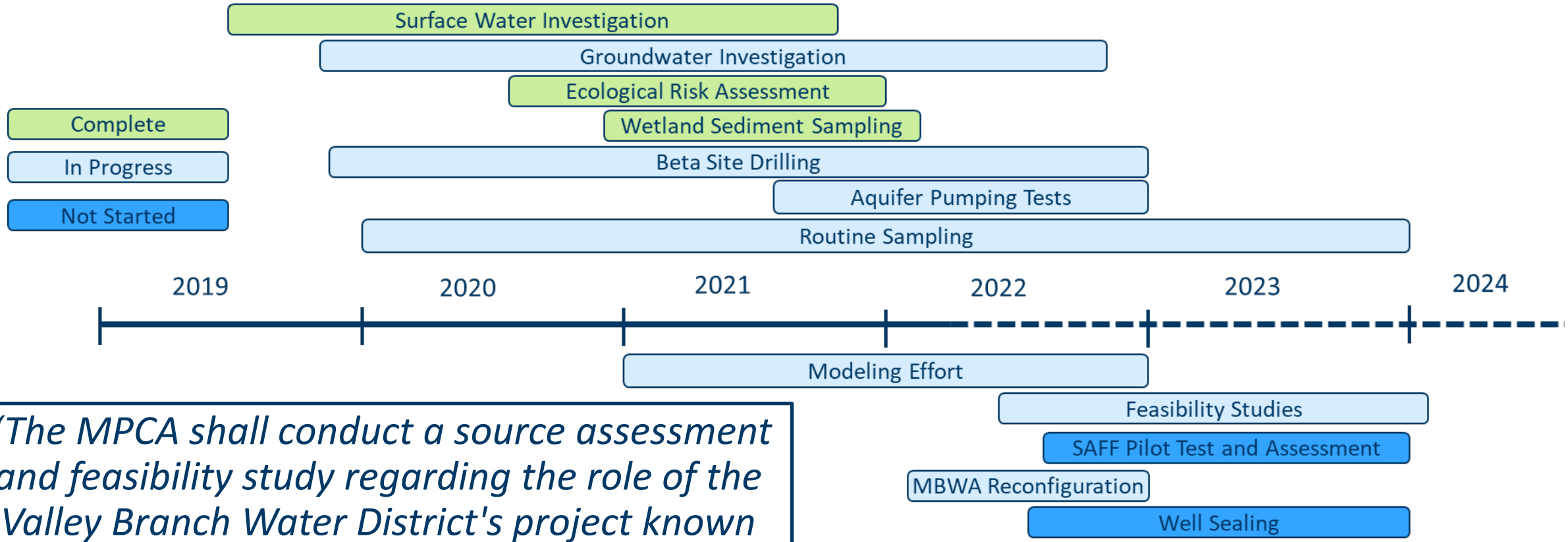
Project 1007 Update

AECOM | MPCA

June 15, 2022

Timeline

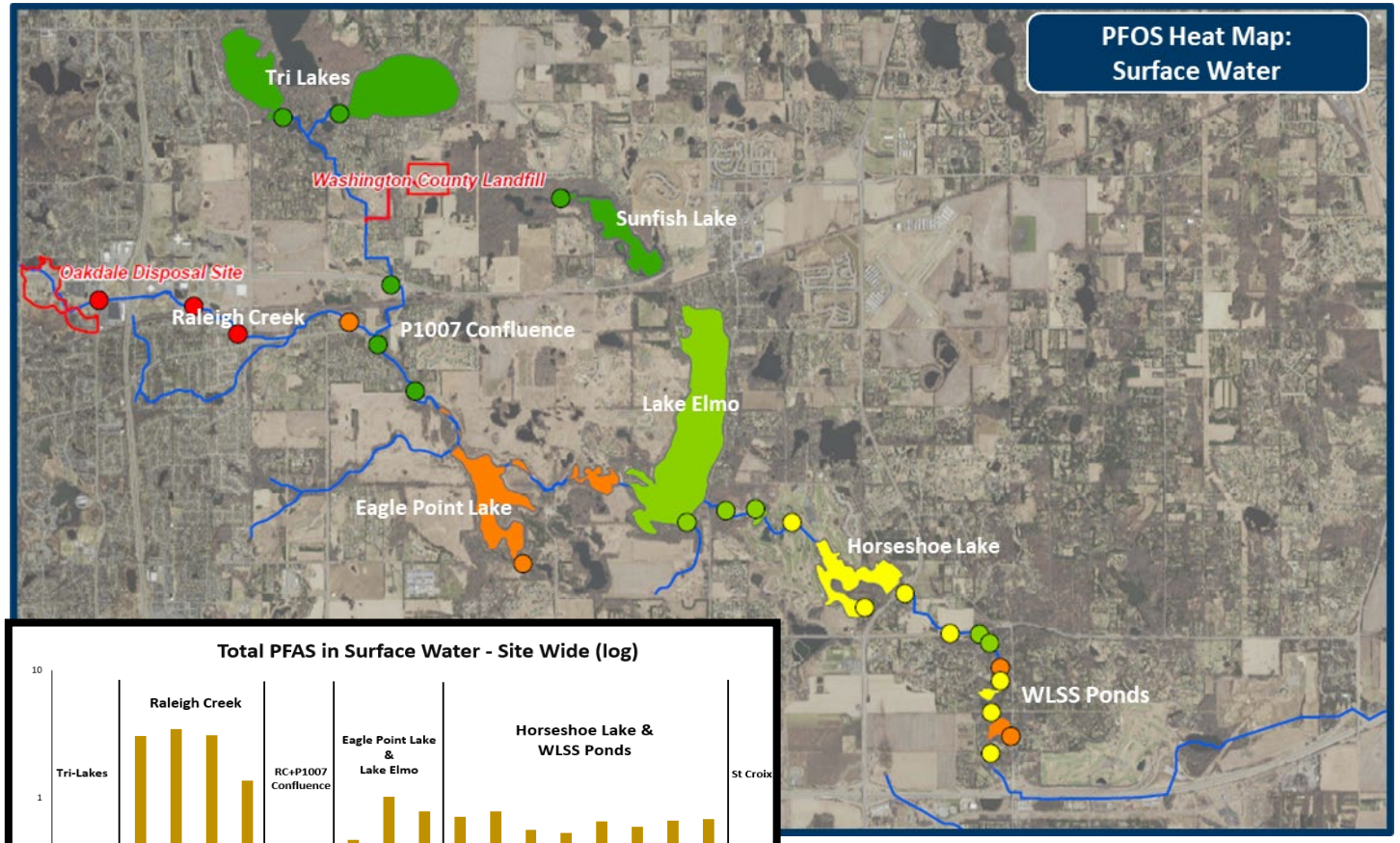


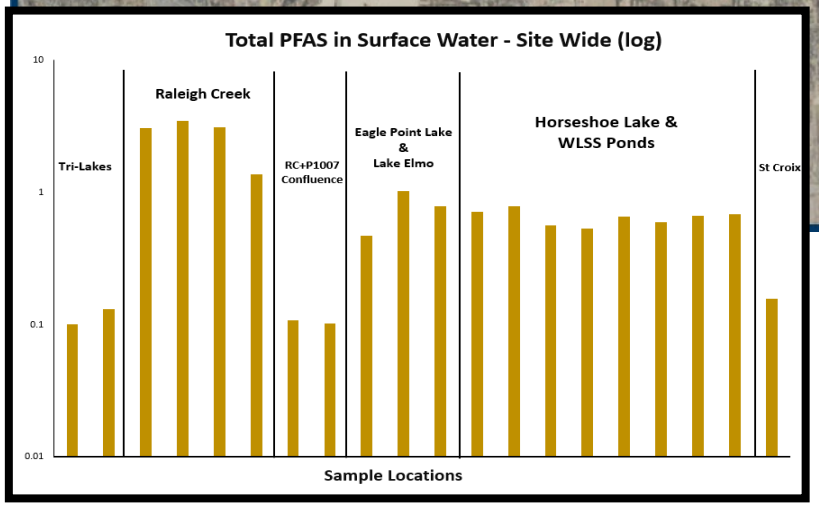
"The MPCA shall conduct a source assessment and feasibility study regarding the role of the Valley Branch Water District's project known as Project 1007 in the conveyance of PFCs in the environment." - 3M Settlement

End Goal:

Develop a feasibility study to address PFAS impacts in groundwater, surface water, and sediment.

PFAS in Surface Water: Results and Approach Going Forward





Progress To Date and Current Strategies

Source Area Investigation

Key Surface Water Pathways Sampled for Seasonal and Temporal Variability in Impacts

Hydrologic Assessment

High vs Low Flow Sampling + Gauging Events in Partner with Analytical Sampling

Fate and Transport: Targeted Sampling

Targeted Water Body and Wetland Sampling to Identify Secondary Source Areas

Remedial Approach: Targeted Sampling

Water Body Sampling for Evaluation of Remedial System Implementation

Timeline

Expected Completion of Routine and Targeted Sampling by End of CY 2023

PFOS in Surface Water (ppb)

- ≤ 0.018
- 0.0181 - 0.150
- 0.151 - 0.190
- 0.191 - 1.060
- 1.061 - 2.40

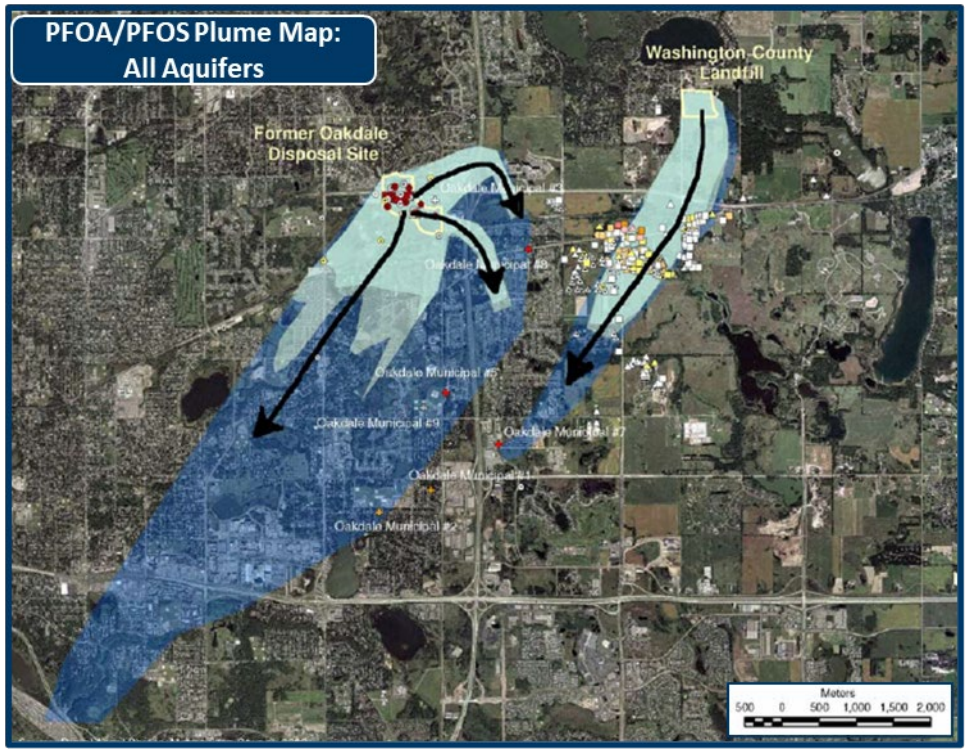
Notes

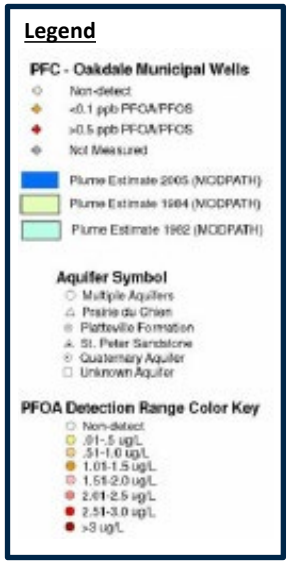
Heat map is comprised of 100+ surface water sample locations collected between 2019-2022.

PFOS Health Risk Limit (HRL) = 0.015 parts per billion (ppb)

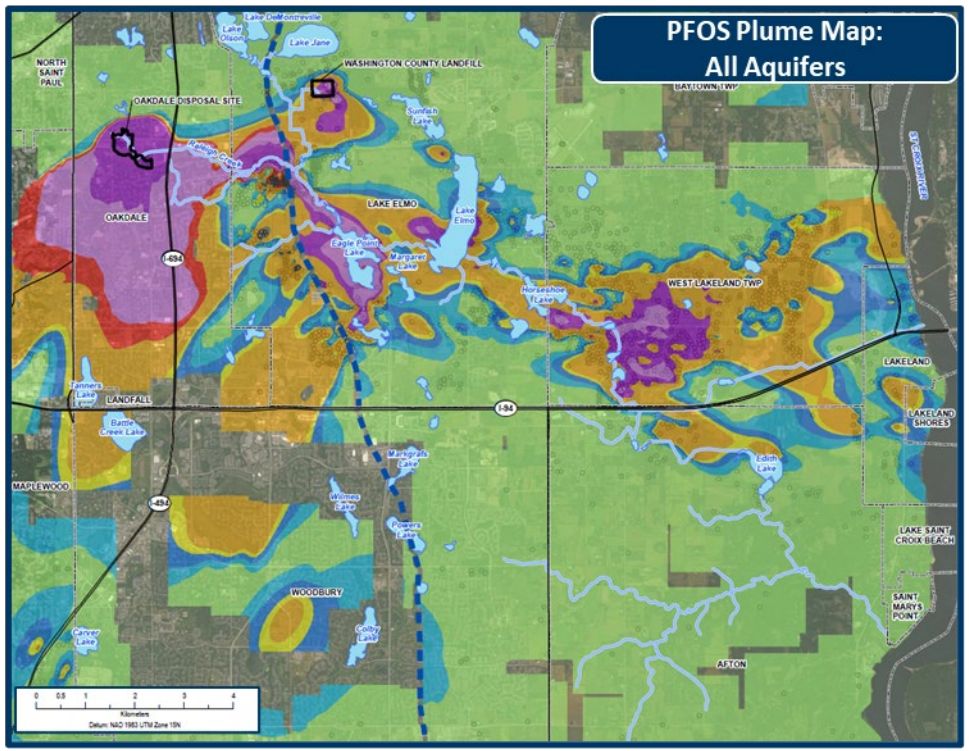
Evolving Conceptual Site Model and Next Steps

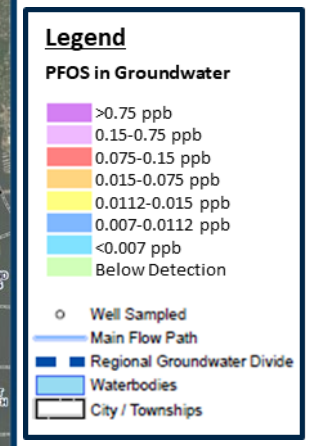
Initial Conceptual Site Model: 2005





Revised Conceptual Site Model: 2021





Next Steps

Continued Data Collection
- Routine and Targeted Sampling
- Additional Multi-Aquifer Well Nests

Refinement of Conceptual Site Model
- Integrated Surface Water and Groundwater Model
- 3D Modeling

Surface Water Treatment
- Feasibility Study
- Bench-Scale and Pilot Testing
- Implementation in Multiple Locations

Long-Term Drinking Water Protection
- Aquifer Tests
- Multi-Benefit Well Array Reconfiguration
- Feasibility Study

Updated Aquifer-Specific PFAS Plume Map: Key Drinking Water Aquifer

Plume Assessment in Key Drinking Water Aquifers

Aquifer-specific plume maps developed based on investigation work and comprehensive reassessment of available historic analytical and hydrogeologic data.

Key Improvements

Expanded and Refined Plume Delineation

Corrected Aquifer Divide and Flow Pathways

Plume mapping is key to determining optimal solutions for preventing further PFAS migration and addressing currently contaminated drinking water supply.

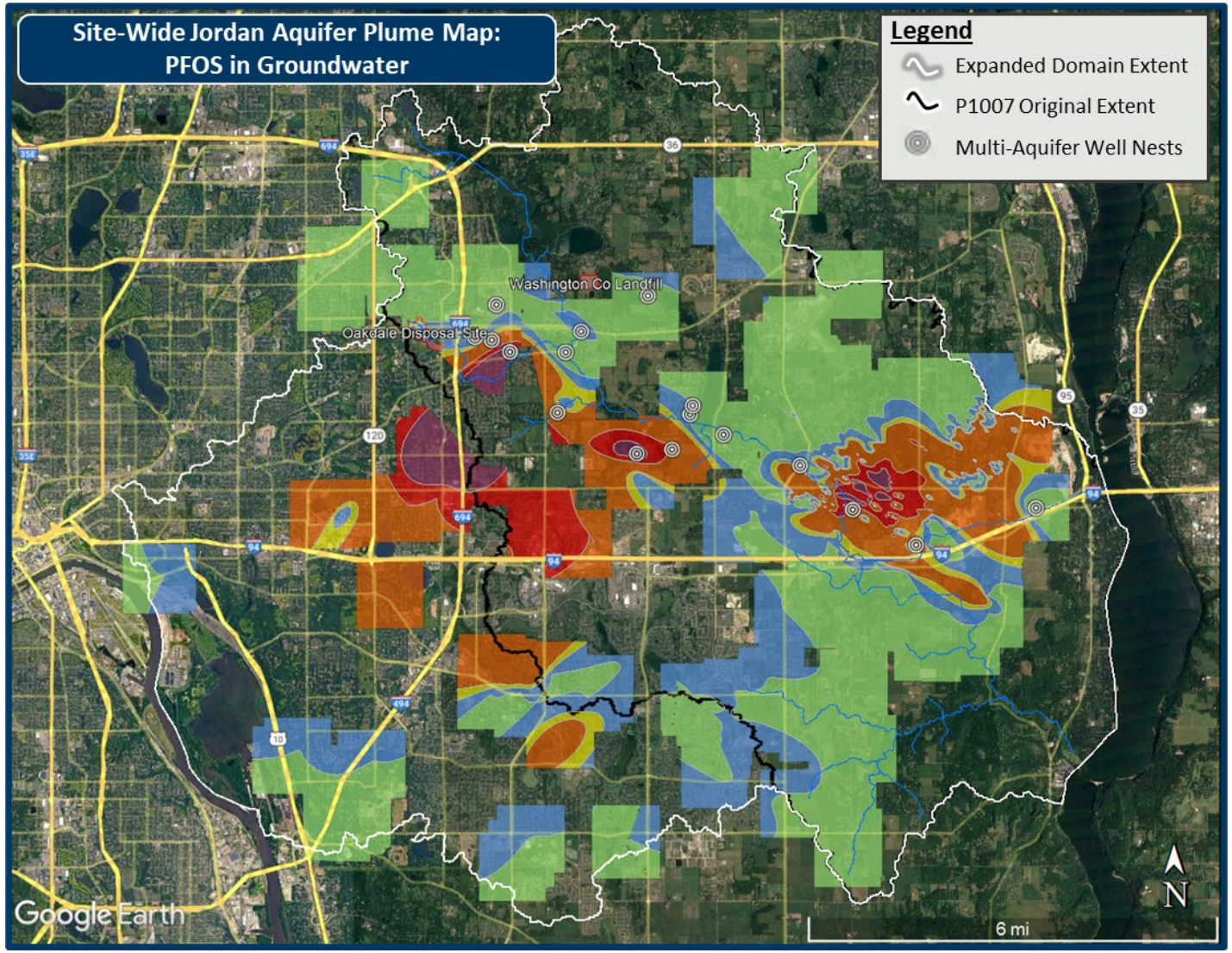
PFOS in Groundwater (ppb)

- PFOS greater than 50x HRL (>0.75 ppb)
- PFOS 10-50x HRL (0.15 – 0.75 ppb)
- PFOS 5-10x HRL (0.075 – 0.15 ppb)
- PFOS 1-5x HRL (0.015 – 0.075 ppb)
- PFOS 75-100% HRL (0.0112 – 0.015 ppb)
- PFOS 50-75% HRL (0.007 – 0.0112 ppb)
- PFOS not detected

Notes

Blank areas indicate insufficient well data to generate plume imagery (i.e., no wells within 0.5 miles).

PFOS Health Risk Limit (HRL) = 0.015 parts per billion (ppb)



Remaining Data Gaps: Planned Monitoring Well Installation

Map Features

- Multi-Aquifer Well Nests
- Planned Well Nests
- Approximate Groundwater Divides

PFOS in Groundwater (ppb)

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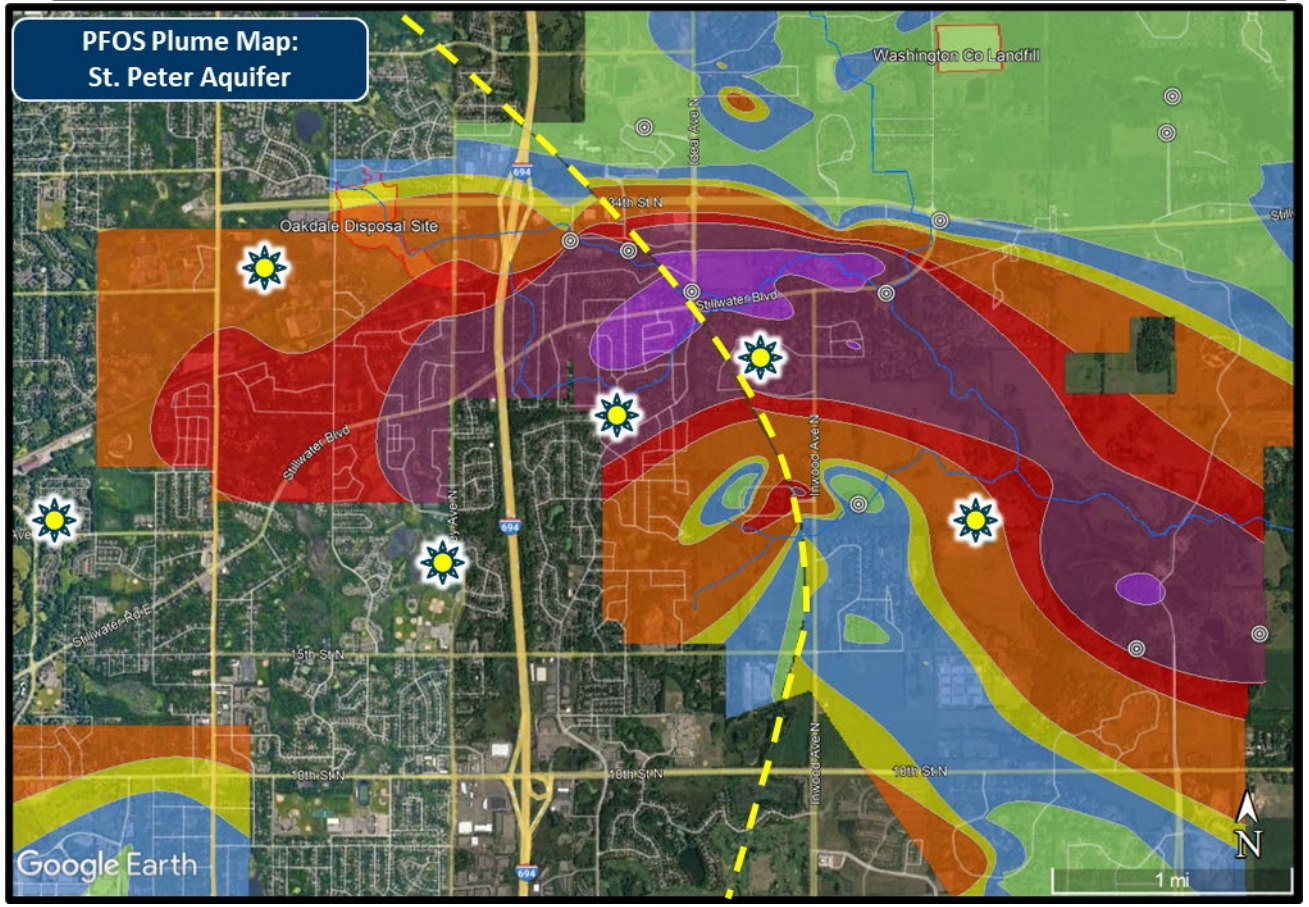
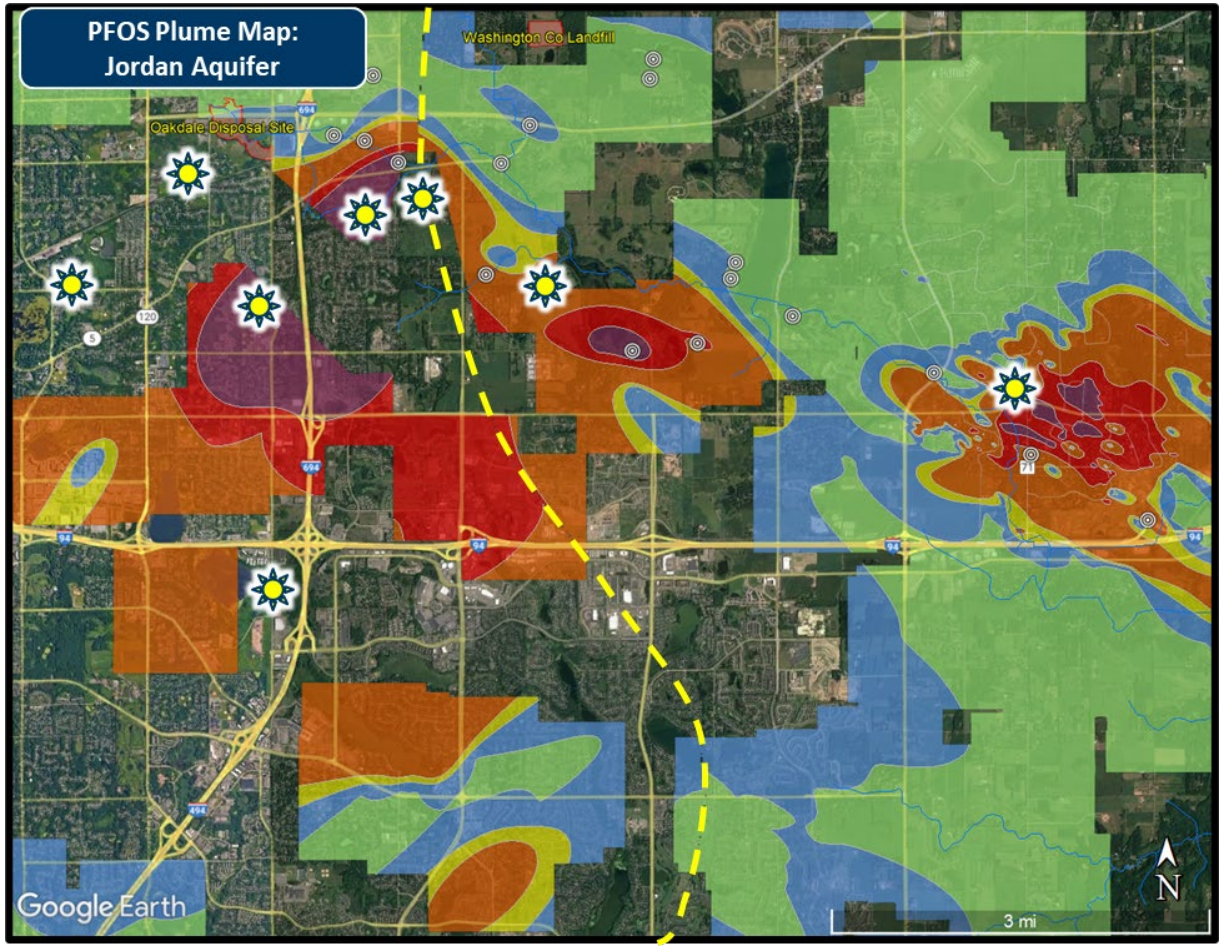


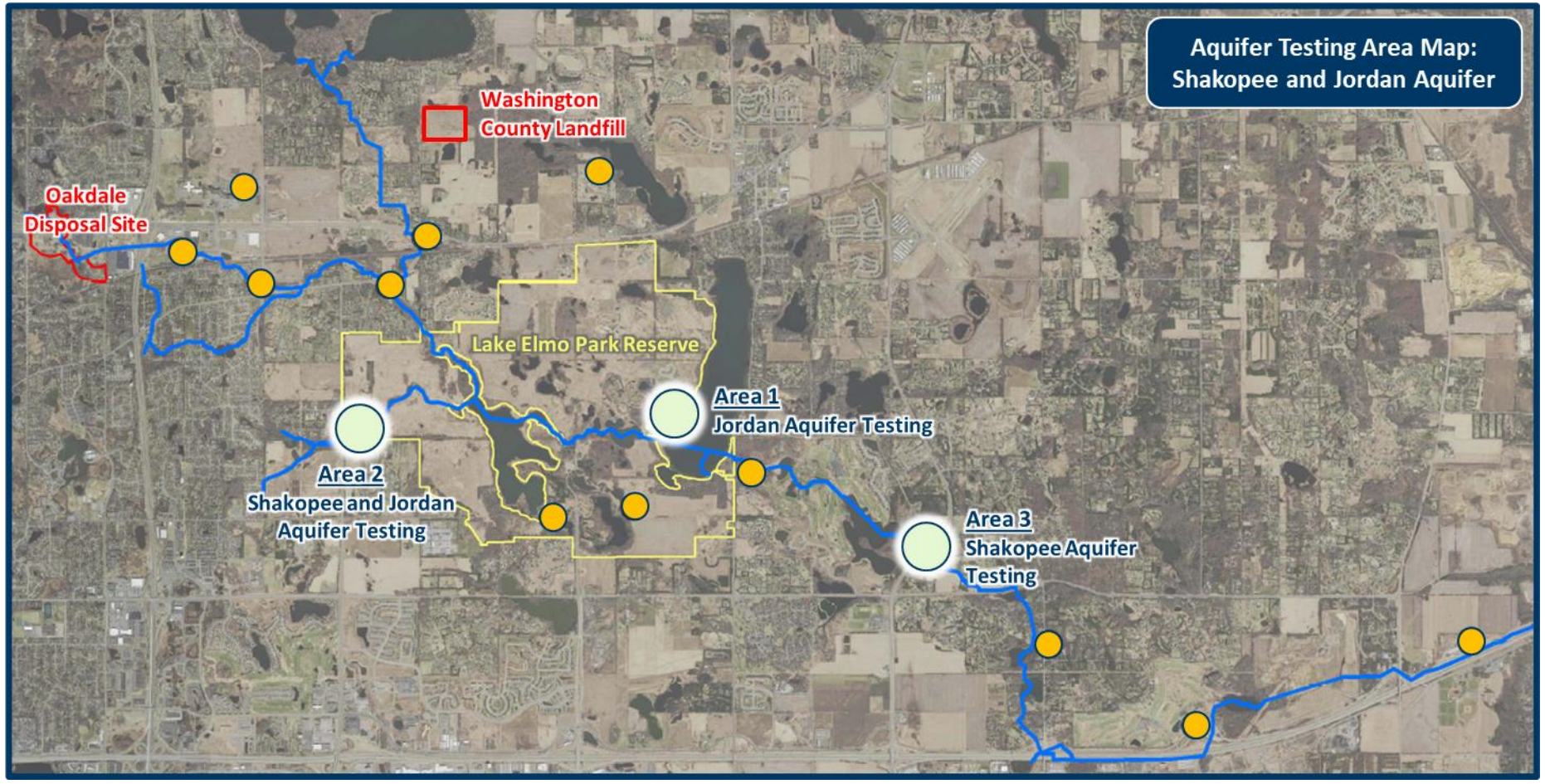


Timeline

Expected Completion of Well Installation by End of CY 2022

Expected Completion of Routine Well Sampling by End of CY 2023

Completed and Planned Aquifer Testing



P1007 Completed and Planned Aquifer Tests

Area 1: Central Portion of Corridor
Jordan Aquifer Test - Completed, September 2021

Area 2: Western Portion of Corridor
Jordan Aquifer Test - Completed, November 2021
Shakopee Aquifer Test - Planned

Area 3: Eastern Portion of Corridor
Shakopee Aquifer Test - Planned

Map Features

- Existing Multi-Aquifer Well Nests (Beta Sites)
- Planned Aquifer Testing Locations
- Extent of Lake Elmo Park Reserve

Timeline

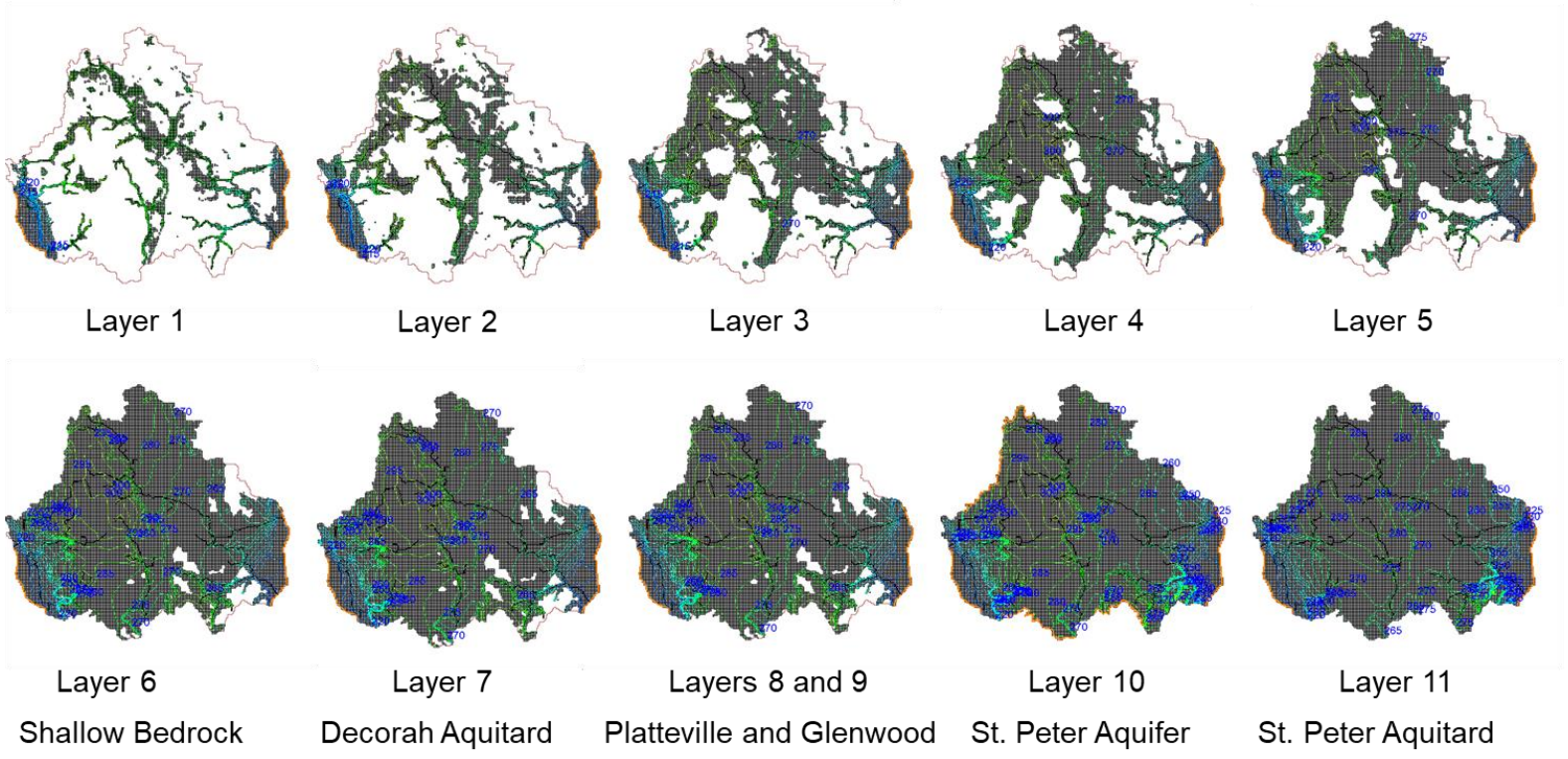
Expected Completion of Well Installation for Aquifer Tests by End of CY 2022
Expected Completion of Aquifer Testing, Assessment, and Final Reporting by Summer CY 2023

Model Development

Recent Modifications

Refinement of Model Layers

Improved Data Inputs

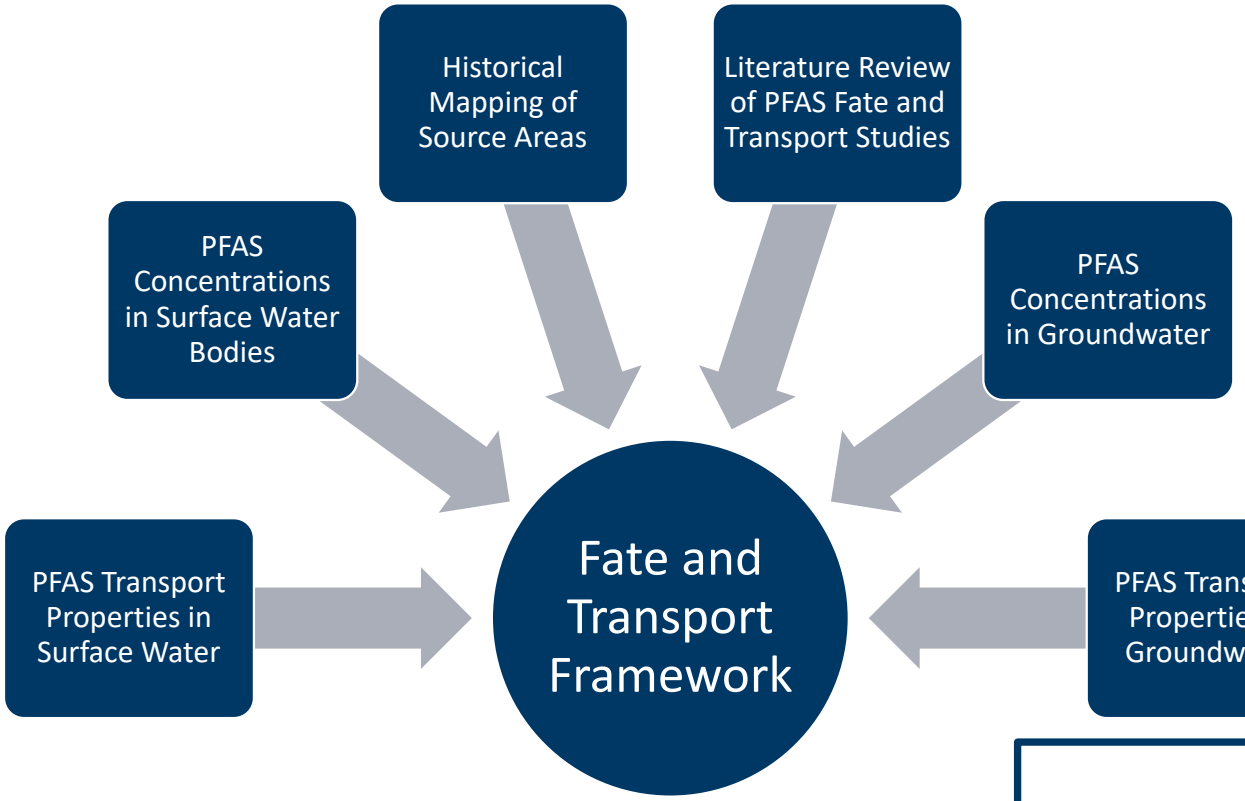


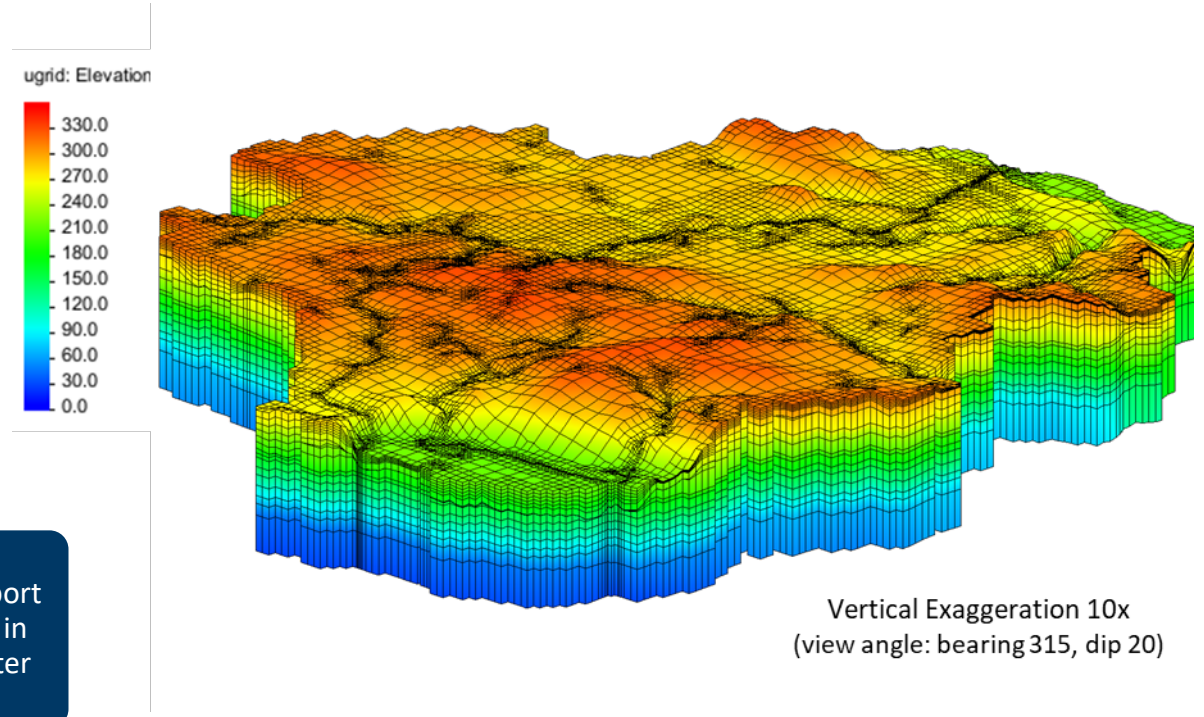
Model Layer Number	Geologic Unit
1	Water
2	Clay and Organics
3	Sand and Gravel
4	Sandy Till
5	Loamy Till
6	Top of Bedrock (enhanced fractured zone)
7	Decorah Aquitard
8	Platteville Aquifer
9	Glenwood Aquitard
10	St. Peter Aquifer
11	St. Peter Aquitard
12	Prairie du Chien Aquifer
13	Oneota Aquitard
14	Jordan Aquifer
15	Jordan – St. Lawrence Aquitard
16	Tunnel City Aquifer
17	Tunnel City Aquitard
18	Wonewoc Aquifer
19	Eau Claire Aquitard
20	Mt. Simon Aquifer

Timeline

Expected Completion of Groundwater Layer for Model: End of July 2022
Expected Completion of Surface Water Layer for Model: End of July 2022
Expected Integration of Groundwater and Surface Water Models End of CY 2022

PFAS Fate and Transport Model





Timeline
Expected completion end of CY 2022

Objectives of Fate and Transport Model

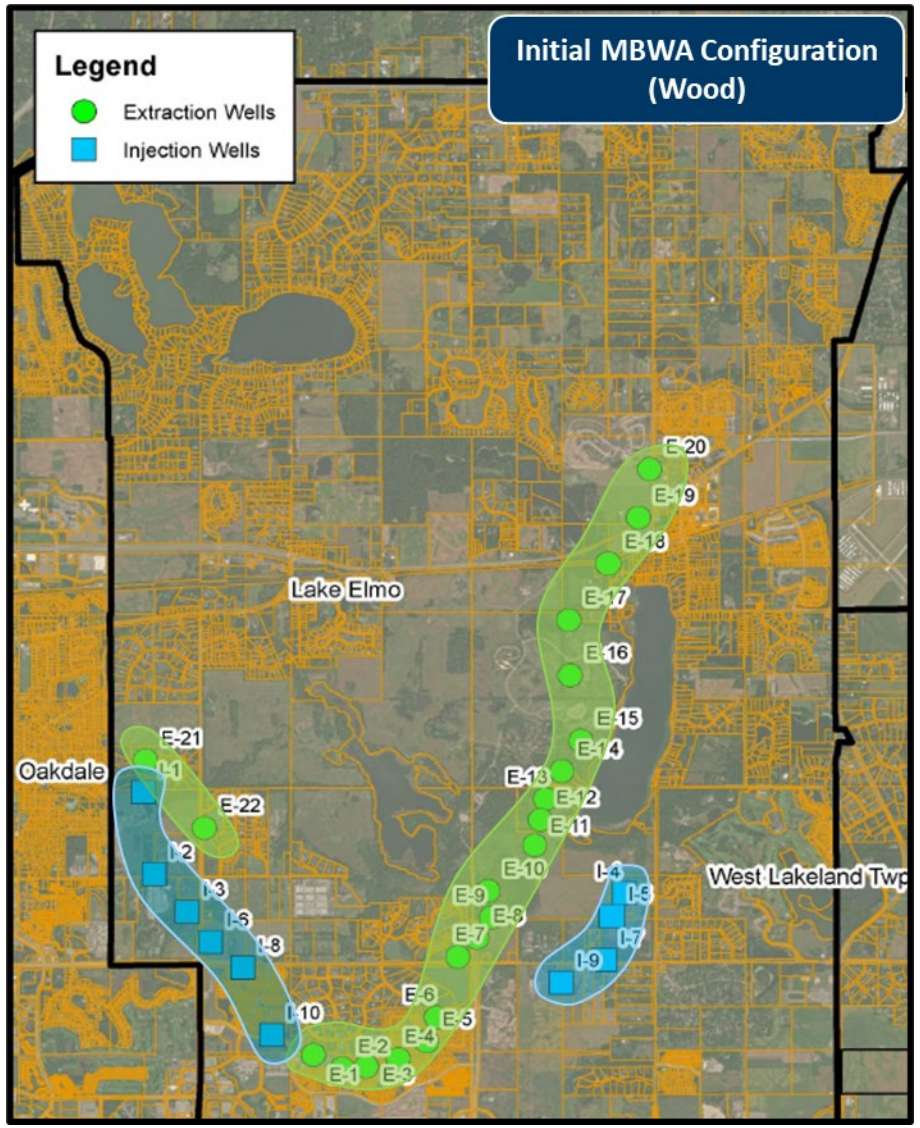
Identify Source Areas and Probably Migration Pathways to Receptors

Identify Hydrologic Conditions That May Modify Migration Pathways

Identify Anthropogenic Activities That May Modify Migration Pathways

Develop Numeric Modelling Tool to Support Future Plume Capture

Multi-Benefit Well Array Evaluation



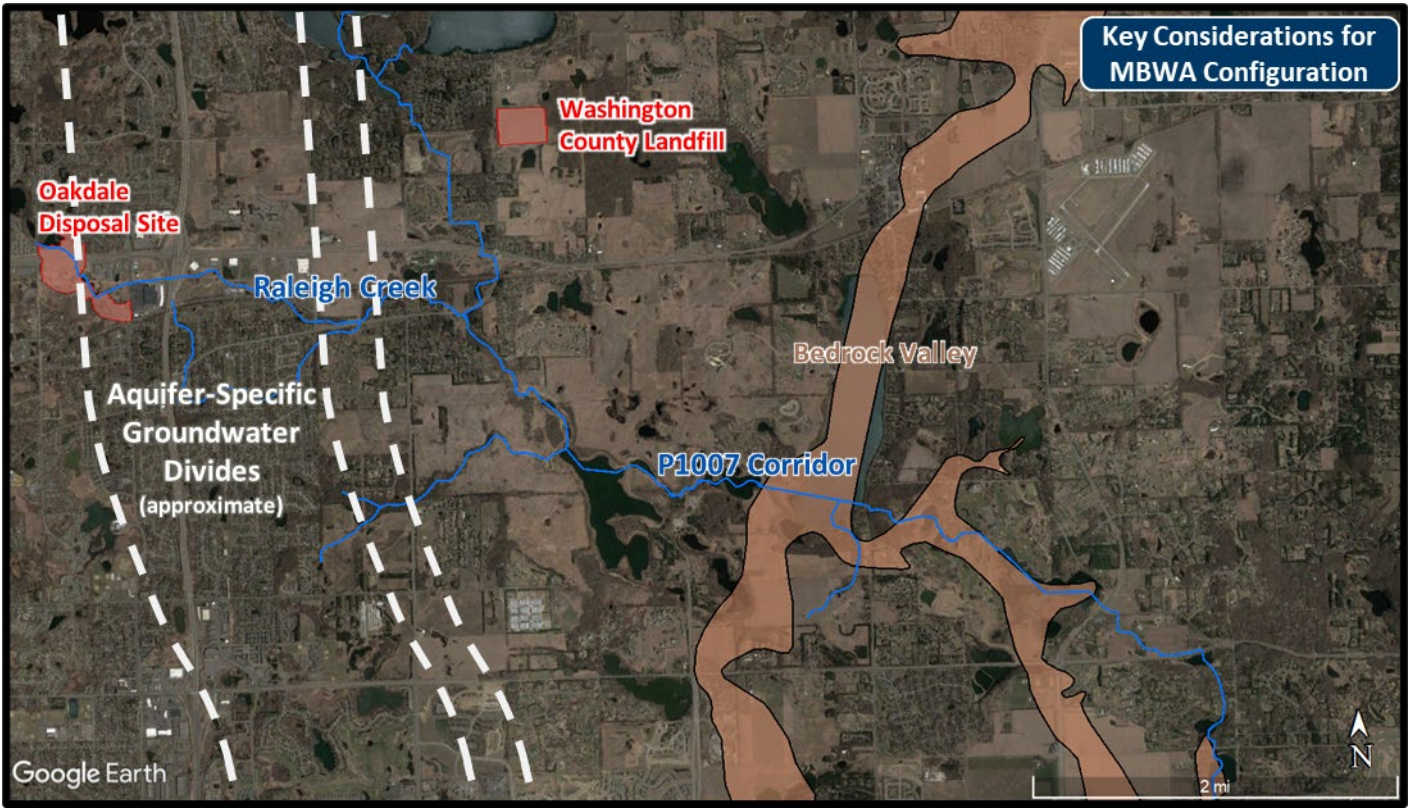
Initial Multi-Benefit Well Array Placement

Extraction well placement primarily downgradient of Washington County Landfill and not the Oakdale Disposal Site.

Considered migration pathways from groundwater and not surface infiltration from Raleigh Creek and P1007 Corridor secondary source areas.

Additional hydrogeologic information has since been acquired, including the effects of the bedrock valley and multiple aquifer groundwater divides.

Multi-Benefit Well Array Evaluation (continued)



Approach for Reconfiguration of MBWA

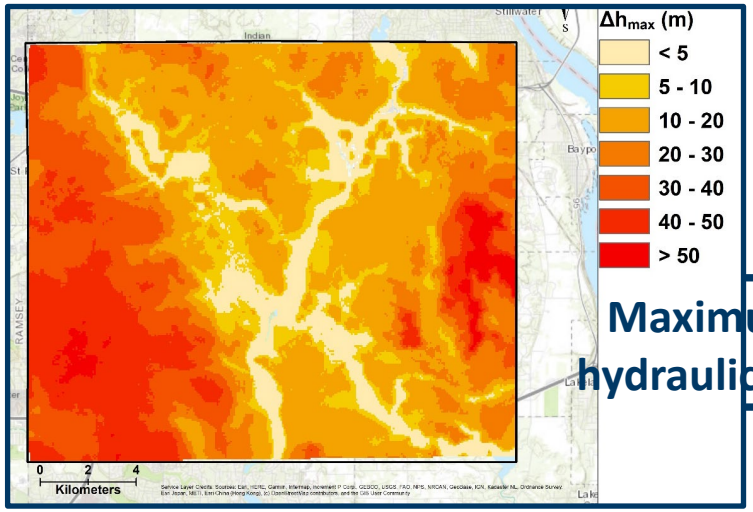
Align PFAS capture areas based on updated plume maps and groundwater divide locations

Consider well placement in St. Peter, Shakopee, and Jordan Aquifers

Incorporate aquifer pumping test results

Determine injection well placement by aquifer recharge capacity

Refine well placement based on information from integrated surface water / groundwater model once completed



Maximum allowable hydraulic head increase

Timeline

Expected Preliminary Particle Tracking Analysis end of October 2022

Expected Completion of Initial Evaluation and Preliminary Well Location end of CY 2022

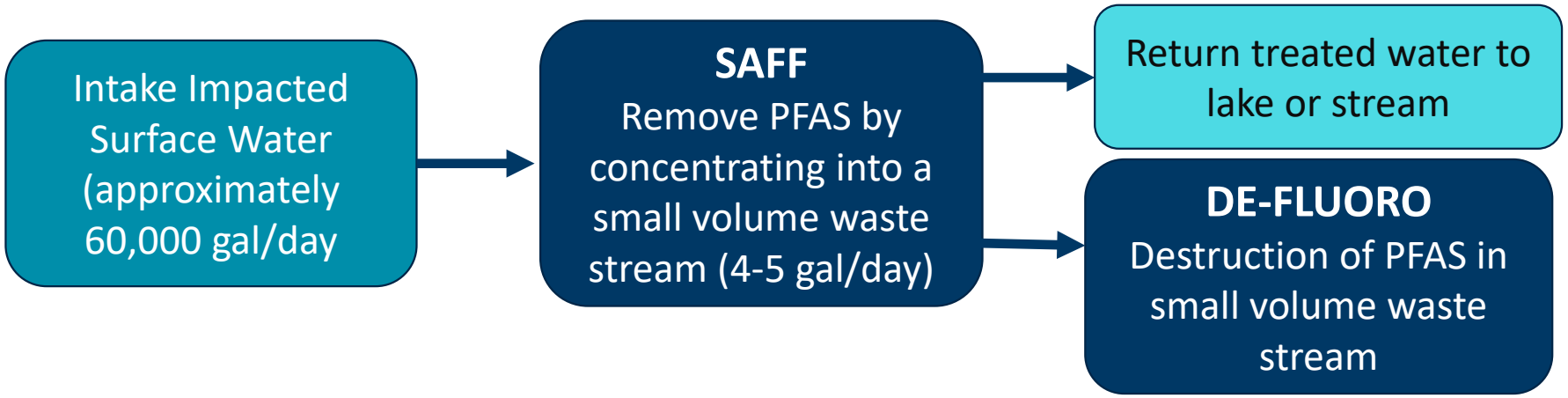
Surface Water Treatment Pilot Study

Goals

Operate the PFAS removal system at locations of varying PFAS concentrations, water chemistry, and flow conditions

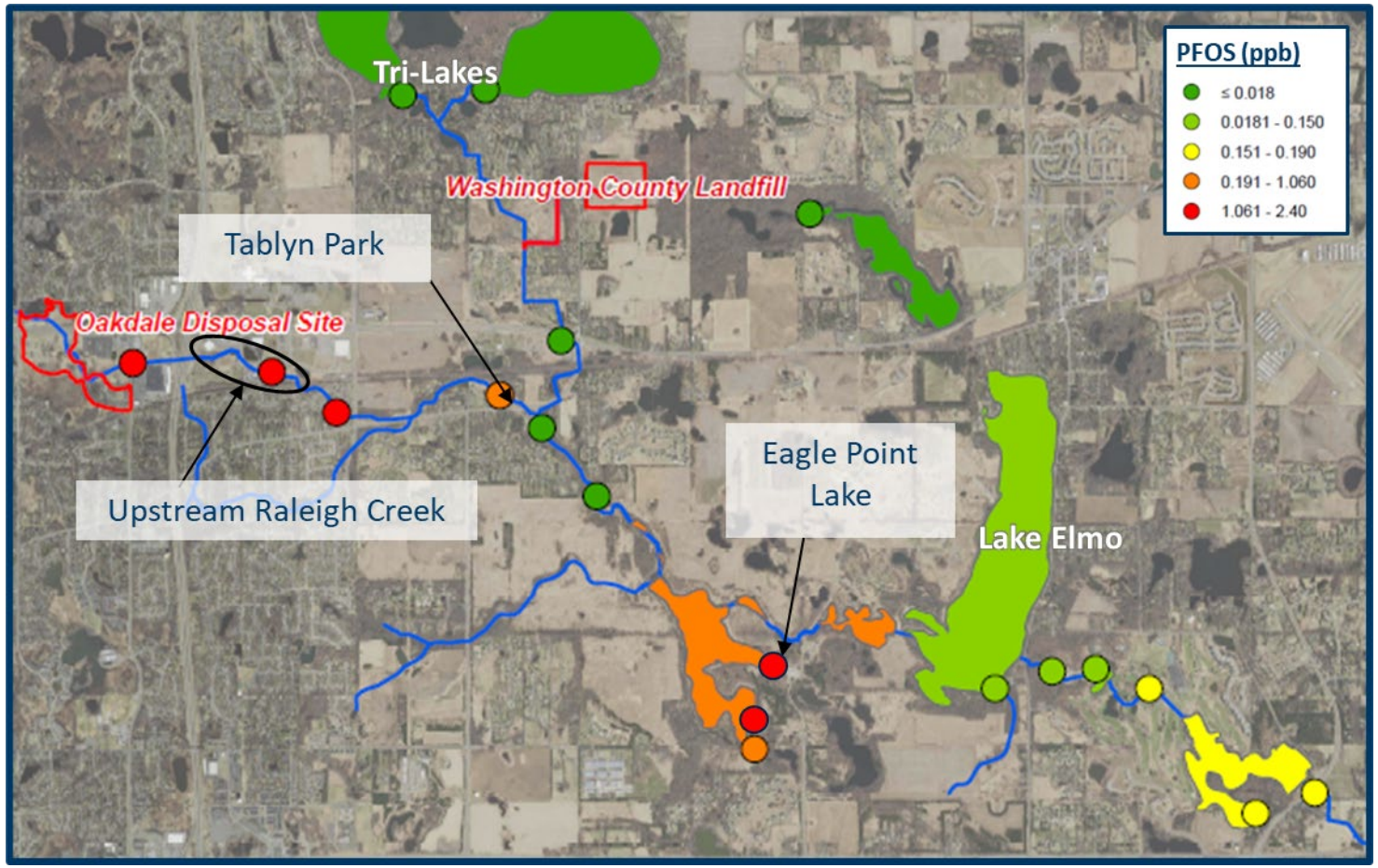
Evaluate system performance to determine optimal operational parameters

Determine if removal and destruction efficiency would be applicable as a full-scale treatment approach



SAFF and DE-FLUORO pilot test results will be presented in the feasibility study and compared to other surface water treatment options

Proposed Pilot Study Locations



Timeline

Planning and Design until September 2022
Expected Pilot Testing from October 2022 to August 2023.
Expected Assessment and Final Reporting end of CY2023.

Eagle Point Lake

Tentative implementation Fall 2022

Consistent water source

Higher PFAS concentrations have been observed at the canoe landing

Tablyn Park

Tentative implementation Spring 2023

Treat water in Raleigh Creek upstream of confluence

Intermittent flow depending on rainfall and snow melt

Upstream Raleigh Creek

Tentative implementation Spring/Summer 2023

Consistent flow but can be low depending on rainfall

Highest PFAS concentrations

Proposed Site Layout and Components

Components

SAFF Unit

DE-FLUORO unit

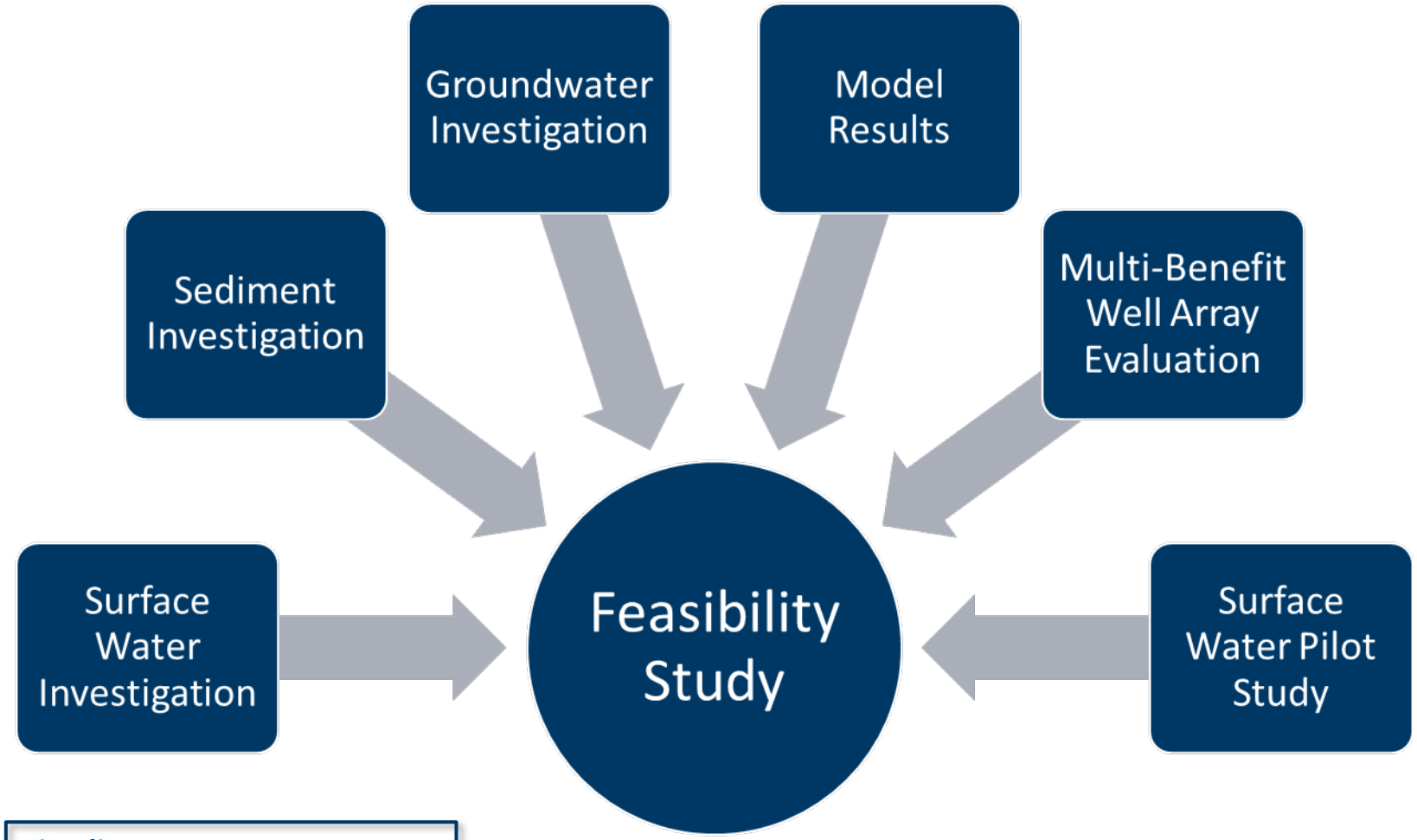
Intake Pump

Pre-Filtration

Fencing

Generator

Feasibility Study



Goals of Feasibility Study

Identify areas where treatment of surface water, sediment, or groundwater is required.

Evaluate applicable treatment options.

Recommend solutions to address PFAS impacts in surface water, sediment, and groundwater.

Timeline
Expected completion end of CY2023

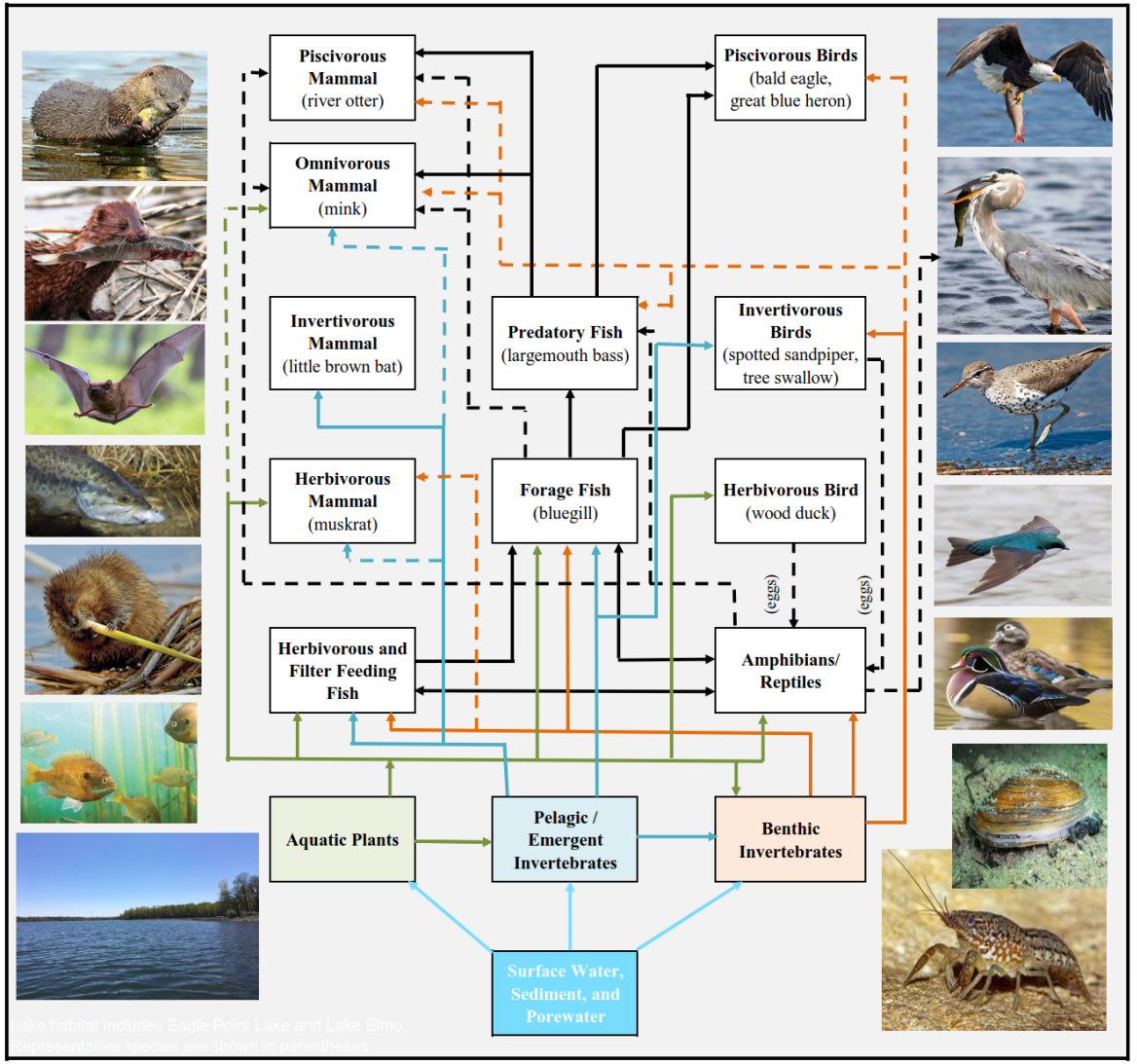
Baseline Ecological Risk Assessment

BERA Results Summary

Risks identified for the muskrat, great blue heron, and mink in the Upper Raleigh Creek Wetlands and Eagle Point Lake

Risk to muskrat and other herbivores dependent on if estimate of plant PFAS concentrations used surface water or sediment data

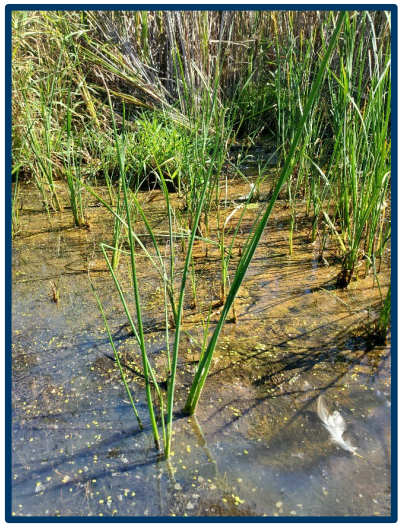
Determined a BERA Addendum was required to assess PFAS risk to muskrat in the Upper Raleigh Creek Wetlands and Eagle Point Lake



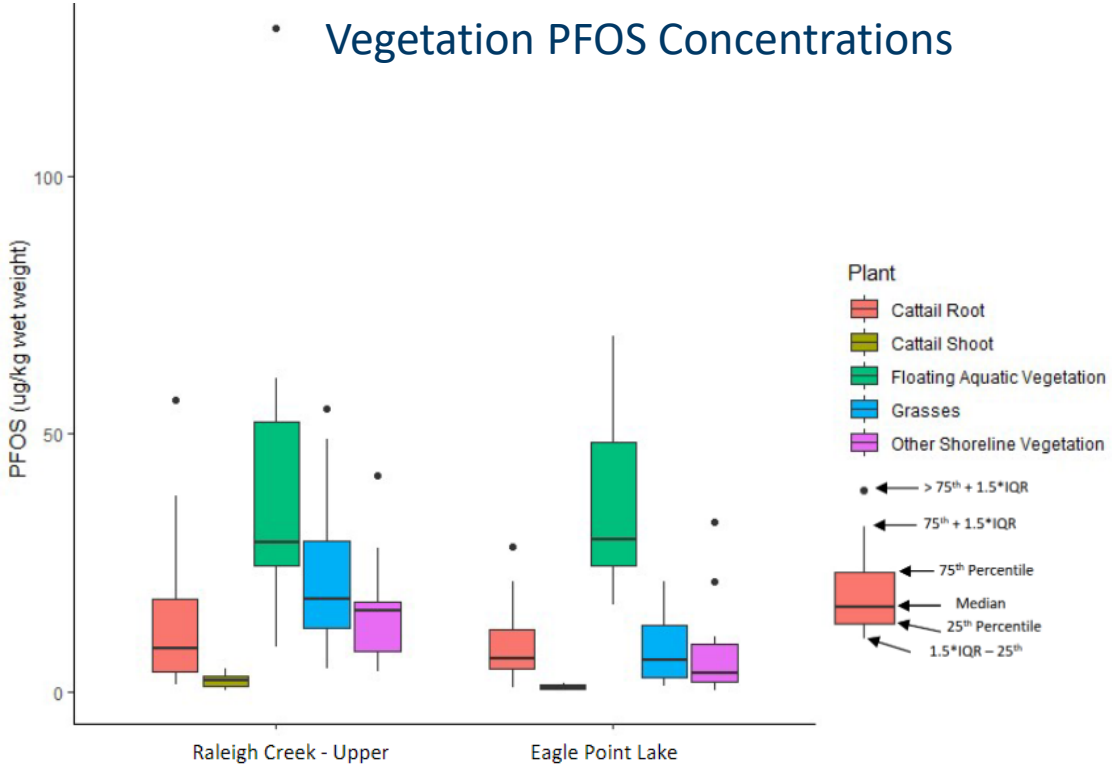
Baseline Ecological Risk Assessment Addendum

2021 Vegetation Sampling

Collected cattails, grasses, floating vegetation, and shoreline vegetation in wetland areas of upstream Raleigh Creek and along shore of Eagle Point Lake.



- Vegetation PFOS Concentrations



Results

PFAS concentrations were lower in plant tissues than modeled which reduced the risk to the muskrat.

Floating vegetation unexpectedly had highest PFAS concentrations.

Additional Ecological Work

DNR collected deer Fall 2021 and results are pending.

DNR will be collecting geese and ducks this year.

Questions

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- 0.175-0.349 ppb
- 0.035-0.1749 ppb
- 0.026-0.0349 ppb
- 0.0041-0.0259 ppb
- Below Detection

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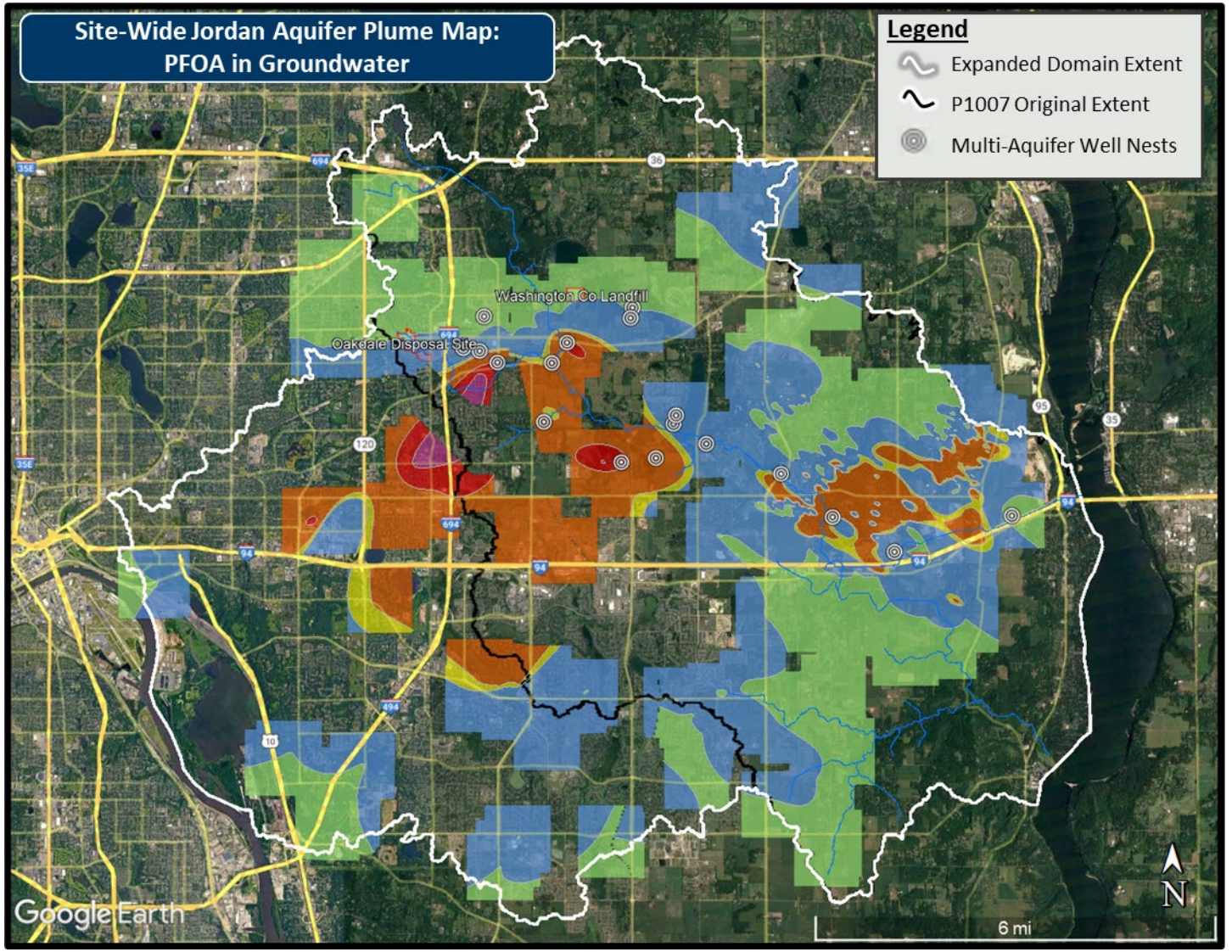

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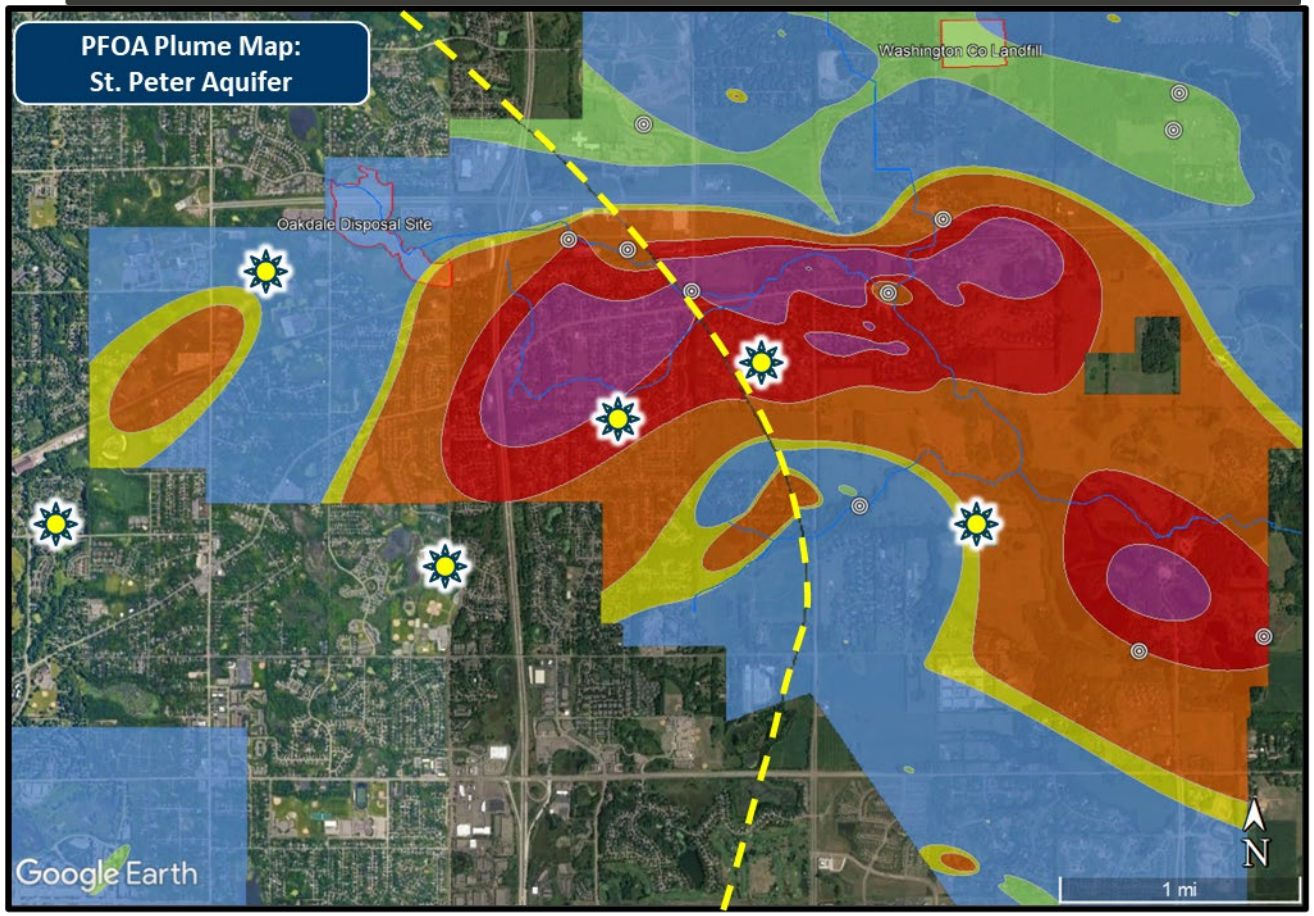

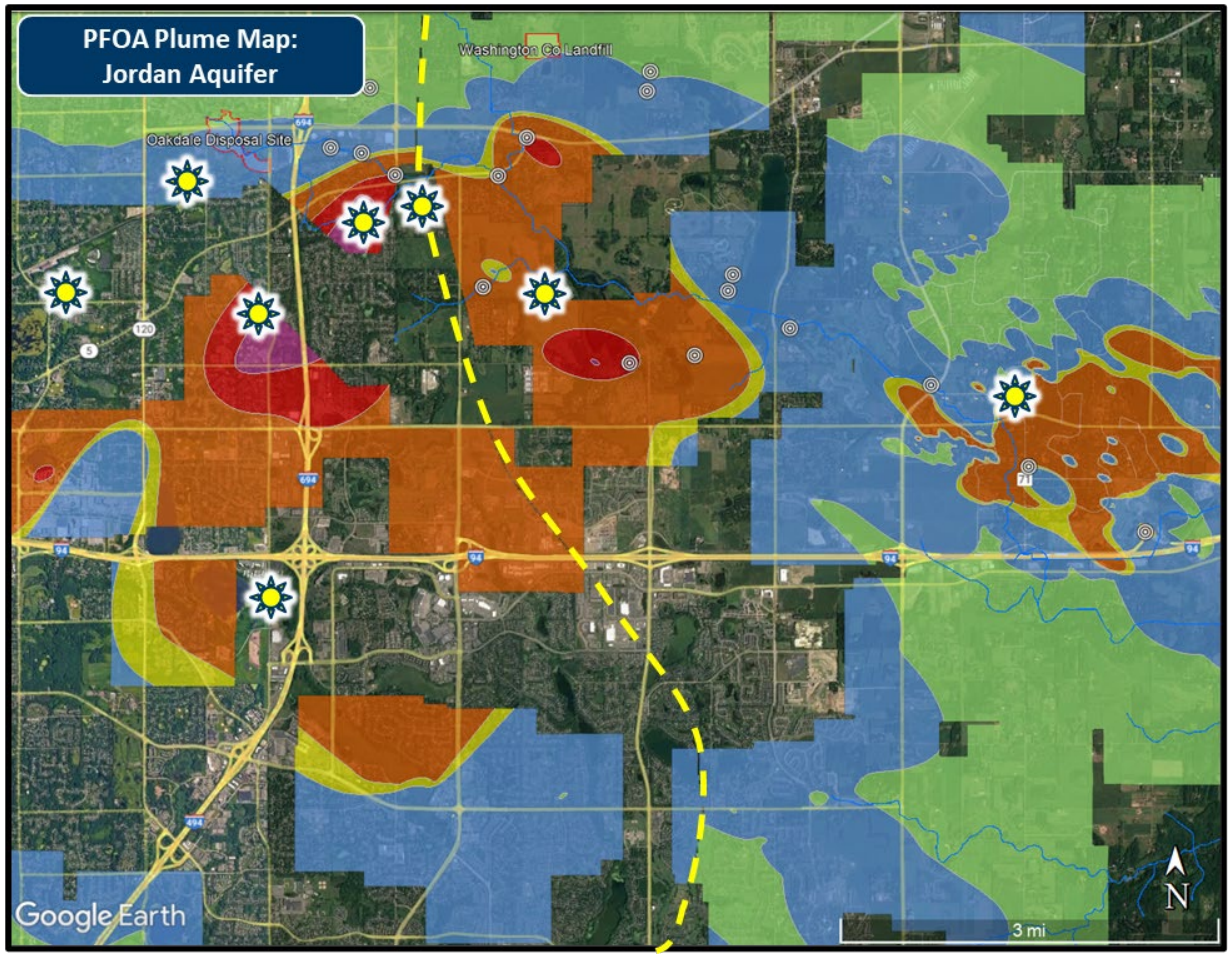

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