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Subject:	BFFs Phase II RFI NMED Concerns
Date:	Tuesday, October 21, 2025 2:35:00 PM
Attachments:	Items Requiring Clarification from the BFFs Phase II RFI.docx

Good afternoon,

Attached to this email is a document containing NMED concerns on the BFFs Phase II RFI. This document was compiled from the items NMED and Kirtland Air Force Base had discussed in multiple meetings throughout the past few months.

As we had discussed, please send a response that addresses each of these items with the proper clarification and/or additional information as needed.

If you have any questions, feel free to email Sam Bollinger at Samuel.bollinger@env.nm.gov or give me a call at 505-490-5808.

Regards,

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The New Mexico Environmental Department (NMED) received the Phase II Resource Conservation And Recovery Act Facility Investigation Report For Solid Waste Management Units ST-106/SS-111 Bulk Fuels Facility Release, April 2025, (Report), with cover letter dated March 28, 2025, on April 29, 2025.

To facilitate a thorough review of the report, NMED is requesting some additional clarification and supplemental material related to the items contained within this document.

Please respond to this email with clarifications for the following items below:

1. The Phase II RFI presents what can be seen as two separate models for the downward migration of LNAPL: one where the LNAPL pools at the clay layers until the hydrostatic head is sufficient to permeate the layer, and one where the LNAPL slowly migrated downwards through preferential flow paths in the discontinuous clay layers. The Permittee must clarify the current understanding of how the LNAPL progressed downward through the vadose zone:

    - The Permittee must state if both mechanisms are considered equally likely, based on the available evidence, to have occurred and if it is unknown which mechanism happened, or

    - The Permittee must state if both processes are considered to have occurred and that some portion of LNAPL pooled at the clay layers and overcame hydrostatic forces to proceed downward, while other portions flowed along preferential pathways in a long and tortuous way downward.

    The Permittee must provide a robust discussion that summarizes the available data presented within the RFI that supports the model of downward migration determined to be most likely to have occurred. If the Permittee considers both models to be equally likely, the Permittee must demonstrate that the usage of two models will not affect the deployment and function of any future remedies.

2. The Phase II RFI describes the contaminants as essentially pooling along some of the clay layers before overcoming the hydrostatic head and proceeding downwards through the vadose zone. The Permittee must expand on this with a discussion that identifies locations within the site where this was observed, including these locations in the updated cross sections and other figures as needed. The discussion must include all available lines of evidence of these observations. If the pooling is suggested by lines of

evidence, but not observed at the site, provide a discussion on the lines of evidence that suggest this.

3. The Phase I RFI required the submittal of searchable/sortable analytical data from the above 20 ft bgs investigation/excavation that was a part of the former pipeline investigations. In response to NMED Comment 1 of the approval with modifications for the Phase I RFI, located in Appendix A-2 of the Phase II RFI, the Permittee states that a searchable/sortable dataset of the confirmation samples from the 2012 and 2014 former pipeline investigation have been included in Appendix H-2 of the Phase II RFI. Appendix H of the Phase II RFI presents historical groundwater elevations and hydrographs for select wells, while Appendix C-2 presents the analytical data from the 2014 former pipeline investigation. The analytical data contained within Appendix C-2 is only from the year 2014. The Permittee must provide clarification on why only the 2014 data was included (as discussed, cite the 2012 removal action, point to the documentation of the action, and include any other pertinent details).

4. NMED Comment 26 for the Phase I RFI further requires at least two aquifer tests to be conducted at the site, one at the source area, and one at the leading edge of the EDB plume (the Trumbull well field is given as an example). Section 7.2.2.1 of the Phase II RFI describes how transmissivity values were estimated using data from aquifer tests "mostly in City of Albuquerque drinking water supply wells". The Permittee must clarify which wells were used for these estimates along with the associated dates and times that these aquifer tests were performed. The Permittee must expand on the methodology used for these estimates and clarify how the referenced report Geologic Framework and Hydrologic Conditions in the Albuquerque Basin, Central NM (Thorn et al., 1993) was used to derive the estimations provided within the section.

   Additionally, the Permittee must provide a detailed discussion that demonstrates why an aquifer test within the source area was not necessary. This discussion must include what standards were used to make this determination and provide all available lines of evidence that shows that the material used to define the aquifer properties is sufficient for understanding of site conditions.

5. Section 7.2.2.4 of the Phase II RFI states that "Additional pump testing was performed in 2021 which included injection well KAFB-106IN2". The Permittee must clarify if other pump testing was included in this event aside from KAFB-106IN2. The Permittee must also provide a discussion of the location of KAFB-106IN2 relative to the site and must

demonstrate that the data obtained from this location is representative of the conditions at the site.

6. NMED Comment 26 of the Approval With Modifications for the Phase I RFI notes that the Aquifer Test Report for Groundwater Extraction Well KAFB-106228 indicates that the aquifer test was unsuccessful. The Permittee states in the Phase II RFI that the aquifer test for KAFB-106228 was successful. The Permittee must provide a discussion that demonstrates that the aquifer test for KAFB-106228 was a successful test. The discussion must include any issues that affected the test and provide evidence for why these issues did not affect the applicability of the data.
7. The Phase II RFI presents hydrocarbon/contaminant removal volumetric estimates throughout the Phase II RFI (e.g., Executive Summary, Section 2.2.1, Section 7.6.1, and others). Add statements along with each of these estimates to clarify that these numbers are estimates and that they are being used within the RFI for illustrative purposes only.
8. Section 2.3.4 describes the modified bioslurping systems as featuring a small diameter drop pipe. Page 5-2 (5th paragraph) of the Phase I RFI states that the bioslurping systems did not have a small diameter drop pipe. The Permittee must clarify whether this feature was a part of the design or not and clarify the discrepancy between the two RFI documents.
9. NMED Comment 11 from the Phase I RFI approval with mods, and the Permittee's response to the comment, indicate that there was an issue with airtight seals on the SVMPs present at the site at the time. From context, it appears that this issue was rectified post-2016. The Permittee must clarify if the issue with the seals was rectified and provide a brief discussion of this issue.
10. The Quant-ArrayTM-Chlor and reduced gases (Hydrogen/Methane/Ethene/Ethane) Study was removed from the Phase I RFI due to multiple issues. Section 3.2.1 (pg. 3-6) of the Phase II RFI presents Quant-ArrayTM-Chlor as a method used for analysis of cores collected in the vadose zone. The Permittee must provide clarification that core analysis is unrelated to the Quant-ArrayTM-Chlor study that was removed from the Phase 1 RFI.
11. The status of the supply well KAFB-03 is unknown, though monthly sampling results for this well are included in the Phase II RFI. Provide a brief description of the current and historical usage for KAFB-03.

12. In response to NMED Comment 3 of the second revision of the SZC Report, the Permittee states that "All relevant data will be utilized to define the horizontal and vertical extent of LNAPL within Section 3.1.2.2 of the RFI Phase II.". The Phase II RFI does not contain a Section 3.1.2.2. Section 3.1.2 describes the groundwater monitoring activities completed for the SZC, and it does not appear that a missing section on LNAPL extent was left out. The Permittee must define where the information the horizontal and vertical extent of LNAPL is found within the Phase II RFI.

13. In response to NMED Comment 4, Permittee defends the usage of the description "diffused and dispersed" LNAPL at the site, and states that Section 6.2.3 through Section 6.2.5 of the Phase II RFI demonstrate that the usage of this description is accurate. The Permittee must clarify what Sections of the Phase II RFI include this information as Sections 6.2.3 and Section 6.2.4 discuss LNAPL field screening results and analytical results, respectively, and Section 6.2.5 does not exist in the Phase II RFI.

14. In response to NMED Comment 5, the Permittee states that as NMED did not define the "Qualitative Soil Vapor COCs", the Permittee would use numerical soil vapor concentrations to bound the nature and extent of the SV plume and define the LNAPL migration pathway in Section 6.1.3 of the Phase II RFI. Section 6.1.3 of the Phase II RFI does not exist, and it appears that this information is included in Sections 6.1 and 6.2. Clarification is needed on where this information is included in the report.

15. In review of the second revision of the SZC Report, NMED requested cross sections and specified the requirements of what needed to be included in the cross sections. After reviewing the cross sections provided in the Phase II RFI, there are multiple deviations from the requests as well as other issues that need to be addressed. As discussed in the meetings between NMED and KAFB, the Permittee must submit a comprehensive document (referred to in the meetings as a "nexus") that addresses all concerns related to the cross sections presented in the Phase II RFI. Below are some issues identified in relation to the NMED requirements for cross sections from the SZC report.

    a. The Cross Sections needed to include lithology based on USCS classifications as logged by a field geologist. There were a few issues with the presentation of this information:

        i. **All Transects:** USCS lithologic identification is presented on the cross sections only for select wells on most of the transects. The Permittee needs to specify why this was done (e.g. left out to reduce clutter, certain wells were not logged during drilling, etc.).

ii. **Transect A-A':** KAFB-106244 is labeled as "Projected". The Permittee needs to explain what the use of this term signifies. A projected lithology is not appropriate to be used as a defined data point in the cross section.
iii. **Transect B-B':** USCS classifications are not included in the cross sections for this transect. All cross sections must include USCS classifications.
iv. **Transect D-D' through J-J':** The lithologic classifications change for these transects and are not as detailed. The Permittee must use the same classification for all cross sections, or explain what the differences in classification are and why there was a need to change the classification scheme.
v. **Transects H-H' through J-J':** There are black bars on the lithologic logs that do not have a corresponding lithologic identifier in the key. The Permittee must identify what these black bars represent.

b. Depth to water at the time of drilling was required to be indicated for each transect, as well as historic high, intermediate, and low levels:
i. **Transect A-A' and B-B':** The required water levels are not shown on any of the cross section figures presented for Transect A-A' or B-B'. The Permittee needs to include this information for all transects.
ii. **Transects C-C' through F-F':** A water level is depicted for "2001-2011". The Permittee must clarify what is meant by this timeframe, as it is unlikely that the water levels stayed the same for a period of 10 years.
iii. **Transects G-G' through J-J':** Water levels were not provided for any of these transects. The Permittee needs to include these levels for all cross sections (at least presented on one cross section figure per transect) or provide a comprehensive discussion on why they were not included.

c. Surface features were required to be included on the top horizontal axis of the cross section such as the FFOR, Ridgecrest Drive, Bullhead Park, etc.
i. **Transect A-A' and Transect B-B':** None of the surface features are indicated on the top horizontal axis, but they are shown (unlabeled) on the small aerial photo included at the bottom left of the figures. Provide surface features at the top horizontal axis for easy reference.
ii. Transect F-F': Ridgecrest Blvd is not depicted on any of the cross section figures for this transect.
iii. **Transects G-G' through J-J':** See comment for Transects A-A' and B-B'.

d. **PID results were required to be included on the cross sections; some cross sections are missing these readings. All PID readings have a minimum detection range of 0-1000 ppm. The Permittee must discuss the limitations of this range, as it does not**

distinguish between a sample in the 20 ppm range and a sample in the 900 ppm range.

i. **Transect A-A':** No PID results were included for this transect. The Permittee must include PID results or state that there were no PID readings available for the wells/borings within the transect.
ii. **Transects B-B' through D-D':** The cross sections provided for these transects only contain PID results for select wells. The Permittee must include PID results for all wells or include a list of wells/borings within the transect in which there were no PID readings available.
iii. **Transect F-F':** See Transects B-B' through D-D'.
iv. **Transects G-G' through J-J':** PID readings are not included for any of the figures for these transects. The Permittee must include PID results or state that there were no PID readings available for the wells/borings within the transect.

e. **UV screening results were required to be included on the cross sections. For all cross sections that do not include this information, the Permittee must clarify if the UV results were not included or are not available for each well/borehole.**

i. **Transect A-A':** No UV screening results were presented on any of the figures for this cross section.
ii. **Transect B-B':** The list of acronyms for Figure 7-5-D includes UV, but there is no mention of UV screening on the key.
iii. **Transect C-C':** UV markers are shown without any identification (it is assumed that these markers indicate areas within the vadose zone where the UV response was positive). A brief discussion of the UV response is needed, along with the spectrum range used for positive identification.
iv. **Transect D-D':** See comments for C-C'. Also, there are multiple boreholes indicated by the figure for this run. Explain whether there are multiple wells in this set with positive UV detection or otherwise indicate which well had UV run.
v. **Transect E-E':** UV is included in the list of acronyms for Figure 7-8-D, but no boreholes on the figure indicate that UV run was completed. If there were any boreholes that had UV run, include them in the figure.
vi. **Transect F-F':** See previous comments.
vii. **Transects G-G' through J-J':** None of these transects include UV analysis. If there were any boreholes within the transects that included UV analysis, they need to be included in their corresponding figures.

f. **Depths of samples collected for laboratory analysis and the results of the analysis were requested to be depicted at the appropriate depths for each cross section.**

i. **Transect A-A':** This information was not included for this transect. Add the information to the transects, or provide a discussion if there

is a compelling reason why this data was not included for this transect.

ii. **Transects B-B' through F-F':** The only data included is for EDB and Benzene. If Benzene is being used as an indicator for all BTEX compounds, provide a robust discussion about the merits of this approach, as well as any data gaps that may potentially emerge from using the dataset in this manner.

iii. **Transects G-G' through J-J':** The information was not provided for these transects. Add the information to the transects, or provide a discussion if there is a compelling reason why this data was not included for these transects.

g. **The depth to LNAPL was required to be depicted in the cross sections,** and although Transects B-B' through F-F' give data from which LNAPL depth may be inferred, the Permittee did not depict the projected depth to LNAPL in the cross sections. The Permittee also did not give any LNAPL data for the remaining transects.

h. **Geological and geophysical issues in the cross sections:**

i. Steel centralizers are present on many of the wells at the site. The centralizers affect the readings of the resistivity logs and need to be identified. The Permittee must identify all wells that included steel centralizers in their construction, and identify at what interval they are present within the cross sections. Provide a discussion of the centralizers and their effect on the resistivity logs.

ii. Provide a detailed discussion on the pros and cons of ARCH drilling in regard to geologic logging (potential issues such as losing fines, mixing layers, etc.). Include a discussion that identifies wellbores that were not both geologically and geophysical logged. Discussion should note these wellbores and detail what uncertainties with identification were encountered when determining the lithology.

iii. Calibration issues were identified for some of the geophysical logs of wellbores within the site. Provide a discussion that identifies the affected logs and provides the rationale for their lithologic interpretation. Discuss any issues and uncertainties related to these improperly calibrated logs.

iv. Page 7-5 of the Phase II RFI states that "Gamma logs were not used on the cross sections due to the presence of a 'hot sand' in the locality consisting of feldspars and heavy minerals that result in high gamma value like in clay…". Provide a more in-depth discussion of this issue along with sample cross sections showing the gamma and the "hot sand" zones in relation to the lithology as determined in the cross sections provided in the Phase II RFI.

v. Provide a comprehensive guide to the construction of the cross sections (specify that the information requested in previous comments for the cross section was included). Discuss the reasoning for each lithologic layer displayed on the cross sections and what resources were used to make each decision.

16. Using the updated cross sections, inclusive of all the changes requested in this letter, the Permittee must expand on the lithologic understanding of the site. The Permittee must provide an in-depth discussion of the lithologic structure of the site as depicted in each cross section. This description must make use of all available lines of evidence to provide a robust and comprehensive description of how each lithologic determination was constructed and what factors (data/literature/site knowledge) were used as a basis for these determinations. This discussion should differentiate between silts and clays identified at the site and on the cross sections.

17. The SZC states on page 5-11 that 11 samples were collected from KAFB-106S7, KAFB-106S8, and KAFB-106247. The lab report also states that all mentioned samples were submitted to the lab for microbial analysis. In the attached lab reports, three samples from KAFB-106S7, two samples from KAFB-106S8, and three samples from KAFB-106247 are listed. The Permittee needs to either correct the text to eight samples, or provide the missing analysis. Additionally, the Permittee discusses an unidentified substance that potentially interfered with the PCR. The Permittee must provide a brief discussion on the interference and if there was ever any identification of the substance causing the interference.

18. The request letter for deferment of the air-lift enhanced bioremediation pilot test mentioned in the report for KAFB-106S1 never received an official response. The Permittee included a copy of the well construction diagram that had a note scribbled on it that appeared to provide NMED approval from a previous NMED official. The Permittee must provide additional information and material on this matter, such as email correspondence relating to the matter, and provide a discussion detailing what happened regarding the approval process.

19. The Permittee stated that an additional discussion of the effects of groundwater rise in relation to dissolved contaminants was added to the last paragraph of Section 5.3 of the SZC Report. The last paragraph of this section does not appear to have been altered in any way. The Permittee must clarify where the additional discussion was added.

20. Hold time flags were required by previous NMED comments to be listed for Appendix J. Although Appendix J-2 includes the identification of these flags, Appendices J-1 and J-3 do not include hold time flags as part of their data qualifiers listed in the footnotes. If this is because no samples exceeded the hold times for the datasets listed within the appendices, this should be stated.

21. In response to NMED comment 27, the Permittee lists examples of field documentation that supports the usage of 55-gallon steel drums for IDW collection and storage along with their locations within Appendix F. Many of these locations are off by a page or two or are in a slightly different location. The Permittee must accurately direct the reader to the material.

22. The Permittee was required to include a discussion and evaluation of contaminants present at the site that are not related to the fuel spill at the BFFs. In the RTC's, the Permittee states that these contaminants are discussed in Sections 6.1.2 and 6.2.2.3 of the Phase II RFI. Although Section 6.1.2 contains the required material, there is no Section 6.2.2.3 within the Phase II RFI, nor is there pertinent information contained within Sections 6.2.2 or 6.2.3. The Permittee must clarify if and where more information on non-fuel spill related contaminants present at the site is provided.

23. The RTC states that a discussion of benzene concentrations north of Ridgecrest drive was included in Section 6.2.2.2 of the Phase II RFI. The actual location of this information is in Section 6.1.2.2. The Permittee must clarify that there is not missing additional information related to this.

24. The RTC states that a footnote was added to Table 5-7 specifying which laboratory soil moisture content data set was used, along with the rationale for its use. Although the footnote did specify which data set was used, the footnote did not adequately provide the rationale for each datasets usage. The Permittee must provide a discussion that describes the rationale behind each data choice.

25. As discussed in the meetings between NMED and KAFB, the provision of a "clean" version of the SZC report, along with an updated response to comments containing accurate Phase II RFI references, would clear up many technical issues that were noted by NMED for the SZC report.

26. KAFB-106V1-252 and KAFB-106V2-252 had maximum benzene concentrations recorded in Q4 2019 after which concentrations decreased by an order of magnitude. KAFB-

106116-250 and KAFB-106117-250 have soil vapor concentrations that were measured in the tens of thousands µg/m3 to barely detected after 2018. Provide a discussion as to why soil vapor concentrations would decrease by orders of magnitude between monitoring events.

27. Provide an expanded discussion on how the term 250 ft clay layer is used within the report to denote a discontinuous layer that is approximately 250 ft deep rather than a layer that is continuous throughout and limited to 250 ft. Describe the observed depth and height variations within this layer and provide examples of these variations.

28. Provide a depiction and a discussion of the vertical component of the LNAPL smear zone.

29. Soil vapor monitoring point KAFB-106115 has elevated benzene and EDB concentrations at the 450-ft monitoring interval and is located 1000 ft SE of the source area. Provide a brief discussion on this monitoring point.

30. Soil vapor and soul analytical data indicate fuel migration as far as KAFB-106142 (supported by analytical data from KAFB106S5). Provide a brief discussion on these data points.

31. Expand/reinforce the discussion of water level rise that notes any stability in water levels observed. Include any data that indicates that the LNAPL footprint within the water table is not expected to expand past the maximum observed boundaries.

32. Provide a brief discussion on the differences between the datasets obtained from inundated wells and wells screened across the top of the water table. Discussion should describe how each are used, and should make note of any observed trends within each set.

33. Section 7.2.2.3 states that “Contingency well screens were set approximately 50 ft higher than the wells with screens that intersected the water table at the time of installation.” The Permittee must provide a brief discussion/explanation on how this height was determined.

34. Elevated heated headspace readings were detected in the vadose zone at KAFB-106V1 and KAFB-106V2. Provide a discussion on these and any other elevated heated headspace readings detected at the site.

35. Significant measurable LNAPL at KAFB-106EX1 and KAFB-106EX2 should be noted in Figure 6-64. A footnote should be added to Figure 6-64 that indicates the status of these wells and the reason for the significant LNAPL measured there. Provide a discussion of LNAPL measurements in these wells through time.

36. Provide a more robust discussion on seasonal variation in sampling data. This discussion should include any observed trends. Describe how these variations affect site understanding or dataset interpretation.

37. An expanded discussion should also be provided for the rationale behind the well selection for multiple analyses provided in Section 6 (Mann-Kendall Trend Analysis, hydrographs, and time series evaluations, etc.). Additionally, the EDB trend graphs should be revised to account for the multiple methodologies used during quarterly sampling.