Project 1007 Feasibility Study

East Metro Unit

Minnesota Pollution Control Agency

May 20, 2026

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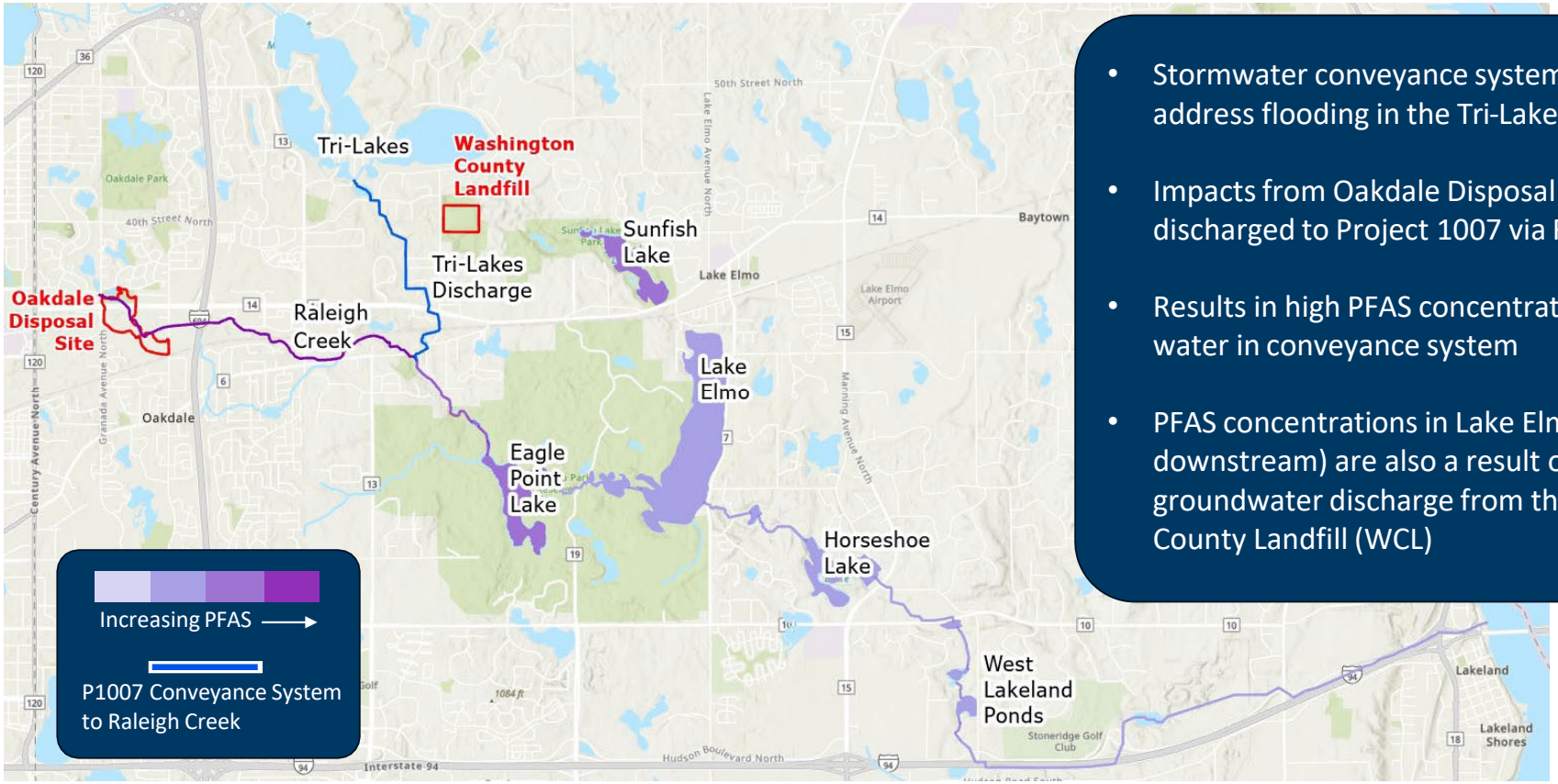
Project 1007 Overview



- Stormwater conveyance system constructed to address flooding in the Tri-Lakes area
- Impacts from Oakdale Disposal Site (ODS) are discharged to Project 1007 via Raleigh Creek
- Results in high PFAS concentrations in surface water in conveyance system
- PFAS concentrations in Lake Elmo (and downstream) are also a result of impacted groundwater discharge from the Washington County Landfill (WCL)

Key Remedial Investigation Findings: Migration Pathways

Surface Water

PFAS migrates through connected water bodies including those with high rates of infiltration, increasing extent of contamination in drinking water aquifers

Surface Water & Sediment Cycling

Impacted sediment can leach PFAS to surface water and groundwater, acting as a secondary source

Surface Water Infiltration to Groundwater

PFAS in surface water migrates into groundwater

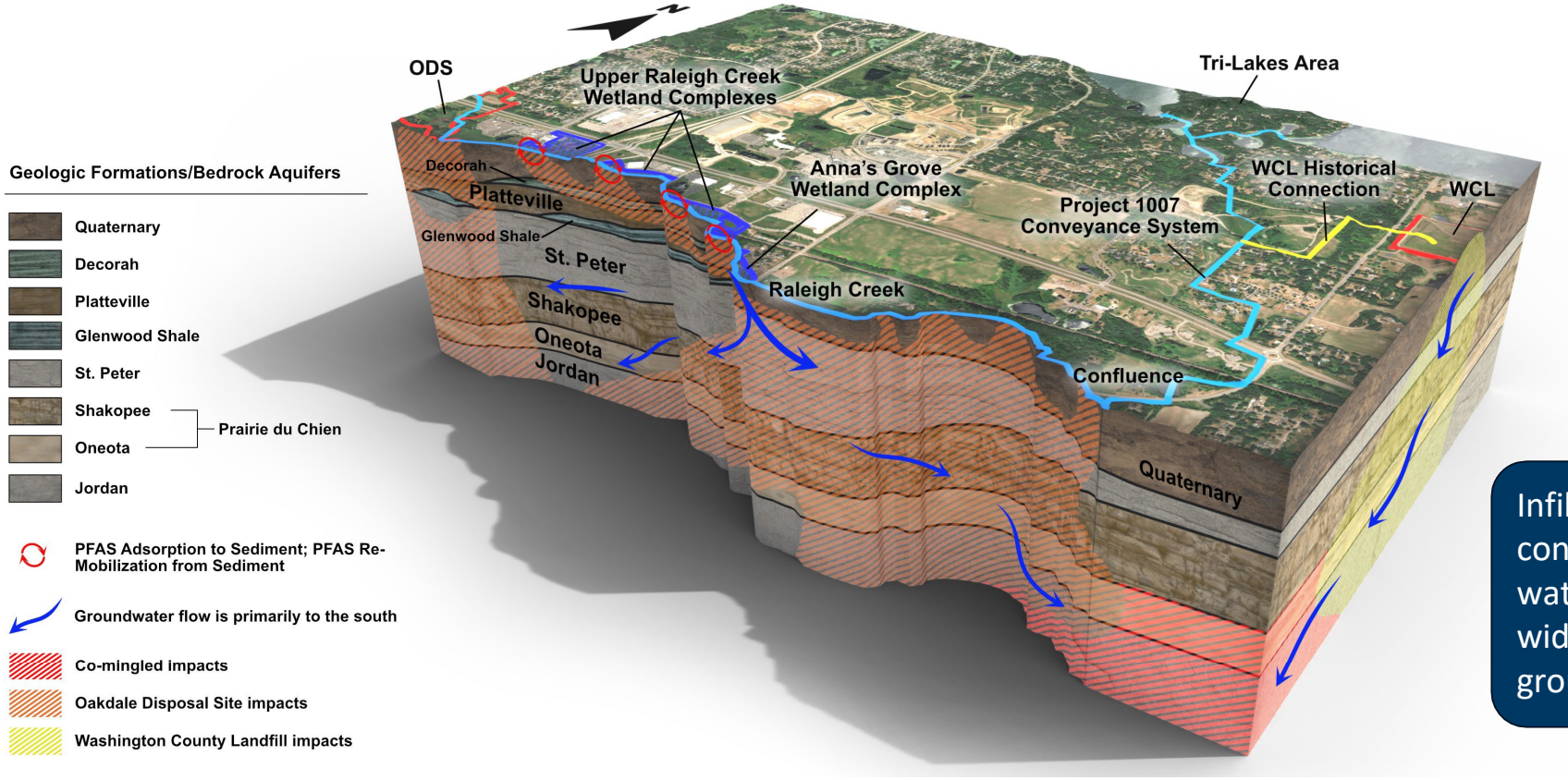
Groundwater Discharge to Surface Water

PFAS in groundwater migrates into surface water

Groundwater Migration

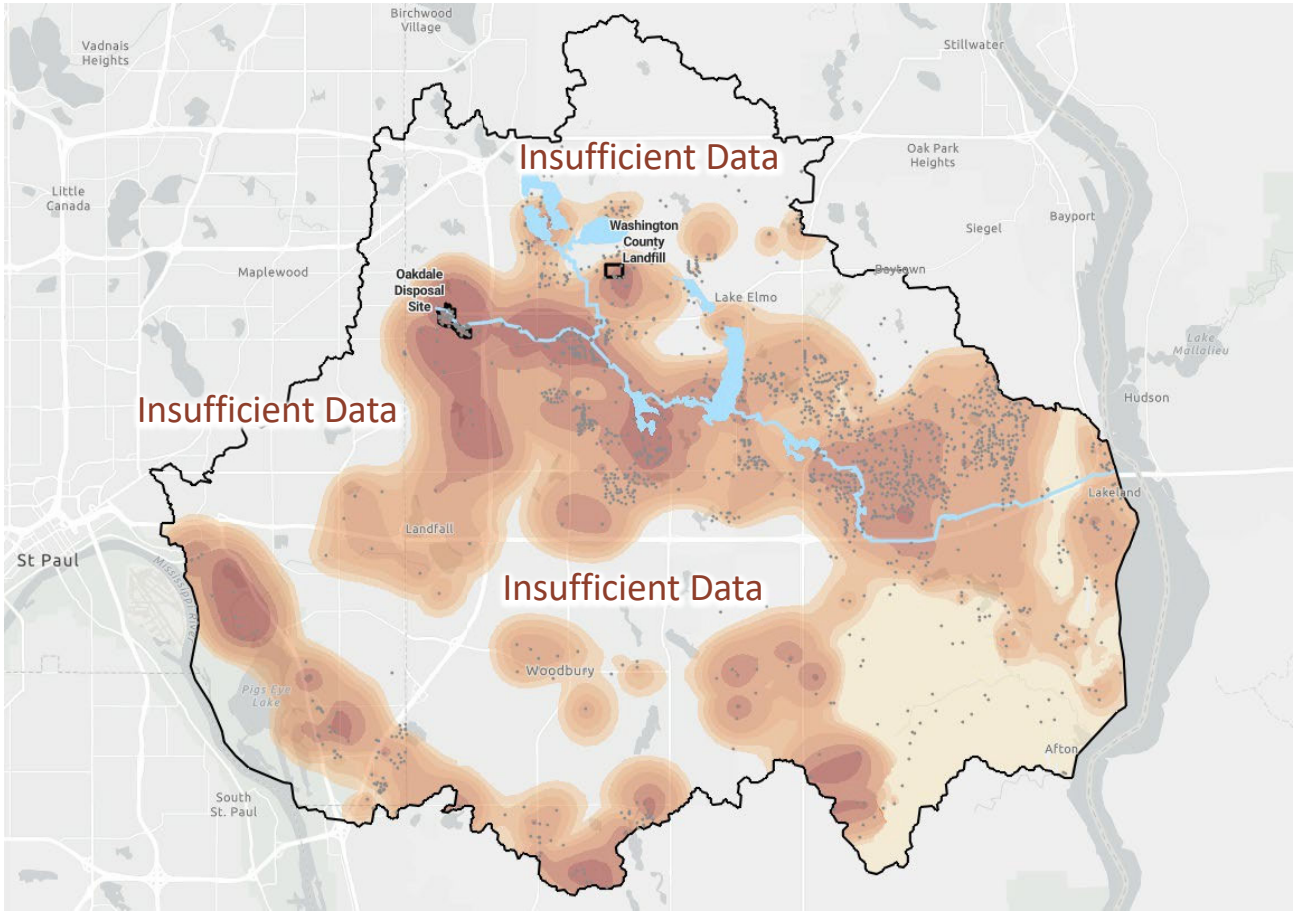
PFAS in groundwater migrates with the groundwater flow and increases the extent of contamination in drinking water aquifers.

Example of Migration Pathways



Infiltration from contaminated surface water has resulted in widespread groundwater impacts

PFOS Groundwater Impacts



Migration resulted in widespread impact in drinking water aquifers

Impacts from ODS and WCL are likely more extensive because of the Project 1007 Conveyance System

PFOS Concentration

- > 300 ng/L
- 75 - 299 ng/L
- 15 - 74.9 ng/L
- 7.6 - 74.9 ng/L
- 4 - 7.59 ng/L
- 2.3 - 3.9 ng/L
- Less than 2.3 ng/L

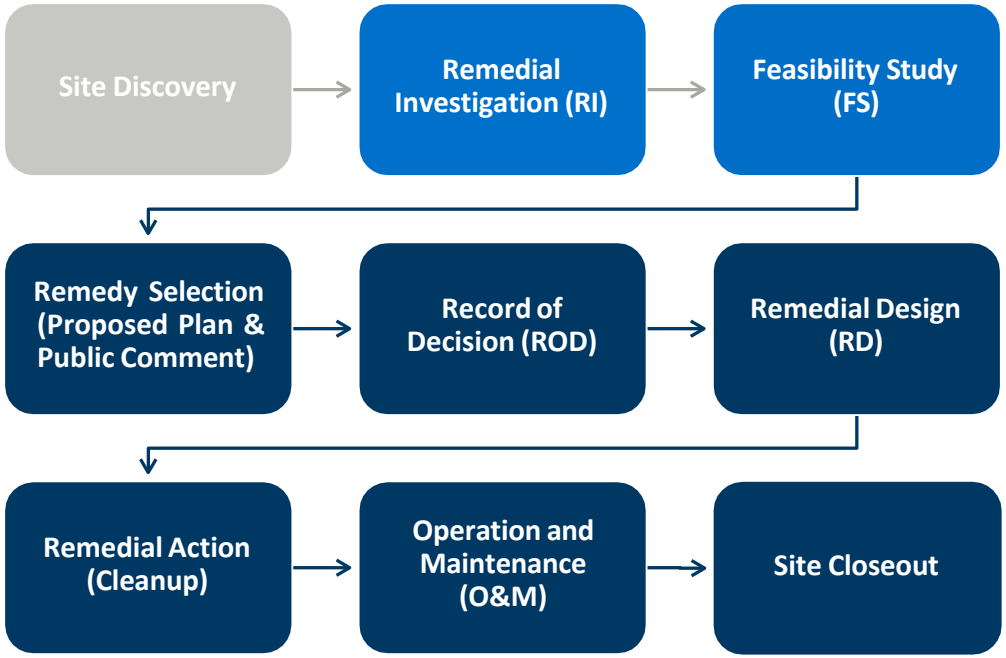
- Groundwater data point
- Project 1007 area surface water

Feasibility Study: Recommend Solutions to Limit PFAS Spread

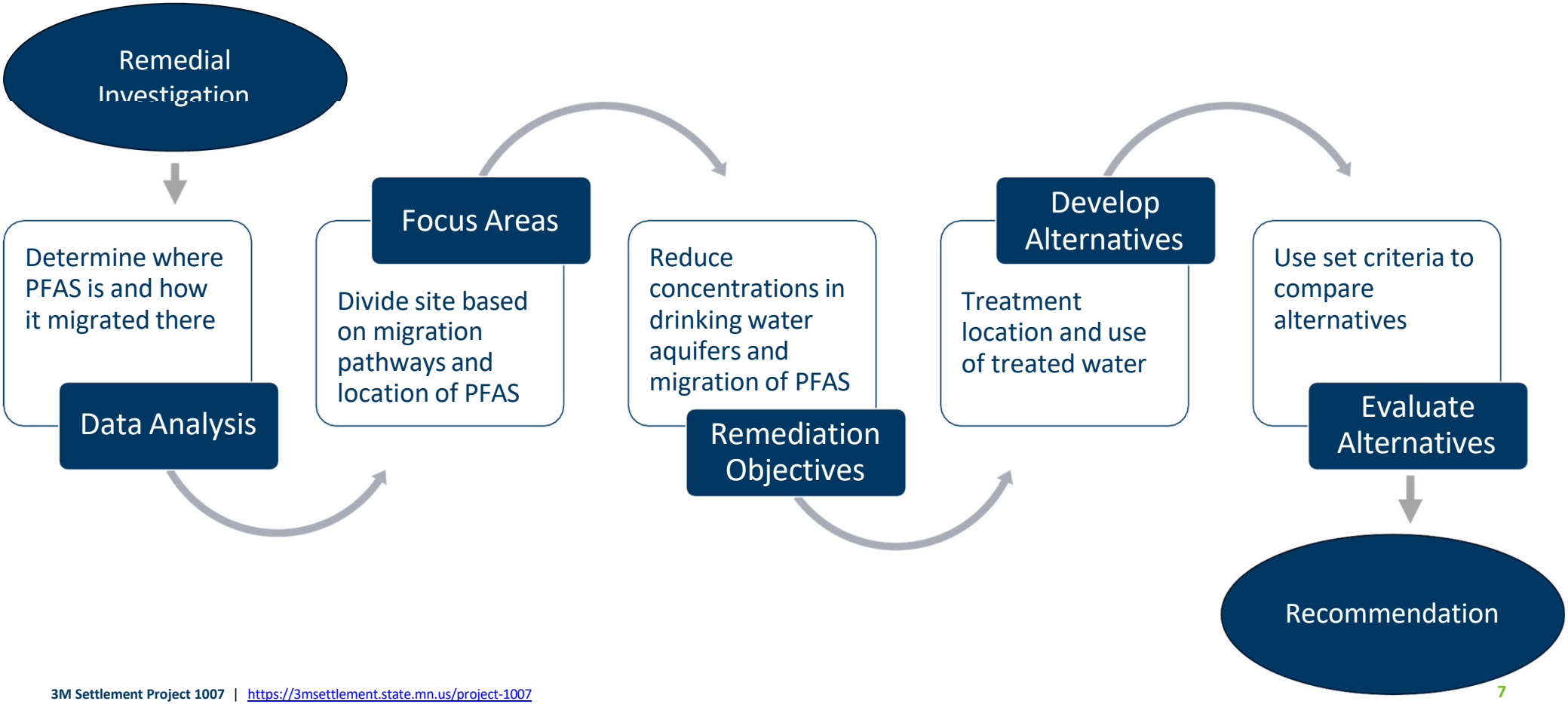
Completion of the Feasibility Study and implementation of selected remedial actions are intended to:

- Aid in the long-term reduction of PFAS in the East Metro
- Reduce the continued spread of PFAS in surface water and groundwater
- Provide long-term protection to drinking water supplies

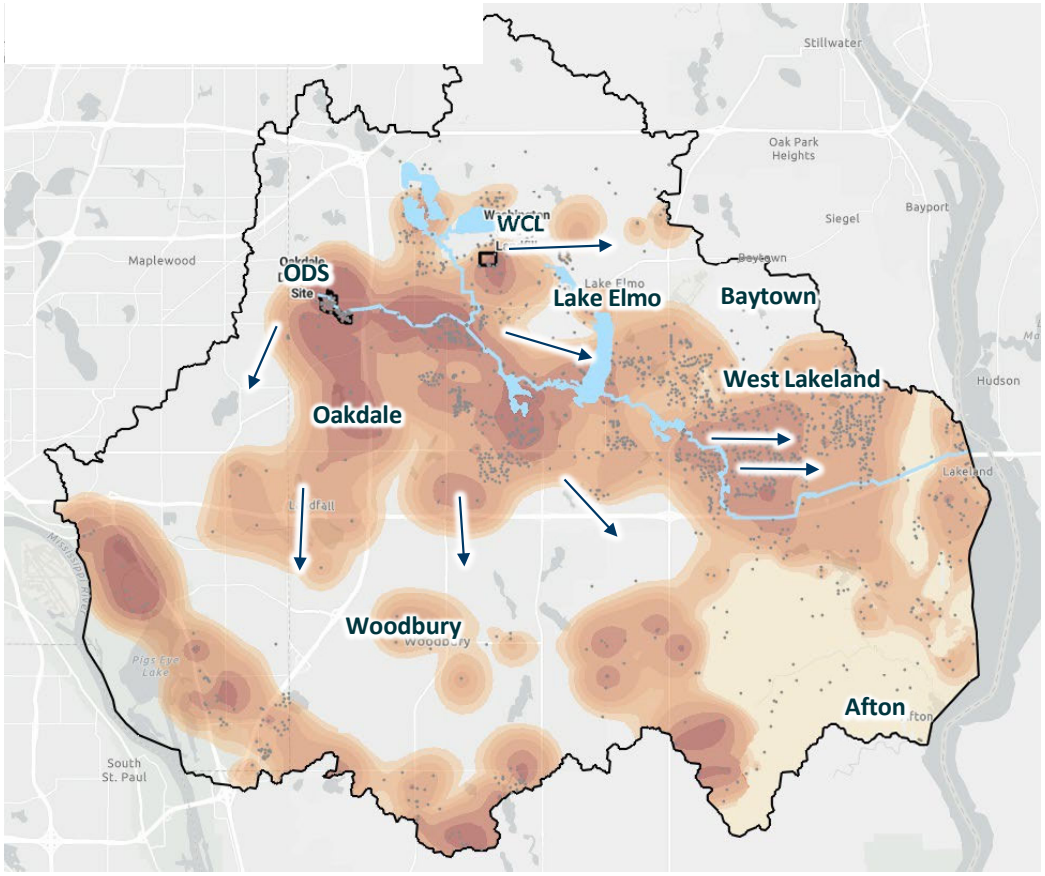
Part of Superfund process to advise future action



Feasibility Study Process



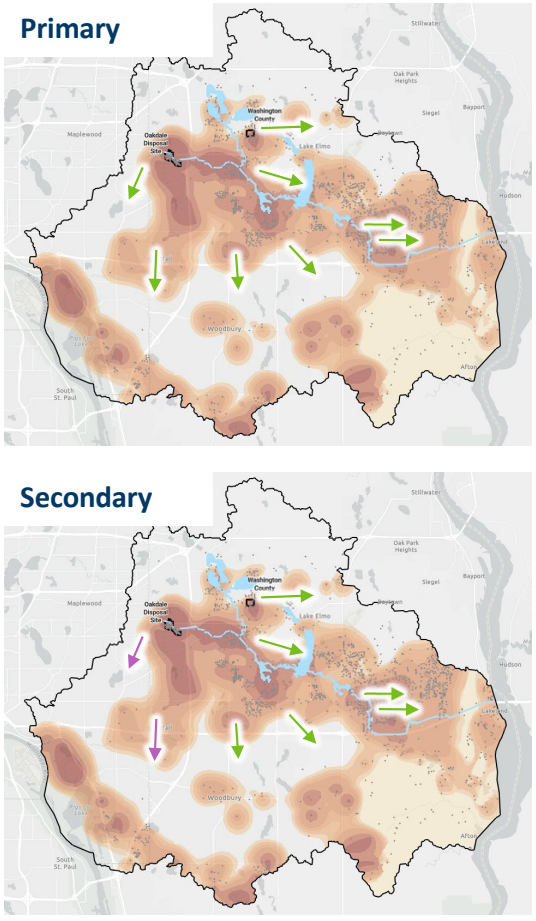
Baseline: Drinking Water Treatment Only



- Drinking water treatment plans outlined in Conceptual Drinking Water Supply Plan (CDWSP)
- Focus is providing safe drinking water and not remediation
- Groundwater with high concentrations of PFAS continue to migrate
- Implications:
  - Higher drinking water treatment costs by communities already impacted
  - Additional communities and homes may require treatment
- Changing pumping conditions can change migration pathways

Feasibility Study Recommendations

	Alternative	Drinking Water Supply	Rationale
Primary Recommendation	• Source zone control • Regional Multi Benefit Well Array (MBWA) • Surface water in-stream permeable adsorptive barrier • Sediment access restrictions	Lake Elmo and Oakdale	Best plume capture
Secondary Recommendation	• Source zone control • Localized MBWA in Lake Elmo • Pump & Treat in West Lakeland • Surface water in-stream permeable adsorptive barrier • Sediment access restrictions	Lake Elmo	Less coordination with communities for drinking water supply Lower cost



Two Active Source Areas

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Oakdale Disposal Site (ODS)

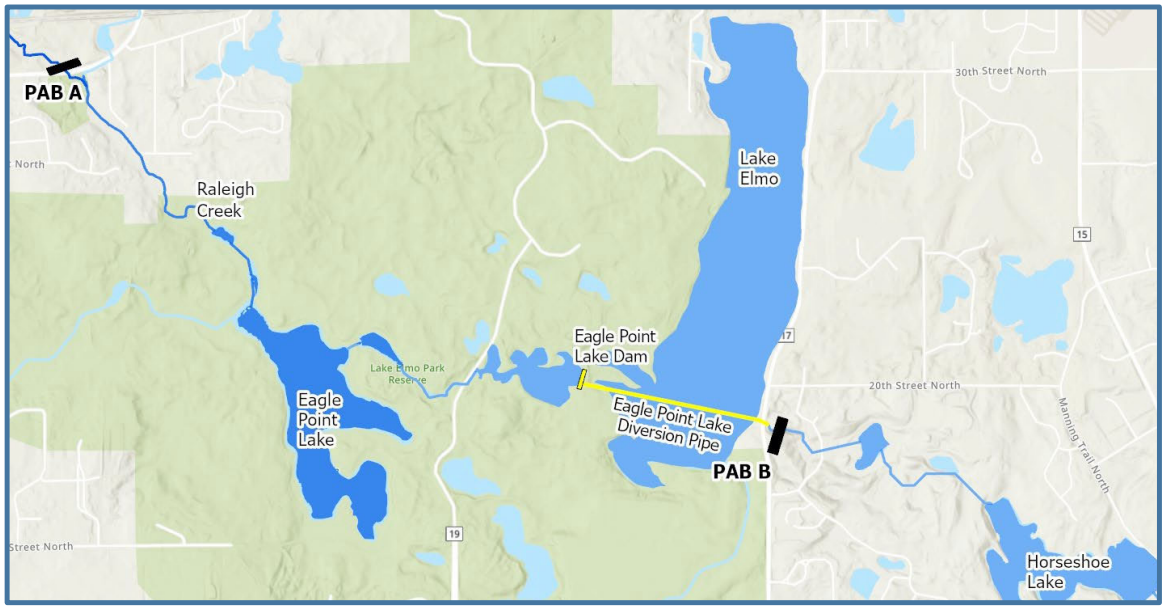
- Current Remedial Action: Shallow groundwater treatment
- Active Off-Site Migration
- Future Remedial Action is beyond the scope of this study
- Site Management: Superfund program

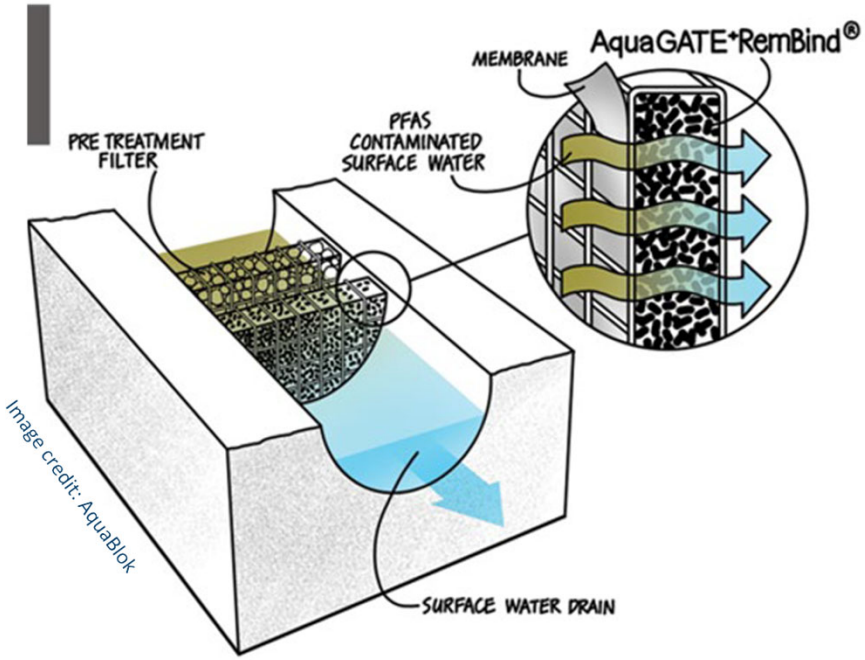
Washington County Landfill (WCL)

- Current Remedial Action: Landfill was lined and has leachate collection; no active remediation for PFAS impacts outside of the liner
- Active Off-Site Migration
- Recommended Remedial Action: Localized pump and treat system
- Site Management: Closed Landfill Program

Source area control is needed to limit the spread of PFAS throughout the East Metro via groundwater and surface water

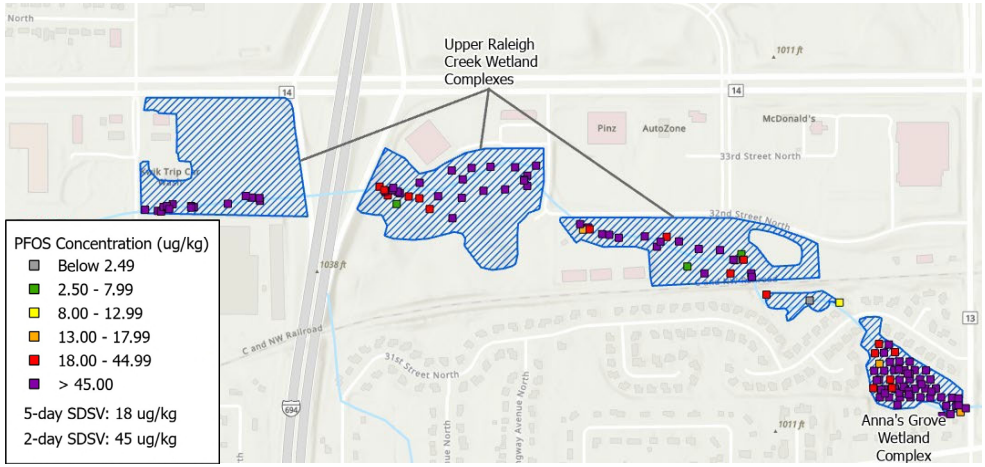
Surface Water Recommendation: In-Stream Permeable Adsorptive Barriers (PABs)





- Reduces downstream migration of PFAS currently sorbed to sediment in Raleigh Creek Wetlands and Eagle Point Lake
- Reduces downstream migration of PFAS within Lake Elmo to West Lakeland

Sediment Recommendation: Access Restrictions



- Once migration from ODS via Raleigh Creek is addressed, uncertainty in how the PFAS mass in sediment will impact downgradient surface water and groundwater
- Sediment remediation is costly and expected to exceed $50M (excavate, transport, dispose, backfill)
- Wetland restoration is time-intensive and expensive

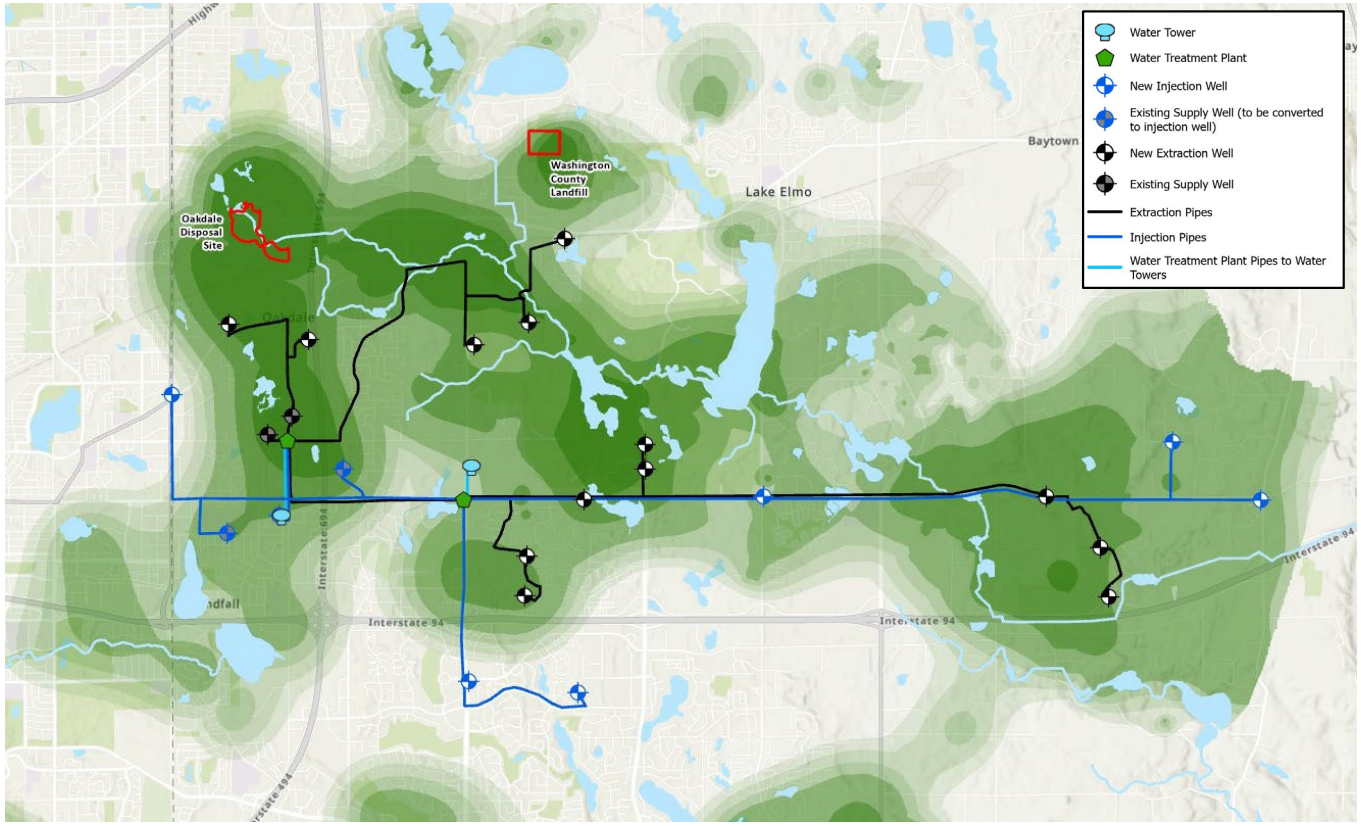
Recommendation:

1. Limit public exposure to impacted sediment
2. Do not remediate sediment at this time
3. Monitor sediment and downstream surface water PFAS concentrations after surface water from ODS is addressed

Reasons to Re-Evaluate in the Future:

1. If monitoring data shows significant long-term leaching of PFAS into surface water and/or groundwater
2. Additional consideration of ecological receptors

Site-Wide Recommendation: Multi-Benefit Well Array



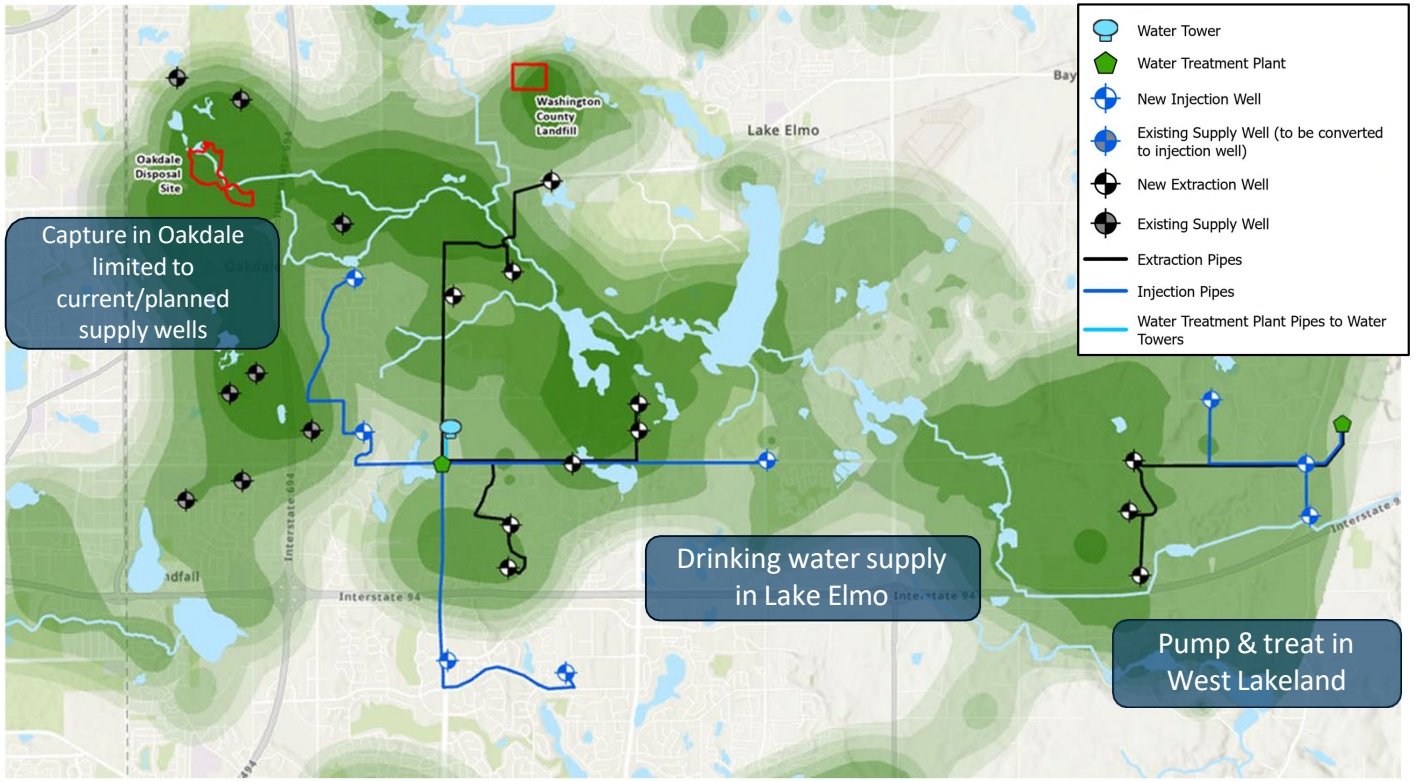
Extract groundwater from areas with high concentrations downgradient of source areas and points of infiltration

Treat to drinking water standards and distribute to Cities of Oakdale and Lake Elmo

Inject remaining water to Jordan aquifer to enhance plume capture to reduce migration

Well array may be adjusted based on stakeholder input and changes in drinking water demand

Localized MBWA and Pump & Treat (Secondary Recommendation)



Treat water in central area of plume to drinking water standards and distribute to City of Lake Elmo with remaining water injected

Separate groundwater pump and treat system in West Lakeland where all water would be injected to enhance plume capture

Hydraulic control in Oakdale is more limited and relies on municipal supply wells for partial plume capture.

Well array may be adjusted based on stakeholder input and changes in drinking water demand

Multi-Benefit Well Array vs Non-Drinking Water Pump and Treat

	MBWA	Pump and Treat
Cost	Higher capital cost	Lower individual project cost, duplicative efforts in treating water for both supply and remediation
Plume Control	These alternatives have more direct management over regional plume migration	Regional regulatory body has less hydraulic control over plume migration, which is impacted by changes in municipal well pumping; installation of additional wells may be required in response to regional changes in pumping
Water Use	Treated water would be used for both drinking water and injection into the aquifer for plume control	Water would be treated to PFAS drinking water standards and immediately injected back into the aquifer for plume control
Community Coordination and System Operations	Requires coordination between a new administrative body and municipalities for implementation and operations	New administrative body could operate apart from municipalities to install and operate treatment system
Treatment Options	Requires NSF 61 Certification	Does not require NSF 61 Certification

Evaluation of Treatment Technologies

- Technologies considered: foam fractionation, granular activated carbon, ion exchange, reverse osmosis
- Utilized treatability studies to evaluate effectiveness and estimate costs
  - Surface active foam fractionation (SAFF®)
  - Granular activated carbon and ion exchange column studies
- Additional pilot studies required to better refine costs and understand treatment efficiency across Site
- Selection of technology will greatly impact costs
  - Potential use of multiple technologies resulted in a large range of total costs for each alternative
  - Technologies with higher capital costs tend to have lower operating costs

Cost Comparison

	Estimated Capital Costs	Estimated Yearly Operating Costs
Only Drinking Water Treatment	$148M to $187M	$4.2M to $8.3M
Non-Source Zone Treatment		
Primary Recommendation	$210M to $356M	$10.8M to $39.8M
Secondary Recommendation	$181M to $308M	$10.0M to $29.2M
Source Zone Treatment (Same for both Primary & Secondary Recommendations)		
WCL Pump & Treat	$17M to $49M	$1.5M to $44.4M

Costs do not include additional treatment at ODS, assumed 3M will address

What is not addressed by this Feasibility Study

Under the settlement, the Project 1007 FS was directed at protecting drinking water aquifers for current and future use.

A typical FS would also address the following:

- Ecological receptors
  - Additional sediment and surface water treatment required
- Other ways humans could be impacted by PFAS
  - Fish consumption
  - Swimming
  - Contact with foam
  - Contact with sediment

Next Steps

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Data Gaps

Additional source area investigations to determine extent of ongoing PFAS migration

Additional delineation of plume

Pilot scale testing to evaluate specific treatment technologies and further refine cost estimates

Injection capacity of Jordan Aquifer

Moving Towards Remediation

Work with stakeholder to finalize remediation approach

Coordinate with impacted communities to integrate remediation with existing infrastructure

Develop regional MBWA management strategy

Work with DNR to determine potential impacts to White Bear Lake