water level data obtained during each event (Appendix E-3), which varied between measurement events for each phase of the RI field work (e.g., 1994-1996 OU-1 RI field work as compared to the 2012-2013 comprehensive groundwater sampling) and between events within a given phase of field work (*e.g.*, between the July 2012 and the October 2013 events), were reviewed to identify the minimum and maximum values observed in any alluvial well during each measurement event. Therefore, the minimum and maximum values were derived from different wells for each measurement event. The minimum and maximum values observed in the entire data set for each measurement event were included on Table 5-2. The available water level data collected as part of the OU-1 investigations includes monthly water level data obtained in 1995, during which year the Missouri River experienced a 300-year flood event.

104. Page 117, last paragraph: Delete the last sentence on this page. This statement is vague and misleading. The USGS Report did not say that a reverse gradient from the river to the Site could not or would not occur during higher river stages.

RESPONSE: The last sentence is not referring to the 2014 USGS report but rather to the 2013 USGS evaluation of the comments offered by Dr. Criss on behalf of the Missouri Coalition for the Environment. In responses to comments by Dr. Criss, the USGS responded as quoted below:

> **G4 – Section 5, Groundwater Contamination**
> Page 6, paragraph 1, third sentence: "*The water table in the alluvial aquifer is known to rapidly respond to the river stage as well as to the delivery of recent precipitation, with groundwater rapidly moving either toward or away from the river, depending on the river stage (e.g., Emmett and Jeffrey, 1968; Grannemann and Sharp, 1979; Criss and Criss, 2012).*" [emphasis added]
>
> "The underlined part of the statement is incorrect. A rapid change in water level measured in an alluvial aquifer well associated with changes in river stage does not indicate rapid movement of the water itself, but the rapid propagation of a pressure head. This is a common misconception and given the author's background and discussion on the following page, probably an unintended misstatement. As the author indicates later, the hydraulic conductivity of the alluvial aquifer can be large. The large hydraulic conductivity leads to the rapid propagation of head changes (aquifer pressure) in alluvial wells in response to river changes, but not the actual movement of the water within the aquifer."

Regardless, the sentence has been removed from the report.

105. Page 117, last paragraph: Table 5-2 indicates that the river was higher than the alluvium water level, indicating that this may be a nearly annual occurrence and does not support the statement that "*there is no indication of groundwater flow from the river towards the Site*." This statement also does not seem to be consistent with the next section (5.6.2.4.1 OU1 and OU2 RIA Hydraulic Gradient Data) or the 2000 RI. Review and revise the text of this section (and other related sections) based upon the complete data set.

RESPONSE: Although the river stage may be higher than the groundwater elevations observed beneath the Site, this condition does not indicate that groundwater is flowing from the river to the Site. Potentiometric data obtained from the Site indicates that the water table surface beneath the Site slopes to the northwest, toward the river. As indicated in the USGS evaluation of the comments provided by Dr. Criss (quoted in the prior comment response), the large hydraulic conductivity of the alluvial aquifer leads to the rapid propagation of head changes in alluvial wells in response to river changes, but not the actual movement of the water within the aquifer.

5.6.2.4.2 Hydraulic Gradients Based on 2012-13 Groundwater Monitoring Events

106. Page 120, *Horizontal Hydraulic Gradients* portion: Add text to briefly describe the Bridgeton Landfill leachate collection system, including the number and location of collection points and the average volume per day, week or month (depending on data available). Compare this information to Missouri River surface water levels and to an average leachate volume (annual basis). Provide groundwater elevations in North and South Quarry if available. Discuss the potential leachate collection system effects and any other known or suspected impacts that may occur at the overall Site on local horizontal hydraulic gradients in the alluvium and bedrock formations. Briefly describe what is known and identify potential data gaps that will need to be addressed by OU3. See Primary Comment III above on Groundwater.

RESPONSE: Additional details regarding the leachate collection system components and operation have been added to Section 5.6.2.2. We do not understand EPA's request to compare the volume of leachate collected to the Missouri River surface water levels. Groundwater level (or more appropriately fluid level) data are not obtained from within the North and South Quarry. A general discussion of the effects of the leachate collection system on the local hydraulic gradients is presented in Sections 5.6.2.4.1 and 5.6.2.4.2. Potential data gaps are discussed in Section 9.

107. Page 121, Salem Formation Section: Monitoring wells PZ-100-KS and PZ-111-KS are referenced under the Salem Formation Heading, but actually these two wells monitor portions of the Keokuk Formation not the Salem Formation. Revise this section for accuracy.

RESPONSE: This paragraph and the subsequent paragraphs have been deleted from the text as the potentiometric maps for the Salem and Keokuk Formations, referenced in these two paragraphs, were not actually included in the draft RIA. For clarification, the original text contained an error and should have referred to wells PZ-100-SD and PZ-111-SD. Review of the water levels for these two Salem Formation wells, located on opposite sides of the North Quarry portion of the Bridgeton Landfill, indicates that the hydraulic gradient within the Salem Formation in the vicinity of the North Quarry portion of the Bridgeton Landfill is to the northwest, toward the river.

108. For monitoring well information associated with OU2, incorporate 2014 and 2015 radiological data from the most recent sampling events at OU2 into the discussion.

RESPONSE: This portion of the text only describes hydraulic conditions. Discussion of the radionuclide occurrences in groundwater is presented in Section 7.

5.6.2.6 Groundwater Flow Directions

109. Page 128: The referenced figures (K.1 to K. 2) should be oriented in the same direction (not 90 degrees off). Additionally, the K.1 figures do not support the conclusions in the text that during 1994-1996 groundwater flow in the alluvium

was primarily in a southern direction toward Bridgeton Landfill. Some data points are not labeled, making full interpretation difficult. Two data points (205AS and I-73) do seem to support this statement, however the other wells on the figures demonstrate a general west/northwest flow direction for groundwater. Precipitation events and changes to Site/area topography may have affected the readings in 205AS and I-73. Revise the K figures to provide consistent orientation and revise the text of this section to clearly identify limitations related to the information and conclusions presented.

RESPONSE: The requested changes have been made.

5.6.2.7 Groundwater Velocity

110. Page 129, last paragraph in section: Alluvial groundwater flux of 76,000 gallons per day cannot be verified with the information provided in the RIA. Tables 5-4 and 5-5 contain information to support the flux number but the aquifer thickness of 100 feet is likely too large as the majority of flow in the alluvial aquifer will be through the course sands and gravels in the lower part of the aquifer. It is unlikely that there is substantial flow/flux with the upper 10-30 feet of the silty sands. Provide information on groundwater flux as a range, using a range of estimates (high-low) and using a range of thickness and gradients. Also include a discussion on how this groundwater flux potentially effects the sub-surface environment of the various landfill cells (i.e. North Quarry effects versus effects to Area 1 of OU1). Update tables 5-4, 5-5, and 5-6 as necessary.

RESPONSE: Tables 5-5 and 5-6 and the text have been revised to include a discussion of the effects of varying input values. Table 5-4 only presents estimates of the vertical hydraulic gradients between wells within individual clusters and, therefore, no aquifer parameter values were used to develop this table. The range of values for the groundwater flux within the alluvium only applies to the alluvial deposits located beneath the northern portion of the landfill property (*e.g.*, beneath Areas 1 and 2, the Closed Demolition Landfill and the Inactive Sanitary Landfill). Because there are no alluvial deposits below (or above) the North or South Quarries, the estimated flux within the alluvial aquifer is not applicable to these areas.

5.7 Subsurface Reaction in the South Quarry Portion of the Bridgeton Landfill

111. Page 132, fifth paragraph, and first paragraph on page 133: Update the evaluation in Appendix A (Radon Flux) to be consistent with the methodologies in the draft updated BLRA, final supplemental radon flux analysis from the Area South of the Proposed Isolation Barrier, and final particulate emission analysis from area south of the proposed Isolation Barrier. This paragraph should then be updated to reflect the results of this updated assessment.

RESPONSE: The text has been revised per the discussions held at the May 11, 2017 meeting with EPA. Specifically, the last sentence of the fifth paragraph on p. 132 of the 2016 draft RIA and the last sentence of the first paragraph on p. 133 of the 2016 draft RIA have been deleted and an additional sentence has been added to the 2017 draft RIA to

indicate that EPA is still reviewing these reports and EPA's review may result in changes to the reports or the report conclusions.

112. Page 133, first paragraph: Revise this paragraph following the update to Appendix A as noted in the previous comment.

RESPONSE: Please see the response to the prior comment.

113. Page 133, last paragraph, first sentence: Update this paragraph as appropriate to reflect the status of any actions required by North Quarry order such as the installation of a Heat Extraction System (HES), installation of additional Temperature Monitoring Probes (TMPs), expansion of the Ethylene Vinyl Alcohol (EVOH) Cover, and development Inert Gas Injections (IGI) efforts).

RESPONSE: The requested change has been made.

6.0 NATURE AND EXTENT OF RADIOLOGICALLY IMPACTED MATERIALS

6.1 Potential Sources of Radionuclides in Areas 1 and 2

114. Page 135, first paragraph, last sentence: Replace "*sulfate ion*" with "*sulfate ions*."

RESPONSE: The requested change has been made.

115. Page 135, second paragraph, second sentence: The statement that "*LBSR is therefore a chemically solidified and stabilized treatment product*" is not in the cited reference (NRC). Delete this statement/sentence.

RESPONSE: The RIA noted that barium sulfate was specifically generated as a treatment product targeting the removal of sulfate ion (via the addition of sulfuric acid for removal of radium and lead sulfate) by the addition of barium carbonate to the uranium-bearing solution within the Mallinckrodt operation, as discussed above. An artifact of this sulfate-removal targeted treatment was the coincident removal of both radium and thorium ions from solution. This resulted in a barium sulfate precipitate enriched in Radium-226 and Thorium-230. Radium removal via barium sulfate precipitation is now a widely employed treatment process at uranium mining operations. As discussed in an EPA Environmental Research brief (1987), barium sulfate and co-associated radium removal is a documented process with a product that can be considered a chemically solidified and stabilized product.

This text has been revised to reference the Environmental Research brief (1987) to support the statement in the text.

116. Page 135, second paragraph, last sentence: The EPA does not agree with this statement because materials that may be considered inert under normal conditions may not remain inert in a landfill environment. This statement also does not appear to be accurate in the cited reference (Harrington and Ruehle, 1959). Delete this statement.

RESPONSE: The text has been revised.

117. Page 135, third paragraph: Please provide a reference to any documentation supporting the disposal of water treatment sludges or any other industrial wastes at OU-1.

RESPONSE: This discussion has been removed.

118. Pages 136, top paragraph: Include additional details and discussions regarding the effects that reducing conditions can have on certain radium compounds such as radium sulfate and radium sulfite, which are a part of RIM.

RESPONSE: The text associated with this comment has been removed.

119. Page 136, first paragraph: Include a sentence or brief discussion of scientific literature that indicates dissolution and solubilization (leaching) of barium sulfate can occur under the conditions associated with a municipal solid waste (MSW) landfill.

RESPONSE: The referenced paragraph and associated discussion were removed from the report in conjunction with revision of this section pursuant to Primary Comment No. II.

120. Page 136, third paragraph, first sentence: Delete the first two words ("*Over time*") from this sentence.

RESPONSE: The requested change has been made.

121. Page 136, third paragraph, first sentence: Change "have been" to "has become" to reflect that this was not actively mixed.

RESPONSE: The requested change has been made.

122. Page 136, third paragraph: This paragraph is confusing with regard to how RIM is contained/exists within the waste mass. Revise this information to be consistent with Primary Comment VI above on CSM, and refer readers to Section 9.5 (CSM discussion).

RESPONSE: The requested change has been made.

6.2.1 UMTRCA Regulations

6.2.2 EPA OSWER Directive 9200.4-25

123. Page 137-8: Remove the second, third and fourth paragraphs of this section. Discussions of applicable or relevant and appropriate requirements (ARARs) are not appropriate in the RIA.

RESPONSE: The requested change was made.

6.2.3 EPA OSWER Directive 9200.4-18

124. Page 139, second paragraph in section, last sentence: This sentence is unclear. Delete the last sentence.

RESPONSE: The sentence was in error in that it referred to "residential" land use where it should have referred to "industrial" land use. The text has been revised.

6.2.5 Background Levels

125. Page 141: There is no figure showing the locations of background samples, no indication of whether background samples are surface or subsurface samples, and no discussion of how non-detect results for specific compounds were addressed in calculating mean averages. Add the missing information (and figure, if appropriate) as related to background samples and data discussions.

RESPONSE: A figure showing the locations of the background samples obtained by McLaren/Hart was included in the McLaren/Hart 1996 Soil Boring/Surface Soil Investigation report. A figure has been prepared based on the information contained in this report and is included in the revised RIA report. The background soil samples were surface soil samples; however, some of the samples were obtained from the active Bridgeton Landfill soil borrow pit and thus would have been subsurface materials at some point. Samples without detections were not used to calculate the background statistics, consistent with the method used in the prior 2000 RI and the SFS.

126. Page 141, last full paragraph, third sentence: "For example, Th-232 and Ra-228 are members of the Th-232 decay series and should be in equilibrium with each other." Add "when naturally occurring" at the end of the sentence.

RESPONSE: The requested change has been made.

127. Page 141, last sentence on the page: Clarify what the term "short-lived" means as used in this sentence or delete this term. Further clarify in this section's text how the background level for uranium was determined.

RESPONSE: The term "short-lived" has been defined. The background level for uranium is presented in Section 6.2.5, but in response to this comment, a parenthetical explanation of the background uranium value has also been added to the sixth paragraph of Section 6.2.6.

6.2.6 Definition of RIM

128. Page 143, first paragraph, second sentence: Remove the sentence regarding use of the Site for residential purposes.

RESPONSE: The requested change has been made.

129. Page 143, third and fourth paragraphs in this section: Provide proper citations for the statements made regarding the stated EPA actions included in the text of this

section (concluded/adjusted/determined) and clarify that these items are related to FUSRAP locations.

RESPONSE: The requested changes were made.

130. Top of page 145: Add the following sentence "However, the definition of RIM that the EPA has established at this site is consistent with Uranium Mill Tailings Radiation Control Act (UMTRCA) and relevant Office of Land and Emergency Management (OLEM) guidance as discussed in the previous sections."

RESPONSE: The requested change has been made.

131. Page 143, second paragraph: Delete the first sentence regarding "…no ARARs… for uranium."

RESPONSE: The requested change has been made.

6.3 Procedures Used to Identify RIM Occurrences

132. Page 145, second paragraph in section, first sentence: This statement implies there is additional data that was not available when this version of the RIA was prepared. If so, specify the missing data and update this section to include it.

RESPONSE: The requested change has been made. The text was referring to the NCC soil data which has been included in the revised RIA report.

133. Page 145: Delete this footnote if it is no longer needed or update accordingly.

RESPONSE: The requested change has been made.

134. Page 146, first full paragraph, last sentence: Revise the sentence to change "Lastly" to "Additionally."

RESPONSE: The requested change has been made.

135. Page 146, second paragraph, sixth sentence: Ensure that the sentence beginning with "Based on review and the results…" is accurate for all of the data collected to date for OU1 and if so, revise this sentence as follows, "Based on review and the results of the evaluation of all the data available at the time this RI was written, it was determined that any…"

RESPONSE: The requested change has been made.

136. Page 146, third paragraph: In this paragraph add the basis for deciding how alpha screening values were used to determine that RIM was present.

RESPONSE: The requested change has been made. Only limited alpha scan data were available as these data were only collected in conjunction with the later investigations (*e.g.*,

the Phase 1D, Additional Characterization and Cotter investigations). The results of the alpha scans are provided on the core sample scans included in Appendices C-6, C-7 and C-8. The results of the alpha scans are also summarized on Tables 6-4 and 6-5 relative to identification of locations and intervals containing RIM. Similar to the downhole gamma logging and core sample gamma scans, the core sample alpha scan data were evaluated to identify intervals of elevated alpha counts (relative to instrument background and the base level alpha counts for the core material from each boring) that likely reflect occurrences of RIM. The alpha scan data were also considered as part of the evaluation and use of "soft" data in the geostatistical evaluation of RIM occurrences and extent as described in Estimated Three-Dimensional Extent of Radiological Material prepared by S.S. Papadopulos & Associates, Inc. (Appendix P to the revised RIA).

6.4 Occurrences of RIM in Areas 1 and 2

137. Page 147, second paragraph: Expand this discussion to specify which data sets were used (hard, soft) and clearly describe how the average thickness and depths were determined.

RESPONSE: The data and procedures used to identify the RIM occurrences and intervals are described in the prior Section (6.3) of the RIA. The results of the evaluations of RIM occurrences and intervals are provided on the Borehole Summary Sheets contained in Appendix L. The Borehole Summary Sheets have been annotated to identify the top and bottom of the RIM intervals based on evaluation of the hard (laboratory analytical) and soft (downhole gamma logging, and core gamma and core alpha scans) data, which are included on the Borehole Summary Sheets. The results of these evaluations are summarized on Tables 6-4 and 6-5, from which the average and range of depths and elevations to the top and bottom of the RIM intervals and the minimum, average and maximum thicknesses of RIM in Areas 1 and 2 were calculated. The terms "hard" and "soft" data were only used in conjunction with the geostatistical evaluation of RIM. The data sets (hard and soft) used for those evaluations are described in the Estimated Three-Dimensional Extent of Radiological Material prepared by S.S. Papadopulos & Associates, Inc., which was included as Appendix P to the revised RIA report.

138. Page 147, Third paragraph: Update this paragraph in accordance with previous comments. Also include the average depth for RIM in Area 2.

RESPONSE: The requested change has been made.

139. Page 147: Clarify whether the information provided in this section is based upon the Estimated Three-Dimensional Extent of Radiological Material (geostatistical report).

RESPONSE: The requested clarification has been made to the text. Section 6.5 is based on the results of the indicator kriging as described in the Estimated Three-Dimensional Extent of Radiological Material (geostatistical report). The evaluations presented in the prior Section (6.4) are based on manual evaluation of the results of the investigation by EMSI based on the procedures described in Section 6.3 of the RIA report. These

evaluations were performed to provide a basis for identification of the locations and intervals of RIM occurrences and for evaluation of the results of the kriging.

6.5 Areal Extent of RIM in Areas 1 and 2

140. Pages 147-148, entire section: Review this section and revise to be consistent with the geostatistical report as provided to the EPA on September 30, 2016. Also, add all portions of the geostatistical report utilized to describe the extent of RIM in OU1 as an Appendix to the RIA. The EPA will provide specific comments to the geostatistical report at a later date.

RESPONSE: The requested revisions have been made.

6.6 Radiological Characterization of RIM

141. Page 149-150: The EPA is reviewing its verification data set associated with the samples collected from borings by Cotter Corporation. The EPA will provide additional input to the Respondents following completion of our review.

RESPONSE: Per discussions with EPA, a data usability evaluation was performed and is included in the revised RIA report as Appendix D-12.

142. The EPA will review this section further once the final data set for the Site is incorporated.

RESPONSE: No action is required at this time.

6.7 Radionuclide Occurrences in the Buffer Zone and Crossroads Lot 2A2

143. Page 152, last paragraph: The document states that no recent sampling has occurred for the Buffer Zone or Crossroads property; however, multiple samples including soil, sediment, and dust have been collected. Include in the RIA the data associated with the samples collected from this area during the installation of the NCC and reference the March 2016 MDNR Vicinity Sampling Report. Update the discussion in this section using this additional data.

RESPONSE: The requested change has been made. Please see our response to Comment No. 44, above. Please note that the sediment sample collected by EPA and the OU-1 Respondents was obtained from Lot 2A1, not Lot 2A2. MDNR sample S-09 was obtained from Lot 2A1; however, MDNR sample S-10, although collected outside of the old fence, was actually obtained from Area 2. The text has been modified to reflect the collection of sediment sample SEDIMENT-2016-03-16A from Lot 2A1 and MDNR sample S-09 from Lot 2A1. Although we are aware that MDNR collected dust samples in the vicinity of the Site, these samples do not provide any information related to the identification of RIM in the soil/waste materials at the Site which is the topic of this section of the text.

7.0 RADIONUCLIDE OCCURRENCES IN ENVIRONMENTAL MEDIA

144. Reference Appendix Q: Updated Baseline Risk Assessment in this section where appropriate and include references for any figures in Appendix Q that would be pertinent to this section.

RESPONSE: We are not sure how the BRA evaluations fit into a discussion of the radionuclide occurrences in environmental media. Section 7.0 and subsequent subsections present discussion of measurements that describe the nature and extent of radionuclide and chemical occurrences associated with OU-1. The Baseline Risk Assessment uses the data introduced in this section to evaluate potential risks from those occurrences. It does not introduce any new data and it is not clear what information, if any, should be referenced.

7.1.1.1 Surface Emission of Radon Gas

145. Page 154, last paragraph, and page 155, first paragraph: Provide a baseline count rate when discussing gamma screening values in order to provide the reader context as to the significance of particular screening values. Revise to include the missing details.

RESPONSE: The baseline count rate for the OU-1 RI borings drilled by McLaren/Hart was approximately 6,000 cpm. Additional details regarding the depths of the soil samples discussed in this paragraph have also been added.

146. Page 155, first paragraph, second to last sentence: Elevated gamma readings not supported by corresponding analytical sampling are likely the result of the contamination existing near but not in the boring location. Furthermore, radon can also migrate through the soil via various preferential pathways that exist in the heterogeneous landfill substrate. Therefore, radon may not simply diffuse "normally" from the source material. Revise this paragraph to include a discussion of these points.

RESPONSE: The requested additions have been made to the text.

7.1.1.2 Radon Migration With Landfill Gas

147. Page 155: Revise this section as appropriate to include consideration of the more recent radon flux measurements.

RESPONSE: The requested revision has been made to the text.

148. Page 155, first paragraph in section, third sentence: Delete the portion of this sentence that states "*…or within the gas extraction system…*"

RESPONSE: The requested change has been made.

149. Page 155, first paragraph in section, fourth sentence: Provide more documentation to support the conclusion in this statement. Reference the products that are to be developed as specified by the first comment in section 5.7.

RESPONSE: The requested change has been made.

150. Page 155-156, first paragraph in section, last sentence: Replace the word "flux" with "gas." Because the amount of radon at the boundary of the Site as a result of releases from the gas collection system would be measured as an air concentration this section should instead consider the 0.5 picocuries per liter (pCi/L). fence line UMTRCA standard. Revise accordingly.

RESPONSE: The requested change has been made.

7.1.1.3 Radon in the Atmosphere

151. In this section (or a new subsection) include a discussion on the deposition of Pb210 onto/into soil from air and as a "natural" part of the overall decay process.

RESPONSE: The text has been revised. The cited subsection provides and discusses results of site-related investigations associated with radon in the atmosphere around West Lake Landfill. No similar systematic, site-related studies of lead-210 or atmospheric deposition of lead-210 have been performed at the Site. Additional narrative regarding lead-210 has been added to the text based on information from the USACE regarding lead-210 at FUSRAP sites and EPA's conclusion presented in its December 8, 2016 West Lake Update regarding lead-210 occurrences.

152. Page 156, first paragraph in section, last sentence: Radon flux is not a measurement that directly equates to a human exposure. Delete the remaining portion of the sentence after the word "surface."

RESPONSE: The requested change has been made.

153. Page 156, second paragraph in section: Add a reference to Figure 4-19 showing air monitoring locations.

RESPONSE: The requested change has been made. The following reference was added: "Measurements of radon levels in atmospheric air have been conducted at the 13 air monitoring stations installed in 2015 (Figure 4-19) and operated to obtain baseline air monitoring data for the Site."

154. Page 156, second paragraph in section, fourth sentence: This statement should acknowledge that the first three quarters of sampling were collected for less than the minimum number of days (90) as required by the laboratory specified analytical method.

RESPONSE: The requested change has been made. The track etch detectors were deployed for 83 days for the first quarter, 83 days for the second quarter, and 85 days for the third quarter.

155. Page 156, last paragraph, last sentence: Technically, 0.5 is 25% greater than 0.4. Revise this paragraph to instead state that the average annual level of radon

measured at the Site is below the 0.5 pCi/l standard plus background, i.e. 0.9 pCi/l.

RESPONSE: The requested change has been made.

156. Page 157, second full paragraph: Revise the text in this section/paragraph to discuss the prior five EPA off-site stations and associated data in one paragraph and start a new paragraph to discuss Respondents' current 13 on-site stations and associated data. Add a third paragraph to discuss comparisons between the two data sets, as appropriate.

RESPONSE: The requested change has been made.

157. Page 157, second full paragraph, last sentence: Check to confirm this statement is still true after incorporating all currently available on-site air monitoring data. Revise section to incorporate all currently available data.

RESPONSE: The requested check and associated change has been made.

7.1.2 Fugitive Dust

158. Page 157: Include a short description in this section of how the fugitive dust samples were collected. Also, delete the term "extremely low" as it is subjective.

RESPONSE: The requested description has been added and the description of the sample collection activities presented in the 1996 McLaren/Hart Radon Gas, Landfill Gas and Fugitive Dust report has been added to the text. The requested deletion was also made to the text.

159. Page 158, third full sentence on page: This section should include a discussion to support the conclusion "… there does not appear to be any significant radionuclide transport…" including comparisons of fugitive dust sample results to available background values.

RESPONSE: This text is a summary of the results of the work performed by McLaren/Hart as presented in the 1996 McLaren/Hart Fugitive Dust report. In accordance with the EPA-approved Work Plan, background fugitive dust samples were not obtained as part of the 1995 fugitive dust sampling program; rather upwind and downwind samples were obtained under generally adverse conditions (dry period with light to moderate winds) to evaluate whether migration of radionuclides in fugitive dust was a potential migration pathway. We do not believe it would be appropriate to compare these 8-hour duration sample results obtained within Areas 1 and 2 in 1995 to background levels obtained by EPA twenty years later.

160. Page 158, fifth full sentence on page: Nearly all of the inert fill was placed on areas where RIM is not present near the surface. Placement of inert fill is not relevant in a discussion about the potential significance of the fugitive dust contamination migration pathway. Delete this sentence.

RESPONSE: Per subsequent discussions with EPA, no change is required for this comment.

161. Page 158, first full paragraph, sixth sentence: The comparison for gross alpha results is described as "similar to or only slightly higher." Delete this statement as the mean is an order of magnitude higher in all samples. The text also references additional sampling "ongoing at this time." Revise to include the missing information and data which is now available.

RESPONSE: The text of the RIA has been revised. The text has also been updated to reflect the results obtained through the second quarter of the second year of baseline air monitoring.

162. Page 158: Update Tables 7-5 through 7-9 to correct for any errors that the EPA identified in the associated quarterly air monitoring reports and revise this section accordingly.

RESPONSE: The tables have been revised to include the most current data available from the various air monitoring reports, which includes corrections of any errors identified by EPA, at the time of publication of the revised RIA report.

163. Page 158, first full paragraph, last three sentences: The referenced data has been collected. Revise this paragraph accordingly.

RESPONSE: The requested change has been made.

164. Page 159, partial paragraph at top of page, last sentence: The phrase "well below" is subjective. Delete the term "well."

RESPONSE: The requested change has been made. The sentence has been modified to read, "The results are between one and three orders of magnitude below the applicable effluent limits in 10 CFR 20 Appendix B."

165. Page 159, first paragraph, second sentence states: Delete the portion of this sentence from "… the limited area…" to "Areas 1 and 2." Add a discussion after this sentence that briefly describes Site conditions prior to the presence of an "extensive vegetation cover." Revise this paragraph to remove speculation as to whether contamination has migrated via fugitive dust emissions during time periods in the past when Site conditions differed from current conditions described in this section.

RESPONSE: The text has been revised to address EPA's comment.

166. Page 159, first paragraph last sentence: Revise this sentence as follows, "Based on the monitoring results, along with the presence of the prior vegetative cover and the subsequent rock cover over Areas 1 and 2, atmospheric transport of

radionuclides in fugitive dust does not appear to be a significant pathway for offsite migration during the time that the Site was investigated."

RESPONSE: The requested change has been made.

7.2 Surface Water Transport

167. Page 159, second paragraph in section: Revise the second sentences as follows, "All of these actions would serve to reduce the potential for radionuclide transport in surface water."

RESPONSE: The requested change has been made.

7.2.1.1 OU1 RI Rainwater Runoff Sampling

168. Page 161, third paragraph, last sentence: State whether the May 1997 runoff sample discussed here was filtered or unfiltered. Remove the subjective phrase, "*or even come close to*" in the last sentence.

RESPONSE: The requested addition and change has been made to the text. Both filtered and unfiltered samples were collected in 1997 (see summary table in Appendix G-1).

169. Page 161, fourth paragraph, second to last sentence: Revise to avoid using two parentheticals.

RESPONSE: The requested change has been made.

170. Page 161: Delete the footnote related to the North Surface Water Body. Include this information in the body of the text of this section and discuss the various topographic information related to surface water bodies located on and around the Site detailed in Section 5.3.1. Add a reference in this section to the relevant discussion in 5.3.1.

RESPONSE: The requested change has been made. A discussion of the changes in the surface water bodies over time, based on review of aerial photographs, has been added to Section 5.3.3.4.

171. Page 162, paragraph at top of page, second sentence: "… *radionuclides were well below* …" Remove the word "*well*" as it subjective.

RESPONSE: The requested change has been made.

7.2.1.2 NCC Stormwater Samples

172. Page 163, first paragraph in section: Some of the NCC outfalls are not mentioned or discussed such as those located near the Buffer Zone. Stormwater exceedances for total uranium occurred in April 2016 at NCC-002 as discussed in the next paragraph of the RIA but the last sentence of this paragraph states the results were "not available." Revise this paragraph by deleting the last sentence and including

missing details/information for the entire set of NCC outfalls. Provide details regarding the data collected to date from the various NCC outfalls.

RESPONSE: The requested changes to the text to include discussion of the other NCC outfalls have been made. This section was also expanded to reflect the more current OU-1 Stormwater monitoring program implemented after the draft RIA was prepared. With regard to the April 2016 sample at NCC-002, we do not agree that the result represented an exceedance. The uranium MCL is based on uranium mass as measured in micrograms per liter (ug/L) whereas the NCC monitoring included collection of samples for radioactivity measured in picoCuries per liter (pCi/l). A rough conversion was performed to assess whether the sample obtained from NCC-002 in April 2016 with a purportedly high uranium activity may indicate a potential for exceedance of the mass-based criteria. Based on this comparison, a determination was made to add total uranium mass, as measured in units of ug/L, to the analyte list. No exceedance of the mass-based criteria has ever been reported for this outfall or any other outfall and the purported elevated uranium activity reported for the April 2016 sample was not reproduced in any of the prior or subsequent sampling events. The text has been updated to include additional validated data obtained approximately two months before the submission date of the revised RIA.

7.2.2 Surface Water Samples

173. Page 164: There is a format issue in the paragraphs at the top of page 164. Check and resolve.

RESPONSE: The requested change has been made.

174. Page 164, second paragraph: Correct the Maximum Contaminant Level (MCL) listed for Gross Alpha to 15 pCi/L.

RESPONSE: The requested change has been made.

7.2.3 Summary and Conclusions Regarding Surface Water Transport

175. Page 164, first paragraph in section: Revise the second to last sentence in this paragraph by replacing the word "*eliminates*" with "*reduces*." Revise the last sentence as follows, "The results of the 2016 stormwater monitoring further support this conclusion."

RESPONSE: The requested changes have been made.

7.3 Sediment Transport

176. Section 7.3, entire section: Define "sediment" as used in this section and in the RIA.

RESPONSE: The requested addition to the text has been made.

177. Page 165, 1st paragraph, last sentence: Confirm that the Preliminary Remediation Goal (PRG) developed for an outside worker is current and correct per the BLRA. Revise accordingly if necessary.

RESPONSE: The subject sentence was deleted from the text during the revision of the RIA.

7.3.1 Sediment Sample Results

178. Page 166-169: Sections 7.3.1.1.1, Area 1 Surface Drainage Sediment; Section 7.3.1.1.2, Area 2 Surface Drainage Sediment; and Section 7.3.1.1.3, Northeast Perimeter Drainage Ditch and Access Road Drainage Ditch need to be added to the Table of Contents.

RESPONSE: The requested change has been made. The table of contents only included headings to the fourth order level. The table of contents to the revised RIA also only included headings to the fourth order level. A revised table of contents expanded to include fifth order headings has been prepared and submitted to EPA as an addendum to the June 16, 2017 RIA submittal.

7.3.1.1.3 Northeast Perimeter Drainage Ditch and Access Road Drainage Ditch

179. Page 168, fourth paragraph: Revise this paragraph to include consideration of the SED-4 combined thorium result of 16.16 pCi and the EPA's split sample result for combined thorium of 20.63 pCi/g which is above 7.9 pCi/g or the definition of RIM.

RESPONSE: The requested change has been made.

180. Page 168, fifth paragraph: Revise the last sentence that begins with "*However, to the extent…*" as follows, "However, to the extent that sediment transport occurred along the Northeast Perimeter Drainage Ditch, any sediments that *may have been* transported along this pathway would have accumulated in the North Surface Water Body and, due to the stilling effects of this water body, *would be unlikely to be* transported *further* offsite."

RESPONSE: The requested change has been made.

181. Page 169, top of the page: Subjective language. Delete the words "ultimately, likely eliminate" from this sentence.

RESPONSE: The requested change has been made.

7.3.1.2 Sediment Transport from Area 2 Slope Erosion

182. Page 169, second paragraph, last sentence: The text states the runoff and erosion were stopped through construction of runoff diversion berms. Include dates or a date range for when these berms were constructed and cite the documentation for this information.

RESPONSE: We have not identified any reports or other documentation to determine when the berms were constructed. To the best of our knowledge, the berms were constructed by the West Lake Quarry or an associated entity and have been in place since the mid- to late-1970s. Evaluation of aerial photographs (Appendix O) did not indicate the

approximate date when the berms were constructed. Regardless of when the berms were constructed, the berms exist and serve to prevent overland or channelized flow of water from the upper surface of Area 2 across the face of the berm.

183. Page 170, top partial paragraph, last sentence: The text references Section 4.7 for more detailed discussions but Section 4.7 does not contain substantive additional details. Revise these statements and either revise Section 4.7 or this section to include the detailed discussions referenced.

RESPONSE: The requested change has been made. The reference to Section 4.7 was incorrect and should have been to Section 6.7. This reference was already included two paragraphs below in the text so the sentence has been deleted.

184. Page 170, last paragraph: As the Buffer Zone and Lot 2A2 are a part of the Site, delete the word "offsite" from the last sentence and replace with "contaminant."

RESPONSE: The requested change has been made.

185. Page 171, first paragraph, last 2 sentences: These sentences are not consistent with previous statements. Text in this section indicates the extent of radionuclides from erosional transport is limited to specific areas; however, Section 6.2.2 on page 138 states that current conditions relative to occurrences of radionuclides at these properties are unknown and will be investigated. Remove these two sentences starting with "*These results indicate…*"

RESPONSE: The prior (OU-1 RI/FS) sampling results indicated that the extent of radionuclides from erosional transport was limited. This conclusion is still valid. What is unknown is the current extent of radionuclide occurrences on the Buffer Zone and Lot 2A2 due to subsequent regrading of these areas by other parties. No changes have been made to the text relative to this comment.

186. Page 227-228: The text at the bottom of the page discusses Buffer Zone and history of Lot 2A2. Clarify the "owner" mentioned in the text. Discuss the sample depth information as provided in the text and ensure this is correct for the sample locations discussed (3 - 6 inches).

RESPONSE: Prior reports stated that a contractor retained by AAA Trailer conducted the regrading; however, EPA previously asked that this language be modified to use the more generic term "owner". The text has been revised to indicate the work was performed on behalf of AAA Trailer. The sampling referenced in this discussion included samples collected from 0-3 inch depths and 3-6 inch depths. The text has been revised to indicate that the radionuclides were found in the samples obtained at depths of up to 3-inches or, in some locations, depths of 6-inches.

7.4 Radionuclides in Perched Groundwater or the Former Leachate Seep

187. Page 171, second paragraph in section: The perched water areas shown on Figure 4-9 are fewer than described in the text and are not clearly defined on the figure.

Revise the figure to clearly define and explain discrepancies between the referenced figure and the text.

RESPONSE: As noted in the response to Comment No. 61, the text of Section 4.6 (which is the text from the original 2000 RI report) included the wrong list of borings for perched water occurrences in Area 2. The text of Section 4.6 has been revised to include the correct list of borings such that it is now consistent with what is shown on Figure 4-9.

188. Page 172, top of page: The text indicates all samples had less than 1 pCi/L of Th-234 but neglects to state that one high level (133 pCi/L) was thrown out. Include the rational for rejecting this result in this section.

RESPONSE: McLaren/Hart determined that the reported result for Th-234 for the sample obtained from boring WL-219 was a false positive. The half-life of Th-234 is 24 days and therefore Th-234 should be in secular equilibrium with U-238. Review of parent and daughter products of Th-234 indicate that secular equilibrium conditions exist and that the Th-234 concentration should approximate 0.35 to 0.39 pCi/L. This is noted on the table of the perched water results included in Appendix F-1 of the draft RIA which is included in Appendix D-9 of the current RIA report. This discussion has been added to the text of the RIA as requested by the comment.

189. Page 172, third paragraph, last sentence: Reevaluate the conclusion in this paragraph after addressing other comments related to perched water and closed topographic contours. This evaluation should also be reflected in the CSM discussion. Revise this paragraph to be consistent with that evaluation.

RESPONSE: Per discussions with EPA, this comment was addressed by deleting the last paragraph of this section, which previously concluded that perched water does not represent a significant source or pathway for migration of radionuclides from OU-1.

7.5 Radionuclides in Groundwater

190. Conclusions or summary statements within Section 7.5 cannot be made until the groundwater investigation planned for OU3 is completed. These conclusions and summary statements should be removed from the RIA.

RESPONSE: The text has been revised to indicate that an RI/FS will be conducted in the future for OU-3 (Groundwater), which will evaluate the nature and occurrences of radionuclides in groundwater at the Site.

191. Add a discussion to this section on the technologies and efforts used to control groundwater and leachate levels at the Site and their potential effects on OU1 and any radionuclides present.

RESPONSE: Additional discussion of the leachate collection system was added to Section 5.6.2.2 in response to prior comments. Per discussions with EPA, the potential effects of leachate extraction on groundwater within OU-1 and possible radionuclide migration in groundwater will be addressed as part of the future groundwater (OU-3) RI/FS.

7.5.1 Radium

192. Page 174, third paragraph, last sentence: Remove the statement, "As discussed in sections 5.6.3, there are no drinking water supply wells located at, near or downgradient of the Site, and therefore the MCL is not an applicable requirement." Replace the statement, "However, due to the unlikely potential use of groundwater as a drinking water supply…" with "However, since this aquifer is a potential drinking water aquifer,…"

RESPONSE: The requested deletion has been made; however, the requested addition has not been made to be consistent with the overall approach that further assessment of groundwater will be made during the OU-3 investigations.

193. Page 174, last paragraph, last sentence: Replace "likely" with "may."

RESPONSE: The requested change has been made.

194. Page 174-175: The terms "upgradient" and "crossgradient," as used in this section, have not yet been site-specifically determined by a full groundwater investigation. Revise the text using and discussing the terms "Upgradient" and "Crossgradient" as appropriate. Refer to Primary Comment III above on Groundwater.

RESPONSE: The requested changes have been made.

7.5.1.1 Background Radium Levels

195. Page 175: The use of Formerly Utilized Sites Remedial Action Program, (FUSRAP) Hazelwood Interim Storage Site (HISS) and Weldon Springs bedrock and/or glacial wells to establish a background level for groundwater at West Lake is not appropriate. Some of the wells from the other off-site areas may in fact be alluvial but not all. Clarify in the text of this section that background levels for the West Lake Site will be site specific and determined during the OU3 RI/FS.

RESPONSE: The requested change has been made. The intent of including a reference to the FUSRAP, HISS and Weldon Springs sites was not to use data from these sites to establish background but rather to assist with evaluation of the representativeness of the background data obtained from the vicinity of the West Lake Site. Regardless, the text has been revised to indicate that evaluation of groundwater conditions will be performed as part of OU-3.

7.5.1.1.1 Background Values from Published Technical Reports

196. Page 175, second paragraph in section: Delete this paragraph. There is insufficient detail presented to adequately evaluate these statements and the USGS evaluation of public water supplies cited in Section 7.5.1.1.5 is more thorough.

RESPONSE: The requested change has been made.

7.5.1.1.2 Sample Results from Off-site Private Supply Wells

197. Pages 176-177: The last sentence on page 176 states the USGS data was not available when the report was prepared; however, that data was collected in 2013 and should be available. Revise this section to include discussion of the private well data collected by the USGS.

RESPONSE: To the best of our knowledge, the Respondents were never provided with the USGS data from the sampling of five private wells located regionally upgradient of the Site or the results of the earlier EPA sampling of six private wells located to the north of the Site. Furthermore, although the sampling of the private wells is discussed in the USGS report, the results of this sampling are not presented, tabulated or summarized in that report. EPA subsequently provided these data and they are now included in Appendix F-5 of the RIA.

198. Page 176: The end of the paragraph incorrectly states that the Weldon Spring well is alluvial but this well was/is situated in bedrock. Correct this information in this paragraph.

RESPONSE: The requested change has been made.

7.5.1.1.3 Radium Results From Upgradient Monitoring Wells

199. Many of these samples had Minimum Detectable Activities (MDAs) too high to be usable and the report provides assumptions about high detections. Discuss the data quality issues related to the high MDAs and how this affects the data set.

RESPONSE: The text has been clarified to indicate that two historical samples from well S-80 had high MDAs for Ra-226.

7.5.1.1.4 Radium Results From Monitoring Wells Located Upgradient of Areas 1 and 2

200. Page 178 and 179: The terms "upgradient" and "cross-gradient" as used in this section have not yet been determined by a full groundwater investigation for monitoring wells located on-site. Wells impacted by leachate should not be considered as "upgradient." Upgradient/cross gradient or background monitoring wells should not be adjacent to, within, or being affected by leachate. Revise this entire section related to using and discussing the terms "Upgradient" and "Cross-gradient."

RESPONSE: We disagree with the comment. Wells located upgradient of Areas 1 and 2 could, due to their proximity to other landfill units, be impacted by leachate; however, such impacts are not a result of, and are unrelated to, the presence of radionuclides in Areas 1 and 2. However, since an OU-3 RI/FS will be performed, this entire section has been deleted from the RIA report.

201. Page 178, last paragraph: The USGS 2014 report clearly states that a large number of wells sampled at the Site exhibited leachate impacts and that there is a positive relationship between radium in excess of MCLs and the presence of

leachate. The USGS report was not conclusive about potential RIM releases to groundwater and specifically mentioned some locations where RIM could not be ruled out. Revise this section (and other related sections) to include the complete summary of groundwater results and conclusions from the USGS 2014 report.

RESPONSE: As indicated in the response to the prior comment, since an OU-3 RI/FS will be performed this entire section has been deleted from the report.

202. Pages 178-179, text below the table: Delete the last sentence on the page which starts, "Regardless, these 32 bedrock wells…"

RESPONSE: This entire section has been deleted from the report.

7.5.1.1.5 USGS Evaluations of Background Water Quality

203. Page 181, last paragraph: The EPA and the USGS collected data from a total of 11 private wells however only nine were in the alluvium (alluvium aquifer). The remaining two wells were completed in the Mississippian bedrock. Revise this paragraph accordingly.

RESPONSE: This statement was already included on p. 180 in the third paragraph of this section in the 2016 draft of the RIA (now in the 2nd paragraph on p. 205 of the 2017 RIA) and does not seem to fit with the discussion in the last paragraph of Section 7.5.1.1.5; therefore, no change has been made in this paragraph.

7.5.1.1.5 USGS Evaluation of Background Water Quality

204. Page 181, last three paragraphs of the section: This section appears to omit statements from the USGS 2014 report reading the potential for RIM to contribute to levels of radium identified in groundwater samples. Revise this section to include a complete summary of the data presented in the USGS report, including identifying wells that exhibited effects from landfill leachate and potentially from RIM.

RESPONSE: Additional conclusions from the USGS report, including its discussions of monitoring wells affected by landfill leachate, monitoring wells that contained radium above the MCL, and that the USGS could not rule out as having a RIM origin, were added to the RIA.

7.5.1.2 Radium Results in Site Groundwater

205. Page 181: This section does not include the conclusion in the USGS report that the radium levels detected in the wells could be from a combination of sources, including RIM. Revise this section to include a full accounting of the conclusions of the USGS 2014 report.

RESPONSE: This section already contained USGS's conclusion number 8, which includes the statement that there likely is a combination of mechanisms occurring across the Site. The USGS's four general hypotheses for the origin of dissolved combined radium above the MCL in groundwater at the Site, which includes "leaching of radium from RIM",

were also already included in Section 7.5.1.1.5 of the 2016 RIA report (Section 7.5.1.1.4 of the 2017 RIA report).

7.5.1.2.1 Combined Total Radium-226 Plus Radium-228

206. Page 183, second paragraph: The figure referenced in this section should be Figure N-1.5 not Figure N-5.

RESPONSE: The reference to the figure number has been revised.

7.5.1.2.2 Combined Dissolved Radium-226 Plus Radium-228

207. Page 184: Figure nomenclature appears inaccurate (Figure 7-4). Check and resolve.

RESPONSE: The references to the figure numbers in the draft report were correct. The comparison of dissolved radium levels to the MCL was presented on Figure 7-4.

208. Page 184, last paragraph, conclusion paragraph: Delete this paragraph as it provides very broad definitive statements that are not supported.

RESPONSE: The requested change has been made.

7.5.1.2.4 Time Series Trends in Radium Levels

209. Page 187, last paragraph, last sentence: Reference to Section 4.2.1.1.1 is incorrect as this section is not included in the document. Revise with the correct reference.

RESPONSE: The reference to the Section number was incorrect and should have been to Section 7.5.1.1.1. The reference has been revised.

210. Page 187: Add linear regression trend lines to Figures 7-5 through 7-12. Also, the results specified in the text do not seem to be consistent with radium levels in alluvium and the text does not specify whether the wells are in bedrock or alluvium. Clearly distinguish between bedrock and alluvium wells/data.

RESPONSE: The requested change to the figures has been made. All of the wells discussed in this section are alluvial wells and this identification has been added to the second paragraph of the section.

7.5.1.3 Geochemical Controls on Combined Radium Occurrences

211. Page 189: Delete the entire first paragraph of this section as it presents unsupported conclusions.

RESPONSE: The requested change has been made.

212. Page 190, first paragraph: Delete the first sentence of the paragraph and revise the last sentence to read: “One potential mechanism responsible for the broad distribution of radium at the Site is mobilization of naturally occurring radium

from the soil and rock in response to changes in the geochemical environment caused by decomposition of the landfilled wastes."

RESPONSE: Based on discussions with EPA, it is our understanding that this comment actually was intended to refer to the first sentence of the first paragraph of this section on p. 189, not p. 190. Per the prior comment, this entire paragraph has been deleted. However, per discussion with EPA that the proposed additional sentence should be included somewhere in the text, it has been added to the beginning of Section 7.5.1.3.1.

7.5.1.3.2 Radium Occurrences in Leachate

213. Page 190, last paragraph: Define in the text of this section whether the leachate results are pre- or post-treatment levels and where the leachate samples were collected.

RESPONSE: The requested change has been made. Leachate samples are collected after treatment, prior to discharge to the force main that ties into MSD.

214. Include the laboratory data on a new summary table of radionuclide data collected from or in support of the leachate collection system, including water quality parameters and leachate collection volume.

RESPONSE: The requested change has been made. The radionuclide results obtained from the leachate discharge to MSD are summarized in Appendix F-7.

215. Page 191: Estimate source contribution of groundwater into the quarry as bedrock or alluvium. Provide a citation or source for the statement made in the last sentence of this section.

RESPONSE: Due to the general absence of alluvium in the vicinity of the quarry landfills, the source of inflow into the quarry landfills is primarily from the bedrock. Monitoring results show the bedrock contains radionuclides, specifically radium. Therefore, the presence of radium in the leachate is consistent with the presence of radium in the bedrock groundwater that flows into the quarry landfills. Per a discussion with EPA, this comment was addressed by deleting the last sentence of this section.

216. Figures in Appendix N are mislabeled. Figure N-1 should be Figure N-1.1.

RESPONSE: The figure numbers are correct in Appendix N but references to the figure numbers in the text were incorrect and have been revised.

217. Include a brief discussion on the discharge/permit limits for radionuclides to the Metropolitan Sewer District.

RESPONSE: The requested change has been made.

7.5.1.3.3 Landfill Chemistry and Radium Occurrences at the North and South Quarry Portions of the Bridgeton Landfill

218. Page 192, last paragraph: Delete conclusions provided in this Section that cannot be supported due to insufficient information related to groundwater gradients onsite. Specifically delete "including areas upgradient of Areas 1 and 2" from the first sentence on page 192 and the following sentence that begins, "Therefore, the source…." Revise the third sentence to state, "One possible source of the radium…"

RESPONSE: The requested changes have been made.

7.5.2 Thorium

219. Page 192, third paragraph: Edit the sentence that begins with, "The five bedrock wells…" by deleting the conclusion "… and therefore are upgradient from and unimpacted by the presence of RIM in Areas 1 and 2."

RESPONSE: The requested change has been made.

220. Page 192-193. Explain why the November 2013 PZ-210-SD result is considered anomalous or delete this statement.

RESPONSE: The dissolved fraction exceeded the result obtained from the total fraction and was not confirmed by subsequent sampling. Please note that although the value has been identified as potentially anomalous, it has been retained in the dataset and included in the various evaluations. Therefore, the sentence has been deleted.

221. Include figures for thorium similar to Figures 7-3 and 7-4, color coded by results that are above and below standard deviations.

RESPONSE: The requested figures have been prepared and included in the revised RIA. Per subsequent direction from EPA, the thorium results were compared to the gross alpha MCL of 15 pCi/L.

222. Page 193: Remove the entire last paragraph of this section. The conclusions regarding thorium presented in this paragraph do not take into consideration several previous comments made on the RIA above by the EPA.

RESPONSE: The requested change has been made.

7.5.3 Uranium

223. Include figures for uranium similar to the radium Figures 7-3 and 7-4, color coded by results that are above and below standard deviations.

RESPONSE: The requested figures have been prepared and included in the revised RIA. Per subsequent discussion with EPA, the uranium results were converted to mass values (ug/L) and compared to the uranium MCL of 30 pCi/L.

224. Page 194: Remove the entire last paragraph of this section. There is insufficient evidence to draw these conclusions at this time.

RESPONSE: The requested change has been made.

7.5.4 Summary of Radionuclide Occurrences in Groundwater

225. Page 194: The conclusion drawn in this section is not supported by data, and should be deleted or significantly revised in accordance with previous the EPA comments to acknowledge the existing data gaps. There is limited analytical data and the existing monitoring well network is insufficient to determine whether the RIM is causing or contributing to the radionuclide impacts to groundwater above MCLs. Additional investigation is necessary.

RESPONSE: The section has been deleted.

226. Page 194: Identify and discuss existing data gaps in the current knowledge of groundwater so that an adequate investigation and evaluation may be designed and conducted during the OU3 RI/FS process to draw conclusions regarding the nature and extent of radionuclides in groundwater at the Site. Add statements to this section regarding the pending OU3 RI/FS.

RESPONSE: A list of potential data gaps, based on the discussions that occurred at the May 10, 2017 meeting with EPA, has been included in the RIA. Additionally, the following statement was added to the RIA text: "Further evaluation of these potential data gaps is expected to be performed as part of the scoping of the groundwater (OU-3) RI/FS, and all data gaps that are identified will be addressed as part of the OU-3 investigation."

7.6 Radionuclide Fate and Persistence

227. Upgradient and side gradient designations are used in this section for wells with leachate impacts. Revise to exclude these designations. See Primary Comment III above on groundwater.

RESPONSE: The requested changes have been made.

7.6.1 Radioactive Decay7.6.2 Changes in Radionuclide Concentrations

228. The RIA should provide an estimate of the time period required for radium to reach peak concentrations in Areas 1 and 2. Include this information in the text of this section.

RESPONSE: The requested addition has been made. This information is included on the figures and already included in the text of Section 7.6.4.

7.6.3 Other Fate and Transport Processes

229. Add a reference in this section to Appendix P and make sure the text in this section is consistent with the Fate and Transport evaluation in Appendix Q.

RESPONSE: We assume that the comment meant to refer to Appendix P in both instances; regardless, per the discussions at the May 10, 2017 meeting with EPA, the Fate and Transport Evaluation will now be a separate report, and therefore, the reference is to the separate report rather than Appendix P.

7.6.3.1 Leaching Potential and Sorption

230. Page 198: Update and revise this section to be consistent with the findings of the Fate and Transport evaluations in Appendix P.

RESPONSE: This section has been revised to be consistent with the results of the discussions at the May 10, 2017 meeting (as noted in response to Comment No. 229).

231. Page 199: Include a reasonable range of hydraulic conductivity (Kd) values appropriate for the Site area. State if the alluvium is considered silty.

RESPONSE: Per the decisions reached at the May 10, 2017 meeting, this entire discussion has been removed from the OU-1 RIA and will be addressed as part of OU-3.

232. Clarify in the text of this section that the values used and discussed in this section are consistent with reducing conditions.

RESPONSE: Per the decisions reached at the May 10, 2017 meeting, this entire discussion has been removed from the OU-1 RIA and will be addressed as part of OU-3.

233. Pages 200-201, last paragraph in section: Add a reference to the Toxicity Characteristic Leaching Procedure (TCLP) data and include any relevant corresponding analysis of that data to this section. The text in the last paragraph states that the TCLP data demonstrated that the radionuclides are "generally retained at 90% or more of the original activities." This does not address whether any of the samples failed the TCLP test. Clearly discuss the results of the TCLP analysis in the text of this section. The EPA is currently reviewing the TCLP data and will provide additional comments to Respondents regarding this data at a later date.

RESPONSE: There are no standards for radionuclide results from TCLP analyses so the concept of failure relative to TCLP tests is not applicable. In any event, per the decisions reached at the May 10, 2017 meeting, this entire discussion has been removed from the OU-1 RIA and will be addressed as part of OU-3.

234. Page 201, last paragraph in section: Provide additional evidence and discussion to support the statement regarding an anoxic environment in the vadose zone of the waste profile, and discuss potential methods to confirm this statement.

RESPONSE: Per the decisions reached at the May 10, 2017 meeting, this entire discussion has been removed from the OU-1 RIA and will be addressed as part of OU-3.

235. Page 201, last paragraph of this section: The EPA is still evaluating appendix P related to the Fate and Transport evaluation of RIM, and will be providing comments that may impact this section.

RESPONSE: EPA's comments were received on April 26, 2017 and will be responded to separately. Per subsequent discussions with EPA, the Fate and Transport evaluations will now be submitted separately from the RIA.

7.6.3.2 Volatilization

236. Page 201: Delete this section as radon gas is discussed in previous sections and it does not provide new or useful information.

RESPONSE: The requested change has been made.

7.6.4 Summary of Fate and Persistence of Radionuclides

237. Page 201, second paragraph in section: The use of the term "significant" in the first sentence of this paragraph is subjective and should be removed. There is insufficient groundwater data to evaluate the potential impact of OU1 to groundwater at this time. Revise this first sentence accordingly. In the last sentence of the paragraph, replace the words "Additional evaluations" with "Modeling."

RESPONSE: The requested changes have been made. Consistent with the discussions at the May 2017 meeting with EPA, the text has been revised to indicate that based on the laboratory testing and modeling performed for the fate and transport evaluations there is a potential for leaching of radionuclides from the RIM in Areas 1 and 2.

8.0 NON-RADIOLOGICAL CHEMICAL OCCURRENCES IN AREAS 1 AND 2

8.1 Occurrences of Non-Radiological Chemical Constituents in Soil/Waste

238. Page 202: In this section briefly describe the process used for selecting the sampling intervals for the non-radiological samples.

RESPONSE: The 1996 McLaren/Hart Soil Boring and Surface Soil Investigation report states (pp. 2-5): "*Soil samples selected for priority pollutant analyses were collected from the bottom of the boring in the lower portion of the landfill debris, and generally at the same depth as the lower radiological sample collected in that boring. Contingency soil samples were collected based on visual observations, odor and monitoring. In the contingency sampled borings, a second sample was collected below the depth that triggered collection of the contingency sample*." This discussion was added to the text of Section 4.5.2 of the RIA.

8.2 Non-Radiological Constituents Detected in Erosional Sediment

239. Page 204: Identify the locations where erosional sediment samples were collected and cite the figure that shows the locations.

RESPONSE: The requested additions have been made. Samples were obtained from Weirs 1-9, the locations of which are provided on Figure 4-13.

240. Compare non-radiological data results in this section and any other sections/tables where these sample results are discussed to standard regulatory levels.

RESPONSE: Per discussion with EPA at the May 2017 meeting, no changes were required in response to this comment because there are no standard regulatory levels for erosional sediment.

241. Page 204-205: It is unclear from the sediment tables presented in Appendix G-2 what the analytes were. Add a table summarizing the analytical parameters for the non-radiological sediment samples.

RESPONSE: OU-1 RI investigation sediment samples were analyzed for priority pollutant metals, petroleum hydrocarbons, SVOC, pesticides and PCBs. None of the prior (McLaren/Hart) reports contain a summary or listing of the specific analytes included for each analytical method/group. We will go back through the lab reports and manually prepare a table that summarizes the specific constituents included in each analytical group associated with these 1995 samples. This activity will be completed prior to the next draft of the RIA.

242. Page 204-205: Discuss the more current sediment sampling locations and results for non-radiological samples. If the more current sediment samples were not analyzed for non-rad constituents, clearly state so in this section.

RESPONSE: The requested addition has been made. The text already included a statement that the only erosional sediment samples analyzed for non-radiological constituents were those collected by McLaren/Hart. The more current sediment samples were not analyzed for non-rad constituents. This statement has been added to the text.

8.3 Non-Radiological Constituents Detected in Rainwater Runoff Samples

243. Page 205, last paragraph: The first sentence states samples were collected from four stormwater monitoring points but only three locations are discussed in the text. Revise text to include a discussion of all four locations. Also include a brief discussion on exceedances above regulatory standards and summarize any follow-on actions conducted as of a result of review of this data.

RESPONSE: At the time the draft RIA was prepared, results from the fourth location (now identified as OU-1-004) had not been obtained. The text has been revised to reflect the additional data obtained after the draft RIA was prepared; however, there are still some sample locations for which the data had not yet been received (*e.g.*, OU-1-006, -009, -010, and -011) or validated (*e.g.*, OU-1-008) prior to the time the revised RIA was submitted to EPA. Per discussions with EPA, comparison of the stormwater results to standards is not required.

8.4 Non-Radiological Constituents Detected in Surface Water Samples

244. Page 206: Summarize additional information about the surface water sampling, including how many samples were collected, the location that were sampled, and the compounds for which the samples were analyzed.

RESPONSE: The requested additions have been made. Additional descriptions of the surface water samples were added to Sections 4.12.1.3 and 8.4.

8.5 Non-Radiological Constituents in Perched Water and Area 2 Seep

245. Page 206: Define the term "perched water" as used here and describe its nature at the Site (see comments in previous section and in Primary Comment IV above about Perched Water). Add a reference to other sections in the RIA where perched water is discussed.

RESPONSE: Please see the response to Primary Comment No. IV. Additional text has been added to Section 4.6.

246. Page 206: Cite the table and/or appendix where the data discussed in this section can be reviewed in the document and is compared to regulatory values.

RESPONSE: Summary tables of the data have been included in Appendix D-9. Per subsequent discussions with EPA, no comparison to regulatory values is required because there are no regulatory values or standards for perched water or leachate.

247. Page 206, second paragraph in section: The statement regarding both filtered metal detections being below MCLs is inaccurate because lead does not have an MCL, and the lead detected at 17 micrograms per liter (ug/L) does exceed the lead drinking water action level of 15 ug/L. Unfiltered analytical results should also be reported and discussed because migration of contaminants can occur in colloidal form. Revise the text in this section to resolve these issues.

RESPONSE: The text was part of the original 2000 RI report, which was prepared at a time when a 50 ug/L MCL existed for lead. The text has been revised to reflect the current lead action level and a discussion of the total fraction results. The text already includes a discussion of unfiltered sample results as these were the only fractions in which the metals were detected. Specifically, the text in the 2016 draft RIA states: "*These metals were detected in only the **unfiltered** samples at concentrations of 17 ug/L and 130 ug/L, respectively*." Metals were not detected in the filtered samples. Therefore, no changes or additions have been made to the text.

8.6 Non-Radiological Constituents Detected in Groundwater Samples

248. Page 207: Section 8.6: Create and include new tables for each analyte group, including the chemical parameters analyzed for (VOCs, SVOCs, Metals). Present relevant sampling events (not just 2012-2014) side by side so that they can be compared over time. Include both filtered and unfiltered analyses. Clarify which analytes were included in each analysis. Include this information in the tables or

create a new table that shows the analytes considered during each sampling period or event. Also include the appropriate allowable regulatory concentrations (ex., MCLs, PRGs) on the table(s).

RESPONSE: Summary tables of the data were already included in Appendix F. A listing of the analytical parameters was inadvertently not included in the revised RIA but has been prepared and provided to EPA separately.

249. Page 207: Section 8.6: Include a brief discussion in this section regarding any statistical trends seen in the analytical results and sample locations over time. For example, in 1995-1997 benzene was detected in OU1 Area 2 in monitoring wells D-93 and I-9, but was not detected in these wells in 2012-2014. Briefly discuss these findings in the appropriate Section 8 sub-sections.

RESPONSE: Pursuant to subsequent discussion with EPA, such an evaluation has been deferred to the OU-3 RI/FS.

8.6.1 OU1 RI Groundwater Sampling for Chemical Constituents (1995-97).

250. Page 207: Clarify which analytes were included in each analysis during the 1995-1997 sampling events. Cite where this information is available in this document.

RESPONSE: A listing of the analytical parameters was inadvertently not included in the revised RIA but will be provided to EPA separately.

8.6.2.1 Volatile Organic Compounds

251. Page 212, first paragraph: The first sentence begins with, "Except for the August 2012…," but this exception is never explained. Explain the exception in the text.

RESPONSE: The text has been revised to delete the phrase as the highest levels of benzene were found in well PZ-104SS during all four events.

8.6.2.3 Trace Metals

252. Page 213: Provide a new summary table(s) showing all the results of the groundwater trace metals analysis, both filtered and unfiltered. Discuss findings in the text and reference the new table(s).

RESPONSE: The requested tables are already included in Appendix F-3. The text already discusses the results for the principal trace metals, that is the trace metals that were most commonly detected.

253. Page 213, second paragraph in the section: Naturally occurring metals may be present at elevated concentrations due to landfill conditions and their presence in colloidal form does not preclude their ability to migrate. Delete this paragraph.

RESPONSE: Based on subsequent discussions with EPA, this change has not been made; however, the text has been revised to reflect that the occurrences of metals in the unfiltered

samples may reflect sampling artifacts from stirring up accumulated sediment during sampling of wells that had not been sampled in many years.

8.6.2.3.1 Arsenic

254. Page 213: The effects of redox conditions on arsenic levels should be discussed in this section as it is for iron and manganese.

RESPONSE: The requested addition has been made.

8.6.2.3.3 Manganese

255. Page 215, first paragraph, third sentence: This sentence refers to iron rather than manganese. Revise the statement.

RESPONSE: The requested change has been made.

8.6.2.3.4 Barium

256. Page 215-216: Summary tables are included for the trace metals arsenic, iron, and manganese but not for barium. Present a summary table for barium.

RESPONSE: The requested addition has been made.

8.6.2.4 Inorganic Constituents

257. Page 216: This comment applies to the all the subsections in this section related to inorganic constituents. Revise any language where appropriate to be consistent with the Comprehensive Phase 1 report.

RESPONSE: This section discusses inorganic constituents in groundwater. Groundwater samples were not collected and inorganic analyses were not performed as part of Phase 1. As discussed with EPA at the May 11, 2017 meeting, it is not clear what is meant by this comment. EPA indicated at the meeting that they would have to check the basis for this comment. We have not received any further direction from EPA and therefore, no changes have been made.

8.6.2.4.1 Sulfate

258. Page 216, first sentence: This sentence is incorrect. Revise to indicate that wells D-12 and S-10 are in Area 2, not Area 1.

RESPONSE: The requested change has been made.

8.6.2.4.4 Iodide, Bromide, Boron and Strontium

259. Page 218-219: The figure number for the Iodide figure appears to be cited incorrectly (Figure N-3.26 in Appendix N in the text and Figure N-3.14 in Appendix N). Revise the appendix references.

RESPONSE: The correct figure reference is indeed N-3.14 and the text has been revised.

260. Page 219, last paragraph of section: Remove the last sentence of this paragraph. There is insufficient data to definitively determine upgradient wells and to make this conclusion at this time.

RESPONSE: The requested change has been made.

8.6.3 Correlation of Radium and Non-Radionuclide Occurrences

261. Page 219-220: This section makes little or no mention of the strong association of radium greater than its MCL in wells with landfill leachate effects as reported by the USGS (2014). However, there is insufficient data at this time to determine the source of the radionuclide occurrences in groundwater. Additional data collection and evaluation on this issue should be conducted as part of OU3. Revise this section accordingly.

RESPONSE: The text has been revised to present the USGS conclusions regarding potential correlation between radium occurrences and landfill leachate effects. The existing text indicates that additional evaluations are expected to be performed as part of OU-3.

8.6.4 Possible Radionuclide and Chemical Contributions to Groundwater from Areas 1 and 2

262. Page 220 and 221: Remove the first paragraph from this section on p. 220, and the last sentence of the section on page 221. The groundwater data shows the presence of radionuclides above MCLs. The comparison of radium concentrations in the alluvial wells associated with Areas 1 and 2 with higher radium concentrations in the (primarily) bedrock wells associated with OU2 is insufficient to draw conclusions about contribution from RIM because the report is evaluating different geologic units, different landfill leaching environments, and wells with and without leachate effects without accounting for the differences. There is more complexity to the system than is presented here. Ultimately, there is groundwater with radionuclides in excess of MCLs and there is an insufficient monitoring well network, insufficient analytical data, and an insufficient assessment of Site-specific hydrology to draw the conclusions presented in this section. Revise this section in accordance with the comments above and indicate that additional investigation/evaluation will be necessary as a part of the OU3 RI/FS.

RESPONSE: The requested changes have been made.

9.0 SUMMARY AND CONCLUSIONS

The CSM has been re-written in accordance with EPA's Primary Comment No. VI. In the interest of completeness, we have provided responses to the individual comments on Section 9.

9.1 Site Location and Land Uses

263. Page 222-223: Revise so that the text presented in this section, including the summary bullets, succinctly mirrors the CSM to be developed and presented in the text of the revised document. Ensure that this text is consistent with other sections in the RIA regarding Site location and land uses.

RESPONSE: The CSM has been re-written in accordance with EPA's Primary Comment No. VI.

264. Page 222-223, listed bullets: Revise to add a statement or bullet regarding the proximity of residential developments to the Site.

RESPONSE: The requested change has been made.

265. Page 222-223, listed bullets: Revise to add a bullet specifically regarding the proximity of OU1 to the Lambert Airport runway.

RESPONSE: The requested change has been made.

266. Page 223, bullet at top of page regarding 500-year floodplain: See similar comment on Section 5.3.4. Revise this text to acknowledge that the Buffer Zone and/or Lot2A2 of the Crossroads property are within the 500-year floodplain.

RESPONSE: The requested change has been made.

9.2 Geology and Hydrogeology

267. Review the summary bullets in Section 9.2 for consistency with changes made to the RIA in response to earlier EPA comments on geology and hydrogeology.

RESPONSE: The text of this section has been checked against EPA's earlier comments and revised as necessary.

268. Page 223, second bullet: Instead of a general statement, revise this bullet to be more factual. State the deepest occurrence of RIM, the deepest occurrence of refuse and the highest measured groundwater elevation at the Site.

RESPONSE: This discussion has been removed from the CSM and will be evaluated as part of OU-3.

269. Page 223, third bullet: Add the word "Regional" at the start of this statement/bullet and indicate that Site-specific groundwater gradients will be further evaluated in OU3.

RESPONSE: The requested change has been made.

270. Page 223, fourth bullet: Revise this bullet to state: "*The alluvial aquifer is a potential drinking water aquifer; however*, there is no known groundwater use in

the immediate vicinity of the Site, and use of groundwater within a 1 to 2-mile radius of the Site is, according to the MDNR data bases…" Revise this text to be consistent with comments to Section7.5.1.

RESPONSE: The CSM has been re-written in accordance with EPA's Primary Comment No. VI and in accordance with the decision to defer evaluation of groundwater to the OU-3 RI/FS.

9.3 Radiologically Impacted Materials

271. Page 223: Revise the beginning of the second sentence in the section to state, "The specific criteria approved by the EPA to define RIM at the site are…"

RESPONSE: The requested change has been made.

272. Page 223, last paragraph: Revise the beginning of the first sentence of this paragraph to state, "*Based on the definition of RIM…*"

RESPONSE: The last paragraph of this section was removed as part of the overall update to the CSM discussion pursuant to EPA Primary Comment No. VI.

273. Page 224: In general, revise bulleted statement in this section to be consistent with the Primary Comment II above regarding RIM Distribution.

RESPONSE: The requested change has been made.

274. Page 224, third bullet: Revise bulleted statement to "RIM has been found to be present at the surface or beneath…"

RESPONSE: The requested change has been made.

9.4 Potential Migration Pathways

275. Page 225, fourth bullet: Delete the words "downward" and "underlying alluvial" from this bullet.

RESPONSE: The requested change has been made.

9.4.1 Airborne Transport

276. Page 225: Order bullets in this section in chorological order.

RESPONSE: In the draft 2016 RIA, the bullets in the radon flux discussion were in chronological order. The first two discuss the results of the 1997 sampling and the next two pertain to the 2016 sampling. In the revised RIA, Section 9.6.1.1 (Radon Emissions) has been rewritten. It uses narrative rather than bullet points to describe radon flux. To address EPA's comment, the year of each investigation has been added to the text and the investigations are discussed in chronological order.

277. Page 225, third bullet: Indicate whether these flux readings were collected before, during or after construction of the NCC.

RESPONSE: The requested change has been made. The radon flux measurements were obtained after construction of the NCC.

278. Page 225, last two bullets at bottom of the page: Rewrite this section as text without the bullets.

RESPONSE: The requested change has been made.

279. Page 226, second bullet under heading *Radon monitoring in ambient air*: Delete the words "…did not differ from." Revise this bullet to state: "…radon levels in ambient air at the Site were generally consistent with background levels."

RESPONSE: This bullet was removed as part of the overall update to the CSM discussion pursuant to EPA Primary Comment No. VI.

280. Page 226, second bullet under *Fugitive dust monitoring* heading: The term "significant" in this bullet is subjective and should be replaced with the range of values detected during the monitoring.

RESPONSE: The term "significant" has been removed and this entire discussion was revised in response to EPA Primary Comment No. VI.

9.4.3 Soil Erosion and Sediment Transport

281. Page 227, first paragraph of section, second sentence: Revise this sentence to replace "…from the northern slope (landfill berm) of Area 2." with "…from OU1."

RESPONSE: The discussion was removed as not referring to OU-1 here would be confusing given that both Area 2 and the Buffer Zone and Lot 2A2 are now part of the overall update to the CSM discussion pursuant to EPA Primary Comment No. VI.

282. Page 227, second bullet: The bullet references a risk-based worker level. If this sample was collected from a ditch outside the fence, include a comparison to a risk-based level for residential and trespasser exposures.

RESPONSE: The text was revised to compare the result to the 7.9 pCi/g criteria used to identify RIM which is a residential standard. No risk-based level has been calculated for a trespasser. The portion of this sentence that referenced a risk-based worker level has been deleted to address this comment.

283. Page 227, third bullet first sentence: Add the phrase "but can occur" to the last sentence in this bullet.

RESPONSE: The requested addition has been made.

284. Page 227-228: The text at the bottom of the page discusses Buffer Zone and history of Lot 2A2, etc. Clarify who is the "owner" mentioned in the text. Discuss the sample depth information provided in the text and ensure this is correct for the sample locations discussed (3-6 inches).

RESPONSE: The revised section no longer contains this language so this comment is no longer applicable.

9.4.4 Leaching to Groundwater and Groundwater Transport

285. Page228, first paragraph: Delete the words "downward" and "underlying alluvial" from the first sentence.

RESPONSE: The requested change has been made.

286. Page 228, second paragraph: Delete the entire second sentence of this paragraph. Revise the language regarding perched groundwater to be consistent with revisions and clarifications requested in other sections of the RIA.

RESPONSE: Per the discussions with EPA on May 10-11, 2017, the sentence was going to be retained but the phrase "Very low levels" was going to be replaced with "Low levels"; however, per Primary Comment No. VI, this entire section has been revised such that this language is no longer included in this section.

287. Page 228, third paragraph: Delete the words "all of" from the first sentence.

RESPONSE: This discussion has been substantially revised to reflect that further evaluation of groundwater will be performed as part of OU-3.

288. Page 228, first bullet: Delete this bullet.

RESPONSE: This discussion has been substantially revised to reflect that further evaluation of groundwater will be performed as part of OU-3.

289. Page 228, fourth bullet: This statement that starts with "No contiguous area of radium…" cannot be fully substantiated by the current data set which did not include data from beyond the perimeter of the Site. Additional investigation is required. Delete this bullet/statement from this section and elsewhere in the text.

RESPONSE: This discussion has been substantially revised to reflect that further evaluation of groundwater will be performed as part of OU-3.

290. Page 228, fifth bullet: Revise this bullet by replacing "*The most probable*" with "*One potential*." Also add the other hypotheses from the USGS 2014 Groundwater Report.

RESPONSE: This discussion has been substantially revised to reflect that further evaluation of groundwater will be performed as part of OU-3.

291. Page 229: Delete the bullet at the top of the page starting with "Based upon the relatively low solubility of radionuclides…" Add a bullet that states the existing monitoring network and sampling data is insufficient to draw overall conclusions regarding RIM contributions to groundwater and that additional groundwater investigation will be conducted as a part of the OU3 RI/FS.

RESPONSE: This discussion has been substantially revised to reflect that further evaluation of groundwater will be performed as part of OU-3.

292. Page 229, first paragraph: Replace "*Additional evaluations*" with "*Modeling*." Also, delete the second sentence of this paragraph starting with, "Subject to the EPA…"

RESPONSE: This discussion has been substantially revised to reflect that further evaluation of groundwater will be performed as part of OU-3.

293. Page 229: Revise the bullet at the bottom of this page which states, "Radon flux emissions from…" to specify that the radon flux emissions were measured after the installation of the non-combustible cover. Include a statement discussing the 1996-97 radon flux data set as well.

RESPONSE: The requested change has been made.

294. Page 230, second bullet: Delete the phrase "immediately after" to reflect discussions in other sections of the RIA regarding when this erosion was documented to have occurred. Revise this bullet after the words, "construction of a non-combustible cover have" to say, "reduced the potential for contamination to migrate via this pathway."

RESPONSE: The revised section no longer contains this language so this comment is no longer applicable.

295. Revise the third bullet to be consistent with other comments provided related to the use of terminology such as "Crossroads property" and any other comments about these adjacent properties. See Primary Comment I above on Site Definitions and specific comments on section 6.7.

RESPONSE: This text was removed as part of the overall update to the CSM discussion pursuant to EPA Primary Comment No. VI. The text of the RIA was revised to specify Lot 2A2 rather than Crossroads property and to indicate that the Buffer Zone and Lot 2A2 are part of OU-1; however, the revised CSM section no longer contains this language so this comment is no longer applicable

296. Page 230, third bullet: Revise this bullet to indicate that evaluation of the extent of radionuclides on the adjacent property has not been finalized and will be a required part of any final remedy for the Site.

RESPONSE: This text section was removed as part of the overall update to the CSM discussion pursuant to EPA Primary Comment No. VI. The text of the RIA was revised to specify Lot 2A2 rather than Crossroads property and to indicate that the Buffer Zone and Lot 2A2 are part of OU-1; however, the revised CSM section no longer contains this language so this comment is no longer applicable.

297. Page 230, fourth, fifth, sixth, and first half of seventh bullets: The comment regarding radionuclides occurrences in groundwater cannot be substantiated by the current data set. Delete all such statements. Retain last portion of seventh bullet regarding OU3, as follows, "Additional evaluations of radionuclide transport are ongoing and the EPA has…"

RESPONSE: This discussion has been substantially revised to reflect that further evaluation of groundwater will be performed as part of OU-3.

9.5 Conceptual Site Model

298. Completely re-write section 9.5 to expand this discussion with full citations in one comprehensive location and references to the CSM key elements that are located in other sections of the document. See primary comment for this item.

RESPONSE: The CSM discussion in Section 9 of the report was revised in response to this comment, and to be consistent with Primary Comment No. VI.

Tables

General Comment for data/results tables

299. Add footnotes/keys to tables with data results to identify data qualifiers and other acronyms. Tables 7-11/7-12/7-14/7-25, etc., already has this information in footnotes, but it is not provided on all tables. Check and as appropriate revise tables to include this information.

RESPONSE: The requested changes have been made.

Table 4-5: Wells Sampled and Split Samples Collected (2012-14 events)

300. Add a footnote to this table to explain why there is no MDNR or EPA split data for the sampling of the wells associated with PZ-209, PZ-210, PZ-211, PZ-212.

RESPONSE: The change was inadvertently left off of Table 4-5 during revision of the RIA. A revised table has been provided to EPA.

Table 5-2: Comparison of Alluvial Groundwater Elevations to Missouri River Stage

301. Table 5-2 indicates that the river was higher than the alluvium water level, indicating that this may be a nearly annual occurrence and does not support the statement (in the last paragraph, page 117) that "*there is no indication of*

groundwater flow from the river towards the Site." This statement also does not seem to be consistent with the next text section (5.6.2.4.1 OU1 and OU2 RI Hydraulic Gradient Data) and with the 2000 RI. See primary comment on this item.

RESPONSE: No change to Table 5-2 appears to be necessary. The text has been changed in response to a prior comment.

Table 5-7: Summary of Available Information on Water Supply Wells Within Two Miles of the Site

302. Add the wells identified and sampled by the EPA and the USGS to this table and highlight which of the wells were sampled by each agency.

RESPONSE: A discussion of the wells sampled by EPA and the USGS has been added to the text Section 5.6.3 in the 2017 RIA. These wells have not been identified on Table 5-7. Table 5-7 lists the wells identified through review of the database maintained by MDNR, which apparently does not include the wells sampled by EPA. EPA did not provide locations for the wells it sampled and the USGS previously commented that per agreement with the well owners, the locations of the private wells they sampled should not be identified.

Table 6-4: Summary of Occurrences of Radiologically Impacted Material (RIM) in

Area 1

303. Add to this table the maximum alpha screening value, the depth to the maximum alpha screening value, and elevation of the maximum alpha screening value.

RESPONSE: The requested additions have been made.

Table 6-6: Summary Statistics for Radium and Thorium Results — Areas 1 and 2

304. The EPA is currently evaluating appendix O and other statistical descriptions of the analytical data contained in this RIA and will provide comments on this subject area in a subsequent letter that may impact this table.

RESPONSE: Comment noted; however, this Appendix is no longer included in the RIA. A revised version of Table 6-6 based on the updated ProUCL calculations is included in the revised RIA.

Table 7-4: Fugitive Dust Analytical Results

305. Add the sampling dates to table 7-4.

RESPONSE: The requested addition has been made.

Table 7-5: Summary of Gross Alpha Results in Particulate Air Samples

306. Update the Tables 7-5 through 7-9 to correct for errors and related corrections that the EPA identified in the associated quarterly air monitoring reports and revise the associated text section accordingly.

RESPONSE: The requested changes have been made.

Table 7-16: Radium Results From Prior and Existing Upgradient Monitoring Wells at the Site

307. This table has many empty cells. Explain or revise this table.

RESPONSE: No samples were collected for radium analyses on these dates. The table format has been revised per discussions with EPA to minimize the number of empty cells.

308. Combine all radium groundwater results (Table 7-13) into one table with the exception of the off-site results (Table 7-14). Do the same for thorium and uranium results.

RESPONSE: A combined summary of the radium results over time for each well was already included in Appendix N-2. Per discussions with EPA, preparation of combined tables for thorium and uranium will be performed as part of OU-3.

Table 7-17: Bedrock Monitoring Wells Near Waste Disposal Units but Upgradient of Areas 1 and 2

309. This information should be incorporated into Table 7-19.

RESPONSE: The requested change has been made.

Table 7-18: Alluvial Monitoring Wells Near Waste Disposal Units but Up-/Cross-Gradient of Areas 1 and 2

310. This information should be incorporated into Table 7-19.

RESPONSE: The requested change has been made.

Table 7-23: Historical Pre-RI/FS and RI/FS Radium Isotope Results: 1983-2004

311. Format (font size) should be checked and revised for this table. Many blank columns are presented. Include these results in one more readable. Also see comment for Table 7-16.

RESPONSE: The table is set up to be an 11 x 17 table. If it was printed as an 8 ½ x 11 the font size will indeed be too small.

Table 7-24: Oxidation-Reduction Potential Monitoring Results — May 2014

312. The table indicates redox was measured only once on a single day. Discuss in the text the limitation of this data due to only having one sample and include the sample location on a relevant figure/map.

RESPONSE: It is our understanding that beginning with the spring of 2016, Bridgeton Landfill collects oxidation-reduction potential (ORP) data as part of its routine groundwater monitoring activities. The data shown on Table 7-24 were the closest data in time to the period when the comprehensive groundwater events were performed and were all that were available when the original draft of the RIA report was prepared. We presume that any additional ORP data will be included and evaluated as part of the upcoming OU-3 RI/FS.

Table 7-27: Summary of Thorium-230 Decay and Radium-226 In-Growth Over Time — Area 1

313. Correct the half-life value for Th-230 to 75,400 years. Update the corresponding value for Lambda and update the table accordingly.

RESPONSE: The requested changes have been made.

Table 7-28: Summary of Thorium-230 Decay and Radium-226 In-Growth Over Time — Area 2

314. See the previous comment and update this table in a consistent manor to correct the half-life for Th230 and update Lambda values in this table.

RESPONSE: The requested changes have been made.

Table 8-1: Summary Comparison of Soil Sample Results to RCRA Toxicity Characteristic

Regulatory Levels

315. Not all qualifiers are identified on table footnotes (J- JY). Update to identify the qualifiers.

RESPONSE: The footnotes do include all of the qualifiers. Note JY means it was qualified both with a “J” and with a “Y”.

316. Add summary statistics to this table including the number of detects and number of samples for non-rad results. Add a brief description of what this data means (Tables 8-1 thru 8-6) in the text RIA.

RESPONSE: The requested changes have been made to the table.

Figures

317. Check nomenclature on all figures for consistency issues (example: landfill cells, Crossroads, Lot 2A, Ford, etc. on 3-2, 3-4, 3-5, 4-19, etc.) and revise as appropriate.

RESPONSE: The requested checks were made and the figures were revised as necessary.

318. Check that figure legends include all of the used symbols (i.e. fence line, roads, etc.) and that sources are consistently cited where relevant.

RESPONSE: The requested checks were made and the figures were revised as necessary.

Figure 3-2: Site Location Map

319. Check nomenclature on all figures for consistency with other figures (example: 3-5, 4-19, etc.) and revise as appropriate.

RESPONSE: The requested checks were made and the figures were revised as necessary.

Figure 3-3: Landfill Property Ownership

320. Some of these color choices are difficult to see/differentiate and could be problematic for readers. Revise the figure to include texture fill for clarity.

RESPONSE: The figure was revised.

Figure 3-5: Areas of Landfill Operations:

321. Revise figure 3-5 to incorporate the Buffer Zone into OU1 Area 2 and make this change for all other figures as necessary.

RESPONSE: The figures were revised consistent with this comment.

322. Check nomenclature on this figure for consistency with other figures (example: 3-2, 4-19, etc.) and revise as appropriate.

RESPONSE: The requested checks were made and the figures were revised as necessary.

Figure 3-8b: Change in Elevation from 1971 to 1973 — West Lake/Bridgeton Landfill

323. The added elevation line along the perimeter of the south side of the North Quarry appears to be an artifact and in error. Check and correct as appropriate.

RESPONSE: The figure was revised.

Figure 3-8c: Change in Elevation from 1973 to 1974 — West Lake/Bridgeton Landfill

324. The added elevation line along the perimeter of the south side of the North Quarry appears to be an artifact and in error. Check and correct as appropriate.

RESPONSE: The figure was revised.

Figure 4-6: Soil Boring Locations — Area 2

325. Check Figure 4-6 for location identification errors. PVC2* location appears to be incorrect and is listed twice; correct to be PVC 22.

RESPONSE: Only one PVC-2 boring is shown on the figure. What appears to be a second "PVC-2" location is actually PVC-21; however, the "1" overlies the line delineating one of the drilling access roads making the "1" difficult to see. The figure has been modified to more clearly show the "21".

Figure 4-7: Summary of Downhole Gamma Logging Results — Area 1

326. Add the derived background value from the text in Section 4.4.5.1 to the figure's legend.

RESPONSE: There is no single derived "background value" as "background" or more appropriately "baseline" value that can be included on this figure. The value cited in Section 4.4.5.1 only applies to the GCPT soundings. The baseline response observed in the downhole logging and GCPT work varied between the various investigations and even between individual borings/soundings within a particular investigation. For example, the baseline level of counts for most of the 1995 McLaren/Hart investigation borings was approximately 6,000 cpm, although higher baseline levels were noted in a few borings. In contrast, the baseline or "background" level for the GCPT soundings was approximately 250 – 300 cps (15,000 to 18,000 cpm). The baseline/background level for the Phase 1C, Phase 1D and Additional Characterization borings ranged from approximately 1,000 to 5,000 cpm, although higher baseline levels were noted in a few borings.

327. GCPT13-3 lists its count rate a: 4 cps, which is much lower than the other results. Check to see if this is an error and correct as appropriate.

RESPONSE: The value should have been listed as 42, not 4. The figure was revised.

Figure 4-9: Occurrences of Perched Water and Leachate Seepage in Areas 1 and 2 during RI Investigation

328. Review the "perched" water figure and revise per the primary and specific comments on this item.

RESPONSE: The figure is correct. As noted in the response to Comment No. 61, the list of borings in which perched water was encountered in Area 2 included in the text was incorrect.

Figure 4-14: Post-ROD Sediment Sample Locations

329. This figure does not appear to have all of the sediment sampling locations. Update this figure to include all sediment sampling locations.

RESPONSE: The figure was revised.

Figure 4-16: Bridgeton Landfill Stormwater Monitoring Outfall Locations

330. This figure shows outfall 7; however, the legend has not been updated to show the approximate location of outfall 7 as it does for all other locations. Update this figure to include all relevant outfalls.

RESPONSE: The figure was revised.

331. The EPA understands that a new draft Bridgeton NPDES permit is pending from the MDNR. Update the text discussion of this figure to include that a pending permit is anticipated, which may affect the number and location of stormwater outfalls.

RESPONSE: A note was added to the figure indicating that a new permit is pending which may affect the number and location of the outfalls.

Figure 5-4: Site Topography

332. Update this figure to include the former leachate lagoon located to the southwest and any related infrastructure areas as a part of the overall "Site".

RESPONSE: The figure was revised to identify the area of the former leachate lagoon.

Figure 5-6 Missouri River Geomorphic Flood Plain

333. Define the flood plain line on this figure as being either the 100-year or 500-year boundary.

RESPONSE: It is neither. It is the geomorphic floodplain limit, which is what EPA asked be defined as part of the SFS. It represents the edge of the alluvial deposits based on geologic mapping performed by MDNR as shown on Figure 5-5.

Figure 5-13: Cross Section A — A'

334. Update the figure to reflect potentially fluctuating groundwater conditions at the Site by including a range of groundwater levels as determined by all the available groundwater investigations.

RESPONSE: The figure was revised.

Figure 5-14: Cross Section B — B'

335. See the previous comment and update this figure in a consistent manor.

RESPONSE: The figure was revised.

Figure 5-17: Missouri River Stage

336. Expand the scale of the elevation in this figure in order to depict the range of surface water elevations in the Missouri River.

RESPONSE: The figure was revised.

Figure 5-18: Registered Wells (from Missouri DNR Websites) Within Two-Mile Radius From Site

337. A radius is a circle. The yellow perimeter line is not. Correct text or figure to account for this misstatement.

RESPONSE: The figure has been revised to remove the reference to a "radius". A revised figure is included with other amended pages to the RIA that have been provided to EPA.

Figure 5-19: SSR Migration in South Quarry Based on Observed Settlement Areas

338. Include the other North Quarry features (Heat Extraction System, Temperature Monitoring Probes, Gas Extraction Wells, Ethylene Vinyl Alcohol Cover, etc.) on this figure or add another figure to demonstrate current and pending North Quarry actions/ infrastructure.

RESPONSE: The figure was revised.

Figure 6-1: Combined Radium 226+228 in Soil/Waste – Area 1 and 6-3: Combined Thorium 230+232 in Soil/Waste – Area 1

339. Location "2-2 Geoprobe" appears to combine "GP2-2" and "GP 2-3" data sets for radium and thorium based on a comparison of Phase 1 Comprehensive report (3/22/16) Figures 8 and 9. Check this discrepancy and revise if necessary.

RESPONSE: The figure was revised.

340. The "5-3 Sonic" box is missing the original sample concentration value at the 29-30 foot interval of 450.33pCi/g.

RESPONSE: The figure was revised.

341. Add the surface soil samples collected and analyzed per the Surface Fire Prevention UAO to these figures.

RESPONSE: The requested additions were made to these figures.

Figure 6-2: Combined Radium 226+228 in Soil/Waste - Area 2 and Figure 6-4: Combined Thorium 230+232 in Soil/Waste – Area 2

342. Add the surface soil samples collected and analyzed per the Surface Fire Prevention UAO to these figures.

RESPONSE: The requested additions were made to these figures.

343. Add the soil samples collected around Area 2 as a part of the 2015 Vicinity Sampling report conducted by the MDNR to these figures.

RESPONSE: The requested additions were made to these figures.

Figure 6-5: Combined Uranium 234+235+238 in Soil/Waste – Area 1

344. Add the surface soil samples collected and analyzed per the Surface Fire Prevention UAO to these figures.

RESPONSE: The requested additions were made to these figures.

345. "WL-106A" appears to be missing from this figure. Revise accordingly

RESPONSE: Boring 106A is already included on the figure.

346. The data presented for "WL-113" for combined U appears to be different from what is presented in Figure 10 of the Phase 1 Comprehensive (3/22/16). Check this discrepancy and revise this figure as necessary.

RESPONSE: The values provided on this figure for WL-113 match what is included on Table 6-2. The values provided in the Phase 1 report were an average of the original and duplicate sample whereas the values provided in the RIA include the results for both the original and duplicate sample.

Figure 6-6: Combined Uranium 234+235+238 in Soil/Waste — Area 2

347. Discuss in the text section related to this figure how past activities conducted on the Buffer Zone and on Lot 2A may have potentially affected the sample locations and related data points as shown on this Area 2 figure. Verify that the values provided for this figure (and Figure 6-5) are consistent with the values as provided in the Comprehensive Phase 1 Report.

RESPONSE: We did not understand this comment. The past activities conducted on the Buffer Zone and Lot 2A2 would not have affected the prior sample locations, but would have instead raised questions about whether the prior sample results reflect current conditions, which is discussed in the text of the RIA. Because the Comprehensive Phase 1 Report only addresses Area 1, it did not contain any information or values for the Buffer Zone or Lot 2A2 so there is nothing to verify.

Figure 6-7: Approximate Extent of RIM — Area 1

348. The extent of RIM "line" is heavier on 6-7 than on 6-8. Check and revise figures to use consistent line weights, as appropriate.

RESPONSE: The figure has been revised to reflect the updated estimate of the extent of RIM.

349. Choose a color for the "RI Soil Boring" classification that is more distinctive from the "Presence of RIM" classification.

RESPONSE: The figure was revised.

Figure 6-8: Approximate Extent of RIM — Area 2

350. Discuss in the text section related to this figure how past activities conducted on the Buffer Zone and on Lot 2A may have potentially affected the sample locations and related data points as shown on this Area 2 figure.

RESPONSE: As with similar Comment 347, we do not understand this comment. The past activities conducted on the Buffer Zone and Lot 2A2 would not have affected the prior sample locations, but would have instead raised questions about whether the prior sample results reflect current conditions, which is discussed in the text of the RIA.

351. Check this figure for samples that have been identified as "RI Soil Boring" vs. "Presence of RIM." If samples have data that meet the definition of RIM, revise accordingly.

RESPONSE: The RI soil borings (and other soil borings) that did not contain RIM are shown in brown whereas those that did contain RIM are colored orange. The two colors appear to have been too similar to be easily differentiated and the figure was revised to make this differentiation more clear.

352. Explain why the "Extent of RIM" estimate does not encompass all the boring locations that were positive for RIM (example WL 206, RC 02).

RESPONSE: The extent of RIM shown on the figure is the geostatistical estimate of the source material in Area 2. The cause (overland transport from Area 2) and resultant nature of the radionuclide occurrences on the Buffer Zone and Lot 2A2 (surficial soil occurrences) are different from the source of the radionuclide occurrences in Area 2 and therefore it would be inappropriate to include them in the same geostatistical treatment. Furthermore, as discussed in the text, due to subsequent regrading by AAA Trailer, the prior sample results are not likely representative of the current extent of radionuclide occurrences, if any, on the Buffer Zone and Lot 2A2.

Figure 6-13: Buffer Zone and Crossroad Properties

353. The MDNR sample S09 is shown on this figure, but is not discussed in the text. Other MDNR sample locations are not shown or discussed in the text. Revise the figure and related discussions to include the relevant MDNR sample locations and results.

RESPONSE: The requested additions were made.

Figures utilized in section 7

354. Check these figures for wells that may be missing such as S-1 and I-2 in figures 7-3 and 7-4.

RESPONSE: The figures show all of the wells that were sampled during the 2012-2013 event. Wells S-1 and I-2 were sampled during the earlier OU-1 RI/FS events (1994-1997) but were damaged/destroyed, apparently during the grading work performed by AAA Trailer. These wells could not be located at the time the 2012-2013 events were performed and thus were not sampled. During the vegetation clearing conducted as part of the NCC work, these wells were located, found to have been damaged, and were subsequently abandoned.

Figure 7-2: Well Groups Used for Evaluation of Radium Results

355. Revise this figure to exclude designations of upgradient and/or side gradient for wells.

RESPONSE: The figure was revised.

Figure 7-5 through 7-12: Well Radium Results

356. Add trend line (linear regression) to each of these plots.

RESPONSE: The requested additions were made to the figures.

Figure 9-1: Potential Exposure Pathways

357. The title of the figure per the tile block is “Site Conceptual Model” which does not match the title as provided on the Table of Contents (TOC). Check and correct the Table of Contents or the title block of Figure 9-1.

RESPONSE: The list of figures in the TOC was revised to reflect the correct title for this figure.

358. Delete the “*1” footnote on this figure.

RESPONSE: The requested change was made.

APPENDICES

Appendix D: Soil Sample Analytical Results Summary Tables

359. Soil Tables in this appendix do not indicate whether the tables represent all compounds analyzed for or just detections. If only detections, there should be a table identifying the compounds looked for.

RESPONSE: This comment and other similar comments will be addressed through preparation of additional tables to be provided to EPA that describe the analyte list associated with each event.

Appendix F-6: Bridgeton Landfill Groundwater Monitoring Results

360. No data or information is included in Appendix F6.

RESPONSE: Appendix F-6 was provided to EPA on November 29, 2016 and has been included in the revised RIA report.

Appendix G-1: OU1 RI Rainwater/Runoff Sample Results

361. The non-radiological tables should state whether they include only detected compounds or all compounds analyzed. Also, the non-radiological sample tables do not include the date they were collected. Since there have been multiple sampling events, the tables should include sample collection date (or analyzed date).

RESPONSE: We inadvertently forgot to revise the tables to include the sample dates; however, the sample dates are the same as those provided for the radiological samples. Revised tables have been provided to EPA with the other amended pages to the RIA. Please note that we were unable to find documentation of the specific date on which McLaren/Hart collected the sample from the leachate seep in Area 2 and therefore just entered "1995" for the date of this sample.

Appendix G-2: OU1 Sediment Sample Results

362. Correct the figure to add sample dates. Without dates, it is not possible to correlate results with specific sampling events.

RESPONSE: The sample dates are already included on the tables summarizing the radionuclide results. The sample dates for the chemical data are the same as those provided for the radionuclide results.

Appendix M: Cross-Sections

363. Discuss boring locations that show over 100 ft. of alluvium in the section that discusses the corresponding investigation.

RESPONSE: The cross-sections included in Appendix M were designed to display the extent of RIM and the depth of waste and as such do not include the full depth of borings that penetrated deep into the alluvium, such as WL-216 and WL-224; however, the depth

of alluvium for such borings is noted at the bottom of each boring that penetrated deeper portions of the alluvium.

Appendix N-1: Maps of Radionuclide Monitoring Results

364. Figures in Appendix N are mislabeled; Figure N-1 should be Figure N-1.1.

RESPONSE: No change was made. We do not understand this comment as the correct figure numbers were already on the figures.

Appendix N-2: Tabular Comparison of Radium Results From Pre-RI/FS, RI/FS and 2012-13

Samples

365. PZ 101 data does not appear to be included in the comparison set. Include a summary of all relevant wells or discuss why some wells are not included on the comparison tables.

RESPONSE: PZ-101 was not sampled for radionuclides prior to the 2012-2013 events.

Appendix O: Upper Confidence Limits of the Mean (UCLs) for Areas 1 and 2

366. The EPA will provide comments to Appendix O in a separate comment letter.

RESPONSE: Comment noted; however, as part of the revision of the RIA, this appendix was removed.