Project 1007 Feasibility Study Recommendation

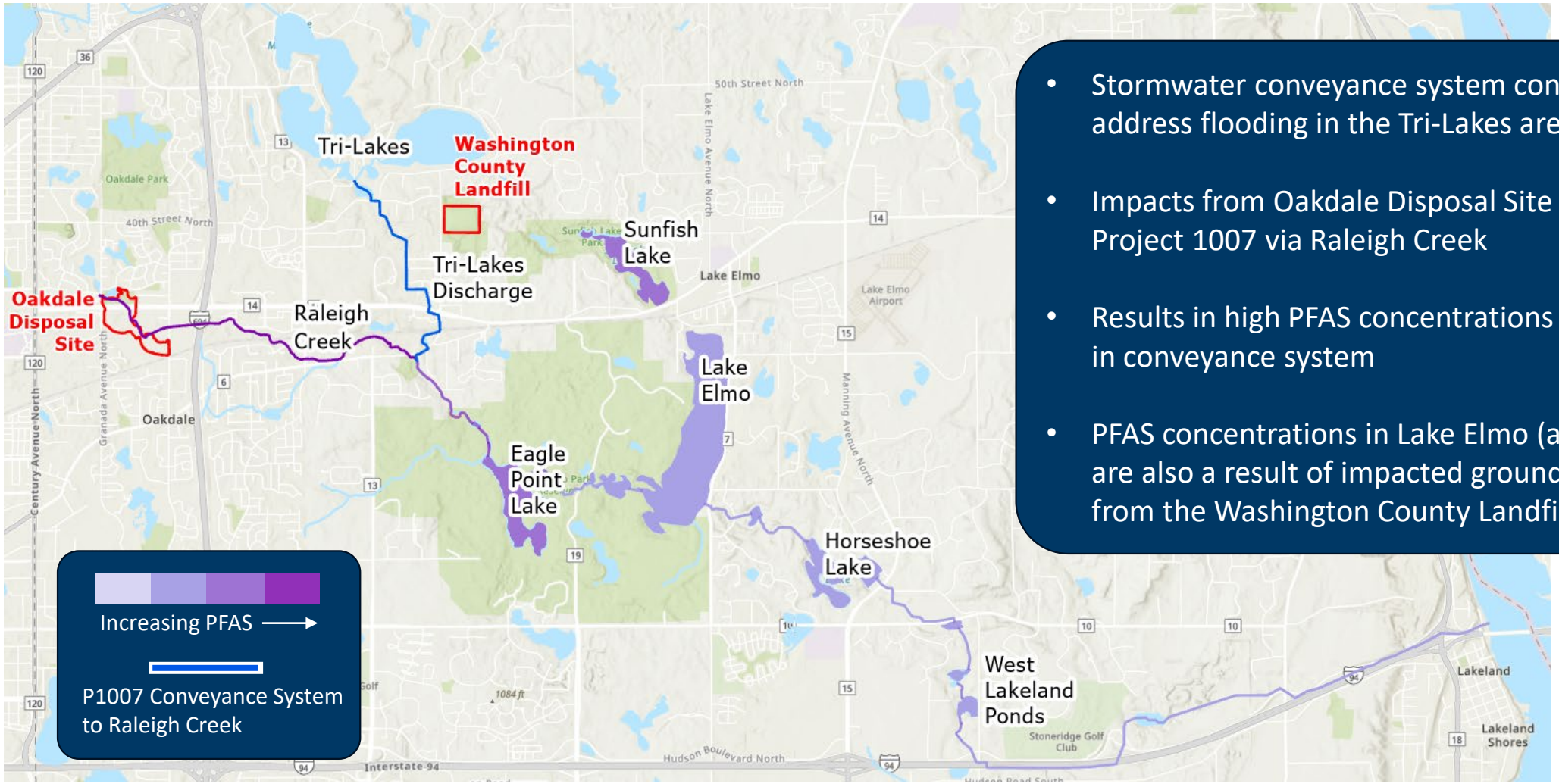
East Metro Unit

Minnesota Pollution Control Agency

February 4, 2024

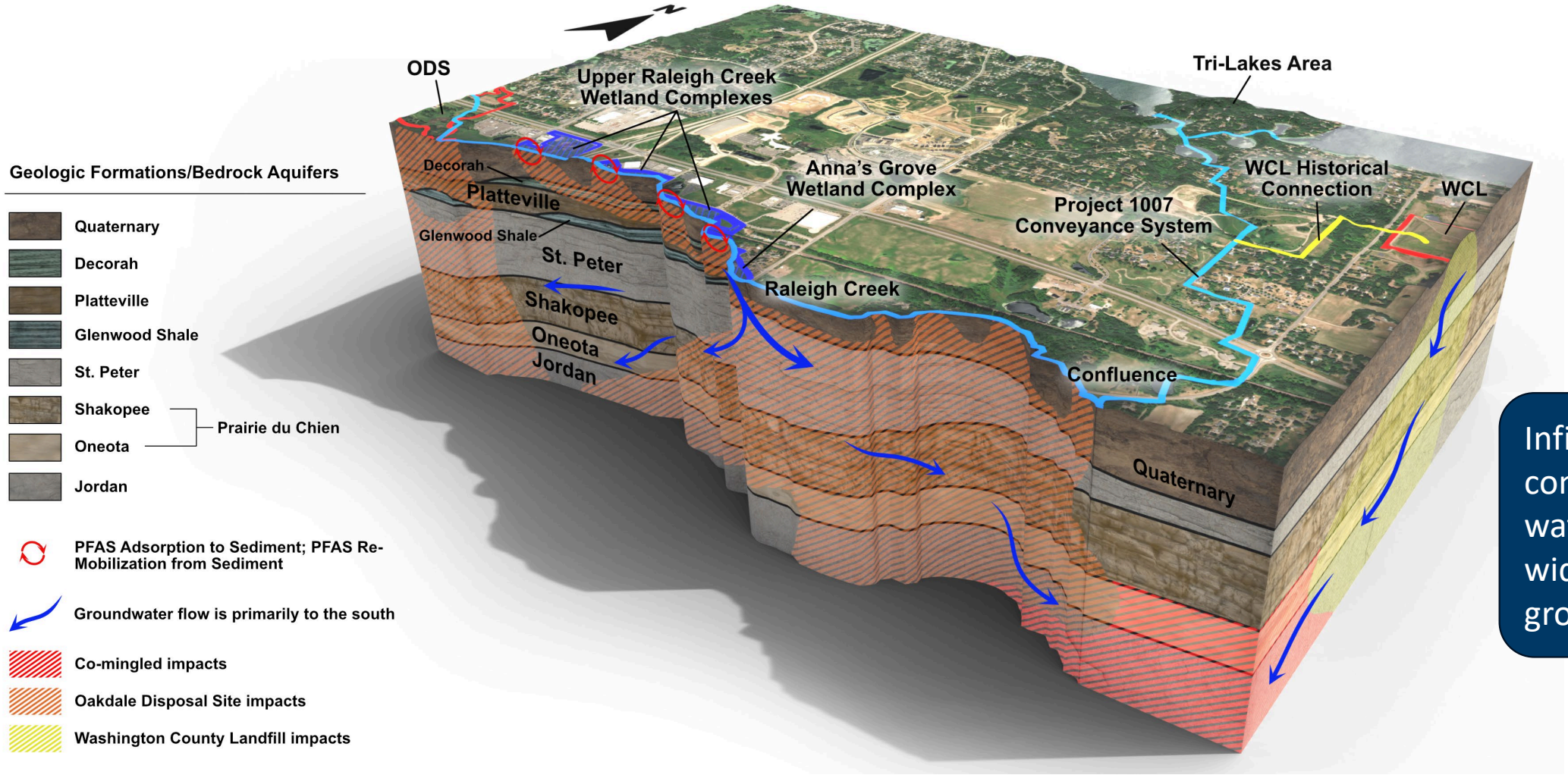
AECOM

Project 1007 Overview



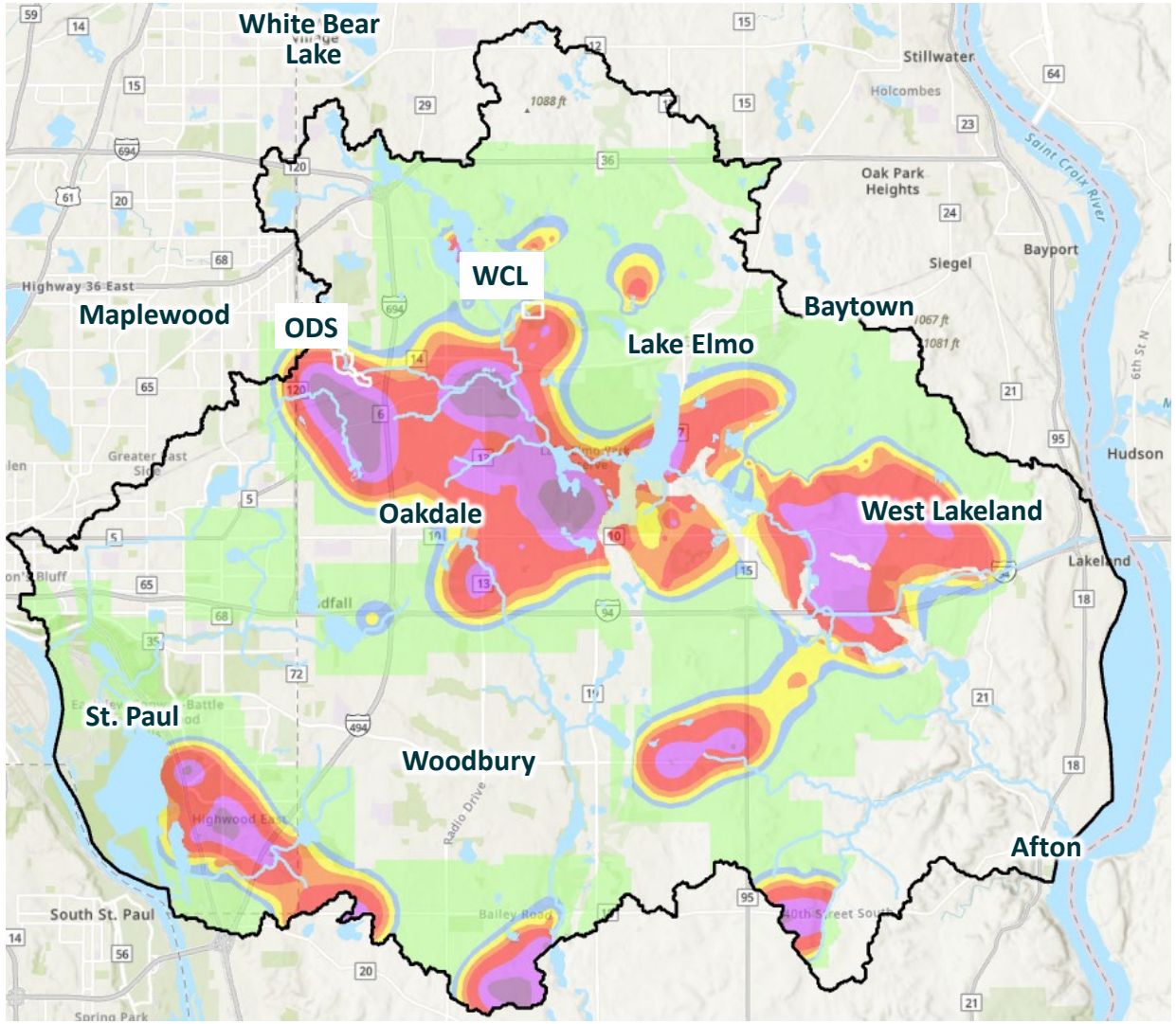
- Stormwater conveyance system constructed to address flooding in the Tri-Lakes area
- Impacts from Oakdale Disposal Site are discharged to Project 1007 via Raleigh Creek
- Results in high PFAS concentrations in surface water in conveyance system
- PFAS concentrations in Lake Elmo (and downstream) are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

Project 1007 Surface Water to Groundwater Migration

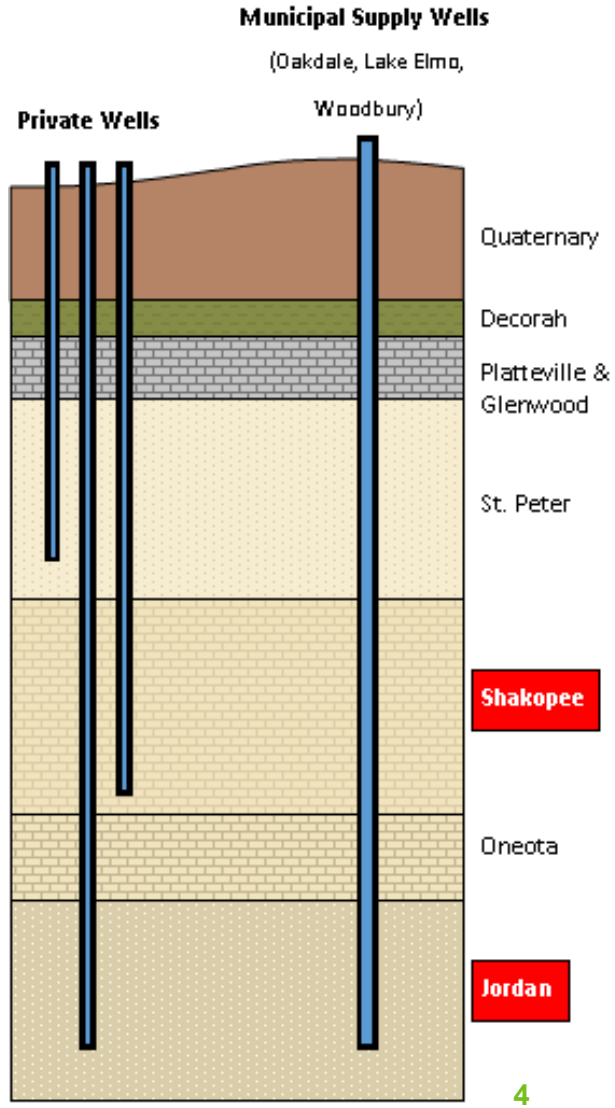


Infiltration from contaminated surface water has resulted in widespread groundwater impacts

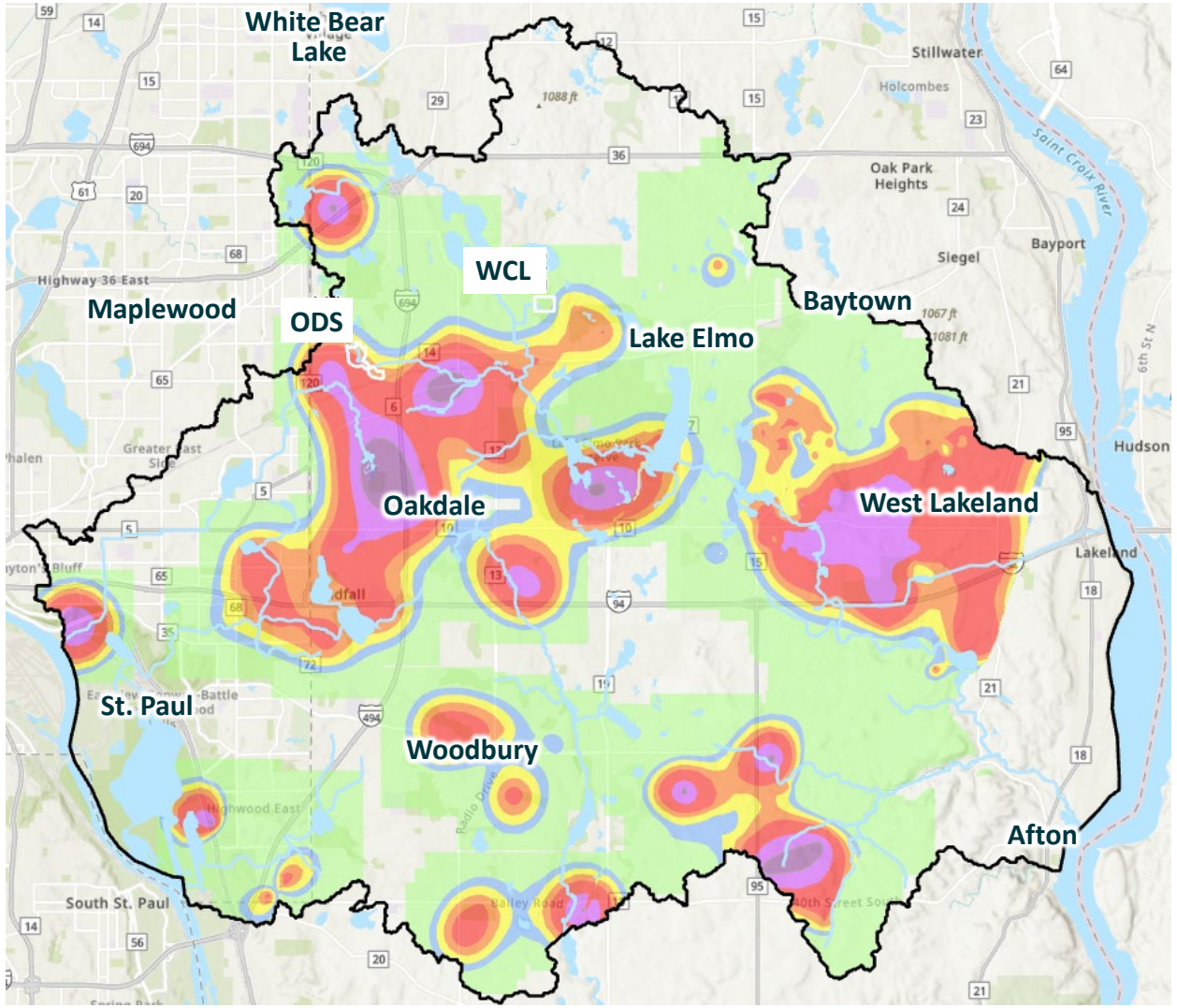
PFOS Groundwater Impacts – Shakopee Aquifer



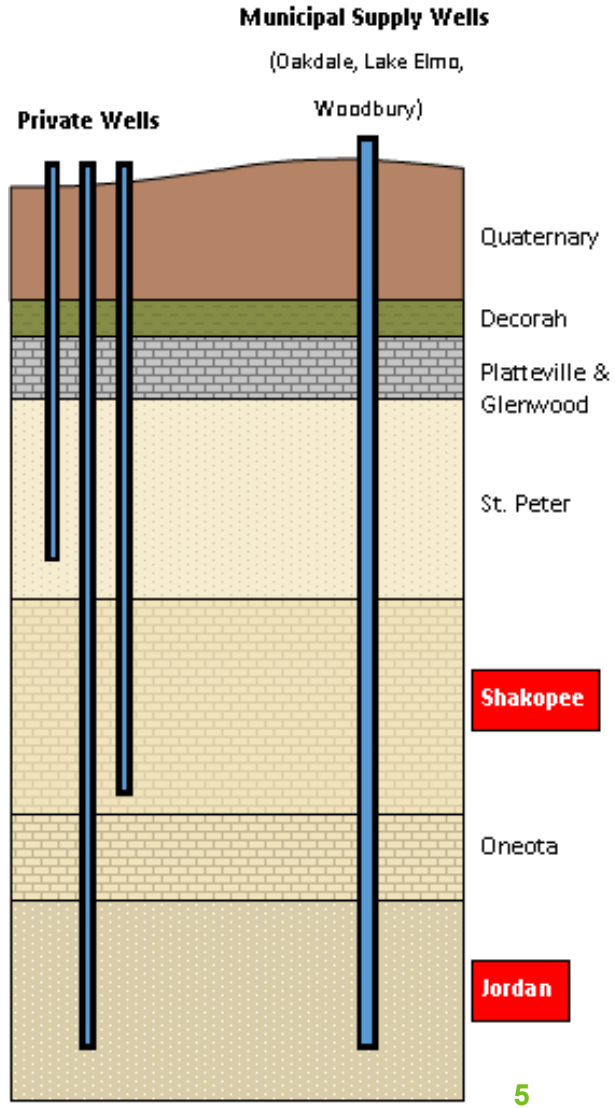
>300 ng/L	MDH Health Risk Limit
75 – 299 ng/L	
15 – 74.9 ng/L	
7.6 – 14.9 ng/L	
4 – 7.59 ng/L	EPA Maximum Contaminant Level
2.3 – 3.9 ng/L	MDH Health-Based Value
Below 2.3 ng/L	



PFOS Groundwater Impacts – Jordan Aquifer



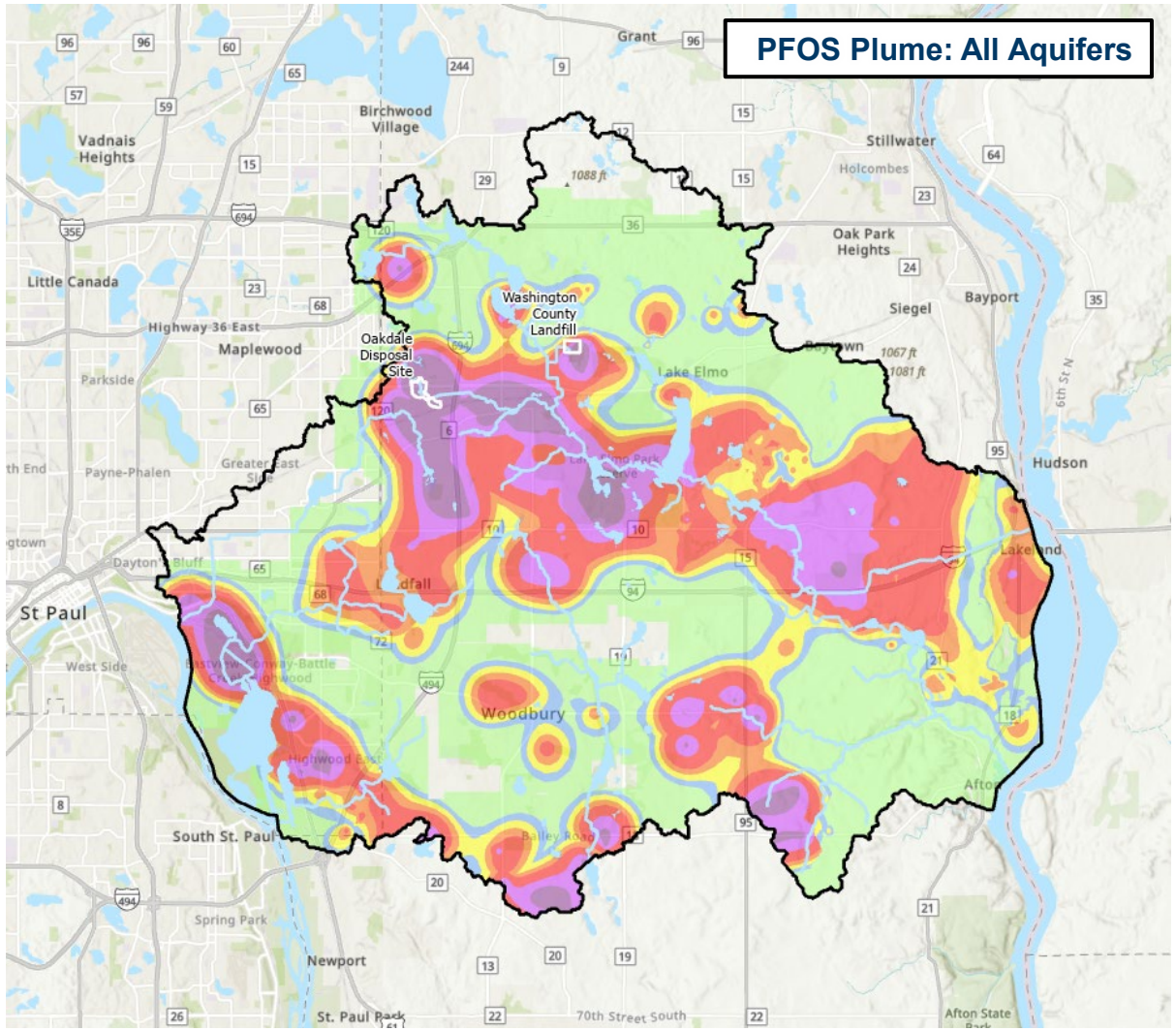
- >300 ng/L → MDH Health Risk Limit
- 75 – 299 ng/L
- 15 – 74.9 ng/L
- 7.6 – 14.9 ng/L
- 4 – 7.59 ng/L → EPA Maximum Contaminant Level
- 2.3 – 3.9 ng/L → MDH Health-Based Value
- Below 2.3 ng/L



Feasibility Study = Recommends 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 (currently in Draft stage)



Two Active Source Areas

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, there is not 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

Site Wide Remedial Alternatives

		Groundwater Pump and Treatment+				Drinking Water Supply		Other Media	
	Alternative	Shallow WCL Impacts	Bedrock Impacts from EPL+RC / WCL Bedrock AOC	Bedrock Impacts in West Lakeland	Bedrock Impacts South of ODS	Lake Elmo	Oakdale	Sediment Access Restrictions	Passive Surface Water Treatment
No Drinking Water Supply	1	✗	✗	✗	✗	✗	✗	✗	✗
	2	✓	✗	✗	✗	✗	✗	✓	✗
	3	✓	✗	✗	✗	✗	✗	✓	✓
	4	✓	✓	✓	✗	✗	✗	✓	✓
Drinking Water Supply	5	✓	✓	✗	✗	✓	✗	✓	✓
	6	✓	✓	✓*	✗	✓	✗	✓	✓
	7	✓	✓	✓*	✓	✓	✓	✓	✓
	8	✓	✓	✓	✓	✓	✓	✓	✓

WCL: Washington County Landfill
EPL: Eagle Point Lake
RC: Raleigh Creek
ODS: Oakdale Disposal Site

** Indicates separate West Lakeland pump and treat system not connected to MBWA.*
+ Groundwater pump and treat would still be required to reduce plume migration even if communities converted to surface water.

Differences Between Alternatives

		Groundwater Pump and Treatment				Drinking Water Supply		Other Media	
	Alternative	Shallow WCL Impacts	Bedrock Impacts from EPL+RC / WCL Bedrock AOC	Bedrock Impacts in West Lakeland	Bedrock Impacts South of ODS	Lake Elmo	Oakdale	Sediment Access Restrictions	Passive Surface Water Treatment
No Drinking Water Supply	1	✗	✗	✗	✗	✗			
	2	✓	✗	✗	✗				
	3								
	4								
Drinking Water Supply	5					✓	✗	✓	✓
	6					✓	✗	✓	✓
	7	✓	✓	✓*	✓	✓	✓	✓	✓
	8	✓	✓	✓	✓	✓	✓	✓	✓

Different uses of the treated water (injection back to ground vs drinking water supply and injection)

Varying levels of plume control (where treatment would occur)

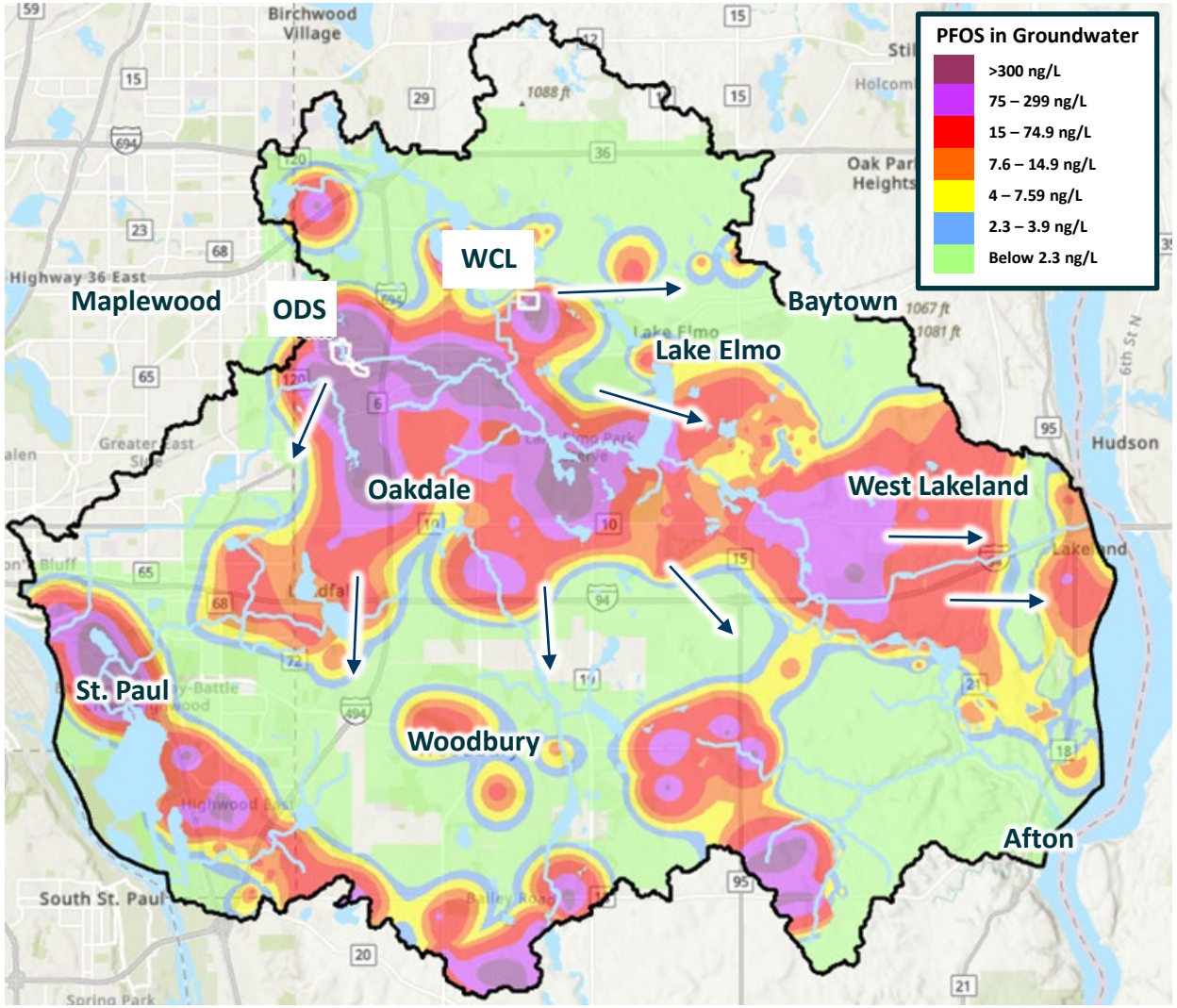
Site Wide Remedial Alternatives

		Groundwater Pump and Treatment				Drinking Water Supply		Other Media	
	Alternative	Shallow WCL Impacts	Bedrock Impacts from EPL+RC / WCL Bedrock AOC	Bedrock Impacts in West Lakeland	Bedrock Impacts South of ODS	Lake Elmo	Oakdale	Sediment Access Restrictions	Passive Surface Water Treatment
No Drinking Water Supply	1	✗	✗	✗	✗	✗	✗	✗	✗
	2	✓	✗	✗	✗	✗	✗	✓	✗
	3	✓	✗	✗	✗	✗	✗	✓	✓
	4	✓	✓	✓	✗	✗	✗	✓	✓
Drinking Water Supply	5	✓	✓	✗	✗	✓	✗	✓	✓
	6	✓	✓	✓*	✗	✓	✗	✓	✓
	7	✓	✓	✓*	✓	✓	✓	✓	✓
	8	✓	✓	✓	✓	✓	✓	✓	✓

WCL: Washington County Landfill
EPL: Eagle Point Lake
RC: Raleigh Creek
ODS: Oakdale Disposal Site

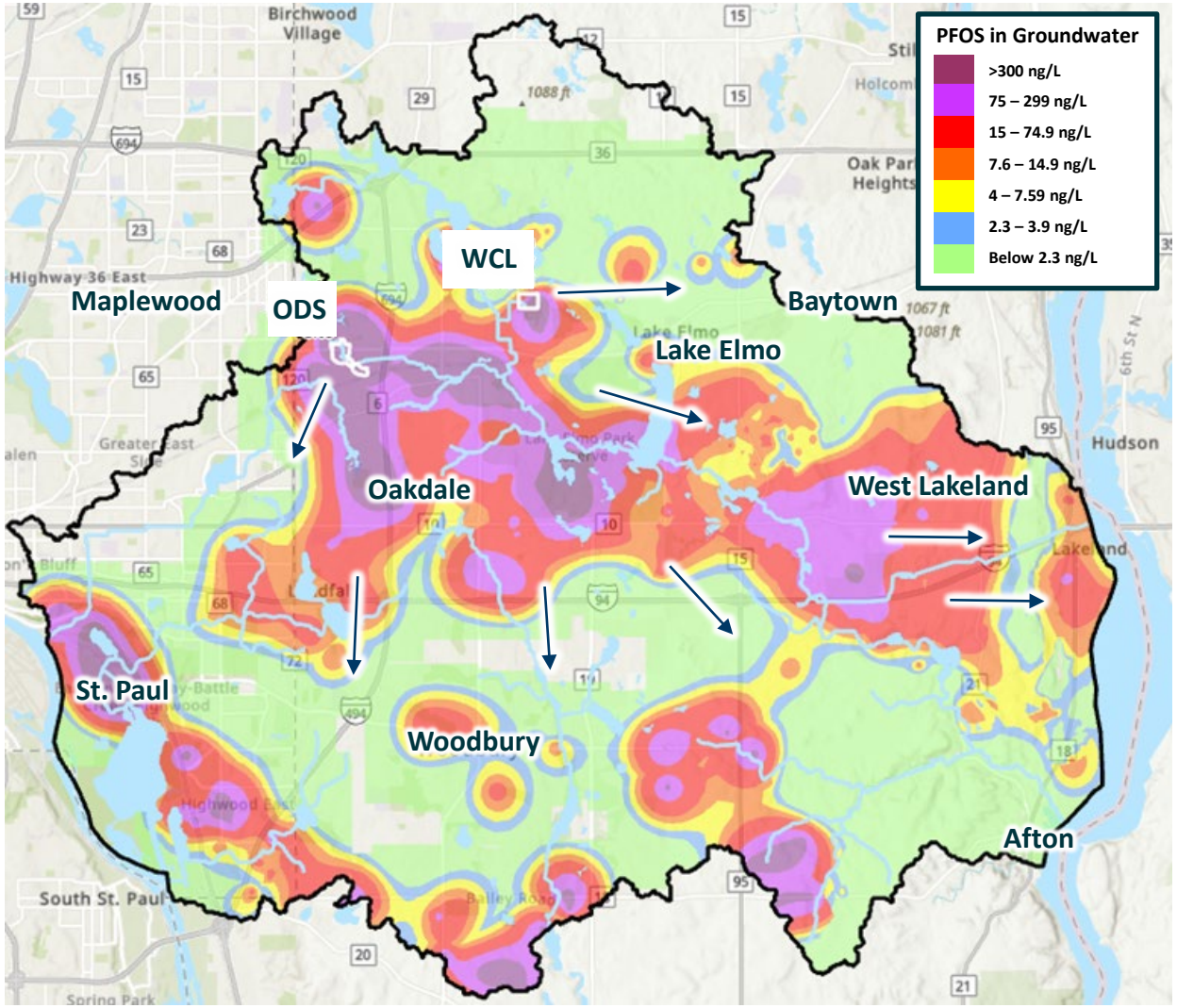
** Indicates separate West Lakeland pump and treat system not connected to MBWA.*

Alternative 1: No Further Action



- Washington County Landfill PFAS potentially migrate:
  - Into Lake Elmo, impacting West Lakeland
  - East towards private and municipal supply wells
- Oakdale Disposal Site PFAS migrate south, southeast, and southwest with partial capture by Oakdale supply wells
- Raleigh Creek and Eagle Point Lake impacts:
  - Migrate towards Woodbury Tamarack Well Field
  - Migrate east/southeast towards private wells
- West Lakeland impacts migrate east and northeast to affect additional communities and private wells
- Increased O&M costs for communities downgradient of source areas and secondary source areas as PFAS continues to move

Alternative 1: No Further Action Costs



Oakdale Costs
CapEx: $38-51M
25 yr OpEx: $44-87M

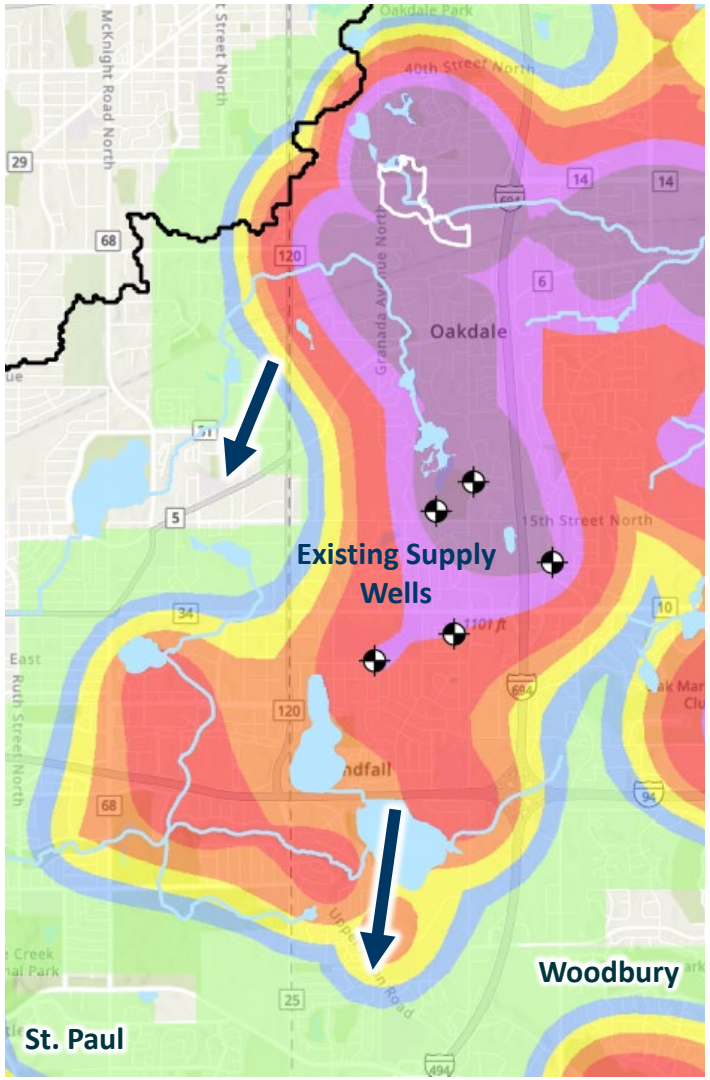
Lake Elmo Costs
CapEx: $105-130M
25 yr OpEx: $24-48M

Additional costs from PFAS migration to other communities

CapEx cost estimates have been provided by the MPCA. Low end OpEx costs are derived from the CDWSP and adjusted for inflation. High end OpEx costs attempt to account for uncertainty with increased cost and usage of GAC.
These costs are likely underestimates.

No Further Action and Transition of Oakdale Municipal Supply to Surface Water

- Existing Oakdale Supply Wells contribute to the capture of high concentration PFAS impacts.
- A transition to surface water supply in Oakdale and cessation of pumping from these wells would allow high concentration impacts to migrate south uninhibited.
- Groundwater pumping and treatment would still be required for hydraulic control and PFAS extraction to reduce plume migration



Feasibility Study Recommendation: Alternative 8

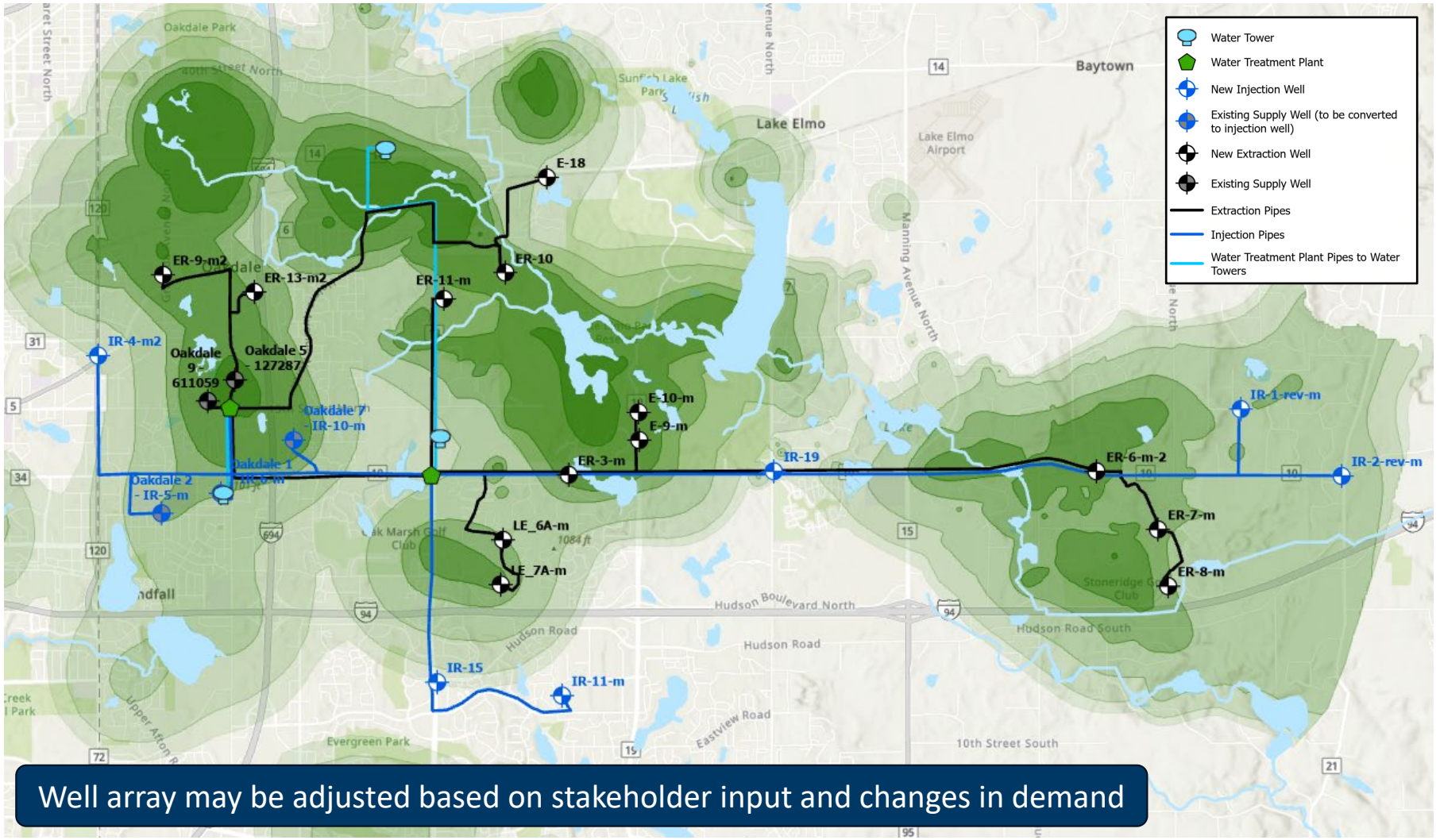
Multi-Benefit Well Array
Extraction in Oakdale, Lake Elmo, and West Lakeland
Municipal supply to Oakdale and Lake Elmo

Washington County Landfill Source Zone Treatment

Surface Water Permeable Adsorptive Barriers

Sediment Access Restrictions

Site-Wide Recommendation: Multi-Benefit Well Array



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

Wells to Turn Off:
Lake Elmo Wells 2 and 4, Oakdale Wells 10 and 3

Wells to Keep Off:
Oakdale Wells 6 and 8

Wells to Repurpose:
Oakdale Wells 1, 2, 7, 5, and 9
Possibly Lake Elmo 3

New Extraction Wells: 13

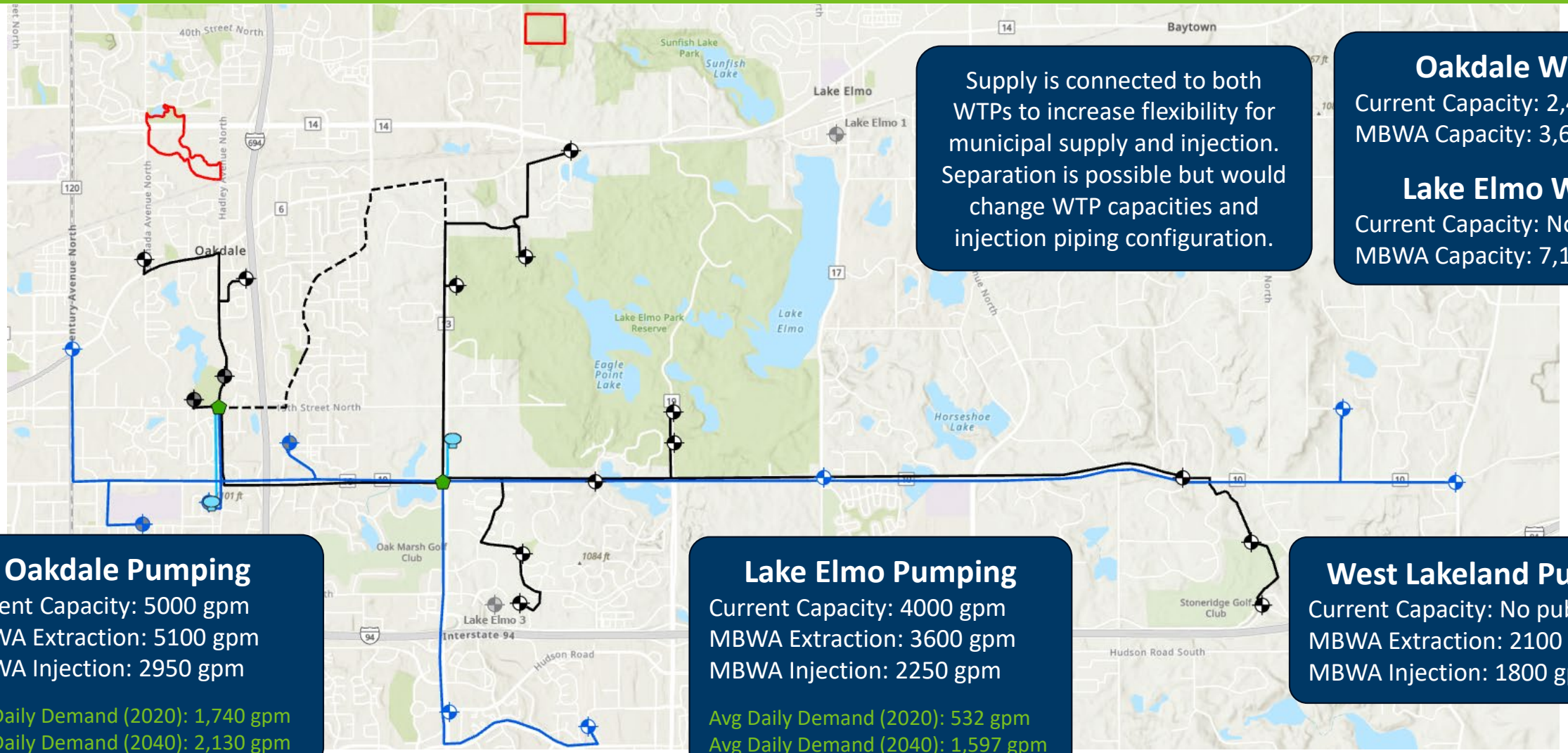
New Injection Wells: 5

Total Pipe Length: 189,400 feet

Costs

CapEX: $200 - $367M
OpEX: Requires pilot studies, currently estimated at $4.2 to $8.1M

MBWA Water Balance



Supply is connected to both WTPs to increase flexibility for municipal supply and injection. Separation is possible but would change WTP capacities and injection piping configuration.

Oakdale WTP

Current Capacity: 2,400 gpm
MBWA Capacity: 3,600 gpm

Lake Elmo WTP

Current Capacity: No plant
MBWA Capacity: 7,100 gpm

Oakdale Pumping

Current Capacity: 5000 gpm
MBWA Extraction: 5100 gpm
MBWA Injection: 2950 gpm

Avg Daily Demand (2020): 1,740 gpm
Avg Daily Demand (2040): 2,130 gpm

Lake Elmo Pumping

Current Capacity: 4000 gpm
MBWA Extraction: 3600 gpm
MBWA Injection: 2250 gpm

Avg Daily Demand (2020): 532 gpm
Avg Daily Demand (2040): 1,597 gpm

West Lakeland Pumping

Current Capacity: No public supply
MBWA Extraction: 2100 gpm
MBWA Injection: 1800 gpm

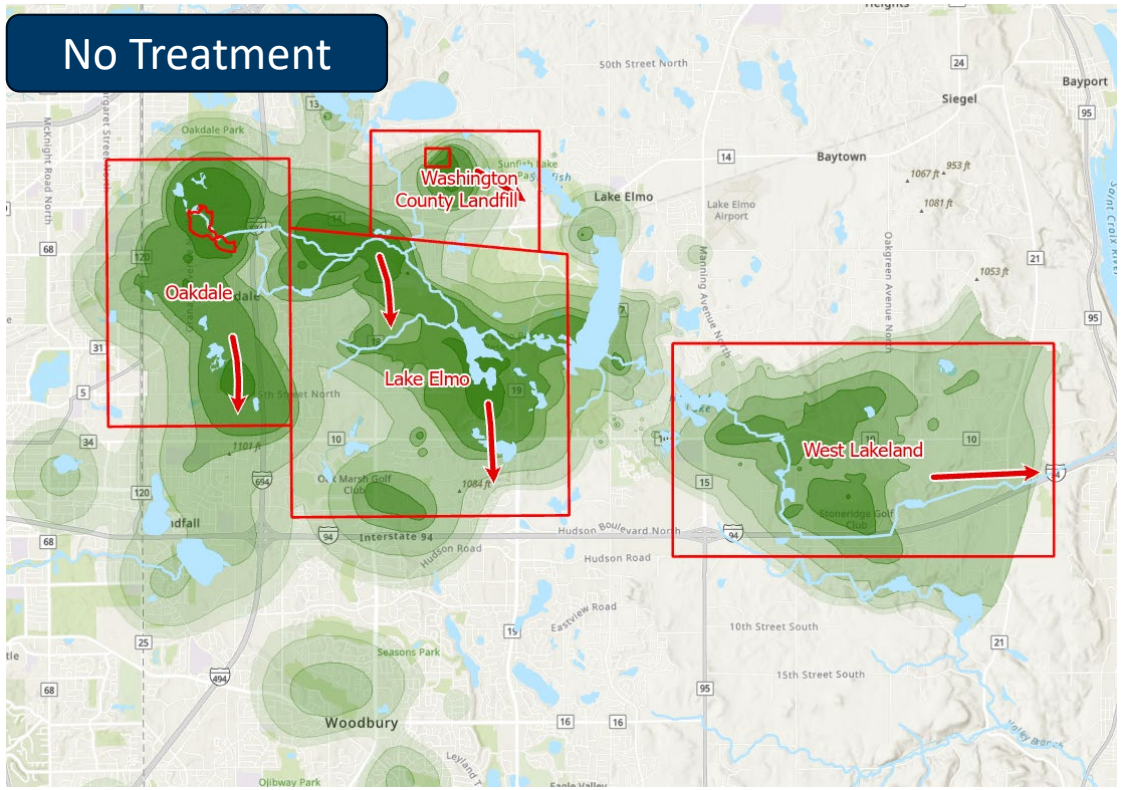
Why was this alternative recommended?

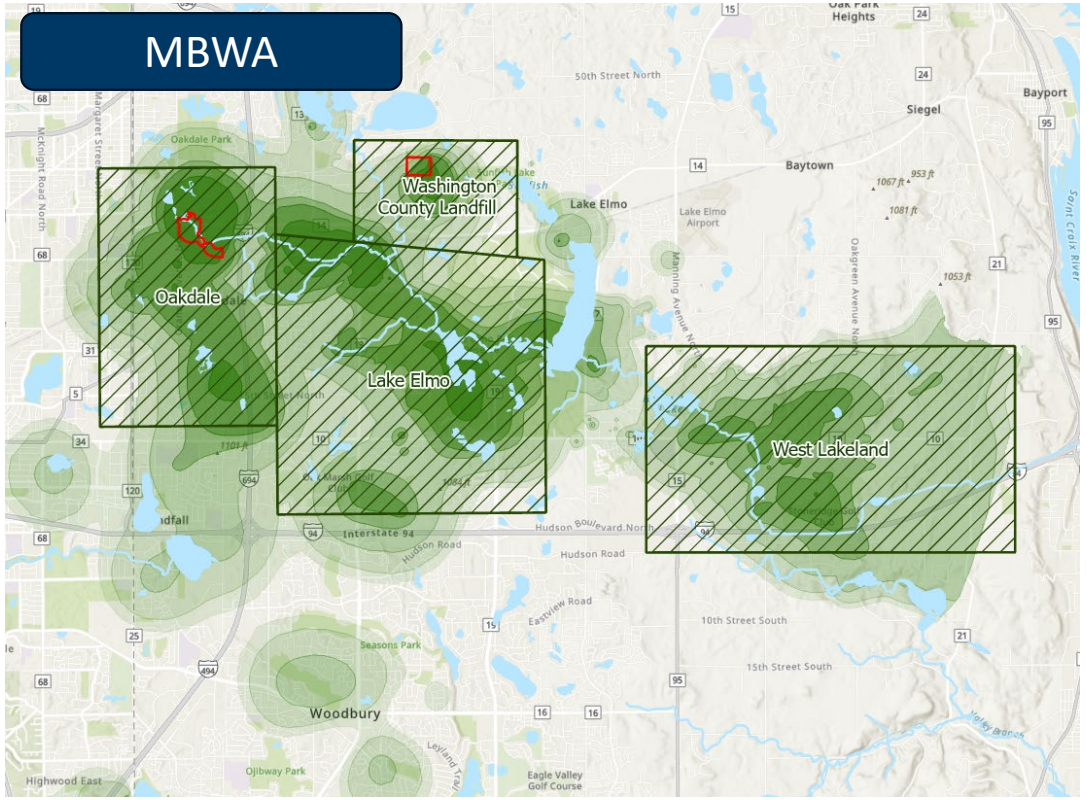
Provides plume control across the entire site

- Provides protection to Woodbury, Afton, Baytown, and other downgradient communities
- Result in reduced O&M for downgradient communities

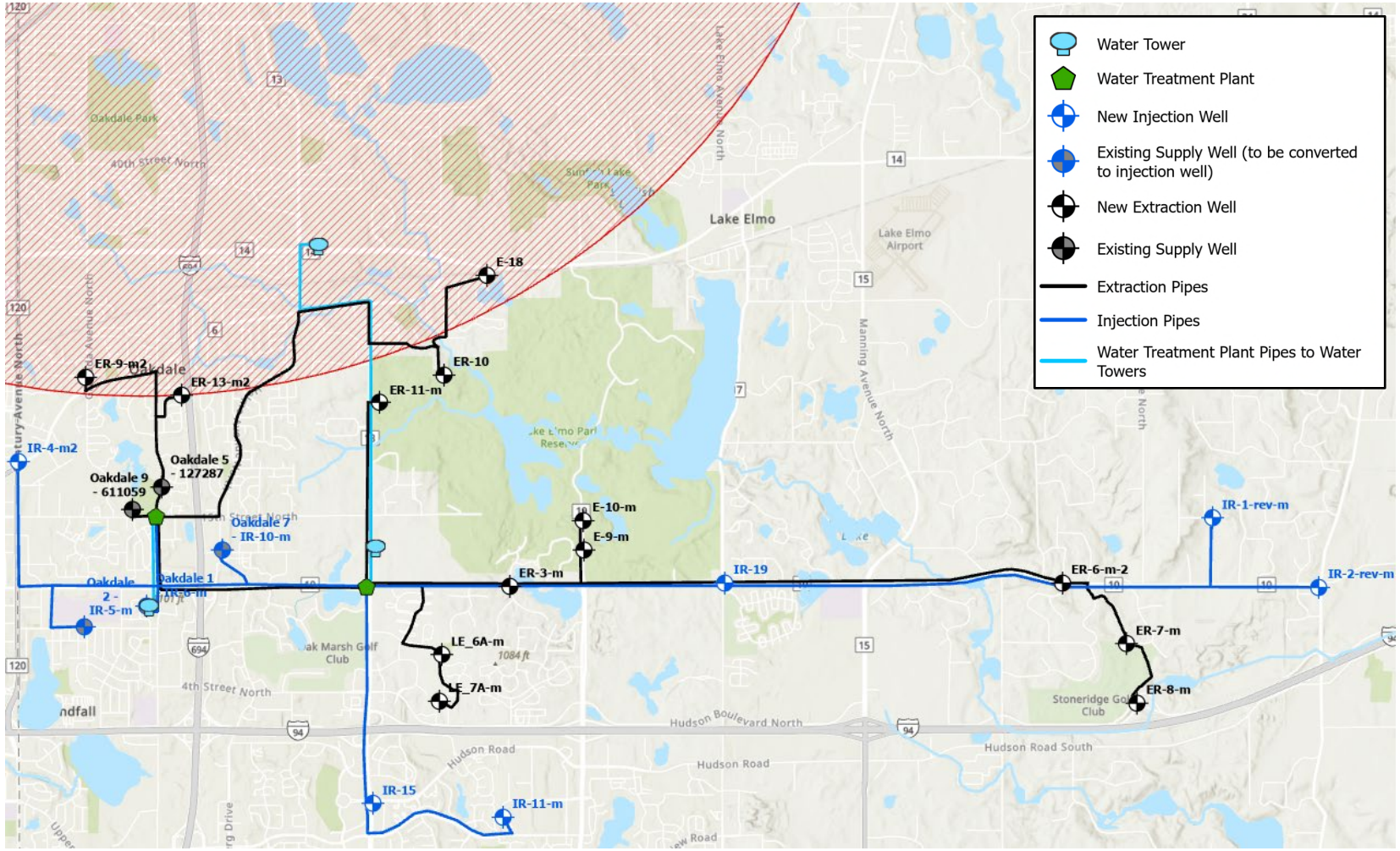
Protection of Lake Elmo and surface water bodies downgradient

Beneficial reuse of the water which could limit overall costs and improve sustainability





Multi-Benefit Well Array and White Bear Lake



*Model results are dependent on model assumptions and subject to uncertainty.

Preliminary DNR Modeling Results:

Compared MBWA to current use scenario

- Maximum stage difference: +0.24 ft
- Stage difference at time step with lowest lake stage: +0.18 ft
- Average stage difference (2008-2015): +0.18 ft

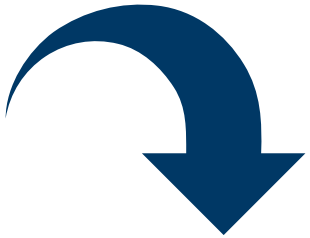
In summary: White Bear Lake levels may increase, likely because northern Oakdale and Lake Elmo supply wells would be turned off.

Extraction wells shown within or near the 5-mile radius could be adjusted as-needed. Current configuration were determined by access and may change.

MBWA Potential Next Steps

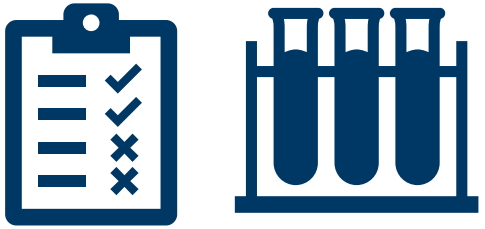
Injection Wells:

- Permitting and approval
- Water quality assessment
- Injection capacity pilot studies



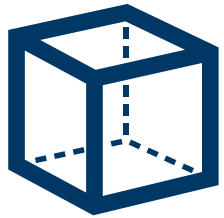
Treatment:

- Rapid Small-Scale Column Studies (RSSCTs) to improve costs estimates for media consumption
- Bench scale studies to determine optimal pretreatment
- Work with communities to incorporate into existing drinking water systems and infrastructure



Modeling:

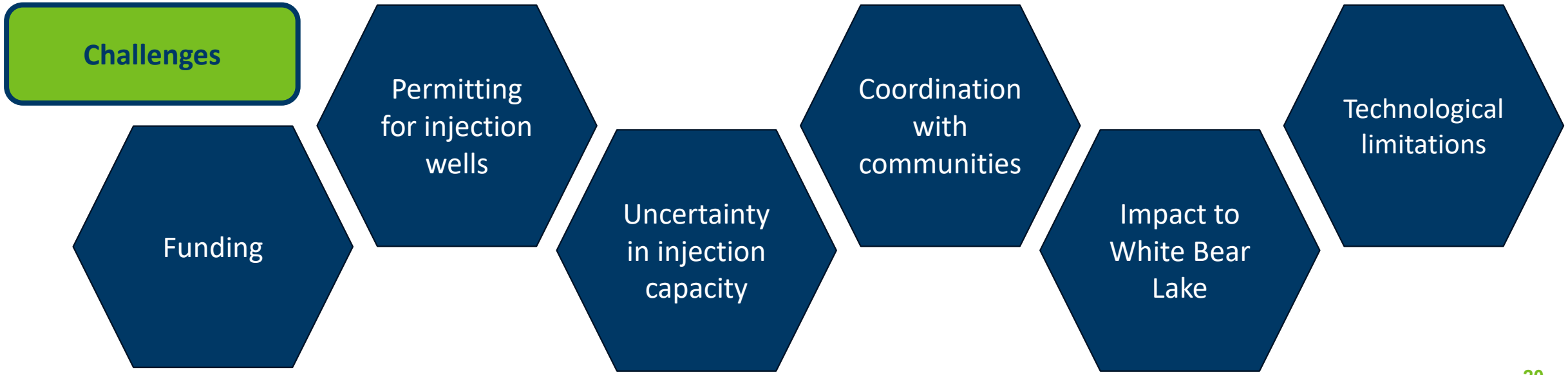
- Determine required changes to well network to meet 2050 demand
- Evaluate particle tracking
- Determine impacts to White Bear Lake



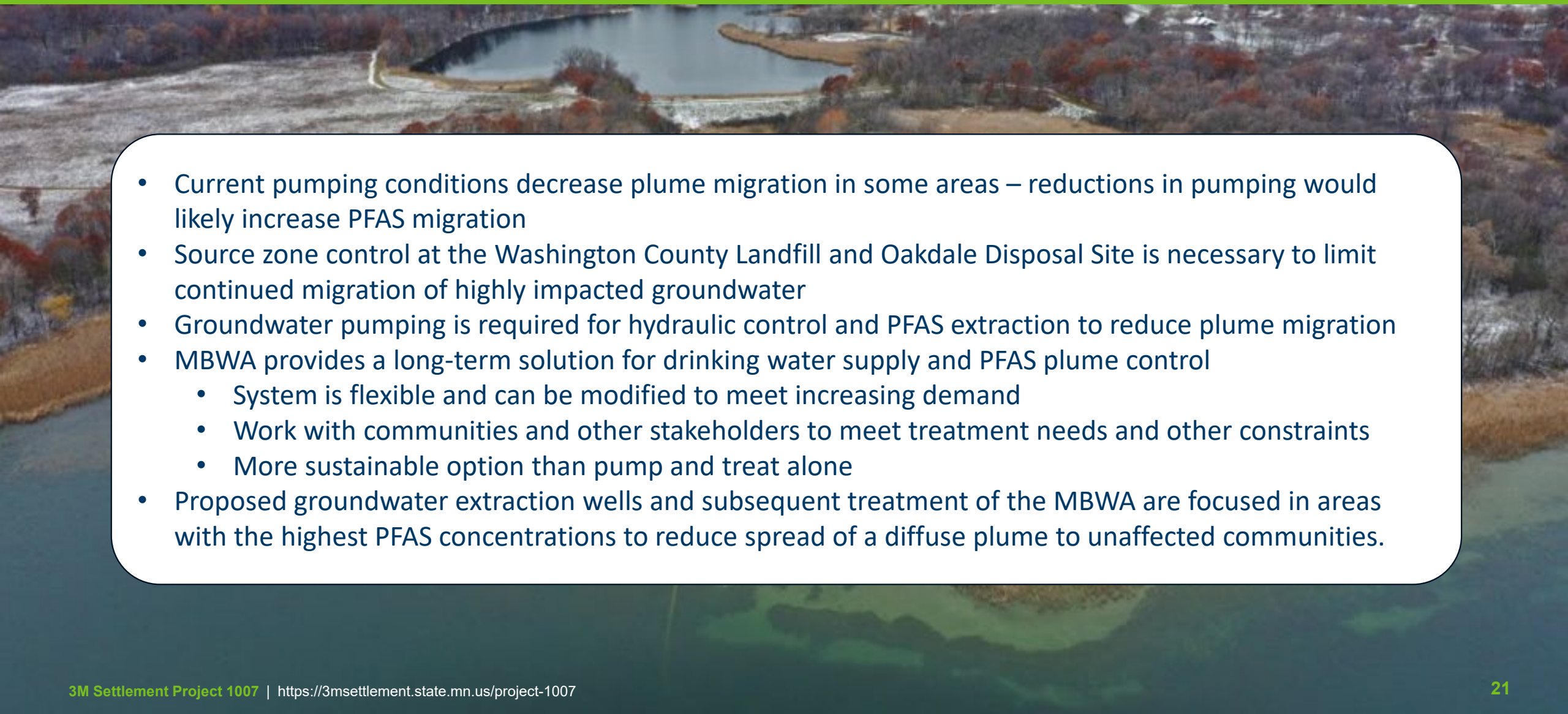
Implementation

The MBWA is a recommendation of this Feasibility Study (draft) and a final decision will be documented in a Record of Decision.

A staged approach to well installation and treatment plant construction would meet community demand during implementation.



Conclusions



- Current pumping conditions decrease plume migration in some areas – reductions in pumping would likely increase PFAS migration
- Source zone control at the Washington County Landfill and Oakdale Disposal Site is necessary to limit continued migration of highly impacted groundwater
- Groundwater pumping is required for hydraulic control and PFAS extraction to reduce plume migration
- MBWA provides a long-term solution for drinking water supply and PFAS plume control
  - System is flexible and can be modified to meet increasing demand
  - Work with communities and other stakeholders to meet treatment needs and other constraints
  - More sustainable option than pump and treat alone
- Proposed groundwater extraction wells and subsequent treatment of the MBWA are focused in areas with the highest PFAS concentrations to reduce spread of a diffuse plume to unaffected communities.