



U.S. ARMY



**U.S. ARMY
ENVIRONMENTAL
COMMAND**

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

RAB Meeting

2-20-2024

AGENDA – February 20, 2024 at 7 P.M.

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



- Vote to accept the minutes from previous meeting.
- Contract for Round Lake construction was awarded in August 2023. Date of next Round Lake Technical Working Group meeting to be determined.
- PFAS Preliminary Assessment/Site Investigation (PA/SI) was completed in September 2023.

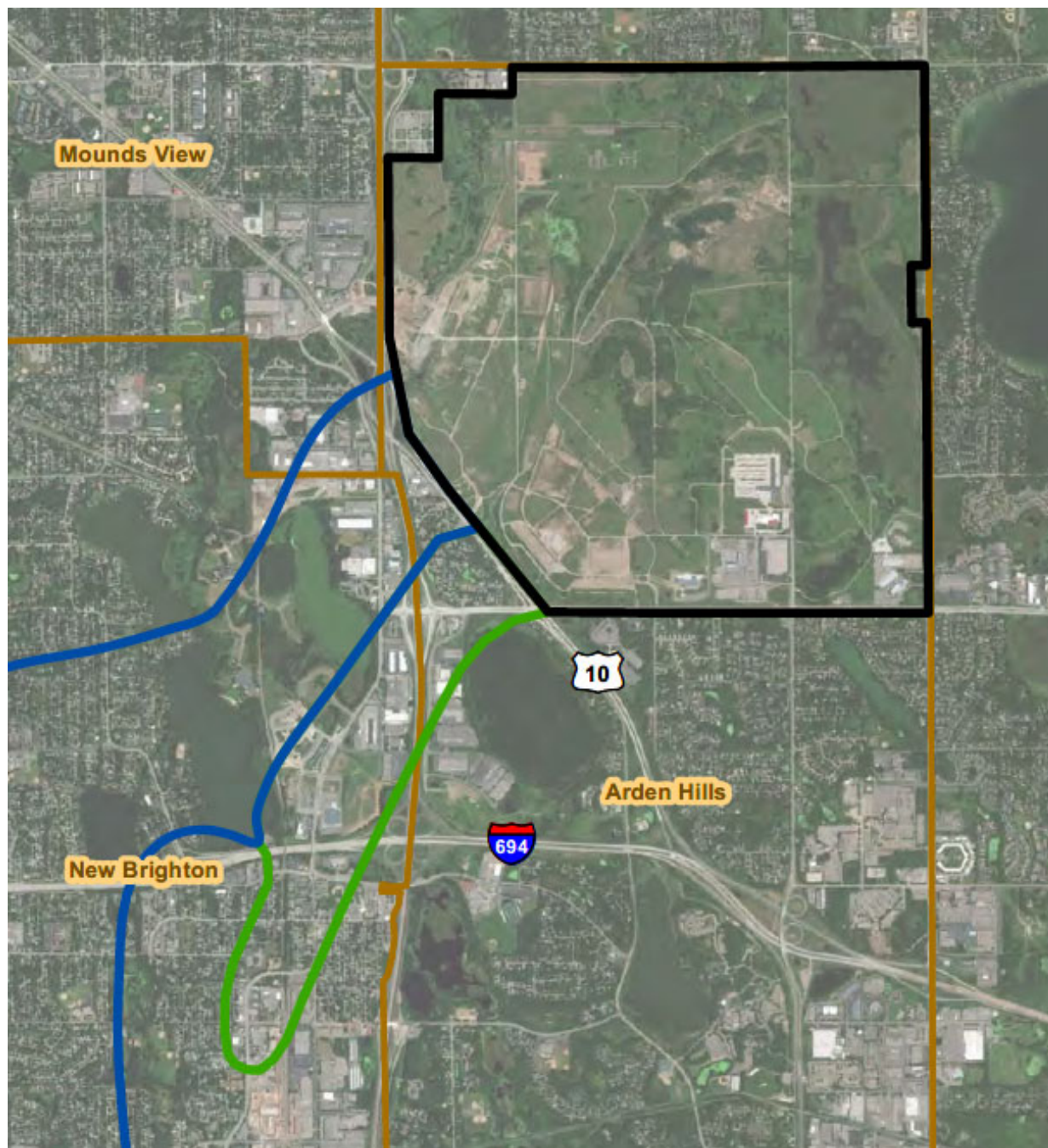


What has the Army done since September 2023?





- Next Round Lake Technical Working Group (TWG) meeting date to be determined.
- Hydraulic evaluation of the TCAAP Groundwater Recovery System (TGRS) in process.
- Annual groundwater sampling and land use control inspections completed. Draft Final FY2023 Annual Performance Report submitted to regulators.



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



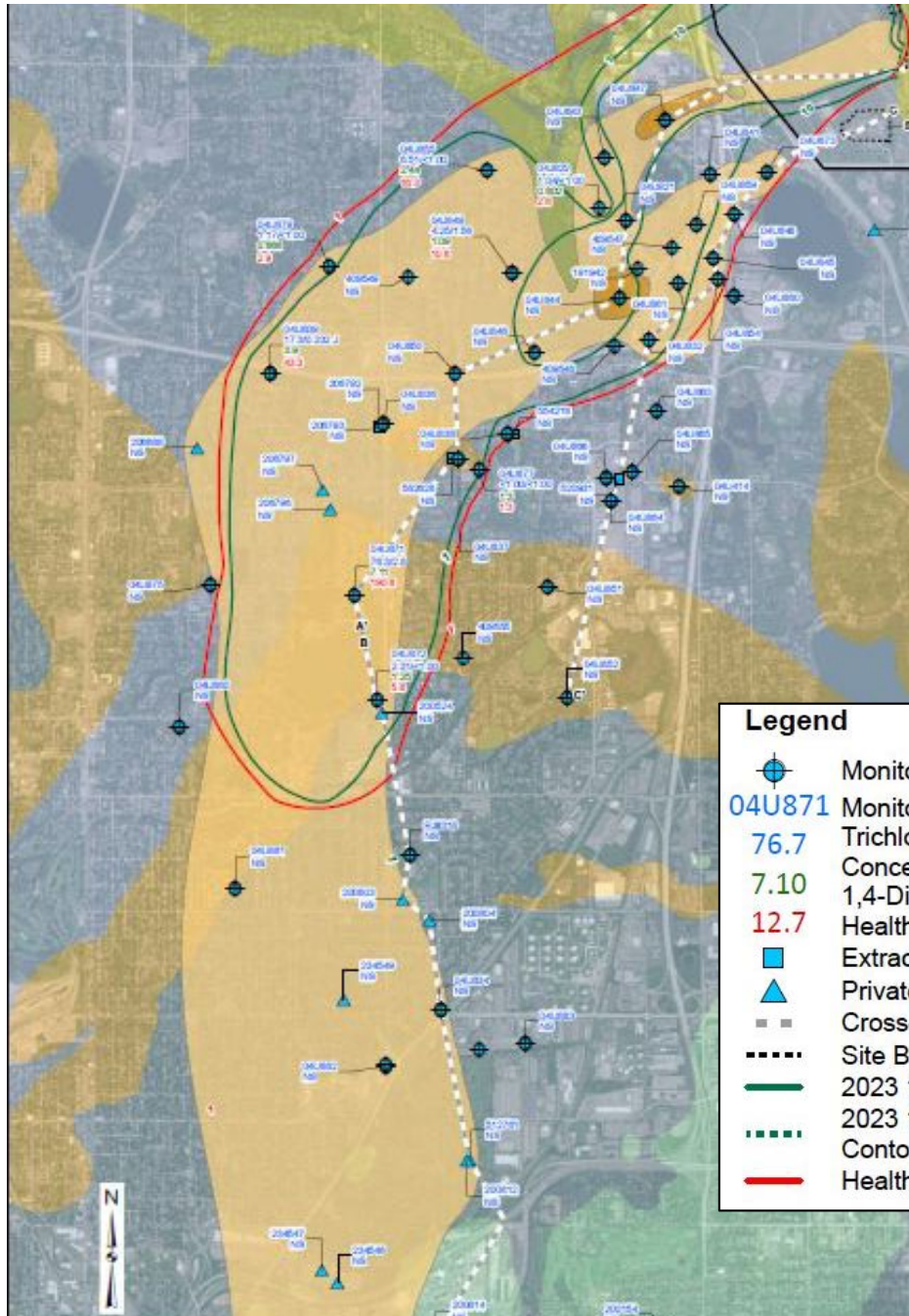
Groundwater Sampling Update

- Groundwater sampling allows the Army to monitor the plumes and update the maps.
- Groundwater sampling (minor year) completed in Summer 2023.
- Groundwater data has been validated and incorporated into the Draft Final FY 2023 APR.
- Annual plume maps are available in the respective APRs, which have been updated in the Draft Final FY 2023 APR.
- Statistical evaluation of monitoring well network to be completed during FY 2024.



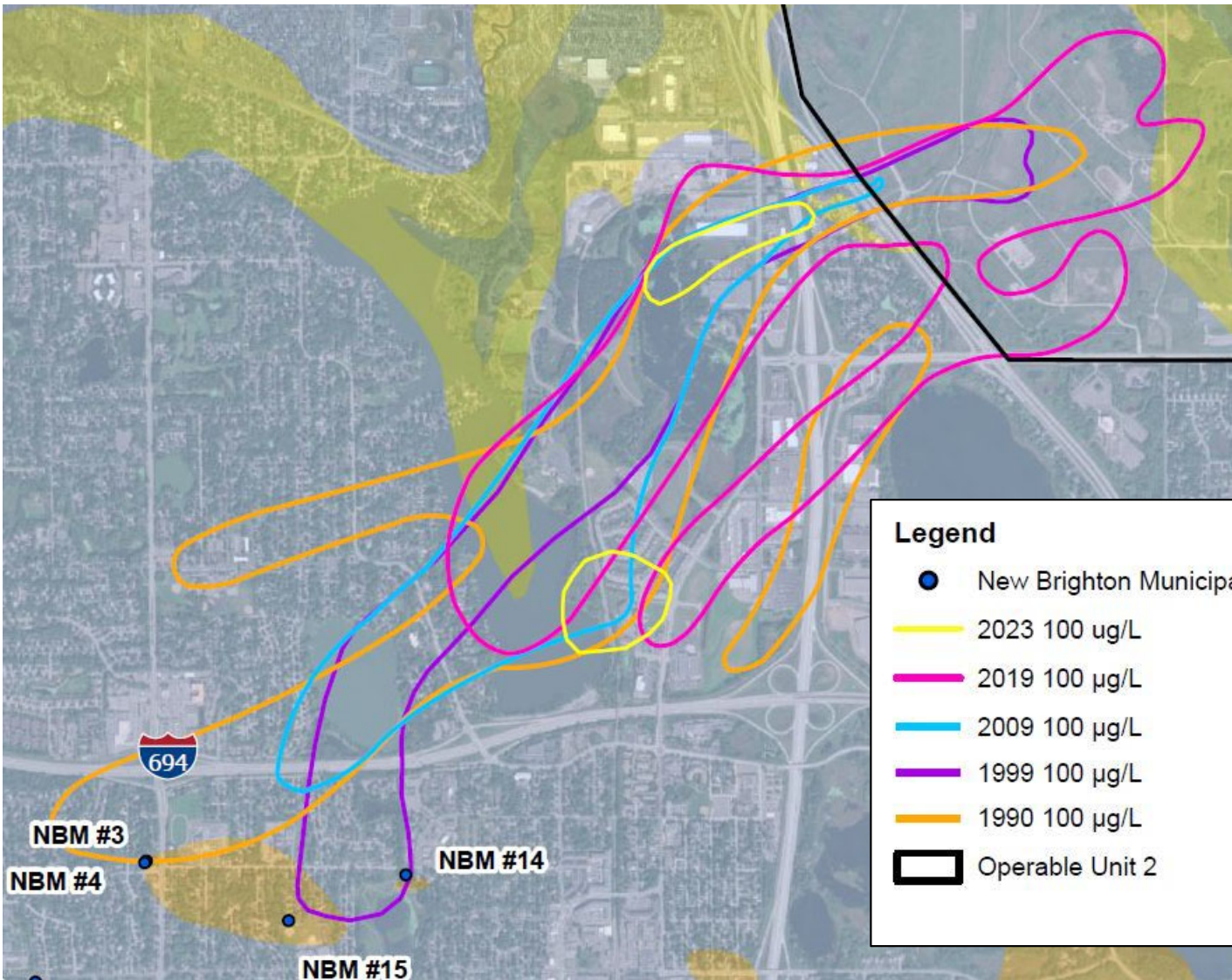
FY 2023 – Prairie du Chien Plume Map

- Plume remains relatively stable compared to FY22 results.
- Some minor decreases spread throughout the plume.
- Higher concentration area (>100ug/L) remains as two distinct lobes (shown on next slide), consistent with FY22 results.



Legend		2023 Trichloroethene Concentrations (µg/L)	
	Monitoring Well		> 0.4 µg/L
	Monitoring Well ID		> 100 µg/L
	76.7 Trichloroethene/1,1,1-Trichloroethane Concentration (µg/L)		Operable Unit 2
	7.10 1,4-Dioxane Concentration (µg/L)		Decorah Shale, Galena Group
	12.7 Health Risk Index		Platteville and Glenwood Fms
	Extraction Well		St. Peter Sandstone
	Private Well		Prairie du Chien Group
	Cross-Section Line		Jordan Sandstone
	Site Boundary		St. Lawrence Formation
	2023 1,4 Dioxane Concentration Contour (µg/L)		Tunnel City Group
	2023 1,4 Dioxane Concentration Inferred Contour (µg/L)		
	Health Risk Index = 1		

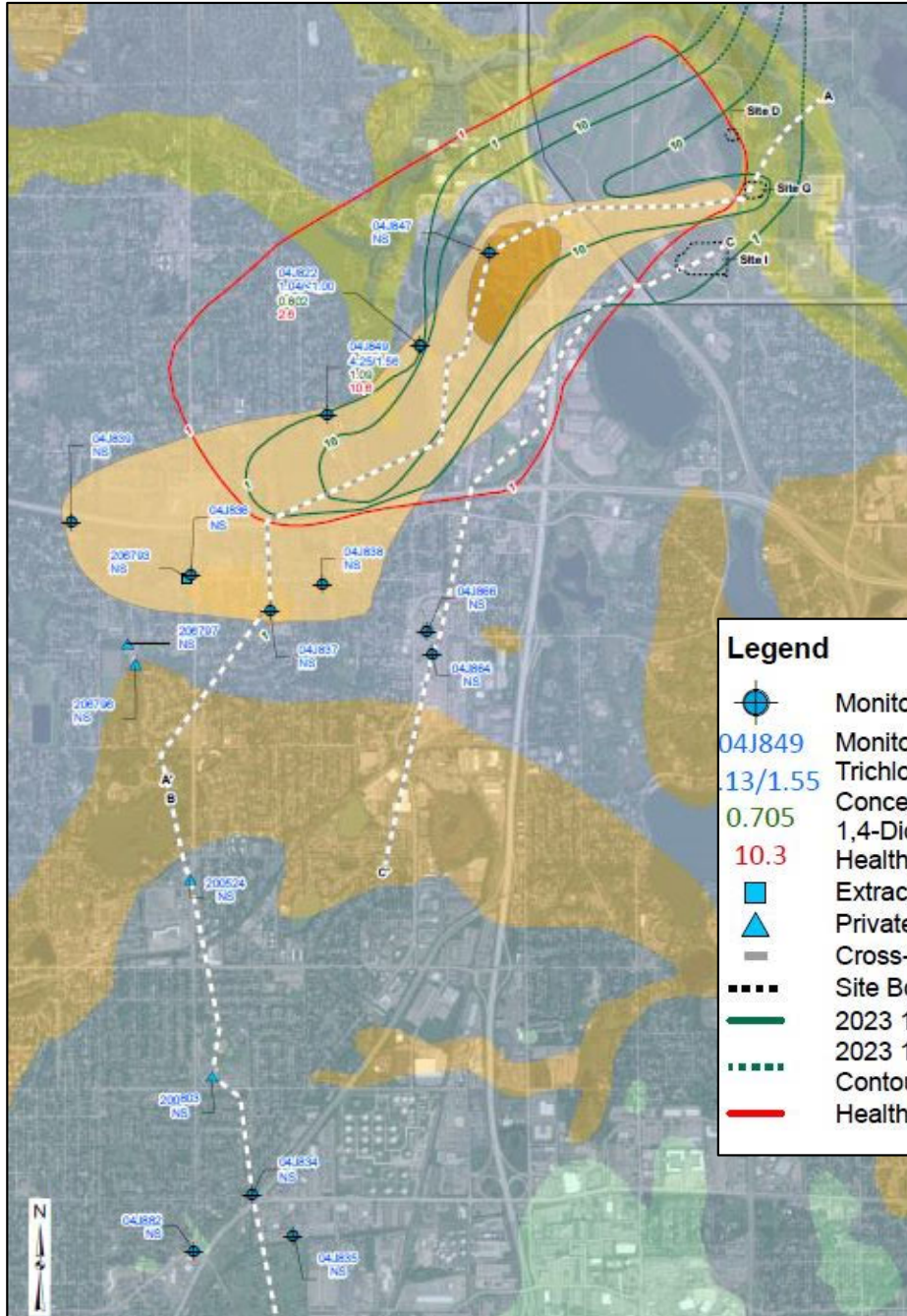




Legend	
●	New Brighton Municipal Wells
— (Yellow)	2023 100 µg/L
— (Magenta)	2019 100 µg/L
— (Cyan)	2009 100 µg/L
— (Purple)	1999 100 µg/L
— (Orange)	1990 100 µg/L
□ (Black)	Operable Unit 2
Bedrock Geology	
■ (Light Green)	Decorah Shale, Galena Group
■ (Blue-Gray)	Platteville and Glenwood Fms
■ (Light Orange)	St. Peter Sandstone
■ (Light Blue)	Prairie du Chien Group
■ (Yellow)	Jordan Sandstone
■ (Light Green)	St. Lawrence Formation
■ (Light Yellow)	Tunnel City Group











FY 2023 – Jordan Plume Map






- Main plume remains relatively stable compared to FY22 results.
- Downgradient wells non-detect in FY22 (most not sampled in FY23).
- Higher concentration area not sampled in FY23.

Legend

-  Monitoring Well
- 04J849** Monitoring Well ID
- 13/1.55** Trichloroethene/1,1,1-Trichloroethane Concentration ($\mu\text{g/L}$)
- 0.705** 1,4-Dioxane Concentration ($\mu\text{g/L}$)
- 10.3** Health Risk Index
-  Extraction Well
-  Private Well
-  Cross-Section Line
-  Site Boundary
-  2023 1,4 Dioxane Concentration Contour ($\mu\text{g/L}$)
-  2023 1,4 Dioxane Concentration Inferred Contour ($\mu\text{g/L}$)
-  Health Risk Index = 1

2023 Trichloroethene Concentrations ($\mu\text{g/L}$)

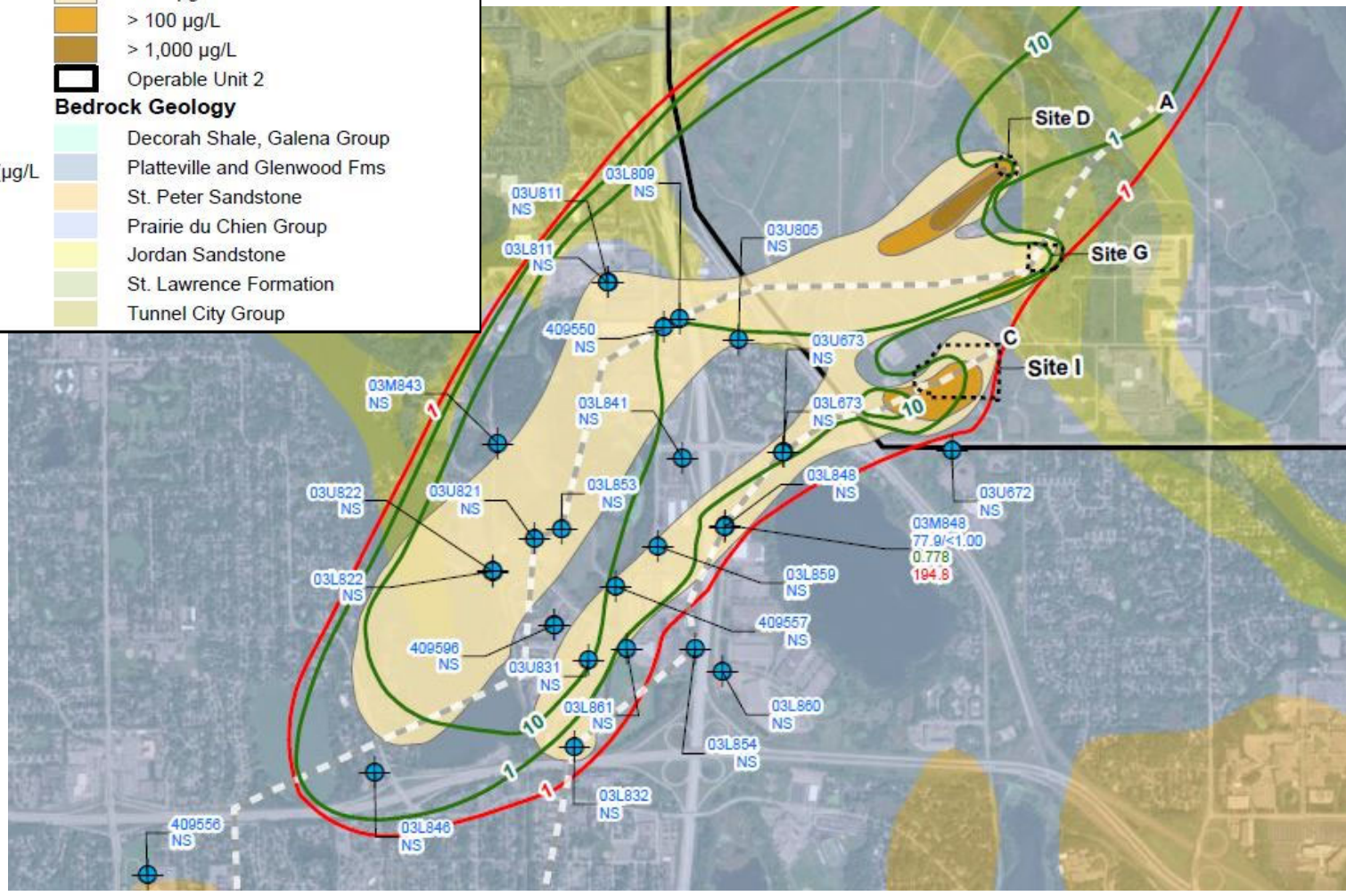
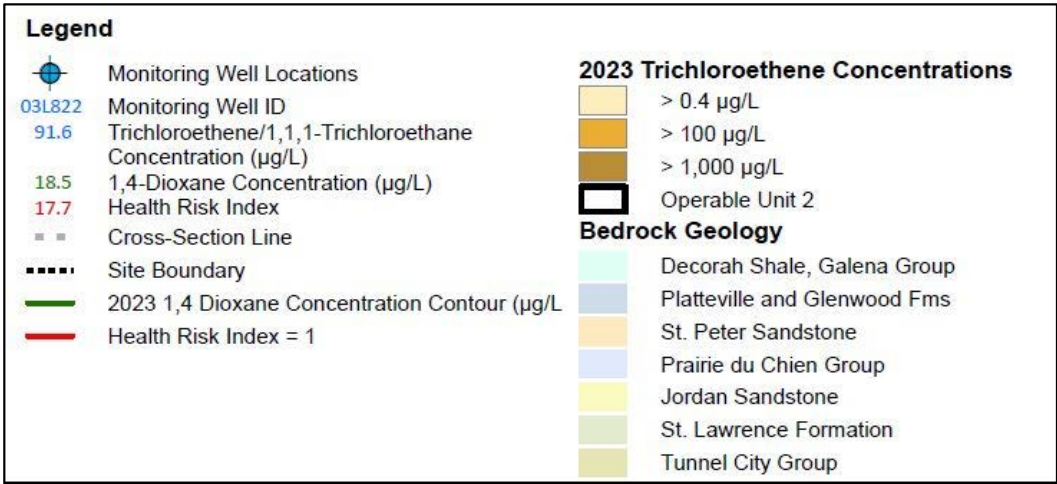
-  $> 0.4 \mu\text{g/L}$
-  $> 100 \mu\text{g/L}$
-  Operable Unit 2

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



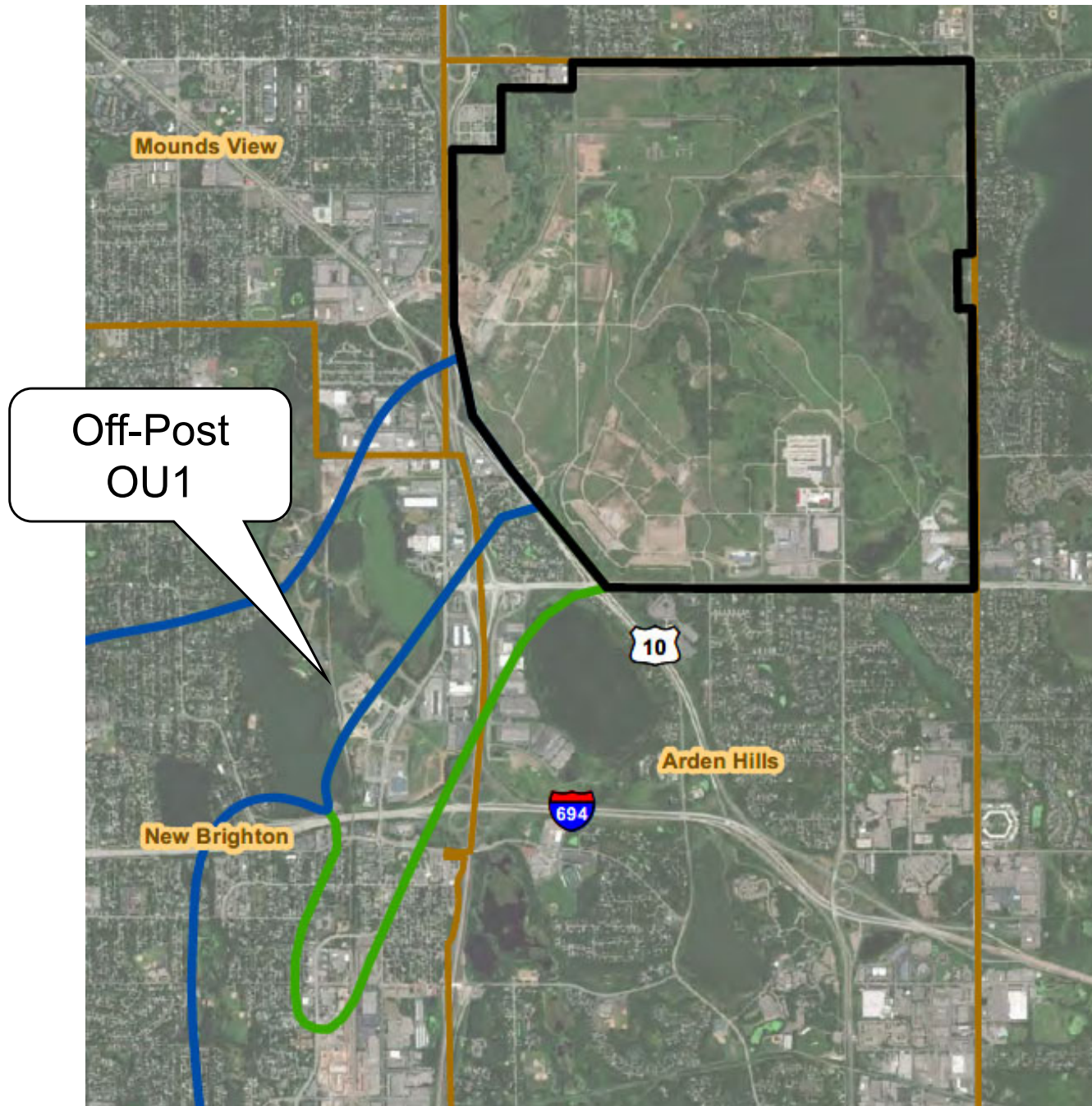
FY 2023 – OU2 Unconsolidated Sediments Plume Map







- Plume remains relatively stable compared to FY22 results.
- Higher concentration area (>1,000ug/L) consistent with FY22 results.



Twin Cities Army Ammunition Plant Cleanup



LEGEND:

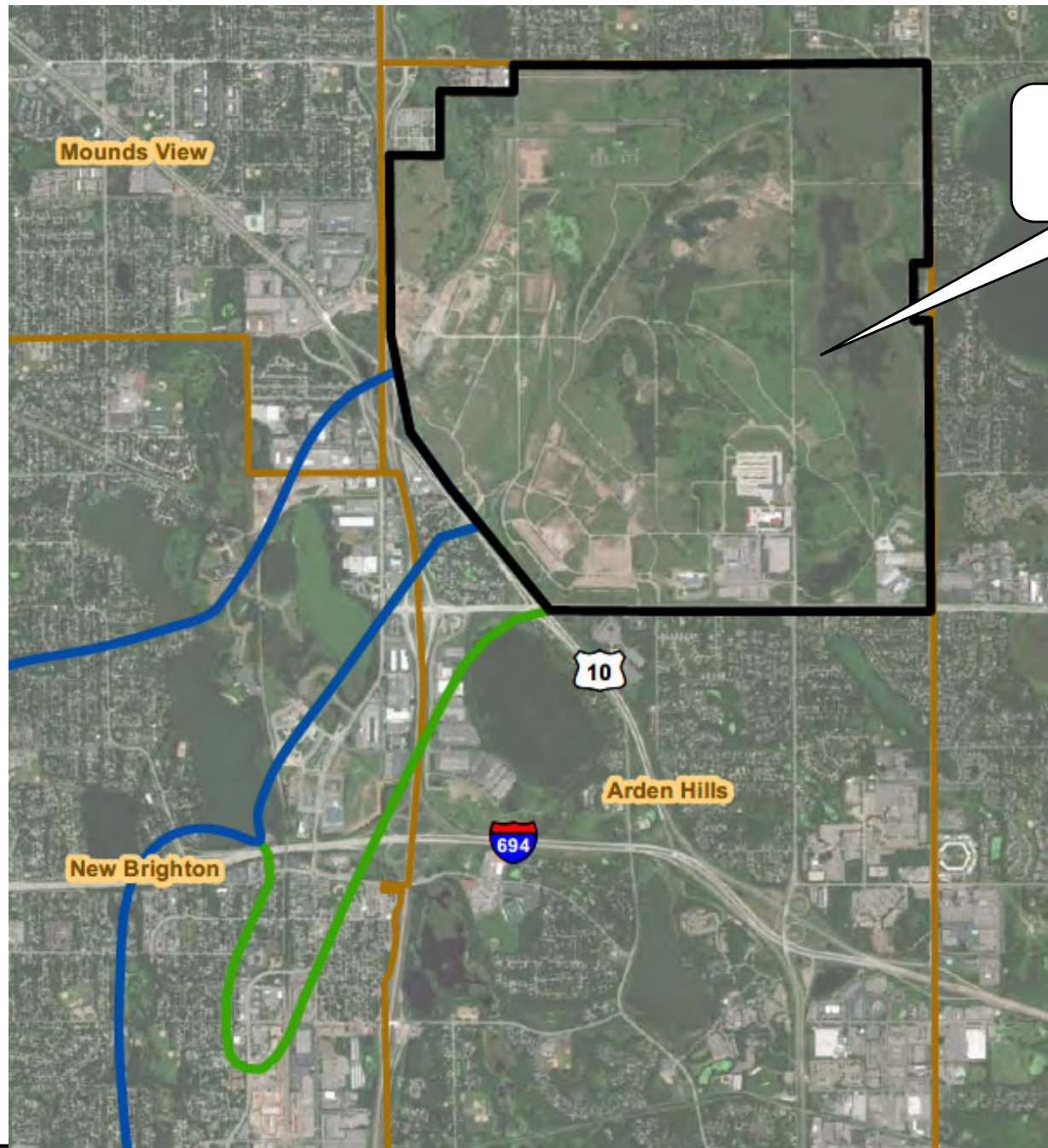
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-  Operable Unit 3 (South Plume)
-  Municipal Boundaries



- 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.







Twin Cities Army Ammunition Plant Cleanup

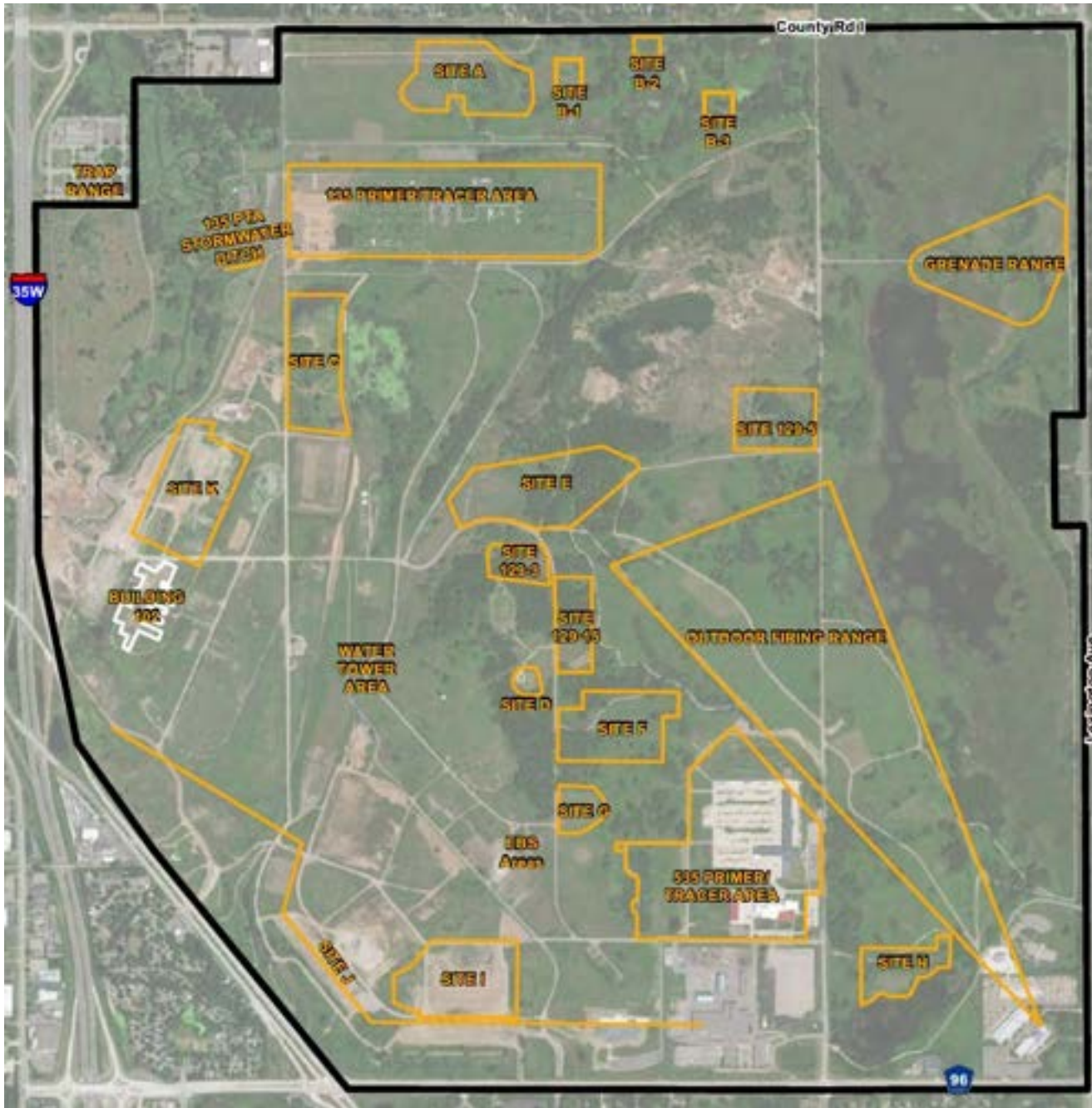


On-Post
OU2

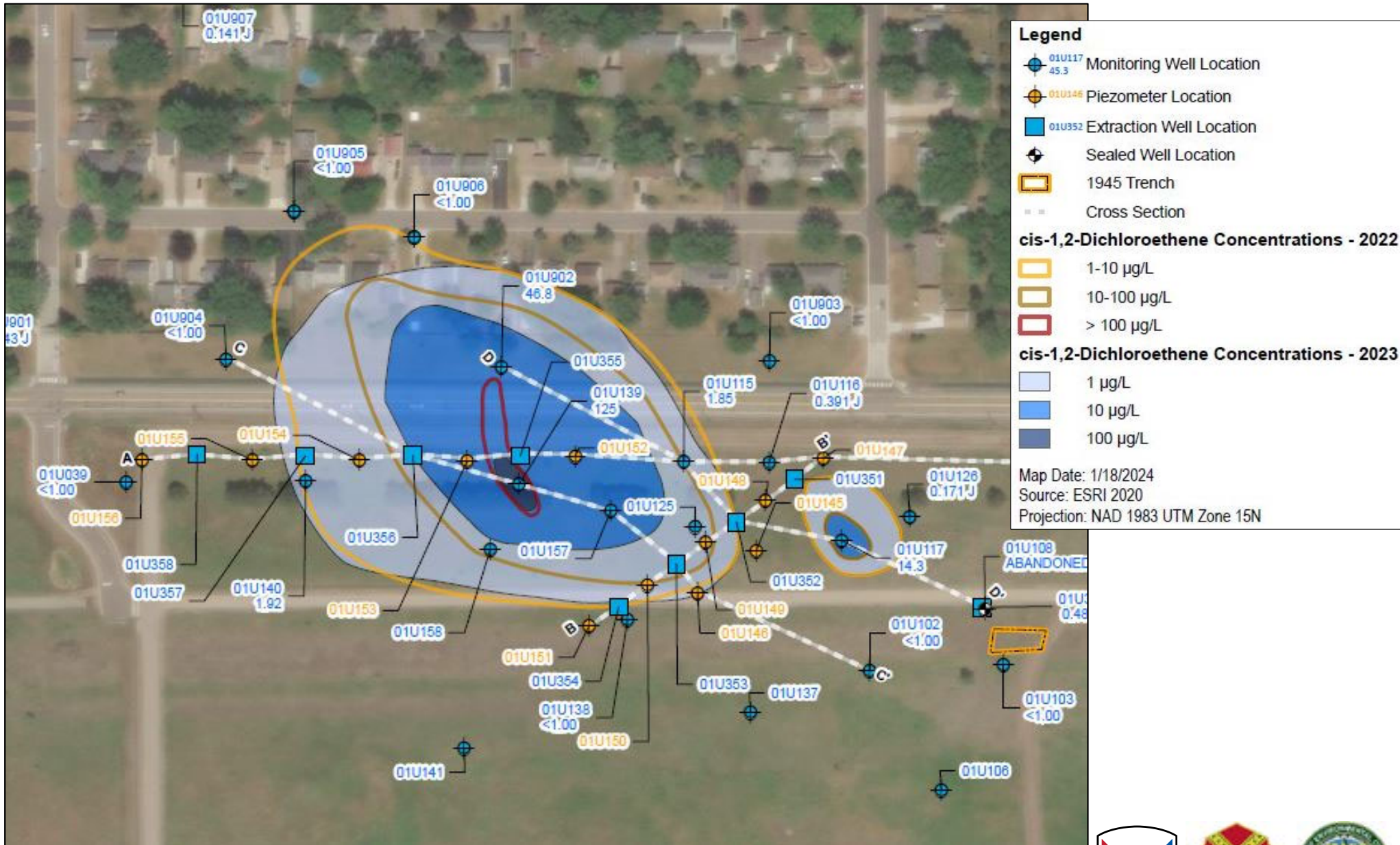
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OU2 – Site A Monitored Natural Attenuation



OU2 – Site A Monitored Natural Attenuation

- Main plume (FY 2023) relatively stable compared to FY 2022 – higher concentration area ($> 100 \mu\text{g/L}$) continues decreasing.
- Concentrations within the heart of the smaller plume have decreased from FY 2022.

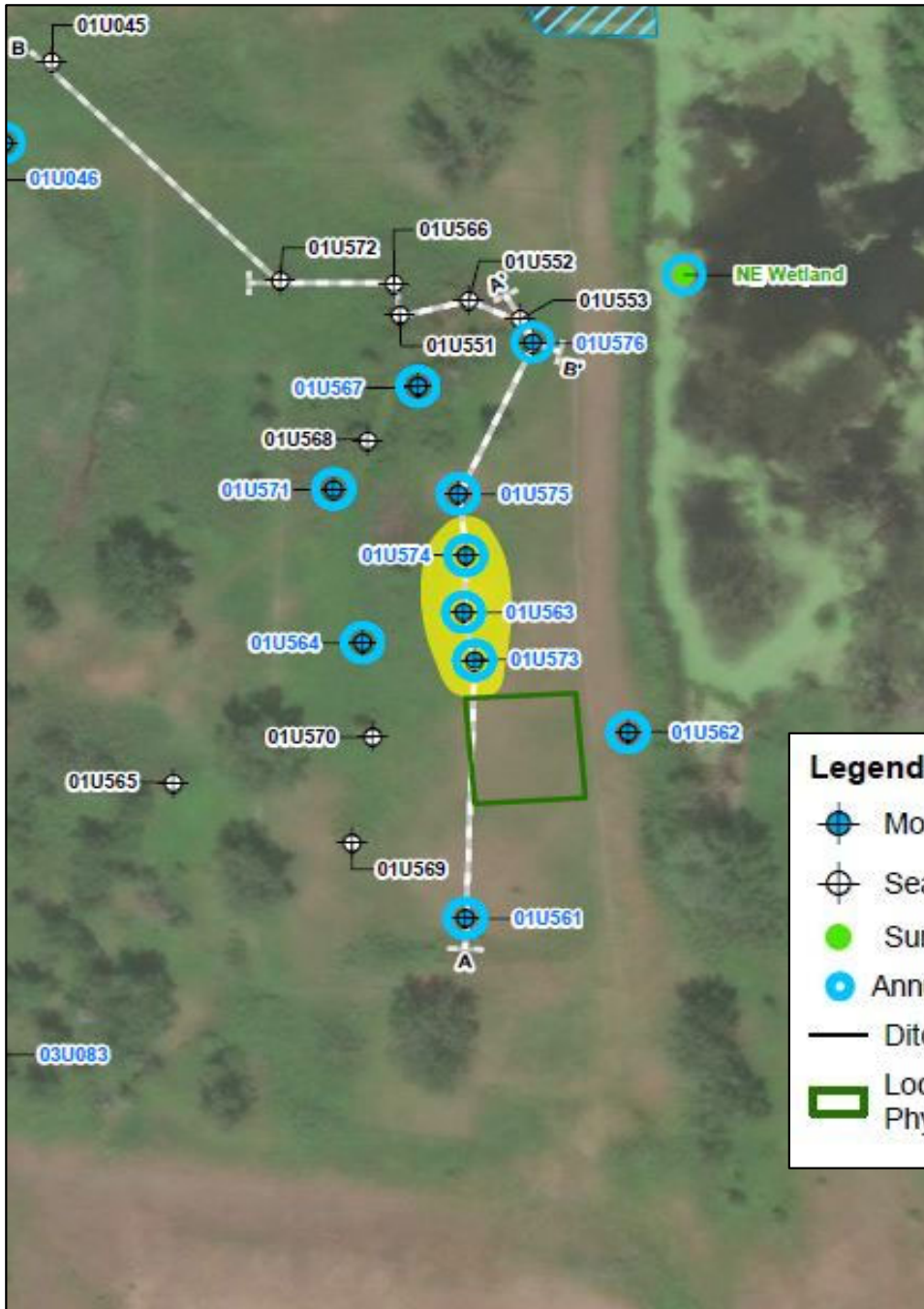


OU2 – Site C Monitored Natural Attenuation










- Three locations exceed cleanup level compared to one location in FY 2022.
- Plume rebounded compared to FY 2022; however, new exceedances are localized.
- Continue monitored natural attenuation.



OU2 – Site C Monitored Natural Attenuation



Legend

 Monitoring Well Location	 Approximate Boundary of Wetland Constructed in 2007
 Sealed Well Location	 Cross Section
 Surface Water Sampling Locations	 15 µg/L Lead Contour (2023)
 Annual Monitoring Locations	
 Ditch	
 Location of Plot for Phytoremediation Demonstration	

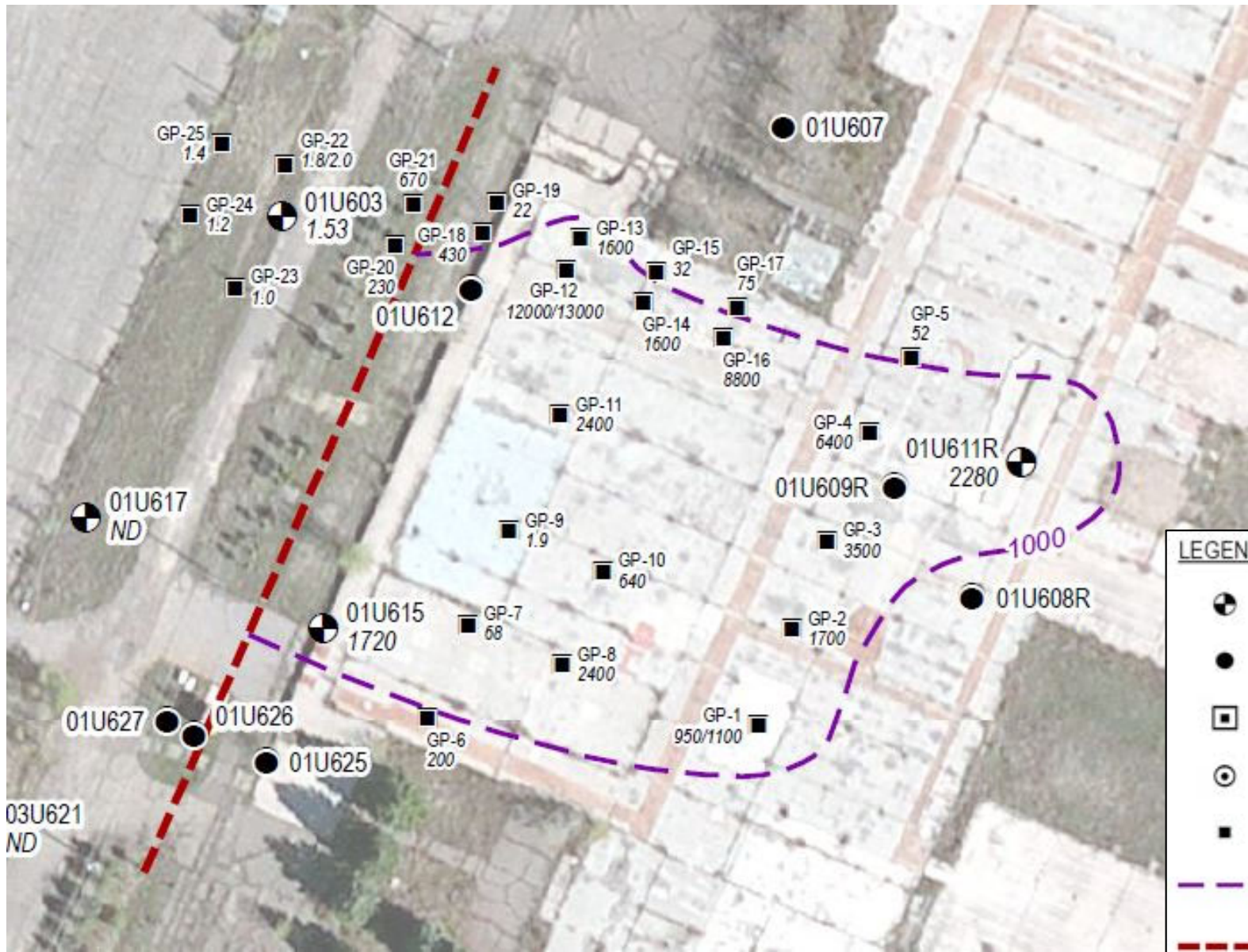


OU2 – Site K Pump and Treat








- Plume relatively stable compared to FY 2022.
- Groundwater collection system continues to provide containment of the horizontal and vertical extent of the trichloroethene (TCE) plume.
- Continue pump and treat operations.



OU2 – Site K Pump and Treat



LEGEND

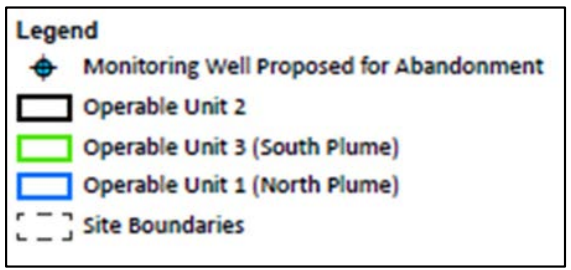
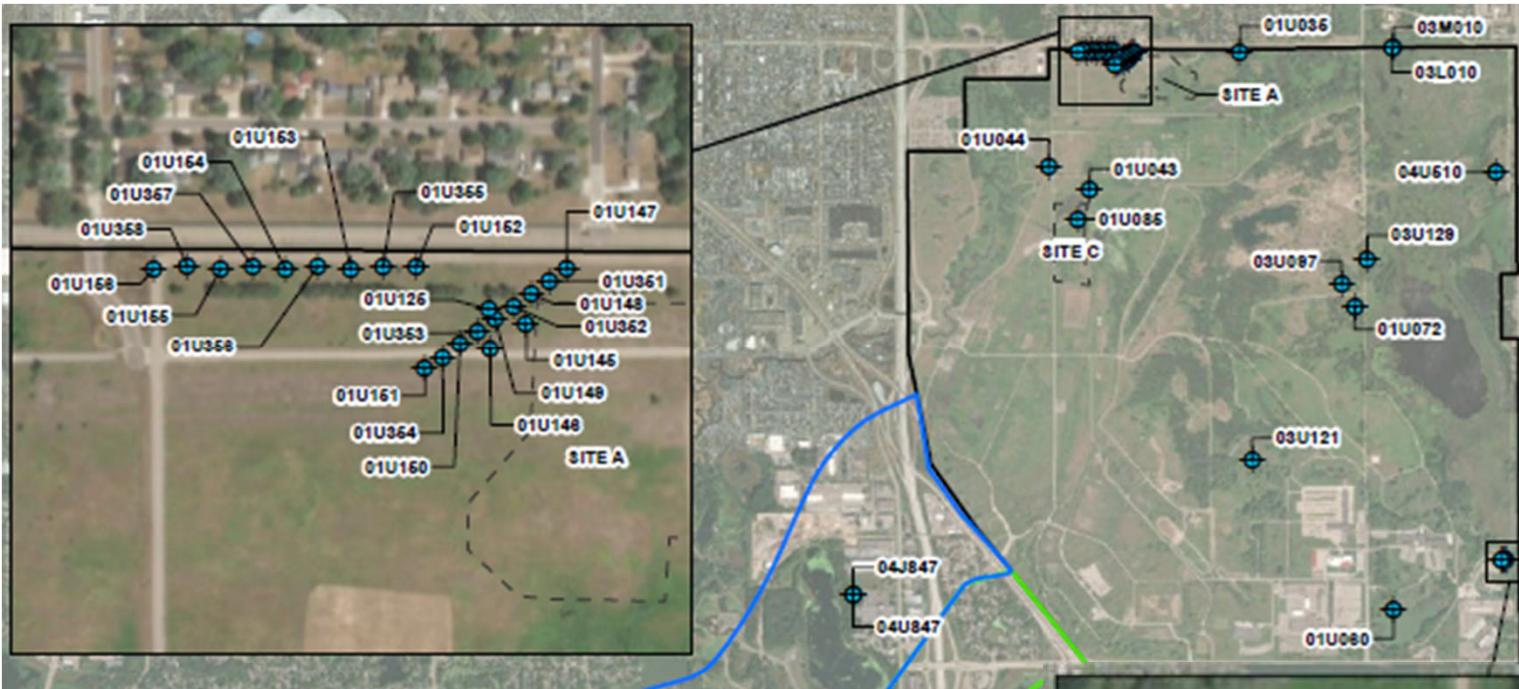
-  ANNUAL UNIT 1 WATER QUALITY MONITORING WELL LOCATION
-  ANNUAL UNIT 1 WATER LEVEL MONITORING WELL LOCATION
-  UNIT 3 SENTINEL WELL LOCATION
-  BUILDING 102 MONITORING WELL (SAMPLED IN AUGUST 2023)
-  GEOPROBE BORING LOCATION FROM 2014 INVESTIGATION
-  1000 µg/L TCE PLUME LIMIT (ESTIMATED BASED ON 2014 DATA)
-  SITE K COLLECTION TRENCH LOCATION



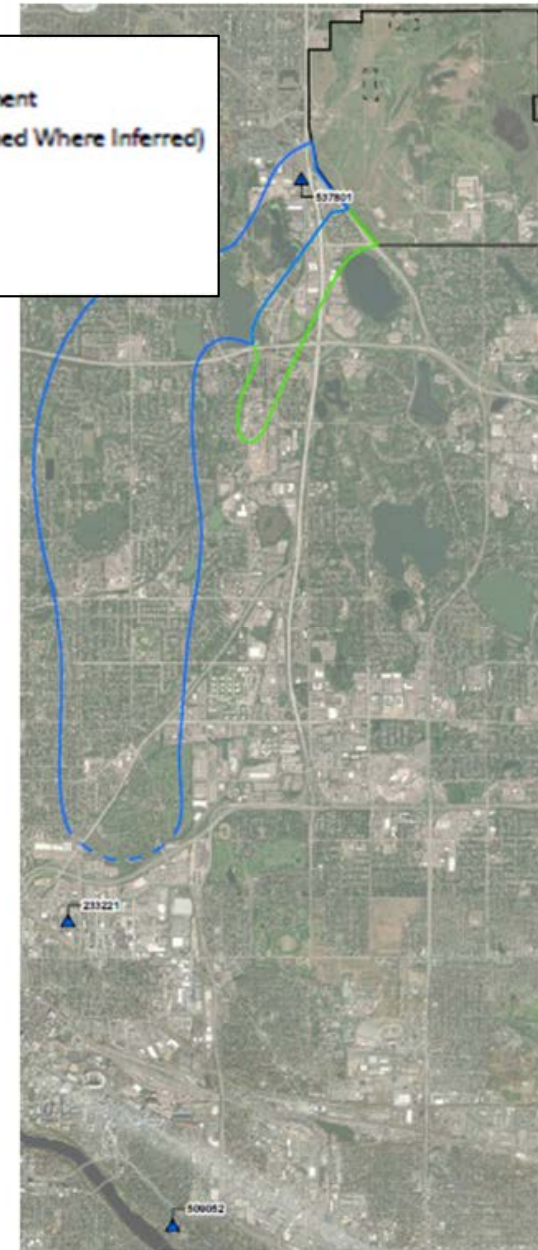
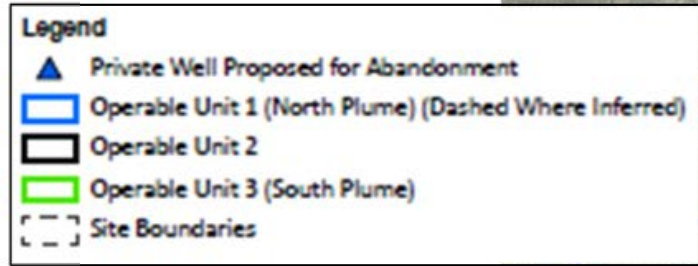
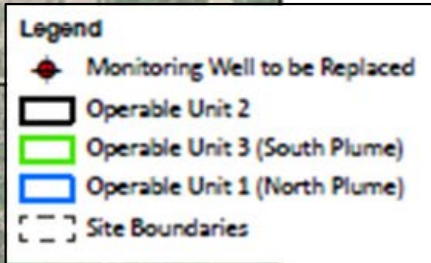
- Abandonment of three industrial wells in OU1 and 42 monitoring wells in OU2.
- Reinstallation of four monitoring wells in OU1 and one monitoring well in OU2.
- Monitoring well reinstallation in OU1 pending successful right-of-entry negotiations.
- All activities planned for FY 2024.



OU1/OU2 Well Abandonment and Reinstallation







OU1/OU2 Well Abandonment and Reinstallation



Twin Cities Army Ammunition Plant Cleanup



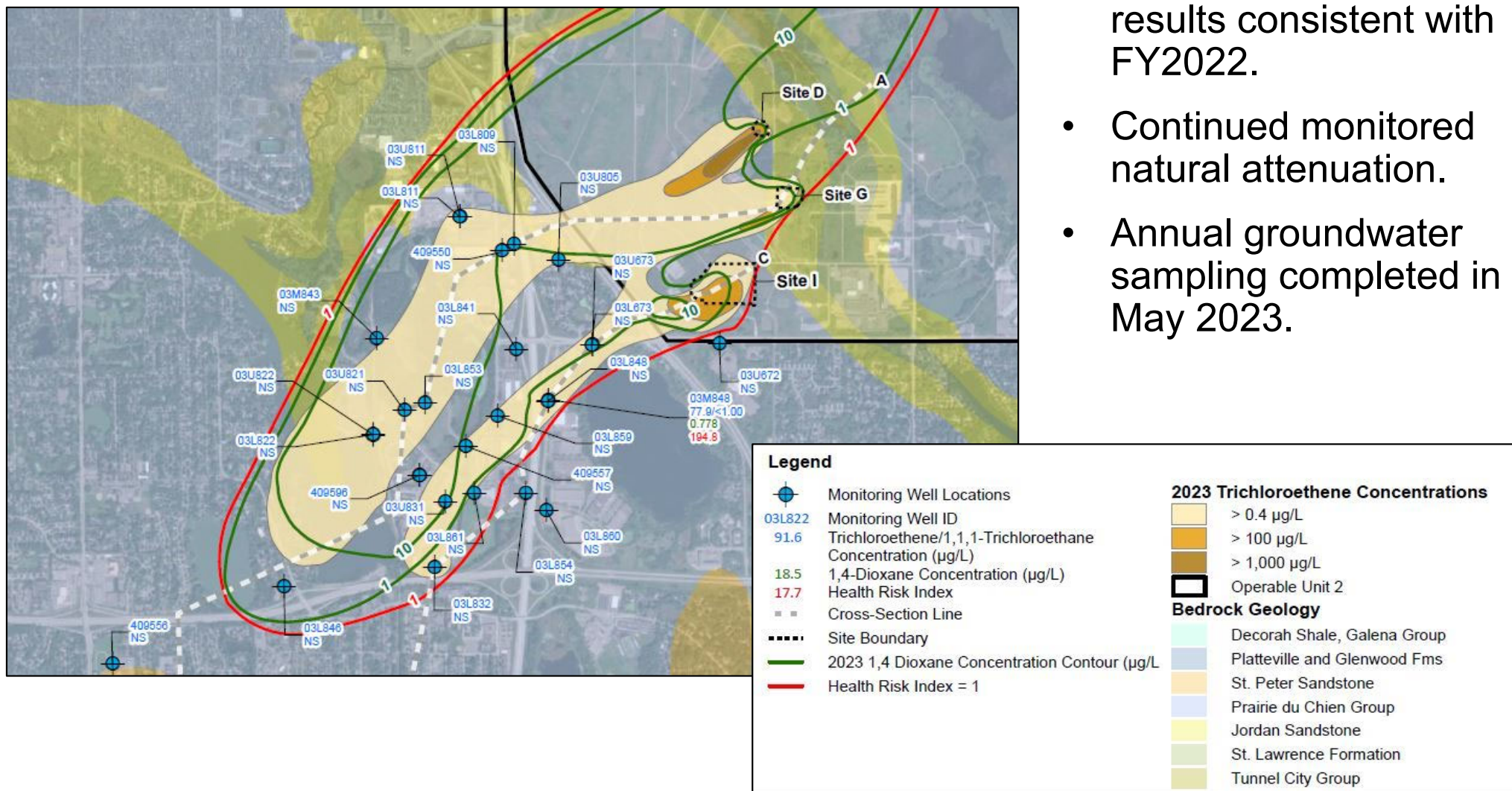
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-  Municipal Boundaries

Off-Post
OU3



- OU3 plume remains relatively stable – results consistent with FY2022.
- Continued monitored natural attenuation.
- Annual groundwater sampling completed in May 2023.



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

















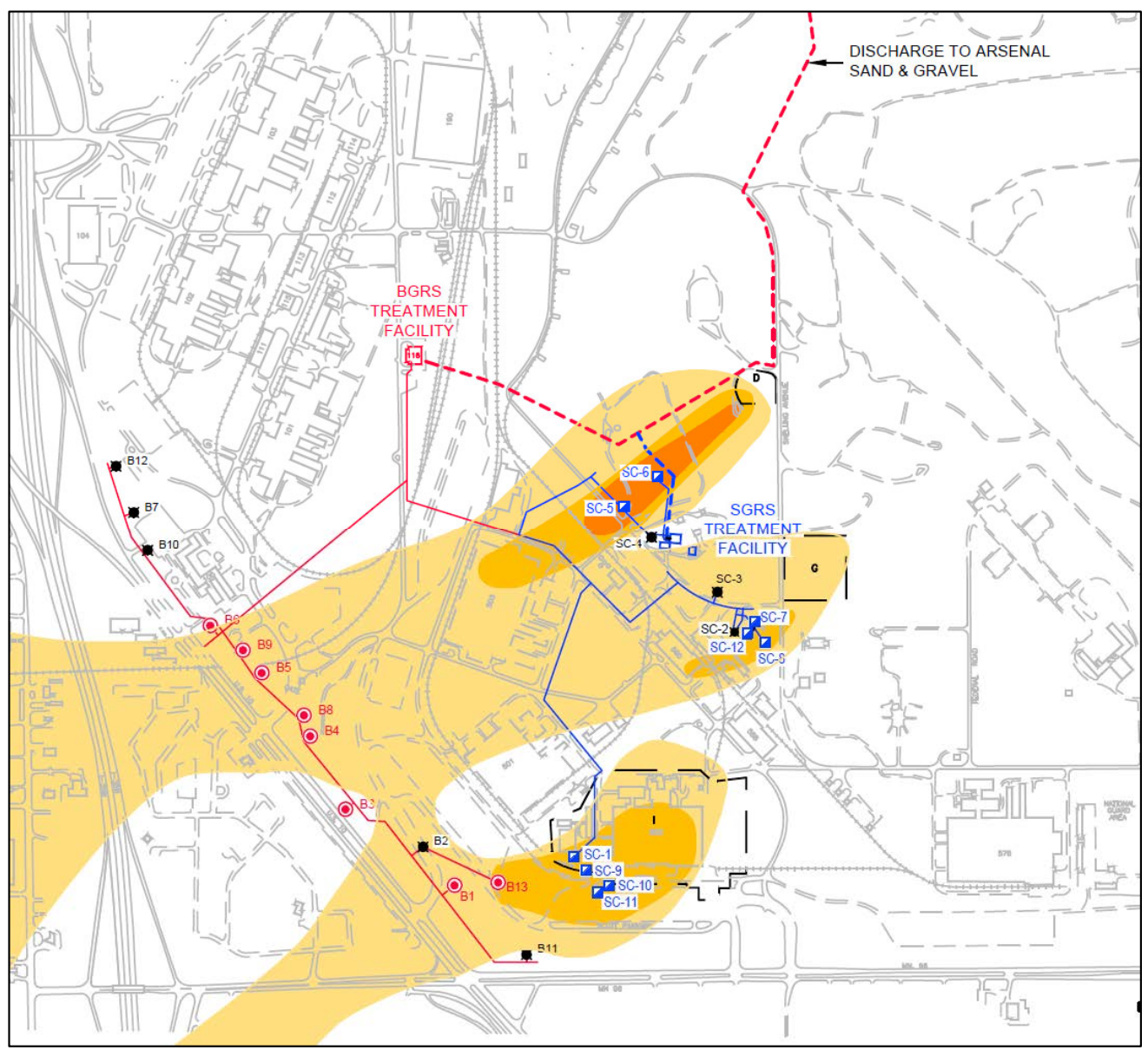
OU2 Optimization – TGRS Layout – TCE

Boundary Groundwater Recovery System (BGRS)

Source Area Groundwater Recovery System (SGRS)

BGRS + SGRS = TGRS

- LEGEND**
-  PRIMARY ROAD
 -  SECONDARY ROAD
 -  RAILROAD
 -  DRAINAGE
 -  BUILDING
 -  BUILDING REMOVED
 -  SOURCE AREA
 -  TREATMENT FACILITY DISCHARGE LINE
 -  ACTIVE BGRS EXTRACTION WELL LOCATION
 -  INACTIVE EXTRACTION WELL LOCATION
 -  ACTIVE SGRS EXTRACTION WELL LOCATION
 -  TCE PLUME 5-100 ug/L
 -  TCE PLUME 100-1000 ug/L
 -  TCE PLUME 1000+ ug/L

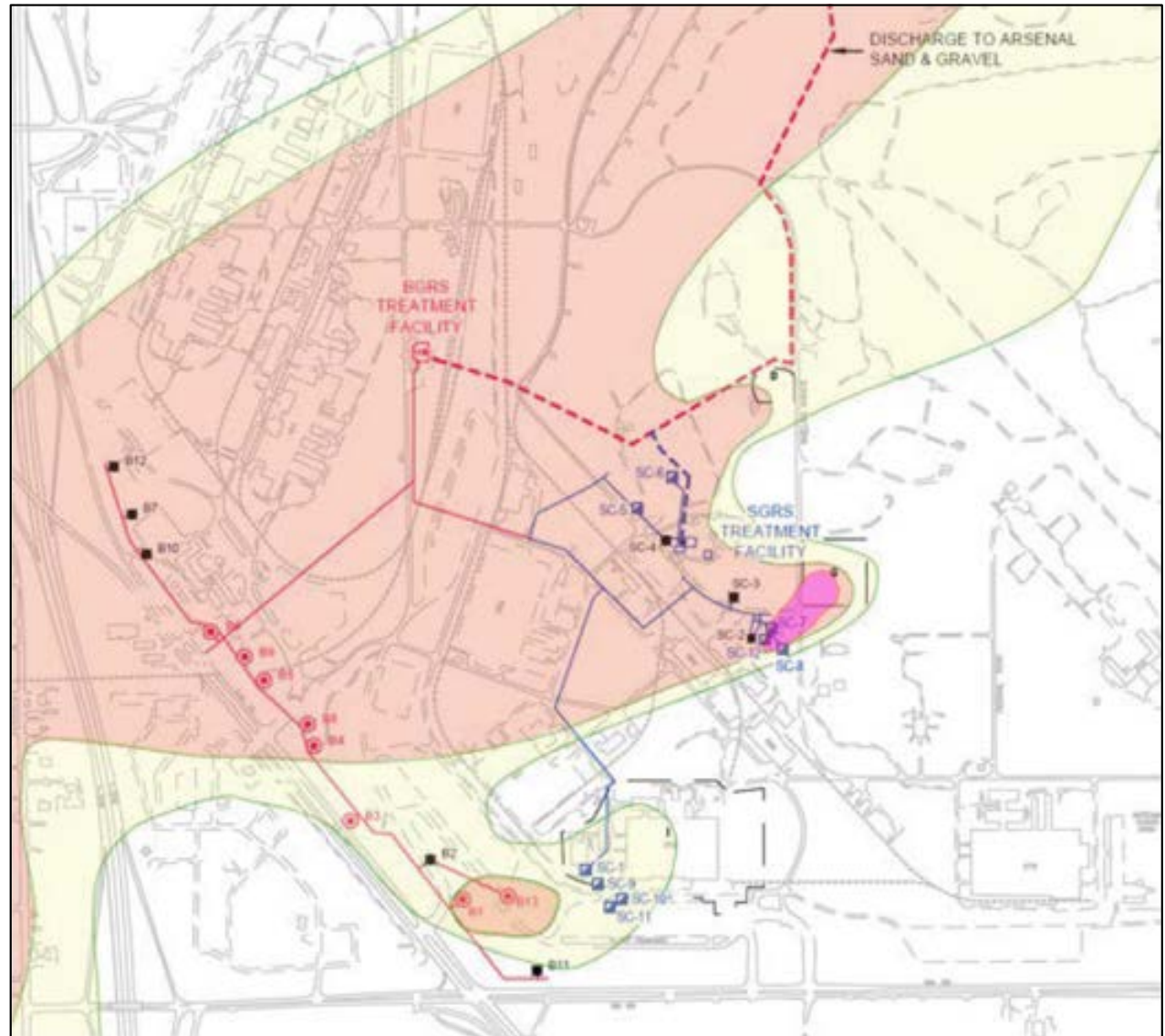


Boundary Groundwater Recovery System (BGRS)

Source Area Groundwater Recovery System (SGRS)

BGRS + SGRS = TGRS

- LEGEND**
- PRIMARY ROAD
 - SECONDARY ROAD
 - RAILROAD
 - DRAINAGE
 - BUILDING
 - BUILDING REMOVED
 - SOURCE AREA
 - TREATMENT FACILITY DISCHARGE LINE
 - ACTIVE BGRS EXTRACTION WELL LOCATION
 - INACTIVE EXTRACTION WELL LOCATION
 - ACTIVE SGRS EXTRACTION WELL LOCATION



- System is operating and meeting all discharge criteria (1,4-Dioxane, TCE, 1,1,1-TCA, bromate) from monthly sampling since February 2023.
- SGRS Discharge Criteria:
 - 1,4-Dioxane: 1.0 $\mu\text{g/L}$
 - TCE: 5 $\mu\text{g/L}$
 - 1,1,1-TCA: 200 $\mu\text{g/L}$
 - Bromate: 10 $\mu\text{g/L}$



Advanced Oxidation (AO) Reactor



System Operation

- Full treatment to criteria of 1,4-dioxane and TCE in advanced oxidation (AO) reactor; air stripper only needed for chlorinated alkanes
- 400 to 430 gpm water flow under steady state conditions
- Treated effluent discharged to sand and gravel pit with BGRS effluent



Sampling

- Discharge Criteria: Discharged water from both Building 116 (BGRS) and SGRS are sampled monthly and analyzed in accordance with the ROD to ensure discharge standards are met.

		9/7/2023	9/7/2023	10/9/2023	10/9/2023	11/20/2023	11/20/2023	12/12/2023	12/12/2023	1/17/2024	1/17/2024
	Discharge Limit	SGRSE	SGRSE	SGRSE	SGRSE	SGRSE	SGRSE	SGRSE	SGRSE	SGRSE	SGRSE
TCE	5	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19
TCA	200	19.7	21.5	0.161	<0.149	0.19	<0.149	<0.149	<0.149	0.178 J	0.174 J
14D	1	0.155	0.133	0.187 B	0.464 B	< 0.0447	< 0.0447	< 0.0447	< 0.0447	<0.227 B J	< 0.0919 BJ
Bromate (Pace)	10	3.5J	3.6J	2.7J	2.5J	1.6J		1.1U	1.1U		
		BGRSE	BGRSE	BGRSE	BGRSE	BGRSE	BGRSE	BGRSE	BGRSE	BGRSE	BGRSE
TCE	5	<0.19	<0.19	0.35 J		0.411 J	0.252 J	0.341 J	0.348 J	0.361 J	0.394 J

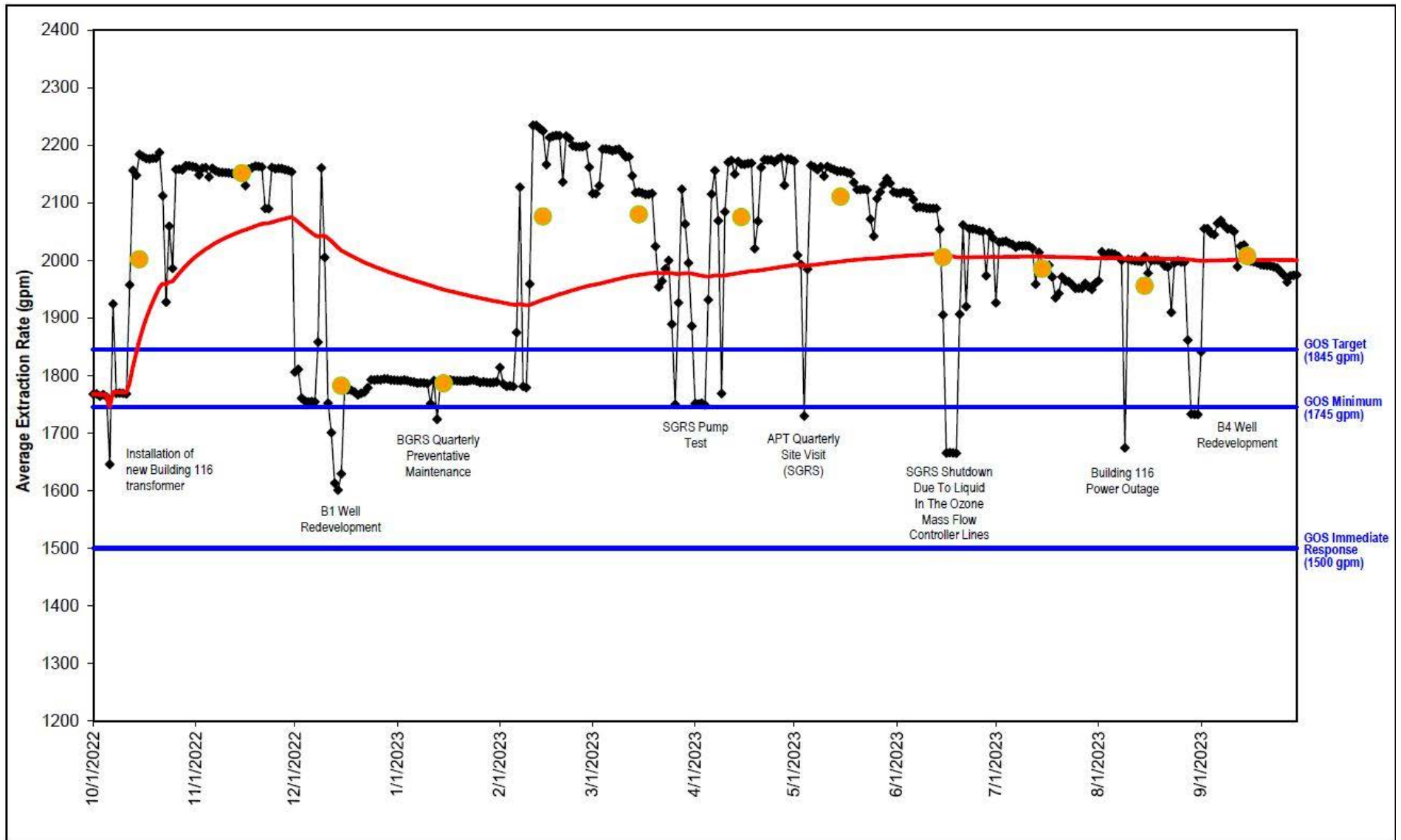
- Air sampling and modeling will be completed for Building 116 emissions once new TGRS operational flow rates are established after a hydraulic capture analysis of the SGRS.



- The Fiscal Year 2023 annual average extraction rate (BGRS + SGRS) was approximately 2,000 gal per minute (gpm), well above the Global Operating Strategy (GOS) Operational Minimum of 1,745 gpm.
- The 1,745 gpm is based on the 2001 TCE plume that has decreased in width by over 16% (according to FY 2022 sample results).
- 2,713 lbs. of VOCs and 61 lbs. of 1,4-dioxane removed in FY 2023. Similar VOC removal totals not achieved since FY 2004.
- The Source Area Hydraulic Evaluation Report and modified operating strategy for the TGRS is expected to be finalized during FY 2024.



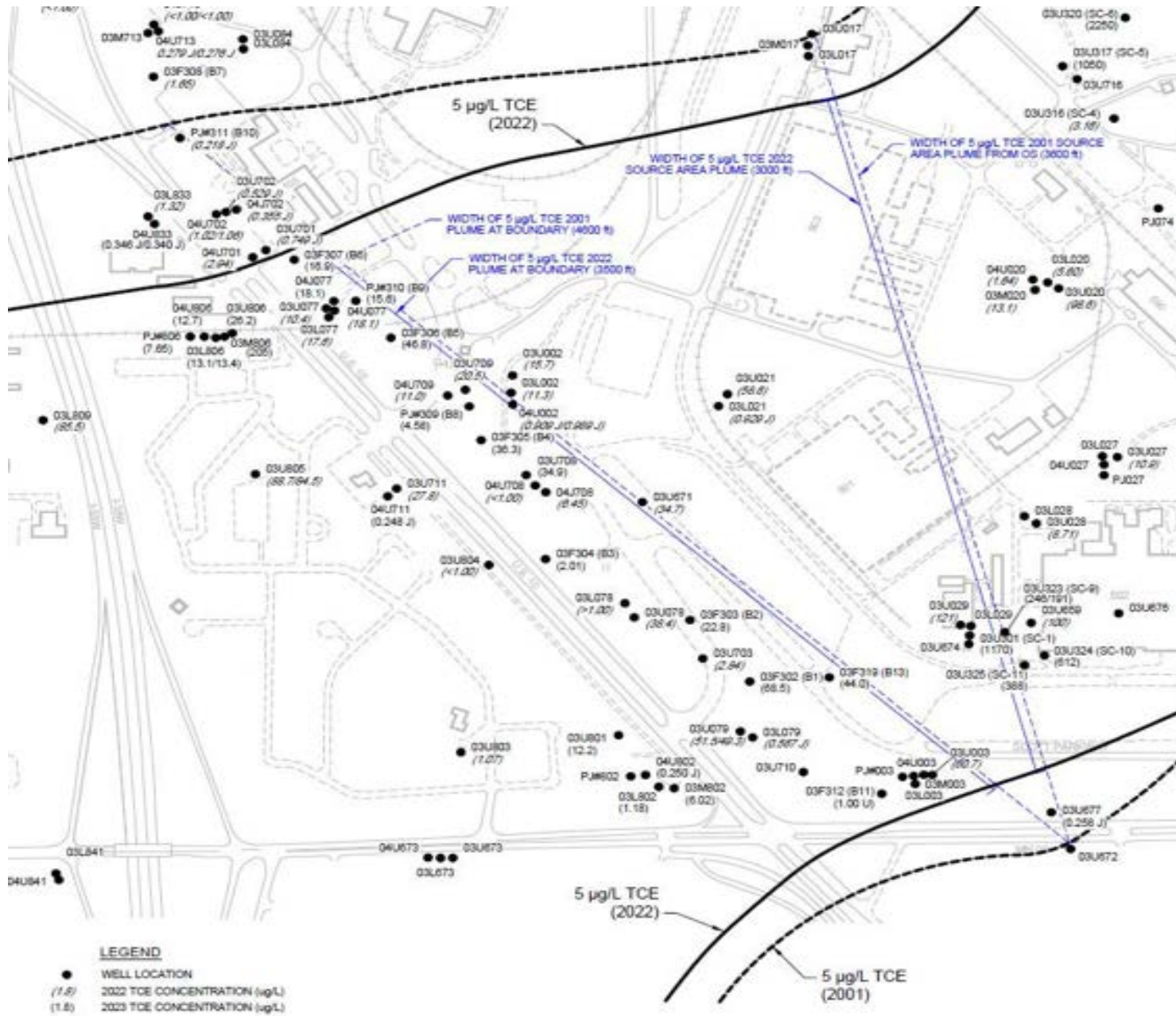
FY 2023 Daily Flow Rates

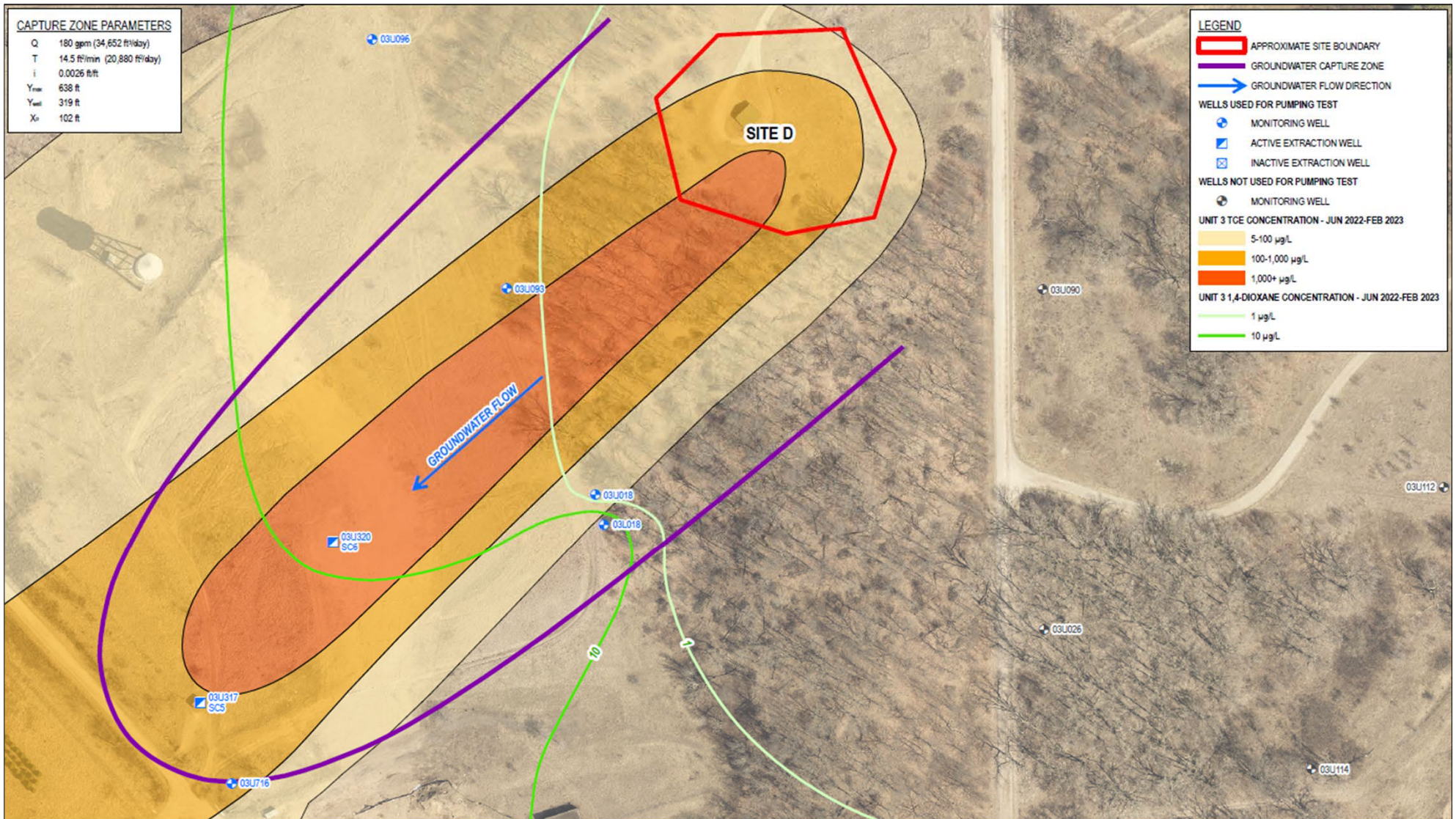


◆ Daily Total ● Monthly Average — Rolling Average

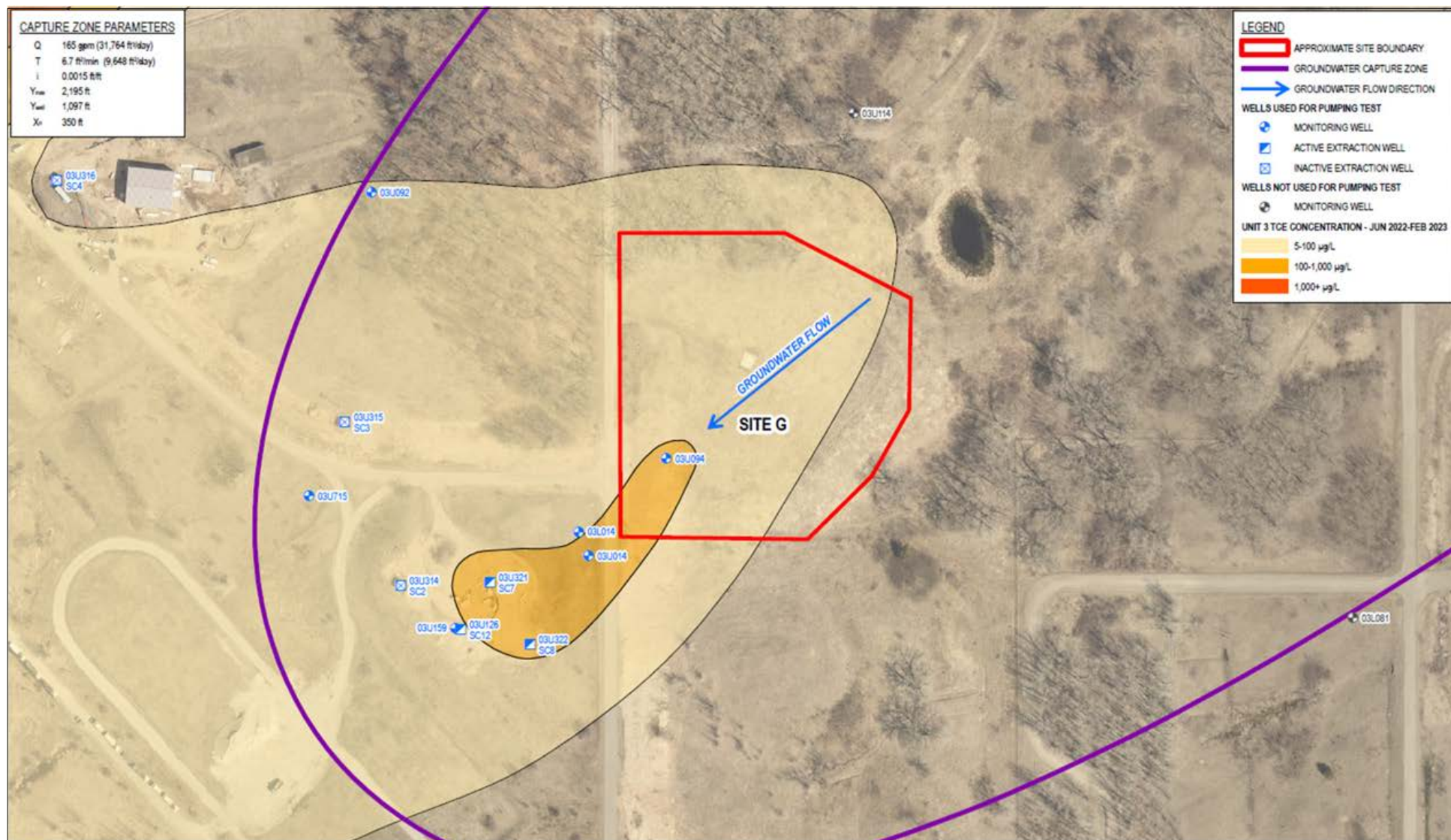


2023 TCE Plume (3,000 feet wide)

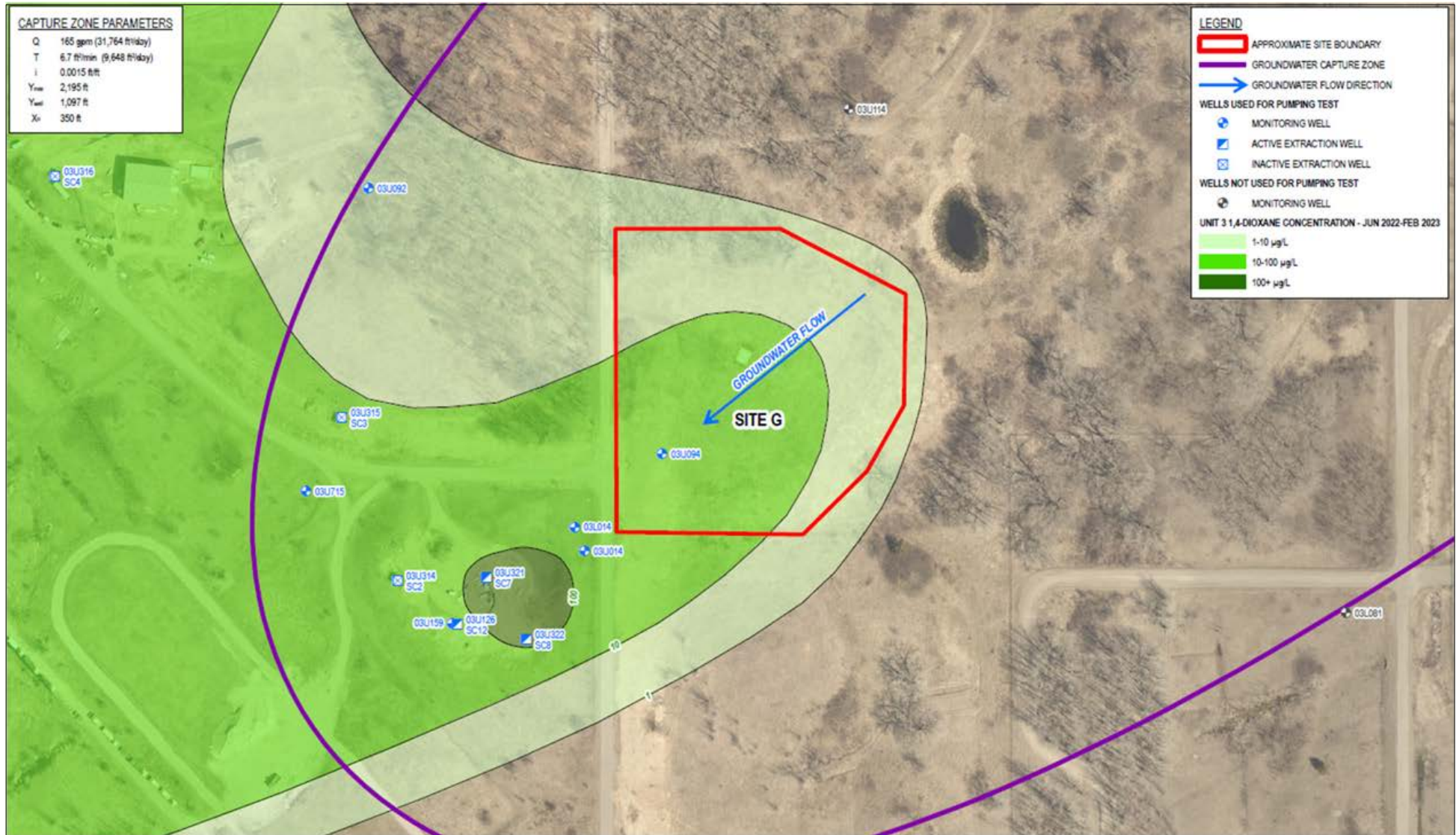




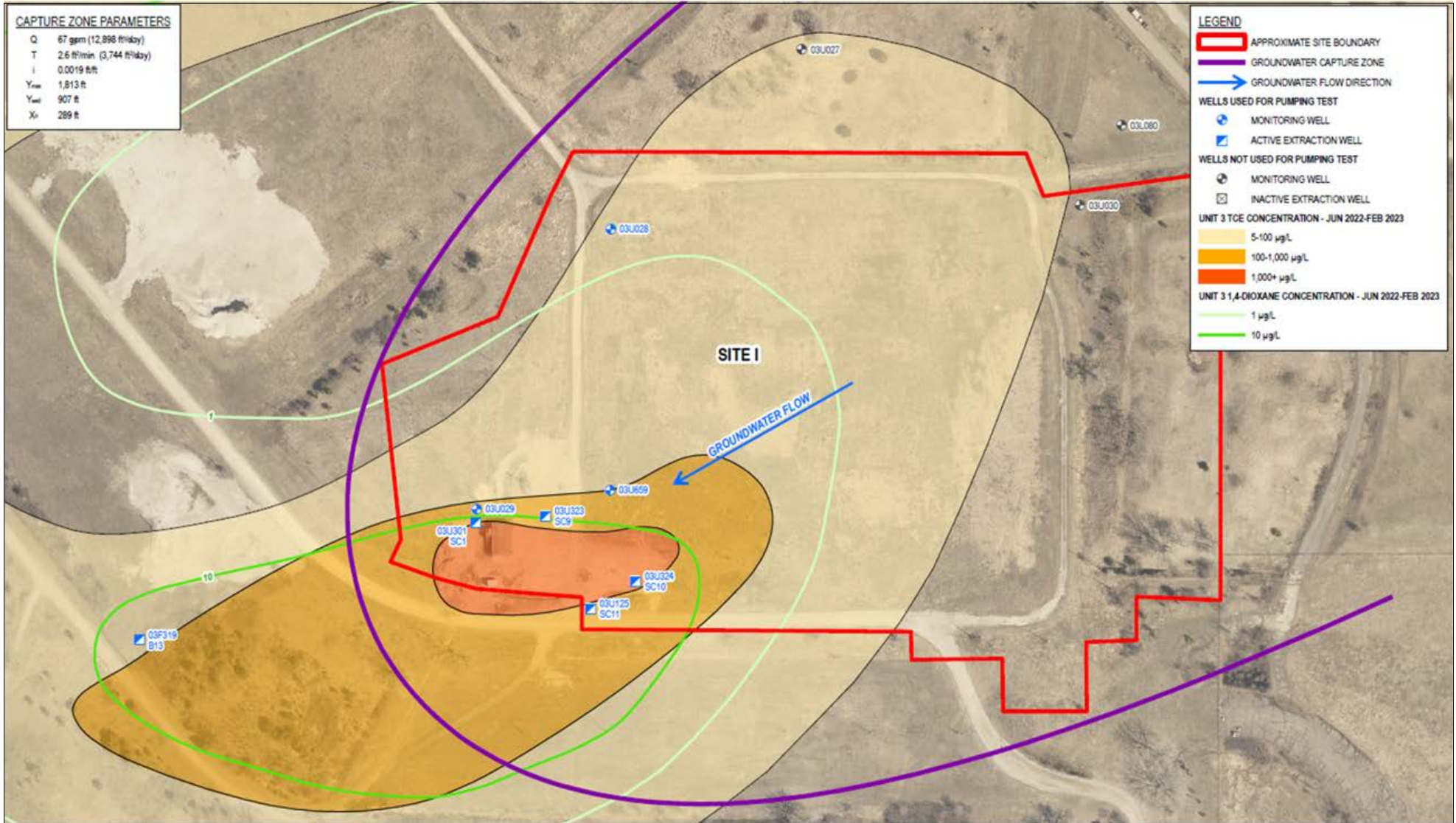
Site G Hydraulic Capture – TCE



Site G Hydraulic Capture – 1,4-Dioxane



Site I Hydraulic Capture – TCE and 1,4-Dioxane



BGRS (Building 116) Air Emissions

- Since SC-5 and SC-1 have been removed from BGRS influent and re-routed to SGRS influent, TCE concentrations have reduced from 201 $\mu\text{g}/\text{L}$ in 2020 (when modelled/sampled) to less than 40 $\mu\text{g}/\text{L}$ (80% reduction) while operating the full boundary well system (greater than 1,600 gpm).
- Once new operating strategy is approved (with likely lower BGRS flow and TCE emission rates), an air sampling work plan will be prepared and submitted for Regulator (EPA and MPCA) review.



- University of Iowa Site G Update
- Round Lake Design



- OU1
 - Optimization identified a need for a new well in New Brighton.
 - Begin industrial well abandonment (3 wells).
 - Begin installation of 4 monitoring wells.
- 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.
- Round Lake
 - Continue remedial design.
- Administrative Record/Information Repository
 - Army working with Arden Hills Army Training Site (AHATS) to enlarge space.



- Recommend next RAB meeting 17 September 2024.
- Topics for future RAB meetings?
- Additional administrative requirements for RAB?
- Suggestions for improvement of RAB?



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



- Does anyone have any comments, concerns or suggestions



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



