Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

October 3, 2018

Ms. Sue Smiley
Fernald Preserve Site Manager
DOE-LM-20.2
10995 Hamilton Cleves Highway
Hamilton, Ohio 45030

Re: Fernald Preserve
Remediation Response
Project records
Remedial Response
Hamilton County
531000297004

Subject: COMMENTS – FERNALD PRESERVE 2017 SITE ENVIRONMENTAL REPORT, dated May 2018

Ms. Smiley:

Ohio EPA has received and reviewed the "Fernald Preserve 2017 Site Environmental Report", dated May 2018. Ohio EPA's comments are enclosed.

If you have any questions, please contact me at (937) 285-6455.

Sincerely,

Laura Hafer

Laura Hafer
Environmental Specialist 2
Division of Environmental Response and Revitalization
Federal Facilities Section

Attachment

ec: David Seely, U.S. EPA
Bill Hertel, Navarro, Inc.
Thomas A. Schneider, DERR, Ohio EPA, SWDO
Matt Justice, DDAGW, Ohio EPA, SWDO

LH/tsf

ATTACHMENT
Ohio EPA Comments on the Fernald Preserve 2017 Site Environmental Report
Date May 2018
October 3, 2018

1. Commenting Organization: Ohio EPA
   Section: Executive Summary
   Pg#: ix and Section 4.3.3 and Appendix B

   Comment: DOE has acknowledged in our quarterly regulator meetings that an updated calculation for uncontrolled runoff will be used after this year to align with changing site conditions. Please ensure that in future reports the evolution of this calculation is captured in the text where applicable.

2. Commenting Organization: Ohio EPA
   Section: 3.4
   Pg#: 57 Line#:

   Comment: In future reports please remove the word "slightly" in the last paragraph of Section 3.4. These calculations continue to be updated. It will be helpful to introduce the new Ricker calculation in this section in future reports.

3. Commenting Organization: Ohio EPA
   Section: 3.5 and A.5
   Pg#: 58 and page 11 Line#:

   Comment: OSDF Cell 6 LDS reached a new high of 70.8 ug/L which is nearly double the previous high. In future reports please provide possible explanations when new highs or upward trends are realized. (Presumably in the case of Cell 6, the sample volume was small so the concentration was high? And/or the upward trend can be attributed to fluctuating ambient concentrations beneath the cell.) Additionally, if this LDS concentration stays high, please keep Ohio EPA advised of the situation. On both page 58 of the report and page 11 of A.5, please refer the reader to Figure A.5.6-6A which shows the upward trend in Cell 6.

4. Commenting Organization: Ohio EPA
   Section: 3.5 and A.5
   Pg#: 58 and page 11 Line#:

   Comment: Similar to OSDF Cell 6, the LDS data for Cell 8 is showing an upward trend in Total U (as well as other parameters). Please provide possible explanations for this upward trend in the OSDF Monitoring section of the report and in the summary section of Attachment A.5. Additionally, if this LDS concentration stays high, please keep Ohio EPA advised of the situation. On both page 58 of the report and page 11 of A.5, please refer the reader to Figure A.5.8-8A which shows the upward trend in Cell 8.

5. Commenting Organization: Ohio EPA
Section: 4.3.1
Pg#: 64 Line#:

Comment: It should be stated in the first paragraph of this section that a high uranium concentration of 2,087 ug/L was measured at SWD-09 in December 2016 and that this is a significant exceedance of the FRL. The maximum exceedance for the current reporting year should also be stated in this section in all future reports. During last year's SER comment resolution, DOE committed to providing more discussion about this issue in Section 4 of future reports.

Appendixes

6. Commenting Organization: Ohio EPA
Section: Appendix A.1.2 and A.3.2
Pg#: 3 and 4 Line#:

Comment: In addition to the traditional reporting of planned ground water system shutdown time, future reports should also report the length of unplanned shutdowns. Unplanned shutdowns in recent years have been significant. For example, in year 2016 the system was down an additional 79 unplanned days, compared to the 42 planned days.

7. Commenting Organization: Ohio EPA
Section: Appendix A.1.6
Pg#: 6 Line#:

Comment: Total Uranium Data - In future reports, the second paragraph should acknowledge that some of the extraction wells no longer "*continue to decrease*" within predicted timeframes. For example, steady concentration trends over time, for four of the extraction wells are at or above the FRL.

Uranium trends extending beyond predicted FRL (30 ug/L) attainment dates		
Extraction Well	**Location**	**Steady trend**
EW-18	S. South Field (yr. 2022)	At 30 ug/L
EW-23	S. South Field (yr. 2022)	Above 30 ug/L
EW-20	Northern South Field (yr. 2030)	Above 30 ug/L
RW-6	South Plume (yr. 2022)	At 30 ug/L

8. Commenting Organization: Ohio EPA
   Section: Appendix A.1.6
   Pg#: 6 and 7 Line#:

   Comment: Total Uranium Data –
   a. Future reports should discuss the representativeness of the model assumption that uranium partitioning between the adsorbed and dissolved phases is "adequately" represented. The adsorbed phase today is probably significantly greater than that represented by the model (VAM-3D). The model's input distribution coefficient (Kd) was last updated fifteen years ago (U.S. DOE report, year 2003). Therefore, consideration should be given to updating model distribution coefficients with current values.
   b. Future discussion should also address the fact that attainment will be slower than predicted, as evinced by the pump and treat system's steady state mass removal curve (Figure 17) and the steady-state concentration trends for extraction wells EW-18, EW-20, EW-23, and RW-6 (Figures A 1-26, A 1-28, A 1-33, and A 1-22).

9. Commenting Organization: Ohio EPA
   Section: Appendix A.1.6
   Pg#: 7 Line#:

   Comment: Future reports should modify the last paragraph description of uranium adsorption as being a "minor" process. Partitioning equation estimates based on the model's last updated Kd value of 3 L/Kg (year 2003), estimate 19.8 times more adsorbed phase mass exists than dissolved phase mass (Section A.2.5.2). If the slow process of desorption is the primary release mechanism of dissolved phase mass, then significant dissolved mass removal through pore volume flushing should no longer be expected.

10. Commenting Organization: Ohio EPA
    Section: Appendix A.2.1.1.3
    Pg#: 7 Line#:

    Comment: Ohio EPA requests continued updates on direct-push ground water uranium sample results, from the vicinity of former monitoring well 3821 in the former WSA. Updates are requested to validate the hypothesis used as the basis for abandoning monitoring well 3821. Monitoring well 3821 had been increasing in uranium concentration since year 2012, with detections above the FRL. However, the hypothesis used as the basis for abandoning the well was that the increase was artificially biased high, by perched water cascading down a breach in the well casing overlying the screen interval. A downhole camera survey of well 3821 confirmed that water was cascading down the well casing.

If cascading perched water was the cause of the uranium increase, then perched sample would presumably be more concentrated. However, the maximum direct push result of 11.7 ug/L was less than that detected in the monitoring well. If local direct-push perched water results continue to be less than that formerly detected in monitoring well 3821, then a replacement monitoring well might be necessary.

11. Commenting Organization: Ohio EPA
Section: Appendix A.2.1.1.4
Pg#: 7 Line#:

Comment: The last paragraph of this section should provide more detail including the location (SWD-09) and high uranium concentration (2,087 ug/L). The maximum exceedance for the current reporting year should also be stated in this section in all future reports. It should also be noted that this is a significant exceedance of the FRL of 530 ug/L.

12. Commenting Organization: Ohio EPA
Section: Appendix A.2.5
Pg#: 28 Line#:

Comment: In future reports, please modify statement that the Ricker method requires fixed sample locations. Fixed sample locations are ideal, but not required. The method simply estimates average dissolved mass based on the distribution of sample locations. As the plume contracts, direct push locations are moved upgradient to more accurately bracket plume extent.

13. Commenting Organization: Ohio EPA
Section: Appendix A.2.5
Pg#: 30 Line#:

Comment: To improve future evaluation of remedy efficiency, we recommend the next report include an updated estimate of total adsorbed uranium mass. Adsorbed phase mass could be significantly greater than the 3,470.25 pounds estimate, because the input uranium distribution coefficient (Kd) was last updated 15 years ago (DOE report, year 2003). The distribution coefficient represents the ratio of adsorbed average uranium concentration to the average dissolved concentration. Rather than remaining constant, this ratio has probably increased over the last 15 years. Therefore, the adsorbed mass remaining could be significantly greater than the 19.83 times the average annual dissolved mass reported.

14. Commenting Organization: Ohio EPA
Section: A.3.1
Pg#: 3 Line#:

Comment: Groundwater Elevations and Capture Assessment

a. In the next report, the legend in capture zone Figure A.3-5 should identify the 10-year advective time of travel zone used to predict the remedy's hydraulic containment area.
b. The next report should also discuss how long the extraction system can be off before hydraulic containment is lost. Clarification should be provided whether the estimated time is based on the conservative assumption of advective transport, or a retardation factor of 12 (uranium transport velocity equal to 1/12 ground water velocity).

15. Commenting Organization: Ohio EPA
Section: A.4.0
Pg#: 2 Line#:

Comment: Non-Uranium Final Remediation Level Results

a. Future reports should note that in addition to uranium, four of the non-uranium constituents with concentrations above respective FRLs are also REDOX sensitive. The stability of uranium, manganese, and molybdenum species is controlled in large measure by a ground water's oxidation reduction status. In addition, the degradation potential of nitrate and trichloroethene is influenced by oxidation reduction status.
b. Regarding cases where manganese is above its FRL of 900 ug/L, Ohio EPA recommends future discussion of whether a correlation exists with negative oxidation reduction potential (ORP) measurements and elevated total iron. Correlation can help distinguish whether elevated manganese is attributable to residual process chemical, or desorption of native manganese under anaerobic conditions. Negative ORP measurements and manganese results greater than the secondary MCL of 50 ug/L provide good indication that at least anaerobic manganese reducing conditions conducive to the desorption of native manganese exist. As stated in Section A.4.2.1 (Background), for those cases outside the operation design remediation footprint, "if an FRL exceedance is determined to be persistent, then the cause will be identified." Such persistence has been identified for monitoring well 22204, just east of the OSDF, since year 2004.

16. Commenting Organization: Ohio EPA
Section: A.4.0
Pg#: 2 and 8 Line#:

Comment: Five non-uranium constituents are listed on the summary table on page 2 as having an FRL exceedance however the value of exceedance is not listed anywhere in Attachment A.4. The values are listed on page 54 of the report, however, in future reports, please ensure this information is also in the appropriate Appendix. Please add a column to Table A.4-1 to list the maximum exceedance for that reporting year.

17. Commenting Organization: Ohio EPA
Section: Appendix A.5.1 – A.5.8
Pg#: Figure: Bivariate Plots for all cells

Comment: There is no indication of time range represented on each cells bivariate plot figure. Perhaps under "Cell 1" you can add the years, such as "2003 to present".

18. Commenting Organization: Ohio EPA
Section: Appendix A.5.6.1 and A.5.6.3
Pg#: 1 and 3 Figure:

Comment: In the 5th paragraph on page 1 and the second bullet on page 3, please acknowledge that there is an upward trend in Total U in the LDS of Cell 6 should this trend continue for the 2018 report.

19. Commenting Organization: Ohio EPA
Section: Appendix A.5.6
Pg#: 1 and 18 Figure: A.5.6-19

Comment: Page 1 of sub-attachment A.5.6 describes the uranium-sodium bivariate plot for Cell 6 as showing separate and distinct sample populations. Though still separate and distinct, the sodium-uranium bivariate plot and the uranium time series plots show LDS uranium concentrations trending toward that in the LCS. Therefore, the next report's Cell 6 bivariate plot should label the earliest and latest LCS and LDS sample dates to distinguish sample population trend. If the increasing trend continues into next year, more explanation should be provided, including discussion of leakage rate, the primary means of leak detection. A trilinear diagram displaying potential change in major ions for the LCS and LDS populations could add a useful line of evidence for assessing potential mixing.

20. Commenting Organization: Ohio EPA
Section: Appendix A.5.6.3
Pg#: 3 and 10 Figure: A.5.6-6A

Comment: Please refer the reader to Figure A.5.6-6A which shows the upward trend in Cell 6.

21. Commenting Organization: Ohio EPA
Section: Appendix A.5.8
Pg#: Figure:

Comment: Similar to OSDF Cell 6, the LDS data for Cell 8 is showing an upward trend in Total U (as well as other parameters). Please ensure that in future reports this is fully documented, referenced and explained in the Results section as well as in the Summary and Conclusions.

22. Commenting Organization: Ohio EPA
Section: Appendix B.1.1.1
Pg#: B-2 Line#:

Comment: Given the significant uranium concentrations reported in SWD-09, future reports should discuss perched water lateral fate and transport to swales, and possibly Paddy's Run. Uranium plume cross-section D-D' (Attachment A.2, Page 77, Figure A.2-25), transecting the former Waste Storage Area, illustrates that ground surface overlying the plume center intercepts the glacial till (aquitard) upon which perched water is thought to rest. While the aquitard should limit vertical infiltration, perched water might have the potential to migrate laterally to lower elevation swales, through gravity drainage.

Department of Energy
Washington, DC 20585

October 15, 2018

Mr. David Seely
U.S. Environmental Protection Agency
Region 5-SRF-6J
77 W. Jackson Blvd.
Chicago, IL 60604-3590

Ms. Laura Hafer
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402

Dear Mr. Seely and Ms. Hafer:

Subject: Transmittal of Responses to Ohio Environmental Protection Agency Comments on the 2017 Fernald Preserve Site Environmental Report

Reference: Letter, L. Hafer to S. Smiley, "Comments-Fernald Preserve 2017 Site Environmental Report, Dated May 2018," dated October 3, 2018

Enclosed for your review are responses to Ohio Environmental Protection Agency (Ohio EPA) comments on the 2017 Fernald Preserve Site Environmental Report (reference). These responses reflect discussions held during the October 2, 2018, Fernald Regulatory Meeting and subsequent discussions between Ms. Hafer and DOE contractor (Navarro) staff. To date, written comments have not been received from the U.S. Environmental Protection Agency (EPA); however, the enclosed responses to Ohio EPA comments were discussed during the aforementioned October 2, 2018 meeting, at which both EPA (by phone) and Ohio EPA were present. During this meeting, EPA indicated that no additional comments would be provided.

Consistent with past practice, the 2017 Fernald Preserve Site Environmental Report and appendixes will not be revised. The Ohio EPA comments on the 2017 report will be considered during preparation of the 2018 Fernald Preserve Site Environmental Report.

If you have any questions regarding this report, please call me at (513) 648-3333. Please send any correspondence to my attention at:

U.S. Department of Energy
Office of Legacy Management
10995 Hamilton-Cleves Highway
Harrison, OH 45030

Sincerely,

Susan Smiley
Fernald Preserve Manager
DOE-LM-22

Enclosure

cc w/enclosure:
G. Hooten, DOE
B. Zimmerman, DOE
J. Finfera, USFWS
T. Schneider, Ohio EPA
S. Helmer, ODH
B. Hertel, Navarro
J. Homer, Navarro
K. Voisard, Navarro
C. White, Navarro
Project Record File FER 0115.02.10[A] (thru M. Korte)

RESPONSE TO OHIO EPA COMMENTS
DATED OCTOBER 3, 2018
ON THE FERNALD PRESERVE
2017 SITE ENVIRONMENTAL REPORT
MAY 2018

1. **Commenting Organization:** Ohio EPA
   Section: Executive Summary **Pg#:** ix and Section 4.3.3 and Appendix B
   Comment: DOE has acknowledged in our quarterly regulator meetings that an updated calculation for uncontrolled runoff will be used after this year to align with changing site conditions. Please ensure that in future reports the evolution of this calculation is captured in the text where applicable.

   Response: DOE agrees with the comment.

   Action: Future reports will document the evolution of the calculation in Section 4.3.3 and Appendix B.

2. **Commenting Organization:** Ohio EPA
   Section: 3.4 **Pg#:** 57
   Comment: In future reports please remove the word "slightly" in the last paragraph of Section 3.4. These calculations continue to be updated. It will be helpful to introduce the new Ricker calculation in this section in future reports.

   Response: This comment has two parts: 1) removing the word "slightly" and 2) introducing the Ricker calculation in this section.

   1) The word "slightly" was used to characterize the comparison between 18.5 ug/L and 22 ug/L.
   2) The upfront portion of the SER is intentionally written for the layman. The details will remain in the appendixes, but a brief focused discussion of the Ricker calculation will be added to future SERs.

   Action: The action has two parts: 1) The word "slightly" will not be used when reporting the comparison in future reports. 2) DOE will introduce the Ricker calculation in Section 3.4 in future SERs.

3. **Commenting Organization:** Ohio EPA
   Section: 3.5 and A.5 **Pg#:** 58 and page 11
   Comment: OSDF Cell 6 LDS reached a new high of 70.8 ug/L which is nearly double the previous high. In future reports please provide possible explanations when new highs or upward trends are realized. (Presumably in the case of Cell 6, the sample volume was small so the concentration was high? And/or the upward trend can be attributed to fluctuating ambient concentrations beneath the cell.) Additionally, if this LDS concentration stays high, please keep Ohio EPA advised of the situation. On both page 58 of the report and page 11 of A.5, please refer the reader to Figure A.5.6-6A which shows the upward trend in Cell 6.

   Response: The comment has three parts: 1) to provide an explanation of the new high, 2) communicate to the Ohio EPA if the concentration remains elevated and 3) refer the reader to other sections. The answer to each is provided below:

   1) As stated in Section 3.5 and A.5, the cause for the increase between 2016 and 2017 is not known. As suggested in the comment, the increase could be the result of the LDS drying up. Fluctuating ambient conditions beneath the cell are not expected to impact LDS concentrations. As stated in the SER, continued routine sampling is the recommended action at this time.
   2) DOE will advise Ohio EPA if the concentration remains elevated in Cell 6 LDS.
   3) Because the 2017 SER is final, the 2017 SER will not be revised, but reference to other sections can be added to future SERs.

Action: The action has three parts: 1) A discussion of uranium mass flux and decreasing flow rates will be added to Section 3.5 OSDF Monitoring (page 58), Appendix A.5, and the affected subattachments to help clarify the significance of the higher uranium concentrations and upward trends. 2) DOE discussed the upward trend in the Cell 6 LDS at the October 2, 2018 regulator meeting. 3) Table 7 will be modified to include the historical statistical trend, the total uranium concentrations for the reporting year, and the reference to the uranium concentration versus time figure in Appendix A. In addition, when a new high uranium concentration occurs during the reporting year, the following will be reported:

- **Report:** A reference to the concentration versus time figure in the subattachments will be added to Section 3.5, OSDF Monitoring (page 58).
- **Appendix A.5:** A summary level discussion of new high uranium concentrations will be added to Appendix A.5, Section A.5.2.2, Concentration Plots. The revised Table 7 will be added to Section A.5.2.2. A summary bullet will be added to Section A.5.4, Summary of Overall Performance and Findings and Recommendations that lists the new high uranium concentrations for the reporting year.
- **Appendix A.5 Subattachments:** Information concerning the new high concentration will be added to the first section of the appropriate subattachment (e.g., Section A.5.1.1 for Cell 1), Water Quality Monitoring Results as well as the third section of the appropriate Subattachment (e.g., Section A.5.1.3 for Cell 1), Summary and Conclusions.

4. **Commenting Organization:** Ohio EPA
Section: 3.5 and A.5 **Pg#:** 58 and page 11
Comment: Similar to OSDF Cell 6, the LDS data for Cell 8 is showing an upward trend in Total U (as well as other parameters). Please provide possible explanations for this upward trend in the OSDF Monitoring section of the report and in the summary section of Attachment A.5. Additionally, if this LDS concentration stays high, please keep Ohio EPA advised of the situation. On both page 58 of the report and page 11 of A.5, please refer the reader to Figure A.5.8-8A which shows the upward trend in Cell 8.

Response: The comment has three parts: 1) to provide an explanation of the new high, 2) communicate to the Ohio EPA if the concentration remains elevated and 3) refer the reader to other sections. The answer to each is provided below.

1) The cause of the upward uranium trend in the LDS could be the result of decreasing flow rates. The bivariate plots continue to show that the LCS is separate and distinct from the LDS in all 8 cells which lends support to this explanation.

2) DOE will advise Ohio EPA if the Cell 8 LDS concentration remains elevated.

3) Section 3.6 and Table 7 are used to report new high concentrations detected in each OSDF monitoring horizon during the reporting year. Because Cell 6 had a new high uranium concentration detected in the LDS in 2017, it was reported in the upfront sections of the SER. The uranium concentration for 2017 in the Cell 8 LDS was not a new high, so it was not reported in the upfront sections of the SER; however, DOE agrees that the trend of the uranium concentration in the LDS is important to discuss in Section 3.5 of future SERs.

Action: The action has three parts: 1) See Action 1 to Comment 3. 2) During the periodic regulatory meetings, DOE will communicate the concentrations in the Cell 8 LDS if they remain high. 3) In addition to the Action to Comment 3, text will be added to Section 3.5, OSDF Monitoring to discuss the significance of the data in the LDS versus the other horizons and the upward trends in the LDS of any cell.

5. **Commenting Organization:** Ohio EPA
Section: 4.3.1 P**g#:** 64
Comment: It should be stated in the first paragraph of this section that a high uranium concentration of 2,087 ug/L was measured at SWD-09 in December 2016 and that this is a significant exceedance of the FRL. The maximum exceedance for the current reporting year should also be stated in this section in all future reports. There should also be a summarized discussion here analyzing why this location is still above the FRL.

Response: This comment has two parts: 1) reporting the highest historical result for SWD-09 as well as the maximum for the current reporting year and 2) the cause of the exceedances at SWD-09. Each is discussed below:

1) Because the high uranium concentration did not occur in 2017, it was not reported in Section 4.3.1; however, the reader is referred to Appendix B where this information is presented. As stated in Appendix B, results of the weekly uranium sampling at SWD-09, which was dry approximately 40 percent of the year, continue to trend statistically downward. Over the 10 year period of sampling at this location, 319 samples have been collected and approximately one third of these samples were below the uranium surface water FRL (530 ug/L). Additionally, as stated on Table 9-4 of the Operable Unit 5 Record of Decision, "The point of compliance is outside the mixing zone" in the Great Miami River for all surface water FRLs.

2) Residual uranium contamination in the soil appears to be the cause for the elevated uranium concentrations at SWD-09. The contamination appears to be localized, to the area around SWD-09, and the uranium concentrations measured in water collected from SWD-09 appear to be influenced by seasonal changes.

Action: The actions are as follows 1) The historically high value for SWD-09 will be reported in Section 4.3.1 in future SERs as well as the current maximum for the reporting year. 2) A discussion of the possible causes of the elevated uranium concentration will be also provided.

Appendixes

6. **Commenting Organization:** Ohio EPA
Section: Appendix A.1.2 and A.3.2 **Pg#:** 3 and 4
Comment: In addition to the traditional reporting of planned ground water system shutdown time, future reports should also report the length of unplanned shutdowns. Unplanned shutdowns in recent years have been significant. For example, in year 2016 the system was down an additional 79 unplanned days, compared to the 42 planned days.

Response: DOE reports any individual well shutdown greater than 24 hours each year in sub-attachment A.1. With the exception of the unplanned shutdown of the entire wellfield in 2016 caused by a breaker failure in the site electrical substation that required significant repairs, there have been few well field shutdowns in recent years. As agreed to with EPA and Ohio EPA at the March 14, 2018 meeting, the entire wellfield will be shut down when the Great Miami River flood waters are predicted to reach a certain height since this causes issues with discharge of the treated water to the river. This will likely result in more wellfield shutdowns than in the past and will generally occur in the spring.

Action: In future reports, DOE will report any wellfield shutdown of the entire wellfield that lasts more than 24 hours (planned or unplanned). Individual well outages greater than 24 hours will continue to be reported in attachment A.1.

7. **Commenting Organization:** Ohio EPA
Section: Appendix A.1.6 **Pg#:** 6
Comment: Total Uranium Data - In future reports, the second paragraph should acknowledge that some of the extraction wells no longer "*continue to decrease*" within predicted timeframes. For example, steady concentration trends over time, for four of the extraction wells are at or above the FRL.

Uranium trends extending beyond predicted FRL (30 ug/L) attainment dates		
Extraction Well	**Location**	**Steady trend**
EW-18	S. South Field (yr. 2022)	At 30 ug/L
EW-23	S. South Field (yr. 2022)	Above 30 ug/L
EW-20	Northern South Field (yr. 2030)	Above 30 ug/L
RW-6	South Plume (yr. 2022)	At 30 ug/L

Response: DOE agrees with the comment.

Action: In future reports, text will be added that explains that the uranium concentration in samples collected from some of the extraction wells no longer continue to decrease as predicted.

8. **Commenting Organization:** Ohio EPA
Section: Appendix A.1.6 **Pg#:** 6 and 7
Comment: Total Uranium Data –
a. Future reports should discuss the representativeness of the model assumption that uranium partitioning between the adsorbed and dissolved phases is "adequately" represented. The adsorbed phase today is probably significantly greater than that represented by the model (VAM-3D). The model's input distribution coefficient (K_d) was last updated fifteen years ago (U.S. DOE report, year 2003). Therefore, consideration should be given to updating model distribution coefficients with current values.

b. Future discussion should also address the fact that attainment will be slower than predicted, as evinced by the pump and treat system's steady state mass removal curve (Figure 17) and the steady-state concentration trends for extraction wells EW-18, EW-20, EW-23, and RW-6 (Figures A 1-26, A 1-28, A 1-33, and A 1-22).

Response 8a: DOE acknowledges that representative partitioning coefficients that reflect actual site conditions over the life of an extended groundwater remediation effort are difficult to establish. Groundwater model predictions for Fernald are based on the assumption that an equilibrium linear isotherm adequately describes the partitioning of total uranium between sorbed and dissolved phases. One K_d value (K_d = 3) is used to represent the entire model domain and timeframe. This value was determined empirically at the Sandia National Laboratory using core samples of aquifer sediment collected from contaminated areas across the Fernald site. As the remedy progresses DOE acknowledges that additional K_d work may be beneficial to determine if conditions in the aquifer have changed.

As Ohio EPA states in Comment 9, if the slow process of desorption is the primary release mechanism of dissolved phase mass, then significant dissolved uranium mass removal through pore volume flushing should no longer be expected; however, in 2017, 503 pounds of uranium were removed from the aquifer indicating that in 2017 the pumping operation remained effective in removing uranium mass.

As was done in 2014, DOE believes that the remedy will probably need to be optimized again in the future to help keep the removal rate as high as possible. Consistent with the Operable Unit 5 Record of Decision, DOE remains committed to seeking new and innovative ways to improve the groundwater remedy, including addressing K_d. DOE is reviewing K_d to determine if and what options might be available for improvement. As has been done in the past, DOE will continue to keep EPA and Ohio EPA informed as new information concerning remedy improvements become available.

Response 8b: DOE agrees with the comment.

Action 8a: In future reports, DOE will add a discussion of the representativeness of the model assumption that uranium partitioning between the adsorbed and dissolved phases is "adequately" represented.

Action 8b: DOE will add more discussion concerning path/progress toward attainment of predicted cleanup dates in future reports and possible future optimization of the system.

9. **Commenting Organization:** Ohio EPA
Section: Appendix A.1.6 **Pg#:** 7
Comment: Future reports should modify the last paragraph description of uranium adsorption as being a "minor" process. Partitioning equation estimates based on the model's last updated K_d value of 3 L/Kg (year 2003), estimate 19.8 times more adsorbed phase mass exists than dissolved phase mass (Section A.2.5.2). If the slow process of desorption is the primary release mechanism of dissolved phase mass, then significant dissolved mass removal through pore volume flushing should no longer be expected.

Response: Pumping remains effective for now, given that 503 pounds of uranium were removed from the aquifer in 2017. DOE acknowledges that pumping alone may not remain effective as the remedy progresses and that desorption plays an increasingly important role in the ongoing remedy.

Action: If the specific sentence is used in the 2018 SER, the word "minor" will be removed from the subject paragraph. Text will be added to better address Ohio EPA's concerns regarding the role that the slow process of desorption can play in affecting cleanup progress.

10. **Commenting Organization:** Ohio EPA
Section: Appendix A.2.1.1.3 **Pg#:** 7
Comment:
Ohio EPA requests continued updates on direct-push ground water uranium sample results, from the vicinity of former monitoring well 3821. Updates are requested to validate the hypothesis used as the basis for abandoning monitoring well 3821. Monitoring well 3821 had been increasing in uranium concentration since year 2012, with detections above the FRL. However, the hypothesis used as the basis for abandoning the well was that the increase was artificially biased high, by perched water cascading down a breach in the well casing overlying the screen interval. A downhole camera survey of well 3821 confirmed that water was cascading down the well casing. If cascading perched water was the cause of the uranium increase, then perched sample would presumably be more concentrated. However, the maximum direct push result of 11.7 ug/L was less than that detected in the monitoring well. If local direct-push perched water results continue to be less than that formerly detected in monitoring well 3821, then a replacement monitoring well might be necessary.

Response: DOE will continue to share and report direct-push ground water uranium sampling results near the location of former monitoring well 3821 with EPA and Ohio EPA. The maximum uranium concentration result reported for 2017 from the nearby Geoprobe was 11.7 µg/L. The groundwater sample was from the Great Miami Aquifer and not from the perched water. The result helps to confirm that with the pathway eliminated, concentrations in the aquifer at the location of the former well have decreased.

Action: DOE will continue to share and report direct-push ground water uranium sampling results near the location of monitoring well 3821 in the SER.

11. **Commenting Organization:** Ohio EPA
Section: Appendix A.2.1.1.4 **Pg#:** 7
Comment: The last paragraph of this section should provide more detail including the location (SWD-09) and high uranium concentration (2,087 ug/L). The maximum exceedance for the current reporting year should also be stated in this section in all future reports. It should also be noted that this is a significant exceedance of the FRL of 530 ug/L.

Response: See Response to Comment 5.

Action: See Action to Comment 5.

12. Commenting Organization: Ohio EPA
Section: Appendix A.2.5 **Pg#:** 28
Comment: In future reports, please modify statement that the Ricker method requires fixed sample locations. Fixed sample locations are ideal, but not required. The method simply estimates average dissolved mass based on the distribution of sample locations. As the plume contracts, direct push locations are moved upgradient to more accurately bracket plume extent.

Response: The text referred to in the comment pertains to the 2016 SER and why Geoprobe data was not used for the 2016 analysis. The 2017 SER explains that Geoprobe data was used. This change was made after receiving clarification from Dr. Ricker in 2017 that inclusion of Geoprobe data in the analysis is acceptable.

Action: No action required.

13. **Commenting Organization**: Ohio EPA
Section: Appendix A.2.5 **Pg#:** 30
Comment: To improve future evaluation of remedy efficiency, we recommend the next report include an updated estimate of total adsorbed uranium mass. Adsorbed phase mass could be significantly greater than the 3,470.25 pounds estimate, because the input uranium distribution coefficient (K_d) was last updated 15 years ago (DOE report, year 2003). The distribution coefficient represents the ratio of adsorbed average uranium concentration to the average dissolved concentration. Rather than remaining constant, this ratio has probably increased over the last 15 years. Therefore, the adsorbed mass remaining could be significantly greater than the 19.83 times the average annual dissolved mass reported.

Response: In 2017, 503 pounds of uranium were removed from the aquifer. This indicates that pumping for now remains effective in removing uranium from the aquifer to achieve a concentration-based clean up. DOE is committed to removing as much uranium as is possible in order to achieve concentration-based cleanup goals.

The 2017 SER included an estimate of total adsorbed uranium mass based on a K_d of 3. The value of 3 was determined from leachate tests conducted by Sandia National Laboratory. The updated K_d would be needed to provide an adjusted estimate of total adsorbed uranium mass and would require new data to be collected.

Action: DOE will work with EPA and Ohio EPA to determine if and what improvements can be made to improve predictions of when the groundwater remediation will be completed, including possible redefining K_d, to provide a better estimate of total adsorbed uranium mass that may be remaining in the aquifer. Results will be reported in the annual Site Environmental Reports.

14. **Commenting Organization:** Ohio EPA
Section: A.3.1 **Pg#:** 3
Comment: Groundwater Elevations and Capture Assessment

a. In the next report, the legend in capture zone Figure A.3-5 should identify the 10-year advective time of travel zone used to predict the remedy's hydraulic containment area.

b. The next report should also discuss how long the extraction system can be off before hydraulic containment is lost. Clarification should be provided whether the estimated time is based on the conservative assumption of advective transport, or a retardation factor of 12 (uranium transport velocity equal to 1/12 ground water velocity).

Response 14 a: The particle paths presented in Figure A.3-5 represent the path that each particle is predicted to travel in 10 years during each of the three pumping stages modeled for cleanup. This is described in Section A.3.1 of the report.

Response 14 b: A discussion of how long the extraction system can be turned off before hydraulic containment is lost is provided in Section 5.4, Wellfield Operational Objectives in Attachment A, Operations and Maintenance Master Plan of the LMICP.

Action 14 a: The legend in capture zone Figure A.3-5 will be modified as requested.

Action 14 b: No action required.

15. **Commenting Organization:** Ohio EPA
Section: A.4.0 **Pg#:** 2
Comment: Non-Uranium Final Remediation Level Results

a. Future reports should note that in addition to uranium, four of the non-uranium constituents with concentrations above respective FRLs are also REDOX sensitive. The stability of uranium, manganese, and molybdenum species is controlled in large measure by a ground water's oxidation reduction status. In addition, the degradation potential of nitrate and trichloroethene is influenced by oxidation reduction status.

b. Regarding cases where manganese is above its FRL of 900 ug/L, Ohio EPA recommends future discussion of whether a correlation exists with negative oxidation reduction potential (ORP) measurements and elevated total iron. Correlation can help distinguish whether elevated manganese is attributable to residual process chemical, or desorption of native manganese under anaerobic conditions. Negative ORP measurements and manganese results greater than the secondary MCL of 50 ug/L provide good indication that at least anaerobic manganese reducing conditions conducive to the desorption of native manganese exist. As stated in Section A.4.2.1 (Background), for those cases outside the operation design remediation footprint, "if an FRL exceedance is determined to be persistent, then the cause will be identified." Such persistence has been identified for monitoring well 22204, just east of the OSDF, since year 2004.

Response 15 a: DOE agrees with the comment.

Response 15 b: There were 2 wells reported in 2017 where manganese concentrations were above the FRL: Well 22204 and Well 2010. Well 222014 is located outside of the restoration footprint: well 2010 is located in the former waste storage area, within the capture footprint.

The cause for the persistent manganese exceedance at monitoring well 22204 (outside the remediation footprint) is not attributed to the presence of a localized manganese plume that requires remediation. As reported in the SER, additional characterization of the area near the OSDF for manganese was conducted in 2008. Given lack of a definable plume from the 2008 sampling, the cause is attributed to a background value that was defined in the remedial investigation or to biofouling at the well.

Well 2010 is located in the former Waste Storage Area, which is within capture of the remediation system. DOE will revisit this issue as the certification stage of the cleanup approaches and if it appears that the manganese FRL will not be achieved in this localized area.

Action 15 a: DOE will include information in future reports concerning redox sensitivity of groundwater constituents with FRLs.

Action 15 b: No action required.

16. **Commenting Organization:** Ohio EPA
Section: Appendix A.4 **Pg#:** 2 and 8
Comment: Five non-uranium constituents are listed on the summary table on page 2 as having an FRL exceedance however the value of exceedance is not listed anywhere in Attachment A.4. The values are listed on page 54 of the report, however, in future reports, please ensure this information is also in the appropriate Appendix. Please add a column to Table A.4-1 to list the maximum exceedance for that reporting year.

Response: DOE agrees with the comment.

Action: DOE will add a column that presents the value of the maximum FRL exceedance for the reporting year to Table A.4-1 in future reports.

17. **Commenting Organization:** Ohio EPA
Section: Appendix A.5.1 – A.5.8 **Figure:** Bivariate Plots for all cells
Comment: There is no indication of time range represented on each cells bivariate plot figure. Perhaps under "Cell 1" you can add the years, such as "2003 to present".

Response: DOE agrees that reference to a time range would be beneficial.

Action: DOE will include the time range being reported in all bivariate plot figure titles.

18. **Commenting Organization:** Ohio EPA
Section: Appendix A.5.6.1 and A.5.6.3 **Pg#:** 1 and 3
Comment: In the 5th paragraph on page 1 and the second bullet on page 3, please acknowledge that there is an upward trend in Total U in the LDS of Cell 6 should this trend continue for the 2018 report.

Response: See Response to Comment 3.

Action: See Action to Comment 3.

19. **Commenting Organization:** Ohio EPA
Section: Appendix A.5.6 **Pg#:** 1 and 18 **Figure:** A.5.6-19
Comment: Page 1 of sub-attachment A.5.6 describes the uranium-sodium bivariate plot for Cell 6 as showing separate and distinct sample populations. Though still separate and distinct, the sodium-uranium bivariate plot and the uranium time series plots show LDS uranium concentrations trending toward that in the LCS. Therefore, the next report's Cell 6 bivariate plot should label the earliest and latest LCS and LDS sample dates to distinguish sample population trend. If the increasing trend continues into next year, more explanation should be provided, including discussion of leakage rate, the primary means of leak detection. A trilinear diagram displaying potential change in major ions for the LCS and LDS populations could add a useful line of evidence for assessing potential mixing.

Response: DOE agrees that adding the earliest and latest LCS and LDS sample dates to the bivariate plots would be beneficial. If the increasing trend continues into next year, more discussion will be added to the report concerning the increase. DOE does not want to commit to trilinear diagrams at this time.

Action: The earliest and latest dates will be added to the Cell 6 graph in the 2018 SER.

20. **Commenting Organization:** Ohio EPA
Section: Appendix A.5.6.3 **Pg#:** 3 and 10 **Figure:** A.5.6-6A
Comment: Please refer the reader to Figure A.5.6-6A which shows the upward trend in Cell 6.

Response: See Response to Comment 3.

Action: See Action to Comment 3.

21. **Commenting Organization:** Ohio EPA
Section: Appendix A.5.8 **Pg#:**
Comment: Similar to OSDF Cell 6, the LDS data for Cell 8 is showing an upward trend in Total U (as well as other parameters). Please ensure that in future reports this is fully documented, referenced and explained in the Results section as well as in the Summary and Conclusions.

Response: See Response to Comment 4.

Action: See Action to Comment 4.

22. **Commenting Organization:** Ohio EPA
Section: Appendix B.1.1.1 **Pg#:** B-2
Comment: Given the significant uranium concentrations reported in SWD-09, future reports should discuss perched water lateral fate and transport to swales, and possibly Paddys Run. Uranium plume cross-section D-D' (Attachment A.2, Page 77, Figure A.2-25), transecting the former Waste Storage Area, illustrates that ground surface overlying the plume center intercepts the glacial till (aquitard) upon which perched water is thought to rest. While the aquitard should limit vertical infiltration, perched water might have the potential to migrate laterally to lower elevation swales, through gravity drainage.

Response: This information is contained in Section A.2.1.1.4. There are two areas located in the Waste Storage Area drainage basin where perched water may migrate laterally via gravity drainage: the swale west of Waste Pit 3 (monitored by sampling locations SWD-05 and SWD-09) and the former Waste Pit 3 excavation (monitored by sampling location SWD-04). It should be recognized that the ponded water in these two areas would include a large portion of surface water draining through the area during rain events and a small volume of perched water daylighting into the excavation via seasonal seepage. The swale west of Waste Pit 3 is dry during much of the year.

Note that surface water within the swale west of Waste Pit 3 does not normally reach Paddys Run. The post-remediation design of the Waste Storage Area was to provide expanded floodplain, and an inlet to the north was constructed to allow for periodic flooding. The swale typically floods one or two times per year, with water entering from the main channel of Paddys Run as water elevations rise. When this happens, floodwater either infiltrates into the ground or flows back out of the swale and into Paddys Run once high flows recede.

Action: No action required.

Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

January 8, 2019

Ms. Sue Smiley
Fernald Preserve Manager
U.S. Department of Energy
Office of Legacy Management
10995 Hamilton-Cleves Highway
Harrison, Ohio 45030

Re: US DOE Fernald Environmental Mgmt
Project
Remediation Response
Project Records
Remedial Response
Hamilton County
531000297001

Subject: CONCURRENCE – TRANSMITTAL OF RESPONSES TO OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE 2017 FERNALD PRESERVE SITE ENVIRONMENTAL REPORT, OCTOBER 15, 2018

Dear Ms. Smiley:

Ohio EPA has received and reviewed DOE's Response to Ohio EPA Comments on the "2017 Fernald Preserve Site Environmental Report," dated May 2018. Based on Ohio EPA's review, we approve of DOE's responses to comments (dated October 15, 2018) and their incorporation into the 2018 Fernald Preserve Site Environmental Report.

If there are any questions, please contact me at (937) 285-6455.

Sincerely,

Laura Hafer
Fernald Project Lead
Division of Environmental Response and Revitalization – Federal Facilities Section

ec: David Seely, U.S. EPA
Bill Hertel, Navarro, Inc.
Tom Schneider, Ohio EPA

LH/tsf