

Environmental Management
Disposal Facility

Site Groundwater Characterization



U.S. DEPARTMENT OF
ENERGY



The ability to dispose of cleanup waste onsite has been fundamental to the success of the U.S. Department of Energy's (DOE) environmental management mission on the Oak Ridge Reservation (ORR). With the current disposal facility nearing capacity and significant cleanup remaining, the need for a new onsite facility is imminent.

The proposed facility, known as the Environmental Management Disposal Facility (EMDF), will allow DOE to maintain its cleanup momentum on the ORR, enhancing safety and enabling science and national security missions.

DOE has worked collaboratively with the U.S. Environmental Protection Agency (EPA) and Tennessee Department of Environment and Conservation (TDEC) on a science-driven approach to identify a suitable location for the facility. The selected site presents the best location on the ORR for a safe and protective facility.

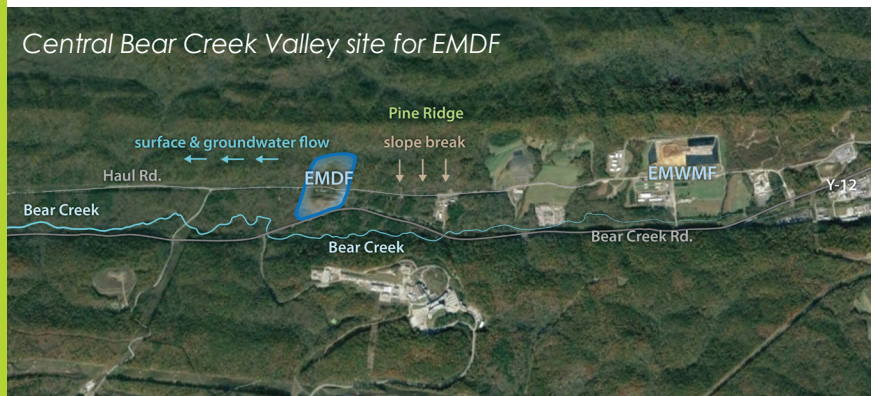
Considerations for Site Selection

DOE evaluated 16 locations across the 32,000-acre ORR to find a site with the geological characteristics most suitable for the facility. DOE, in coordination with EPA and TDEC, evaluated the geology; groundwater elevation and flow direction; and anticipated land use associated with each site.

EMDF would be constructed on federal land within Bear Creek Valley on the south side of Pine Ridge, which provides geologic, groundwater, visual, and noise barriers from the nearest community.

After collecting extensive geologic and groundwater data from numerous investigations, DOE selected this site due to its isolation from flooding concerns; proximity and existing access to future demolition/remediation sites; and its distance from Bear Creek karst features. TDEC and EPA favor the site since permanent underdrains beneath the waste are not required.

Central Bear Creek Valley site for EMDF

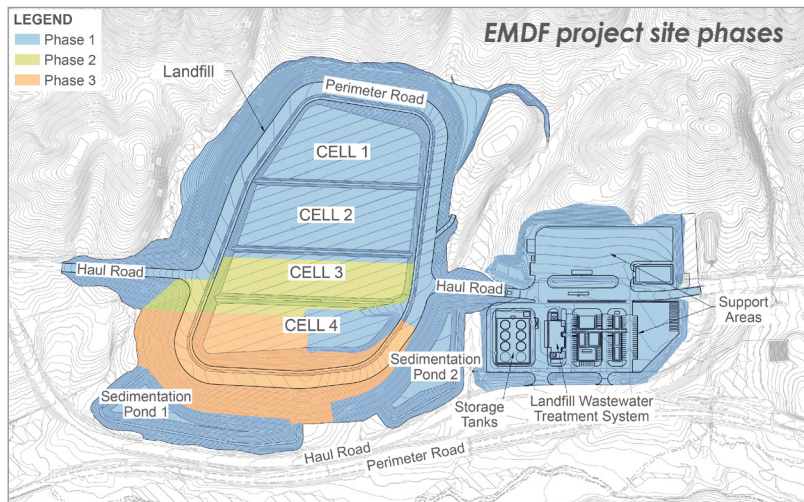


Thorough analysis and safety considerations were key in the EMDF site selection.

Environmental Management Disposal Facility Design

The EMDF is designed to hold ~2.2 million cubic yards of waste that will primarily be generated by the cleanup of deteriorating, contaminated facilities at Y-12 National Security Complex and Oak Ridge National Laboratory. The 25-acre disposal cell area will be constructed in three phases and contain four waste cells (below).

The facility's design will use engineering features to ensure waste remains isolated from the surrounding environment. The liner system (right) includes a protective 15-foot multi-layer base beneath the waste that will be effective in preventing groundwater contamination. When the landfill is completely filled, it will be covered by a multi-layer cap composed of low-permeability clays and synthetic sheeting. The top layer of the cap will be a 4-foot-thick erosion control layer of soil and grasses that provide further protection.

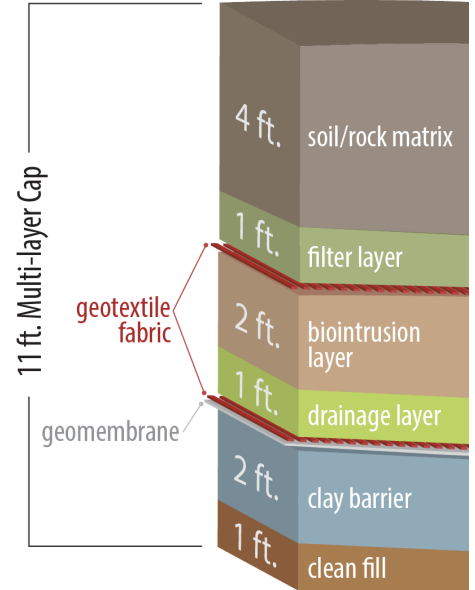


Gathering the Data

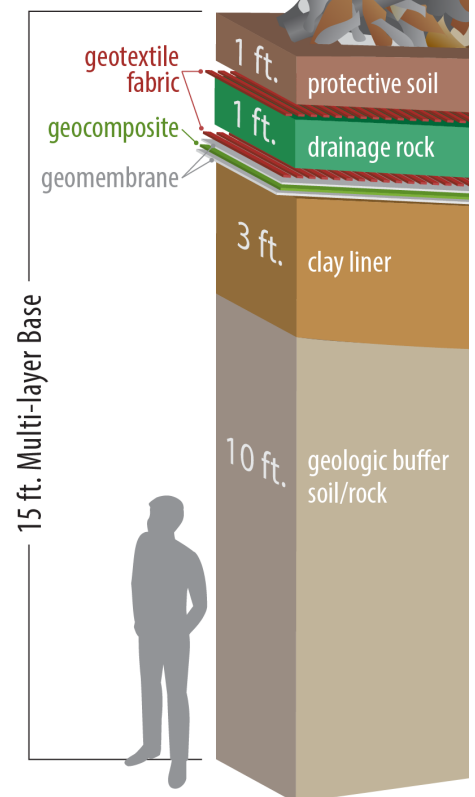
DOE used numerous characterization/sampling locations, shown in the graphic on page 3, to inform its design. The data gathered at these locations demonstrated fluctuations in groundwater elevations with seasons and rainfall. The highest groundwater elevations occur following large rainfalls in the wet season from December through March. Typically, a short-term increase and decrease in groundwater elevations occur directly related to rainfall.

At the proposed EMDF site, groundwater elevations in the highest parts of the knoll area (an existing "hill" in the area of Cells 1 and 2 that will be excavated) are higher than the projected elevation of the EMDF multi-layer base design. However, the impermeable liner system to be installed prior to waste acceptance will act as a cover that effectively prevents rain from entering the subsurface under the site. As a result, the groundwater elevations are predicted to decline below the multi-layer base system and remain below the base following construction.

EMDF Liner System



WASTE (not to scale) average height 75 ft.



Going Beyond Simulations

DOE realizes that while groundwater modeling is routinely performed and widely accepted in landfill design, it is a prediction of future conditions. To verify the modeling prediction and ensure the safest and most informed facility design, DOE will conduct a field demonstration test at the site. The test will show how groundwater levels will be affected after the landfill construction.

The field demonstration will take place in the knoll area of the site where the current groundwater elevations can be higher than the proposed multi-layer base elevation. The groundwater elevations elsewhere in the landfill footprint are already demonstrated to be below the base elevation.

DOE will use the information obtained from this demonstration project for the facility's final design to ensure groundwater will remain below the multi-layer base following construction. EPA will revisit the bases of ARAR waivers to determine their validity if a new design is developed.



*Extensive characterization/
sampling has been performed
at the proposed site.*

-Groundwater level monitoring location
- ⊕Subsurface geological testing location
- ⊙Cross-hole geological testing location
-Shallow geological testing location

To ensure the safest and most informed facility design, DOE will conduct a field demonstration to approximate future groundwater conditions.

Conducting the Field Demonstration Project – An Informed Design

First, crews will clear vegetation and remove the top layer of soil. Next, workers will place a compacted soil/clay layer and geosynthetic cover that will simulate post-construction conditions, although the actual EMDF liner system will be at a lower elevation and be much thicker and more robust.

Groundwater wells within the field demonstration area will monitor groundwater elevations for two wet seasons. Wet season monitoring provides the groundwater elevations on which the design will be

based. After the first wet season, DOE will begin the final facility design based on the available data. Data collection will continue during the second wet season to refine the design, if needed. DOE will monitor the entire year, but the data from the wet season will be key to decision making.

If there are unusual amounts of rainfall during the monitoring period, adjustments may be made to the groundwater elevations observed and used to support design, in consultation with EPA and TDEC.

Waivers/Exemptions

The Applicable or Relevant and Appropriate Requirements for the separation required between the disposed waste and groundwater or surface water are included in the draft Record of Decision. Two waivers/exemptions to siting criteria were requested, with DOE using other measures and design features to ensure protectiveness:

- A Toxic Substances Control Act waiver was requested for two chemical waste landfill requirements: (1) the requirement that there is no hydraulic connection between the site and flowing surface water, and (2) the requirement that the bottom of the landfill liner system be at least 50 feet from the historical high water table. The requested waiver is proposed based on the robust engineered liner system DOE designed that fulfills the intent of the requirements to prevent any rapid release of contamination. The engineering design achieves the level of performance and protection of health, welfare, and the environment that is equal to the original requirement.
- An exemption to a TDEC Nuclear Regulatory Commission-based disposal siting criterion that states "The hydrogeologic unit used for disposal shall not discharge groundwater to the surface within the disposal site." An exemption was requested based on: (1) the ability of the 15-foot-thick engineered liner and geologic buffer system and 11-foot-thick cover system to prevent releases from groundwater to surface water, and (2) limits on waste contaminant acceptance and accumulation that reduce the impact of potential future releases.



Construction of a disposal cell, which involves installing many protective layers below the waste.



Key Points



1. Engineers and scientists from DOE, EPA, and TDEC collected and analyzed extensive data to make informed decisions for the EMDF location to ensure it is safe and protective.
2. The design features of the EMDF isolate and protect the waste from the surrounding environment.
3. DOE will conduct a field demonstration test to verify the expected groundwater conditions following landfill construction.



DOE will accept written comments on the EMDF fact sheets any time from May 9 to June 7, 2022. DOE considers and responds to every comment it receives in a responsiveness summary that details how it affected the final decision. You may submit your comments to:

Mr. Roger Petrie,
OREM Regulatory Affairs
DOE Oak Ridge Operations
P.O. Box 2001
Oak Ridge, TN 37831

OR

OakRidgeEM@orem.doe.gov



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