



**STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION**

Division of Remediation, Oak Ridge Office
761 Emory Valley Road
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June 23, 2023

Mr. Roger Petrie
Federal Facility Agreement Manager
Oak Ridge Office of Environmental Management
U.S. Department of Energy
Post Office Box 2001
Oak Ridge, Tennessee 37831

TDEC Comments: Remedial Design Work Plan/Remedial Action Work Plan for the Groundwater Field Demonstration at the Environmental Management Disposal Facility, Oak Ridge, Tennessee ([DOE/OR/01-2948&D1](#))

Dear Mr. Petrie

The Tennessee Department of Environment and Conservation (TDEC), Division of Remediation - Oak Ridge Office, received the draft (D1) of the subject work plan on May 9, 2023. TDEC reviewed the document in accordance with the [Federal Facility Agreement \(FFA\) for the Oak Ridge Reservation \(ORR\)](#), with one exception. TDEC accommodated a U.S. Department of Energy (DOE) request to complete this review by June 30, 2023, rather than the 90-day FFA review protocol. General comments developed during TDEC's review are offered in the following paragraphs, and specific comments are enclosed.

General Comments

1. The [Record of Decision \(ROD\)](#) for the Environmental Management Disposal Facility (EMDF) requires completion of a Groundwater Field Demonstration (GWFD). As stated in the ROD (p. 2-88), the objective of the GWFD is "to *determine* the seasonal high water table [SHWT] that will control the final design elevation of the geologic buffer in the knoll area" (italics added for emphasis). The agreement is to measure water levels under simulated post-construction conditions to estimate future groundwater elevations and provide a design basis. The ROD notes the possibility that earthen fill materials may be needed to elevate the landfill to achieve the required separation from groundwater.

The work plan describes the GWFD scope well, but wording throughout the document is inconsistent with the ROD requirement. For example, the work plan states (p. 1): "The objective of the GWFD is to *verify* the post-construction groundwater surface is below the design base of the geologic buffer in the knoll area where the seasonal high groundwater elevations sometimes exceed this design base" (italics added for emphasis). This wording

implies a foregone conclusion the GWFD results will support construction of the geologic buffer at the base elevation specified in a preliminary design rather than setting or establishing the SHWT on which the design will be based.

Although the text mentions the design may need to change, the overriding theme conveyed by the document is one of proving a presumed conclusion rather than testing a hypothesis. In an effort to avoid the appearance of a biased evaluation, TDEC recommends revising language throughout the work plan to be consistent with language in the ROD. Specific Comment 1 (enclosed) provides specific examples of language that warrants revision. Some examples are intended to help resolve discrepancies in describing the GWFD objective. Others address inconsistencies with ROD wording on which DOE, TDEC, and the U.S. Environmental Protection Agency (EPA) worked long and hard to agree.

2. A related theme in the work plan is an apparent expectation that conclusions of the study will depend on interpretation instead of relying on direct measurement as agreed in the ROD. Specific Comments 1c, 56b, and 64 (enclosed) address this discrepancy. Resolution of these comments is important in keeping with the original intent of the GWFD. As stated in an enclosure to a [letter](#) dated October 9, 2019, signed jointly by EPA and TDEC, DOE's proposal included several elements, including the following:

"Using direct groundwater elevation measurements from on-site groundwater monitoring wells, EPA, the State, and the Department of Energy shall determine the minimum elevation for facility construction that ensures a perpetual 15-foot unsaturated zone (RAO) between the zone of groundwater fluctuation and emplaced wastes."

3. The work plan should specify the preliminary design base elevation of the geologic buffer at each location (piezometer) to be monitored during the GWFD. This is the threshold against which the seasonal high water table (SHWT) measured during the study will be compared, at least for an initial screening. As a point of reference, the work plan should also present the pre-GWFD SHWT at each existing piezometer. This value should be determined based on the wettest month in the existing water-level data set (2018 to present).

TDEC understands the SHWT may be adjusted if the demonstration period is substantially wetter or drier than historical rainfall trends. However, a clear understanding of these key benchmarks will minimize the risk that different interpretations of the study results could impact the design schedule.

4. TDEC commends DOE for recent successes associated with the approved [Early Site Preparation work plan](#). Achievements include protecting endangered northern long-eared bats by scheduling tree removal in accordance with U.S. Fish & Wildlife Service (USFWS) consultation and relocating a significant population of four-toed salamanders, a species listed by the state as in need of management.

In planning for the GWFD and subsequent activities, DOE should add language to the work plan stating DOE shall consult with the USFWS to identify a specific date when the protective window of opportunity reopens for removing potential bat-roosting trees. Additionally, TDEC encourages DOE to build on recent accomplishments by completing additional surveys for rare state- or federally-listed small mammal and herptile species at the site before early site preparation, GWFD, and other construction activities begin. Additional details supporting this recommendation are provided in Specific Comment 67.

5. Specific Comments 28, 60, and 62 address an assumption in the work plan that groundwater at the future EMDF site is not contaminated. This may be true, particularly for shallow groundwater. However, TDEC encourages DOE to begin monitoring to evaluate baseline conditions because the site lies atop a fractured-rock aquifer downgradient along geologic strike from the Bear Creek Burial Grounds (BCBG), where high concentrations of volatile organic compounds (VOCs) and other contaminants have been documented. In the absence of site-specific data, groundwater contamination cannot be ruled out. Even if DOE elects to defer formal baseline monitoring until 2028-2029, as indicated in the *Field Sampling Plan for Baseline Groundwater and Surface Water Characterization at the Proposed Environmental Management Disposal Facility, Oak Ridge, Tennessee* ([DOE/OR/01-2812&D2](#)), strategic collection of grab samples from existing piezometers and/or GWFD borings would provide data for assessing groundwater conditions and proper management of groundwater generated during the investigation. The findings would support work-plan assumptions or revised plans for equipment decontamination and investigation-derived waste management.
6. The work plan describes various stormwater controls, including ditches/channels, sediment ponds, etc. The document states some of these features will support the GWFD, as well as landfill construction and operation. Therefore, TDEC requests design calculations supporting the sizing and capacity of these features be appended to the revised plan, along with related details—e.g., plans to line the channels and ponds with membranes, design drawings that show membrane/turf limits and anchoring details more clearly, etc.
7. In an effort to keep EMDF and associated demolition and remediation projects on schedule, TDEC recommends setting milestones for the technical memoranda (TMs) that will report results following each wet season during the GWFD. As a partner in the FFA, TDEC commits to sharing any concerns and recommendations in a timely manner after DOE shares the data. Otherwise, deferring the only opportunity for formal regulatory review and comment to a Remedial Design Report (RDR) in 2026 risks schedule impacts with less time to recover.
8. TDEC understands DOE tasked the [Consortium for Risk Evaluation with Stakeholder Participation \(CRESP\)](#) with recommending approaches for monitoring the water table below EMDF. TDEC supports that effort in hopes it will provide a means to reduce uncertainties like those experienced with water-level monitoring beneath the Environmental Management Waste Management Facility (EMWMF). In furtherance of that research, TDEC

suggests the GWFD might provide a good opportunity for field testing potential approaches for monitoring water levels under the future landfill.

9. Given DOE's request for expedited review of the GWFD work plan and the small scales of the maps provided in the D1, TDEC reiterates a request made at recent project team meetings for geographic information system (GIS) files that include key elements of the planned work, including piezometers, engineered features, etc.

Resolution of these comments, along with those enclosed, will facilitate TDEC approval of the document. Questions or clarification requests concerning the contents of this letter should be directed to Brad Stephenson at the above address, by phone at 865-352-1235, or by e-mail at brad.stephenson@tn.gov.

Sincerely

Randy C. Young
FFA Project Manager
Division of Remediation – Oak Ridge Office

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1. **Consistency with ROD**

As mentioned in the cover letter, TDEC recommends revising language throughout the document to be consistent with language in the ROD. The following comments present specific examples of language that warrants revision. Some examples are intended to help resolve discrepancies regarding the objective of the GWFD. Others address inconsistencies with ROD wording on which the FFA parties worked long and hard to reach agreement.

a. **Page ix, 5th paragraph, 3rd sentence**

Remove *whether* and *is appropriate*.

b. **Page 1, 4th paragraph**

Revise the paragraph. Consider wording similar to the following.

The objective of the GWFD is to determine the post-construction seasonal high water table that will control the final design elevation of the geologic buffer in the knoll area, where the seasonal high groundwater elevations sometimes exceed the preliminary design base. The GWFD will be accomplished by placing temporary, low-permeability material over the EMDF knoll area and directly measuring seasonal high (wet season) groundwater elevations to estimate future, post-construction groundwater elevations. These seasonal high groundwater elevation measurements will be used to design the base elevation for the geologic buffer.

c. **Page 1, penultimate bullet (and p. 16 last bullet)**

Revise the text of this bullet, and others as necessary, for consistency with wording in the ROD. The phrase *minimize interpretation between existing piezometers* appears to mix elements the ROD describes in two separate bullets, with selected words italicized below for emphasis.

- Installation of additional piezometers as needed in the study area, to provide sufficient groundwater elevation data so that *interpretation* of data is minimal.
- Evaluations will use linear *interpolation* between piezometers.

d. **Page 4, Section 2.2, Table 1, Note**

Revise the note below the table for consistency with the ROD. In the following excerpts, italics are added for emphasis.

The footnote states:

The landfill RDR will include and document the GWFD *design* as specified in the EMDF ROD.

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The ROD states:

Results of the field study will be incorporated into the RDR, which will present the final landfill design....

e. **Page 5, last paragraph, 2nd sentence**

Delete *indicating recharge is occurring on the site*.

The first part of the sentence is correct, as water level data indicate the piezometric surface responds to rainfall events. The second part of the sentence is also correct, as recharge certainly occurs on the site. It is even likely recharge affects piezometric surface responses to rainfall. However, there are also other possible explanations for groundwater levels rising in response to rainfall, particularly in a fractured-rock aquifer at the base of a ridge. The *extent to which* recharge is responsible for piezometric surface responses remains to be determined. Evaluating this relationship is at the heart of the GWFD. The existing wording implies a predetermined conclusion and could give the appearance of bias in the study.

f. **Page 8, 1st sentence on page**

Revise the sentence for clarity. It is unclear whether the sentence is intended to address the origin of shallow groundwater or the level and configuration of the piezometric surface. Some portion of the shallow groundwater at the site certainly results from recharge in the higher areas of the site, but there is uncertainty regarding the extent to which the piezometric surface, associated gradients, and responses to rainfall are directly attributable to recharge in the knoll area versus higher-elevation areas on Pine Ridge. Similar to wording addressed by the previous comment, this sentence could be interpreted as a predetermined conclusion. The results of the GWFD may well support the hypothesis, but the study results must be evaluated before drawing conclusions.

g. **Page 15, Section 4.1, 1st, 2nd, 3rd, and 5th paragraphs**

Revise these paragraphs for consistency with the ROD, as requested above.

h. **Page 16, last bullet**

a. Second sentence: Should *demonstrate* be *will demonstrate*?

b. Last sentence: Revise for consistency with the ROD and other parts of the document, which state the second wet season will be monitored to refine the design if refinement is needed.

i. **Page 37, Section 8.1, 2nd sentence**

Revise this sentence for consistency with the ROD, as requested above.

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- j. **Page 37, Section 8.2, 1st sentence**
Revise this sentence for consistency with Section 2.14.4 in the ROD . Upward gradients at the EMDF site do not reflect confining conditions. The FFA parties agreed to remove discussion of potential confining conditions from draft ROD language because neither the conceptual site model nor any available data support the presence of confining conditions. A more logical and straightforward explanation for the measured vertical gradients is the location of the piezometers near groundwater discharge zones.
 - k. **Page 41, Section 8.3, 1st paragraph, last sentence**
Delete *due to recharge from the knoll* for consistency with the ROD, as requested above.
 - l. **Page 42, 1st paragraph after bullets, 1st sentence**
Revise the sentence for consistency with language in the ROD and Tenn. Comp. R. & Regs. § 0400-11-01-.04(4)(a)(2). Both refer to the SHWT, not an average. A possible revision might be, "The objective of the GWFD is to determine the seasonal high water table. Therefore, the median monthly...".
 - m. **Page 42, 1st paragraph after bullets, 2nd sentence**
Clarify if the intent is to state the wettest month during the study may not be February.
 - n. **Page 42, 1st paragraph after bullets, 2nd & 3rd sentences**
Remove references to *average*.
 - o. **Page 42, 1st paragraph after bullets, 3rd sentence**
Clarify what is meant by a calculated average seasonal high groundwater elevation, which is not mentioned in the ROD or the TDEC rule.
 - p. **Page 42, 1st paragraph after bullets, 3rd sentence**
Clarify how a calculated average seasonal high groundwater elevation is more conservative (higher) than the average of measurements collected in the wettest month.
 - q. **Page 44, Section 8.6, 2nd paragraph, 2nd sentence**
Delete *due to precipitation and shallow groundwater recharge* for consistency with the ROD, as requested above.
- 2. **Page ix, 5th paragraph, last sentence (and throughout the document)**
 - a. TMs are not primary FFA documents. Revise the text to clarify whether DOE will accept and consider regulatory review comments on the TMs.
 - b. Add text to explain how data from the second wet season will be used, consistent with other language in the document. This comment also applies to p. 42, Section 8.5.
 - 3. **Page ix, 7th paragraph, last sentence**
Publicize the stormwater management requirements document (identified in Section 6 as UCOR-5620) through the [DOE Information Center \(DOEIC\)](#) and provide a copy to TDEC

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because it supports the environmental protectiveness of the planned work addressed under this FFA document.

4. **Page 1, 4th paragraph (and throughout the document)**

- a. Although the wording of this paragraph may change in response to Specific Comment 1b, consider replacing impermeable with low-permeability here and throughout the document.
- b. Consider replacing cover and cover system with liner and liner system for consistency with wording in the ROD.

5. **Page 2, 5th bullet**

While the ROD does not limit GWFD to selected piezometers, it does allow for such details to be specified in the post-ROD plan. Based on the plan presented here to evaluate data from selected piezometers for the GWFD, add a note or footnote to capture the information presented in the last paragraph of Section 8.3 (p. 42) for clarity and consistency. That paragraph states:

Please note, although not required to determine impacts from EMDF construction on the knoll area water levels, the other piezometers in the EMDF area will continue to be monitored, as possible and practical. These will provide comparison data for consideration of seasonal variation outside the influence of the GWFD, if necessary.

6. **Page 2, penultimate paragraph**

- a. First sentence: Revise the text to clarify what is meant by “describe the components to be designed.” It is unclear if this is specific to the GWFD components.
- b. Third sentence: For consistency with Section 8.5, revise the text to clarify there will be two TMs, one for results from each wet season monitored during the GWFD.

7. **Page 4, Section 2.1.2, last sentence**

Revise the sentence to indicate regulatory oversight includes independent oversight and monitoring of associated activities and independent evaluation of results, in accordance with the [DOE-TN Oak Ridge Reservation Environmental Surveillance Oversight Agreement](#).

8. **Page 4, Section 2.2, including Table 1**

- a. Eliminate redundancy and improve consistency by moving the information from Section 2.2, Project Schedule (including Table 1), to Section 9, Schedule.
- b. Update the submittal date to May 9, 2023 for the *GWFD RDWP/RAWP D1* [GWFD Remedial Design Work Plan/Remedial Action Work Plan].
- c. Add other key activities to the schedule, even if the schedule is tentative, including the aquifer pumping tests, well installation, start of monitoring, TM and RDR submittals.

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- d. TDEC urges DOE to establish a milestone for the RDR, and perhaps the TMs, in the appropriate FFA appendix.
9. **Page 5, Section 3, 3rd sentence**
Add *engineered* before *wetland*.
 10. **Page 5, Section 3.2**
Consider including a wet-season potentiometric surface map showing pre-GWFD conditions. A map presented in TM-2 would be sufficient unless updates are needed to reflect recent conditions.
 11. **Page 6, Figure (Fig.) 2**
 - a. Add Bear Creek tributary streams to the map and label them. Text about the streams in the first paragraph of Section 3.3 refers to this figure, but the map does not show them.
 - b. It would be helpful to revise Fig. 2 or include a separate map showing a slightly larger area that shows the crest of Pine Ridge along the top and Bear Creek along the bottom (without truncation). This would require a reformatting the layout of the existing figure or use of a larger map, e.g., B-size (11 x 17 inches). Fig. A.4 might provide the requested coverage if it were revised to show more of Pine Ridge and less of Chestnut Ridge.
 - c. TDEC reiterates a request made at the past several project team meetings for GIS files that include key elements of the planned work, including piezometers, engineered features, etc. This request is more urgent, given DOE's request for expedited document reviews and the small scales of the maps provided in those documents.
 12. **Page 7, Fig. 3**
The color associated with GW-981 on the plot does not appear to match the legend. Consider labeling the lines on the plot.
 13. **Page 8, Section 3.3, paragraph below Fig. 4, 1st sentence**
The parenthetical text refers to flume locations on Fig. 2. However, the Fig. 2 legend labels those locations as stream flow samples with no mention of flumes. Clarify in the text and/or revise the Fig. 2 legend for consistency.
 14. **Page 8, Section 3.3, paragraph below Fig. 4**
 - a. As discussed during recent project team meetings, TDEC supports beneficial reuse of any flumes removed to prepare for the GWFD. Possibilities include monitoring stormwater runoff during the GWFD or establishing an additional gaging station along Northern Tributary 10 (NT-10) to support monitoring after the flow of Drainage 10 West (D-10W) is diverted to that stream.
 - b. Cite as *Robinson & Johnson 1995* instead of *USGS Open-File Report 95-459* for consistency with the subsequent paragraph and the reference listed in Section 10.

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15. **Page 9, Section 3.4, 3rd paragraph (Stream surveys)**
For simplicity and clarity, consider designating the unnamed Bear Creek tributary between NT-9 and NT-10 something like D-9W, similar to the approach taken for D-10W.
16. **Page 11, Fig. 5 (and other figures throughout document)**
Use different border and fill colors for the 7B Borrow Area and the East Spoils Area or rename the pattern in the legend to apply to both.
17. **Page 13, Fig. 6 and Page A-14, Fig. A.6**
For clarity, increase the contrast of the green-shaded color ramp for habitat density, or replace it with a multi-color or diverging color scale.
18. **Page 14, paragraph after bullets**
Has DOE established criteria to assess the efficacy of relocating the salamanders and orchids? If so, summarize them in the plan. Otherwise, TDEC recommends DOE assess the success of the relocation efforts to support planning for required mitigation efforts.
19. **Page 14, paragraph before Section 3.5 & last sentence on Pages A-13, A-19 & A-21**
Add documentation of the required mitigation to the project team action items list.
20. **Page 14, last sentence (also p. A-15, Section A.3)**
Replace *No historical sites* with *No historically significant sites* or similar wording.
21. **Page 15, Section 4.1, 4th paragraph, 3rd sentence**
 - a. Clarify what D-10W is slightly higher than. Is it higher than the base of the geologic buffer or higher than other tributaries?
 - b. Clarify where the stream channel is lower than the proposed bottom of the geologic buffer. Does this mean all points along the stream are below all points on the base of the geologic buffer in the preliminary design?
22. **Page 16, 2nd paragraph, 1st sentence**
Revise the sentence to clarify the study area will approximate the northern part of the constructed landfill—i.e., that portion currently occupied by the topographic knoll. It is not accurate to state the study area approximates the entire landfill, including areas of the groundwater discharge zone to be covered with fill material.
23. **Page 16, 6th bullet**
The revised plan should include additional details regarding the alternative sediment control measures that will be used if the sediment ponds are not available for use during the GWFD.
24. **Page 16, 8th bullet, 2nd sentence**
 - a. Clarify which piezometers are considered deeper piezometers. Does this refer to the deeper of the two piezometers in each collocated pair?

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- b. TDEC recommends continuation of automated water level monitoring at all remaining piezometers, including the deeper ones, throughout the GWFD to provide backup data in during periods with sensor malfunctions. If DOE plans to discontinue monitoring the deeper piezometers before or during the GWFD, add text to justify that decision. The explanation should demonstrate the shallower piezometers are capable of monitoring the water table if it drops as predicted during the study.

In some cases, the shallow piezometer in each pair/group has the highest water level, so the approach can be conservative. On the other hand, data from the deeper piezometer may be useful if the water level drops below the shallow piezometer.

In any case, at least one piezometer needs to be monitored in each of the following pairs/groups: GY-019/020/GW-990, GW-982/983, GW-988/989, GW-992/993, and GW-980R/981. TDEC also requests continued high-frequency monitoring of water levels in wells/piezometers outside the study area, such as those at EMWMF. Data from these stations may prove valuable for determining whether the study results warrant adjustments and the magnitude of any such adjustments.

25. Page 17, Section 4.2, last sentence

The text notes the preliminary design conservatively set the base of the geologic buffer 5 feet (ft) above a model-derived SHWT. Will the final design include a similar 5-ft safety factor above the SHWT determined by the GWFD?

26. Page 17, Section 4.4, 2nd paragraph, 3rd sentence

For clarity, add *existing* or *original* before *Haul Road*.

27. Page 18, Fig. 7

- a. Clarify whether only the six piezometers marked in red will be used for the GWFD and how these six piezometers relate to the five MWs (monitoring wells) on Fig. 2.
- b. Add the downstream reach of the unnamed Bear Creek tributary between NT-9 and NT-10 (D-9W?) to the map, unless it sinks at the Haul Road.
- c. The GWFD cover color on the map does not match the legend on this and similar figures (e.g., Fig. 13).

28. Page 21, 1st sentence & Page 47, Section 8.6.1.5, 2nd paragraph, 2nd sentence

Present data supporting these sentences or revise them for accuracy. It can be documented the site is outside previously disturbed areas, but the plan presents no data to document the lack of groundwater contamination at the site. The EMDF site lies atop a fractured-rock aquifer downgradient along geologic strike from the BCBG, where high concentrations of

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VOCs and other contaminants have been documented.¹ In the absence of data, groundwater contamination cannot be ruled out.

29. **Page 22, Section 6.2, 1st paragraph, 2nd sentence**

- a. Consider rewording the text for clarity.
- b. Review text throughout the document for consistency in use of terms related to the stormflow interceptor channel, stormwater interceptor channel, stormwater interceptor ditch, stormwater flow interceptor ditch, etc. Specifically, clarify whether the feature is designed to intercept surface runoff and/or stormflow in shallow soil, as distinguished in Section 3.3.

30. **Page 22, Section 6.2, 2nd paragraph, 3rd sentence**

Consider rewording the text for clarity. It appears the intent is to indicate the channel will extend the headwaters of NT-11 eastward, and the D-10W diversion will carry water from the NT-11 watershed divide eastward to NT-10.

31. **Page 23, Fig. 9, Legend & Page 32, last sub-bullet**

- a. Labels distinguish the stormwater diversion ditch from a separate diversion ditch that diverts water from D-10W to NT-10. Revise how these features are symbolized on the map to clarify where one ends and the other begins.
- b. Clarify whether the roads have been converted to asphalt or if they will be paved in conjunction with the GWFD. Text in the last sub-bullet on p. 32 only discusses gravel roads. Review the figure and/or text as needed for accuracy and consistency.

32. **Page 24, Fig. 10**

- a. Revise the labels and/or use different line weights or colors to clarify the figure. As currently presented, the labels appear to designate two separate lines as *GWFD temporary cover* and *cover system with a separation geotextile* between them. Are the *GWFD temporary cover* and *cover system* two separate features?
- b. Label the channel width.

33. **Page 25, Section 6.3.1, 3rd bullet, 2nd sentence**

If the GWFD cover system and wells are not expected to be removed until landfill construction begins, TDEC recommends the collection of groundwater samples from the wells during the interim to support baseline characterization. Data collected during that timeframe would support planning for detection monitoring and reduce potential future uncertainties regarding detection monitoring results. At a minimum, TDEC recommends continued automated water-level monitoring as long as the wells remain in place.

¹ U.S. Department of Energy (DOE), 1997, *Report on the Remedial Investigation of Bear Creek Valley at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, Volume 2, Appendix A—Waste Sites Source Terms, and Waste Inventory Report*, [DOE/OR/01-1455/V2&D2](https://www.energy.gov/sites/default/files/2014/05/DOE/OR/01-1455/V2&D2).

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34. **Page 26, Fig. 11**

- a. Add *Existing* before *Haul Road* since this feature will be relocated soon.
- b. Add a scale and north arrow to the locator map.

35. **Page 29, 1st bullet list**

- a. The bullet list is very similar to one presented on p. 25 in Section 6.3.1. Consider consolidating the two lists to avoid unnecessary duplication.
- b. Second bullet: Consider adding text indicating the planned disposition of the cover system after the GWFD. TDEC recommends reusing the material to the extent practical.
- c. Third bullet (and throughout the document): It appears that High Density Polyethylene (HDPE) geomembrane and geosynthetic liner material are used interchangeably. Clarify if these are the same feature. If so, use one term consistently or add text in Section 6.3.5 to clarify the terms refer to the same feature.

36. **Page 29, Section 6.3.5.1 & Page 30, Section 6.3.5.2**

- a. Given [documentation of historical use](#) of per- and polyfluoroalkyl substances (PFAS) on the ORR and [EPA's proposal](#) to establish Maximum Contaminant Levels (MCLs) for six PFAS compounds, TDEC recommends selecting PFAS-free material to the extent practical for the geomembrane, engineered turf, and any associated coatings. Doing so would be consistent with [DOE's commitment](#) to "Proactively prevent PFAS from entering air, land, and water at levels that can adversely impact human health and the environment."² While the materials listed in Sections 6.3.5.1 and 6.3.5.2 do not inherently contain PFAS, care should be taken to confirm and document this applies to the materials and any coatings that may be applied as water repellants.
- b. Specify the minimum overlap for the HDPE geomembrane seams. The overlap is specified for the engineered turf (p. 31).
- c. Consider the use of turf binding agents to reinforce the turf layer, particularly on steeper slopes and areas where vehicular traffic is expected.

37. **Page 31, Section 6.4, 3rd paragraph, 1st sentence**

Revise the text to specify the dates between which the USFWS recommends removal of potential bat-roosting trees.

38. **Page 31, Section 6.4, last paragraph, 1st sentence**

Identify the location of the newly constructed sediment basin referenced in the text.

² U.S. Department of Energy (DOE), 2022, *PFAS Strategic Roadmap: DOE Commitments to Action 2022-2025*, <https://www.energy.gov/pfas/articles/pfas-strategic-roadmap-doe-commitments-action-2022-2025> August.

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39. **Page 32, Section 6.5, bullet list**

The bullet list is very similar to one presented on p. 21 in the Section 6 introduction. Consider consolidating the two lists to avoid unnecessary duplication.

40. **Page 33, last sub-bullet**

Change *prevent* to *minimize*.

41. **Page 33, 3rd full paragraph**

Add *construction/operation of the* before *landfill* or similar appropriate wording.

42. **Page 35, last sentence**

TDEC recommends use of surplus temporary cover materials for the EMWMF enhanced operational cover rather than onsite disposal.

43. **Page 37, Section 8.1, 3rd sentence**

TDEC acknowledges the framework language in the ROD simply states, "Evaluations will use linear interpolation between piezometers." At this work plan stage, the text should be more specific about the interpolation method to be used—e.g., two-dimensional space, three-dimensional space/surface, linear regression, kriging, etc.

44. **Page 37, Section 8.2**

- a. Revise the text to clarify which piezometers will be monitored. Include one table and one figure that present all piezometers, both existing and proposed, that will be monitored as part of the GWFD. The table should include actual/projected construction details and the geologic formation intercepted by each screen, as well as the elevation of the base of the geologic buffer in the preliminary design. Details should be provided as depths (feet below ground surface) and elevations (feet above mean sea level).
- b. Second paragraph, last sentence: Add the piezometers to the profile on Fig. 11 for consistency with the text.
- c. Second paragraph, last sentence: For context, show the planned geologic buffer and liner system, along with pre-GWFD water levels and geologic units. It would be helpful to include profiles of the adjacent tributaries (NT-10, D-10W, and NT-11) to resolve Specific Comment 21. Alternatively, provide a separate figure showing these details in profile.
- d. Bullet list: Include GW-990 because Table 5 identifies this piezometer as having a seasonal high groundwater water elevation higher than the bottom of the geologic buffer.
- e. Third paragraph: The text states that Table 5 lists shallow piezometers that will be used in the GWFD. Table 5 indicates two piezometers (GW-979 and GY-005) are "to be abandoned." Clarify if these two piezometers will be monitored as part of the GWFD, as stated in the text, or abandoned, as stated in the table.

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45. **Page 38, Table 5 & Page 39, Fig. 13**

- a. Revise the information presented on the table and/or figure for consistency.
- b. Table 5: Consider noting in the comments column and/or a footnote for the third column that the pre-study SHWT elevation is within 3 to 4 feet of the base of the geologic buffer at GW-993.

46. **Page 40, Table 6**

- a. Total Depth: For clarity, footnote this column to indicate the values are relative to the projected (new) ground surface elevation.
- b. Screened Interval: Provide the screened interval elevations for easier comparison with the elevation of the base of the geologic buffer and the map on Fig. 13. Inclusion of a cross-sectional view showing the geologic buffer and the planned well screens would also be helpful.
- c. Add units feet above mean sea level (ft amsl) for the geologic buffer column.

47. **Page 40, last paragraph**

Cite the standard specification that will be followed for piezometer development and clarify why water quality parameter stabilization is not specified.

48. **Page 41, Section 8.2.2, bullets**

- a. List (name) the six seismic boreholes that will be abandoned.
- b. Revise the second bullet for consistency with Fig. 13, which shows seismic boreholes EBH-01A, B, and C are located southeast of SF-1, not west of SF-1.

49. **Page 42, bullets**

Confirm whether GW-990 should be included in the list.

50. **Page 42, Section 8.3, 2nd paragraph below bullets**

Assuming this paragraph is intended to convey the potential for adjusting the experimentally derived SHWT if the demonstration period is substantially wetter or drier than historical trends, then revise the text for clarity. The GWFD is designed to collect data over wet and dry seasons, so seasonality will be represented in the data. No correction should be needed for seasonality. If that is not the intent of the paragraph, additional explanation is needed.

51. **Page 42, Section 8.4**

Publicize the quality assurance plan (UCOR-4189) through the [DOEIC](#) because it supports the environmental protectiveness of the planned work addressed under this FFA document.

Enclosure - Comments

52. Page 42, Section 8.5

TDEC requests that DOE provide all water-level data from all piezometers as soon as practical following each wet season, in parallel with DOE's data interpretation and TM preparation.

53. Page 43, Fig. 14

- a. The figure title suggests all piezometers illustrated on the map will be monitored as part of the GWFD. Revise the list of piezometers in the text and/or the map for consistency.
- b. Remove surface water flumes from the map unless they will be monitored.

54. Page 44, Section 8.6, especially 1st, 2nd & last paragraphs

TDEC supports the collection of any data needed to better understand the aquifer and associated engineering properties.

- a. It would be helpful to have a better explanation of the rationale for the pumping test and how DOE plans to apply the results.
- b. It will be important to document that effects of the aquifer pumping test have dissipated before initiating wet-season monitoring for the GWFD.

55. Page 44, Section 8.6, 3rd paragraph

- a. TDEC recommends programming the pressure transducers to record water levels (e.g., logarithmic or log-linear sampling) more frequently at the start of testing, during recovery, and at each pump rate change during the step test.
- b. Third sentence: Change *testing* to *pumping* to distinguish this test from the GWFD.
- c. Fourth sentence: Change *start* to *stage*, as *initial start* seems redundant.
- d. Last sentence: If appropriate, add *initial stage of the* before *recovery*.

56. Page 44, Section 8.6.1, 2nd paragraph

- a. Revise the text to explain why the shallower well (GW-983) was selected for pumping and the deeper well (GW-982) was selected for monitoring and how this configuration may impact interpretation of data. This approach differs from the plan for GW-990 where the deeper well will be pumped and the shallower wells (GY-019/GY-020) will be monitored.
- b. Third sentence: Clarify how results of the pumping test will support interpretation of piezometer measurements in response to the GWFD. As noted in Specific Comment 1c, the ROD calls for minimal interpretation of the measurements.

57. Page 44, Section 8.6.1, 3rd paragraph, 1st sentence & Page 45, 1st full sentence

Should *drawdown* be changed to *drawdown potential*, *drawdown capacity*, or *a sufficient water column*?

Enclosure - Comments

58. **Page 45, Table 8**

- a. TDEC recommends monitoring water levels in GW-980/981 and GW-988/989 during the pumping tests to evaluate the degree of anisotropy—i.e., relative hydraulic conductivities in the directions of geologic strike and dip.
- b. Include screen interval depths and approximate groundwater levels as elevations (feet above mean sea level) to support understanding where the piezometers are screened in relation to each other.

59. **Page 45, Section 8.6.1.1, 1st paragraph**

- a. The specified pump requires a minimum diameter of 2.99 inches. Confirm the diameters of GW-983 and GW-990 allow use of this pump or revise the text to specify a pump that is compatible with the piezometers.
- b. Because of the anticipated low pumping rates identified in the text (0.4 to 7 gpm), it may be difficult to maintain a constant flow and measure the pumping rate accurately. Include more details on the type of flow controller to be used to reduce and maintain a constant flow rate and what type of flow meter will be used to monitor and record pumping rates.

60. **Page 46, 1st full paragraph, 1st sentence**

TDEC recommends sampling the groundwater withdrawn from the wells for VOCs, radionuclides, and other contaminants associated with the BCBG. As noted in Specific Comment 28, that site lies upgradient of EMDF along geologic strike and has been documented to have high contaminant concentrations in bedrock.

61. **Page 46, Section 8.6.1.3, 1st paragraph, 2nd sentence**

Consider replacing *one that places* with *intended to place, planned to place*, or similar.

62. **Page 47, Section 8.6.1.5, 2nd paragraph, last sentence**

TDEC recommends decontaminating equipment used during the aquifer pumping tests and managing groundwater withdrawn from the wells as investigation-derived waste unless or until data are available to document the lack of groundwater contamination at the site.

63. **Page 47, Section 8.6.2**

Revise the text to clarify how pumping rates will be adjusted as water levels decrease during the 14-hour intervals when the pumps will be left unattended.

64. **Page 47, Section 8.6.3, last sentence**

Clarify how the pumping test results are expected to support and add clarity to the GWFD monitoring results. As noted in Specific Comment 1c, the ROD calls for direct measurement of water levels with minimal interpretation of the results.

Enclosure - Comments

65. **Page 49, Section 9**

- a. Add other key activities to the schedule discussion in Section 9, even if the timing is tentative, including the aquifer pumping tests, well installation, start of monitoring, TM and RDR submittals. This comment may be resolved in response to Specific Comment 8 (on Page 4, Section 2.2, including Table 1), particularly if Section 2.2 is moved to Section 9.
- b. Delete the last two sentences of this section or add text to clarify their relevance.

As described in the ROD and throughout the work plan, a significant element of the GWFD is monitoring groundwater elevations during the wettest month of the year to determine the seasonal high groundwater. TDEC agrees with wording in the ROD and the work plan that interprets this to mean the wettest *winter* month (December through March or April). Why, then, does the concluding sentence of the work plan state, "...every attempt will be made to monitor during the wettest winter month of the year for the GWFD"?

66. **Page A-3, 2nd paragraph**

Explain what "the description" references that will be performed in conjunction with the mitigation. In accordance with Tenn. Comp. R. & Regs. § 0400-40-07-.04(7)(a)1 (an Applicable or Relevant and Appropriate Requirement [ARAR]), to the extent practicable, mitigation is to be conducted "prior to, or simultaneous with" impacts. If the intent of this statement is to align with this requirement, use clarifying language. If that is not the intent of this statement, ensure this requirement is referenced in this document.

67. **Page A-5, Section A.2, Ecological Resources**

DOE is to be commended for recent successes associated with the approved [Early Site Preparation work plan](#). Those achievements include protecting endangered northern long-eared bats by scheduling tree removal before the end of March, in accordance with USFWS consultation³, and relocating a significant population of four-toed salamanders, a species listed by the state as in need of management.

In planning for the GWFD and subsequent activities, DOE should add language to the work plan stating DOE shall consult with the USFWS to identify a specific date when the protective window of opportunity reopens for removing potential bat-roosting trees. Additionally, TDEC encourages DOE to build on recent accomplishments by using the time between now and the start of GWFD and other construction activities to complete additional surveys for rare (i.e., small population sizes) state- or federally-listed small mammal and herptile species at the site. Along with Section 3.4, Section A.2 cites the 2018 [Natural Resource Assessment report \(ORNL/TM-2018-515\)](#). That document reports "No state or federally listed reptile or amphibian species were recorded on the site during these surveys" (ORNL/TM-2018-515, Section 3.4.4, p. 22-23).

³ Documented in Attachment F.1 (p. F-25-F.30) of the [Early Site Preparation work plan](#).

Enclosure - Comments

TDEC noted in a [letter dated November 29, 2018](#) that the methods used to survey for small mammal and herptile species were likely insufficient to successfully identify any rare species that may be present on the site. As stated in that letter:

Collectively, DOE, TDEC, and Domain 07 National Ecological Observatory Network (NEON) assessments documented 11 state- and federally-listed flora and fauna species in the CBCV [Central Bear Creek Valley] area since 2015. However, the DOE assessment does not document four of these species.

Subsequently, ORNL natural resources scientists identified many four-toed salamander nests and described the site as “containing the highest densities of four-toed salamander breeding sites known on the ORR” (p. A-12 of the GWFD plan; [DOE/OR/01-2948&D1](#)). Fortunately, this discovery allowed DOE to relocate the salamanders, protecting them and their offspring from construction impacts.

The four-toed salamander is one of the four listed species that was not documented at the EMDF site by the 2018 Natural Resource Assessment (ORNL/TM-2018-515). Based on the presence of an established mixed oak/maple forest, other state- or federally-listed small mammal species may exist at the site, including jumping mice and shrews, per [Mammals of the Oak Ridge Reservation \(revised May 2017\)](#).

68. Page A-5, last paragraph

Why have neither the [Tennessee Rapid Assessment Methods](#) nor [Tennessee Stream Quantification Tools](#) been employed? Will they be employed prior to and included in the D2?

69. Page A-6, 1st paragraph (Wetland delineations)

This paragraph states approximately 3.6 acres of wetland will be impacted, whereas Table A.1 on the same page states 3.78 acres. Pages 9 and A-17 state 4.6 acres, and Page 12 states approximately 5 acres. Page A-21 states up to 3.78 acres. Revise these values for accuracy and consistency.

70. Page A-6, Table A.1

- a. Provide a map showing the wetlands identified in the table. It appears Fig. A.6 shows all the wetlands listed except UPF [Uranium Processing Facility] W11 and Spoils. Labeling those two on Fig. A.6 and citing that in the text would suffice.
- b. The “Spoils” row does not have a value for acreage, but it recognizes wetlands will be impacted indirectly. The other areas of indirect impact have an associated acreage. When will the acreage of indirect impacts from the spoils area be known, and in which report will that information be documented to account for cumulative impacts?

71. Page A-7, Stream surveys

Revise the text to quantify/estimate the anticipated stream impacts (total linear feet).

Enclosure - Comments

72. **Pages A-8 through A-12**

The pagination needs correction. The current sequence is A-8, A-9, A-10, A-8, A-9, A-11, A-11, and A-12.

73. **Page A-9, Fig. A.4**

Remove or explain the "1285" label along Bear Creek.

74. **Page A-12, 1st paragraph, last sentence**

Add documentation of USFWS consultation to the project team action items list.

75. **Page A-13, 1st bullet, last sentence**

Add text to clarify the March 31 date was determined in consultation with the USFWS.

76. **Page A-13, last paragraph**

a. In accordance with Tenn. Comp. R. & Regs. § 0400-40-07-.04(7)(a), the overall net loss of resources must be mitigated. The cumulative impacts from all activities (Early Site Preparations, GWFD, and construction of the landfill and associated facilities) must be calculated to determine mitigation requirements. Include language recognizing this requirement.

b. In accordance with Tenn. Comp. R. & Regs. § 0400-40-07-.04(7)(a)4, mitigation should occur as close to the impacted location as practicable. The mitigation plan should ensure this requirement is met.

77. **Page A-14, Fig. A.6**

The EMDF design must integrate the need for groundwater monitoring wells to comply with the ROD, including Resource Conservation and Recovery Act (RCRA) requirements for baseline and detection monitoring: 40 CFR 761.75(b)(6)(i)(A), Tenn. Comp. R. & Regs. § 0400-12-01-.06(6)(h)(1) [40 CFR 264.97(a)], and Tenn. Comp. R. & Regs. § 0400-12-01-.06(6)(i)(1)-(7) [40 CFR §264.98(a)-(g)].

Based on this map and others in the document, including design drawings in Appendix C, the preliminary design appears to leave little room for the installation of groundwater monitoring wells that will be needed to comply with the ROD and the ARARs cited above. In particular, there appears to be little room for well installation between the planned western edge of the landfill and the adjacent stream (NT-11).

78. **Page A-18, last sentence**

Show the planned location for the additional stormwater pond on a map.

79. **Pages B-9, B-10, B-12, Requirements (TBCs [To Be Considered])**

One bullet on each page addresses prohibitions on blasting within 50 ft of any jurisdictional stream or wetland. Is blasting anticipated for any phase of construction?

Enclosure - Comments

80. **Page B-19, Table B.2**

Explain why General Permit TNR10-0000 is “relevant and appropriate” rather than “applicable.” This permit applies to soil disturbing activities such as clearing, grading, grubbing, filling and excavation. The activities described in this workplan appear applicable to the permit.

81. **Page C-39, Section 4d**

This specification requires the installer to submit geomembrane record documents. TDEC requests that DOE attach these documents to the first Technical Memorandum.

End of Comments