



Wisconsin Section
American Water Works Association



Navigating New Waters: Designing and Permitting a New Drinking Water Supply System

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Waukesha Water Utility

SERVING WAUKESHA SINCE 1918



**GREAT WATER
ALLIANCE™**



GREELEY AND HANSEN

GREAT WATER ALLIANCE PROGRAM DRIVERS

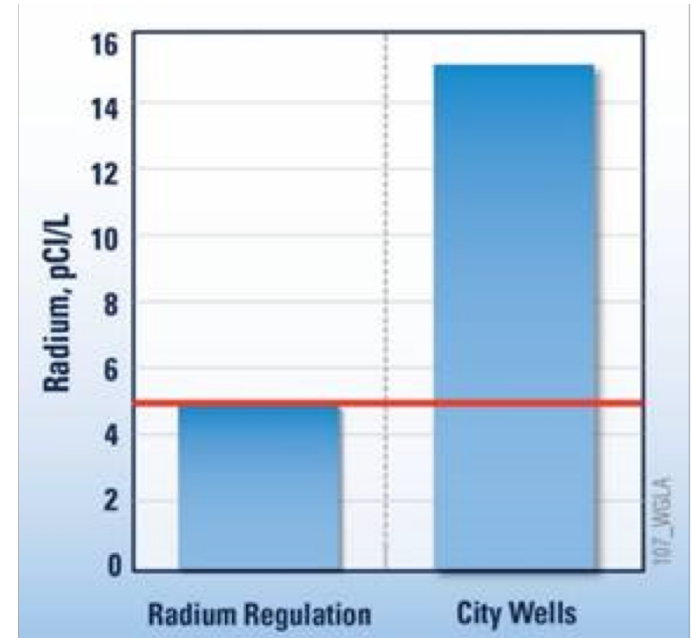
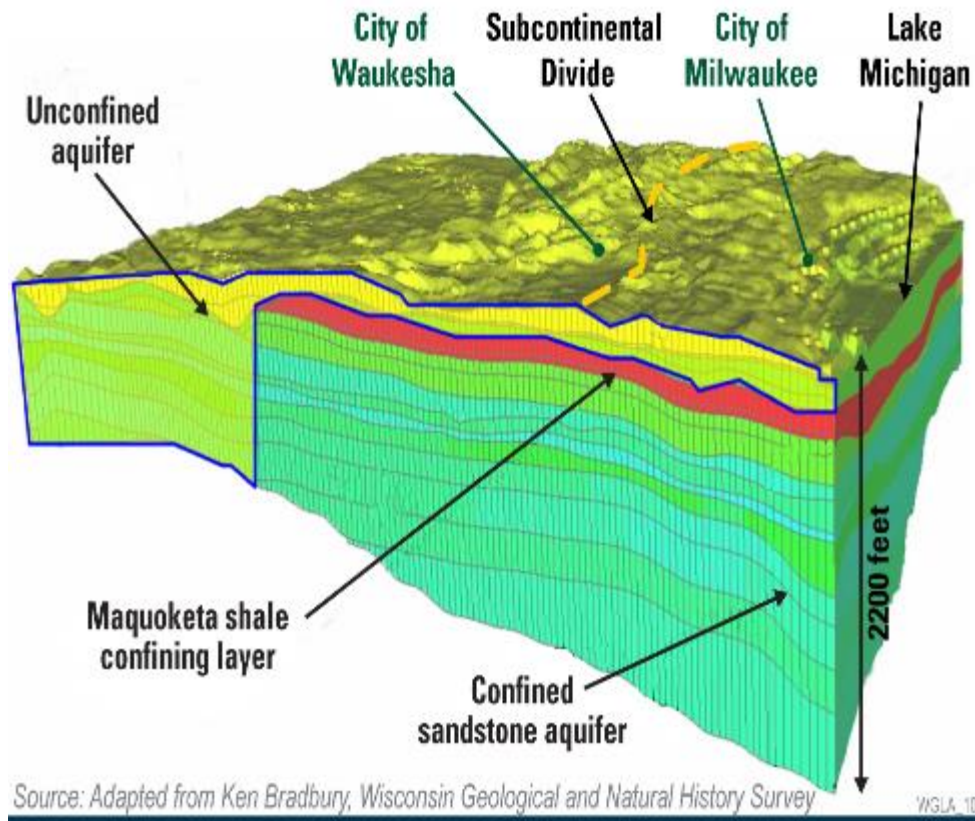


Waukesha Water Utility
SERVING WAUKESHA SINCE 1886

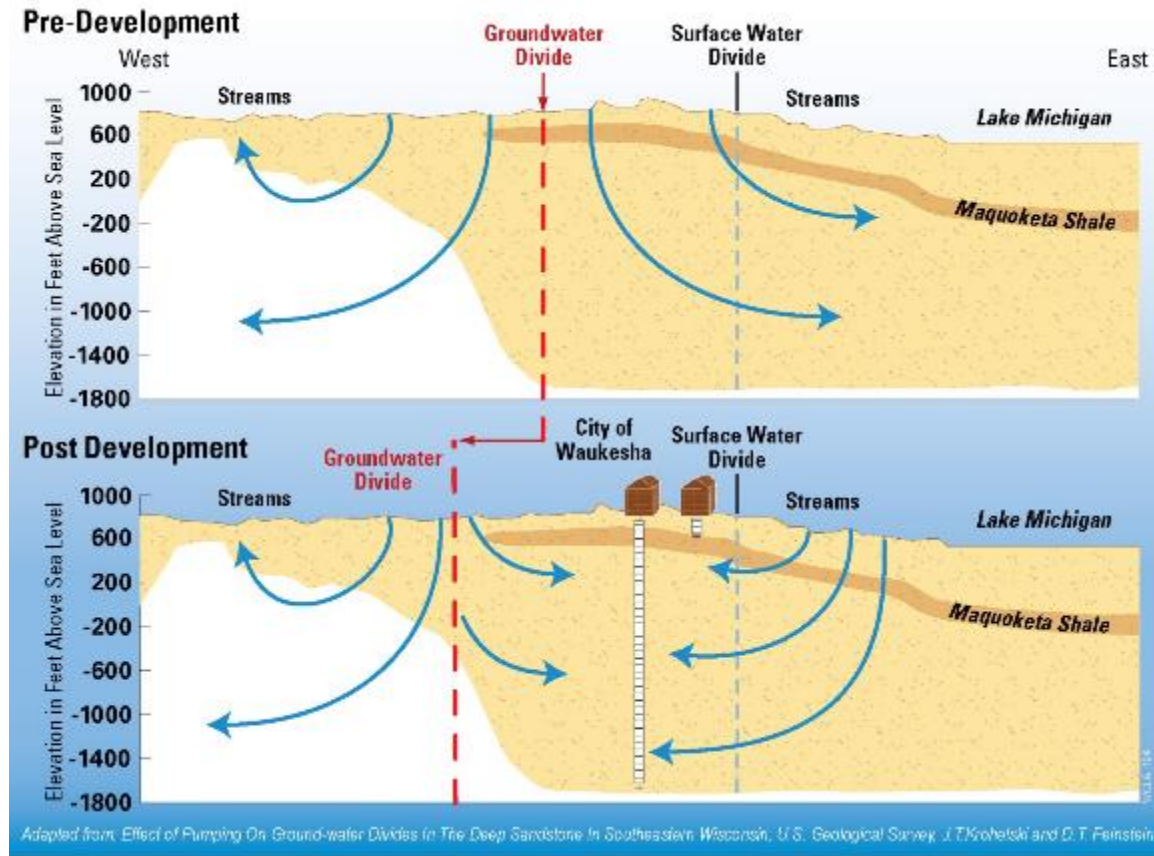


GREELEY AND HANSEN

Deep aquifer replenishment is very slow due to shale confining layer

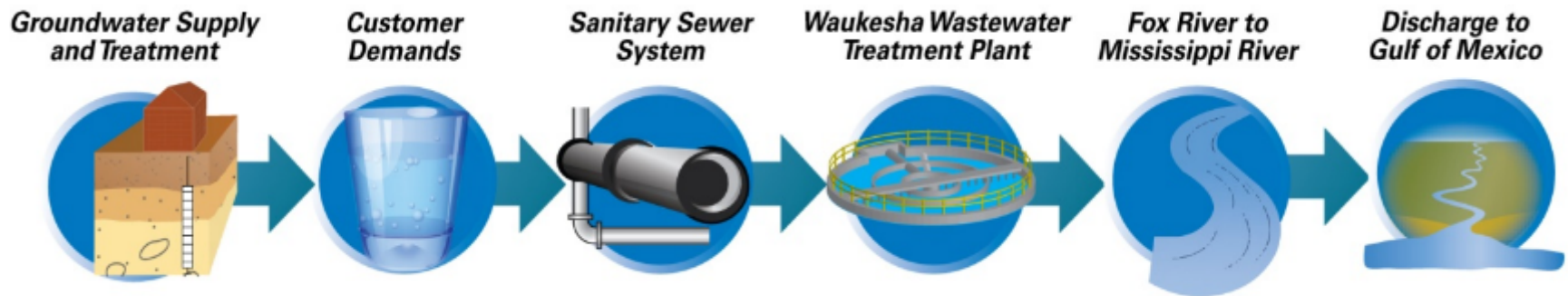


Waukesha's groundwater supply is connected to the Great Lakes Basin water resources



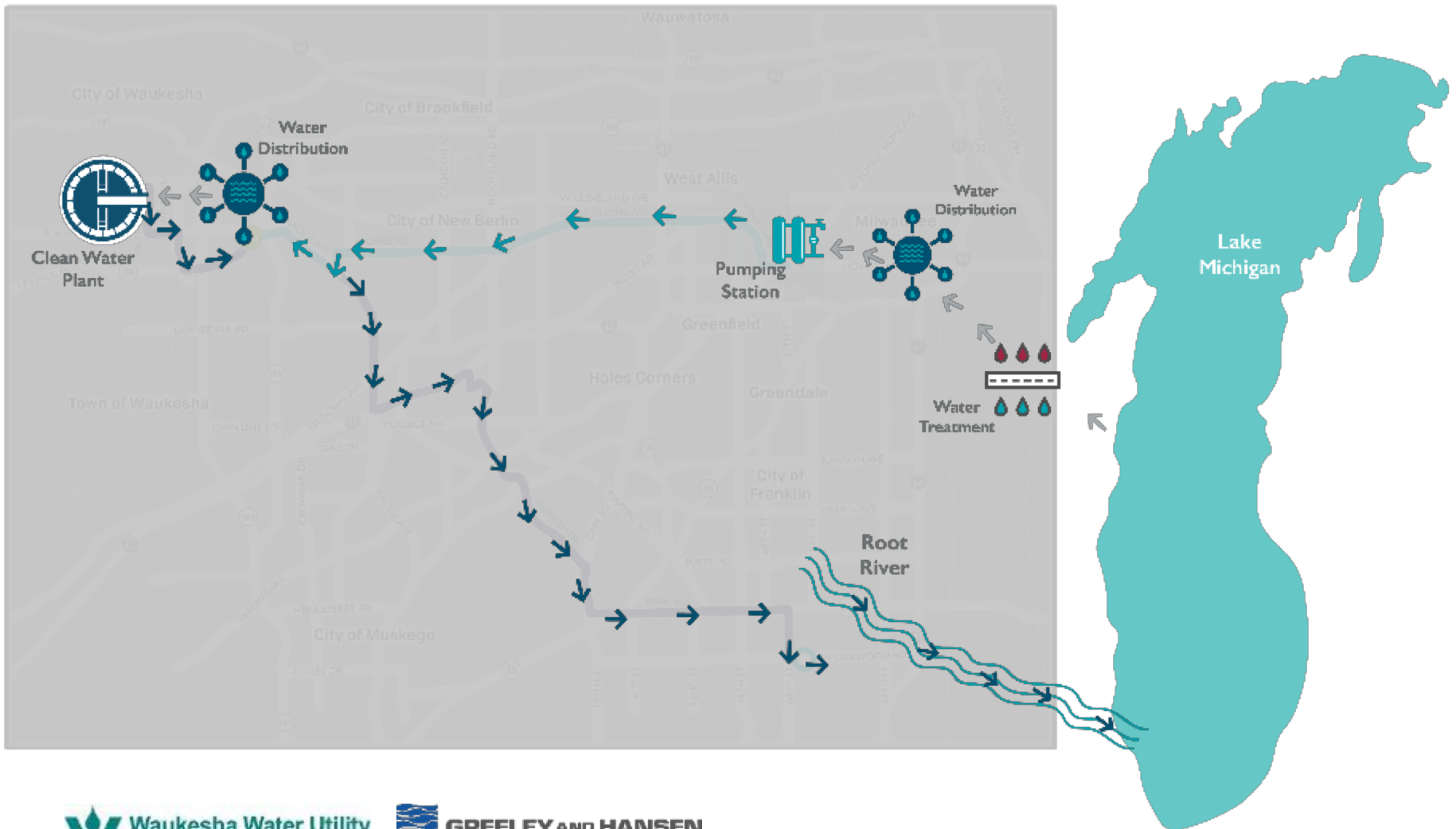
Waukesha's groundwater supply is not sustainable

5



WGLA 100

Future Water Cycle



PROGRAM OVERVIEW



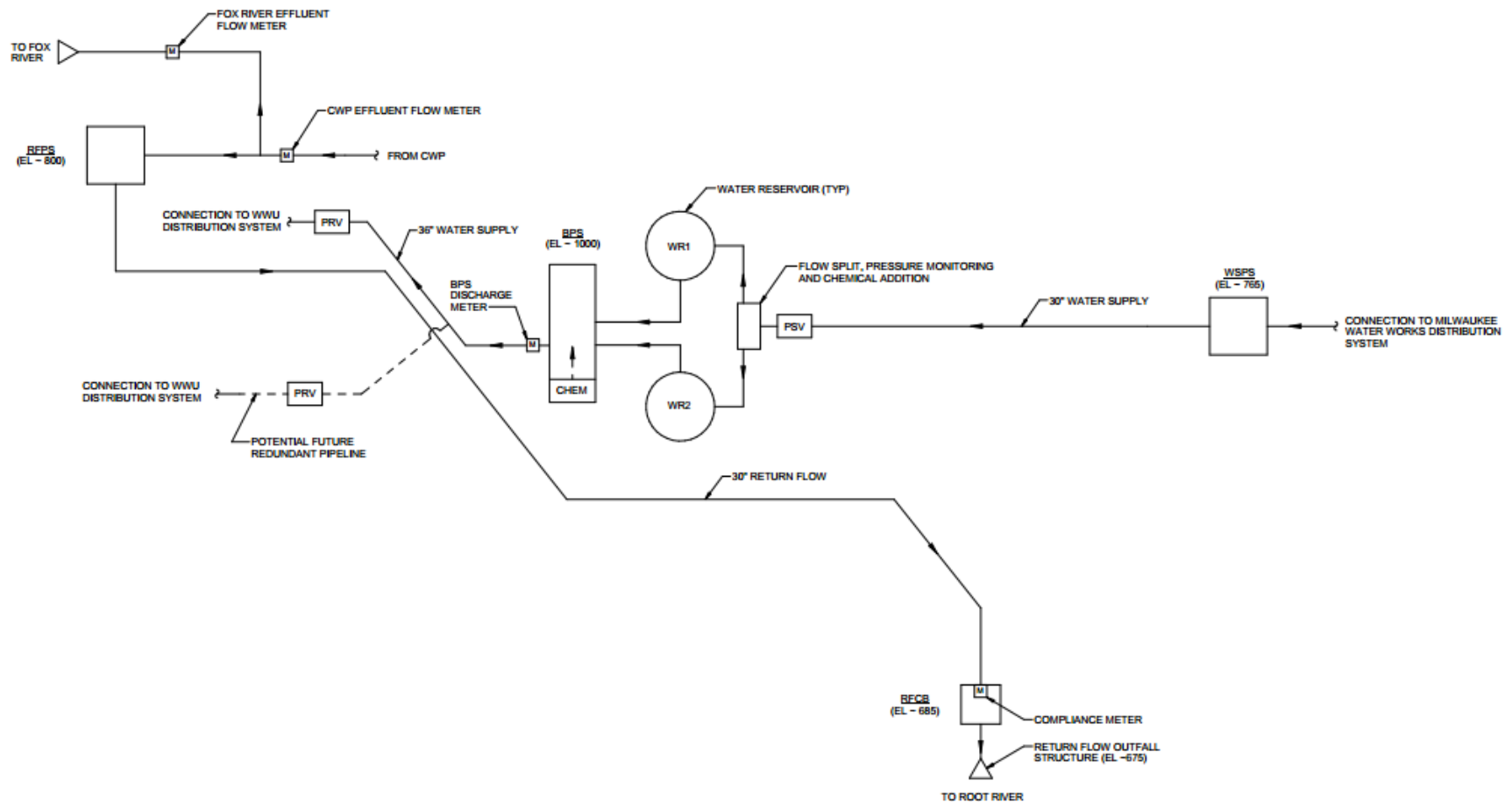
Waukesha Water Utility

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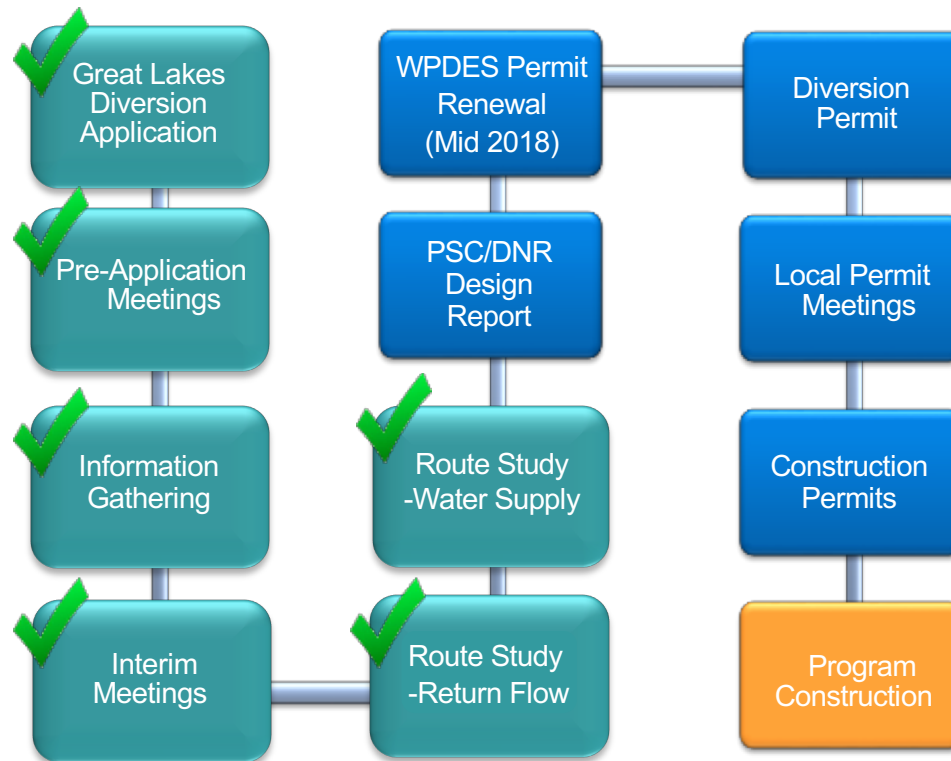


GREELEY AND HANSEN

Program System Diagram



Permitting Schedule



ROUTE STUDY AND PIPELINE DESIGN

The Water Supply and Return Flow pipelines will total over 36 miles of pipe through six communities that do not see a direct benefit of the new water supply.

Non-economic Evaluation Criteria

- Total pipeline length
- Special crossings
- Geotechnical conditions
- Contaminated materials
- Wetlands
- Waterways
- Endangered resources
- Cultural resources
- Agricultural resources
- Maintenance of traffic requirements
- Recent and planned regional transportation projects
- Stakeholder feedback
- Real property and easement requirements
- Constructability

Economic Evaluation Criteria

1
2

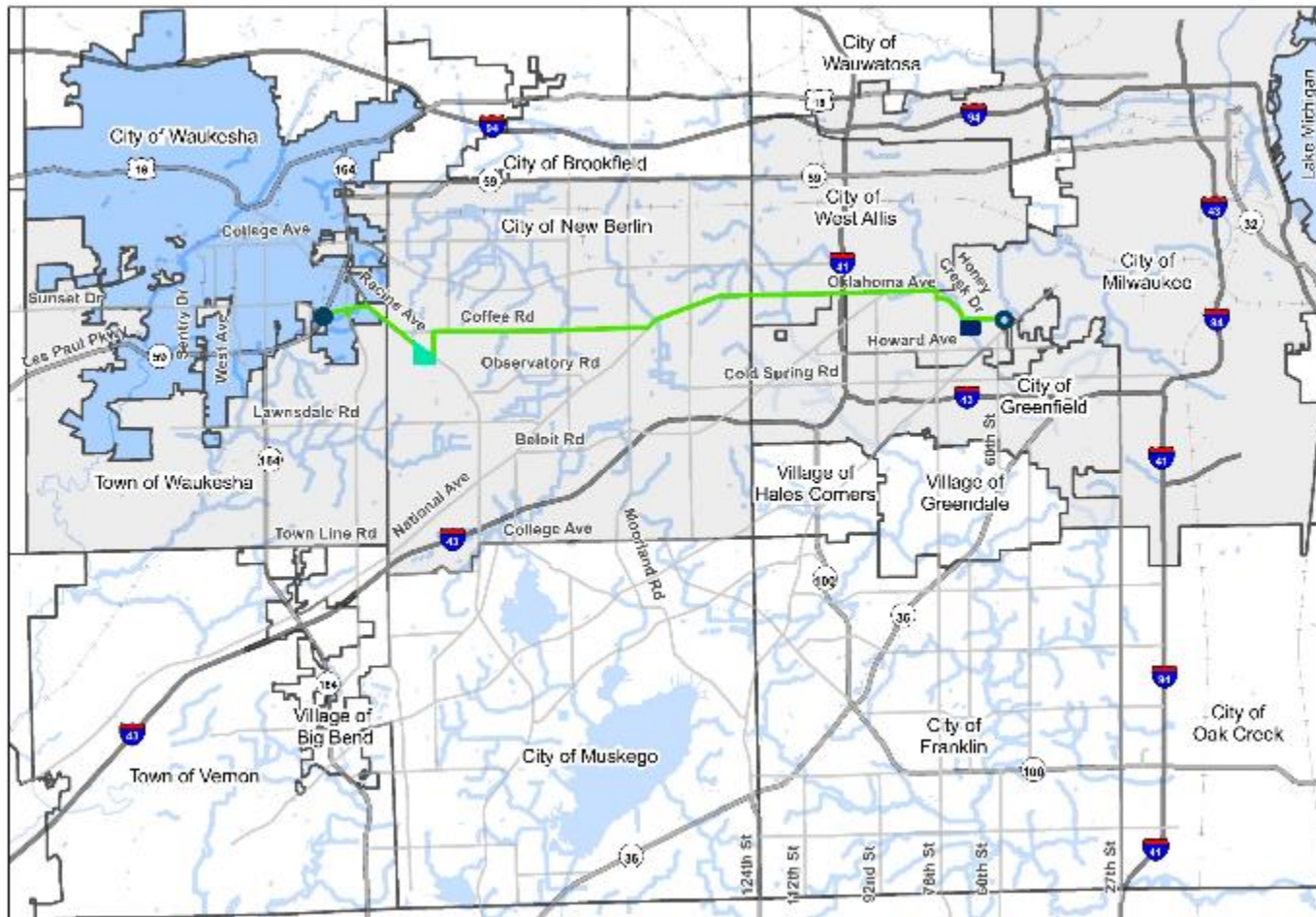
- AACE Class 4 opinions of probable construction cost (OPCCs)
 - Earthwork
 - Pipe and Fittings
 - Special Crossings
 - Valves
 - Restoration
 - Corrosion Protection
- Life cycle pumping costs (energy)
-

Water Supply Route Scoring: Triple Bottom Line Analysis

1
3

Criteria		Actual Weights	Maximum Possible Score	Route Alternatives		
				M1	M2	M3
1	<i>Social and Community Goals</i>					
1.1	<i>Schedule</i>	14.0	5	3	2	2
1.2	<i>Public Acceptability</i>	6.5	5	5	2	3
1.3	<i>Operations</i>	6.0	5	3	3	3
1.4	<i>Future Connections</i>	6.0	5	3	3	4
2	<i>Economic Goals</i>					
2.1	<i>System Reliability</i>	19.0	5	3	3	3
2.2	<i>Life Cycle Cost</i>	15.5	5	3	3	3
2.3	<i>Ease of Construction</i>	11.0	5	4	2	3
2.4	<i>Capital Cost</i>	6.0	5	3	3	2
2.5	<i>Ability to Finance</i>	6.0	5	4	2	3
2.6	<i>Cost Sharing Potential</i>	5.0	5	3	3	4
3	<i>Environmental Goals</i>					
3.1	<i>Environmental Impact</i>	5.0	5	3	3	3
Net TBL Score		100	500	330	263	291
Percent of Max Possible Score			NA	66%	53%	58%

Preferred Water Supply Route

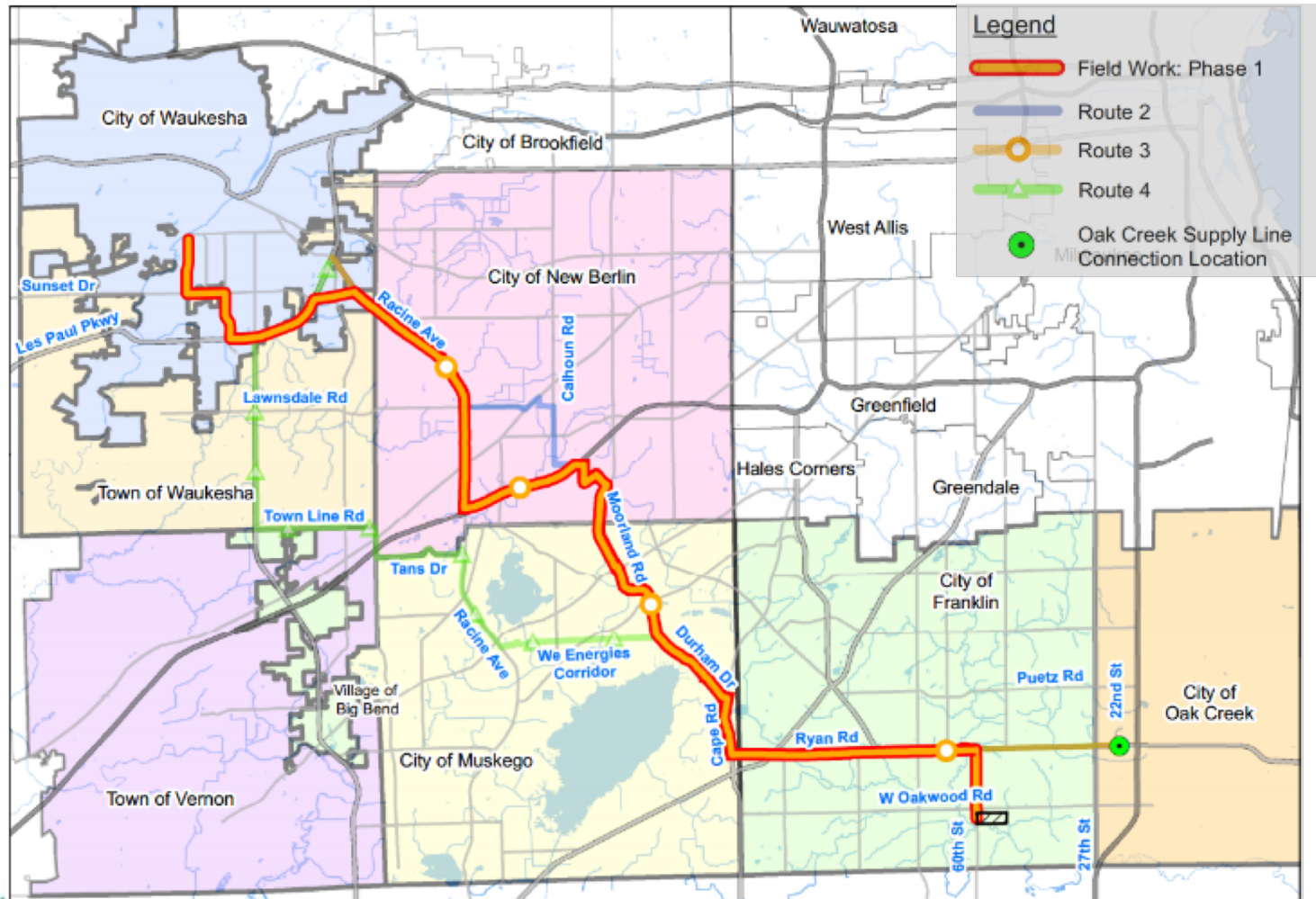


Return Flow Route Scoring: Triple Bottom Line Analysis

1
5

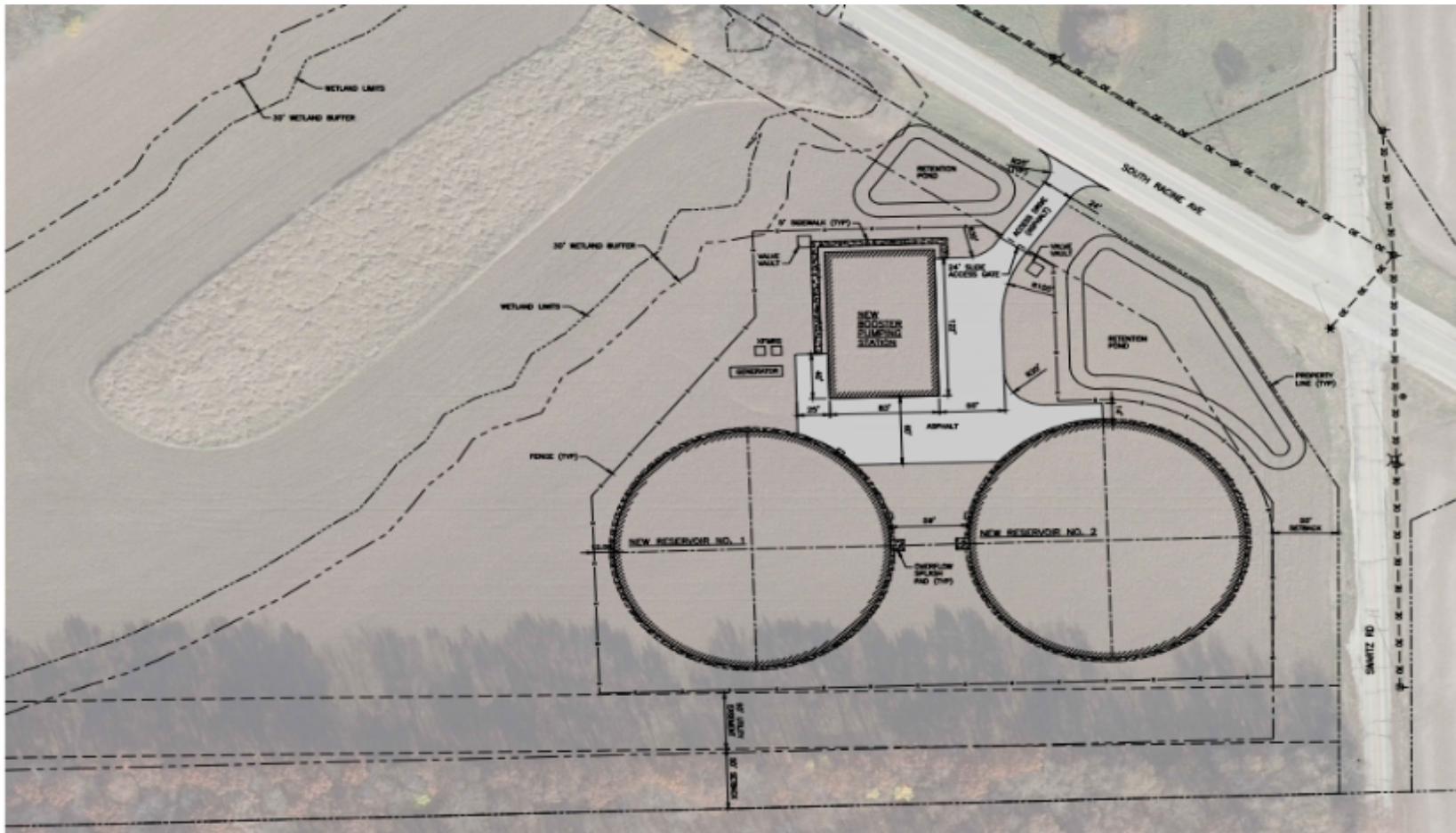
Criteria		Actual Weights	Maximum Possible Score	Route Alternatives		
				2	3	4
1	Social and Community Goals					
1.1	Schedule	14.0	5	3	3	2
1.2	Public Acceptability	6.5	5	2	3	2
1.3	Operations	6.0	5	3	3	4
1.4	Future Connections	6.0	5	4	4	3
2	Economic Goals					
2.1	System Reliability	19.0	5	4	5	3
2.2	Life Cycle Cost	15.5	5	4	4	3
2.3	Ease of Construction	11.0	5	3	3	2
2.4	Capital Cost	6.0	5	4	3	2
2.5	Ability to Finance	6.0	5	3	4	2
2.6	Cost Sharing Potential	5.0	5	4	4	3
3	Environmental Goals					
3.1	Environmental Impact	5.0	5	4	3	2
Net TBL Score		100	470	326	347	240
Percent of Max Possible Score			NA	69%	74%	51%

Preferred Return Flow Route

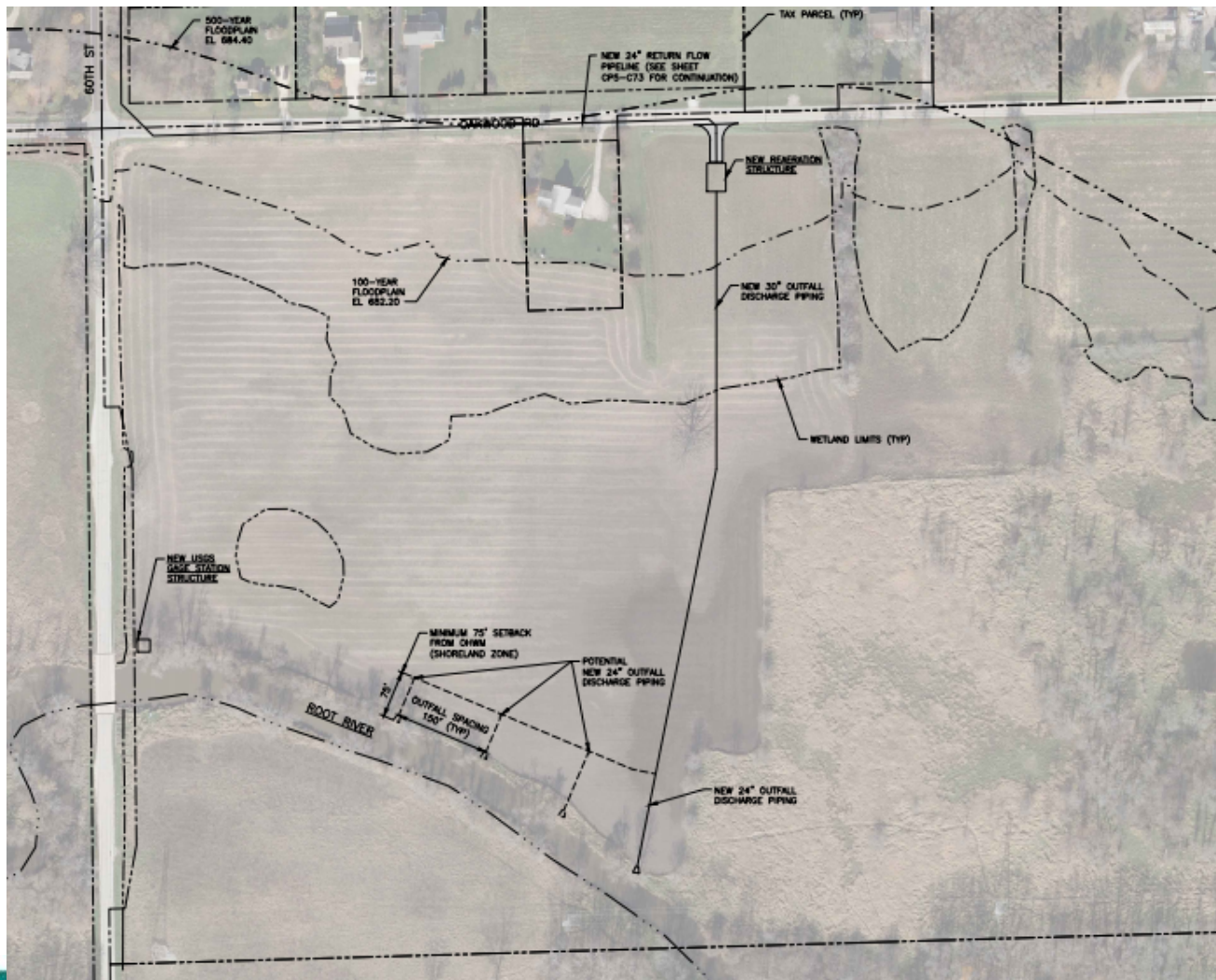


FACILITIES DESIGN

The Water Supply and Return Flow facilities are located in two cities in addition to the City of Waukesha which requires close coordination with those stakeholders as well as regulatory and resiliency design considerations.



Return Flow Facilities



TRANSITION PLAN

The transition to surface water with the differences in water quality and water treatment requires a coordinated transition to minimize local impacts.



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Transition Plan

- Pipe Loop Testing
- Distribution System Water Quality Sampling
- Distribution System Water Quality Monitoring
- Unidirectional Flushing
- Education Program and Customer Outreach

Pipe Loop Testing Apparatus and Conditioning

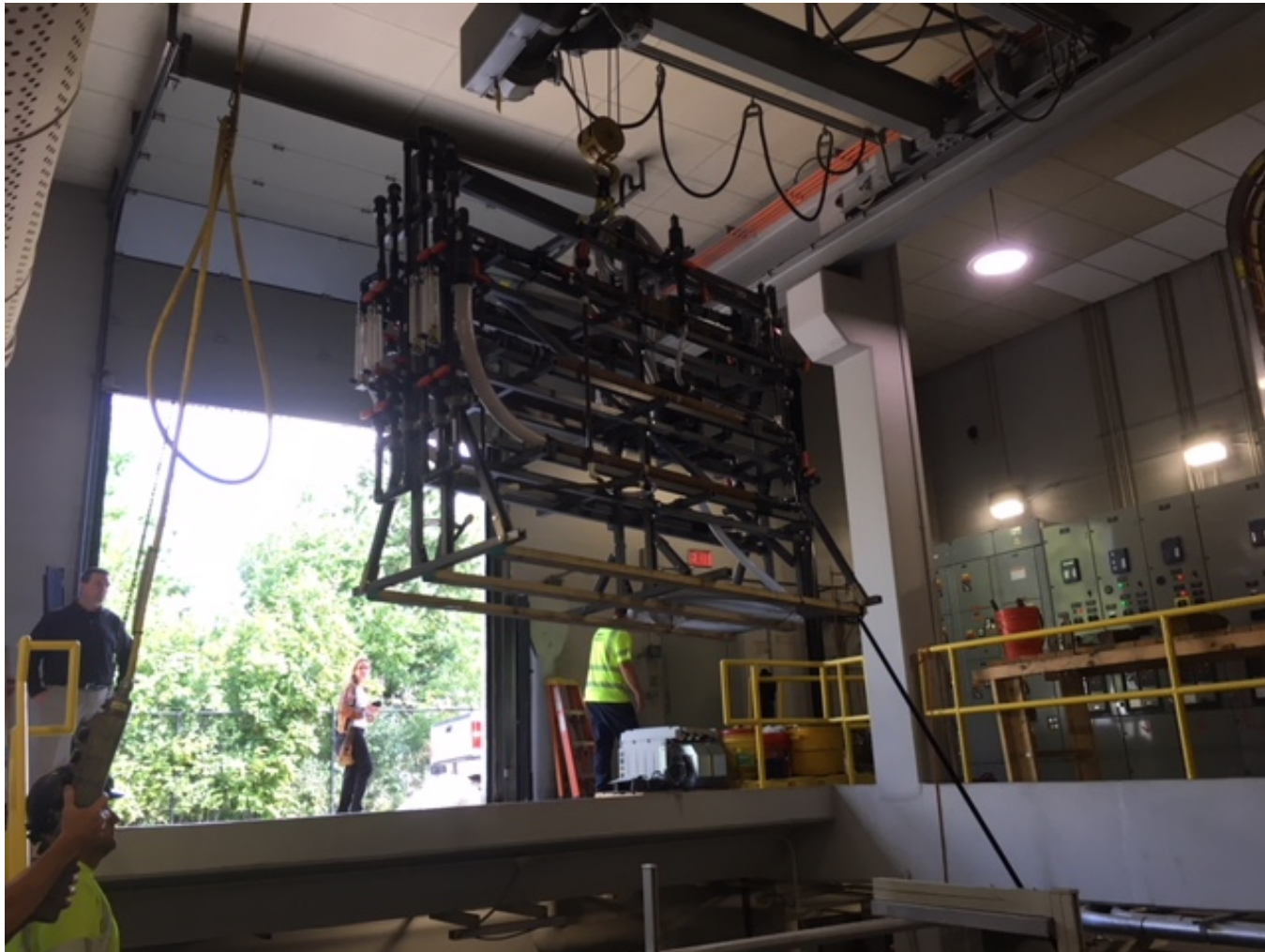
2
2



Moving the Testing Apparatus



Moving the Apparatus



Final Testing Location

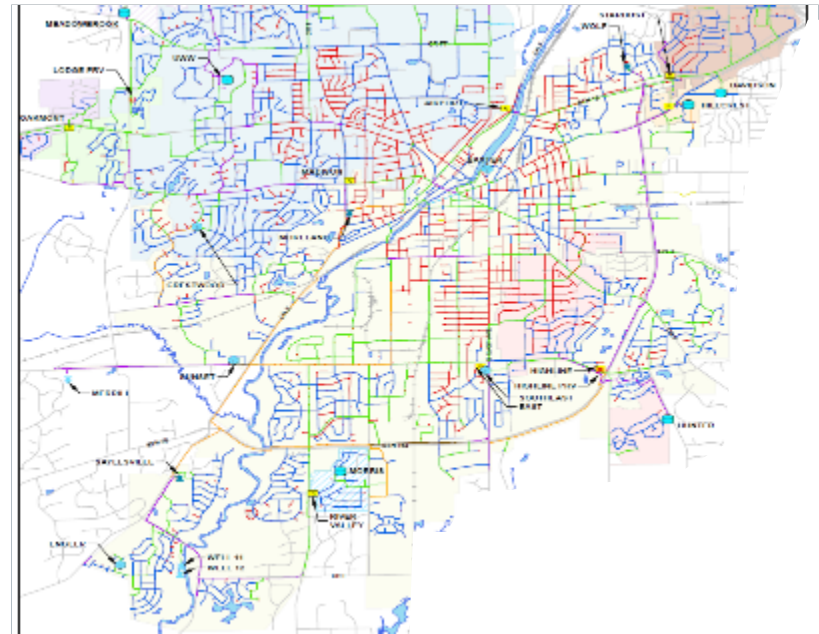


Transition Plan

- Pipe Loop Testing
- Distribution System Water Quality Sampling
- Distribution System Water Quality Monitoring
- Unidirectional Flushing
- Education Program and Customer Outreach

Distribution System Water Sampling

- ✓ Initial Distribution System Evaluation
- ✓ Hydraulic Modeling (Water Age)
- ✓ DBP Sample Locations
- ✓ Total Coliform Sample Locations
- ✓ Lead/Copper Sample Locations



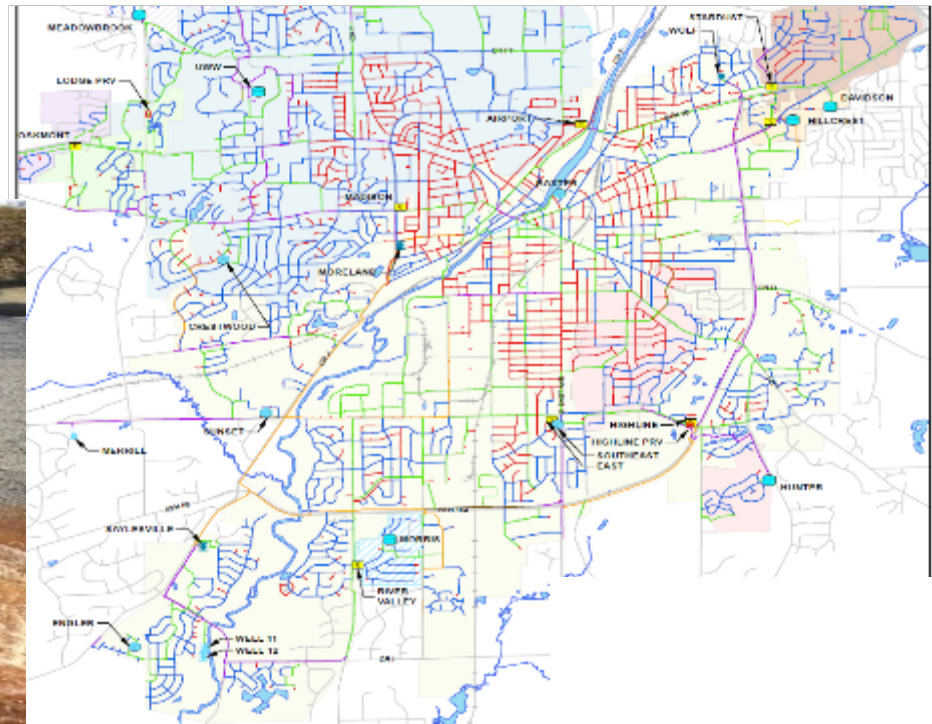
Distribution System Water Monitoring

- ✓ Determine parameters to monitor in distribution system
- ✓ Determine where to monitor
- ✓ Determine how to monitor



Unidirectional Flushing Program

- ✓ Develop UDF Plan
- ✓ Develop UDF Procedures



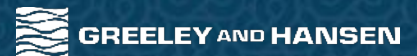
Transition Plan

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QUESTIONS?

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