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U.S. ARMY ENVIRONMENTAL COMMAND

Status of Cleanup at Twin Cities Army Ammunition Plant (TCAAP)

RAB Meeting

2-18-2025

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AGENDA – February 18, 2025 at 7 P.M.

- Old Business
- Cleanup Status Update
  - Round Lake
  - Groundwater Remediation
  - Per- and polyfluoroalkyl substances (PFAS)
  - U.S. Geological Survey (USGS) Groundwater Model
- New Business
- Next Meeting Agenda
- Public Comments

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Old Business

- Vote to accept the minutes from previous meeting.
- Army held groundwater stakeholder meeting on 18 February 2025.

What has the Army done since September 2024?

- Draft Final FY 2023 Annual Performance Report (APR) in regulatory backcheck.
- Met with Groundwater Stakeholders on 18 February 2025.
- Round Lake Technical Working Group (TWG) meetings held 4 December 2024 and 12 February 2025.
- Source Area Hydraulic Evaluation Report of the TCAAP Groundwater Recovery System (TGRS) was finalized on 14 October 2024.
- TGRS Operating Strategy Revision in process
- FY 2024 Annual groundwater sampling and land use control inspections completed. Draft Final FY 2024 Annual Performance Report submitted to regulators.

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Round Lake
Remedial Design / Remedial Action Update

Twin Cities Army Ammunition Plant: Round Lake

Arden Hills, Minnesota

Contract No. W9128F22D0002

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Agenda

- Round Lake Remedial Action Overview
- Additional Sediment Volume
- Project Schedule

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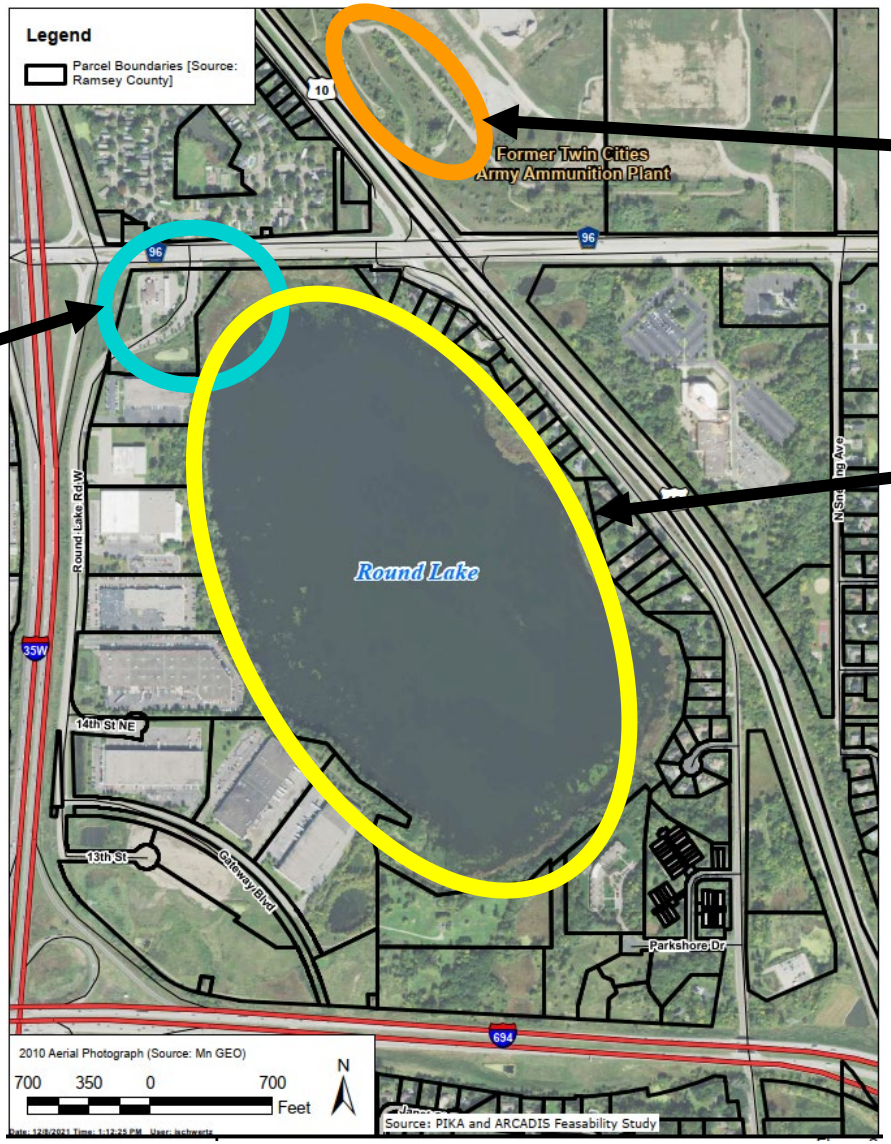
Round Lake Remedial Action



Sediment Processing

Lake Access

Dredging

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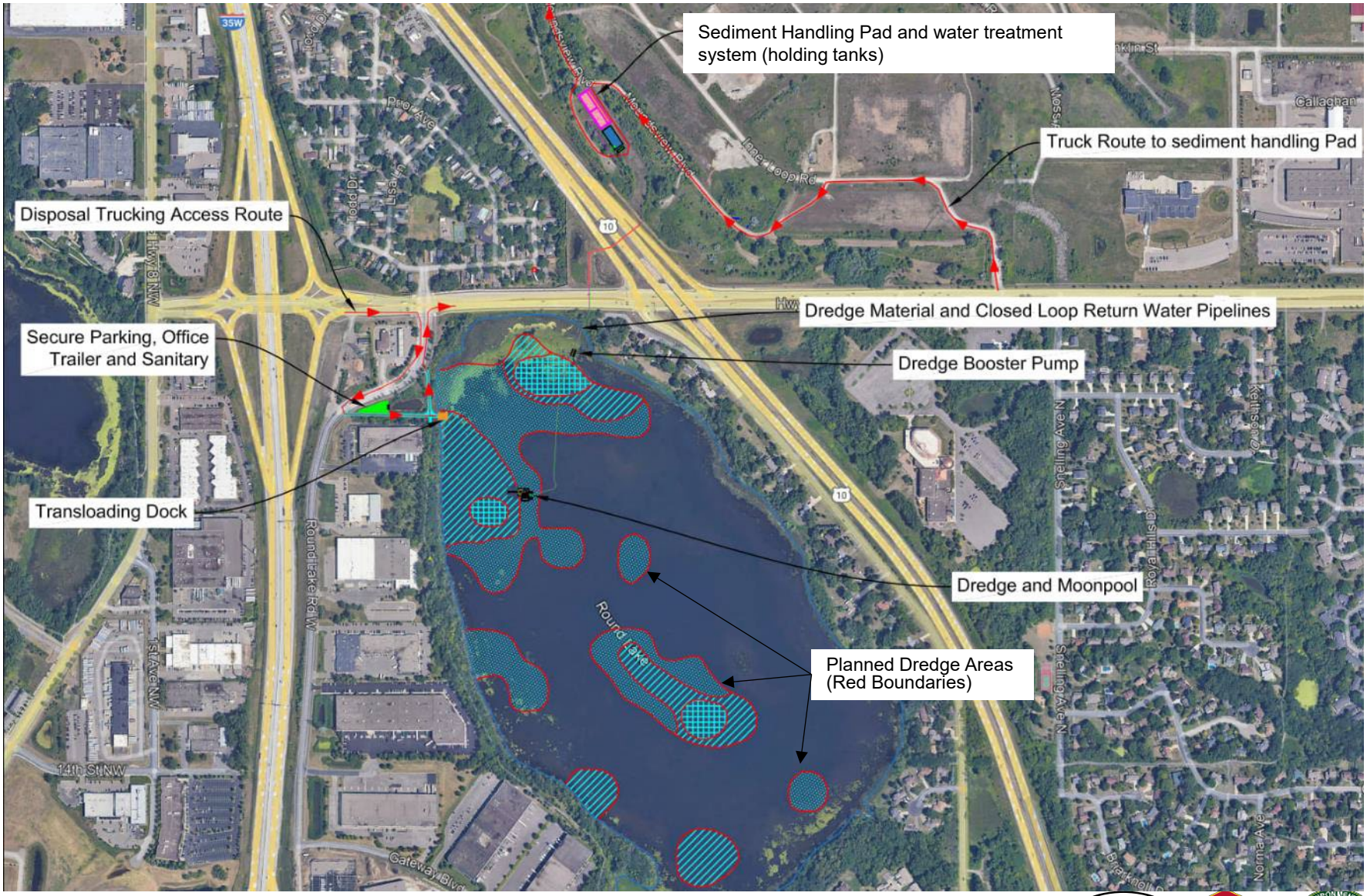
Round Lake Remedial Action



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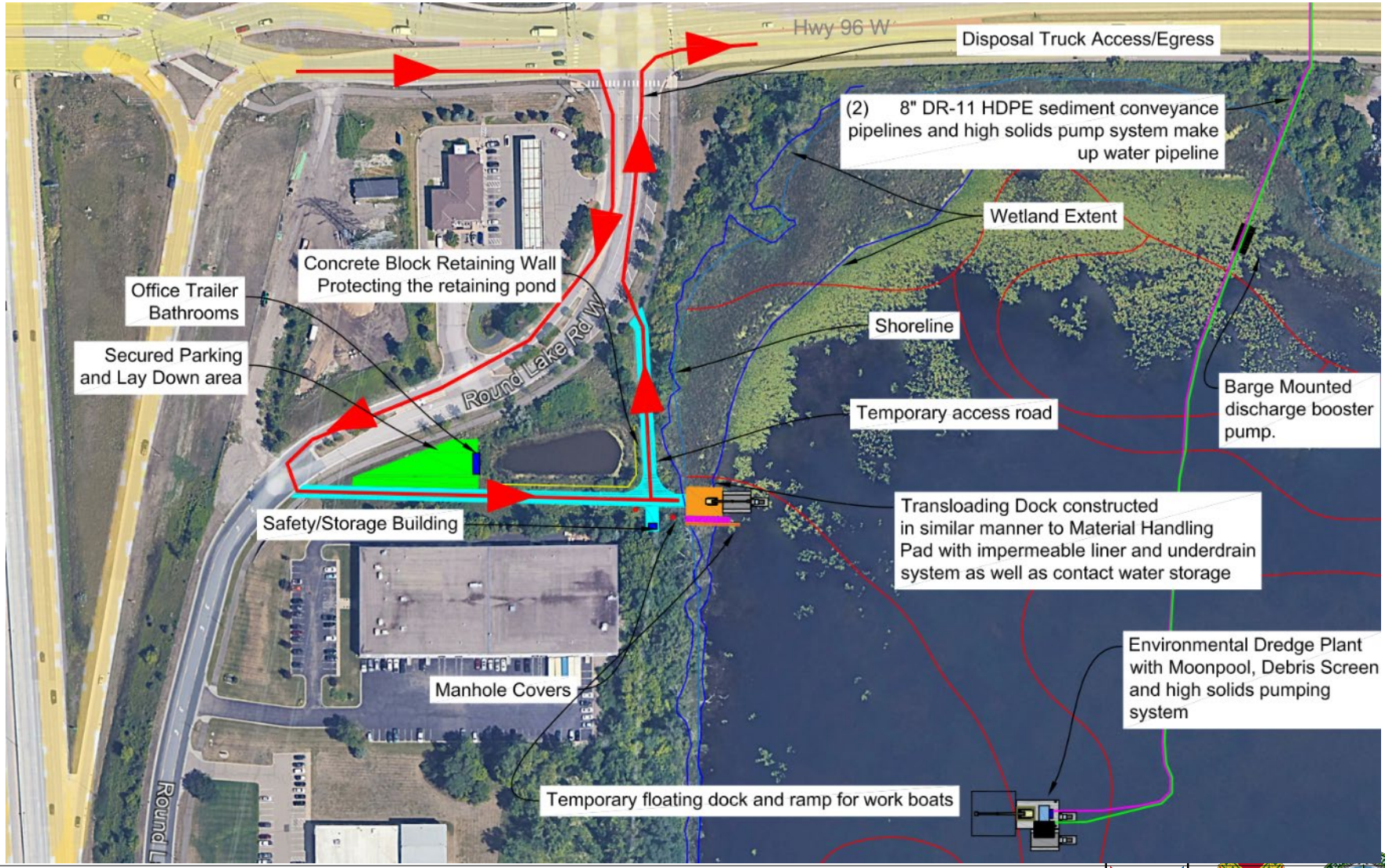
Round Lake Cleanup
Lake Access



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Storm Sewer Orientation

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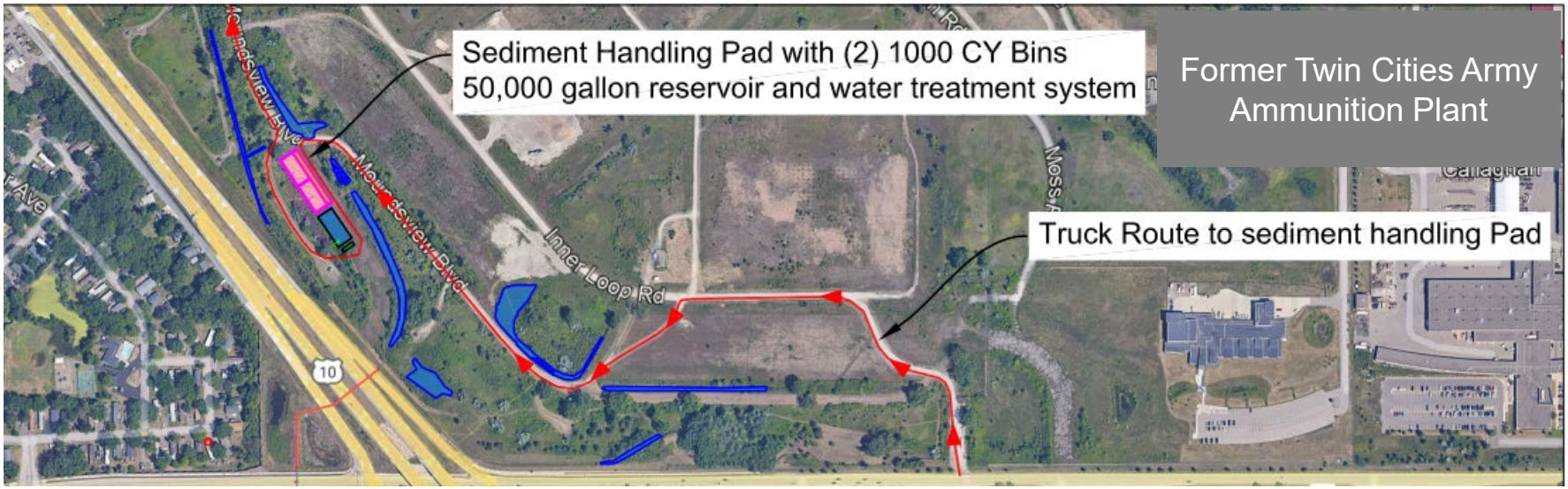
Round Lake Cleanup
Sediment Processing



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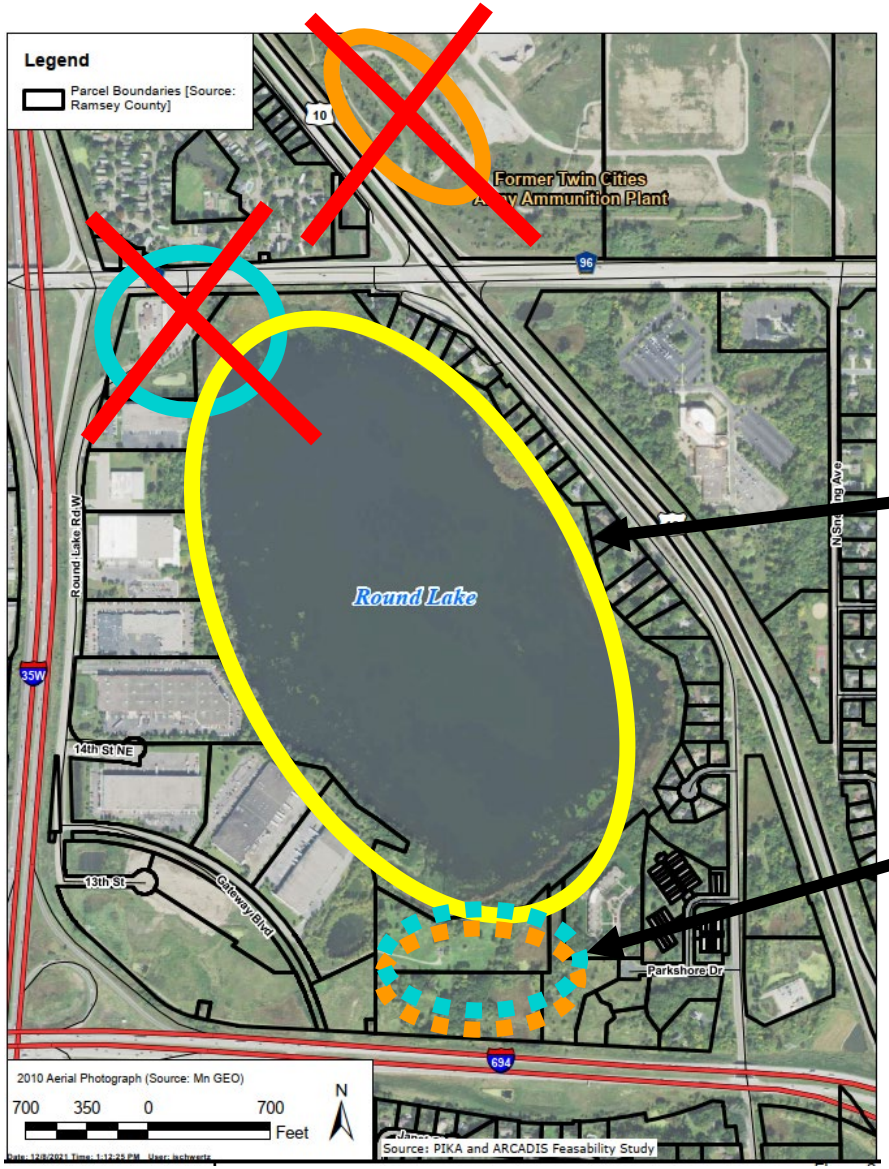
Round Lake Remedial Action



Dredging

POTENTIAL ALTERNATE
Sediment Processing
and
Lake Access

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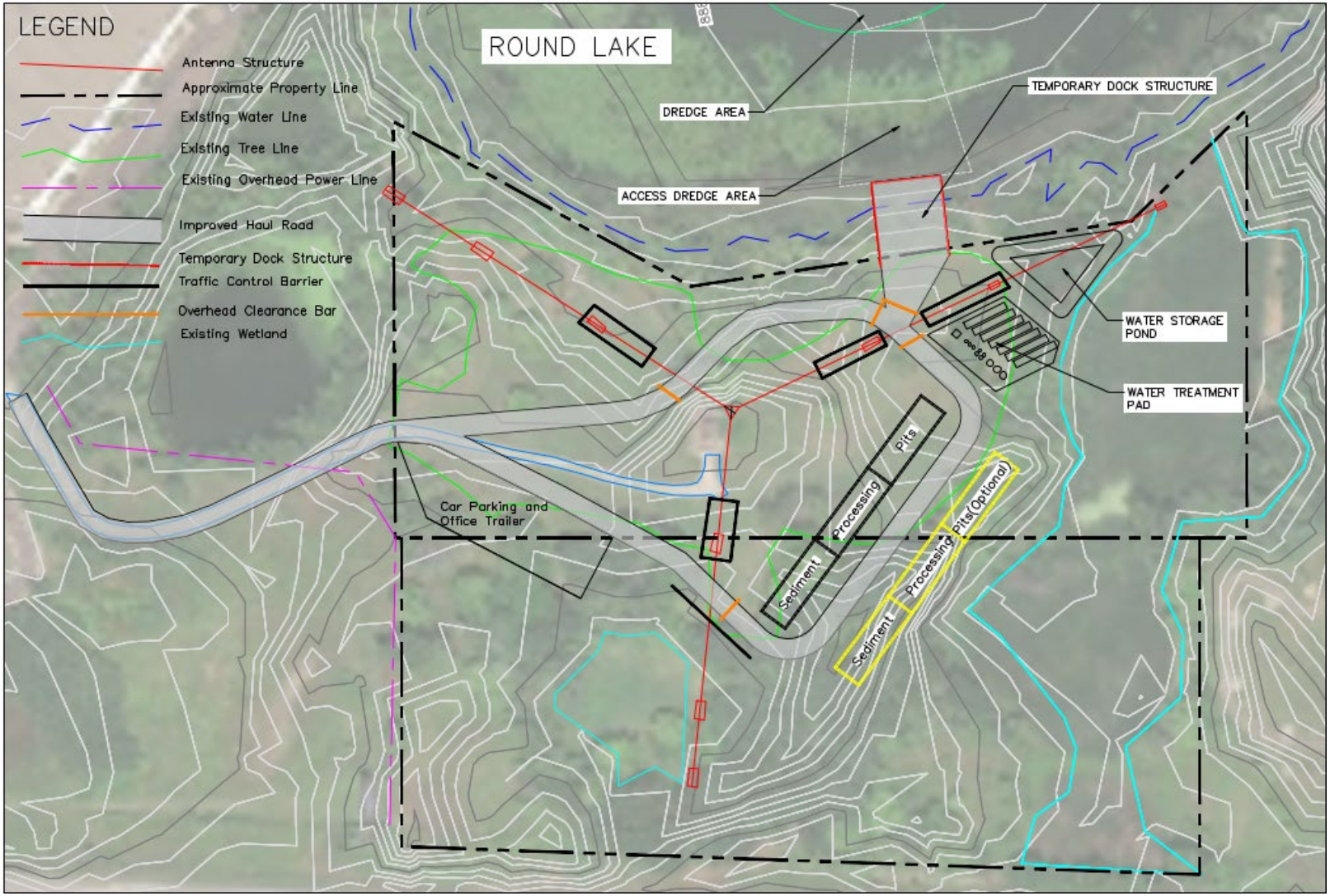
Round Lake Cleanup

Potential Alternate Sediment Processing and Lake Access



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Sediment Deposition in Round Lake

- Previous Sampling Conducted in 2011

  Basis for selected remedy in the ROD and associated sediment removal volume of 82,000 cubic yards.

- Reported Round Lake Sedimentation Rate Greater than 1.5 centimeters (cm) per year.

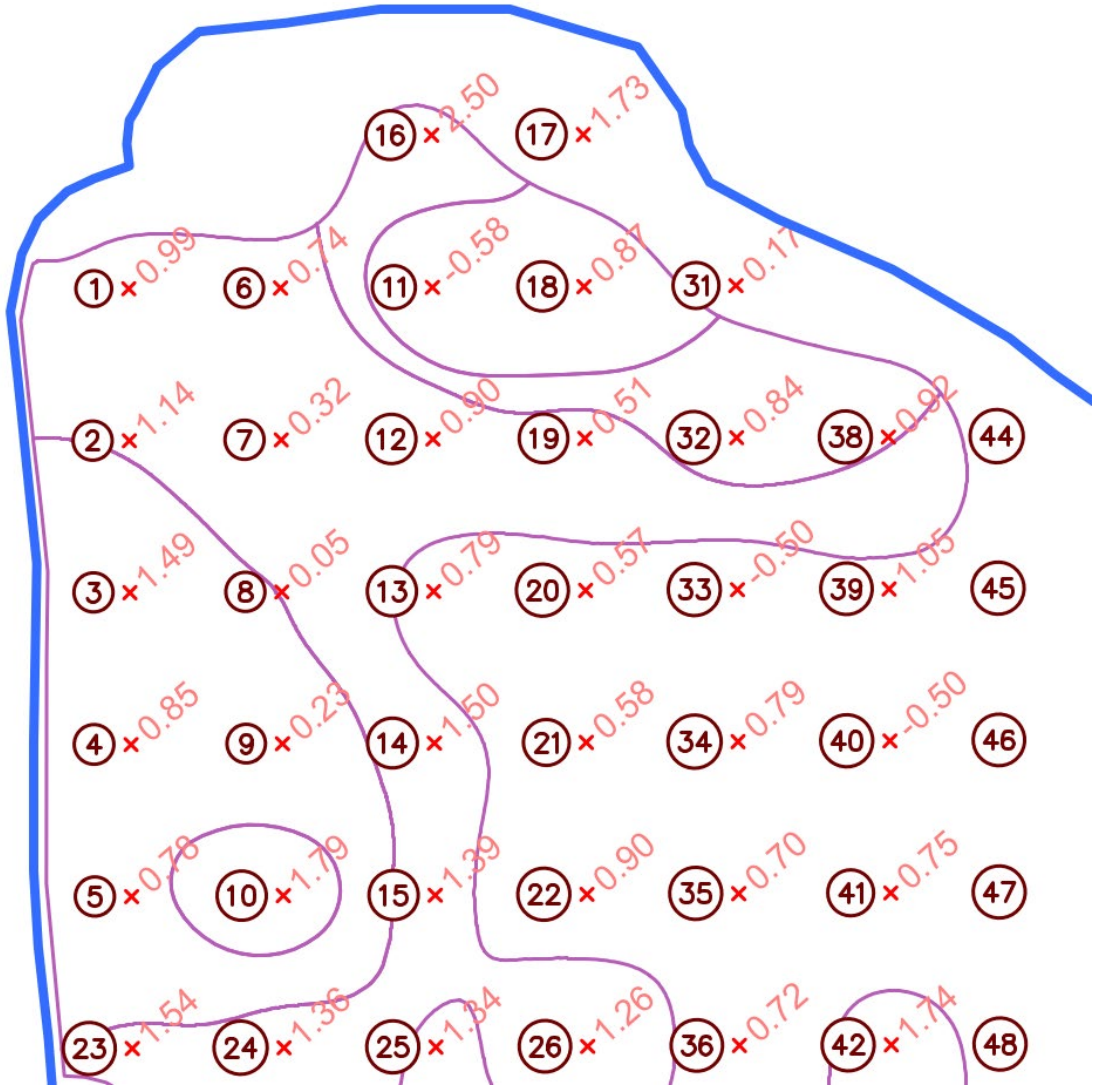
- Estimated Deposition from 2011 to 2024.

  2024 – 2011 = 13 years x 1.5 cm/year

  Greater than 19.5 cm (8 inches)

  ~ 74,000 cubic yards of additional sediment estimated to be present based on 2024 bathymetric survey results.

U.S. ARMY Example Lake Bottom Elevation Change, 2011 - 2024



Legend	
66	Sample Point
×2.59	Sedimentation (ft)
	Removal Area
	Waterline

0 250 500 Feet

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Round Lake Cleanup Schedule Recent Activity

- Preliminary Design Investigation Report
  - Oct 2024 Draft Submitted to Army.
  - Nov 2024 Army Comments Received/Addressed.
  - Feb 2025 Draft Final to be Submitted to Regulators.

- 30% Remedial Design Report
  - Aug 2024 Draft Submitted to Army.
  - Sept 2024 Army Comments Received/Addressed.
  - Nov 2024 Draft Final Submitted to Regulators.
  - Jan 2025 Regulator Comments Received / Being Addressed.
- Technical Meetings
  - Dec 2024 Technical Working Group Meeting for 30% Remedial Design.
  - Dec 2024 Technical Project Planning Meeting for 30% Remedial Design.
  - Feb 2025 Quality Assurance Project Planning Scoping Meeting.
  - Feb 2025 Technical Working Group Over Change in Conditions.

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Round Lake Cleanup Schedule
Upcoming Activities

- Remedial Design
  - Quality Assurance Project Plan: late 2025
  - 60%, 90%, Final Design Reports: mid 2025 / early 2026

- Remedial Action
  - Vegetation Clearing (Nov 2025)
  - Sediment Removal Activities (mid 2026 – 2027)

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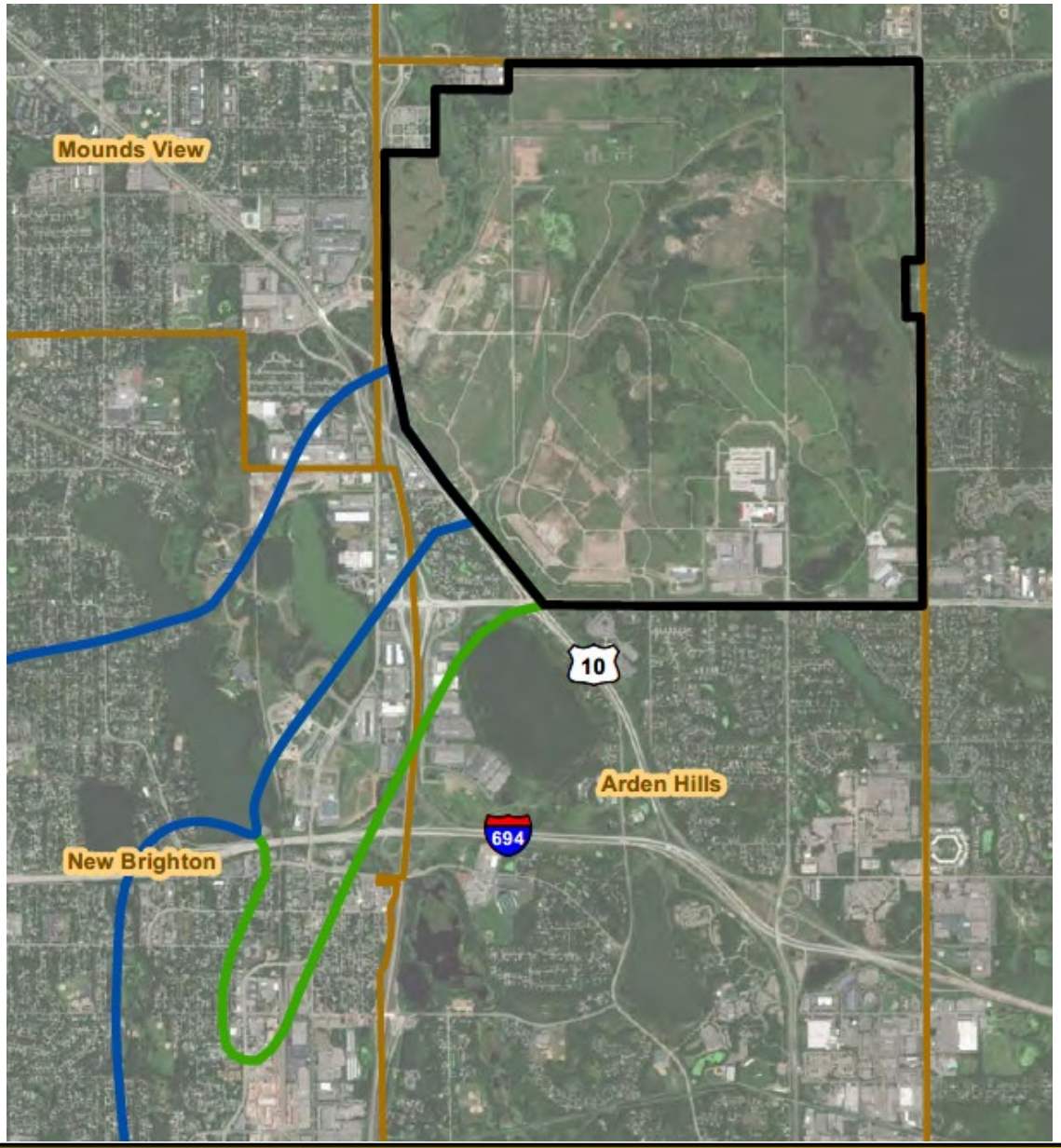
TCAAP Cleanup Status Update



LEGEND:

- Operable Unit 1 (North Plume)
- Operable Unit 2 of the New Brighton/ Arden Hills Superfund Site (the same area occupied by the Twin Cities Army Ammunition Plant in 1983, when the Site was placed on the NPL.)
- Operable Unit 3 (South Plume)
- Municipal Boundaries

POC Information (Thomas Toudouze, U.S. AEC, 210-466-1920, thomas.p.toudouze2.civ@army.mil)

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Groundwater Sampling Update

- Groundwater sampling allows the Army to monitor the plumes and update the maps.
- Groundwater sampling (major year) completed in Summer 2024.
- Groundwater data has been validated and incorporated into the Draft Final FY 2024 APR.
- Annual plume maps are available in the respective APRs, most recently updated in the Draft Final FY 2024 APR.
- Statistical evaluation of monitoring well network in process.

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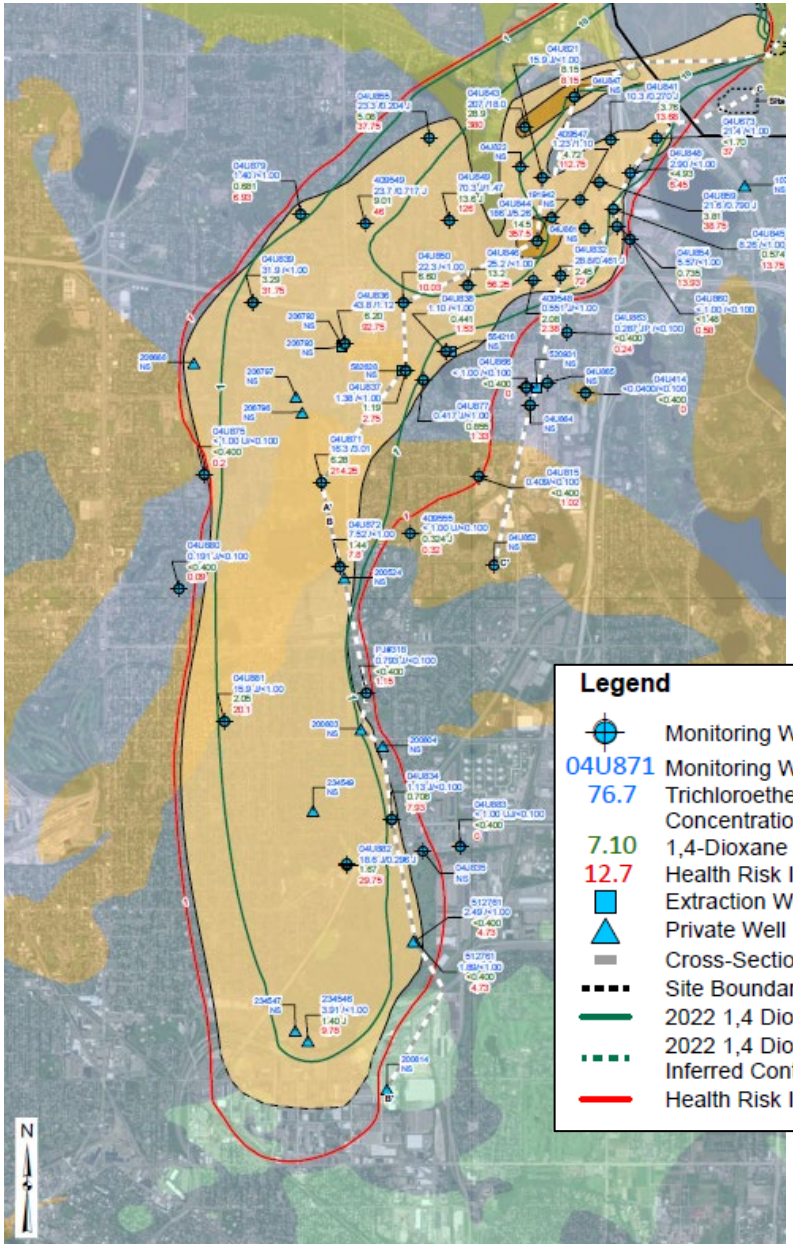
FY 2024 – Prairie du Chien Plume Map



- Plume remains relatively stable compared to FY 2023 results.
- Some minor fluctuations (both increases and decreases) spread throughout the plume.
- Higher concentration area (>100ug/L) remains as two distinct lobes (shown on next slide), consistent with FY 2023 results.

Legend

- Monitoring Well
- 04U871 Monitoring Well ID
- 76.7 Trichloroethene/1,1,1-Trichloroethane Concentration (µg/L)
- 7.10 1,4-Dioxane Concentration (µg/L)
- 12.7 Health Risk Index
- Extraction Well
- Private Well
- Cross-Section Line
- Site Boundary
- 2022 1,4 Dioxane Concentration Contour (µg/L)
- 2022 1,4 Dioxane Concentration Inferred Contour (µg/L)
- Health Risk Index =1

2024 Trichloroethene Concentrations (µg/L)

- > 100 µg/L
- > 0.4 µg/L
- Operable Unit 2

Bedrock Geology

- Decorah Shale, Galena Group
- Platteville and Glenwood Fms
- St. Peter Sandstone
- Prairie du Chien Group
- Jordan Sandstone
- St. Lawrence Formation
- Tunnel City Group

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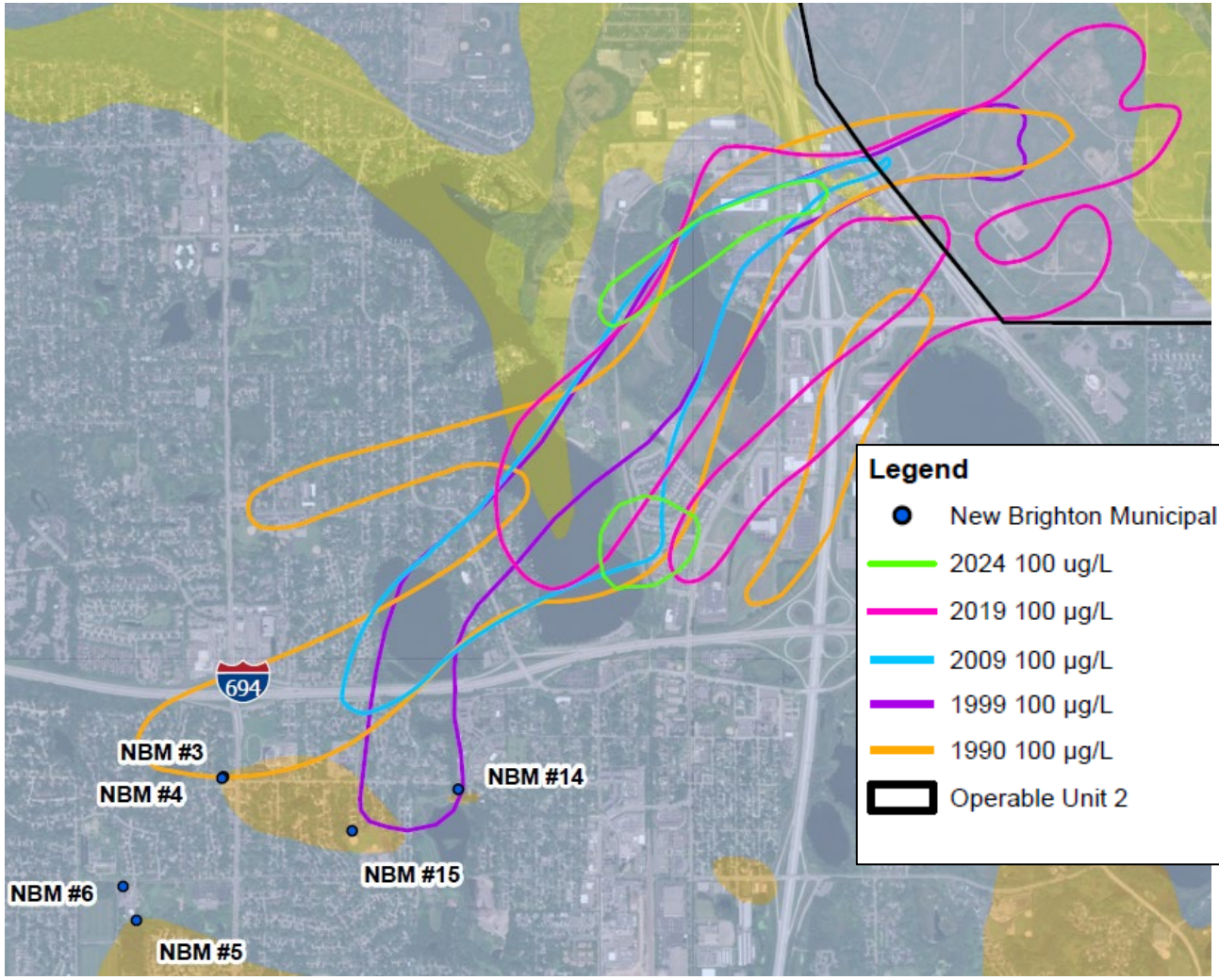
FY 2024 – Prairie du Chien Plume Map Over Time



Legend

- New Brighton Municipal Wells
- 2024 100 ug/L
- 2019 100 µg/L
- 2009 100 µg/L
- 1999 100 µg/L
- 1990 100 µg/L
- Operable Unit 2

Bedrock Geology

- Decorah Shale, Galena Group
- Platteville and Glenwood Fms
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- St. Lawrence Formation
- Tunnel City Group

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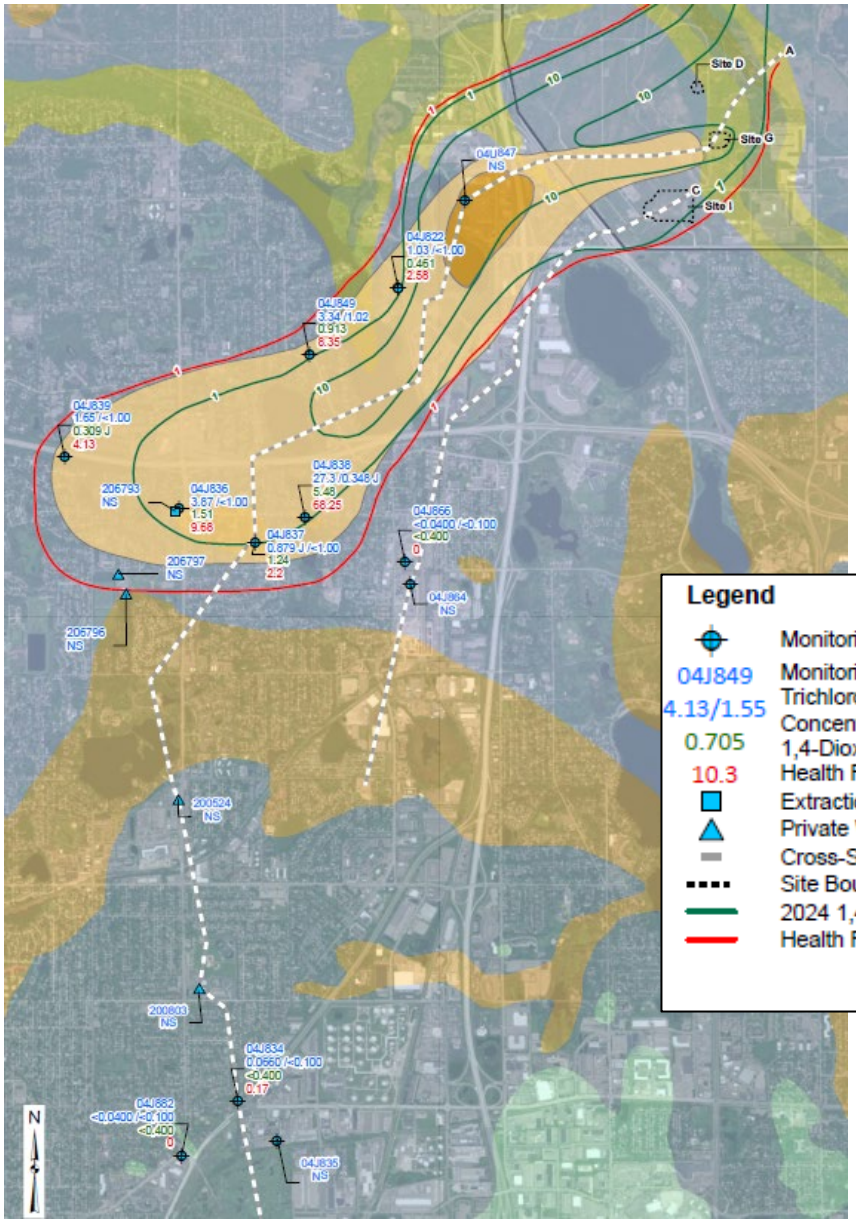
FY 2024 – Jordan Plume Map



- Main plume remains relatively stable compared to FY 2023 results.
- Downgradient wells non-detect in FY 2024 (most not sampled in FY 2023).
- Higher concentration area not sampled in FY 2024.

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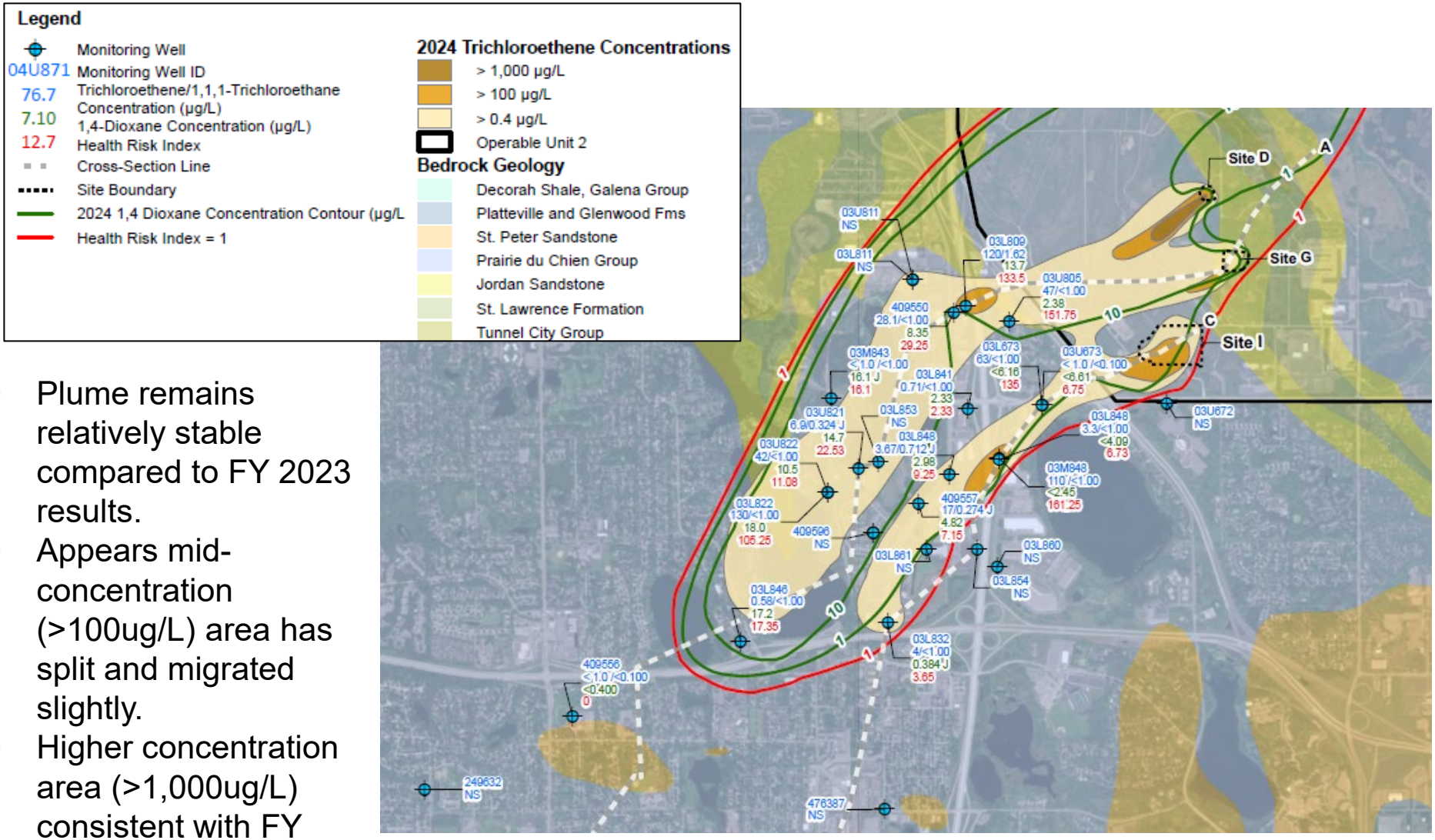
FY 2024 – OU2 Unconsolidated Sediments Plume Map



- Plume remains relatively stable compared to FY 2023 results.
- Appears mid-concentration (>100ug/L) area has split and migrated slightly.
- Higher concentration area (>1,000ug/L) consistent with FY 2023 results.

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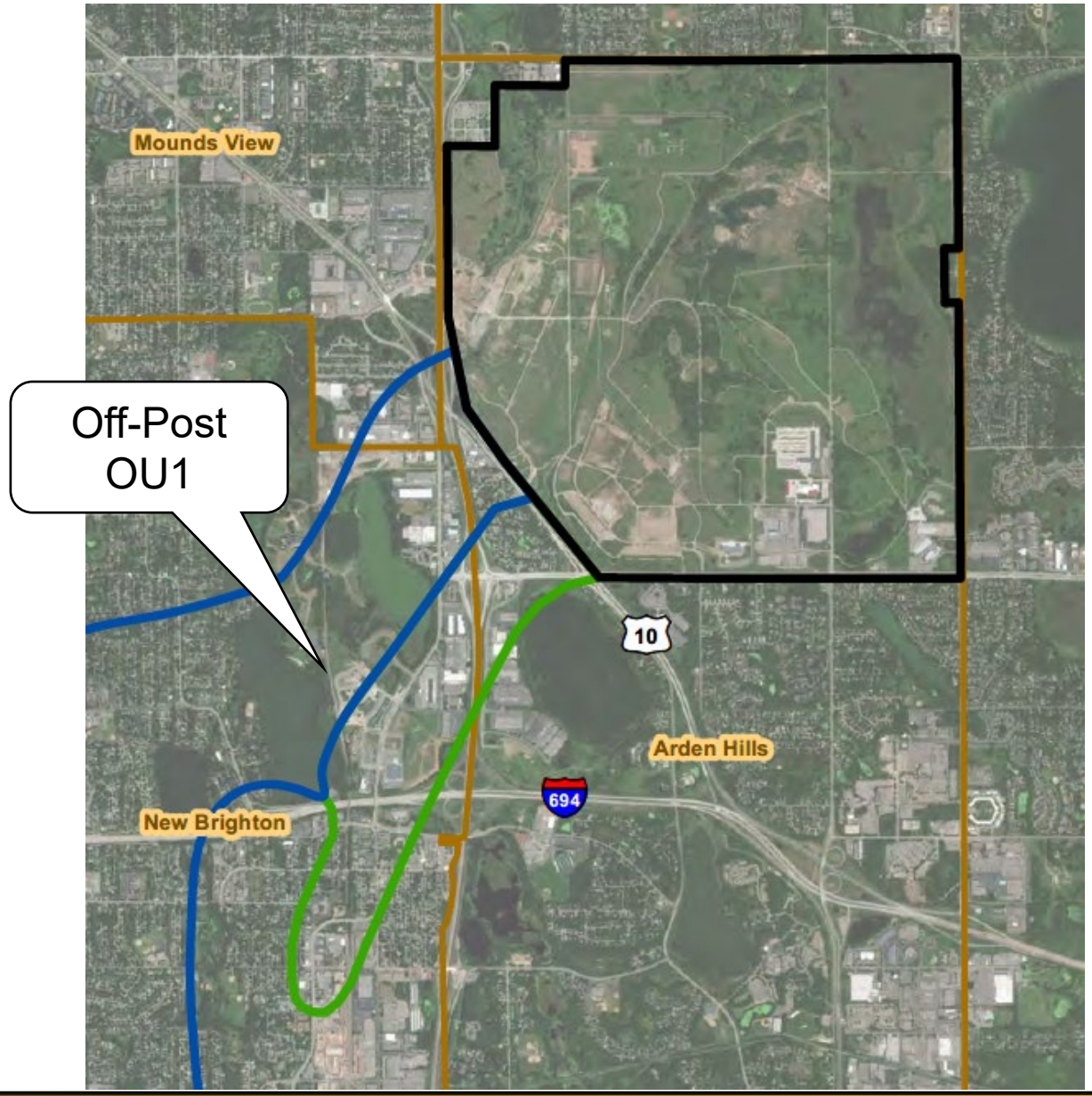
Twin Cities Army Ammunition Plant Cleanup



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- Operable Unit 3 (South Plume)
- Municipal Boundaries

POC Information (Thomas Toudouze, U.S. AEC, 210-466-1920, thomas.p.toudouze2.civ@army.mil)

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OU1 Optimization

- No change since last meeting.
- Goal: increase amount of contaminant removed by relocating well more central to plume.
- Optimization identified a need for a new well in New Brighton.
- Funding was sent to New Brighton in September 2024 for both continued operations and installation of new well.
- Anticipate installation of new well going out for bids in March 2025.

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Twin Cities Army Ammunition Plant Cleanup

LEGEND:

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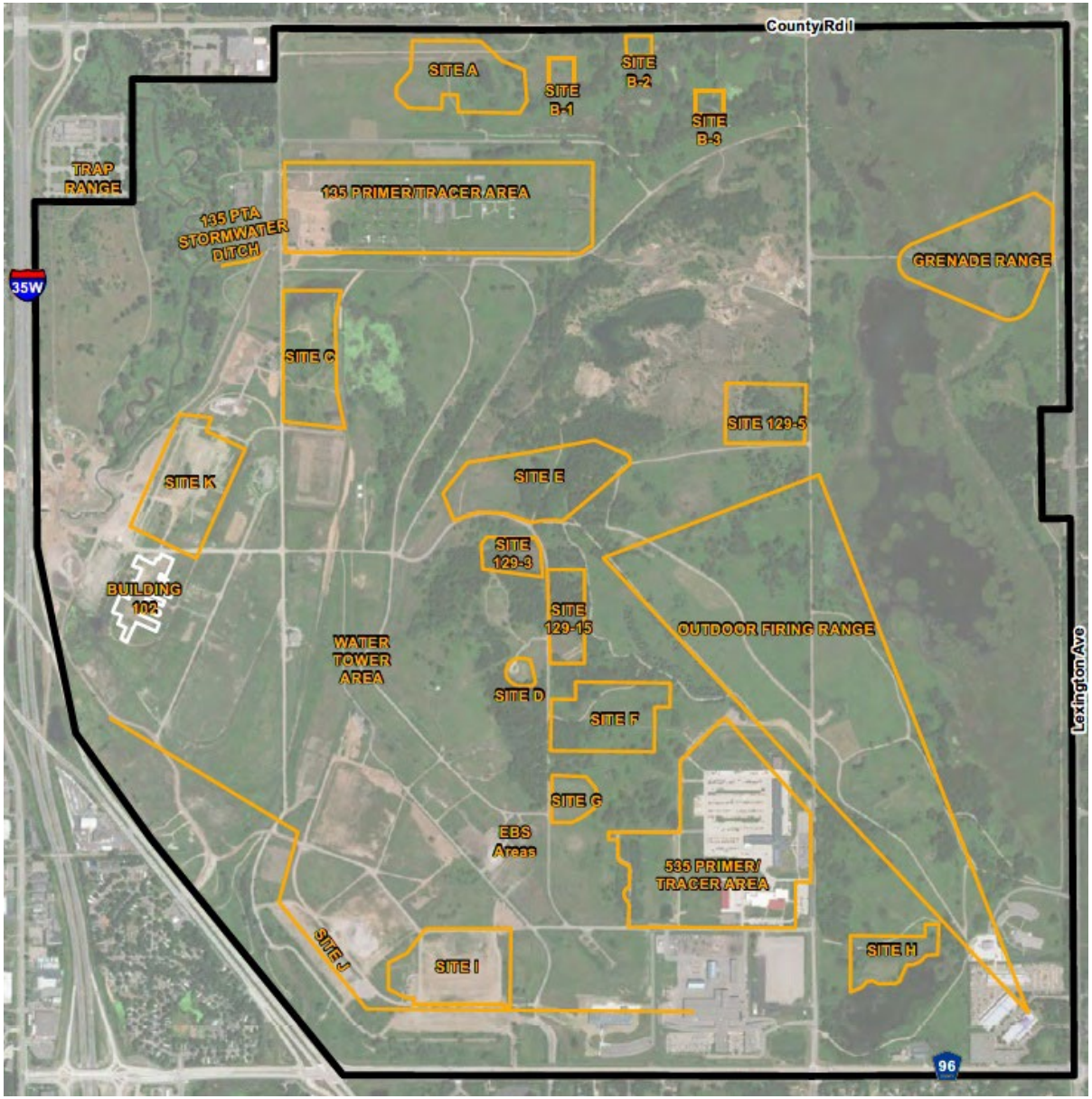
OU2


County Rd I
SITE A
SITE B-1
SITE B-2
SITE B-3
TRAP RANGE
135 PRIMER/TRACER AREA
135 PTA STORMWATER DITCH
GRENADE RANGE
35W
SITE C
SITE 129-5
SITE K
SITE E
SITE 129-3
BUILDING 102
SITE 129-15
OUTDOOR FIRING RANGE
WATER TOWER AREA
SITE D
SITE F
Lexington Ave
SITE G
EBS Areas
535 PRIMER/ TRACER AREA
SITE J
SITE I
SITE H
96

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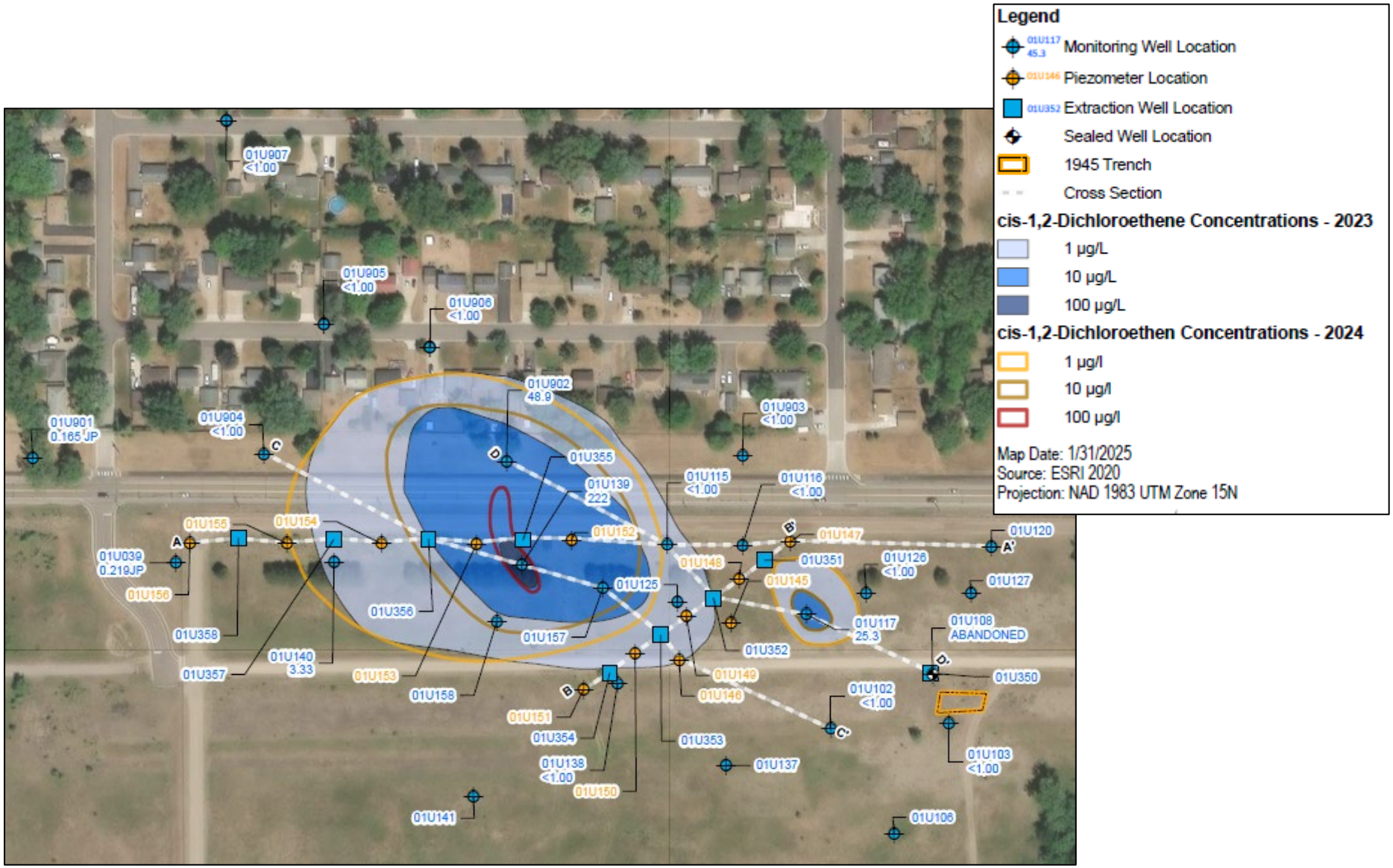
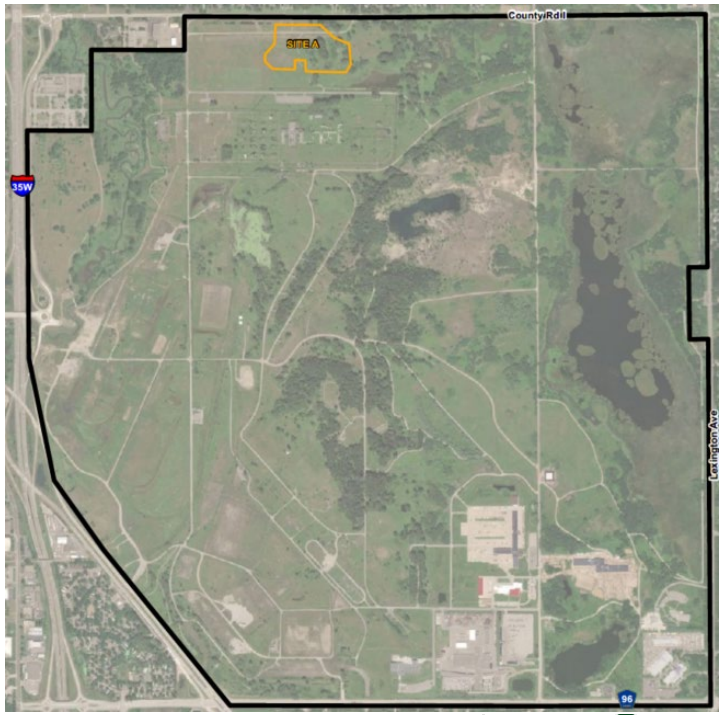
OU2 – Site A Monitored Natural Attenuation



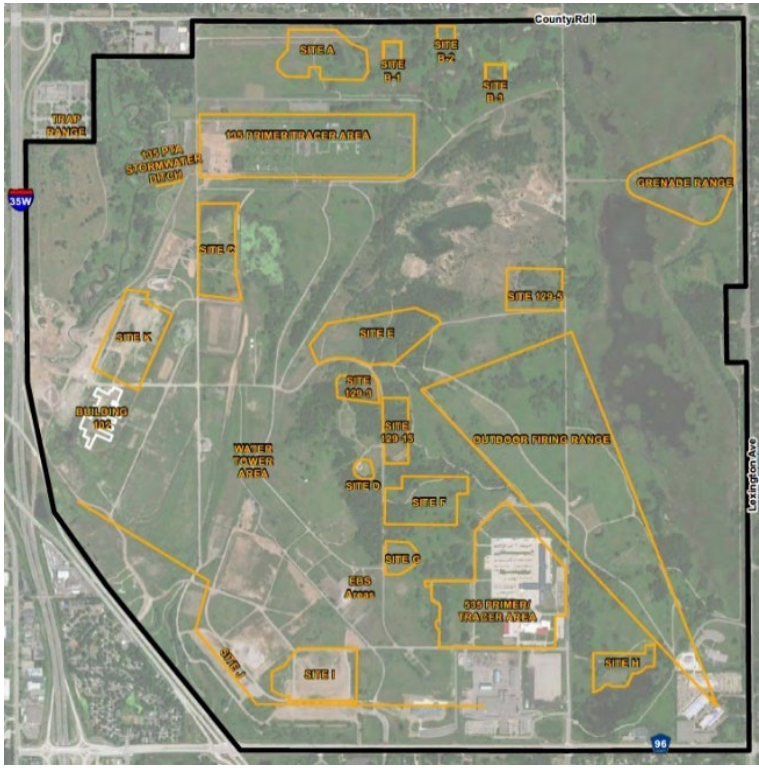
OU2 – Site A Monitored Natural Attenuation

- Main plume (FY 2024) relatively stable compared to FY 2023.
- Concentrations within the heart of the smaller plume have decreased from FY 2023.

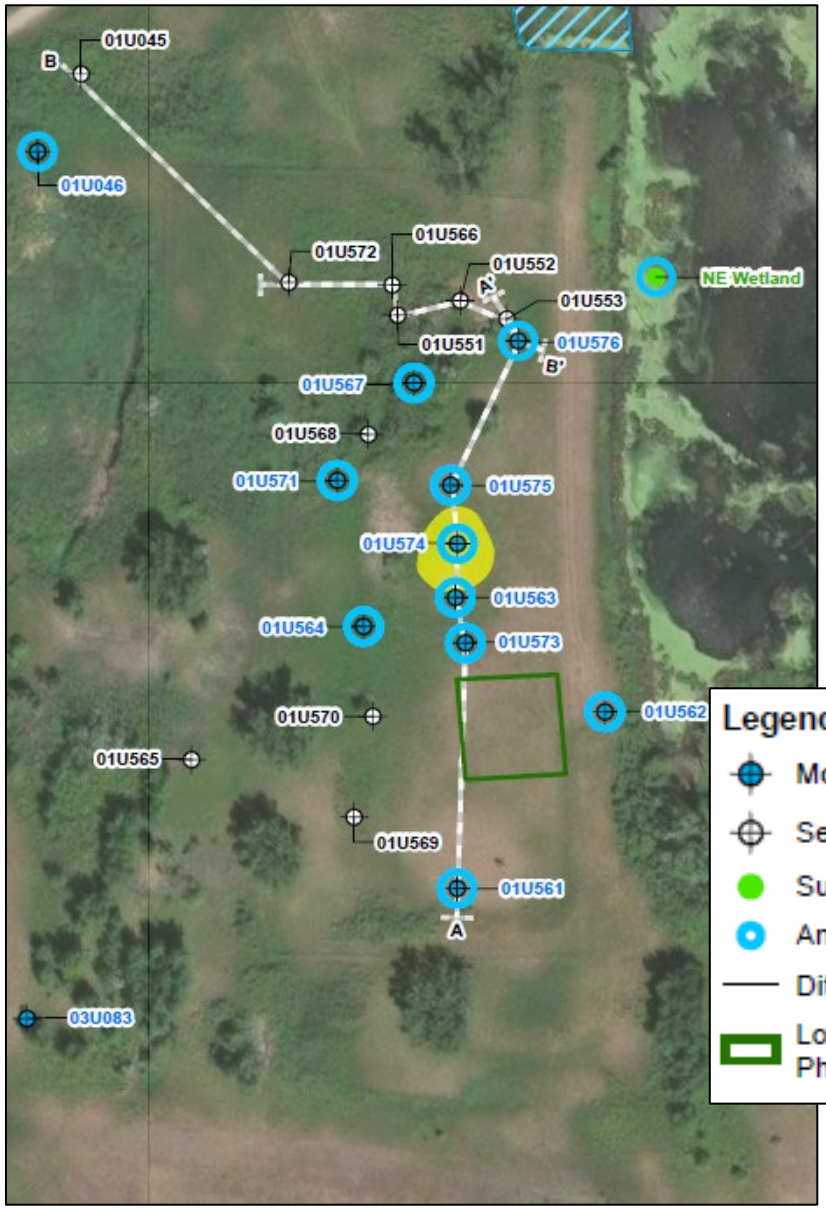


OU2 – Site C Monitored Natural Attenuation

- One location exceeds cleanup level compared to three locations in FY 2024.
- Plume shrank back to FY 2022 levels.
- Continue monitored natural attenuation.



OU2 – Site C Monitored Natural Attenuation



Legend

- Monitoring Well Location
- Sealed Well Location
- Surface Water Sampling Locations
- Annual Monitoring Locations
- Ditch
- Location of Plot for Phytoremediation Demonstration
- Approximate Boundary of Wetland Constructed in 2007
- Cross Section
- 15 µg/L Lead Contour (2024)

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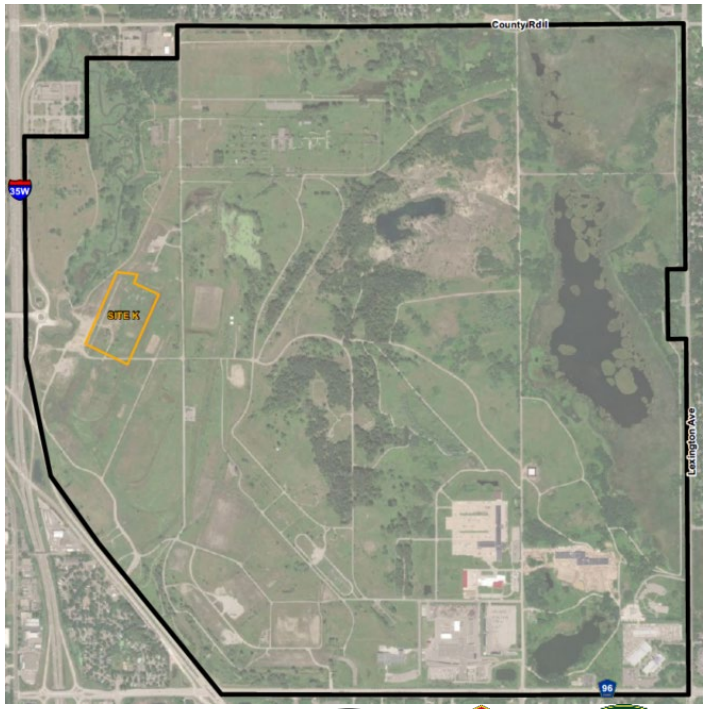
OU2 – Site K Pump and Treat

- Groundwater collection system continues to provide containment of the horizontal and vertical extent of the TCE plume.

- In May 2024, a telemetry system was added to the Site K treatment system. Automated notifications and remote access to system data facilitated faster response times. Increased groundwater extraction volume & treatment (by air stripping).

- June 2024 groundwater sample results confirmed trend of stable or decreasing TCE over 20+ years.



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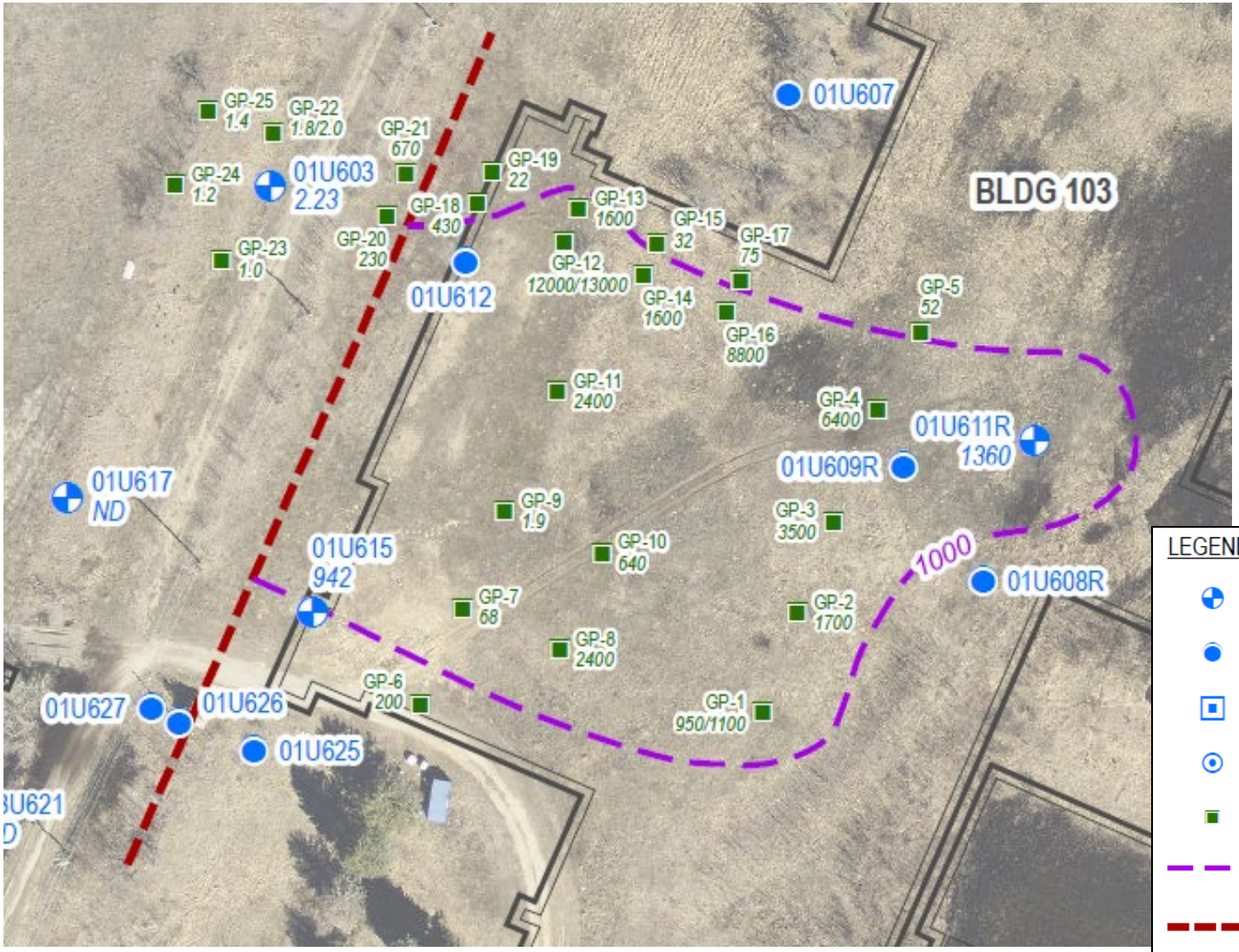
OU2 – Site K Pump and Treat



LEGEND

- ANNUAL UNIT 1 WATER QUALITY MONITORING WELL LOCATION
- ANNUAL UNIT 1 WATER LEVEL MONITORING WELL LOCATION
- UNIT 3 SENTINAL WELL LOCATION
- BUILDING 102 MONITORING WELL (SAMPLED IN MAY 2024)
- GEOPROBE BORING LOCATION FROM 2014 INVESTIGATION
- 1000 µg/L TCE PLUME LIMIT (ESTIMATED BASED ON 2014 DATA)
- SITE K COLLECTION TRENCH LOCATION
- HISTORICAL BUILDING / STRUCTURE

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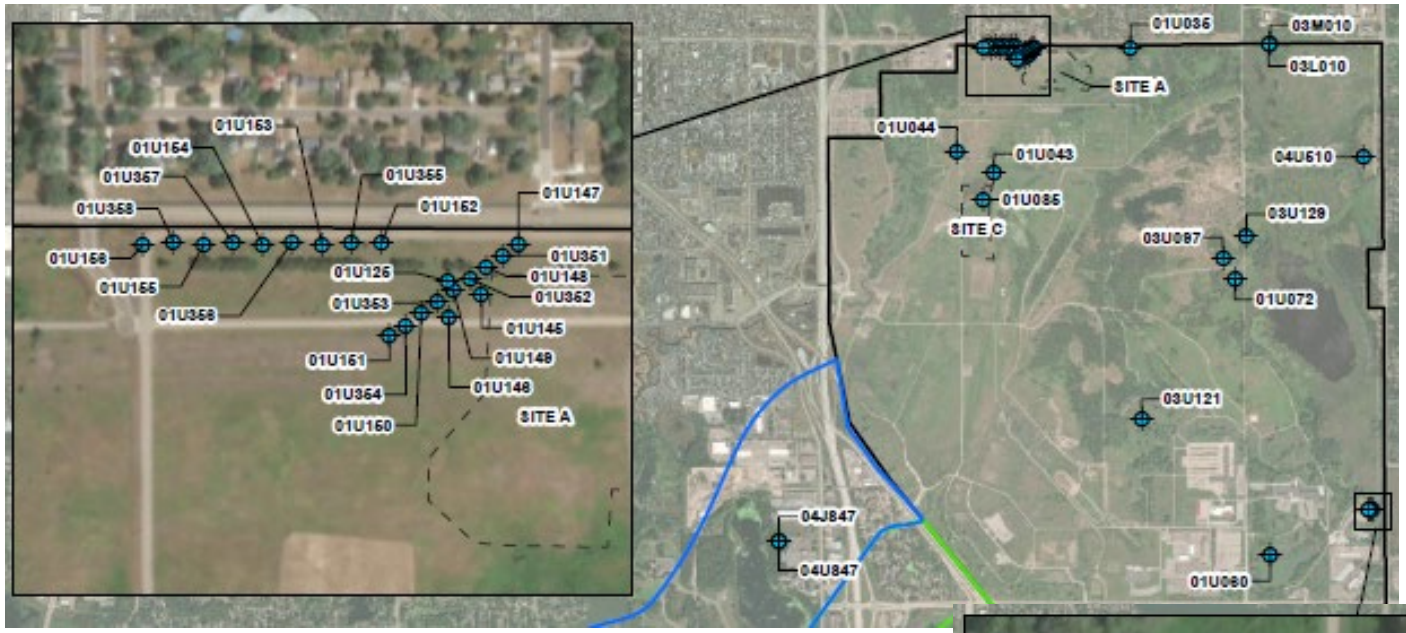
OU1/OU2 Well Abandonment and Reinstallation

- Abandonment of three industrial wells in OU1 and 42 monitoring wells in OU2.
- Reinstallation of four monitoring wells in OU1 and one monitoring well in OU2.
- Monitoring well reinstallation in OU1 pending successful right-of-entry negotiations.
- All activities planned for FY 2025.

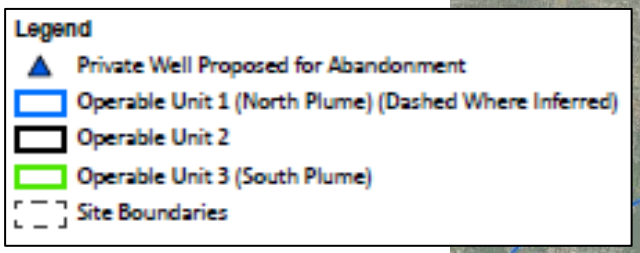
OU1/OU2 Well Abandonment and Reinstallation

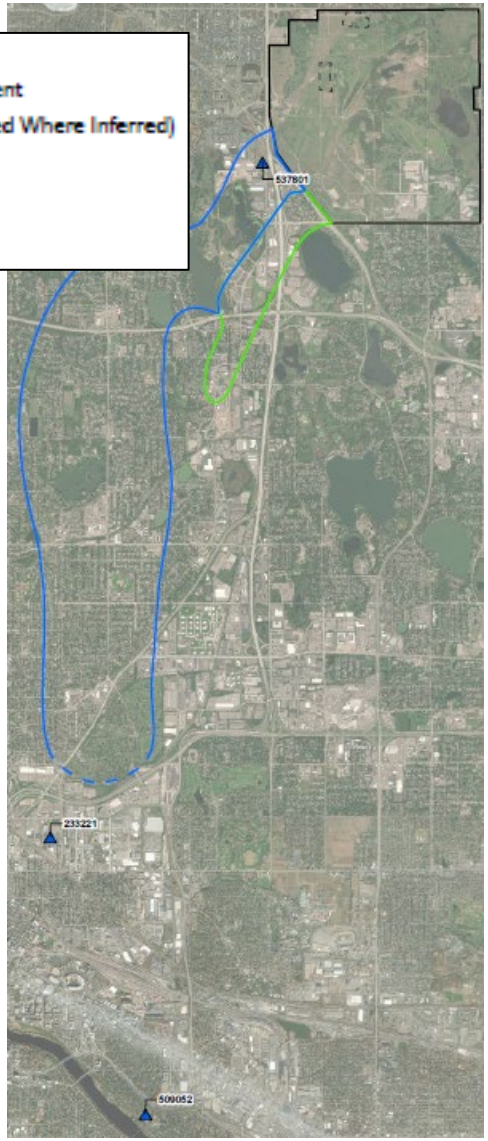


Legend

- Monitoring Well Proposed for Abandonment
- Operable Unit 2
- Operable Unit 3 (South Plume)
- Operable Unit 1 (North Plume)
- Site Boundaries

OU1/OU2 Well Abandonment and Reinstallation





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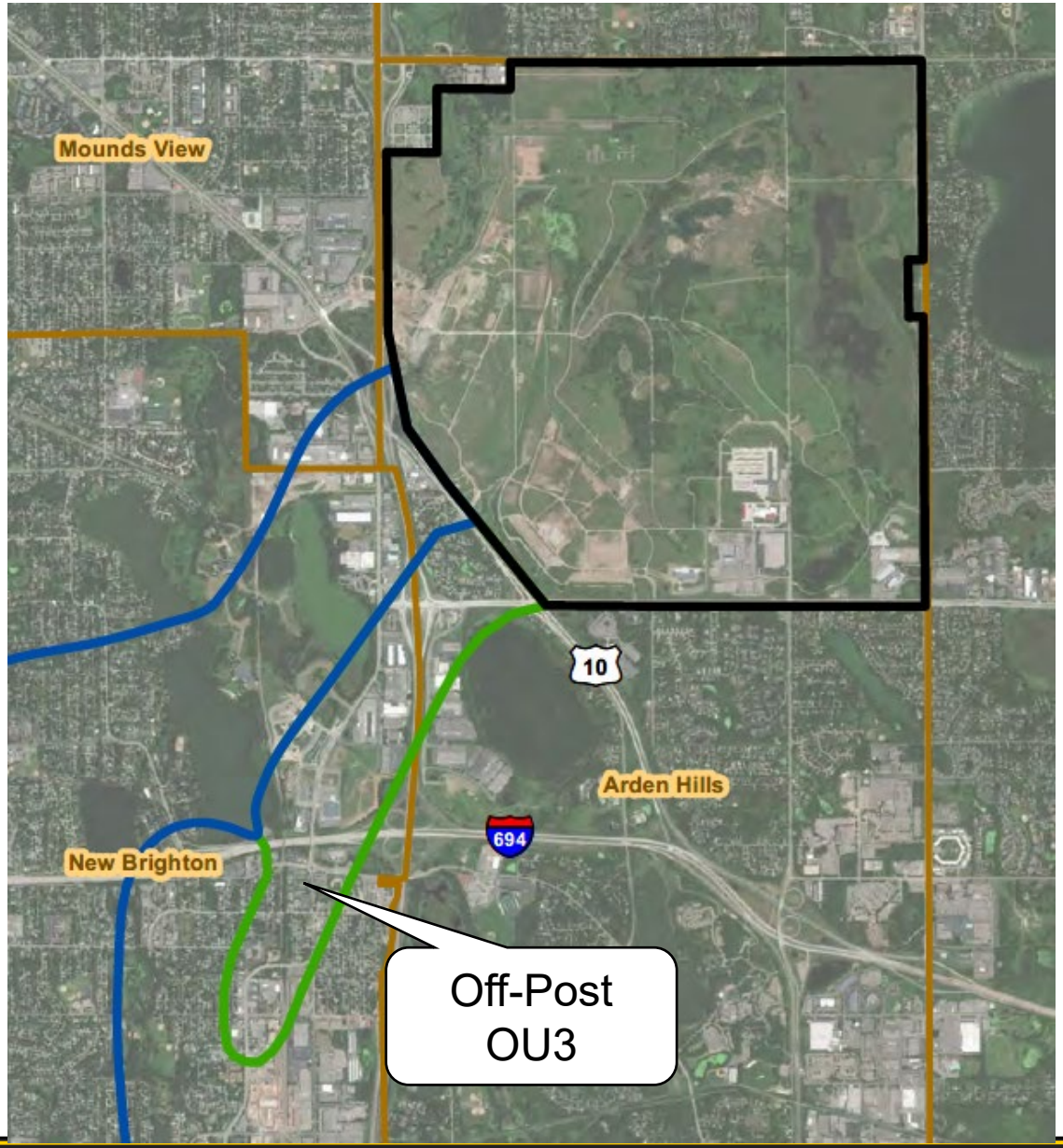
Twin Cities Army Ammunition Plant Cleanup



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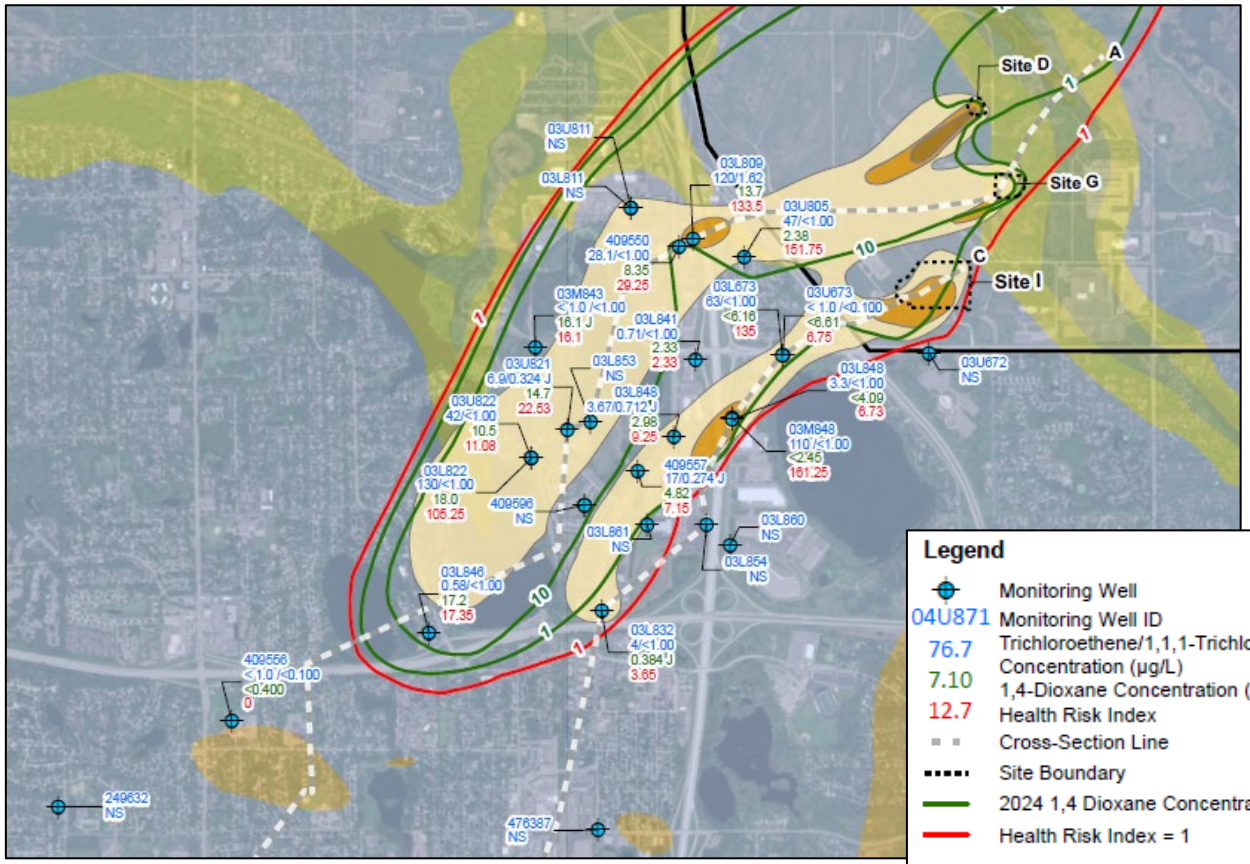
OU3 Plume

- OU3 plume remains relatively stable – results consistent with FY 2023.
- Continued monitored natural attenuation.
- Annual groundwater sampling completed in June 2024.



Legend

- Monitoring Well
- 04U871 Monitoring Well ID
- 76.7 Trichloroethene/1,1,1-Trichloroethane Concentration (µg/L)
- 7.10 1,4-Dioxane Concentration (µg/L)
- 12.7 Health Risk Index
- Cross-Section Line
- Site Boundary
- 2024 1,4 Dioxane Concentration Contour (µg/L
- Health Risk Index = 1

2024 Trichloroethene Concentrations

- > 1,000 µg/L
- > 100 µg/L
- > 0.4 µg/L
- Operable Unit 2

Bedrock Geology

- Decorah Shale, Galena Group
- Platteville and Glenwood Fms
- St. Peter Sandstone
- Prairie du Chien Group
- Jordan Sandstone
- St. Lawrence Formation
- Tunnel City Group

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Update on the Deep Groundwater TCAAP Groundwater Recovery System (TGRS)

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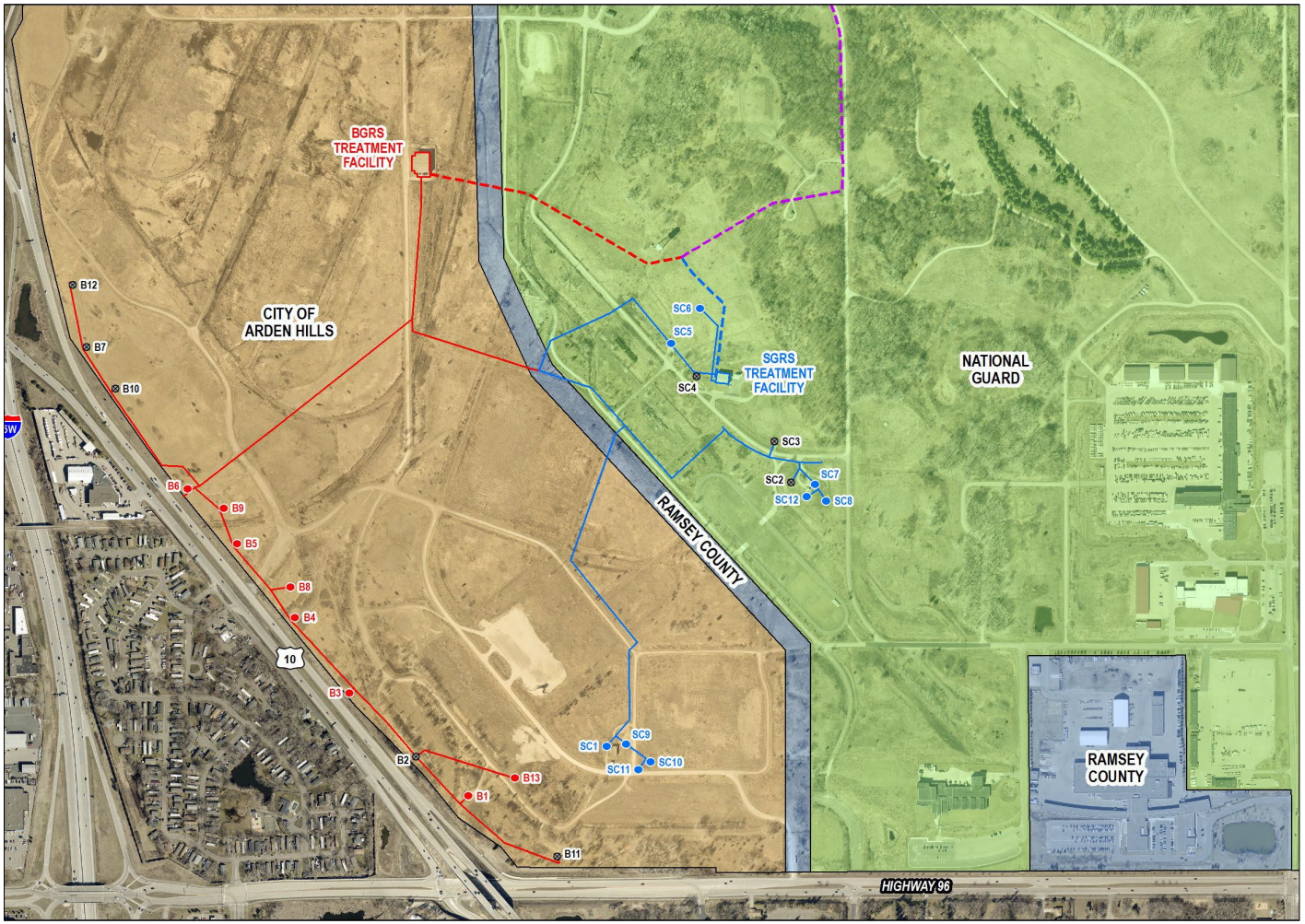
OU2 Optimization – TGRS Layout

Boundary Groundwater Recovery System (BGRS)

Source Area Groundwater Recovery System (SGRS)

BGRS + SGRS = TGRS



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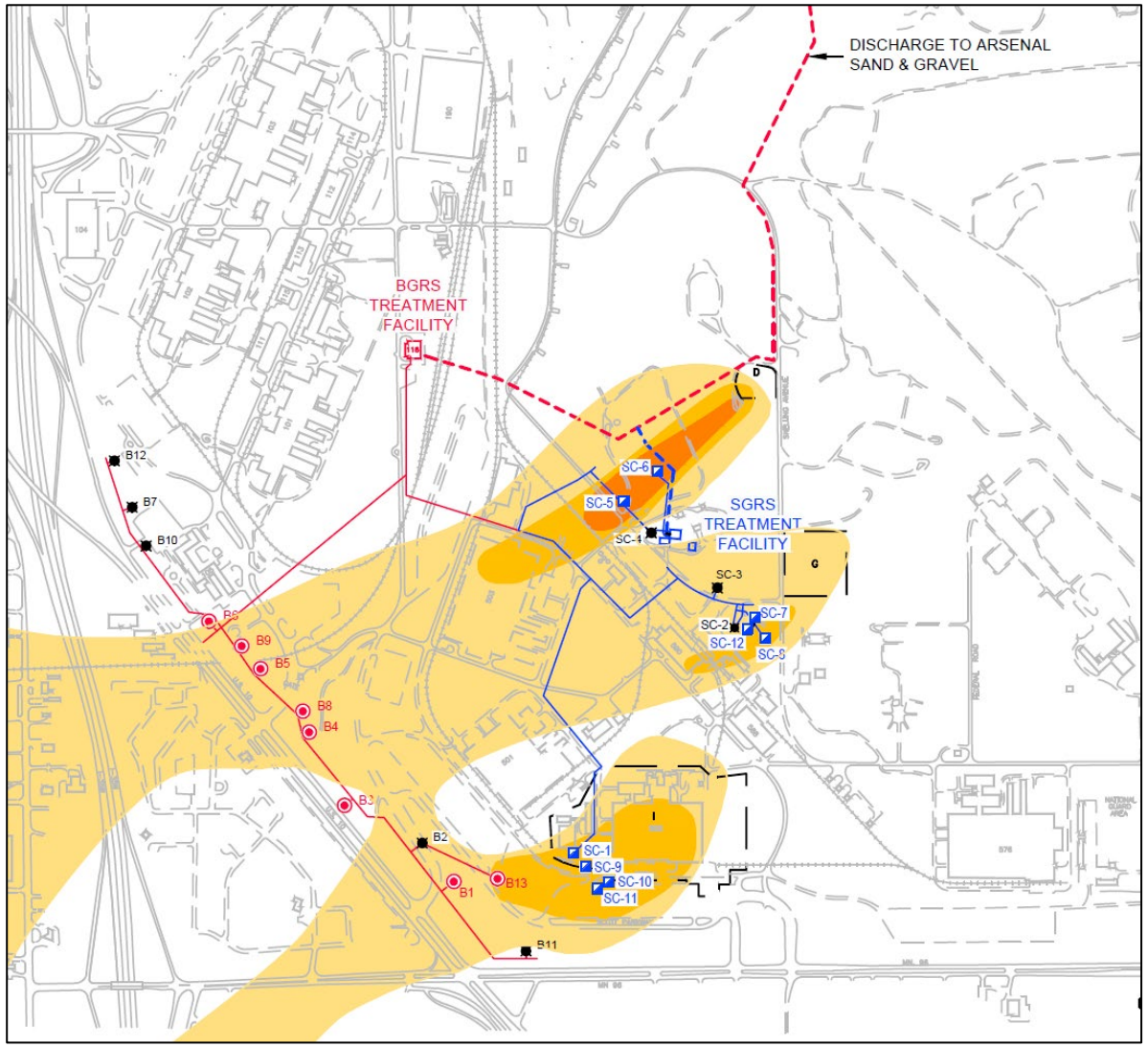
OU2 Optimization – TGRS Layout – TCE

Boundary Groundwater Recovery System (BGRS)

Source Area Groundwater Recovery System (SGRS)

BGRS + SGRS = TGRS

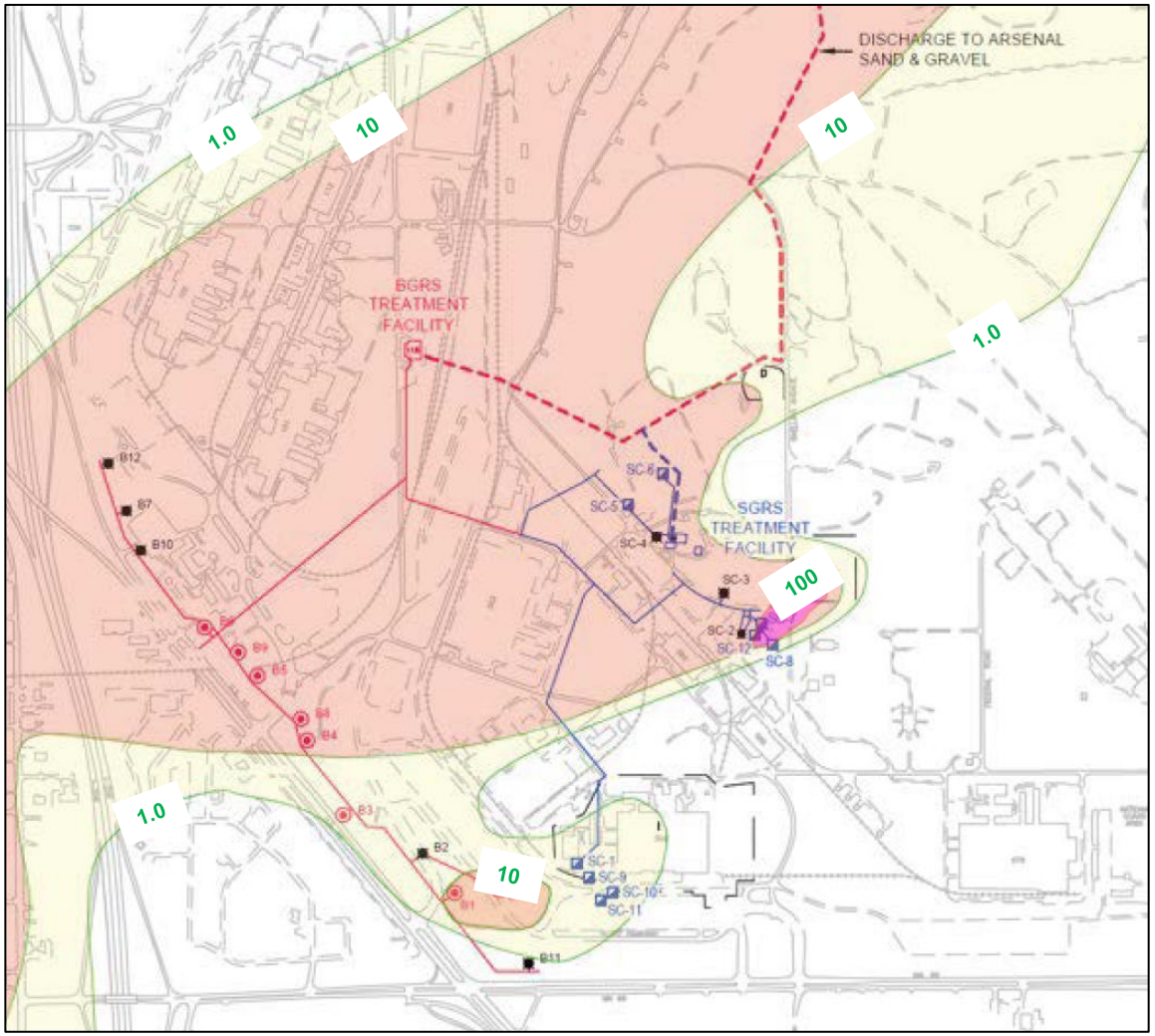


OU2 Optimization – TGRS Layout – 1,4-Dioxane

Boundary Groundwater Recovery System (BGRS)

Source Area Groundwater Recovery System (SGRS)

BGRS + SGRS = TGRS



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OU2 Deep Groundwater Remediation – FY2024
Total TGRS Operation Update

- The Fiscal Year 2024 annual average extraction rate (BGRS + SGRS) was approximately 1,901 gal per minute (gpm), **well above** the Global Operating Strategy (GOS) Operational Minimum of 1,745 gpm.
- GOS is based on the 2001 TCE plume concentrations.
- FY 2024 TCE plume width is ~17% narrower than the FY 2001 plume. TCE contained by TGRS during FY 2024.
- In FY 2024, the BGRS pumped > 820M gallons and removed almost 300 lbs of VOCs; and the SGRS pumped >180M gallons and removed over 1,400 lbs of VOCs.
- Upcoming: FY 2025 TGRS Operating Strategy Revision to optimize contaminant removal & more efficiently sustain hydraulic containment of the source areas.

POC Information (Thomas Toudouze, U.S. AEC, 210-466-1920, thomas.p.toudouze2.civ@army.mil)

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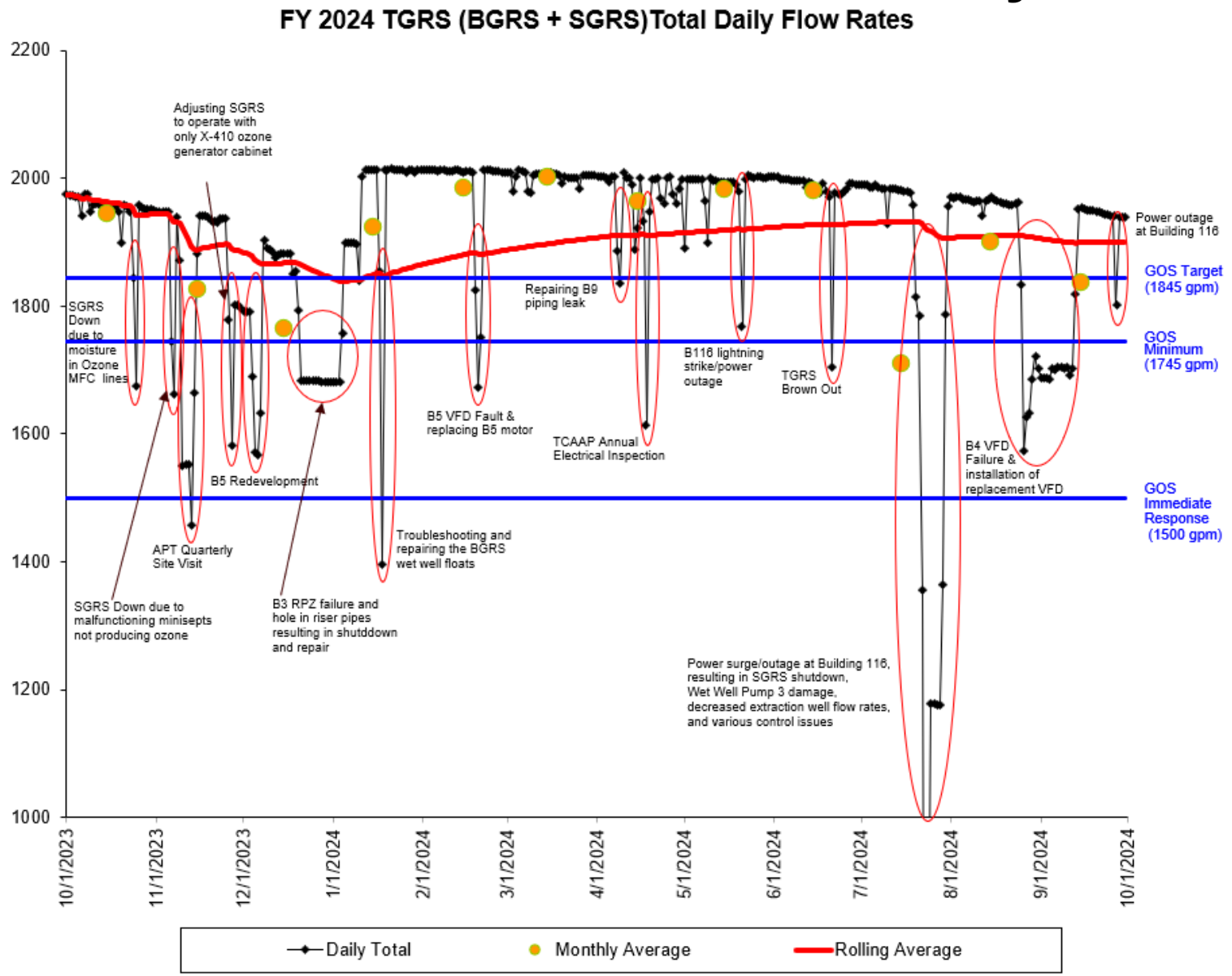
FY 2024 Daily Flow Rates



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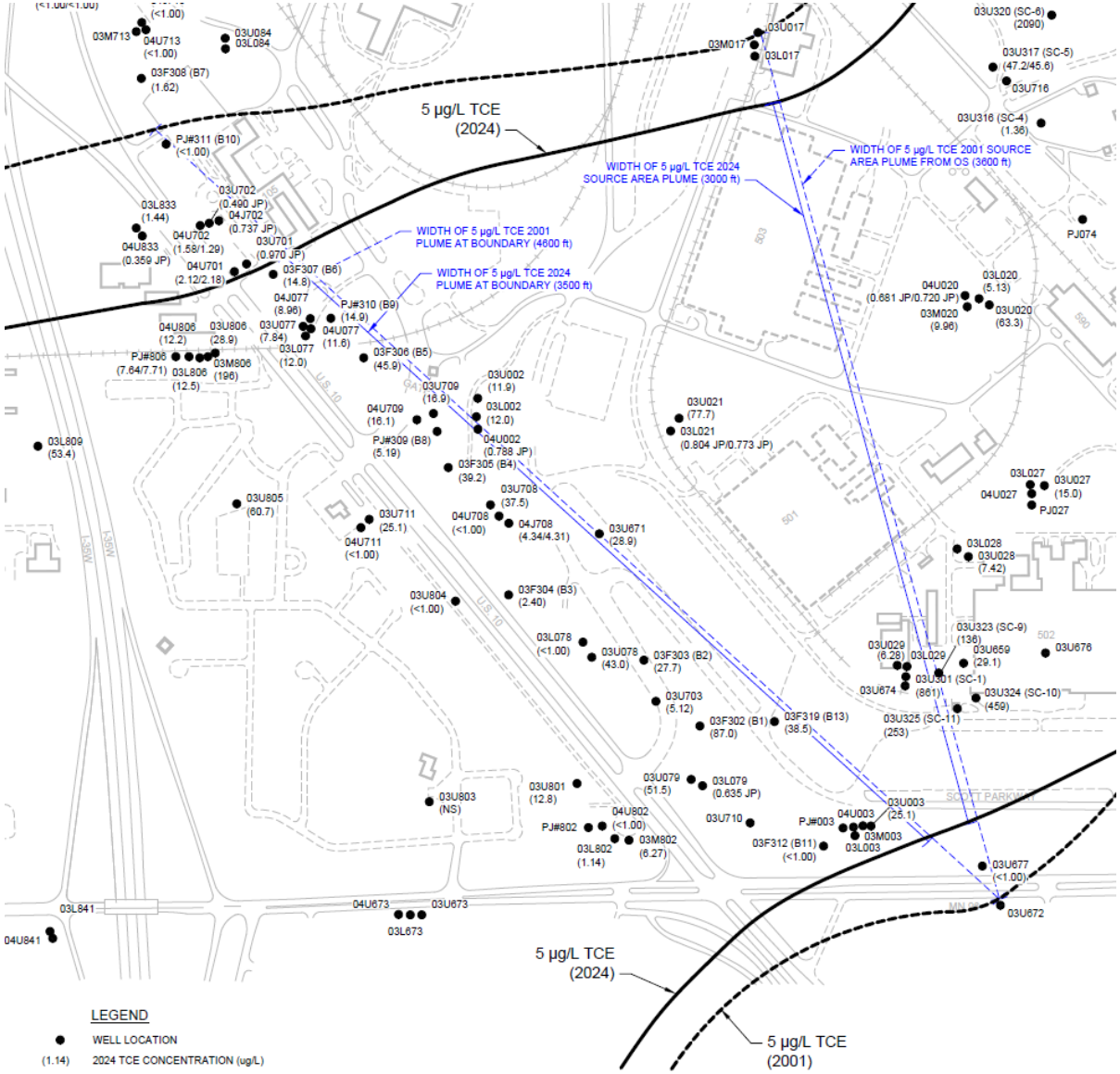
2024 TCE Plume (3,000 feet wide)



TGRS, SGRS Update

SGRS (Source Area) System Operation – AO + Air Stripper

- System is operating and meeting all 1997 OU2 ROD and 2020 ESD #3 discharge criteria in monthly sampling since start up, including:

SGRS Discharge Criteria	
1,4-Dioxane	1.0 µg/L
TCE	5 µg/L
1,1,1-TCA	200 µg/L
Bromate	10 µg/L

- Full treatment to criteria of 1,4-dioxane and TCE in AO reactor; air stripper only needed for chlorinated alkanes.
- Since the SGRS began operation, influent TCE and 1,4-Dioxane concentrations decreased by over 60%. TCE and 1,4-Dioxane concentrations in the individual SGRS extraction wells also decreasing.

SGRS Air Emissions

SGRS startup sampling results:

- Measured contaminants were much less than those assumed/modeled in April 2021.
  - No detectable ozone within the SGRS Building (previously assumed @ 0.18 lb/hr).
  - TCE into air stripper less than 5 ug/L (vs. assumed @ 32 ug/L).

- Confirmed through MPCA screening model that SGRS air emissions are below State of Minnesota inhalation risks levels for acute, subchronic, chronic, and cancer exposures for at National Guard fence line.

TGRS, BGRS Update

BGRS (Boundary) System Operation – Air Stripper

- System is operating and BGRS effluent samples met all 1997 OU2 ROD discharge criteria in monthly sampling completed during FY 2024.
  - TCE all less than 5 µg/L limit.
  - All other contaminants of concern were non-detect (<1.0 µg/L).

  BGRS VOC influent concentrations were consistent from FY 2023 to FY 2024:

  Averaging ~44 µg/L

BGRS Air Emissions

- Development activity has not begun in this area and there are currently no receptors. Modeling and sampling completed in 2020.
- 80% reduction in TCE influent concentrations at BGRS since SC-5 and SC-1 were rerouted from BGRS to SGRS. Influent TCE reduced from 201 µg/L in 2020 to less than 40 µg/L in 2024.
- TCE emission rate through Dec 2024 = 0.0036 g/s (2020 modeled emission rate = 0.005 g/s).
- Additional air sampling and modeling will be completed for BGRS emissions prior to receptors being in the area associated with Ramsey County development work.

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Update on PFAS

PFAS

- A Preliminary Assessment and Site Inspection (PA/SI) was finalized in September 2023.
- In July 2024, the Army received a joint letter from EPA and MPCA documenting that the regulators did not concur with the finalization of the report, identifying a number of specific issues.
- In November 2024, a discussion between USAEC and EPA was held to discuss a path forward, this includes a supplemental screening and sampling event to identify sites potentially missed during the PA/SI. This effort will be combined with the RI/FS contract.
- In January 2025, the Department of Defense adopted new screening levels for PFAS. Due to this two additional AOPIs have been added to the RI, the Southwest Sewer System (Site J) and the Open Burn Area/Salvage Area (Site C).
- An RI/FS contract is currently being developed with an expected award in FY26 pending funds availability.

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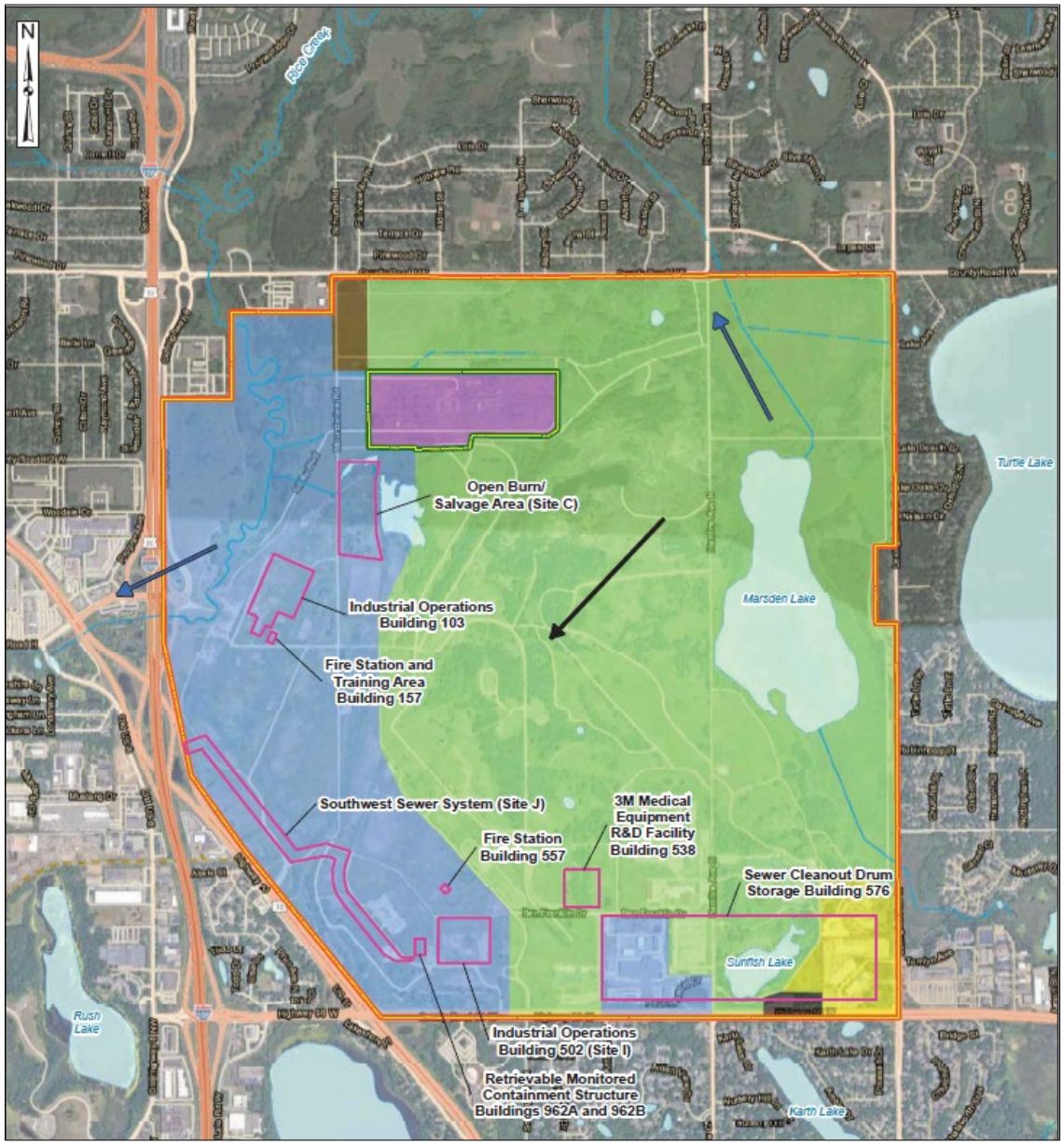
Map of PFAS AOPIs



Current PFAS AOPIs Moving to RI

- Building 103
- Building 157
- Building 502
- Building 576
- Site C
- Site J

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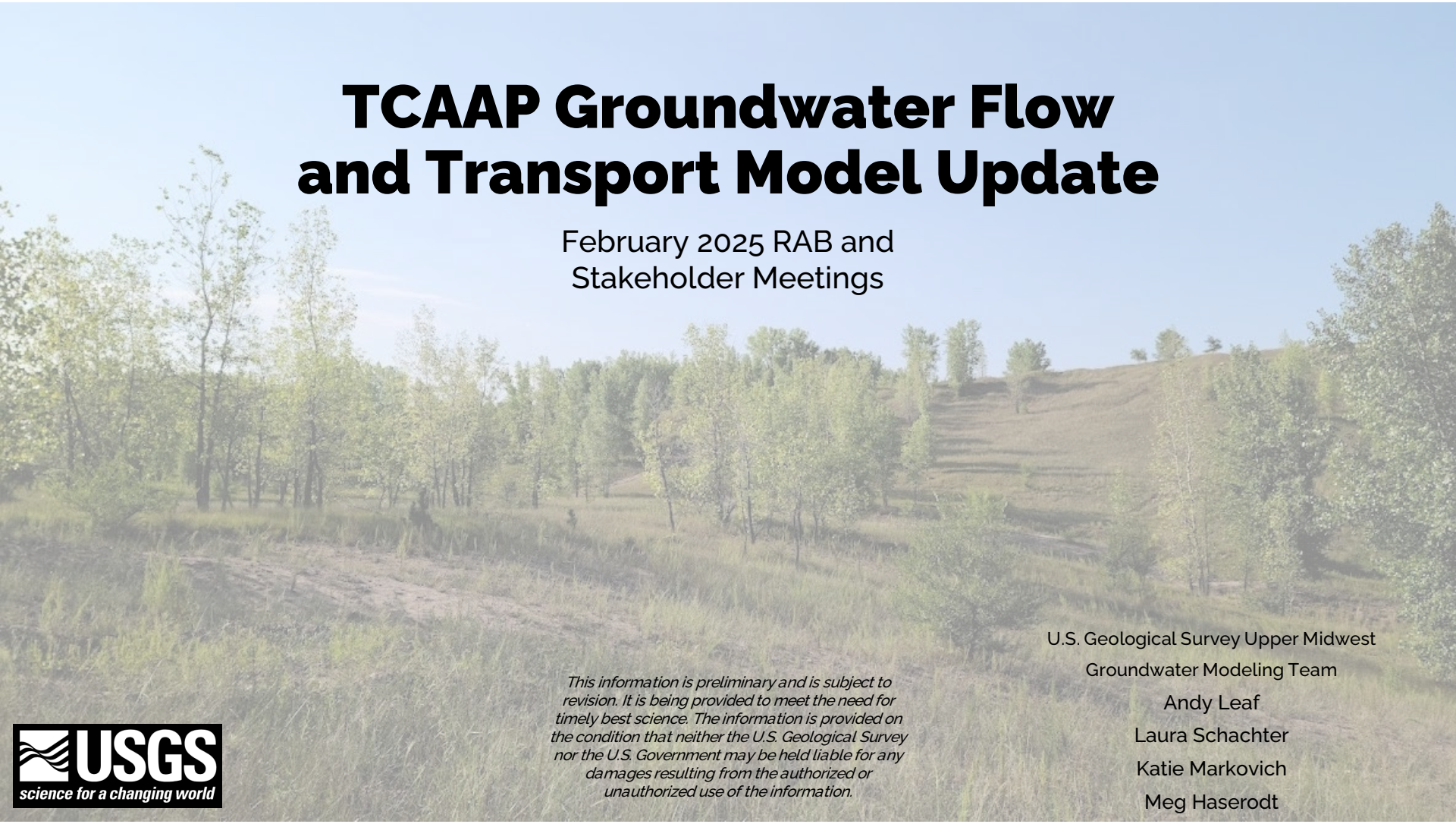
Additional Presentations

- USGS Groundwater Model Update

TCAAP Groundwater Flow and Transport Model Update

February 2025 RAB and Stakeholder Meetings



This information is preliminary and is subject to revision. It is being provided to meet the need for timely best science. The information is provided on the condition that neither the U.S. Geological Survey nor the U.S. Government may be held liable for any damages resulting from the authorized or unauthorized use of the information.

U.S. Geological Survey Upper Midwest Groundwater Modeling Team

Andy Leaf

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USGS science for a changing world

Model Overview

- Build a groundwater flow and transport model to simulate the deeper groundwater system near TCAAP to estimate the expected plume capture from the pumping remediation systems.
- Focus on the OU1, OU2, & OU3 groundwater plumes
- Contaminants
  - 1,4-dioxane
  - Trichloroethene (TCE)

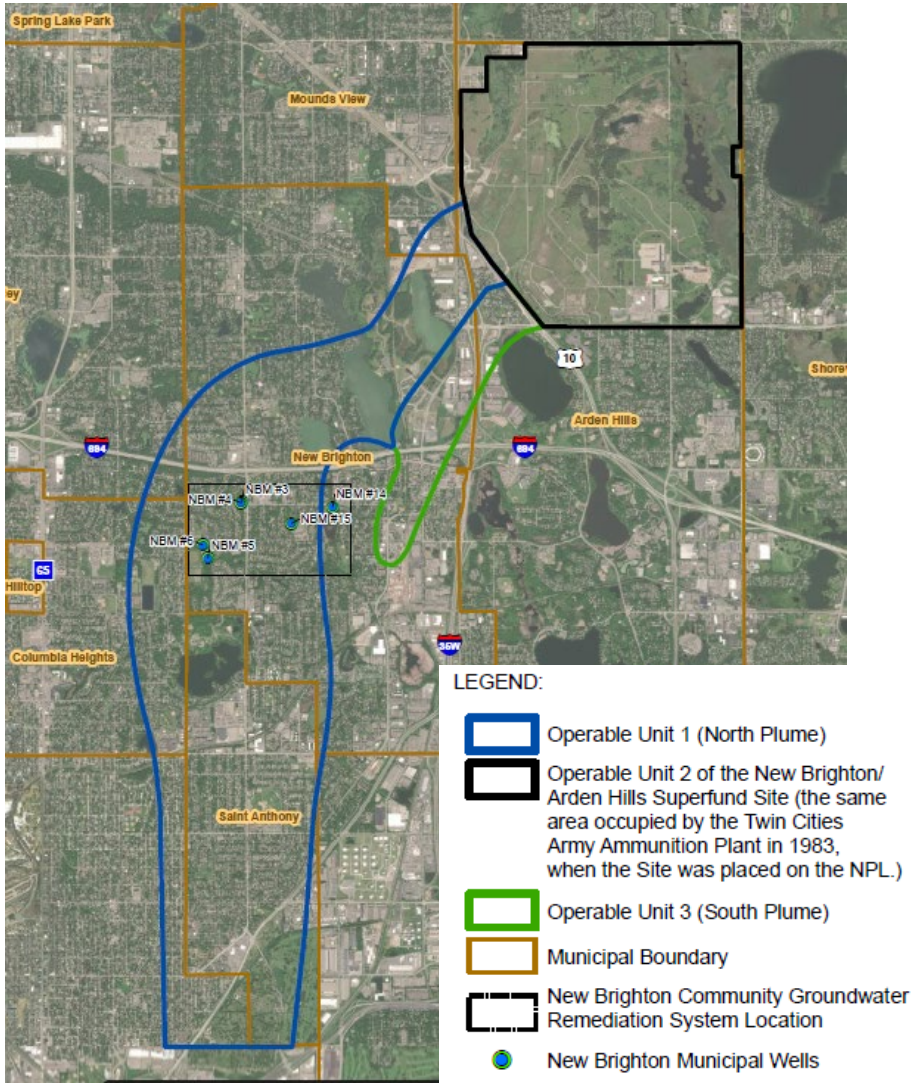

Figure modified from Figure 2-1 in the Fiscal Year 2020 *Annual Performance Report.*

Groundwater Flow and Transport Model Updates

Flow Model

- Collected water levels in the gravel pit in 2024 to help constrain hydraulics near the source areas
- Exploring the simulated hydraulic capture from the pumping system with particle tracking
- Updating the unconsolidated geology in the model with new Minnesota Geological Survey layers
- Using observed streamflows in Rice Creek to constrain groundwater flow near the source areas

Transport Model

- Current focus on TCE
- Testing various transport processes
- Refining the model parameters to better fit observed concentrations of TCE, mass removed by the remediation system, plume footprint, etc.

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Project Timeline

FY 2025

- Refine history matching to get groundwater flow and TCE transport model that reasonably reproduces measured site data – *currently working on this step*
- Build 1,4-Dioxane transport model – *starting soon*
- Draft online map for users to interactively explore model results – *currently working on this step*

FY 2026

- Final model adjustments & estimates of plume capture by pumping system
- Publication of model & results in USGS Series Report
- Archive model files in publicly available data release
- Publish interactive online map of model results

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Questions?

Questions for the USGS Modeling Team that were not asked during the live presentation can be emailed to:

Meg Haserodt, mhaserodt@usgs.gov

What's Next

- OU1
  - Begin industrial well abandonment (3 wells).
  - Begin installation of 4 monitoring wells.
  - New well installation at New Brighton.
- OU2
  - Begin abandonment of 42 monitoring wells.
  - Begin installation of 1 monitoring well including optimization of the monitoring well network.
  - Begin Risk Assessment for unrestricted land use.
  - 135 Primer Tracer Area – sold.
- OU3
  - Continue groundwater monitoring.
- PFAS
  - Continue work on designing and awarding a Remedial Investigation contract.
- Round Lake
  - Continue remedial design.
- Administrative Record/Information Repository
  - Army working with Arden Hills Army Training Site (AHATS) to enlarge space.

New Business

- Recommend next RAB meeting 16 September 2025.
- Topics for future RAB meetings?
- Additional administrative requirements for RAB?
- Suggestions for improvement of RAB?
- Date of next Round Lake Technical Working Group meeting to be determined.
- Potential Round Lake specific Public Meeting to discuss change in conditions to be determined if sufficient interest.

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Next Meeting Agenda

- Review/Approve minutes of last meeting
- Old Business
- Cleanup Status Update
- New Business
- Next Meeting Agenda
- Public Comments

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Public Comments

- Does anyone have any comments, concerns or suggestions?

Questions

- You can ask questions now or at anytime using the email listed on the website.