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**Department of Energy**

Oak Ridge Office of Environmental Management  
P.O. Box 2001  
Oak Ridge, Tennessee 37831

April 26, 2018

**CERTIFIED MAIL**

Ms. Constance A. Jones  
Superfund Division  
U.S. Environmental Protection Agency  
Region 4  
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61 Forsyth Street, SW  
Atlanta, Georgia 30303-8960

Mr. Randy C. Young  
State of Tennessee  
Department of Environment and Conservation  
Division of Remediation – Oak Ridge  
761 Emory Valley Road  
Oak Ridge, Tennessee 37830-7072

Dear Ms. Jones and Mr. Young:

**TRANSMITTAL OF ERRATA PAGES FOR THE *PHASE I FIELD SAMPLING PLAN FOR THE PROPOSED ENVIRONMENTAL MANAGEMENT DISPOSAL FACILITY FOR COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OAK RIDGE RESERVATION WASTE DISPOSAL, OAK RIDGE, TENNESSEE* (DOE/OR/01-2739&D2)**

The subject document was transmitted to you prior to agreement on language regarding surface water walkdowns contained within the document. Per agreement on that language, four instances have been updated, and four separate, double-sided errata pages are enclosed along with compact disks of the complete and corrected document. Please replace the pages in the document(s) transmitted previously with the enclosed corrected ones.

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(JONES 7009 2820 0001 9922 1835)  
(YOUNG 7009 2820 0001 9922 1842)

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BY: DOEIC

April 26, 2018

**TRANSMITTAL OF ERRATA PAGES FOR THE PHASE I FIELD SAMPLING PLAN  
FOR THE PROPOSED ENVIRONMENTAL MANAGEMENT DISPOSAL FACILITY FOR  
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND  
LIABILITY ACT OAK RIDGE RESERVATION WASTE DISPOSAL, OAK RIDGE,  
TENNESSEE (DOE/OR/01-2739&D2)**

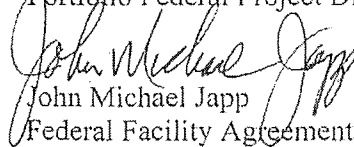
If you have any questions or if we can be of further assistance, please contact John Michael Japp at (865) 241-6344 or Brian Henry at (865) 241-8340.

Sincerely,



Brian T. Henry

Portfolio Federal Project Director



John Michael Japp

Federal Facility Agreement Project Manager

Enclosures:

1. Errata pages
2. CD

EPA: 1 (Enclosure 1), 2 (Enclosure 2)

TDEC: 2 (Enclosure 1), 1 (Enclosure 2)

cc w/enclosure 1:

SSAB

Rhonda Butler, Value Added Solutions, K-1007, MS-7423, plus 1 copy of Enclosure 2

cc w/o enclosures:

Carl Froede, EPA Region 4

Rich Hill, EPA Region 4

Susan DePaoli, Pro2Serve

Howard Crabtree, TDEC, Oak Ridge

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**(YOUNG 7009 2820 0001 9922 1842)**

**Table 1. DQO summary for groundwater data acquisition (cont.)**

<b>DQO step</b>	<b>Groundwater data for design</b>
Optimize the Design (cont.)	<ul style="list-style-type: none"> <li>• FLUTe testing will be performed in accordance with the vendor's specifications and operating procedures for bedrock piezometers to evaluate hydraulic conductivity and detect zones of relatively higher conductivity (if present).</li> <li>• Piezometer installations will be completed in accordance with UCOR procedures or equivalent.</li> <li>• Water-level measurements will be obtained in accordance with UCOR procedures or equivalent.</li> </ul>
<div style="display: flex; justify-content: space-between;"> <div> <p>ASTM = American Society for Testing and Materials</p> <p>CBCV = Central Bear Creek Valley</p> <p>DQO = data quality objective</p> <p>EMDF = Environmental Management Disposal Facility</p> <p>EMWMF = Environmental Management Waste Management Facility</p> <p>FLUTe = Flexible Liner Underground Technologies, LLC</p> </div> <div> <p>FS = Feasibility Study</p> <p>NT = North tributary</p> <p>PCB = polychlorinated biphenyl</p> <p>UCOR = URS   CH2M Oak Ridge LLC</p> <p>USCS = Unified Soil Classification System</p> </div> </div>	

**Table 2. DQO summary for surface water flow data acquisition**

<b>DQO step</b>	<b>Surface water data for design</b>
State the Problem	<p>The CBCV site is being considered for disposal of soils and demolition debris that may contain mixed metals, PCBs, and radioactive constituents (Fig. 1). Additional contaminants (e.g., volatile organic compounds) could also be present in materials disposed in EMDF. The proposed footprint is located in an area of several surface water features, including two streams (NT-10 and NT-11) and other natural drainages. The landfill design must address these surface water features adequately to prevent potential impacts to the landfill liner and structure and to prevent a pathway for potential leakage migration and potential risk to human or ecological receptors.</p>
Identify the Decision (the Design Criteria)	<p>Design criteria for surface water conditions at the CBCV site include controlling the stormwater/surface water flow around the facility. The principal study questions include the following:</p> <ul style="list-style-type: none"> <li>• Does surface water in NT-10, D-10W, D-11E, and NT-11 (Fig. 14) result from precipitation/overland flow, groundwater, or both? This information will be used to determine the appropriate approach for surface water controls.</li> <li>• Are sections of these streams gaining and losing stretches? This information will be used to design appropriate surface water controls. What are the surface water runoff/flow volumes at NT-10, D-10W and NT-11? The calculated runoff (using the estimated runoff coefficient) will be used in conjunction with the groundwater measurements to address the surface water design criteria.</li> </ul>
Identify Inputs to the Decision (to the Design Calculations)	<p>The following design information is needed to determine the design for surface water controls:</p> <ul style="list-style-type: none"> <li>• Surface water capture basin areas, surface water budgets, and potential runoff volumes for NT-10, D-10W, and NT-11</li> <li>• Location of groundwater seeps, springs, or other sources of groundwater contribution in the channels</li> <li>• Current and predicted groundwater elevations</li> <li>• Site topography and features</li> <li>• Analysis and characterization of the current stream channel morphology to provide guidance as to the dimension, pattern, and profile of any planned diversions for long-term stability</li> <li>• Local climate information</li> </ul>

Table 2. DQO summary for surface water flow data acquisition (cont.)

DQO step	Surface water data for design
Define the Study Boundaries	The spatial boundaries of the study are the surface water capture basins as shown in Fig. 6.
Develop a Decision Rule	<p>If localized storm/precipitation events result in storm flows with the streams/drainages of NT-11, NT-10, and/or D-10W, then the design must consider such storm flows in sizing of diversion or surface water conveyances.</p> <p>If shallow groundwater flow results in gaining conditions in the streams/drainages near the perimeter embankments, then the design must consider the vertical and lateral influences of shallow groundwater flow on diversion or surface water conveyances.</p> <p>The proposed data gathered from the site (primarily in the form of surface vegetation, surface soil conditions, site features, and stream measurements) will be used to support an estimate of the runoff coefficient to use in stormwater generation modeling. No specific measurements are proposed to calculate that coefficient. The calculated runoff (using the estimated runoff coefficient) will be used in conjunction with groundwater measurements to address the surface water design criteria.</p>
Develop a Decision Rule (cont.)	If deeper groundwater flow results in encroachment into the geologic buffer, then the design must consider the influences of such deeper groundwater flow on the surface water diversion.
Specify Performance/Acceptance Limits (Error Range)	Data collection and analyses shall be as established using the UCOR procedures provided in Appendix B, Sect. B.4. The current versions of these procedures will be used.
Optimize the Design	<p>Place surface water flow measurement stations in the Nolichucky Shale outcrop areas in the lower reaches of NT-11. A second surface water flow measurement station will be placed along NT-11, south of the Haul Road, downstream of the estimated EMDF disposal site buffer zone. A third station will be placed upgradient of the estimated EMDF disposal site buffer zone (Fig. 14). Locations will be selected following a site walkover.</p> <p>Place two surface water flow measurement stations in D-10W: (1) downstream of the Haul Road where there is a well defined channel, and (2) downstream of Bear Creek Road downstream of the estimated EMDF disposal site buffer zone in the Nolichucky Shale near the projected Nolichucky Shale/Maynardville Limestone geologic contact (Fig. 14).</p> <p>Perform two detailed site walkovers during the wet season (December-April) to identify seeps, springs, and other expressions of shallow groundwater in NT-10, D-10W, and NT-11. The walkovers will include a description every 50 ft (as safe access allows) and field measurements of temperature, specific conductivity, and pH. Perform two additional site walkovers (May/June) following the wet season to collect field measurements of temperature, specific conductivity, and pH.</p>

CBCV = Central Bear Creek Valley  
D = drainage  
DQO = data quality objective  
E = east

NT = North Tributary  
PCB = polychlorinated biphenyl  
UCOR = URS | CH2M Oak Ridge LLC  
W = west

## 5. INVESTIGATION SCHEDULE/APPROACH

The investigation schedule will depend on the availability of specialty subcontractors and the site-specific conditions encountered. The field activities can be performed in phases, with only a subset of activities performed at any given time. However, the following sequence is anticipated for Phase 1 work during the first half of calendar year 2018:

- Procurement of specialty contractors (as required for the investigation phase)
- Development of specific project plans, work control documents, and internal work permits (e.g., excavation/penetration permits)
- Hold point – ensure project plans, work control documents, specialty contractors and designated personnel qualifications and training meet the requirements in the Field Sampling Plan and QAPP, including the DQOs, prior to performing specified work scope
- Performance of two walkovers and evaluation of surface water – Winter 2018
- Performance of two walkovers and evaluation of surface water following the wet season– May/June 2018
- Mobilization of specialty contractors (as required for the investigation phase) – Winter 2018
- Installation of surface water flow meters (independent activity from drilling, may occur before, during, or after drilling) – Spring 2018
- Drilling for piezometers and geotechnical samples, and geotechnical samples collected during drilling operations – Winter/Spring 2018
- Downhole hydrogeologic testing (Flexible Liner Underground Technologies, LLC [FLUTE] and slug tests) – Winter/Spring 2018
- Installation of piezometers – Winter/Spring 2018
- Plugging and abandonment of open boreholes (if any) – Spring 2018
- Demobilization – Spring 2018
- Monitoring (following piezometer installation) – March-April 2018 (monitoring will continue through February 2019, with results documented in Technical Memorandum 2 [will be available prior to the RDWP]; preliminary data will be made available to the FFA parties as it becomes available)
- Technical Memorandum 1 – March-April 2018 (data will be added to the Administrative Record prior to completion of the Proposed Plan)

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Quarterly groundwater elevation data are available for many of the EMWMF wells since 2002 or before, including recent wetter periods. Twice a year groundwater elevations are available for the Bear Creek Burial Ground wells (GW-077 to GW-080). These groundwater elevations will be used to provide the relative magnitude change in groundwater elevations during wetter and drier periods.

Continuous groundwater elevation monitors were installed in March 2017 in EMWMF wells. Therefore, these wells have more specific data to forecast specific responses to precipitation over the year. Specific groundwater elevation data for an appropriate EMWMF well will be matched to the groundwater elevation data for a given EMDF well to predict the wet season data for that well.

Continuous groundwater elevation data for GW-976, located on a knoll in the previous EMDF Site 5 location, is expected to be comparable to the expected groundwater elevations in bedrock piezometers on the knoll in the CBCV site (GW-980, GW-982, and GW-986). This information will augment EMWMF well data for developing projected groundwater elevations for these wells. The shallow piezometer paired with GW-976 is GW-977. This piezometer was dry during drilling and remained dry during the project. It will be checked and groundwater elevations measured (if present) when data are downloaded from GW-976.

No groundwater elevations are available for locations GW-437 through GW-440. However, continuous groundwater elevation monitors will be installed in these (and the other locations noted in Table 4) prior to completion and instrumenting the CBCV piezometers. These wells will provide additional comparable wet season data to augment what is collected for the CBCV piezometers.

## **6.2 SURFACE WATER EVALUATION**

### **6.2.1 Field Identification of Surface Water Features**

Two detailed site walkovers will be performed during the wet season (winter 2018) to further characterize surface geology, identify geotechnical areas of interest, and identify seeps, springs, and other expressions of shallow groundwater in NT-10, D-10W, D-11E, and NT-11. Observations of flow in macropores and similar features during the wet season also will occur to determine potential impacts on design. The walkover will include a description every 50 ft of NT-10, D-10W, and NT-11 (as safe access allows) and field measurements of temperature, specific conductivity, and pH (seeps/springs to be included). The specific conductivity measurements will be performed to determine the potential influence from groundwater. A qualified hydrologic professional (TDEC 2011) will participate in the walkovers. The results of these wet weather walkovers will be documented in Technical Memorandum 1 along with results of two additional walkovers in May and June. Additionally, two dry season walkovers will be performed during September/October 2018 and documented in the Technical Memorandum 2.

### **6.2.2 Surface Water Flow Measurements**

Based on the site walkovers, three surface water flow measurement stations are planned for installation at appropriate locations in the Nolichucky Shale outcrop areas in NT-10 and NT-11. These stations are planned for locations where the tributaries enter or leave the buffer zone (Fig. 14). The specific locations and measurement apparatus sizing will be based on results of the additional fieldwork outlined above.

For the D-10W valley, a surface water flow measurement station is planned for installation upstream of Haul Road in an area where surface water flow diversion may be considered during design. A station is also planned for installation downstream of the existing Bear Creek Road near the Nolichucky

Shale/Maynardville Limestone geologic contact where D-10W leaves the buffer zone (Fig. 14). Another surface water flow measurement station will be placed as indicated by the site walkover.

Surface water flow measurements will be performed as described in Appendix B, Sect. B.4, and will include continuous flow, temperature, pH, and conductivity measurements collected at 30-minute intervals. Phase I characterization will begin in the spring 2018 (March-April timeframe).

Because surface water flow is not present/cannot be measured with conventional flow measurement devices in the D-11E area, and subsurface flow merges with NT-11 prior to leaving the site/buffer zone, the already established flume locations located upstream and downstream of the D-11E area discharge into NT-11 will be used to approximate the D-11E discharge as requested.

### **6.3 STABILITY TESTING**

Standard penetration test data provides the most typical values used for liquefaction analyses and will be collected as described in Sect. 6.4 and Appendix B, Sect. B.5.2, as the boreholes for the piezometer pairs are drilled.

### **6.4 GEOTECHNICAL EXPLORATION AND LABORATORY TESTING**

Geotechnical tests for landfill design will be collected at the piezometer locations (Fig. 14) and will include areas within the landfill footprint. The vertical subsurface boundary extends into bedrock, approximately 30–50 ft below current ground surface (approximately 10 ft into bedrock).

Geotechnical data acquisition will be performed by qualified subcontractors with continuous field oversight by a geotechnical engineer or geologist with geotechnical experience. Geotechnical data will be used for the design, including stability analyses. These data will be collected and analyzed as described in Appendix B, Sect. B.2.1 and Sect. B.5.

### **6.5 SAMPLE COLLECTION, IDENTIFICATION, AND LABELING**

Sampling data generated during all phases of this project must be of acceptable quality. The appropriate contractor characterization team lead is responsible for implementation and performance of sample collection, quality checks, and monitoring activities.

The QAPP (Appendix A) contains the requirements for field documentation, sample containers, sample packaging, decontamination of equipment and devices, sample identification and traceability, and field variance systems integral to the collection of samples.

### **6.6 LABORATORY ANALYSIS**

Geotechnical sample analysis will be performed by a geotechnical laboratory accredited by the U.S. Army Corps of Engineers or American Association of State Highway and Transportation Officials for the specific American Society for Testing and Materials laboratory testing procedures called out in Appendix B, Sect. B.5.2.



## 9. DATA REPORTING

The results of the March-April field investigation data will be presented in Technical Memorandum 1 and will be submitted to the Administrative Record prior to the public comment period on the EMDF preferred alternative. Technical Memorandum 1 will also include the results of two additional surface water walkovers in May and June. Results from longer-term monitoring (May 2018 through February 2019) and the dry season surface water walkdowns will be documented in Technical Memorandum 2.

The following data, evaluations, calculations, and reports will be included in the Administrative Record.

- Groundwater data, including borehole logs, piezometer construction logs, groundwater table maps, charts of groundwater elevation fluctuations over time, hydraulic conductivity data (including FLUTE borehole transmissivity profiling), soil stratigraphy, groundwater gradients, and groundwater flow rates. Data will be collected during March-April 2018 and will be considered part of the field data collection to be provided in Technical Memorandum 1 prior to the public comment period.
- Surface water data, including surface water flow rates, locations of seeps/springs (as well as temperature, conductivity, and pH in streams and seeps/springs), groundwater elevations impacting surface waters, site topography, stream morphology, and climate information. The March-April 2018 surface water data will be considered part of the field data collection to be documented in Technical Memorandum 1 and provided prior to the public comment period.

In addition, a geotechnical data report will be prepared that will include soil consolidation, shear, density, and index properties (moisture content, Atterberg Limits, grain size, and specific gravity); bedrock strength, interface strength, rock type, fractures, and rock quality; and groundwater elevations and variations.

The QAPP (Appendix A, Sect. A.10) contains the specific requirements for data reporting.

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## Comment Resolution Form

<b>Document Number:</b> DOE/OR/01-2739&D1	<b>Document Title:</b> <i>Phase 1 Field Sampling Plan for the Proposed Environmental Management Disposal Facility for Comprehensive Environmental Response, Compensation, and Liability Act, Oak Ridge, Tennessee</i>		
<b>Organization/Project:</b> TDEC/EMDF	<b>Comment Due Date:</b> N/A		

<b>Reviewer Initials and Name</b>	TDEC
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Comment No.	Reviewer Initials	Section, Page, Paragraph	Comment/Suggested Change/Rationale	Resolution	Reviewer Concurrence
General Comments					
1.	TDEC	General	<p>As stated in the SOW and pursuant to 40 <i>CFR</i> 761.75(b)(3), OREM must obtain continuous data on water level fluctuations at Site 7c during March/April 2018 and use those data along with water-level and precipitation data collected over longer periods at comparable locations in Bear Creek Valley (BCV) to estimate historical high water table fluctuations at Site 7c.</p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 3).</p> <p>Section 6.1, Groundwater Evaluation, says that "monitoring will continue for at least one year to ensure seasonal high water levels are captured". TDEC 0400-20-1 1-.17(4)(a) requires a preoperational monitoring program of at least 12 months. TSCA 40 <i>CFR</i> 761.75(b)(3) requires estimating the historical high water table. The SOW required determination of the historical high water table because the historical high water table includes both this year's high water table and past high water tables in determining whether waivers are needed and justifiable.</p> <p>The immediate concern is determining whether there would be a hydraulic connection between the site and standing or flowing surface water and, if so, whether a waiver from this TSCA siting requirement is required and justified. Another</p>	<p>Text was added in Section 6.1.2 as follows:</p> <p><i>"To aid in interpreting the results, long term monitoring of precipitation and groundwater elevations for similarly located piezometers at the Environmental Management Waste Management Facility (EMWMF), and other BCV locations, will be used to provide input into the conditions at the CBCV site, specifically the groundwater elevations during the wet season."</i></p>	

## Comment Resolution Form

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			<p>immediate concern is determining whether the hydrogeologic unit used for disposal would discharge groundwater to the surface within the disposal site and, if so, whether a waiver from this siting requirement is required and justified.</p> <p>FSP Table 1 also states "If the predicted post-construction groundwater table is above the geologic buffer, then the design elevation must be increased or a French drain or other groundwater control system must be included in the design ... If the predicted post-construction groundwater elevations and flows using the <b>planned</b> French drains are insufficient to lower the groundwater table to this allowable level ..." (text bolded for emphasis). French drains as specified here would provide hydraulic connection between the site and standing or flowing surface water and would discharge groundwater to the surface within the disposal site. Use of French drains as specified here would require ARAR waivers that must be justified.</p> <p>Section 6.1 says that "EMWMF [Environmental Management Waste Management Facility] piezometer data will be used to predict groundwater elevations at the CBCV [site] by noting the magnitude of the change during wet season, and applying a similar factor to EMDF piezometer readings." Analyses of March and April 2018 data will be required to determine whether piezometer data from other BCV locations may be comparable to Site 7c. Further, EMWMF piezometers are newly instrumented and will not characterize the historical high water table. In order to estimate historical high water levels, the FSP should specify that OREM will identify monitoring wells and piezometers in BCV which have or previously had continuous water level monitoring data, the time period such data was collected, the topographic and geologic environment for each monitoring well and piezometer, and the rationale for whether OREM considers the monitoring well or piezometer comparable with piezometers installed at Site 7c. Continuous water level monitoring intervals should be compared with annual rainfall to determine whether</p>	<p>The text in Table 1 and elsewhere has been modified to remove the reference to French drains.</p> <p>Table 6 was added that provides the specific wells in Bear Creek Valley that have been identified for groundwater elevation monitoring, including the EMDF Site 5 piezometers that were continuously monitored for one year. The available monitoring data, topographic and geologic environment and rationale are listed in the new Table.</p>	

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			each data collection period related to drought, normal precipitation, or above-average rainfall. OREM should also consider making the FSP more specific. For example, it might indicate that OREM will overlap graphs from Site 7c and other BCV locations to support decisions regarding whether the locations are comparable and what constitutes a "similar factor".		
2.	TDEC	General	<p><b>OREM must demonstrate that BCV wells used to support an estimate of historical high water table fluctuations at Site 7c are comparable to Site 7c piezometers.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 3).</p> <p>Analyses of March and April 2018 data will be required to determine whether 2018 wet season piezometer or monitoring well data in BCV may be comparable to Site 7c. This is a different question than identification of the historical high water table. Also, see discussion in General Comment 1.</p> <p>The FSP must specify which wells OREM will use, including depths, screen lengths, geologic formations, and any other information needed to demonstrate that the BCV wells/piezometers are comparable to the planned locations at Site 7c.</p> <p>Site 5 well pair GWM-3 appear to be located on a knob in a similar geologic environment to Site 7c. OREM monitored water levels continuously during the Site 5 phase 1 investigation and should resume monitoring at the GWM-3 well pair unless that effort is already underway.</p> <p>TDEC staff are optimistic that OREM can identify comparable wells/piezometers in BCV with an adequate combination of recent continuous records to characterize short-term fluctuations and older manual measurements to characterize historical seasonal/annual fluctuations. However, OREM must demonstrate that the wells proposed</p>	<p>Table 6 has been added to provide the evaluation of Bear Creek Valley piezometers to determine whether these are comparable to Site 7c piezometers. Table 6 includes depths, screen lengths, geologic formations, and additional information for each selected piezometer.</p> <p>GW-976 was installed as part of the Site 5 investigation and is one of the selected piezometers now presented in Table 6. As noted, this is located on a knob in a similar geologic environment.</p>	

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			for use are comparable and that it has a plan for using data from those wells along with rainfall data to help estimate historical high water table fluctuations at Site 7c.		
3.	TDEC	General	<p><b>Document precipitation recorded at stations monitored by operations personnel at the Environmental Management Waste Management Facility (EMWMF).</b></p> <p>The FSP meets this data collection requirement identified in the SOW (page 3). No revision is required.</p> <p>There is a statement in Table 1 that OREM will use precipitation data from EMWMF for long-term monitoring of precipitation.</p>	No changes to the FSP are required.	
4.	TDEC	General	<p><b>Collect data during drilling and after piezometer installation to understand hydraulic properties (e.g., hydraulic conductivity) relative to the lithology and water bearing/transmission zones within the soil and rock underlying the site.</b></p> <p>The FSP meets this data collection requirement identified in the SOW (page 3). No revision is required.</p> <p>There are statements in Table 1 Section 6.1 indicating that OREM will collect lithologic and hydraulic conductivity data during and after piezometer installation.</p>	No changes to the FSP are required.	
5.	TDEC	General	<p><b>Demonstrate how groundwater moves through the site and discharges to the ground surface and surface water, including geotechnical characteristics of natural materials at the site (e.g., horizontal and vertical hydraulic conductivity values).</b></p> <p>The FSP meets this data collection requirement identified in the SOW (page 3). No revision is required.</p> <p>There is a statement in Table 1 identifying horizontal and vertical hydraulic conductivity as decision inputs.</p>	No changes to the FSP are required.	
6.	TDEC	General	<p><b>Collect, during drilling of the borings for piezometer installation, standard penetration test (SPT) data.</b></p> <p>The FSP meets this data collection requirement identified in</p>	No changes to the FSP are required.	

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			the SOW (page 3). No revision is required.  Tables 3 and 4 indicate that SPT data will be collected in the deeper boring at each paired piezometer location.		
7.	TDEC	General	Use split spoons and Shelby tubes (or equivalent equipment) to log and sample soils and saprolite continuously throughout the deepest boring at each paired piezometer location.  Revise the FSP to reflect this data collection requirement identified in the SOW (page 3).  Tables 1, 3, and 4 indicate that residuum core samples will be collected in the deeper boring at each paired piezometer location. However, the FSP must state that soil/saprolite will be logged continuously or clarify any rationale for logging only discrete intervals.	Table 1 was revised as follows:  <i>"Collect core using split spoons or equivalent core collection devices for the deep piezometers continuously throughout the deepest boring at each paired piezometer location, including through the soil and saprolite. Core will be continuously logged/described."</i>  Table 4 (now Table 3) was revised to indicate saprolite and bedrock core would be collected.	
8.	TDEC	General	Describe the material with sufficient detail to identify lithology, chert lenses, fractures, relic bedding, moisture and other features that may bear or transmit water.  Revise the FSP to reflect this data collection requirement identified in the SOW (page 3).  The FSP must specify OREM will describe all geologic materials (soil, saprolite and bedrock) sufficiently to identify lithology, chert lenses, fractures/voids, relic bedding, moisture and other features that may bear or transmit water.	Section B.2 was revised to state:  <i>"A geologist or engineer will describe the material with sufficient detail to identify lithology, chert lenses, relic bedding, moisture, and other features that may bear or transmit water (e.g., areas of fracturing, bedding, dissolution)."</i>	
9.	TDEC	General	Select intervals for geotechnical samples (e.g., horizontal and vertical hydraulic conductivity values) based on observed characteristics.  Clarify how D2 FSP meets this data collection requirement identified in the SOW (page 3).  In the D1 FSP, Table 4 indicated that geotechnical data would be gathered from geotechnical borings, test pits, and hydrogeological and seismic borings. However, some of	Section B.3 was modified to state:  <i>"The total number of tests, specific locations, and depths of the laboratory samples will be determined in consultation with geotechnical engineers and the geotechnical laboratory following review of the borehole logs and collected samples. There is no specific criteria available in advance. The selection of samples for</i>	

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			that language has been deleted from the table, which is Table 3 in the D2 FSP.	<p><i>each test will be based on professional judgment by the design team and the laboratory based on the subsurface conditions encountered, sample quantity and quality, and budget."</i></p> <p>The Phase 1 FSP fulfills the requirements of the SOW. Scope previously included in the FSP that is not identified in the referenced SOW will be performed in the Phase 2 investigation.</p>	
10.	TDEC	General	<p>Core any bedrock drilled with detailed observations to identify, quantify, and describe areas of fracturing, bedding, dissolution and other features that may transmit water.</p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW.</p> <p>The FSP indicates that bedrock will be cored to depths of approximately at least 10 feet below the top of bedrock (Tables 1 and 3) at multiple locations (Table 4). However, the FSP must specify that the core samples will be described in detail to identify, quantify, and describe areas of fracturing, bedding, dissolution and other features that may transmit water.</p>	<p>Section B.2 was revised to state:</p> <p><i>"A geologist or engineer will describe the material with sufficient detail to identify lithology, chert lenses, relic bedding, moisture, and other features that may bear or transmit water (e.g., areas of fracturing, bedding, dissolution)."</i></p>	
11.	TDEC	General	<p>Screen piezometers at depths that contain groundwater, based on information and observations made during drilling.</p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 3).</p> <p>The FSP indicates on page B-15 that the screen setting shall be determined based on lithology, the interception of or lack of fractures, and the location of hydrogeological unit contacts. Revise this statement to clarify that the screen setting shall be at depths where groundwater is encountered, based on the interception of water-bearing fractures and other observations made during drilling.</p>	<p>Section B.3 was revised to state:</p> <p><i>"The actual length of the screened interval and the screen setting shall be determined based on lithology, the interception of fractures (e.g., locations encountering groundwater) or lack of fractures, and the location of hydrogeological unit contacts."</i></p>	



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12.	TDEC	General	<p><b>Survey horizontal position and ground surface at each piezometer within 0.1 foot and top-of-casing elevation within 0.01 foot.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>The FSP must include a statement indicating that a Tennessee-licensed land surveyor will survey the horizontal position and ground surface elevation at each piezometer within 0.1 foot and the top-of-casing elevation of each piezometer within 0.01 foot.</p>	<p>Section 6 has been modified to state:</p> <p><i>"Locations will be surveyed by a licensed land surveyor, including horizontal position and ground surface elevation at each piezometer within 0.1 ft and top-of-casing elevation of each piezometer within 0.01 ft."</i></p>	
13.	TDEC	General	<p><b>Instrument each piezometer to record hydraulic head (water level), temperature, conductivity, and pH at intervals of at least every 30 minutes.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>In accordance with OREM's October 4, 2017 transmittal letter for the D2 FSP, OREM did modify the frequency of continuous groundwater measurements to 30-minute intervals for groundwater levels and temperature. However, Section 6.1 of the FSP says that conductivity and pH will be measured only twice bi-weekly for four weeks.</p> <p>The October 4, 2017 transmittal letter for the D1 FSP states that OREM will measure conductivity and pH manually because of difficulties and higher cost associated with continuous monitoring of these parameters. TDEC staff believe there is a benefit to measuring these parameters on a continuous basis. Even if the data are not perfectly accurate, the rate of change in values for these parameters over relatively short time intervals can provide valuable semi-quantitative information regarding interactions among precipitation, surface water, and groundwater. Such changes cannot be characterized with daily or weekly measurements.</p>	<p>Section 6.1.1 has been revised to state:</p> <p><i>"Groundwater elevation, conductivity, pH and temperature data will be collected using downhole monitors placed in each piezometer. Data will be collected continuously and recorded every 30 minutes with downloads every 2 weeks."</i></p>	

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14.	TDEC	General	<p>Collect the data described above from the following locations:</p> <ul style="list-style-type: none"> <li>• GW-978/GW-979</li> <li>• GW-982/GW-983</li> <li>• GW-986/GW-987</li> <li>• GW-988/GW-989</li> <li>• GW-992/GW-993</li> <li>• GW-994/GW-995</li> <li>• GW-998/GW-999</li> </ul> <p>The FSP meets this data collection requirement identified in the SOW (page 4). No revision is required.</p> <p>These locations are included in FSP tables titled "Summary of subsurface sample collection location"; "Groundwater level, location specific target depths and tests"; and "Summary of subsurface sample collection locations". These locations are also listed in Figures 5 and 14.</p>	No changes to the FSP are required.	
15.	TDEC	General	<p><b>Estimate the buffer zone boundary which shall not overlie the karstic Maynardville Limestone or its contact with the Nolichucky Shale.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>The FSP includes numerous references to the geologic buffer that would underlie the proposed landfill, but it must also present an estimated boundary for the horizontal buffer zone around the proposed facility. A horizontal buffer zone is critical to reduce the threat of contaminating groundwater in the karstic Maynardville Limestone and to facilitate the detection and remediation of contaminants released to groundwater before they reach that sensitive groundwater unit. Definition of the buffer zone boundary is also critical for satisfying several requirements presented on pages 4 and 5 of the SOW, as reiterated below.</p> <p><i>"The July 20th map (attached) does not identify the boundary of the <u>buffer zone</u> required for monitoring and potential future corrective action. DOE must estimate</i></p>	<p>Section 6.1.1 and Figure 14 were revised to include a buffer zone. Text added to Section 6.1.1 is as follows:</p> <p><i>"The estimated horizontal buffer zone around the EMDF waste cells is provided in Fig. 14. As defined in TDEC 0400-20-11-.03 the buffer zone is 'portion of the disposal site that is controlled by the licensee and that lies under the disposal units and between the disposal units and the boundary of the site.'</i></p> <p><i>The buffer zone is estimated based on the design presented in the FS and will be refined as the engineering design is developed. As currently drawn, this estimated buffer zone is sufficient for monitoring and future remedial actions (if necessary)."</i></p>	

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			<p>the <u>buffer zone</u> boundary which shall not overlie the karstic Maynardville Limestone or its contact with the Nolichucky Shale. [Footnote 2: DOE must identify the Nolichucky-Maynardville contact based on field observations that do not rely on regional geologic maps. It is particularly important to identify locations where the contact underlies any portion of the site, including locations where the contact crosses streams that flow through the site/buffer.] DOE shall measure the flow of surface water using standard flumes or weirs where any stream (e.g., NT-10, D-10W, and NT-11) enters and leaves the <u>buffer zone</u>. For streams originating within the site/buffer area, spring discharge or stream flow shall be measured as close as possible to the spring/seep zone.... DOE must engage a Qualified Hydrologic Professional [QHP] in accordance with TDEC 0400-40-17 to walk the site area, including the <u>buffer zone</u>, during the wet season and identify locations of springs and seeps. For any spring or seep where it is practical, DOE must measure flow, temperature, conductivity, and pH.</p> <p>DOE must evaluate NT-10, D-1 OW, and NT-11 at intervals of 50 feet or less within the disposal site including <u>buffer zone</u> by describing stream sections, including any observed springs or seeps, and measuring temperature, conductivity, and pH....</p> <p>This SOW assumes that neither the disposal area nor the associated <u>buffer zone</u> overlies the Maynardville Limestone or the Maynardville-Nolichucky contact. If any portion of the disposal area or buffer zone overlies the Maynardville Limestone or its contact with the Nolichucky shale, additional site characterization will be required to demonstrate compliance with additional ARARs [Applicable or Relevant and Appropriate Requirements] complicated by groundwater movement in a karst environment."</p>		
16.	TDEC	General	Identify the Nolichucky-Maynardville contact based on field observations that do not rely on regional geologic maps.	Table 1 was revised to state: "Field walkdowns to identify contact	

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			<p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>The FSP includes numerous references to the Nolichucky-Maynardville contact, but it must state explicitly that the contact will be identified based on field observations rather than relying on regional geologic maps like those on Figures 2 through 6. This is important because, as stated in footnote 2 on page 4 of the SOW, TDEC expects OREM to identify locations where the Nolichucky-Maynardville contact underlies any portion of the site, including locations where the contact crosses streams that flow through the site/buffer.</p> <p>Table 1 identifies that a principal study question is: "Where is the Maynardville contact and does it underlie a buffer zone surrounding the landfill?" Table 1 also identifies bedrock stratigraphy as a decision input for determining "the location of the Maynardville Formation". However, it is not clear how OREM proposes to identify the Nolichucky-Maynardville contact based on field observations.</p> <p>Section 6.1, Groundwater Evaluation, says: "The piezometer along the southern boundary of the disposal cell berms will provide downgradient groundwater elevations and will help locate the contact with the Maynardville Limestone." Regional geologic mapping like that shown on Figure 14 suggest that the southernmost piezometer location is not likely to intersect the Maynardville Limestone, which dips (slopes) southeastward away from that location as shown on Figure 4.</p>	<p><i>between the Nolichucky and Maynardville Formations"</i></p> <p>The phrase "and will help locate the contact with the Maynardville Limestone." was deleted.</p>	
17.	TDEC	General	<p>Measure the flow of surface water using standard flumes or weirs where any stream (e.g., NT-10, D-10W, and NT-11) enters and leaves the buffer zone.</p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>The FSP (Table 2) states that OREM will monitor surface</p>	<p>Section 6.2.2 was revised as follows:</p> <p><i>"Based on the site walkovers, three surface water flow measurement stations are planned for installation at appropriate locations in the Nolichucky Shale outcrop areas in NT-10 and NT-11. These stations are planned for locations where the</i></p>	

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			water flow in the lower reaches of NT-10 and NT-11, including a second location along NT-11 south of the Haul Road, and two locations in D-10W. The locations described may be acceptable depending on how OREM defines the horizontal buffer zone. However, the number and/or locations of surface water monitoring stations may need to be revised, particularly for NT-10 and NT-11, to satisfy the SOW requirement. Just like groundwater level monitoring, OREM must characterize wet season stream conditions and continue data collection at least through the ROD.	<p><i>tributaries enter or leave the buffer zone (Fig. 14). The specific locations and measurement apparatus sizing will be based on results of the additional fieldwork outlined above.</i></p> <p><i>For the D-10W valley, a surface water flow measurement station is planned for installation upstream of Haul Road in an area where surface water flow diversion may be considered during design. A station is also planned for installation downstream of the existing Bear Creek Road near the Nolichucky Shale/ Maynardville Limestone geologic contact where D-10W leaves the buffer zone (Fig. 14). Another surface water flow measurement station will be placed as indicated by the site walkover."</i></p>	
18.	TDEC	General	<p>Measure spring discharge or stream flow for streams originating within the site/buffer area.</p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>The FSP (Table 1) states, "D-11E drainage will be covered by the landfill and does not require a flow evaluation." TDEC does not agree because OREM has provided no data to indicate that groundwater discharge to D-11E will cease as a result of landfill construction. The FSP must state that flow and discharge will be measured along D-11E (shown on Figure 14) and any springs identified during the site walkovers along D-11E. Collection of this characterization information is critical for assessing the currently assumed landfill footprint.</p>	<p>The following text was added to Section 6.2.2:</p> <p><i>"Because surface water flow is not present/ cannot be measured with conventional flow measurement devices in the D-11E area, and subsurface flow merges with NT-11 prior to leaving the site/buffer zone, the already established flume locations located upstream and downstream of the D-11E area discharge into NT-11 will be used to approximate the D-11E discharge as requested."</i></p>	
19.	TDEC	General	<p>Establish downstream gaging stations locations on the Nolichucky Shale, not the Maynardville Limestone.</p> <p>The FSP meets this data collection requirement identified in the SOW (page 4). No revision is required.</p>	No changes to the FSP are required.	

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			Table 2 and Section 6.2.2 state that OREM will place surface water flow measurement stations in the Nolichucky Shale outcrop areas in the lower reaches of NT-10 and NT-11.		
20.	TDEC	General	<p>Instrument each stream gaging station to record discharge (flow), temperature, conductivity, and pH at intervals of at least every 30 minutes.</p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>In accordance with OREM's October 4, 2017 transmittal letter for the D2 FSP, OREM did modify the frequency of continuous surface water measurements to 30-minute intervals for flow and temperature. However, Section 6.2.2 of the FSP says that conductivity and pH will be measured only twice-bi-weekly for four weeks.</p> <p>The October 4, 2017 transmittal letter for the D1 FSP states that OREM will measure conductivity and pH manually because of difficulties and higher cost associated with continuous monitoring of these parameters. TDEC staff believe there is a benefit to measuring these parameters on a continuous basis. Even if the data are not perfectly accurate, the rate of change in values for these parameters over relatively short time intervals can provide valuable semi-quantitative information regarding interactions among precipitation, surface water, and groundwater. Such changes cannot be characterized with daily or weekly measurements.</p>	<p>Section 6.2.2 was revised as follows:</p> <p><i>"Surface water flow measurements will be performed as described in Appendix B, Sect. B.4, and will include continuous flow, temperature, pH, and conductivity measurements collected at 30-minute intervals. Phase 1 characterization will begin in the spring 2018 (March-April timeframe)."</i></p>	
21.	TDEC	General	<p><b>OREM must engage a Qualified Hydrologic Professional (QHP) in accordance with TDEC 0400-40-17 to walk the site area, including the buffer zone, during the wet season and identify locations of springs and seeps.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p>	<p>Section 6.2.1 was revised as follows:</p> <p><i>"A qualified hydrologic professional (TDEC 2011) will participate in the walkovers."</i></p>	

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			<p>During the autumn of 2017, TDEC offered the services of a staff QHP to support the stream characterization, and OREM accepted the offer.</p> <p>Subsequently, on January 10, 2018, OREM notified TDEC by email that a QHP from Oak Ridge National Laboratory (ORNL) will support the effort, along with a hydrogeologist with extensive experience on the ORR. This is consistent with the SOW and needs to be documented in the revised FSP.</p>		
22.	TDEC	General	<p><b>Measure flow, temperature, conductivity, and pH at each spring/seep.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>The FSP (Sections 6.2.1 and 6.2.2) states that electrical conductivity measurements will be performed to determine the potential influence from groundwater. The FSP must clarify that OREM will measure flow, temperature, conductivity, and pH at each spring/seep in addition to every 50 feet along the streams.</p>	<p>Section 6.2.1 was revised as follows:</p> <p><i>"The walkover will include a description every 50 ft of NT-10, D-10W, and NT-11 (as safe access allows) and field measurements of temperature, specific conductivity, and pH (seeps/springs to be included)."</i></p>	
23.	TDEC	General	<p><b>Evaluate NT-10, D-10W, and NT-11 at intervals of 50 feet or less within the disposal site including buffer zone by describing stream sections, including any observed springs or seeps, and measuring temperature, conductivity, and pH twice during the wet season and twice during the dry season.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 4).</p> <p>There are statements in Table 2 and Section 6.2.1 that OREM will identify seeps, springs, and other expressions of shallow groundwater during a wet-season (December-April) site walkover.</p> <p>However, in accordance with the SOW and OREM's October 4, 2017 transmittal letter for the D1 FSP, revise the FSP to reflect OREM's commitment to complete at least</p>	<p>Section 6.2.1 was revised as follows:</p> <p><i>"Two detailed site walkovers will be performed during the wet season (winter 2018) to further characterize surface geology, identify geotechnical areas of interest, and identify seeps, springs, and other expressions of shallow groundwater in NT-10, D-10W, D-11E, and NT-11. Observations of flow in macropores and similar features during the wet season also will occur to determine potential impacts on design. The walkover will include a description every 50 ft of NT-10, D-10W, and NT-11 (as safe access allows) and field measurements of temperature, specific conductivity, and pH"</i></p>	

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			<p>two site walkovers during the wet season and two during the dry season to describe conditions. Also, clarify in Section 6.2.1 that the site walkovers OREM plans to complete southeast of the Haul Road are part of (not in lieu of) the walkovers to characterize conditions along NT-10, D-10W and NT-11.</p> <p>Finally, for consistency with the SOW, delete the phrase "as access allows and is appropriate" or clarify its meaning in Table 2 and Section 6.2.1. TDEC staff understand short reaches of the streams are in culverts under roadways, and description/measurement locations may be adjusted accordingly.</p>	<p>(seeps/springs to be included). The specific conductivity measurements will be performed to determine the potential influence from groundwater. A qualified hydrologic professional (TDEC 2011) will participate in the walkovers. The results of these wet weather walkovers will be documented in Technical Memorandum 1 along with results of two additional walkdowns in May and June. Additionally, two dry season walkovers will be performed during September/October 2018 and documented in the Technical Memorandum 2."</p>	
24.	TDEC	General	<p><b>Perform additional site characterization to demonstrate compliance with additional ARARs complicated by groundwater movement in a karst environment if any portion of the disposal area or buffer zone overlies the Maynardville Limestone or its contact with the Nolichucky shale.</b></p> <p>Revise the FSP to reflect this data collection requirement identified in the SOW (page 5).</p> <p>As discussed in General Comment 15, the FSP must present an estimated boundary for the horizontal buffer zone around the proposed facility. The FSP must also indicate whether any portion of the proposed disposal area or buffer zone overlies the Maynardville Limestone or its contact with the Nolichucky shale. Finally, in accordance with the SOW, the FSP must acknowledge that OREM will work with TDEC and EPA to scope additional characterization to demonstrate ARARs if any portion of the disposal area or buffer zone overlies the Maynardville Limestone or its contact with the Nolichucky shale.</p>	<p>As shown on Figure 14, neither the disposal area nor the buffer zone overlies the Maynardville limestone or the contact with the Nolichucky shale.</p> <p>The estimated boundary of the horizontal buffer zone has been added to Figure 14 as described in the response to General Comment 15.</p>	
Specific Comments					
1.	TDEC	Sect. 1	<p>"This Field Sampling Plan identifies the initial site characterization activities (Phase 1) that have been agreed to by the FFA parties to be included in the Administrative</p>	<p>Section 1 was revised to include the following:</p>	



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			<p>Record prior to the public comment period on the preferred EM DF alternative. Additional investigations will be conducted in the future .... Longer-term monitoring of groundwater and surface water...are not within the scope of this Field Sampling Plan."</p> <p>Revise the FSP to clarify how OREM will comply with the following agreement identified in the DRA (item 3):  <i>"The FSP shall reflect mutual agreement of the parties to implement data collection identified in the "Statement of Work" provided by EPA and TDEC for Site 7C. The results and analysis of the field investigation in accordance with the FSP shall be included in the administrative record and the Proposed Plan public comment period shall be provided thereafter. This field investigation and EPA/TDEC's review of the results thereof shall be conducted prior to execution of the Record of Decision (ROD) and shall be used in selecting the remedy."</i></p> <p>The FSP proposes to implement only a very limited "initial" characterization effort. It does not explain how OREM will fully implement data collection identified in the SOW to comply with the agreement.</p>	<p><i>"This Field Sampling Plan describes the objectives, requirements, and approach to collecting groundwater elevations and surface water flow data, and conducting geotechnical testing and exploration to characterize Site 7c, the current preferred location for the proposed Environmental Management Disposal Facility (EMDF) (Fig. 1) on the DOE ORR. This Field Sampling Plan presents the site characterization activities (Phase 1) identified in the Statement of Work provided by the U.S. Environmental Protection Agency (EPA) and Tennessee Department of Environment and Conservation (TDEC) for Site 7c/CBCV site. The Federal Facility Agreement (FFA) parties have agreed that the results of this Field Sampling Plan will be documented in Technical Memorandum 1 and included in the Administrative Record prior to the public comment period on the preferred EMDF alternative (prior to completion of the Proposed Plan).</i></p> <p><i>Additional investigations will be conducted in the future to obtain additional hydrogeological, geotechnical, and geophysical data for the EMDF design, including data collection to support design of the support facilities and required relocation of the Haul Road and Bear Creek Road. In addition, baseline sampling to determine the baseline analytical data will be performed as part of a future investigation phase. Longer-term monitoring of groundwater and surface water monitoring locations identified in this Field Sampling Plan also will be conducted in the May 2018 through February 2019</i></p>	

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				<i>timeframe and documented in Technical Memorandum 2."</i>	
2.	TDEC	Sect. 2.3.2	Revision of the section title from "Initial Investigation" in the D1 to "Preliminary Investigation" in the D2 is not consistent with the text inserted in Section 1: <i>"This Field Sampling Plan identifies the initial site characterization activities (Phase 1)..."</i> . What distinction is made by changing "Initial" to "Preliminary"? Regardless, revise the FSP to clarify how OREM will comply with the DRA if this FSP only proposes to implement an "initial" or "preliminary" characterization effort.	This section describes a site walkover conducted in advance of FSP development to guide investigation activities and does not include any activities described in the SOW. It was relabeled as "Preliminary" to avoid confusion with the SOW activities.	
3.	TDEC	Table 1	<i>"If the predicted post- construction groundwater table is above the geologic buffer, then the design elevation must be increased or a French drain or other groundwater control system must be included in the design."</i>  It has not been demonstrated that the site would meet CERCLA threshold criteria, if the predicted post-construction groundwater table requires French drains to lower the water table below the geologic buffer.	The text in Table 1 was revised as follows to remove the French Drain as a remedy:  <i>"If the predicted post-construction groundwater table is above the geologic buffer, then the design elevation must be increased or other groundwater control system must be included in the design."</i>  <i>If the predicted post-construction groundwater elevations and flows using the planned groundwater controls are insufficient to lower the groundwater table to this allowable level, then the design must be revised to maintain the geologic buffer layer."</i>	
4.	TDEC	Table 1	<i>"Locations of new water level measurement locations are shown in Fig. 14."</i>  Locations of existing water-level measurement locations should also be shown on a map. As noted by an OREM representative on December 12, 2017, the FSP must state clearly how data will be evaluated. OREM's use of water-level data from existing wells/ piezometers in BCV will be critical to the evaluation.	Figure 15 has been added to the Field Sampling Plan to provide the locations of the existing Bear Creek Valley wells and piezometers that will be used in the evaluation.	
5.	TDEC	Sect. 5	<i>"However, the following sequence is anticipated for Phase 1 work..."</i>  The schedule in Section 5 of the FSP indicates that data	Section 5 was revised in consultation with EPA and TDEC and now reflects mutual agreement on the text and schedule.	

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			collection will be limited to a period of four weeks or less at the end of the 2017-2018 winter wet season. This is not consistent with the SOW and the DRA. Multiple tasks are scheduled very generally as "Spring 2018," indicating that OREM will collect little or no data during the winter wet-season. Revise the FSP to explain how OREM will comply with the DRA and SOW.		
6.	TDEC	Sect. 5	<i>"Monitoring (following piezometer installation) for 4 weeks".</i>  Data collection limited to a period of four weeks or less at/following the end of the 2017-2018 winter wet season is not consistent with the SOW and the DRA. Revise the FSP to comply with the DRA and SOW.	Section 5 was revised in consultation with EPA and TDEC and now reflects mutual agreement on the text and schedule.	
7.	TDEC	Sect. 6.1	<i>"Piezometers are not needed near the main channels for NT-1 1 and D-10W because these are groundwater discharge locations and define the ground water elevation."</i>  Delete this sentence, which adds no value to the FSP. Although these TDEC-requested locations were not included in the SOW, the original rationale for these locations was to evaluate groundwater gradients beneath the proposed landfill footprint adjacent to the streams-not to define groundwater elevations at the streams.	This sentence was deleted.	
8.	TDEC	Sect. 6.1	<i>"Groundwater elevation and temperature data will be initially collected by using downhole monitors placed in each piezometer. Data will be collected every 30 minutes and downloaded biweekly during this initial phase to obtain one month of data. In addition, pH and conductivity measurements will be collected on a bi-weekly basis from the piezometers. The initial phase (Phase 1) of site characterization includes 4 weeks of data collection."</i>  Data collection limited to a period of one month at the end of the 2017-2018 winter wet season is not consistent with the SOW and the DRA. Revise the FSP to comply with the DRA and SOW, including the SOW requirement to also instrument each piezometer to record conductivity and pH at intervals of at least every 30 minutes, not twice (bi-weekly for four weeks).	As described in the response to General Comment 13, Section 6.1.1 now states:  <i>"Groundwater elevation, conductivity, pH and temperature data will be collected using downhole monitors placed in each piezometer. Data will be collected continuously and recorded every 30 minutes with downloads every 2 weeks."</i>  Section 6.1.1 was revised to address data collection timeframe as follows:  <i>"Technical Memorandum 1 will include continuous monitoring of these 16 piezometers during the March/April timeframe. Monitoring will continue for at</i>	

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				<i>least 1 year to ensure seasonal high- and low-water levels are captured."</i>	
9.	TDEC	Sect. 6.1	<p><i>"Groundwater elevations determined from depth-to-water measurements will be used to (1) estimate the groundwater surface elevations across the entire footprint of EMDF (and immediate areas upgradient/downgradient), and (2) assess and design the difference between the water table and the proposed geobuffer beneath all disposal cells."</i></p> <p>In accordance with the SOW and 40 CFR 761.75(b)(3), revise the FSP to clarify that decisions are based on the <u>historical</u> high water table. This parameter may be estimated by comparing to longer records throughout the valley, but it cannot be developed only from a limited set of depth-to-water measurements at Site 7c.</p>	<p>As described in response to General Comment 1, text was added in Section 6.1.2 as follows:</p> <p><i>"To aid in interpreting the results, long term monitoring of precipitation and groundwater elevations for similarly located piezometers at the Environmental Management Waste Management Facility (EMWMF), and other BCV locations, will be used to provide input into the conditions at the CBCV site, specifically the groundwater elevations during the wet season."</i></p>	
10.	TDEC	Sect. 6.2.2	<p><i>"In addition, pH and conductivity measurements will be collected on a bi-weekly basis. The initial phase of characterization (Phase 1) will consist of the first 4 weeks of flow measurements."</i></p> <p>Data collection limited to a period of one month at the end of the 2017-2018 winter wet season is not consistent with the SOW and the DRA. Revise the FSP to comply with the DRA and SOW, including the SOW requirement to also instrument each stream gaging location to record conductivity and pH at intervals of at least every 30 minutes, not twice (bi-weekly for four weeks).</p> <p>Further, the SOW includes surface water discharge (flow) monitoring where the northern tributaries (NTs) enter and leave the buffer zone to help quantify groundwater discharge to surface water within the disposal site. The FSP must specify how stream flow (discharge) monitoring locations relate to the buffer zone.</p>	<p>As described in the response to General Comment 20, Section 6.2.2 was revised as follows:</p> <p><i>"Surface water flow measurements will be performed as described in Appendix B, Sect. B.4, and will include continuous flow, temperature, pH, and conductivity measurements collected at 30-minute intervals. Phase 1 characterization will begin in the spring 2018 (March-April timeframe)."</i></p> <p>As described in the response to General Comment 17, Section 6.2.2 was revised as follows:</p> <p><i>"Based on the site walkovers, three surface water flow measurement stations are planned for installation at appropriate locations in the Nolichucky Shale outcrop areas in NT-10 and NT-11. These stations</i></p>	

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				<p>are planned for locations where the tributaries enter or leave the buffer zone (Fig. 14). The specific locations and measurement apparatus sizing will be based on results of the additional fieldwork outlined above.</p> <p>For the D-10W valley, a surface water flow measurement station is planned for installation upstream of Haul Road in an area where surface water flow diversion may be considered during design. A station is also planned for installation downstream of the existing Bear Creek Road near the Nolichucky Shale/ Maynardville Limestone geologic contact where D-10W leaves the buffer zone (Fig. 14). Another surface water flow measurement station will be placed as indicated by the site walkover."</p>	
11.	TDEC	Sect. 9	<p>"Up to 4 weeks of data will be considered part of the Phase 1 data collection to be provided prior to the public comment period.</p> <p>Data collection limited to a period of one month at the end of the 2017-2018 winter wet season is not consistent with the SOW and the DRA. Revise the FSP to comply with the DRA and SOW.</p>	<p>Section 9 was revised as follows:</p> <p>"The results of the March-April field investigation data will be presented in Technical Memorandum 1 and will be submitted to the Administrative Record prior to the public comment period on the EMDF preferred alternative. Technical Memorandum 1 will also include the results of two additional surface water walkovers in May and June. Results from longer-term monitoring (May 2018 through February 2019) and the dry season surface water walkdowns will be documented in Technical Memorandum 2."</p>	
12.	TDEC	Sect. 9	<p>"Up to 4 weeks of surface water data will be considered part of the Phase 1 data collection to be provided prior to the public comment period."</p> <p>Data collection limited to a period of one month at the end</p>	<p>Section 9 was revised as follows:</p> <p>"The results of the March-April field investigation data will be presented in Technical Memorandum 1 and will be</p>	

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			of the 2017-2018 winter wet season is not consistent with the SOW and the DRA. Revise the FSP to comply with the DRA and SOW.	<i>submitted to the Administrative Record prior to the public comment period on the EMDF preferred alternative. Technical Memorandum 1 will also include the results of two additional surface water walkovers in May and June. Results from longer-term monitoring (May 2018 through February 2019) and the dry season surface water walkdowns will be documented in Technical Memorandum 2."</i>	
13.	TDEC	Pg. A-9, Sect. A.1	<p>"The Phase 1 approach is provided in the attached FSP."</p> <p>Delete this sentence because there is no FSP attached. The quoted statement is made in an attachment to the FSP. Moreover, the FSP indicates that the QAPP also applies to unspecified future work phases that are not described in the FSP.</p>	This sentence was deleted.	
14.	TDEC	Pg. B-17, Sect. B.3	<p>"Downhole monitors will be placed in each piezometer and will collect groundwater level and temperature data every 30 minutes. Data will be downloaded quarterly and groundwater elevations in the well points will be obtained quarterly. In addition, pH and conductivity measurements will be collected on a bi-weekly basis from each piezometer."</p> <p>The phrase "groundwater elevations in the well points will be obtained quarterly" appears to contradict the previous sentence, which states that "monitors...will collect groundwater level and temperature data every 30 minutes". Clarify if this means that manual measurements will be made quarterly in addition to the continuous measurements at 30-minute intervals. Alternatively, the reference to "well points" may be a relic of planned monitoring locations that OREM removed in revising the FSP to include only the minimum work identified in the SOW.</p> <p>Based on the importance of the planned characterization data, OREM should revise the FSP to indicate that data will be downloaded at least every two weeks so that problems like those encountered with recent (November 2017)</p>	<p>Section B.3 was revised as follows:</p> <p>"Downhole monitors will be placed in each piezometer and will collect groundwater level, pH, conductivity, and temperature data every 30 minutes. Data will be downloaded every 2 weeks."</p>	



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			continuous water level monitoring at EMWMF can be corrected in a timely manner.		
15.	TDEC	Pg. B-19, Sect. B.4	<p><i>"In addition, pH and conductivity measurements will be collected on a bi-weekly basis at the surface water flumes."</i></p> <p>Data collection limited to a period of one month at the end of the 2017-2018 winter wet season is not consistent with the SOW and the DRA. Revise the FSP to comply with the DRA and SOW, including the SOW requirement to instrument each stream gaging location to record conductivity and pH at intervals of at least every 30 minutes, not twice (bi-weekly for four weeks).</p>	<p>Section B.4 was revised as follows:</p> <p><i>"The flumes will be monitored on an every 30 minute basis, with data downloaded every 2 weeks. The procedure listed in Table B.7 will be used to collect flow measurements."</i></p> <p><i>Flow, temperature, pH, and conductivity measurements will be collected at the surface water flumes."</i></p>	
16.	TDEC	Pg. B-19, Sect. B.4	<p><i>"The flumes will be monitored on an every 30 minute basis, with data downloaded at least quarterly..."</i></p> <p>Based on the importance of the planned characterization data, OREM should revise the FSP to indicate that data will be downloaded at least every two weeks so that problems can be corrected in a timely manner.</p>	<p>See response to Specific Comment 15 above.</p>	