



# **Converting an Unchlorinated System to Full Chlorination/ Arsenic/Manganese Treatment**

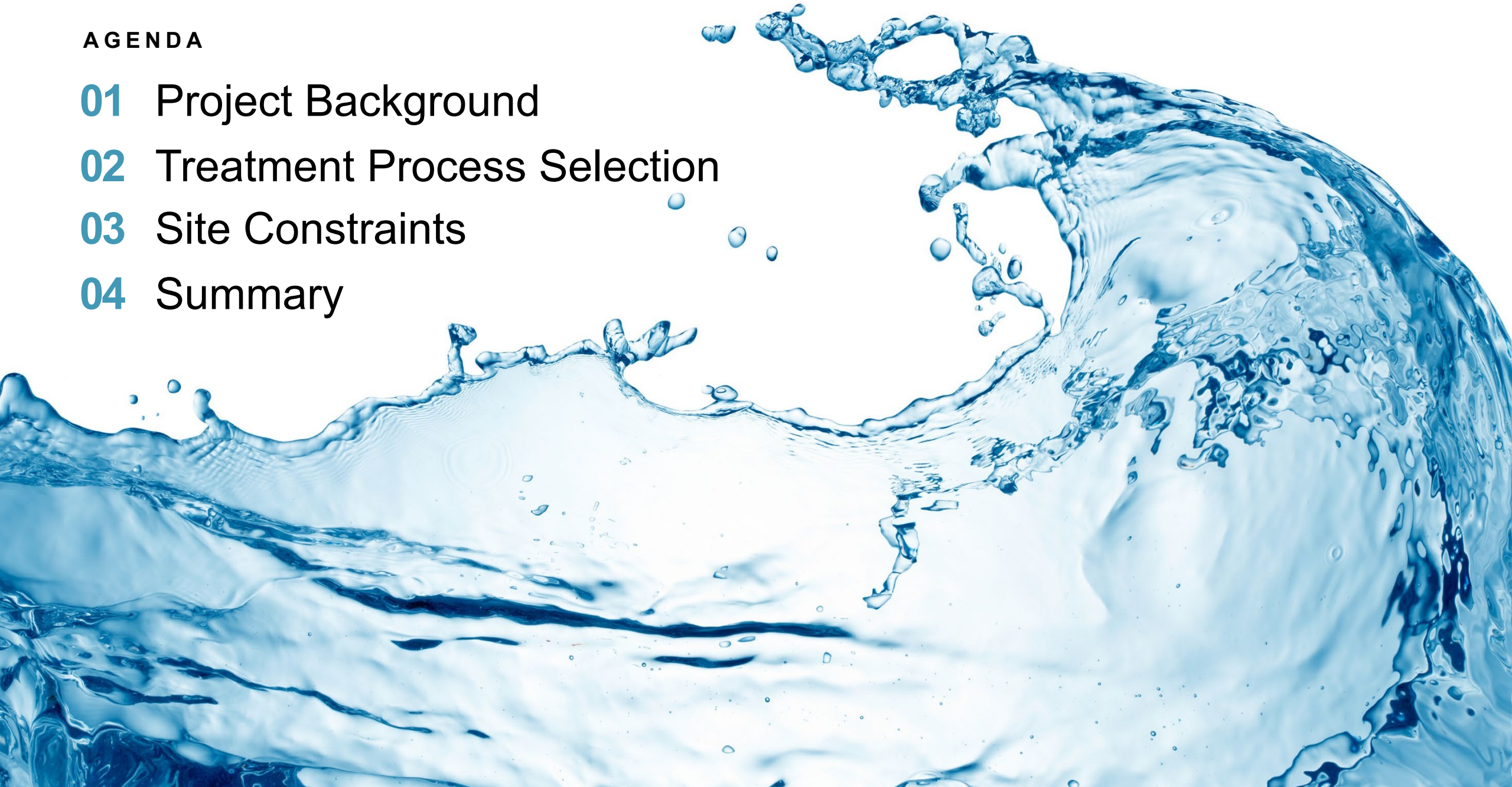
Beth Mende, PE





## AGENDA

- 01 Project Background
- 02 Treatment Process Selection
- 03 Site Constraints
- 04 Summary







# 01 Project Background





# History

- Water Supply:
  - Service Zone A (Wells 2,3 and 4N)
  - Service Zone B (Wells 14 and 16)
- Unchlorinated system
- Total coliform detections in Zone B
  - Risk of violating TCR
- Coliform Investigation
- Required by State to begin chlorinating
- Water quality aesthetic concerns with chlorination
- Groundwater treatment selected to minimize concerns
- DWSRF for project funding

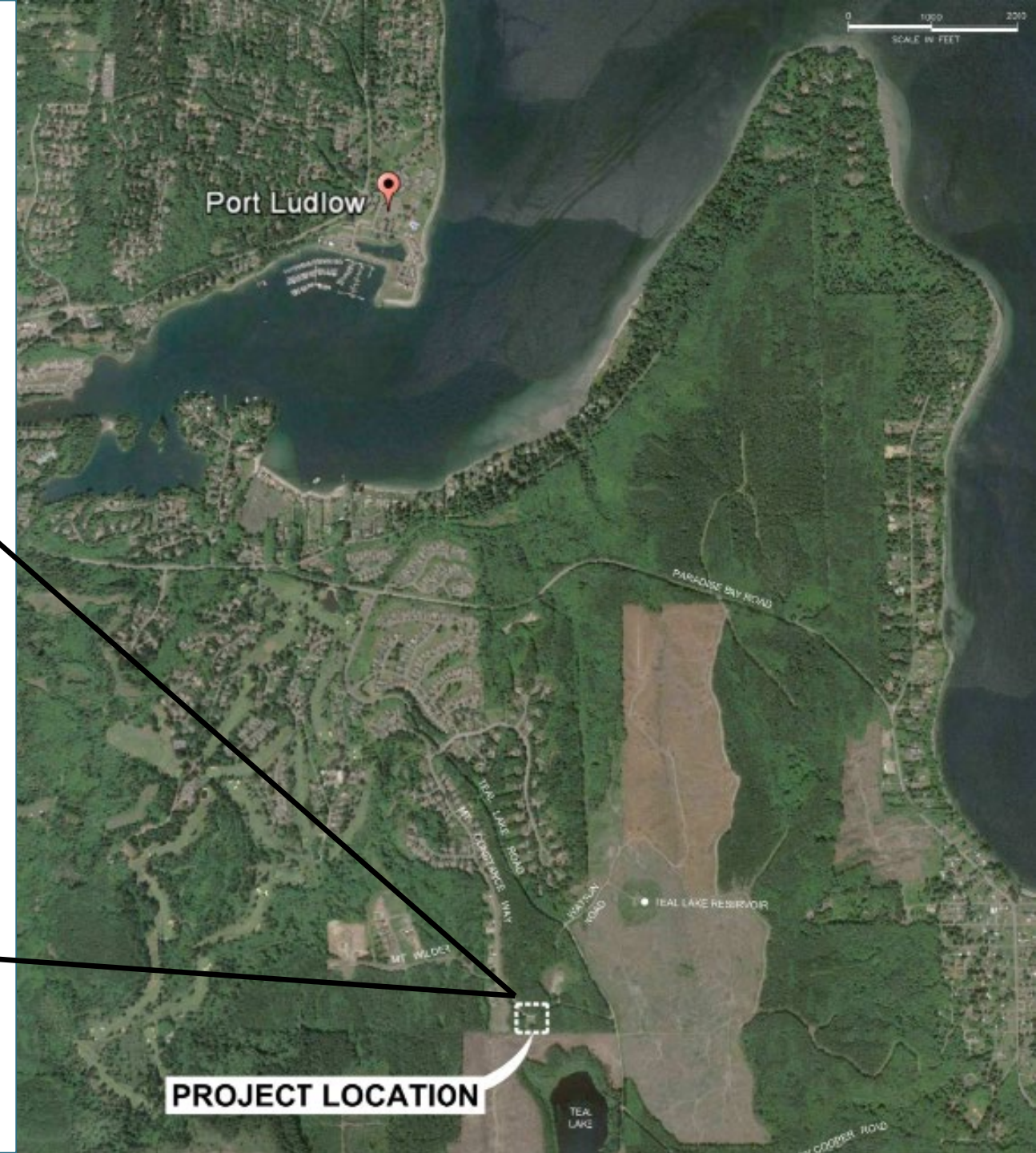
# Well Locations

- Service Zone A
  - Well 2, 3 and 4N
- Service Zone B
  - Well 14 and 16





# Treatment Site



# Zone A Raw Water Quality (Wells 2, 3 and 4N)

Parameter	Units	Regulated Limit	Well 2 Results	Well 3 Results	Well 4N Results
Total Dissolved Solids	mg/L	500	182	258	110
pH	specific units	6.0 – 9.0	7.69	7.69	8.18
Hardness	mg/L as CaCO <sub>3</sub>	-	90.9	133	80.7
Iron	mg/L	0.3	0.1	<0.1	0.324
Manganese	mg/L	0.050	0.02	<b>0.069</b>	0.028
Arsenic	mg/L	0.01	0.003	0.005	0.028
Alkalinity	mg/L as CaCO <sub>3</sub>	(none)	65.6	66.7	79.6

# Zone B Raw Water Quality (Wells 14 and 16)

Parameter	Units	Regulated Limit	Well 14 Results	Well 16 Results
Total Dissolved Solids	mg/L	500	129	119
pH	specific units	6.0 – 9.0	8.06	8.09
Hardness	mg/L as CaCO <sub>3</sub>	-	86	84
Iron	mg/L	0.3	<0.1	<0.1
Manganese	mg/L	0.050	<b>0.079</b>	<b>0.077</b>
Arsenic	mg/L	0.01	<b>0.009</b>	<b>0.008</b>
Alkalinity	mg/L as CaCO <sub>3</sub>	(none)	100	78



# Well Capacities

Source	Service Zone	Capacity (gpm)
Well 2	A	120
Well 3	A	74
Well 4N	A	115
Well 14	B	300
Well 16	B	320



# Treatment Process Selection

02





# Treatment Alternatives

- Maintain current operations
- Regular, intermittent chlorination to kill bacterial growth
- Constant chlorination to kill of bacterial growth and prevent from returning
- Constant chlorination with sequestrant to mask manganese-related color issues
- Constant chlorination and installation of pyrolusite filters to remove manganese

# DWSRF Scope

## Well Nos. 2,3 and 4N Sites

- Chlorination storage, feed and monitoring systems
- Updating Site Telemetry

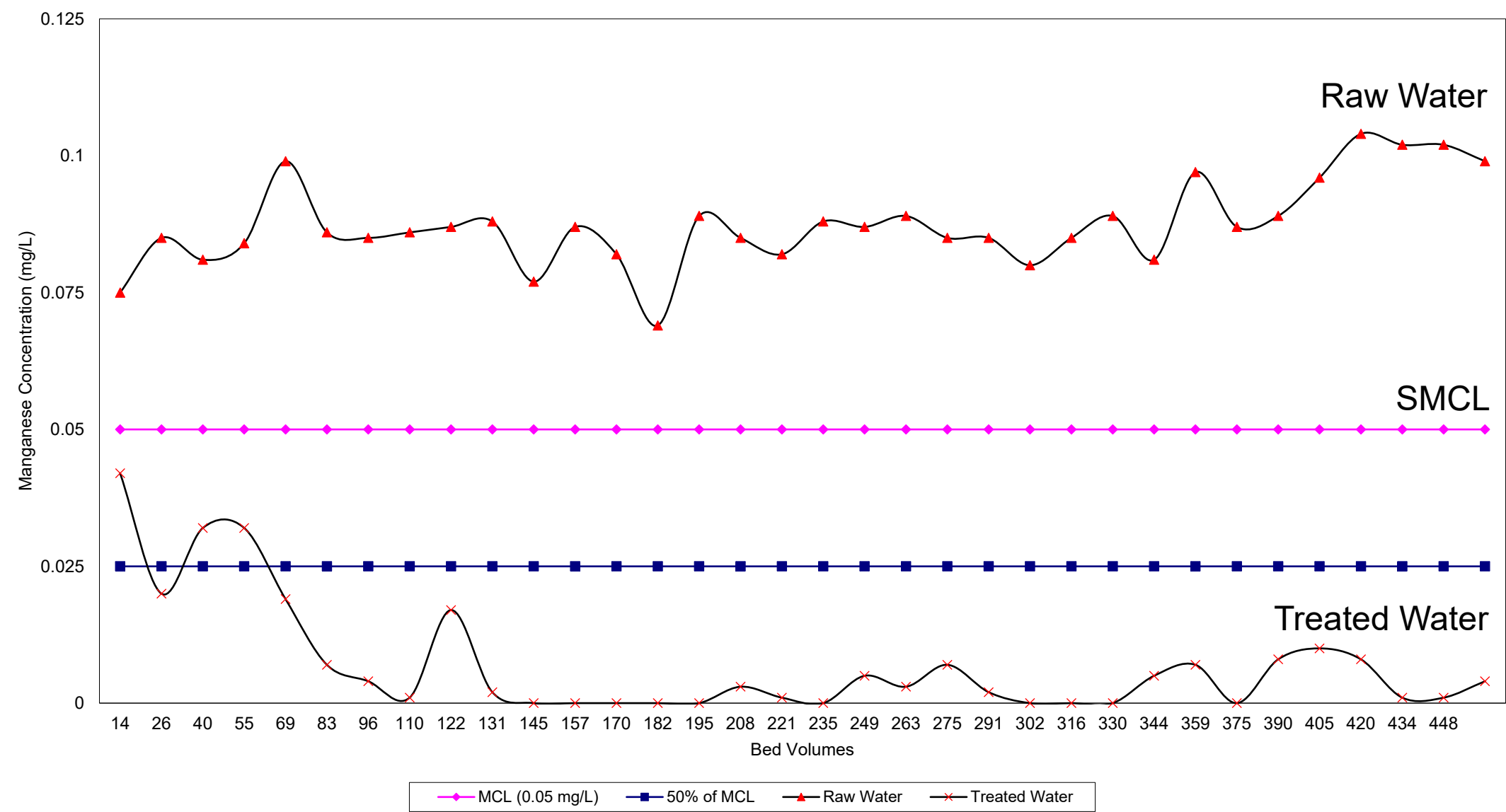
## Well Nos. 14 and 16 Site

- Chlorination storage, feed and monitoring systems
- Installation of new 620 gpm pyrolusite greensand filter
- Ferric chloride chemical storage and feed system for arsenic removal
- Updating Site Telemetry
- A new building to house the new equipment
- A new sewer line to dispose of the filter backwash waste
- Booster pump replacement

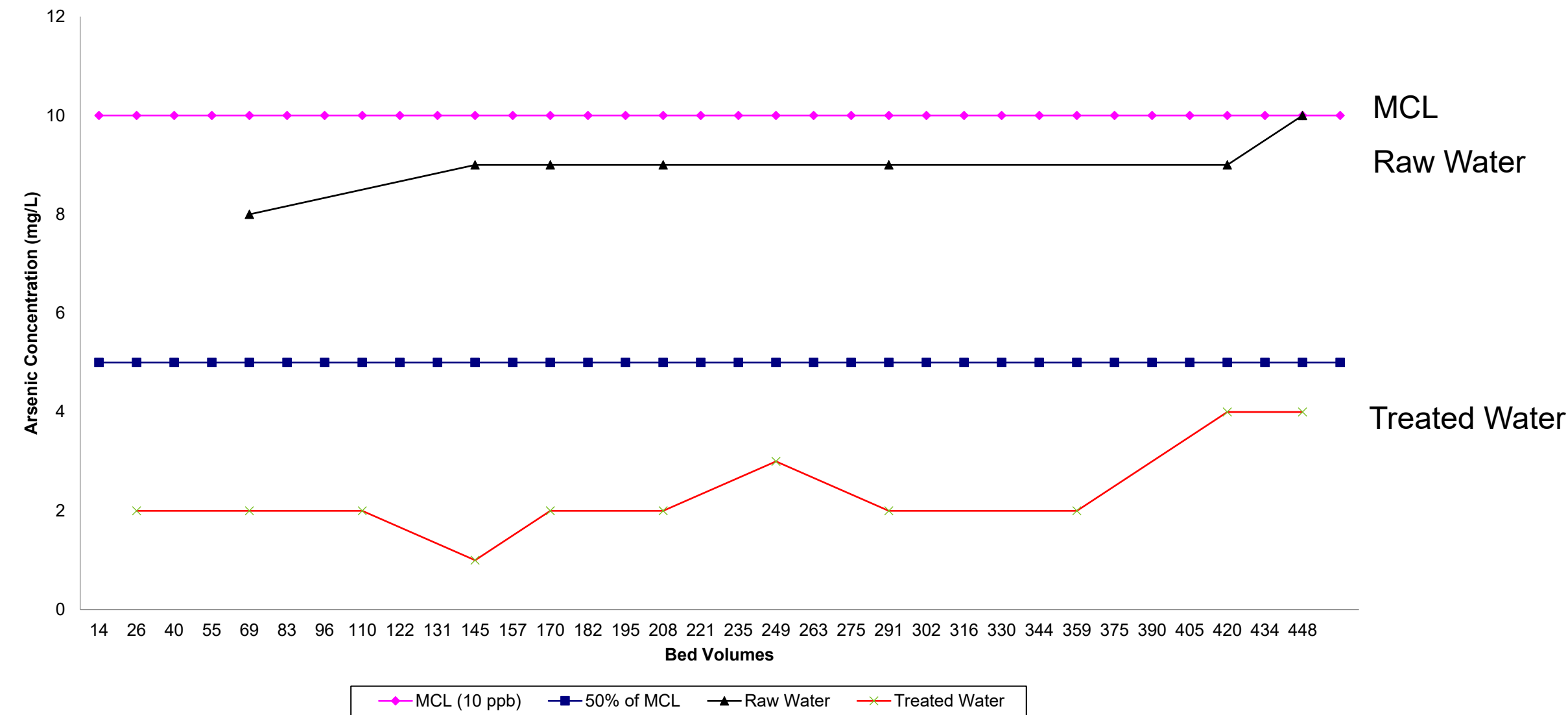




# Pilot Testing – Manganese Removal Results

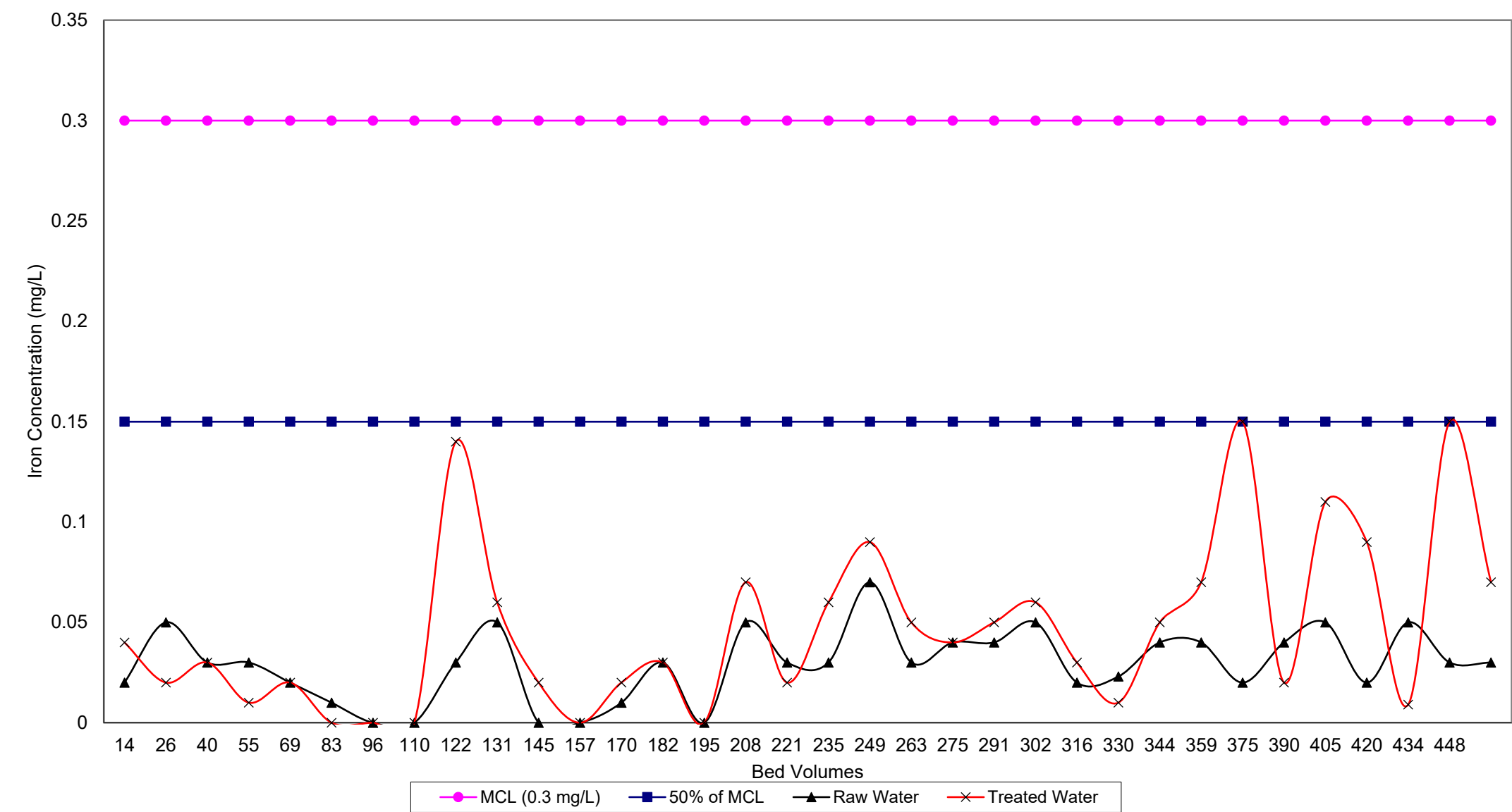


# Pilot Testing – Arsenic Removal Results





# Pilot Testing – Iron Removal Results

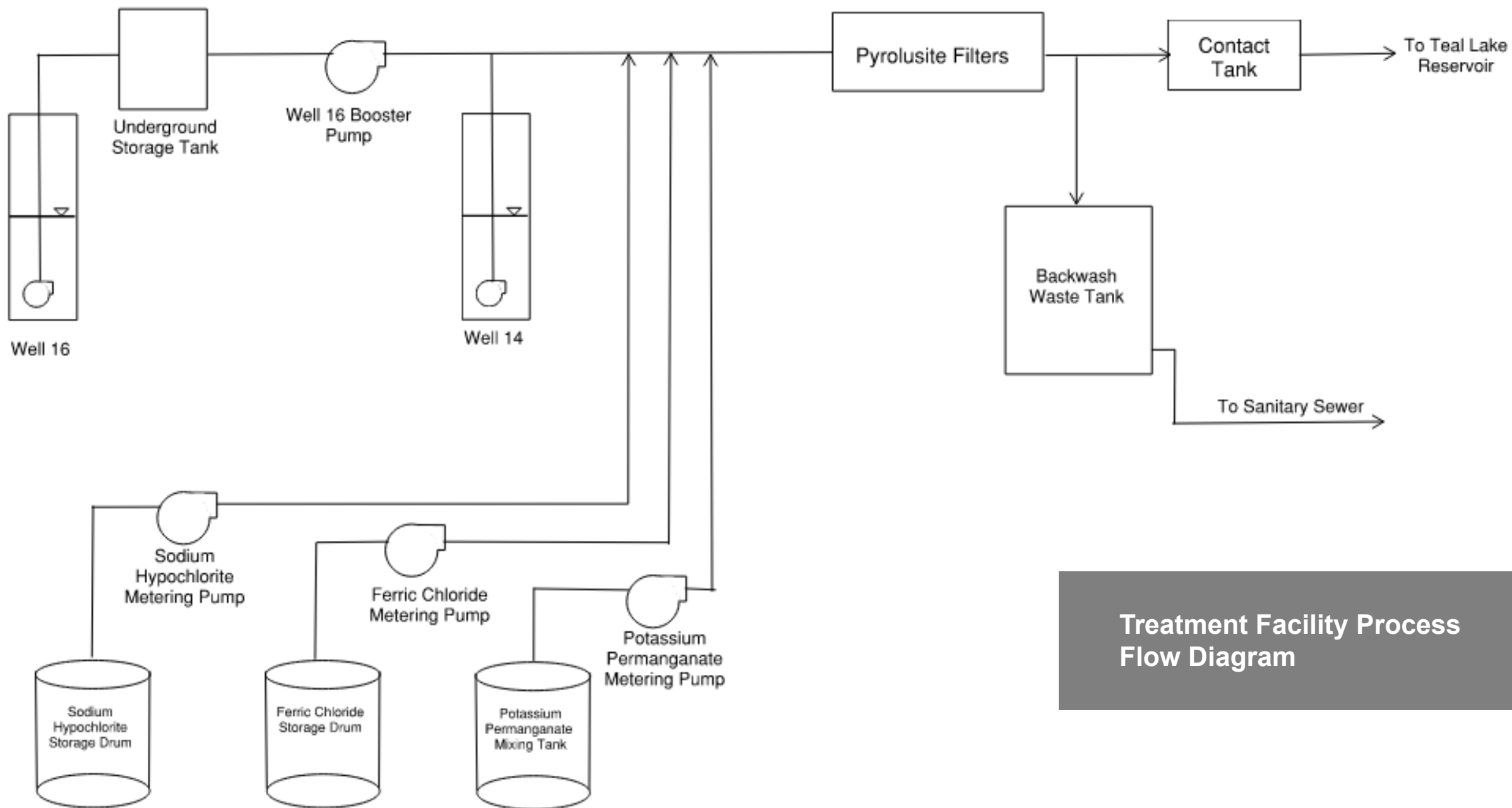




# Pilot Testing Summary

- Week of testing
- Chlorine demand averaged 0.67 mg/L
- pH was reduced from 8.4 in the feed water to just below 7.5 to prevent silica coating
- Ferric chloride was added for arsenic removal
- Supported a reduction in:
  - Manganese concentrations of 0.087 mg/L to below 0.007 mg/L
  - Arsenic concentrations of 9 µg/L to below 2 µg/L







# Treatment

- Bulk Sodium Hypochlorite chemical feed system for disinfection and arsenic and manganese oxidation
- Pyrolusite oxidation/filtration for removal of arsenic and manganese
- Bulk potassium permanganate chemical feed and storage system to prevent silica coating of filter media
- Bulk ferric chloride and feed system to aid in arsenic removal



# Backwash Disposal

- Waste source is backwash waste
- Waste sent to sanitary sewer
  - Storage tank to prevent overwhelming sewer on Mt. Constance Way
  - Air gap provided
- 10,000 gallons
- Will provide 24 hours of storage







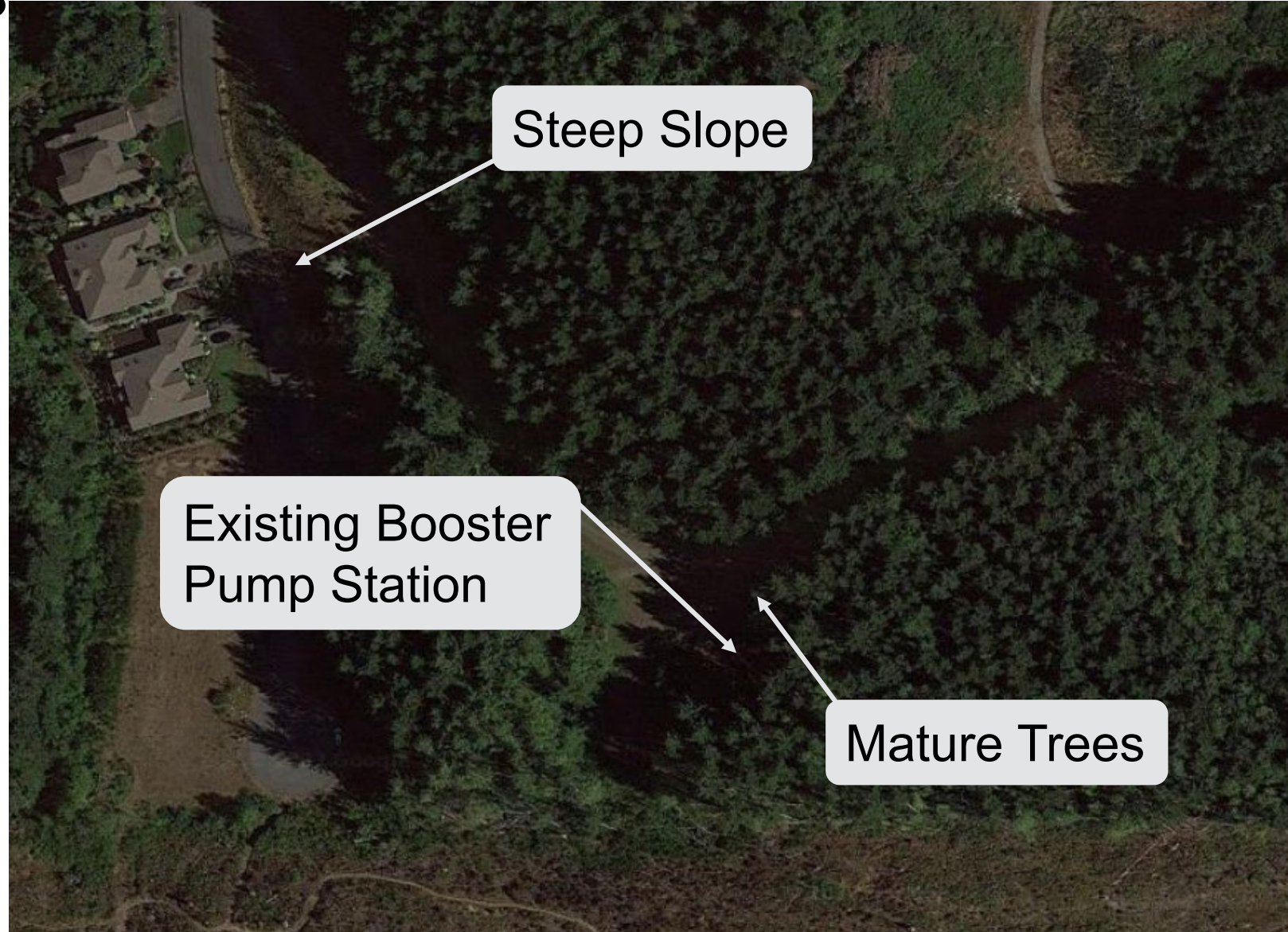
# Project Constraints

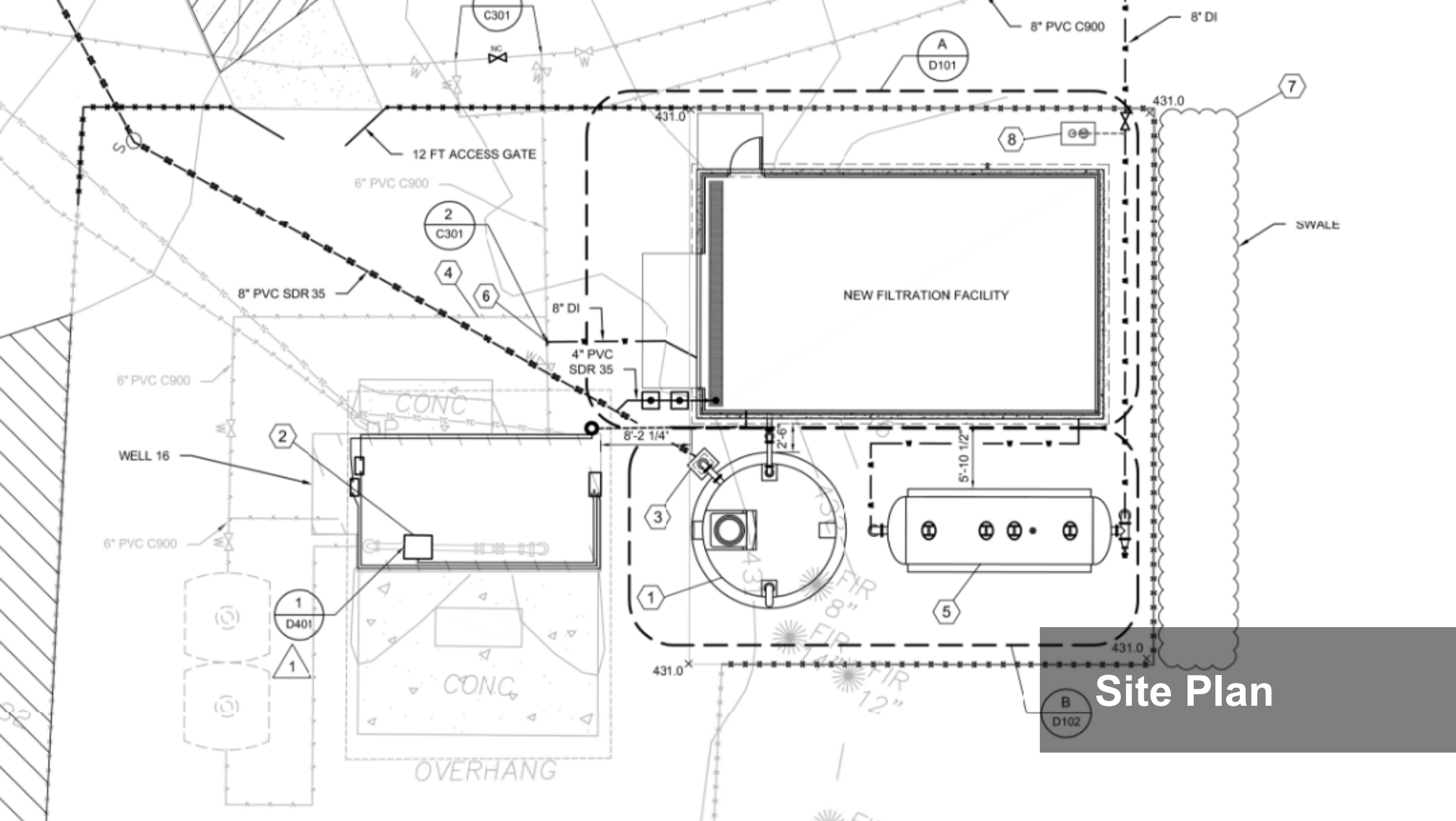
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# Project Constraints and Drivers

- Limited facility records
- Maximizing benefits to the community
- Site challenges
- Limited time-frame
- Primary water supply
- Public health

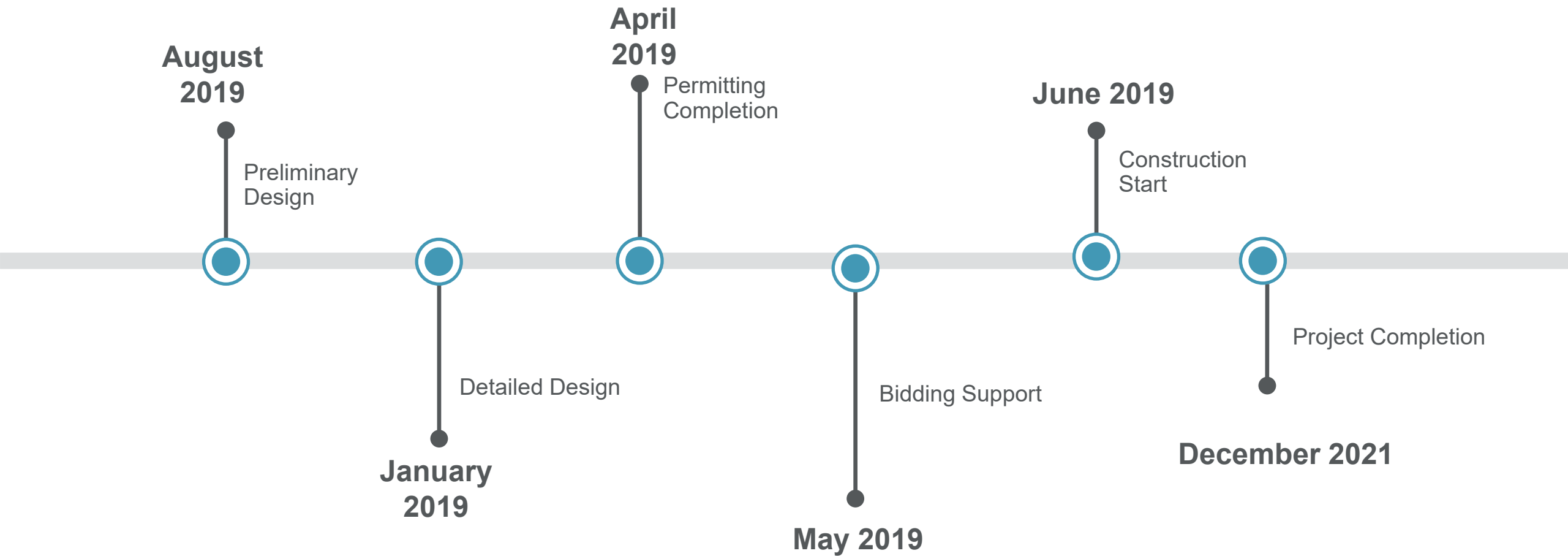




Site Plan



# Project Schedule





# Project Summary

04



## Summary and Current Status

- System has been operational since December 2021
- Successful elimination of coliform issues
- No colored water complaints
- Greatly reduced customers arsenic exposure



# Acknowledgments

## Olympic Water and Sewer, Inc.

- Greg Rae, Water Operations Manager
- Diana Smeland, President

# HDR

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*thank  
you*