Fernald Preserve
Annual Community Meeting

U.S. DEPARTMENT OF ENERGY | Legacy Management

October 9, 2024

Agenda

- Site Mission
- Comprehensive Legacy Management and Institutional Controls Plan
- 2023 Site Environmental Report
- Inspections and Natural Resource Management
- Natural Resource Trusteeship
- Monitoring
- On-Site Disposal Facility (OSDF)
- Aquifer Restoration
- Community Engagement
- Additional Updates

Fernald Preserve

Community meeting agenda

Staff

U.S. Department of Energy Office of Legacy Management

- **Brian Zimmerman**, Site Manager

RSI, Legacy Management Support Partner

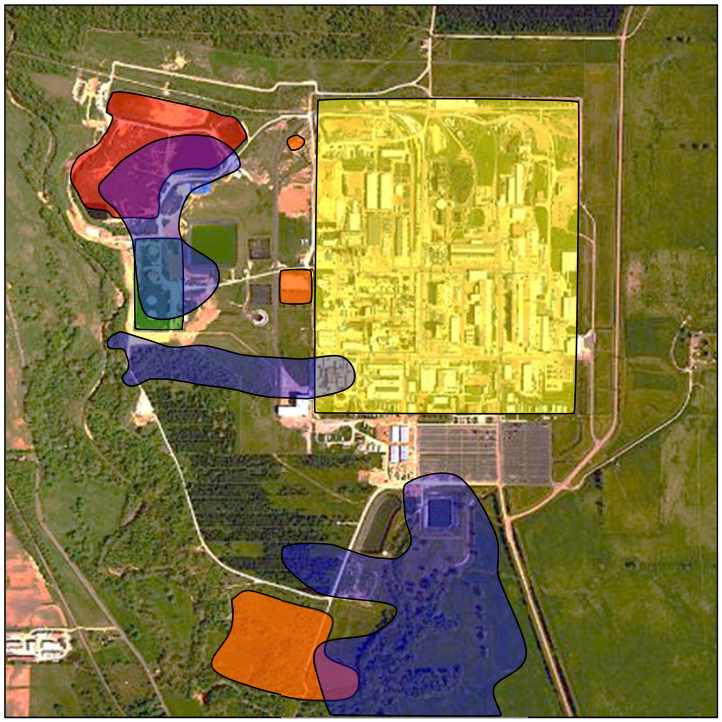
- **Greg Lupton**, Site Lead
  - **Frances Boyens**, Interpretive Services
  - **Ken Broberg**, On-Site Disposal Facility and Aquifer Restoration
  - **Lisa McHenry**, Inspections and Natural Resource Management
  - **Karen Voisard**, Environmental Monitoring, Data Management, and Reporting

Fernald Preserve

Fernald Preserve site management and LM Strategic Partner project leads.

Fernald Preserve

- Operable Unit (OU) 1
  - Waste pits
- OU2
  - Other waste units
- OU3
  - Production area
- OU4
  - Silos
- OU5
  - Environmental media (soil, groundwater, surface water)

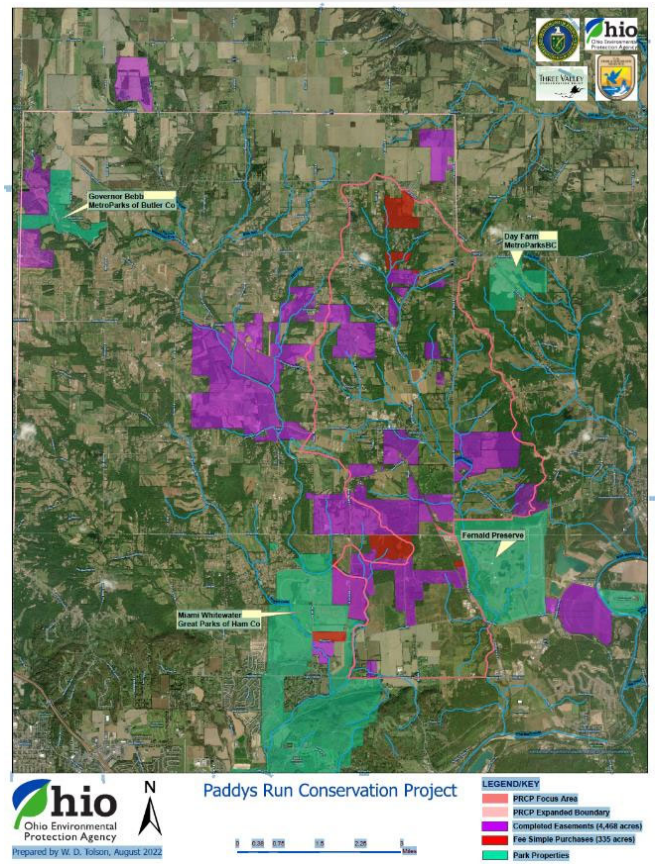


LM Mission

To fulfill the department's post-closure responsibilities and ensure the future protection of human health and the environment.

Fernald Preserve

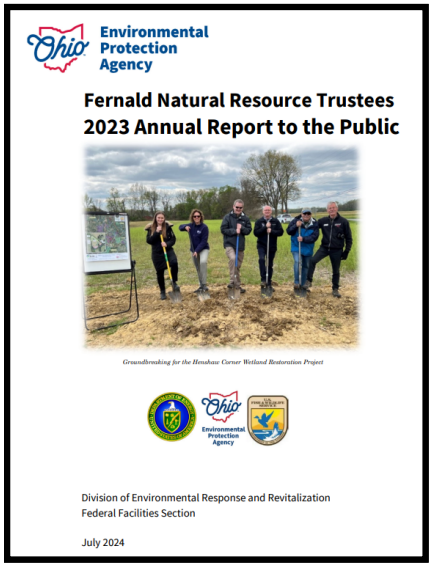
Site cleanup was divided into five Operable Units.



Natural Resource Trusteeship

The 2023 NRT report is available here:

https://dam.assets.ohio.gov/image/upload/epa.ohio.gov/Portals/30/FFS/docs/doe/fernald/2023NRTAnnualRpt_FINAL.pdf


Ohio Environmental Protection Agency

Fernald Natural Resource Trustees 2023 Annual Report to the Public

Groundbreaking for the Renahaw Corner Wetland Restoration Project

Division of Environmental Response and Revitalization
Federal Facilities Section

July 2024

Fernald Preserve

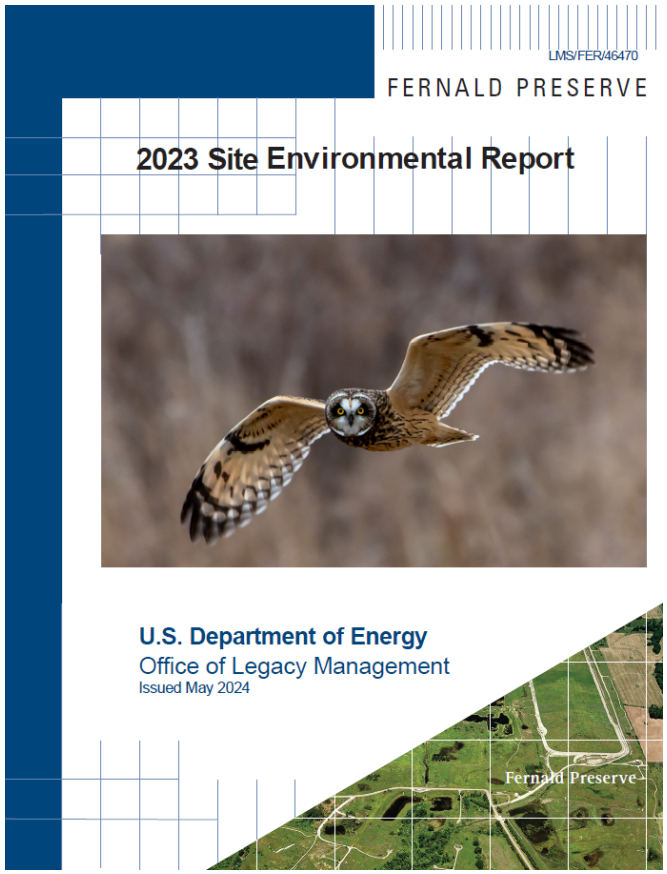
Natural Resource Trusteeship update

Comprehensive Legacy Management and Institutional Controls Plan

- Describes the requirements for the site's long-term management
- Reviewed, revised, and submitted annually to the regulatory agencies
- Consists of two volumes
  - Volume I details site management
  - Volume II is a legally enforceable document required under the Comprehensive Environmental Response, Compensation, and Liability Act
- Available at www.energy.gov/lm/fernald-preserve-ohio-site
- A full revision is available for review for calendar year 2025

Fernald Preserve

The *Comprehensive Legacy Management and Institutional Controls Plan* documents the requirements for Fernald Preserve's long-term management and is reviewed annually. A full revision is available at https://www.energy.gov/lm/fernald-preserve-ohio-site .



2023 Site Environmental Report

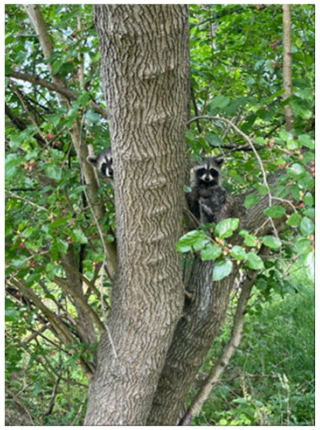
- www.energy.gov/lm/fernald-preserve-ohio-site
- Email requests to: fernald@lm.doe.gov

Fernald Preserve

The *2023 Site Environmental Report* contains annual monitoring requirement results and is available at https://www.energy.gov/lm/fernald-preserve-ohio-site.

Inspections and Natural Resource Management

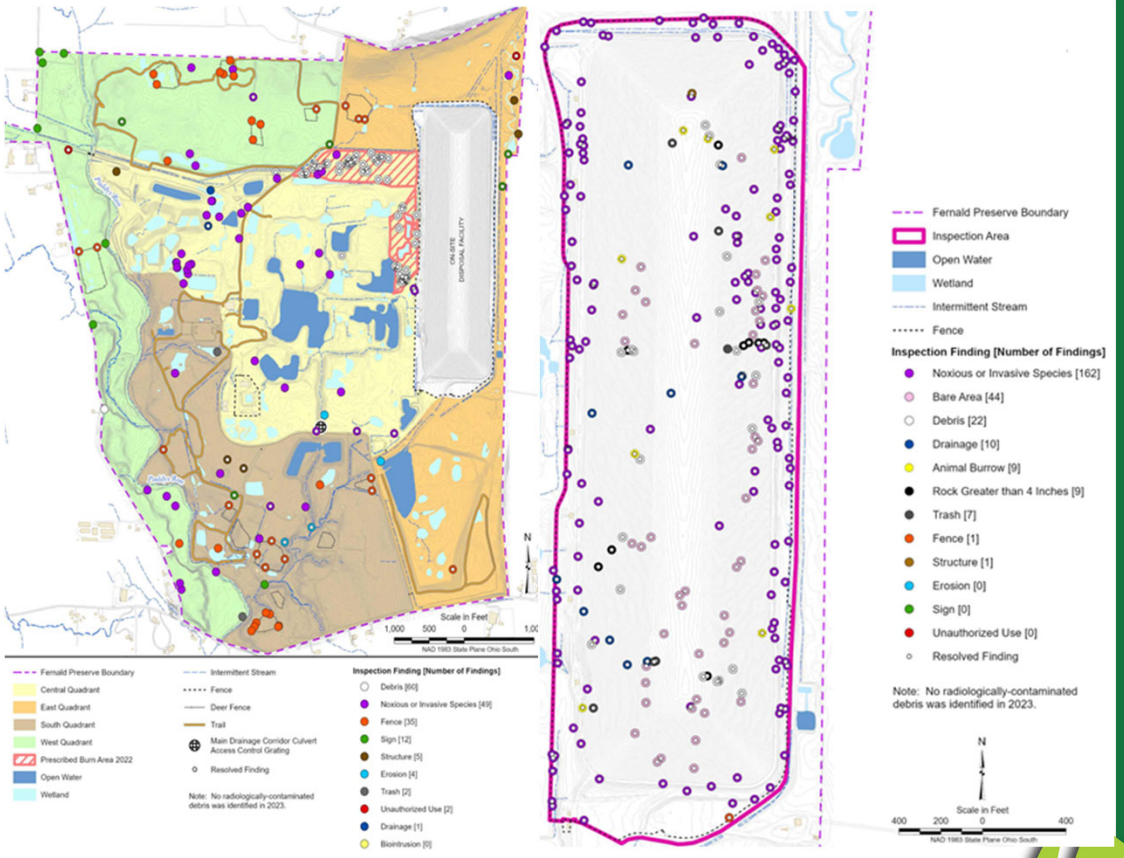
- Inspections
- Restored area maintenance
- Ecological monitoring



Ecological restoration requires inspections, continued maintenance, and monitoring.

Inspections

- Site
- OSDF
- Trails
- Post-burn



The inspection process continues in compliance with the Fernald Preserve *Comprehensive Legacy Management and Institutional Controls Plan*.

Restored Area Maintenance

- Vegetation management
- Inspection follow-up

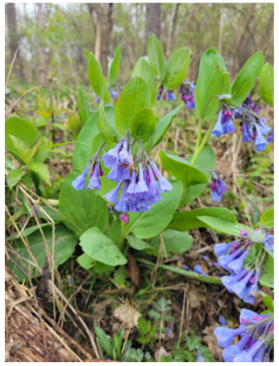
Restored area maintenance includes vegetation management and follow-up from site inspections.

Ecological Monitoring

- Forest floristic inventories
- OSDF vegetation cover

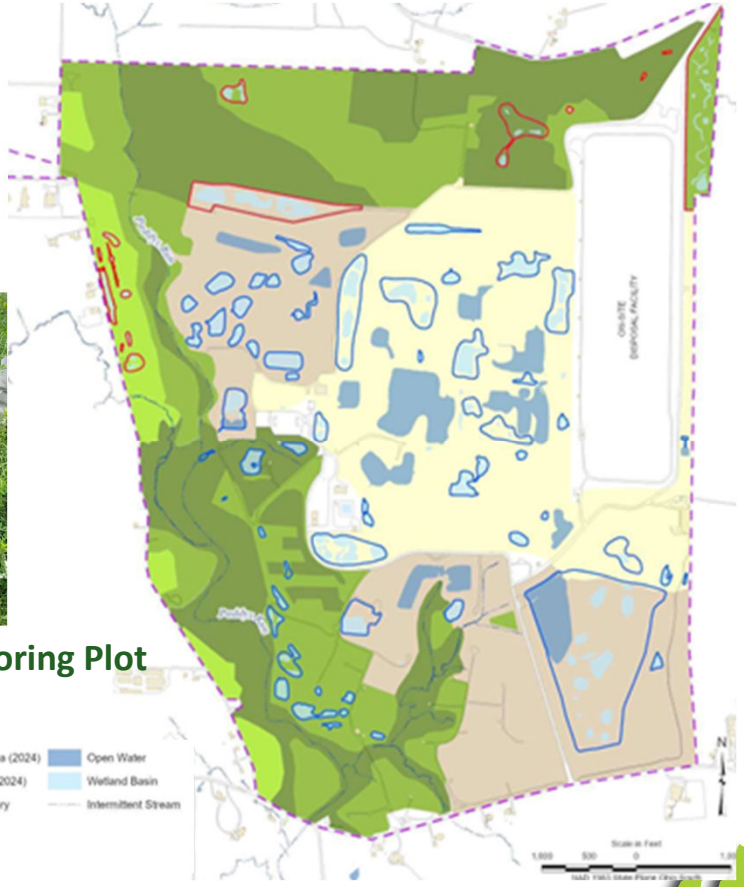
Goose Plum

Sessile Trillium



Virginia Bluebells

OSDF Vegetation Monitoring Plot



Monitoring programs help site personnel evaluate the status of ecologically restored areas, and all natural areas at the site.

New Site Flora Recordings

Spinulose wood fern

Sweet pignut hickory

Sullivant's milkweed

Cross-vine

Bottomland aster

Tufted-fescue sedge

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New site species are identified during monitoring activities.

New Site Fauna Recordings

Smith's Longspur

Mocha Emerald

Flag-tailed Spinyleg

Banded Pennant

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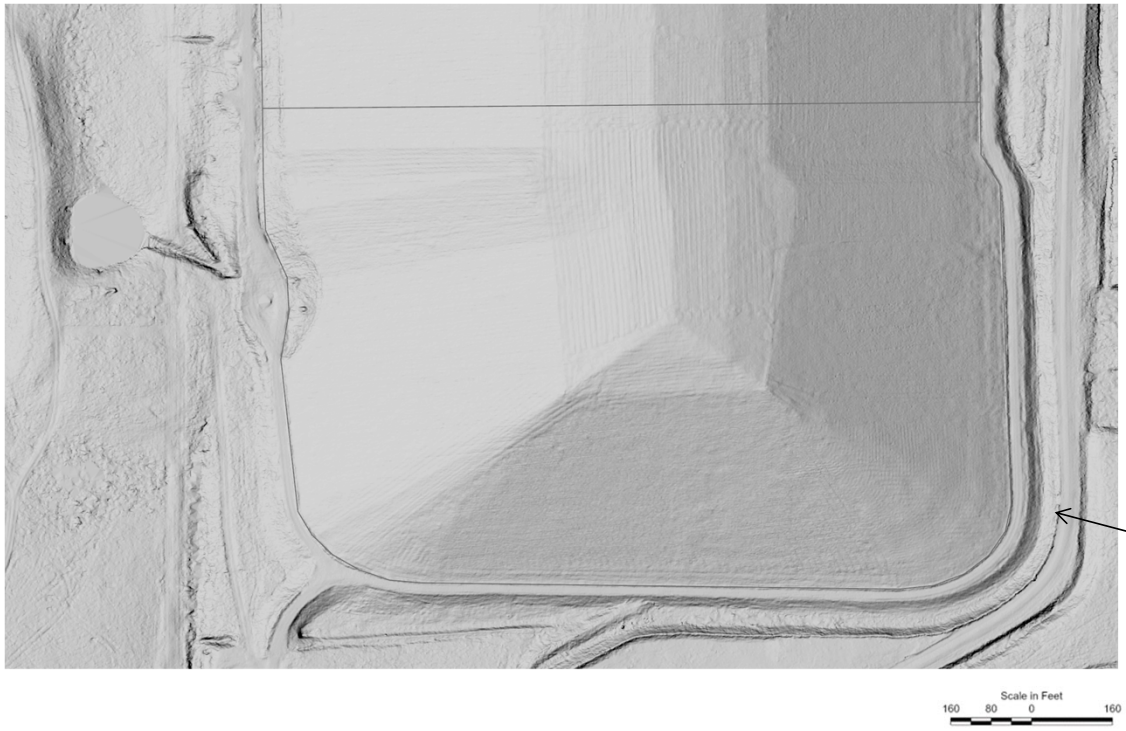
New site species are identified during monitoring and inspection activities.

Baseline Lidar Survey



An unmanned aerial lidar survey of the OSDF cap was conducted to provide a baseline to which future surveys will be compared.

Monitoring

- Surface water sampling at nine locations
- Site effluent sampling at one location
- OSDF leak-detection monitoring at 42 locations
- Groundwater sampling at 93 monitoring wells
- Water-level monitoring at 177 wells

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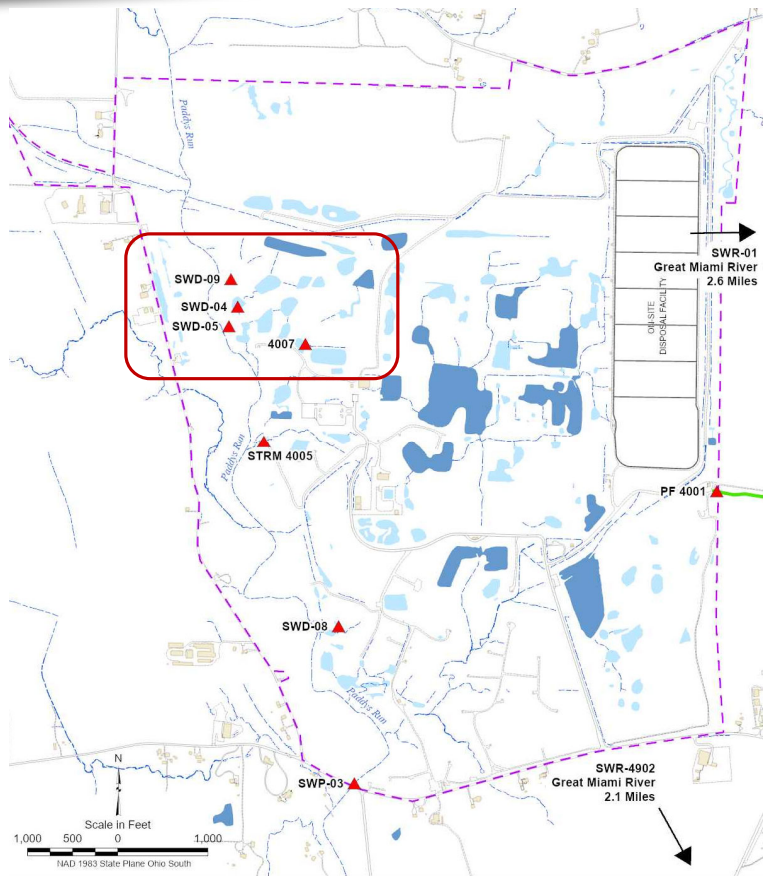
Routine environmental monitoring is conducted to ensure continued effectiveness of the site's cleanup. The 2023 monitoring program included sampling groundwater, surface water, and effluent.

Surface Water



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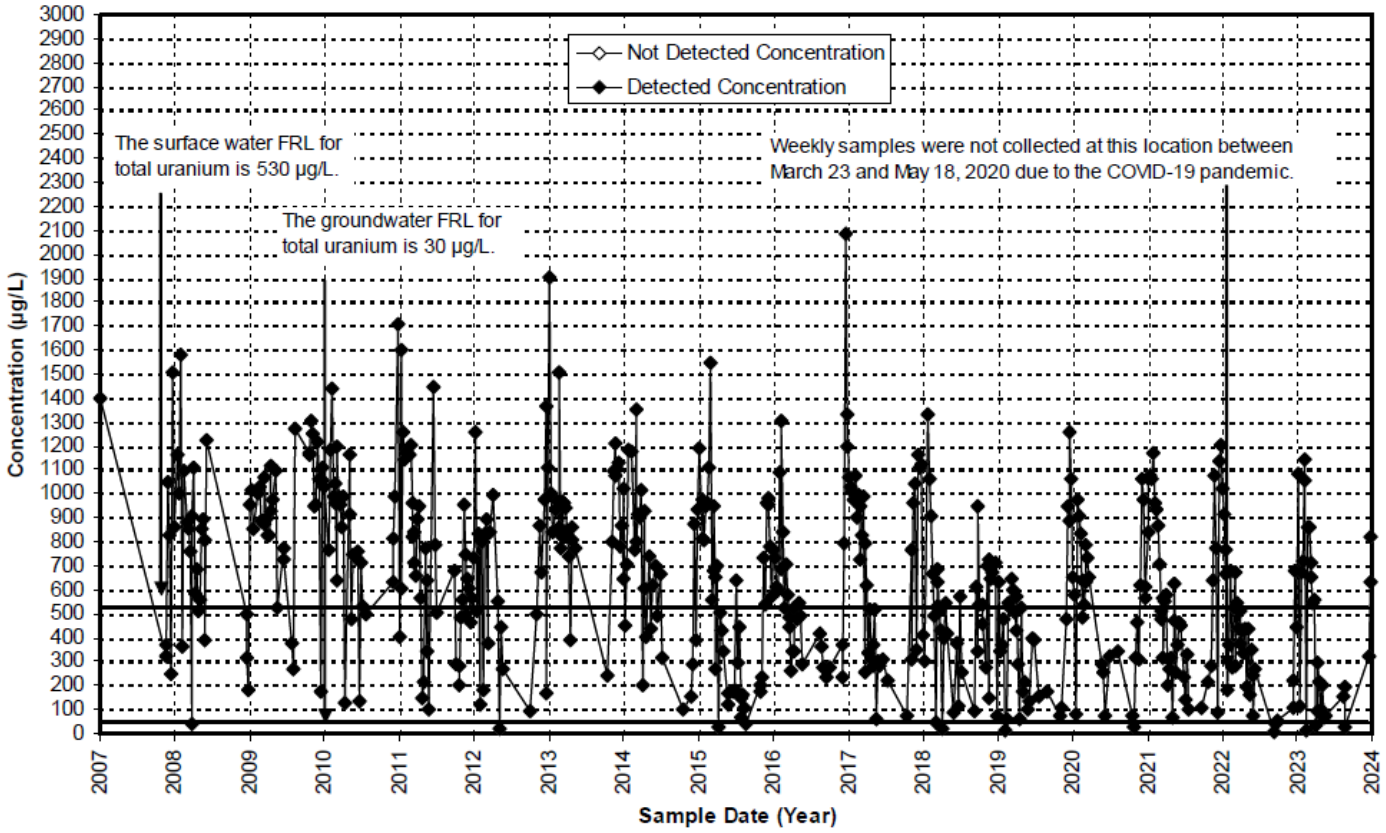
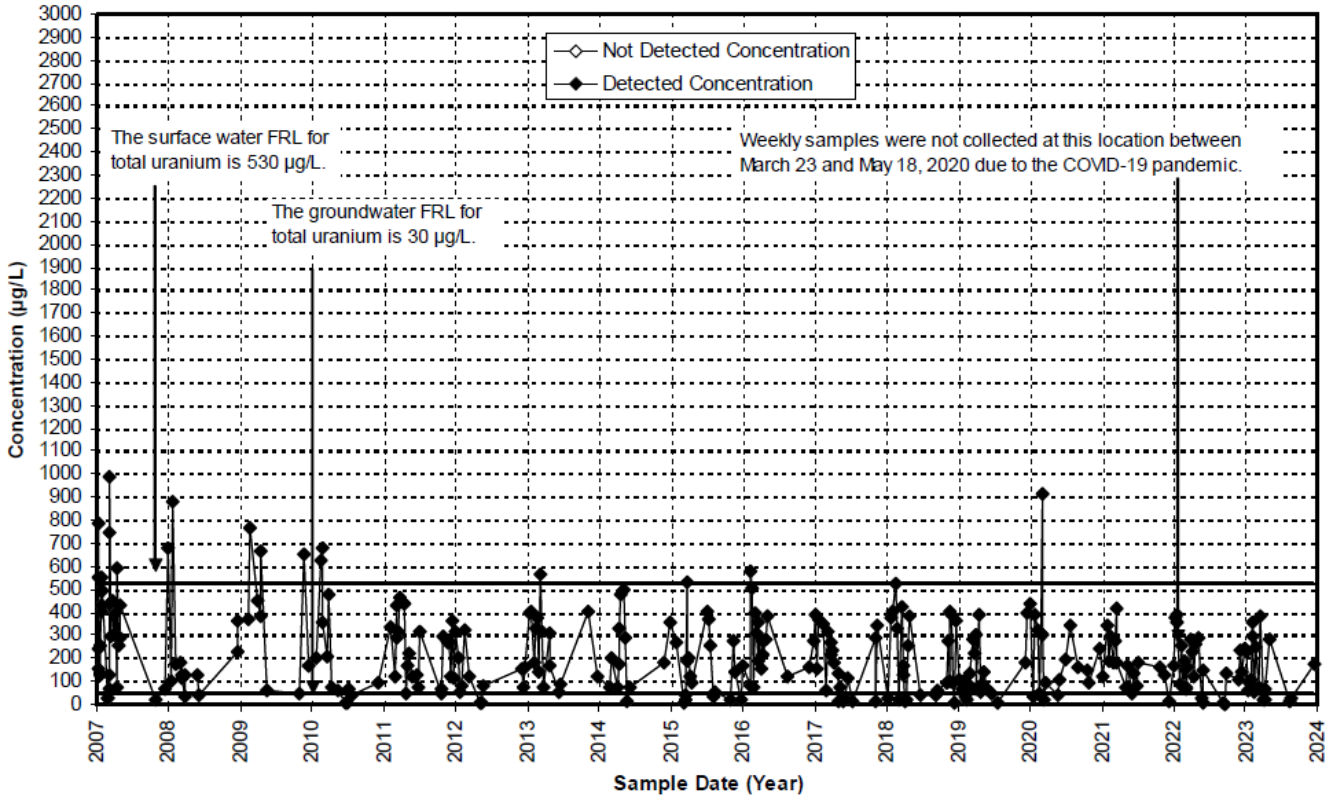
Surface water continues to be monitored at numerous locations on- and off-site.

SWD-09



Data indicates that the total uranium results at both locations continue to trend statistically downward

SWD-05



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Surface water continues to be monitored at numerous locations on- and off-site.

On-Site Disposal Facility

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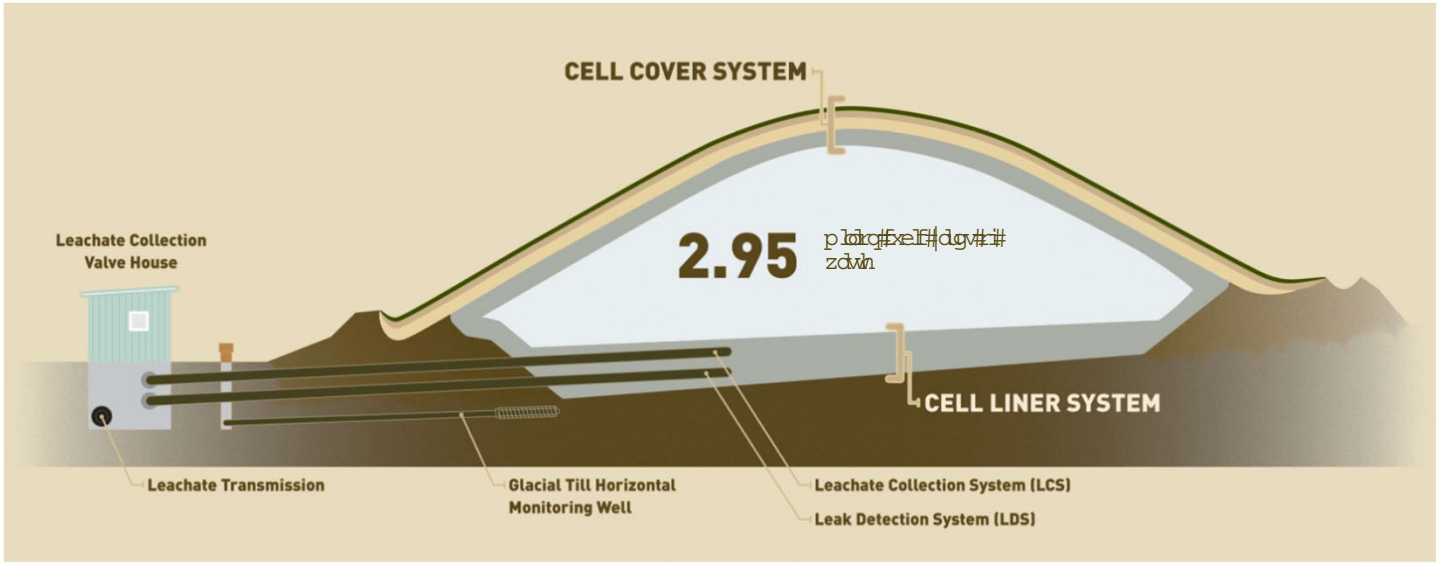
The On-Site Disposal Facility is an engineered waste-storage facility that holds 2.95 million cubic yards of waste (85% soil/soil-like material and 15% demolition debris) that was generated as part of the site cleanup.

Leachate Collection System



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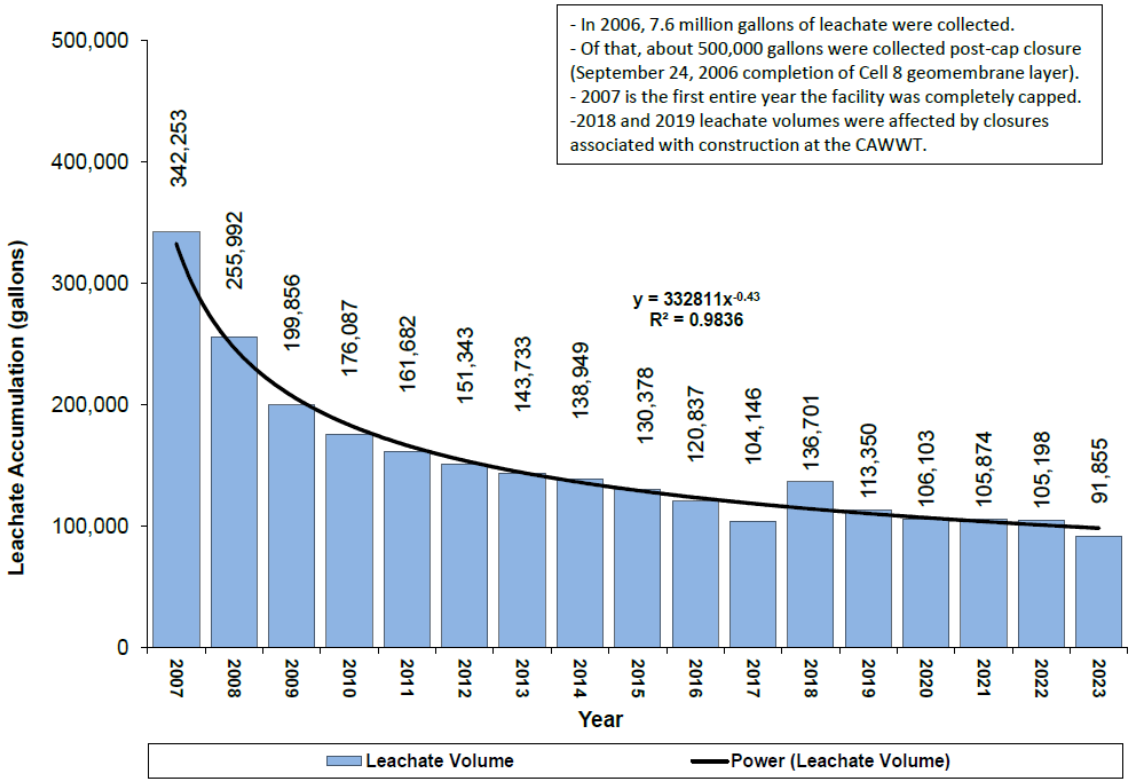
OSDF was constructed with an engineered liner and cover system that serves to isolate the entombed waste from the environment. Any fluid leaving the facility flows through collection systems into tanks located in the leachate valve houses.

Leachate Collection System — Annual Flow



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Leachate is the moisture in the waste within the OSDF. The leachate is collected and transferred to an on-site water treatment facility. As expected, annual leachate flow continues to decline

Low-Flow Response Leakage Rate Basis

Year	Cell	Maximum Accumulation Rate (gpad)	Maximum Flow Rate (gpd)
2019	6	0.32	1.60
2020	6	0.32	1.60
2021	6	0.15	1.0
2022	4	0.00086	0.006
2023	6	0.00465	0.03

Action leakage rate	200 gpad	1,300-1,900 gpd
Initial response leakage rate	20 gpad	130-190 gpd
Low response leakage rate	2 gpad	13-19 gpd

gpad — gallons per acre per day
gpd — gallons per day

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LDS accumulation rates in the disposal cells are currently well below the low-flow response leakage rate of two gallons per acre per day.

Performance: 2023

- No indication of leaks from any of the disposal cells
- Highest recorded level of leak-detection system accumulation was Cell 6 at 0.00465 gpad
- Low-flow response leakage rate: 2 gpad
- Initial response leakage rate: 20 gpad
- Action leakage rate: 200 gpad
- The trend in leachate collection system volumes matches the historical trend, indicating the cell cap is functioning as designed
- Leachate collection system and leak detection system accumulation rates indicate the liner systems are performing as designed
- Water-quality trends in the horizontal till wells and the Great Miami Aquifer (GMA) wells indicate concentration fluctuations beneath the facility are not related to facility performance
- No visual signs of compromised cap integrity

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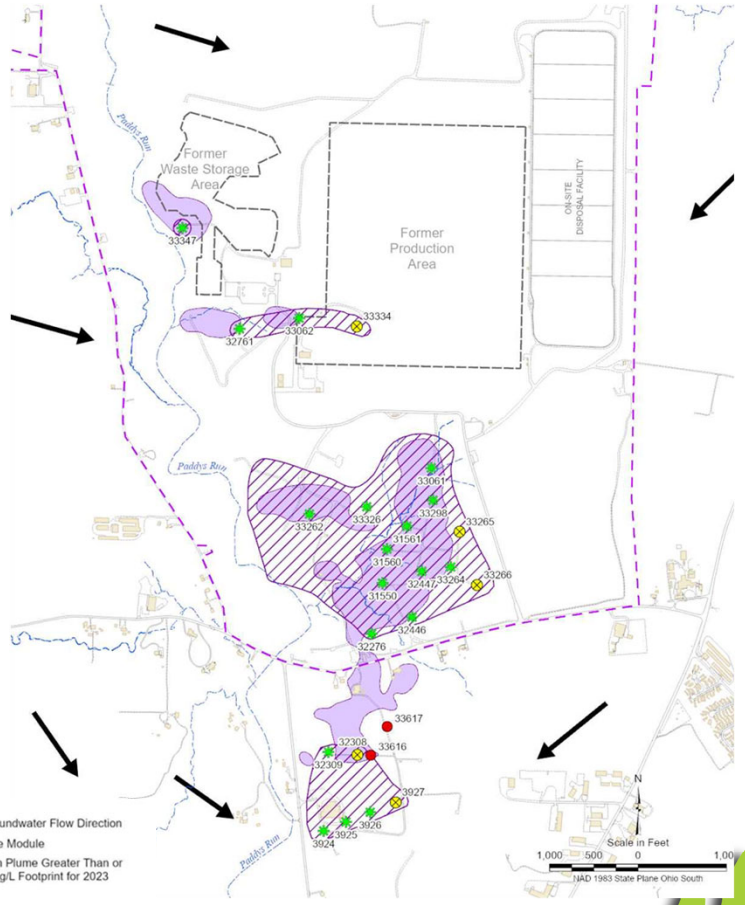
The OSDF continued to perform as designed in 2023.

System Overview

- **Remediation system is organized into modules:**
  - South Plume Module
  - South Field Module
  - Waste Storage Area Module

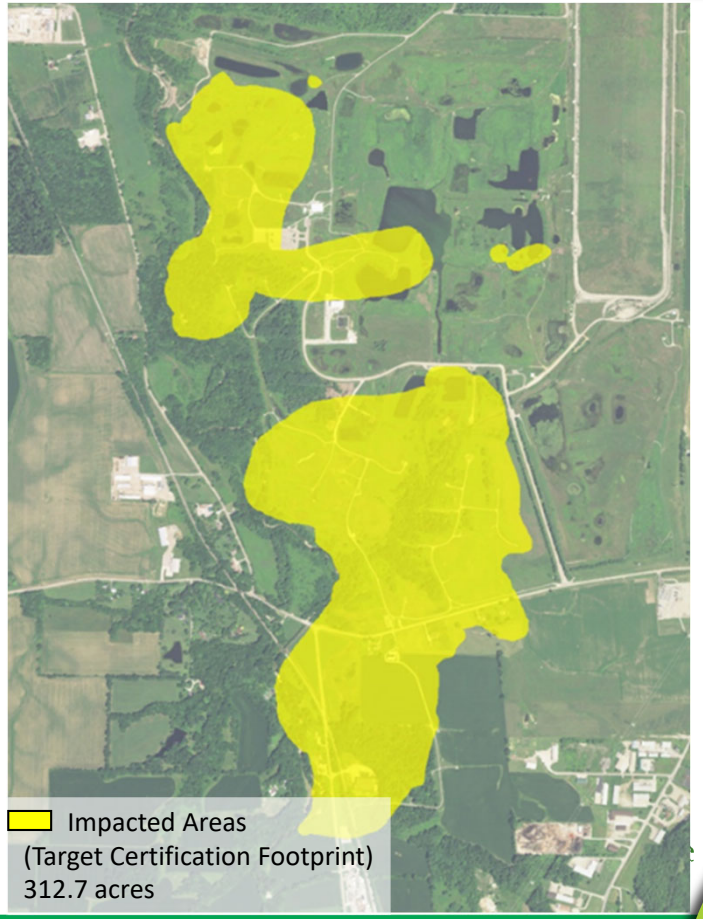
- **Remediation objectives:**
  - Concentration-based cleanup to final remediation levels
  - Limit further expansion of the plume
  - Prevent undesirable groundwater drawdown beyond the site boundary
  - Clean up off-property portions of the plume first
  - Limit impact to private property



The pumping system is organized into modules and operates to achieve remediation objectives.

OU5 Record of Decision

- OU5 Record of Decision (ROD) formally defines the selected groundwater remedy and establishes final remediation levels (FRL) for 50 constituents of concern
- Selected groundwater remedy: impacted areas of GMA exceeding FRLs will be restored through extraction methods
- OU5 ROD commits to an ongoing evaluation of innovative remediation technologies so that we can improve remedy performance as new technologies become available
- Final number and configuration of extraction wells were established during remedial design



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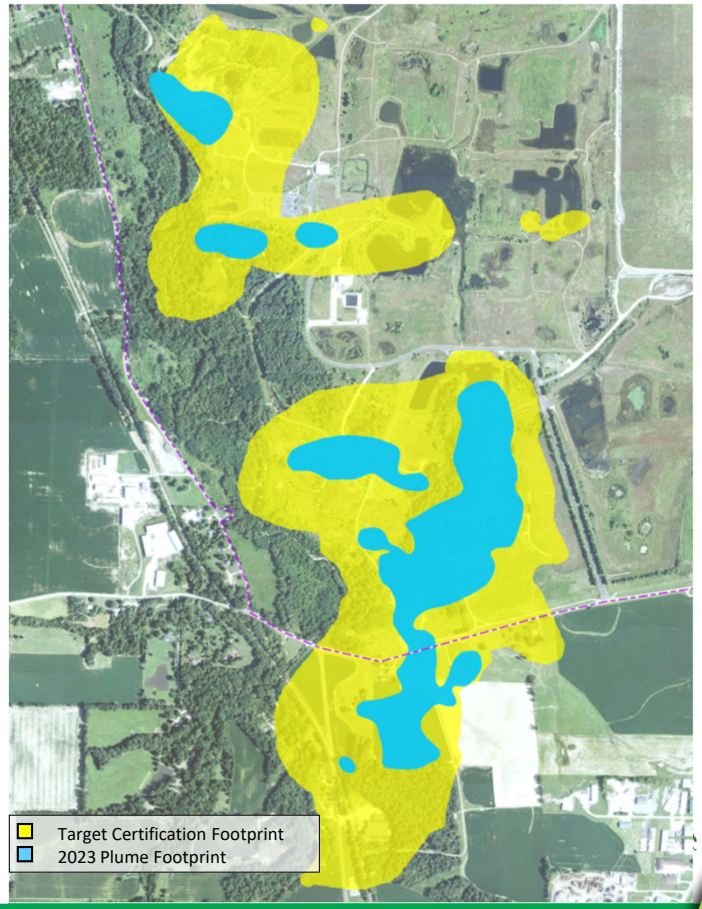
The OU5 Record of Decision is to restore all impacted areas of the aquifer through pumping.

Current Remediation Status

Year	Remaining size (acres) of the maximum uranium plume within the target certification footprint
2006	189.3
2007	186.0
2008	186.9
2009	186.0
2010	184.0
2011	144.3
2012	130.3
2013	127.3
2014	110.9
2015	109.5
2016	105.0
2017	94.4
2018	89.3
2019	86.5
2020	81.5
2021	75.0
2022	74.0
2023	72.1

Between 2006 and 2023, the uranium plume area decreased from 189.3 to 72.1 acres.



Between 2006 and 2023, the area of the uranium plume has decreased from 189.3 acres to 72.1 acres.

Groundwater Remedy: Remedial Design

- **Groundwater remedy evolved through a series of progressive remedial designs:**
  - **1995** — Feasibility Study Report for Operable Unit 5
  - **1997** — Baseline Remedial Strategy Report, Remedial Design for Aquifer Restoration (Task 1)
  - **2001** — Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 areas
  - **2002** — Design for Remediation of the Great Miami Aquifer, South Field (Phase II) Module
  - **2003** — Comprehensive Groundwater Strategy Report
  - **2005** — Waste Storage Area Phase II Design Report
- **Optimization:**
  - **2014** — Operational Design Adjustments -1 WSA Phase II Groundwater Remediation Design
  - **2022** — Update using uranium plume concentrations

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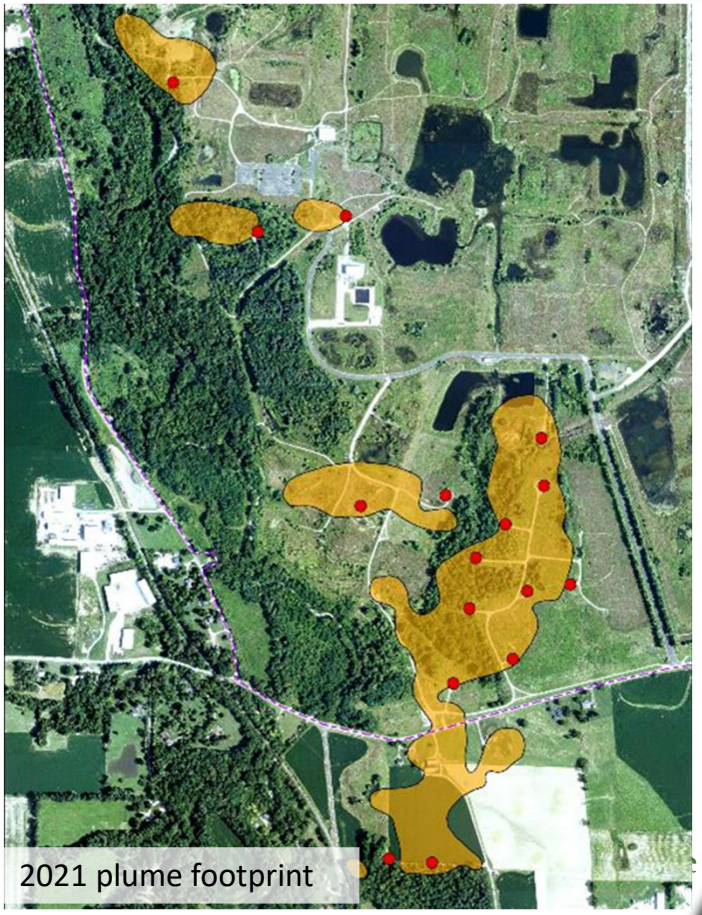
The groundwater remedy system evolved through a series of progressive designs between 1995 and 2005. The 2005 design was optimized in 2014. Additional modeling was conducted in 2022.

Optimizations Since 2005

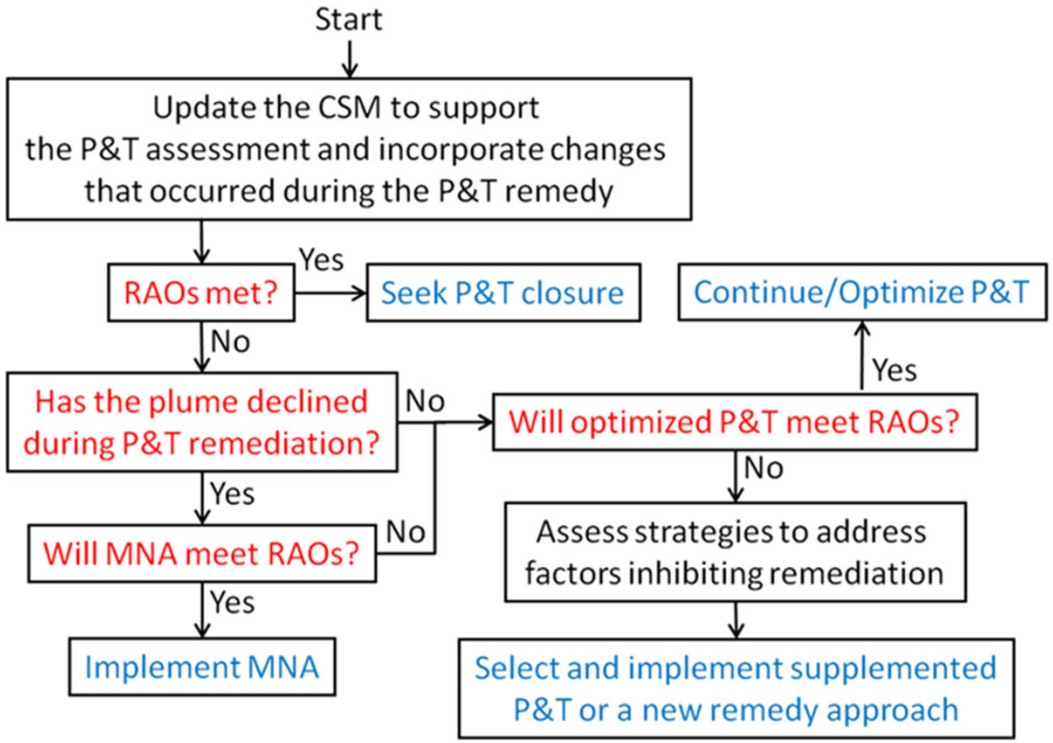
2005 Remedy Design — Revised Cleanup Evaluation

- 2005 design-predicted cleanup dates
  - South Plume: 2015
  - South Field: 2022
  - Waste Storage Area: 2023
- Revised cleanup predictions based on 2011 plume
  - South Plume: 2021 (6 years longer)
  - South Field: 2028 (6 years longer)
  - Waste Storage Area: 2032 (9 years longer)
- Revised cleanup predictions based on 2021 plume
  - South Plume: 2025 (4 years longer)
  - South Field: 2038 (10 years longer)
  - Waste Storage Area: 2045 (13 years longer)


2021 plume footprint

Most recent modeling predicted that cleanup times would be extended by as much as thirteen years.

Optimization Process



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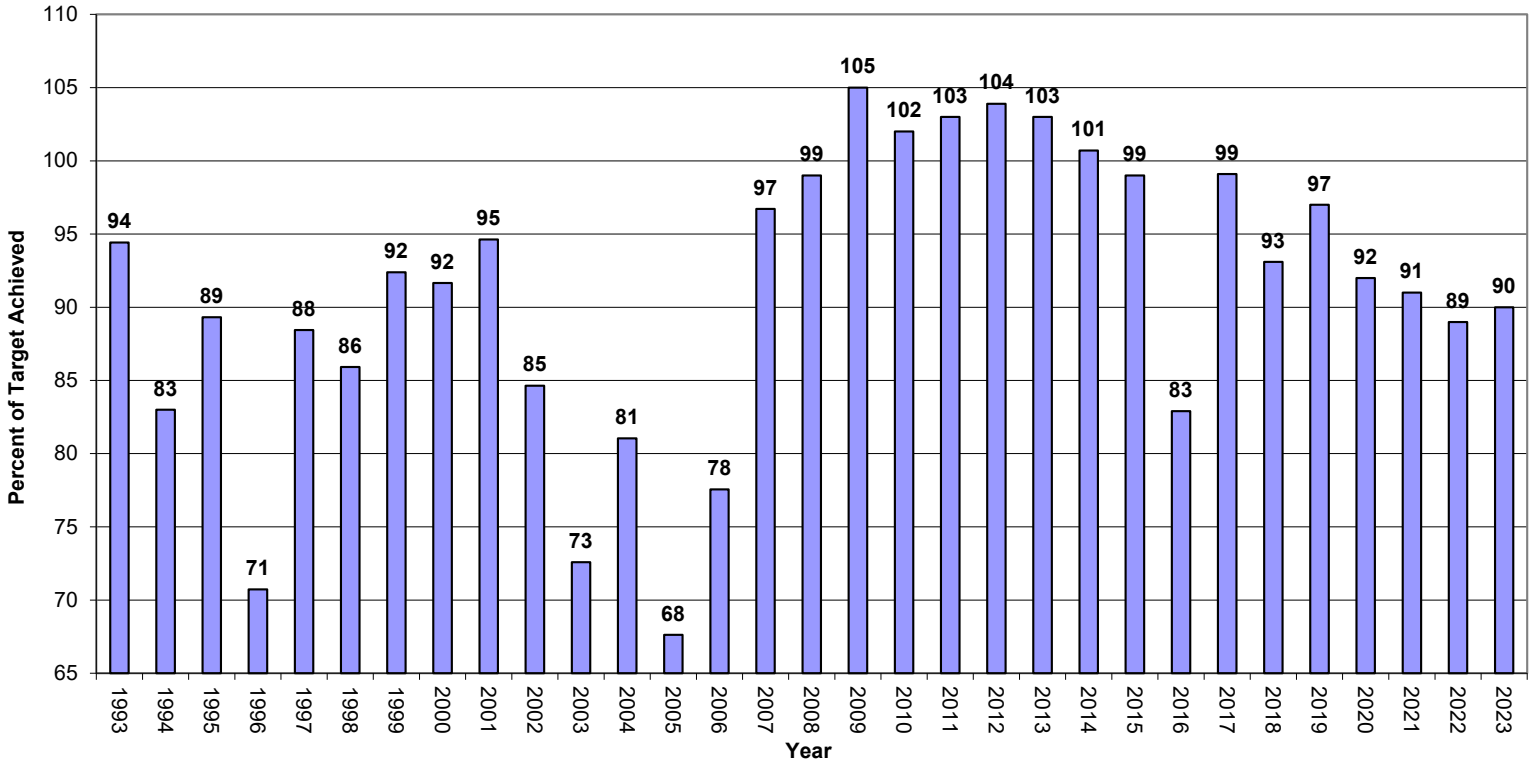
Operational decisions concerning the aquifer remedy are following guidelines presented by DOE Pacific Northwest Laboratory.

Percent of Target Achieved

Actual Versus Target: 1993-2023



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DOE aggressively pumps the extraction wells and tries to achieve 100% of the planned pumping target each year. However, the well system is old, and it is becoming harder each year to achieve 100%. This is illustrated in the downward trend over the past few years.

Pipe Cleaning

Hydrojet

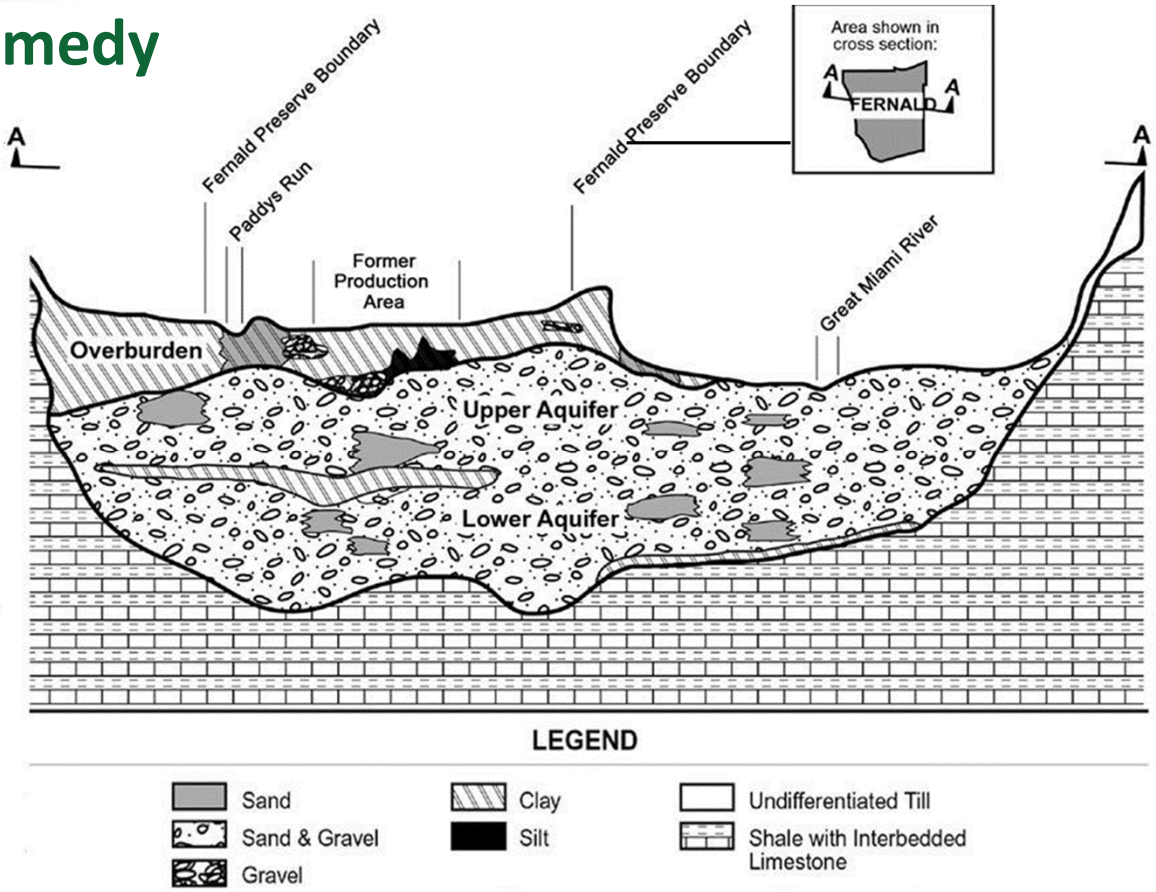
Discharge to backwash basin

Before cleaning

After cleaning

Cleaning the well pipes for all the wells at the Fernald Preserve resulted in at least some reduction in discharge pressure for all the wells and significant improvements in maximum flow rates at several wells.

Groundwater Remedy



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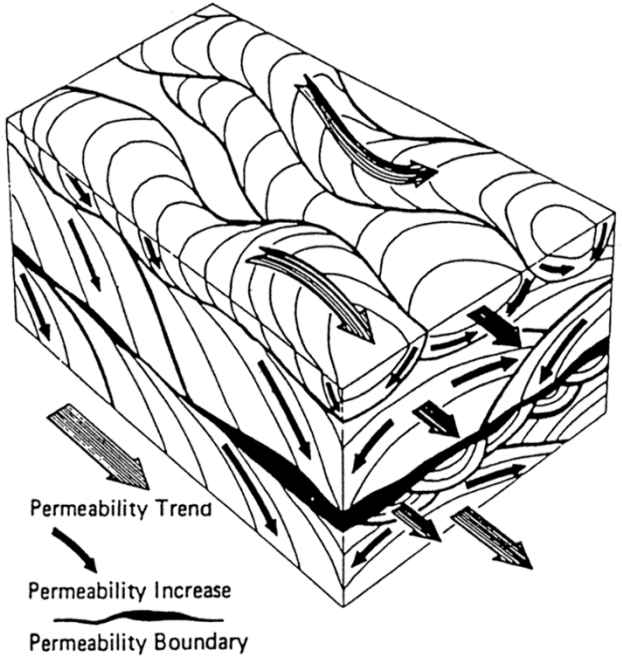
The aquifer consists of a thick sequence of mostly sand and gravel. Beneath the former production area, the aquifer was protected from contamination by a thick layer of glacial overburden consisting mostly of clay.

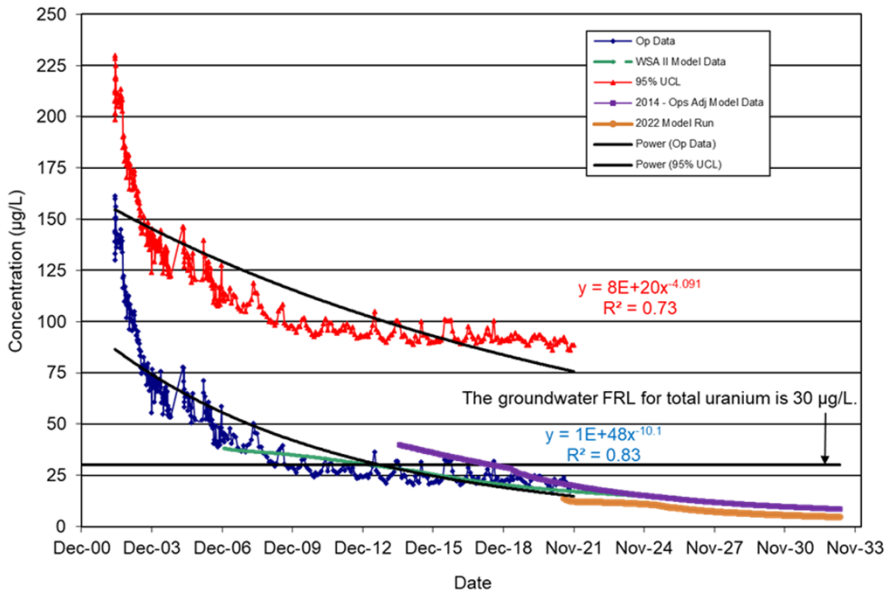
Hydrologic Background

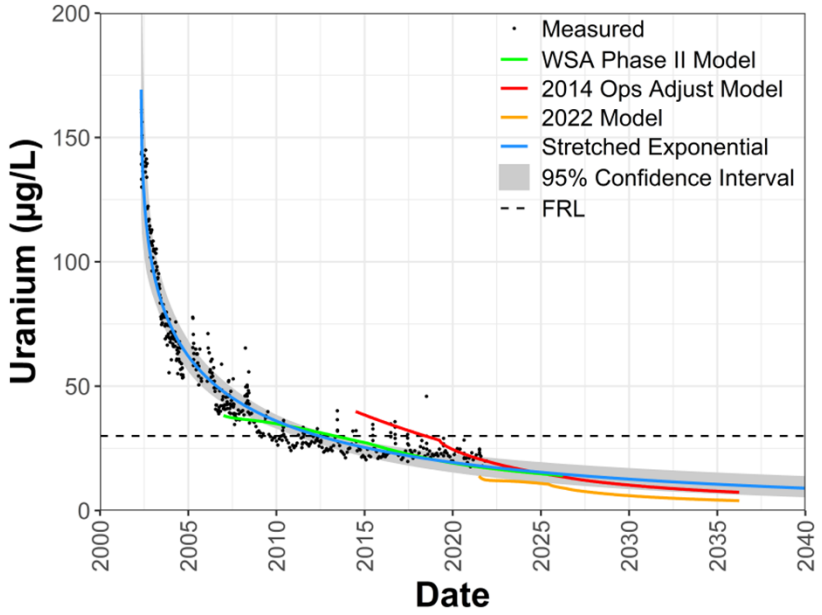


The Great Miami Aquifer beneath the site was deposited in a braided stream environment, known for large energy changes over time, resulting in large variations of sediment grain sizes being in contact with each other. Uranium tends to sorb to the smaller-grain sediments, and water tends to move through the coarser-grained sediments. This makes it difficult to flush contamination in the areas of finer-grained sediments by pumping alone.

NLN Recommendations Completed

Use of Stretched Exponential Equations



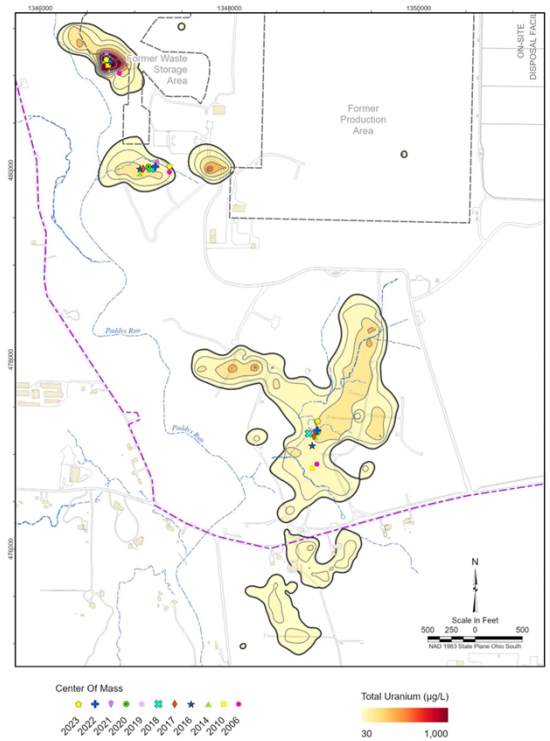


NLN — National Laboratory Network

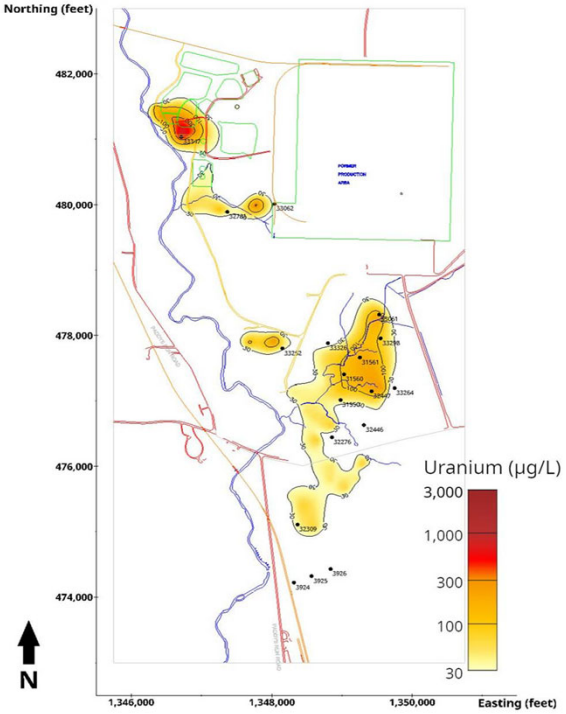
DOE is now using stretched exponential equations to predict obtainment of remediation goals.

Center of Mass Interpretations

Ricker Method 2023 Center of Mass

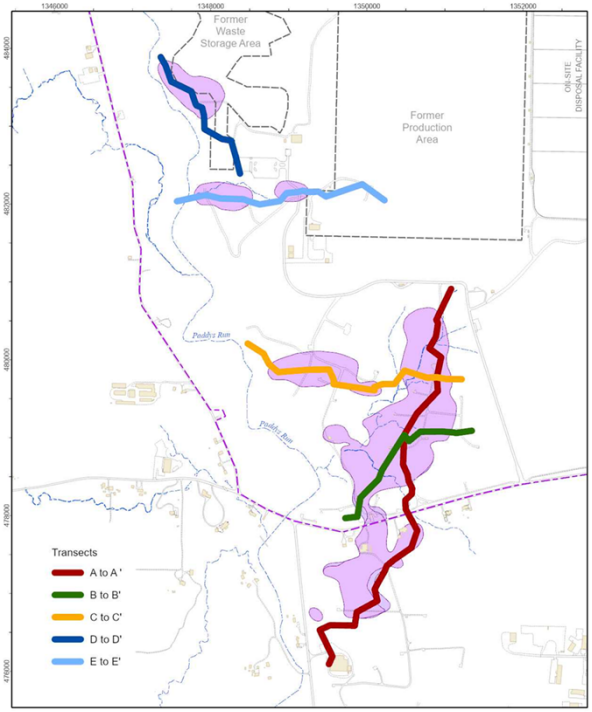


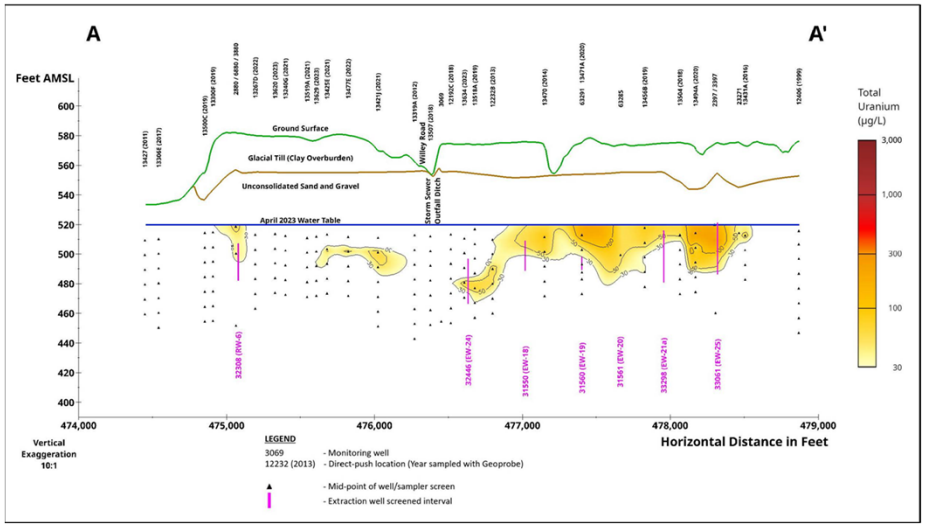
EVS 2023 Plume Interpretation



DOE interprets plume center of mass as a cleanup metric.

3D Visualizations Using Earth Volumetric Studio Software





Red Cross Section Trace

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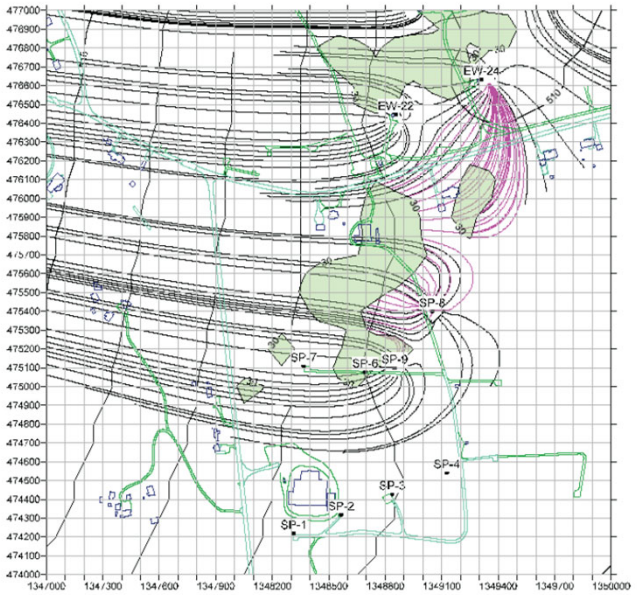
3D interpretations of uranium plume aid in assessing cleanup of the aquifer.



Two New South Plume Wells 8 & 9 Pumping 300 gpm each
S. Plume 8 (replaces 6) moved 2 model blocks (200') North and 4 model blocks (400') East
S. Plume 9 (replaces 7) moved 5 model blocks (500') East
South Plume 1, 2, 3, 4, 6, & 7 Off
Dry Boundary Conditions

10 Year Reverse Particle Tracks From Extraction Wells

30 Year Forward Particle Tracks from 30 ug/L Plume Boundary

Path Forward

- Continue pumping
- Two new extraction wells became operational in the South Plume in March 2024
- Shut down South Plume Extraction Well RW-1 when it can no longer pump 100 gpm
- Evaluate optimizations in the South Field
- Continue pursuing NLN modeling recommendations

Fernald Preserve

Continue with pump and treat.

Interpretive Services Public Amenities

2023 by the Numbers

- **13,535 Interpretive Services Contacts**
  - This includes on- and off-site programming, meeting room use, and tours
  - 2022 contacts: 8,016
- **26,460 Vehicle Visitations** * No data from July-October
  - Compare to 2022 vehicle count: 33,050
- **59,425 Pedestrians**
  - Compare to 2022 pedestrian count: 55,079






Since the site opened to the public in 2008, schools, conservation organizations, former workers, bird watchers, hikers, and many others continue to use the public amenities at the site, including the visitors center, walking trails, wildlife observation areas, interpretive programs, and reservable meeting spaces.

Some 2023 Highlights

Office of Legacy Management
June 22, 2023 ·

Teachers like to learn, too!

Office of Legacy Management
July 6, 2023 ·

U.S. Rep. Warren Davidson visited the Fernald Preserve Site near Cincinnati June 29. LM provided a tour to inform Davidson of the site's history and ongoing long-term stewardship activities. The tour featured stops at the award-winning Visitors Center and the site's Converted Advanced Wastewater Treatment facility. The congressman's visit included an open dialogue with site stakeholders and the site's regulators, the U.S. Environmental Protection Agency and Ohio Environmental Protection Agency.

In-person programs and self-guided trail activities on site-related topics were offered throughout the year.

Community Stakeholder Groups

Fernald community members addressed international attendees at the Forum on Stakeholder Confidence (FSC). FSC is a working group of the Radioactive Waste Management Committee at the OECD Nuclear Energy Agency (NEA).

This international workshop on stakeholder engagement in decommissioning, radioactive waste and legacy management was held at Fernald Preserve on Wednesday, October 25, 2023. The community members were from Fernald Residents for Environmental Safety and Health (FRESH) and the Fernald Community Alliance (FCA).

Fernald Community Alliance
www.fernaldcommunityalliance.org

We thank all members of FRESH and FCA for their continued support and involvement!

Fernald Preserve

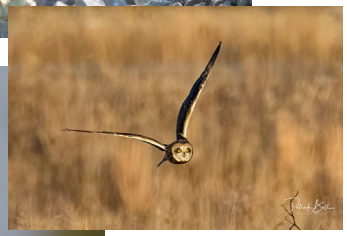
Supporting community events and stakeholder groups including the Fernald Community Alliance and Fernald Residents for Environmental Safety and Health remains a high priority for Fernald Preserve Interpretive Services.

Visitor Wildlife Photos

Birders and wildlife photographers remain frequent guests







Ecologically restored habitats, including expansive prairie grasslands at the site, are recognized as regionally important birding areas that attract birds and many other wildlife species. Photos Credit: Pat Bell, Bruce Fagan, Matt Kofron and Jack Verdin

General Site Updates

- On-site modular offices and garage
- Visitors Center expansion
- Visitors Center Community Meeting Room exhibit
- Infrastructure updates
- Controlled burns
- Radiological waste shipment
- Local partnerships

Fernald Preserve

DOE provides progress updates on current projects and future plans.

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Contact site personnel with questions.