REGION 5
CHICAGO, IL 60604

November 8, 2024

Michael Gerdenich
BASF Corporation
1609 Biddle Avenue
Wyandotte, Michigan 48192-3729

Re: 60% Intermediate Basis of Design for the Comprehensive Interim Measure Remedy at BASF North Works, EPA ID: MID064197742

Dear Mr. Gerdenich:

On March 4, 2024, Arcadis submitted, on behalf of the BASF Corporation (BASF), the *Draft Basis of Design Report Intermediate 60% Design Perimeter Barrier Remedy* (60% Design). The Intermediate Design was submitted following EPA's May 25, 2023, correspondence selecting a Comprehensive Groundwater Interim Measure presented by BASF in the *Preliminary 30% Design*. The *Preliminary 30% Design* provided the initial design details for site-wide perimeter barriers to contain contaminated groundwater and sediment on-site and systems to treat that groundwater prior to any discharge to adjacent property or the Detroit River. EPA's comments on the 60% Design can be found in Attachment A. The comments fall into one or more of the following three categories:

1. Comments pertaining to Permitting, Geophysics/Clay Layer, and the Inward Gradient that require a separate deliverable on or before March 30, 2025 that will be incorporated into the 95% Design Submittal, which is due on August 11, 2025;
2. Comments that require written response from BASF, which are due on or before March 30, 2025; and
3. Comments that must be addressed within the 95% Design submittal, which is due by August 11, 2025.

To aid in the efficient review of these multiple deliverables, EPA proposes a continuation of monthly calls to continue discussions on all deliverables required by this letter to ensure progress is being made to meet deadlines. To aid in achieving the deadlines above, EPA is amenable to increasing the frequency of meetings. Moving forward, EPA requires BASF to provide a through accounting of the resolution of each of EPA's comments. More specifically, BASF must do the following:

1. For each scheduled meeting with the Agency, provide a set of comments for discussion.
2. Provide any deliverable related to resolution of EPA's comments discussed on the call to EPA by email within 7 calendar days from the date of the call. This could include but is not limited to

redline strikeouts, draft and/or revised language, power points presentations, call summaries, next steps, memos, call agendas etc.

3. Develop and update a tracking table for all the comments included in Attachment A. The tracking table shall be updated to reflect the resolution of EPA's comments and be sent to EPA by email within 7 calendar days of each call with EPA.

Performance Standards

There are several fundamental performance standards for the Comprehensive Groundwater Interim Measure that have been discussed in various monthly calls between EPA, Michigan Environment Great Lakes and Energy (EGLE), and BASF. The first performance standard is that the perimeter barriers must be constructed firmly into the underlying sediment on the property to prevent groundwater flow from leaving the site or passing underneath the barriers. The second performance standard is that the groundwater collection and treatment system must prevent on-site flooding and must mitigate the movement of contaminated groundwater that would otherwise discharge to the Detroit River. In EPA's review, the 60% Design makes great strides towards providing an in-depth proposal to meet these performance standards. However, additional investigations and the deliverables outlined below must be completed prior to submittal of the 95% Design due on August 11, 2025.

To achieve the first technical goal, one preliminary task is that BASF must confirm the depth of the basal clay layer. The clay layer on the BASF North Works Site (Site) is the proposed geologic unit into which the steel sheet pile walls contemplated in the 60% Design must be embedded. This layer in the Site's stratigraphy is identified as a regional basal clay aquitard (~20-30 ft below ground surface) that was deposited by the last glaciation. The 60% Design submittal mentions that BASF intends to have a contractor conduct a pre-drilling program to refine the clay surface and provide additional information on potential for encountering subsurface debris during installation. BASF has proposed conducting a pre-drilling program during construction of the steel sheet pile walls following EPA's approval of the 95% Design. EPA has concerns that to date the depth to the clay layer has not been fully delineated on-Site and its properties for engineering purposes unknown, which may lead to complications during construction. Additionally, the results of a pre-drilling investigation could change major components of the proposed perimeter barrier design.

Given these concerns, EPA requires that the pre-drilling program be completed prior to the August 2025 submittal of the 95% Design. The predrilling and/or pre-trenching program must be completed to locate anomalies identified from the geophysics results, to determine the depth to the clay layer along the perimeter of the site, and to provide material properties of the clay layer for engineering purposes.

Geophysics and Clay Layer Physical Data

Within 45 days of receipt of this letter, EPA requires that BASF submit a predrilling and pre-trenching workplan for EPA evaluation. After EPA concurrence, the results of the workplan must be incorporated into the relevant sections and appendices of the design proposal. In particular, Section 4, Appendix D, and Appendix J, are relevant to the predrilling program. A separate submittal is required that provides results of the predrilling and pre-trenching program. EPA requires that the results of the predrilling investigation be submitted on or before March 30, 2025, for EPA evaluation and then the results will

ultimately incorporate into the 95% Design. Please see comments in Attachment A under Section 4 Perimeter Containment Barrier and Appendices D and J for further detail.

Permitting for Discharges

Additionally, within 60 days of receipt of this letter, BASF must submit a plan for engaging with alternatives to Downriver Utility Wastewater Authority (DUWA) for discharge permitting to EPA. BASF must engage with all relevant permitting agencies regarding the alternative plans for implementation as the selected remedy. This effort must include plans for negotiating permits with multiple entities (e.g., pursuit of a pretreatment permit with the DUWA or pursuit of a state National Pollutant Discharge Elimination System (NPDES) permit). Ultimately, the 95% Design must include alternatives to pursue a discharge permit with multiple entities to account for a variety of permitting scenarios. A separate deliverable must be submitted that outlines the contingency plans regarding permitting and submitted for EPA's evaluation on or before March 30, 2025.

Inward Gradient

On or before March 30, 2025, BASF is required to address EPA's comments on certain design details regarding the inward gradient and incorporate the relevant sections of the design proposal.

EPA accepts the proposed performance inward gradient of 0.5 feet (ft) over a rolling 30 day averaging period of river elevation data as stated in the 60% Design. Please be advised, the performance inward gradient may need to be adjusted in the future to fit with a final remedy and/or changing conditions at the site due to climate change. Accordingly, BASF must include a method to demonstrate that the collection system combined with the perimeter barriers remains effective in containing and collecting groundwater on-site. BASF must propose and implement a plan for alternative methods to inspect, monitor and track the groundwater migration into the groundwater collection and treatment trench. Included in this effort, BASF must also add engineering specifications and contingencies for climate change; including but not limited to, flooding, river changes, and precipitation changes.

EPA requires monthly reporting due on the 5th of each month on the performance inward gradient once the system has completed the start-up phase that is described in the 60% Design. The frequency of reporting can be changed in the future after approval from EPA. The 95% Design must include, but are not limited to, the details for the schedule of monitoring, a schedule for monthly reporting that tracks the 0.5 ft gradient, and trigger actions that BASF must take within 72 hours when the performance inward gradient is not being. Trigger actions include, but are not limited to, increasing the rate of sump operation to remove water, operating the system for a longer period of time to maintain the 0.5 ft gradient, mechanical upgrades to the system if non-compliance with the 0.5 ft inward gradient standard is a frequent event, and written notification to EPA within 48 hours when the 0.5 ft inward gradient performance standard has not been maintained. If any of the additional monitoring of the collection and treatment trench, including tracer testing, demonstrates that the 0.5 ft gradient is not being met, then additional actions must be taken within 72 hours of the failure identified above.

In summary, the following need to be submitted for EPA evaluation:

- On or before March 30, 2025, a written response to address the action items identified in

Attachment A.

- Within 45 days of receipt of this letter, BASF is required to submit a predrilling and pre-trenching workplan.
- Within 60 days of receipt of this letter, BASF must submit a plan for permitting alternatives to be incorporated into the design.
- On or before March 30, 2025, BASF must address certain EPA comments as described in this letter and Attachment A related to the Geophysics, Inward Gradient, and Permitting sections of the design proposal. BASF must incorporate the necessary revisions into the 95% Design.

Addressing the items detailed above will allow for a streamlined review of the 95% Design and ensure that major issues are identified and resolved prior to BASF's submittal of the 95% Design. The 95% Design will remain due for submission to EPA on August 11, 2025, as detailed in the 60% Design.

EPA appreciates BASF's efforts thus far and its continued efforts to address groundwater at the site. Please work with my staff to establish a schedule and process for submittal of the aforementioned deliverables. If you have any questions, please reach out to Valerie Voisin of my staff at voisin.valerie@epa.gov.

Sincerely,

JOSE CISNEROS

Digitally signed by JOSE CISNEROS
Date: 2024.11.08 08:52:54 -06'00'

Jose G. Cisneros
Branch Manager, Remediation Branch
Land, Chemicals, and Redevelopment Division

ENCLOSURES
Attachment A: EPA Comments on 60% Basis of Design

cc: Shilpa Patel, US EPA LCRD RB CAS 2 Supervisor
Doug Lam, US EPA LCRD RB Project Manager
Valerie Voisin, US EPA LCRD RB Project Manager
Elizabeth Garver, Michigan EGLE Environmental Manager
Kimberly Tyson, Michigan EGLE Hazardous Waste Section Manager
Marc Messina, Michigan EGLE Geologist
Christina Herbert, Michigan EGLE

ATTACHMENT A:

EPA Comments on the *Draft Basis of Design Report*

March 4, 2024 Intermediate 60% Design Perimeter Barrier Remedy

BASF North Works,

Wyandotte, Michigan

All comments in this attachment must have a written response to comments in the tracking table on or before March 30, 2025. Additionally, all comments in this attachment must be incorporated into the 95% Design.

Section 2 Site Description and Background

1. ***Section 2.3, PDF Page 14, First Bullet:*** The text refers to the BASF North Works Geotechnical Data Report (Arcadis 2021a). This report contains data used for the design.
    a. ***BASF Action Item:*** In the 95% Design, attach the BASF North Works Geotechnical Data Report to Appendix F.
2. ***Section 2.3, PDF Page 16, Last Paragraph:*** The soil-cement slurry barrier wall type is no longer proposed, additional freeze-thaw evaluations of the soil-cement design mix are no longer needed; instead, all subsurface barriers are proposed as steel sheet pile.
    a. ***BASF Action Item:*** In the 95% Design, add a short discussion to support the proposed decision to use steel sheet piling rather than soil-cement slurry.

Section 3 Perimeter Barrier Remedy Basis

3. ***Section 3.2, PDF Page 17 Proposed Remedy Description:*** This section indicates a funnel and gate system may be considered in the future if site conditions change. Please note that EPA's April 24, 2018, letter cited several components of BASF's prior funnel and gate proposal to be problematic. Any major design change, such as funnel and gate, from the current proposal described in the 60% Design must be submitted to EPA for review and approval.
    a. ***BASF Action Item:*** In the 95% Design, remove references to funnel and gate system or reference EPA's April 24, 2018 letter.
4. ***Section 3.4.2.1, PDF Page 26, Lines of Evidence to Support Inward Gradient Thresholds:*** The last bullet in this section notes that lowering groundwater levels quickly and/or significantly may change the hydrogeologic and/or transport conditions that have been established over time.
    a. ***BASF Action Item:*** In the written response to comments due on or before March 30, 2025, include an evaluation of the Corrective Action Objectives as the remedy relates to quickly changing groundwater levels that may change the hydrogeologic and/or transport conditions that have been established over time.
5. ***Section 3.4.3.2, PDF Page 29, Start-Up Period:*** This section indicates that during the start-up period, the performance standard approach will be assessed to confirm that the proposed averaging time frame and compliance gradient requirements result in an achievable and protective drain compliance elevation. However, the 60% Design does not include criteria for this assessment and how the assessment will be implemented.

a. ***BASF Action Item:*** In the written response to comments due on or before March 30, 2025, ensure that the discussion addresses criteria during the startup period. Also, add how the design includes the capacity to address any future changes that may be needed over the design life of the remedy, since the remedy is designed to be operated into perpetuity.

Section 4 Perimeter Containment Barrier

6. ***Section 4.2.1, PDF Page 35, Rip Rap Shoreline:*** This section describes the driven sheet pile as an appropriate technology to implement along the rip rap shoreline; however, the 60% Design does not reference design calculations demonstrating that a bulkhead wall with tiebacks is not needed at this location. Section 4.3.1.2 (Barrier Alignment), notes that the alignment along the rip rap protected shoreline is set at an offset distance that allows for the construction of the wall using conventional techniques and is protective of the existing shoreline. However, details on how this offset distance was determined and how the shoreline is protected were not provided.

    a. ***BASF Action Item:*** In the written response to comments due on or before March 30, 2025, provide the requested design information and a discussion of how the offset distance was determined and how it protects the shoreline.

7. ***Section 4.3.1.1, PDF Page 35, Material Selection, 1st paragraph:*** This paragraph states that the hydraulic conductivity for this wall type will meet the criteria established from the site groundwater model of 1×10^{-6} centimeters per second (cm/sec) and, when considering the application of a sealant at each interlock joint, is expected to range between 1×10^{-6} and 1×10^{-7} cm/sec.

    a. ***BASF Action Item:***

        i. Attach a copy of the reference for the typical hydraulic conductivity of the proposed sheet pile section to the 95% Design.

        ii. Attach a copy of the reference for the typical hydraulic conductivity of the proposed sheet pile with joint sealant applied to the 95% Design.

        iii. Discuss the efficacy of Solid Solution Products (SSP) joint sealants and any necessary application requirements to improve efficacy update the details of the application of the join sealant as needed.

        iv. In the written response to comments due on March 30, 2025, provide a description and calculations on how BASF will demonstrate the required maximum sheet pile wall hydraulic conductivity of 1×10^{-6} to 1×10^{-7} centimeters per second (cm/sec).

8. ***Section 4.3.1.1, PDF Page 35, Material Selection, 3rd paragraph:*** This paragraph states that for the steel sheet pile walls, the estimated section loss of approximately 0.26 inch or 50% of the pile's design thickness of 0.48 inch over an assumed 50-year design life.

    a. ***BASF Action Item:*** In the 95% Design, provide a justification for why this section loss will not result in degradation of the interim measure's performance and provide reference to sections detailing the repair and maintenance of the perimeter barriers.

9. ***Section 4.3.1.2, PDF Page 36, Barrier Alignment, 1st paragraph:*** This paragraph speaks to a watertight connection to the existing bulkhead is required at its eastern end and will consist of overlapping jet grout columns at the intersection of the two sheet pile walls.

    a. ***BASF Action Item:*** In the written response to comments due on March 30, 2025, provide a rationale for proposing jet columns rather than interlocking new SSP with existing SSP.

10. ***Section 4.3.1.3, PDF Page 37, Pile Depths:*** This section states that suitable materials will be used to backfill trenches prior to sheet pile installation; however, suitable materials are not defined. Since pre-trenching may be required for the sheet pile wall driving installation, what are the compaction controls for "suitable" backfill for those trenches to meet the requirements of the earth pressure designs?

    a. ***BASF Action Item:*** In the written response to comments due on March 30, 2025, describe these materials and reference the appropriate specifications in Appendix K in the 95% Design.

11. ***Section 4.3.1.3, PDF Page 37, 2nd Paragraph:*** This paragraph statess that based on findings from subsurface investigations along the alignments, the pile depths for the northern alignment of the sheet pile wall will vary from approximately 12 feet below proposed grade at the western end to 25 feet at the connection to the existing sheet pile bulkhead. For the southern alignment, the pile depths will range from approximately 17 to 57 feet below proposed grade. These are large ranges in depth. It doesn't appear to be a consistent clay layer, and additional confirmation soil borings to determine the horizontal and vertical extent of the clay layer are required.

    a. ***BASF Action Item:*** Add a figure showing profile view of both alignments including borings with top of clay elevation in the 95% Design. **Additionally, please see EPA comments on Appendix D for further detail.**

12. ***Section 4.3.1.3 Pile Depths and Appendix J, Design Calculations*** – **Please see EPA comments on Appendix D for further detail.**

    a. In general, BASF needs to provide more clarity on the actual top and bottom of clay elevations along the sheet pile wall anchoring alignments and provide more detail on the clay's geotechnical properties along the depth of the clay. Based on the geotechnical logs provided, there are potentially two strength profiles of clay, one with higher Standard Penetration Test (SPT) blow counts (~5 to 10) and one with lower SPT blow counts (~0 to 4).

        i. ***BASF Action Item:*** BASF needs to determine if the minimum clay strength parameters needed to anchor the sheet pile wall are present within the in-situ clay profiles to the embedment depths required.

    b. This section speaks to that "In areas of the alignment where the clay profile is variable, the contractor will be required to conduct a pre-drilling program to refine the clay surface and provide additional information on potential for encountering subsurface debris during installation. It is anticipated that the pre-drilling program will consist of soil borings spaced at 25-foot intervals, advanced to the top of the clay layer, with visual confirmation of the clay surface via sampling. Limits of the pre-drilling program will be provided in the Pre-final (95%) Design for the barrier remedy."

i. ***BASF Action Item:*** BASF must conduct the pre-drilling program prior to the 95% Design submittal and include results of a pre-drilling program as a separate submittal as noted in the letter above. This data will provide more clarity for the sheet pile wall design prior to installation of the wall.

c. After reviewing the 60% Design and the BASF North Works, *Geotechnical Data Report, Barrier Wall Pre-Design Investigation*, prepared by Arcadis, June 28, 2021, the following ***BASF Action Items*** for the geotechnical testing should be performed on the sheet pile wall embedment clay profile during the pre-drilling program to supplement the geotechnical information already gathered for the site:

i. Pocket penetrometer testing on the in-situ clay during drilling, along with the SPT blow counts;

ii. Index testing for the clay including moisture content (ASTM D2216), sieve analysis with hydrometer (ASTM D422), and Atterberg Limits (ASTM D 4318);

iii. Flex-wall permeability testing (ASTM D 5084) of the in-situ clay to further demonstrate that the clay meets the barrier requirements noted in Section 4.3.1.1.; and

iv. Additional strength and consolidation testing on the in-situ clay to determine if the clay profile meets the requirements of the sheet pile wall design for embedment and to account for potential clay settlement after the wall is installed.

13. ***Section 4.3.1.2, PDF Page 36, 3rd Paragraph:*** This paragraph notes that where the alignment falls beneath existing overhead power lines that cross James DeSana Drive, installation of sheet piling is not possible and incorporating another wall technology is required. As shown on the Design Drawings, overlapping jet grout columns beneath the power lines is proposed. Jet grouting in the power line area may not be possible either since the grout rig may not be able to safely access the area. There is potential for the temporary relocation of overhead power lines during construction.

    a. ***BASF Action Item:*** Provide these details and consideration within the 95% Design.

14. ***Section 4.3.2.1.2, PDF Page 37, Upper Trenton Channel Dredging Project:*** This section indicates the new bulkhead design accommodates this current dredge prism design and assumes a 10-foot offset from the face of the headwall starting at the current sediment surface elevation. However, it is not clear why the potential dredging up to the wall was not also included as a contingency. The *Final Basis of Design Report – Remedial Design – Upper Trenton Channel, Detroit River Area of Concern, Wyandotte, Michigan* and the *EPA Great Lakes Architect Engineer Services (GLAES) Contract, Task Order 0018/Contract No. EP-R5-11-09*, dated October 2019, prepared by CH2M HILL, Inc., indicates that the volumes associated with the offsets and allowances would be refined during the remedial design process.

    a. ***BASF Action Item:*** In the written response to comments due on March 30, 2025, provide ways to address removing sediment near the wall as any contamination that is left behind (not dredged due to the shoreline offsets and utility offsets and/or capped) are potentially available for transport.

15. ***Section 4.3.2.1.3, PDF Page 38, Paragraph 3:*** Appendix J includes a summary of the 2020 soil data collected for the bulkhead design. This summary includes an analysis of the SPT and CPT

borings, geotechnical laboratory testing, and in-situ field vane testing in support of selection of the design soil profiles and soil parameters used in this Intermediate (60%) Design. The summary of soil conditions assumed soil parameters, and soil profiles should be presented in the body of the report text, not in an attachment in an appendix of the report.

   a. ***BASF Action Item:*** Provide the summary of soil conditions within the body of Appendix J. **Comment to be addressed following the additional soil-boring collection in the pre-drilling program and no later than March 30, 2025.**

16. ***Section 4.3.2.1.3, PDF Page 39, 3rd bullet:*** This bullet speaks to that a soft to medium stiff layer of lacustrine clay was encountered ranging in thickness from approximately 25 to 43.5 feet in the upland area and from approximately 15 to 25 feet in the river.

   a. ***BASF Action Item:*** Add top of clay layer elevation range and permeability of clay sample test results to this bullet. **Comment to be addressed following the additional soil-boring collection in the pre-drilling program.**

17. ***Section 4.3.2.2.1, PDF Page 39 1st Paragraph:*** This paragraph states that the steel bulkhead structure will consist of an anchored steel sheet pile wall.

   a. ***BASF Action Item:*** Please reference the Comprehensive Interim Measure Remedy Selection correspondence dated May 25, 2023 in the 95% Design.

18. ***Section 4.3.2.2.2, PDF Page 40***

   a. ***BASF Action Item*** Add a table in the 95% Design section presenting the assumed soil profile parameters for each SSP design cross section. **Comment to be addressed following the additional soil-boring collection in the future pre-drilling program and no later than March 30, 2025.**

19. ***Section 4.3.2.2.2, PDF Page 41, 1st bullet:*** Restating this bullet that in consideration of the proposed compliance gradient requirement of 0.5 ft inward gradient, it was therefore conservatively assumed that the water levels on either side of the bulkhead were the same (i.e., no water level differential) and the net hydrostatic pressure on the wall was zero.

   a. ***BASF Action Item:*** The 95% Design should describe and evaluate the hydrostatic pressure on the wall when the groundwater extraction system fails and groundwater rises to typical surfaces while the river level is at lowest water depth.

20. ***Section 4.3.2.2.2, PDF Page 41, Design Criteria and Assumptions: Hydrostatic loads***: This section speaks to the seiche events and its impact on the 0.5 ft inward gradient of the groundwater collection and treatment system. However, the impacts of pressure on the perimeter barriers during seiche events were not included in the discussion.

   a. ***BASF Action Item***: In the 95% Design, add an evaluation of increased pressure on the perimeter barriers during seiche events and the estimated impacts on the perimeter barriers.

21. ***Section 4.3.2.2.2, PDF Page 41 2nd Paragraph:*** This paragraph speaks to an allowable lateral deflection of 4 inches has been assumed for the headwall and is based on criteria developed for other projects of similar bulkhead height and conditions and barrier requirements. Lateral deflection of 4 inches may be excessive. Tieback design must account for this movement.

a. ***BASF Action Item:*** In the 95% Design, provide the basis/reference for the four-inch allowable lateral deflection for the entire length sheet piles walls that are designed for a required maximum hydraulic conductivity.

22. ***Section 4.3.2.2.2, PDF Page 41, 4th Paragraph:*** This paragraph speaks to the assumptions on the bulkhead design criteria are listed in Appendix J.

    a. ***BASF Action Item:*** In the 95% Design, add the assumptions in Appendix J to the relevant text in the design document.

23. ***Section 4.3, PDF Page 42, Table 8: Steel Tie Rods***

    a. ***BASF Action Item:*** In the 95% Design, add the proposed spacing of the tie rods and H pile anchors to the table (currently table 8 in the 60% Design).

24. ***Section 4.3.2.2.3, PDF Page 42, Results of the Intermediate (60%) Design Calculations:*** This first bullet on this page references king piles; however, king piles are not discussed in Appendix J (Design Calculations). As such, it is not clear if king piles are still a design option.

    a. ***BASF Action Item:*** In the 95% Design, revise this section and Appendix J to address this discrepancy.

25. ***Section 4.3.2.3.3, PDF Page 44, Backfill Placement:*** This section indicates details of the backfill materials and placement requirements that will continue to be refined in the next design phase. For completeness, ensure these details in the 95% Design also include a freeze-thaw evaluation for proposed flowable, cementitious grout. This section notes that consolidation will likely occur in the clay unit at the bottom of the sheet pile walls. Were the sheet pile wall earth pressure calculations performed using after settlement conditions for that clay layer? Is there concern that the embedment depth should be adjusted for post-consolidation clay elevations? Has consolidation testing been performed on the in-situ clay to determine the amount of potential settlement?

    a. ***BASF Action Item:*** In the written response to comments due on March 30, 2025, add details of backfill placement and include these details in the relevant sections of the design proposal.

26. ***Section 4.3.2.4.3, PDF Page 45, Buttressing to Increase Passive Resistance:*** This section indicates the finished grade in front of the wall will be higher from placement of the buttress material and the localized stability of the buttress would need further review. However, it is not clear if this review will be done as part of the 95% Design.

    a. ***BASF Action Item:*** Include the information on buttresses described above in the 95% Design.

27. ***Section 4.3.2.3.1, PDF Page 43, 1st Paragraph:*** This paragraph speaks to rock shoes welded to the sheet pile tips will be required to penetrate through the glacial till layer and provide a sound connection to the clay layer. Does the bulkhead sheet pile stability require a minimum embedment of the sheet into the top of the clay layer? Does sheet pile installation need rock socketing? Will glacial erratics and other obstructions cause damage to the steel sheet pile walls during installation?

    a. ***BASF Action Item:*** In the written response to comments due on March 30, 2025, provide this detail to the questions above.

28. ***Section 4.3.2.3.1, PDF Page 43, 4th Paragraph:*** This paragraph speaks to that a sealant will be applied to the sheet pile interlocks prior to sheet pile installation. Various interlock sealants are commercially available and are routinely applied by contractors or fabricators. Sealant material and any installation requirements specific to the project must be included in the specifications. Add this detail to the 95% Design.

29. ***Section 4.3.2.3.2, PDF Page 43, Paragraph 3:*** This paragraph speaks to at the anchor wall, the connection point will continue at the same elevation and intersect the concrete cap at approximately 12 inches below the top.

    a. ***BASF Action Item:*** In the written response to comments and the revised relevant section of the design proposal due on March 30, 2025, add a discussion of how deep the tie rods will be installed below surrounding final grade.

30. ***Section 4.3.2.3.3, PDF Page 44, 2nd Paragraph:*** This paragraph states that settlement monitoring of the fill surface will be performed to assess the progress of consolidation in the clay unit and to minimize strain on the tie rods due to settlement of the fill.

    a. ***BASF Action Item:*** In the written response to comments and the revised relevant section of the design proposal due on March 30, 2025, provide a plan for settlement monitoring, and trigger events to add fill material and the OMM plan.

31. ***Section 4.3.2.3.3, PDF Page 44, 2nd Paragraph:*** This paragraph describes details of the backfill materials and placement requirements will continue to be refined in the next design phase. Design has been changed to an A-frame anchor wall. This change allows for locating the A-frame structure closer to the headwall; however, the structure will require positioning within the anchor zone (existing timber piles and tie rods) of the Wakefield wall to avoid substantial historical foundations. What is the assumed type of backfill material for this report? How is backfill loading included in the bulkhead design calculations? Does the anchor wall interfere with the groundwater treatment collection system in any locations?

    a. ***BASF Action Item:*** Provide these details on the backfill materials in the relevant revised section of the design proposal and a description in the written response to comments due on March 30, 2025

32. ***Section 4.3.2.3.3, PDF Page 44, 2nd Paragraph, Alignment Layout Anchor Walls:*** Discuss the offset of the alignment layouts and depths of the anchor wall vs. the groundwater collection system trenches. Will the anchor wall interfere with the groundwater collection system flow path?

    a. ***BASF Action Item:*** Provide this discussion within the 95% Design and provide a preliminary justification within the written response to comments due on March 30, 2025.

33. ***Section 4.4, PDF Page 46, Paragraph 1:*** The existing bulkhead portion of the barrier system is approximately 3,243 feet and is typically described by sections that reference the historical facility feature, namely the Light Dock, Heavy Dock, and North Central Shoreline.

    a. ***BASF Action Item:*** Add a figure showing the extent of each wall section alignment to the 95% Design.

34. ***Section 4.4.1.1.2, PDF Page 47, Findings from Visual Inspections and Diver Survey:*** This

section notes that other than a number of open lift holes and leakage observed at three waler bolt locations, no other openings, holes, or gaps were noted from the diver survey. However, photograph 85, in Appendix C (Diver Inspection Summary) identifies stations 32+52 – 32+64, as one large problem area that runs an average distance of 3 feet, 6 inches down from the cap, and there are several holes visible. While the visible holes in this photograph are above the water line, this section of the text needs to clarify the findings of the diver survey assessment. Similarly, for photograph 104. Further, photograph 95 notes holes around the 10-inch pipe at station 32+75.

    a. ***BASF Action Item:*** In the 95% Design, revise this section to address the above noted findings from Appendix C and the diver survey.

35. ***Section 4.4.1.1.2, PDF Page 48, Paragraph 4:*** This paragraph describes repairs through this perimeter barrier section will generally include placement of metal plates at the lift holes, sealing between existing pipe penetrations and surrounding sheet piles, sealing of wale bolt connections showing signs of leakage, and placement of fill in eroded areas to the original design grade. Is there evidence of soil leakage through the wall, i.e., documentation of contaminated sediment or shoaled material? Do shoaled material locations correspond to openings in the sheet piles?

    a. ***BASF Action Item:*** Provide this information within the 95% Design within the written response to comments due on March 30, 2025.

36. ***Section 4.4.1.2.1, PDF Page 48, Paragraph 2:*** A typical cross section for the Heavy Dock section is shown on the Design Drawings (Appendix G).

    a. ***BASF Action Item:*** In the 95% Design, please reference the specific sheet number.

37. ***Section 4.4.1.2.2, PDF Page 49, Paragraph 3:*** With respect to corrosion or section loss, the diver survey noted nine areas of corrosion across this section, with two of the areas described as containing significant or heavy corrosion. As shown on the data charts included in Appendix C, one thickness measurement point within the Light Dock section is below this tolerance range and eight points are above it. Additionally, twelve thickness measurement points are below this tolerance range and could be indicative of steel thickness loss from corrosion.

    a. ***BASF Action Item:*** Provide a rationale for the section loss or corrosion noted within the diver survey within the 95% Design and provide a preliminary justification on section thickness and it's lifespan within the written response to comments due on March 30, 2025.

Section 5 Groundwater Extraction and Conveyance System

38. ***Section 5.1.1, PDF Page 53, Summary of Groundwater Modeling Results:*** This section speaks to the perimeter drain induces a vertical gradient in the units below the fill such that deeper groundwater in the sand unit is captured by the extraction system. However, an evaluation of potential vertical flux from deeper units is not provided. Discuss simulated water budgets and explain whether silt/clay/peat unit separating fill from the deeper sand unit would preclude significant groundwater discharge from the latter to the perimeter drains. The discussion should also qualify the expected performance of the extraction well and associated twenty-one sump network in maintaining the inward gradient for the fill unit as well as an upward vertical gradient induced by the perimeter drain on the deeper units.

a. ***BASF Action Item:*** In the 95% Design, revise this section to include the requested additional details for clarity in understanding future operational and maintenance aspects of the remedy.

39. ***Section 5.1.2, PDF Page 54, Groundwater Extraction System:*** This section indicates that drain lengths and locations required to hydraulically capture groundwater were established based on groundwater model simulations, Appendix B (Draft Groundwater Modeling Report). While it is understood that a non-continuous drain was simulated in the model, it is not clear how the model accounted for the intermittent nature of the collection drains, as presented in the design drawings. For example, there are cases where there is gap in the collections drains of 100-300 feet. As such, it is not clear if this system will create the inward gradient across the entire site boundary.

    a. ***BASF Action Item:*** In the 95% Design, revise this section to provide additional information on the design of the collection drains and any additional data used to determine the location of the drains.

40. ***Section 5.1.2, PDF Page 54:*** This section mentions that there will be two spare extractions well conveyance lines installed on sump 12 near Drain 6. EPA's review was not able to locate this in the drawings. It is also unclear why this sump would need spare lines when it is not located very close to the extraction well in the North-East corner of the site.

    a. ***BASF Action Item:*** Add additional information as to the two spare extraction lines within the 95% Design and provide a written response to comments due on March 30, 2025.

41. ***Section 5.1.2, PDF Page 54:*** The section notes that sumps will extend approximately 5 feet below the drain invert, but the sump detail on C1-79781 shows a 2' sump.

    a. ***BASF Action Item:*** Please correct this discrepancy in the 95% Design.

Section 6 Above Grade Treatment System

42. ***Section 6.2, PDF Page 58, Resin Pre-Design Study:*** For clarity, the forthcoming pilot test report in the 95% Design must explain how BASF selected the Purolite PFA694 resin and quantity.

    a. ***BASF Action Item:*** The resin and quantity are part of the specifications and as such, a rationale for using it is needed in the text of the 95% Design.

43. ***Section 6.4.6, PDF Page 65:*** This section states that to "An existing onsite construction water treatment system was used to determine the target EBCT, and the maximum design flow rate of 120 gpm was used to establish the parameters for the GAC design."

    a. ***BASF Action Item:*** Provide more detail on how this existing system was used in development of the onsite construction water treatment system.

Section 9 Future Considerations

44. ***Section 9, PDF Page 75, Future Considerations:*** This section describes future potential optimization actions to be taken after completion of the design; however, a mechanism for tracking these optimizations (e.g., as part of performance monitoring or OMM) is not presented.

a. ***BASF Action Item:*** Provide further detail on tracking potential optimization actions within the 95% Design and provide written response to comments due on March 30, 2025.

Section 12 Operation, Monitoring, and Maintenance Requirements

45. ***Section 12.1, PDF Page 78, Perimeter Barrier:*** This section proposes inspecting the barrier sections of the remedy every five years. It also notes the frequency will be adjusted, if needed, based on inspection reports or drain compliance elevation monitoring of the groundwater extraction system. Describe the settlement and deflection monitoring methods to be used in this section (i.e., survey plates, vibrating wire piezometers, inclinometers, etc.). EPA requires that settlement and deflection inspections occur annually and after five years, BASF can propose a reduced frequency if BASF can document that no significant settlement or deflection has occurred.

    a. ***BASF Action Item:*** Provide this inspection schedule within the 95% Design and provide a written response to comments due on March 30, 2025.

46. ***Section 12.2, PDF Page 78:*** This section states that "The system will routinely compare data and alert operators of any alarm conditions and/or increasing drain levels...."

    a. ***BASF Action Item:*** Is the plan for the piezometer readings to automatically adjust the pump to increase the flow based on the river compliance elevation, or to feed that information to an operator who will adjust the flows? Provide these details on piezometer readings and changes to pumping raters in the 95% Design.

    b. ***BASF Action Item:*** Provide additional detail for the procedure following alarms, shutoffs, and other components in the 95% Design.

APPENDICES

Appendix A

47. ***Appendix A, PDF Page 115, Draft Perimeter Conceptual Site Model, Section 3, Updated Perimeter Conceptual Site Model:*** This section notes that the sheet pile creates a hydraulic barrier with the Detroit River that acts as a no-flow boundary during pumping tests.

    a. ***BASF Action Item:*** Indicate the source for the pumping test data/results that support this statement in the written response to comments and provide these details in the 95% Design.

    b. ***BASF Action Item:*** In the 95% Design, revise this section and reference the relevant reports to substantiate these statements.

48. ***Appendix A, PDF Page 121, Draft Perimeter Conceptual Site Model, Section 4, Conclusions:*** This section indicated groundwater stability trends were considered and incorporated into the basis of design for the groundwater treatment system; however, no details on how this was considered and incorporated are provided.

    a. ***BASF Action Item:*** Provide a discussion on how the stability trends affected the design in the written response to comments due on March 30, 2025 and in the 95% Design.

Appendix B

49. ***Appendix B, PDF Page 1900, Draft Groundwater Modeling Report, Section 2.1, Model Domain and Grid:*** Since the basic underpinnings of the model were converted from Block Centered Flow to an Unstructured Grid, the underlying math should have been confirmed by conducting a sensitivity analysis of the model parameters to verify consistent variance between the two mathematical approaches. Define the base units for time and distance. Also, the types of layers were not discussed or supported. According to the listing file, all five layers were convertible (LAYCON = 3); please provide justification for these choices. Sensitivity analysis is not addressed in this document. If addressed in prior efforts, it should be acknowledged by citing the document that covered the topic. Additionally, a sensitivity analysis of this configuration of the model should have been conducted with the remedy features to determine what parameters the model is sensitive to so that there can be confidence in the solution.

    a. ***BASF Action Item:*** In the 95% Design, include a history of updating the model, including the grid, and the sensitivity analysis conducted.

50. ***Appendix B, PDF Page 1901, Draft Groundwater Modeling Report, Section 2.2, last paragraph.***

    a. ***BASF Action Item:*** In the 95% Design, clarify that both the fill (Model Layer 1) and native sand (Model Layer 3) are a part of the unconfined aquifer.

51. ***Appendix B, PDF Page 1901, Draft Groundwater Modeling Report, Section 2.3.1 Groundwater Extraction:*** The section speaks to that the extraction rate is known to be on the order of 2 gallons per minute.

    a. ***BASF Action Item:*** In the 95% Design, clarify the basis for the estimate above.

52. ***Appendix B, PDF Page 1901, Draft Groundwater Modeling Report, Section 2.3.2 Drains:*** Conceptualization of the remediation system relies on the new Connected Linear Network

(CLN) feature of MODFLOW-USG, which is insufficiently documented in the report.

a. ***BASF Action Item:*** In the 95% Design, provide additional information on the CLN and its implementation.

53. ***Appendix B, PDF Page 1901, Draft Groundwater Modeling Report, Section 2.3.3 General Head Boundaries:*** More information is needed for the conductance values for this section**.**

    a. ***BASF Action Item:*** In the 95% Design, provide the conductance values and how they were determined. Also clarify whether the assigned water levels were based on field measurements and whether they were assigned uniformly north to south, Layer 1 through Layer 5.

54. ***Appendix B, PDF Page 1901, Draft Groundwater Modeling Report, Section 2.3, Figure 5:*** The figure presents the hydraulic conductivity (K) distribution assigned to Model Layers 1 through 5.

    a. ***BASF Action Item:*** In the 95% Design, to improve readability of layer-specific K zones, please revise to the color legend utilized to the legend used in the Hydraulic PDI Report.

55. ***Appendix B, PDF Page 1902, Draft Groundwater Modeling Report, Section 2.3.5 Constant Head:*** **Clarification is needed for the Fire Pond in the groundwater model.**

    a. ***BASF Action Item:*** In the 95% Design, add a description of the Fire Pond and provide a rationale for not including the Fire Pond in the groundwater model.

56. ***Appendix B, PDF Page 1902, Draft Groundwater Modeling Report, Section 2.3.7 Recharge:*** More information is needed in regards to recharge values and references in Appendix B.

    a. ***BASF Action Item:*** In the 95% Design, provide some examples of the type of cover and the recharge values, with references to data used, that were utilized for that cover type in the groundwater model portion of the design document.

57. ***Appendix B, PDF Page 1903, Draft Groundwater Modeling Report, Section 3, last paragraph, third sentence:*** Clarification is needed in regard to the comparison of the groundwater model residuals to the referenced text on PDF Page 1903. Although "Anderson et al. (2015) indicates that there are no established industry guidelines regarding the acceptable magnitude of residual statistics," in modeling practice the normalized root mean squared error of less than 10% is often used. Both the steady-state and transient model calibrations presented in the report have not attained this criterion.

    a. ***BASF Action Item:*** Add information on the model's comparison to the residual statistics in this paragraph in the 95% Design and provide a preliminary response in the written response to comments due on March 30, 2025.

58. ***Appendix B, PDF Page 1904, Draft Groundwater Modeling Report, Section 3.2.1 Transient Model Setup:*** The recharge multiplier in Table 2 needs clarification. Clarify whether last column multiplier is applied to each zone. The multiplier seems to be linear with the exception of the first stress period. Since the model's base units are feet and days, it seems that the first stress period should have the same multiplier.

    a. ***BASF Action Item:*** Provide the clarification described above in the 95% Design.

59. ***Appendix B, PDF Page 1906, Draft Groundwater Modeling Report, Section 4.1.2, page 7, first sentence:*** The sentence states that "the instantaneous near 30-year historical river low-

elevation level of 569.5 feet observed in 1995." However, the hydrograph on Chart 1 shows higher elevations in 1995.

a. ***BASF Action Item:*** In the 95% Design, clarify or resolve the discrepancy above.

60. ***Appendix B, PDF Page 1906, Draft Groundwater Modeling Report, Section 4.1.3 Drains*:** The documentation does not clearly state if the placement of the drain nodes representing the sumps was based on what is designed or if drain sump placement in the model will determine sump placement in the construction of the remedy. It appears that the CLN features empty to singular drain nodes that represent the sump.

    a. ***BASF Action Item:*** In the 95% Design, clarify this part of the model described above.

61. ***Appendix B, PDF Page 1907, Draft Groundwater Modeling Report, Section 4.1.4 Extraction Well:*** The documentation speaks to one extraction well was employed, but does not state the reason why, where it was placed, or its extraction rate.

    a. ***BASF Action Item:*** Please add this information in the 95% Design and provide a preliminary response in the written response to comments due on March 30, 2025.

62. ***Appendix B, PDF Page 1907, Draft Groundwater Modeling Report, Section 4.2, second paragraph, last sentence***

    a. ***BASF Action Item:*** In the 95% Design, add an underlined word into: "The perimeter drain remedy induces a vertical <u>upward</u> gradient in the lower model layers …." to clarify the sentence.

63. ***Appendix B, PDF Page 1907, Draft Groundwater Modeling Report, Section 4.2*:** EPA review of data provided by the national weather service shows that Detroit receives over 30 inches of precipitation annually, yet the results of the model show only 7 inches of recharge in the high conditions. Recharge is a key piece of information for the design of the drain and treatment system.

    a. ***BASF Action Item:*** Provide more detail on how the recharge conditions are arrived at in the written response to comments due on March 30, 2025.

Appendix D

64. ***Appendix D, PDF Page 2142, Draft Geophysical Survey Results Report, Section 1, Background and Objectives, 3rd Paragraph, 1st Sentence:*** This sentence states, "To address the noted data gaps, Arcadis tested and collected several types of geophysical data between August 14 and September 22, 2023, and performed test pit observations of select geophysical anomalies between October 23 and October 30, 2023." However, several types of geophysical data were evaluated but not tested.

    a. ***BASF Action Item:*** In the 95% Design, change the phrase "tested and collected" to "collected and evaluated" for clarification.

65. ***Appendix D, PDF Page 2143, Draft Geophysical Survey Results Report, Section 1, Background and Objectives, 6th Paragraph, 1st Sentence:*** This sentence states, "GPR technology was selected for testing to potentially obtain several types of pertinent information including: …." However, the technology was not selected for testing because the methods have already been tested when it was developed.

a. ***BASF Action Item:*** In the 95% Design, change the word "testing" to "evaluation" for clarity and readability.

66. ***Appendix D, PDF Page 2143, Draft Geophysical Survey Results Report, Section 1, Background and Objectives, 7th Paragraph, Last Sentence*** The number and model of seismographs was not fully described in the 60% Design.

    a. ***BASF Action Item:*** In the 95% Design, describe the model of seismograph, number of seismograph channels, and frequency of the vertical component geophones (e.g., 8 Hertz) used at the end of the paragraph identified in the beginning of this comment.

67. ***Appendix D, PDF page 2145, Draft Geophysical Survey Results Report, Section 3, Geophysical Methods, Data Collection, and Data Processing, 2nd Paragraph, 6th Sentence:*** This sentence states, "The eddy currents are caused by the interaction of the primary electromagnetic field created by the transmitter coil and buried conductive bodies such as metallic utilities, rebar within reinforced concrete, buried debris, or other metal objects." However, this description is not accurate.

    a. **BASF Action Item:** Change this description for accuracy and clarity to indicate the transmitter generates a pulsed primary magnetic field when its coil is energized, inducing electrical eddy currents in nearby conductive objects. Also, explain that the decay of the eddy currents is then detected and measured by the coils. Further, describe that the EM61 waits between each pulse until the response from the conductive subsurface dissipates, and then measures the prolonged response from buried metal which is recorded in millivolts (mV). Lastly, describe the time gates indicating that the EM61 measures multiple time gates (216, 366, 660, and 1,266 microseconds) to provide more informative instrument responses. Provide these updates in the 95% Design.

68. ***Appendix D, PDF Page 2145, Draft Geophysical Survey Results Report, Section 3, Geophysical Methods, Data Collection, and Data Processing, 2nd Paragraph, 7th Sentence:*** The text states, "The EMD instrument stores the position of the instrument (based on a differential global positioning system [DGPS] antenna mounted on the frame) and the received signal strength from the receiver coil (in millivolts) in a nearly continuous manner as it is moved along transects by the operator." However, the EM61 instrument does not store the DGPS coordinates. The DGPS coordinates and EM61 data are streamed to the data logger (typically an Archer or Allegro) where they are digitally recorded and merged.

    a. **BASF Action Item:** Revise this sentence for accuracy to state that the collected EM61 data was merged with northing and easting coordinates via a National Marine Electronics Association (NMEA) stream. Provide this in the 95% Design.

69. ***Appendix D, PDF Page 2145, Draft Geophysical Survey Results Report, Section 3, Geophysical Methods, Data Collection, and Data Processing, 2nd Paragraph:*** The EM61 collection rate and transects spacing is not fully provided.

    a. **BASF Action Item:** In the 95% Design, add a description of the EM61 data collection rate (sampling rate) used and nominal transects spacing.

70. ***Appendix D, PDF Page 2145, Draft Geophysical Survey Results Report, Section 3, Geophysical Methods, Data Collection, and Data Processing, 4th Paragraph, 8th Sentence:*** The text states, "A line of evenly spaced highly sensitive geophones oscillate as the surface waves travel

outward from the hammer blow." However, the springs with the geophones oscillate but not the geophones themselves.

a. **BASF Action Item:** In the 95% Design, revise this description to state that the geophones, which are evenly spacing on the surface, record the direct, refracted, and reflected waves.

71. ***Appendix D, PDF Page 2146, Draft Geophysical Survey Results Report, Section 4, Test Pit Excavation, 2nd Paragraph, 4th Sentence:*** The text states, "Fourteen of these test pits were excavated during the field event, the remaining six were deemed unnecessary based on findings from the completed test pits." However, it is not clear why these additional test pits were not necessary.

    a. **BASF Action Item:** In the 95% Design, explain in the text why the remaining six test pits were unnecessary.

72. ***Appendix D, PDF Page 2150, Draft Geophysical Survey Results Report, Section 5.1.1, Aboveground Anomalies from Known Objects:*** Features known or observed at the surface are not anomalies by definition since the source the of elevated response associated with the surface feature is known.

    a. **BASF Action Item:** In the 95% Design, change "Anomalies" to "Features" in the title of this section.

73. ***Appendix D, PDF Page 2154, Draft Geophysical Survey Results Report, Table 2, Known Underground Utilities Crossed by Proposed Design Features:*** **Some of the details on the underground utilities need further clarification.**

    a. **BASF Action Item:** In the 95% Design, provide two numbers past the decimal for each easting and northing listed for consistency and to reflect the accuracy of the coordinates.

74. ***Appendix D, PDF Page 2158, Draft Geophysical Survey Results Report, Table 4, Characteristic Historical Features, Field Observations, and Geophysical Evidence, 3rd Row, Last Column:*** The text states, "It appears the EM61 survey did not cover the southern half of Section B or the Section A deadman anchor."

    a. **BASF Action Item:** In the written response to comments due on March 30, 2025, explain in the text why this area was not covered and indicate whether or not this leaves a significant data gap.

75. ***Appendix D, GENERAL – Electromagnetic Metal Detection (EM-61) Survey:***

    a. It would have been prudent to have established a base station for this device since there are many potential sources of interference from ferrous and non-ferrous metals across the study area. While not required, it is good practice to establish a base station for calibration and independent quality control of data throughout the data gathering process in the field. Utilization of a base station was not discussed in the Report. (This comment was partially answered in the June 7, 2024 supplemental letter discussing geophysical survey techniques. Two areas outside of the survey zones were identified as locations for checking null response on the EM-61 platform prior to and during survey transects. While helpful, a

prove out area to check null and repeatability over known responses is part of a more robust QA/QC protocol on larger surveys.)

b. The East-West running lines that are associated with the Northern Perimeter/ Perry Place in the north and James DeSana Drive in the south contain a number of overhead electrical lines and transformers as well as numerous adjacent steel buildings. Section 5.1.1 and Table 4 on page 16 of Appendix D partially address these concerns; however, the number of power lines, transformers, and industrial equipment might induce too much noise into the data for effective filtering. The interpretation of the data sets on the included figures does not provide enough detail to show the features that were easily identified on the surface or of known subsurface interference. The scale of the figures is such that fine details and responses are too small to be seen and identified. Provide new figures scaled in a size format that can include more references to anomalies and features that would allow for use in picking drilling/excavation sites for ground truthing or removal along the proposed barrier.

c. The plan for barrier wall construction includes excavation of a trench prior to installation (see Section 4.3.x and comments above). However, EM-61 subsurface anomalies should be investigated and removed prior to the 95% Design submittal to increase confidence that the proposed layout is viable.

d. **BASF Action Item:** The general issues noted above need to be addressed following the completion of the predrilling program described in the letter above. A written response to comments is due on or before March 30, 2025.

Appendix F

76. ***Appendix F: General Comment, SPT Soil Boring Logs:*** The SPT soil boring logs need additional detail provided in the design document.

    a. **BASF Action Item:** In the 95% Design, add laboratory test results of soil samples collected in the soil borings. Add soil profiles along the north and south sections. Add a discussion for findings: top of the clay layer; subsurface data for installation of barrier components; and calibration of the geophysical survey results. Add all pertinent historical soil boring and well logs used in the design.

Appendix I

77. ***Appendix I: PDF Page 2655, Subsurface Barrier Options Summary Table:*** A table should be added for the bulkhead wall comparison of sheet pile with tiebacks vs. king pile/SSP wall option (unless this was already presented in the 30% design documents).

    a. **BASF Action Item:** EPA recommends performing a Value Engineering study to determine most cost-effective remedies.

Appendix J

78. ***Appendix J: PDF Page 2670, General Assumptions:*** The assumed dredge prism design along the South Dock includes a 10-foot offset from the face of the South Dock deck, then continuing at a 3H:1V downward dredge slope until transitioning to a flatter dredge slope at distances between 65 and 105 feet from the dock.

a. **BASF Action Item:** Please provide a response and necessary changes to the 95% Design for the following questions. Will dredged areas be backfilled with residual cover material, if so, is the final grade checked in the bulkhead design? This information will need to be confirmed with USEPA GLNPO GLLA UTC Dredging Project.

79. ***Appendix J, PDF Page 2670, General Assumptions, Table 1, notes 3 and 4:*** Note 3 states "Due to earth pressure theory and modeling inputs, the slopes on the river side post dredging operations (passive side, approximately 3H:1V) were assumed as a flat plane at a reduced elevation based on geometry of the failure wedge (see Attachment 2 for profile wedges). Note 4 states "For modeling purposes, the existing fill/sediment surface slope on the active side was conservatively assumed as a flat plane with an elevation approximately mid-height or lower than the existing fill/sediment surface slope."

    a. **BASF Action Item:** Evaluate the scenario in this appendix for conditions with the river side mudline at the dredge elevation planned beyond the 10 ft wall offset in the written response to comments due on March 30, 2025.

80. ***Appendix J, PDF Page 2673, Hydrostatic Assum., note 4:*** This note speaks to "It was assumed that there is no water level differential and the net hydrostatic pressure on the wall will be zero."

    a. **BASF Action Item:** Check this scenario in the 95% Design for when the groundwater treatment system fails, landside water level rises, and river level is in a low seiche condition or Low Water Datum.

81. ***Appendix J, PDF Page 2684, Attach. 3 – Soil Analysis for Design Parameters, page 1/6:*** The subsurface conditions at the South Dock area of the Site, along with physical characteristics of the geologic units are provided in the geotechnical data report for the Site (Arcadis 2021).

82. **BASF Action Item:** The GDR should be attached to the 95% Design. A summary of the results should be presented in this Appendix.

83. ***Appendix J, 2671 – 2680, Design Calculations:*** For the Bulkhead Headwall Design parameters, certain backfill soil parameters were chosen for the design.

    a. **BASF Action Item:** In the 95% Design, please confirm that the backfill properties required for the Headwall Designs are included in the specifications (Section 31 23 05) and construction quality assurance plan for the project.

Appendix K

84. ***Appendix K, PDF Page 3372, Technical Specifications, Section 31 23 05-7, Excavation and Fill:*** This section needs to define "select fill."

    a. **BASF Action Item:** In the 95% Design, revise the specifications to include this definition.

Appendix O

85. ***Appendix O, PDF Page 3620, Draft Waste Management Plan, Section 5.2, Management of Waste in Stockpiles:*** The first bullet of this section states, "Soil staged adjacent to the trench and excavation do not require secondary containment and are not required to be covered at the end of the day; however, erosion and sediment controls are required and will be installed." For clarity this section needs to identify the erosion and sediment controls required (e.g., silt

fence, tarps, temporary seeding, etc.) and reference the Soil Erosion and Sediment Control (SESC) Permit.

a. **BASF Action Item:** Revise this section to address this issue in the written response to comments due on March 30, 2025.

86. ***Appendix O, PDF Page 3620, Draft Waste Management Plan, Section 5.2, Management of Waste in Stockpile, Page 6:*** This section indicates silt fence around the stockpiled waste will be visually inspected following all storm events to ensure erosion and sedimentation controls are properly maintained. However, this section does not define a storm event (e.g., 0.5 inches of rain or equivalent snowfall) and reference the Soil Erosion and Sediment Control Permit.

    a. **BASF Action Item:** For clarity, define a storm event within the 95% Design and provide a preliminary justification within the written response to comments due on March 30, 2025.

87. ***Appendix O, PDF Page 3620, Draft Waste Management Plan, Section 6.1, Regulations Applicable to Waste Impacted with PFAS:*** This section states, "Disposal is being evaluated on a case-by-case basis, and disposal methods vary based on the disposal facility. The Project Waste Advisor will keep the project team informed of current and upcoming regulations and guidance associated with disposal requirements for PFAS-impacted waste."

    a. **BASF Action Item:** This approach is appropriate; however, this section needs to clarify how the project team will be updated (e.g., progress reports, annual reporting, etc.). In the 95% Design, revise this section to address this issue.

Drawings

88. ***Drawings Comment 1: A1-79820:*** This drawing shows a sludge line from the equalization tank. How will sludge that accumulates 200k gal contingency tank be handled?

    a. **BASF Action Item:** In the 95% Design, please provide clarification to this drawing.

89. ***Drawings Comment 2 General:*** Perimeter barrier remedy drawings: Why not show the sumps in the profile view on these drawings? It is difficult to decipher from these drawings whether the drain system is connected or if the collection drains only drain to one sump.

90. **BASF Action Item:** In the 95% Design, provide clarification to this drawing.

91. ***Drawings Comment 3: C1-79781:*** The sump typical (1) shows the concrete valve vault with an opening right below the discharge pipes that seemingly has no purpose.

    a. **BASF Action Item:** In the 95% Design, provide clarification in this drawing.

92. ***Drawings Comment 4: C1-79781:*** Collection Trench typical (2) and (3) - what is the purpose of an impermeable material above the drain?

    a. **BASF Action Item:** In the 95% Design, provide clarification to this drawing.

93. ***Drawings Comment 5: C1-79781:*** The drawing references a bill of materials for the pump sizing. EPA suggests including the drawing number for this or including the pump information in the civil sheets.

    a. **BASF Action Item:** In the 95% Design, provide clarification to this drawing.