# Water Facilities Plan

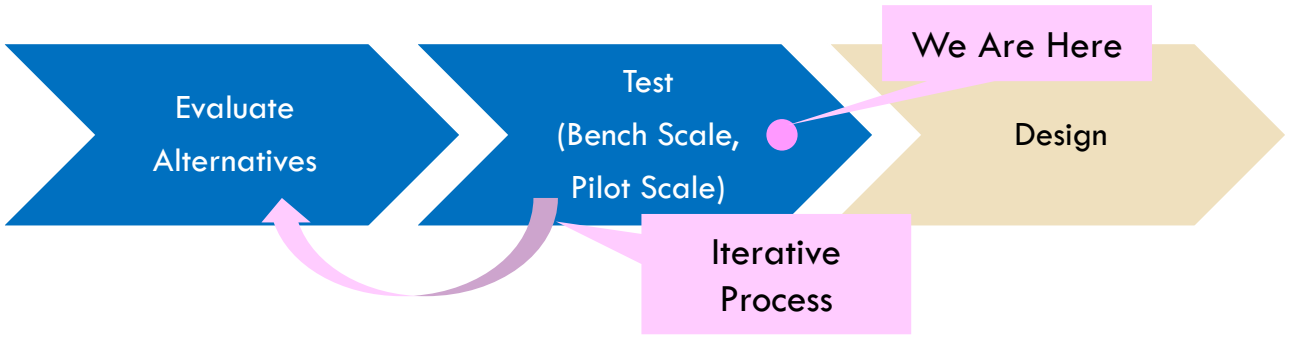
Wausau Water Works Commission
Wausau, WI

January 8, 2019

DONOHUE | BECHER HOPPE

# Water Facilities Plan Discussion

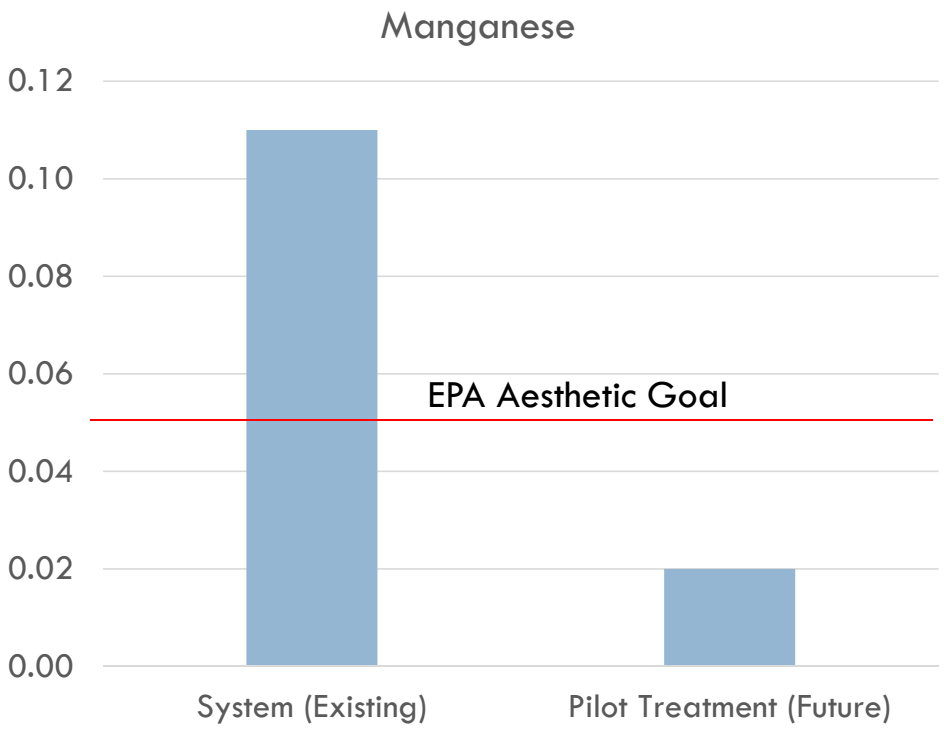
- Project Background & Objectives
- Alternatives for WTP Improvements
  - Rehabilitate/Upgrade Existing WTP
  - Relocate WTP (New Construction)
- Implementation Schedule

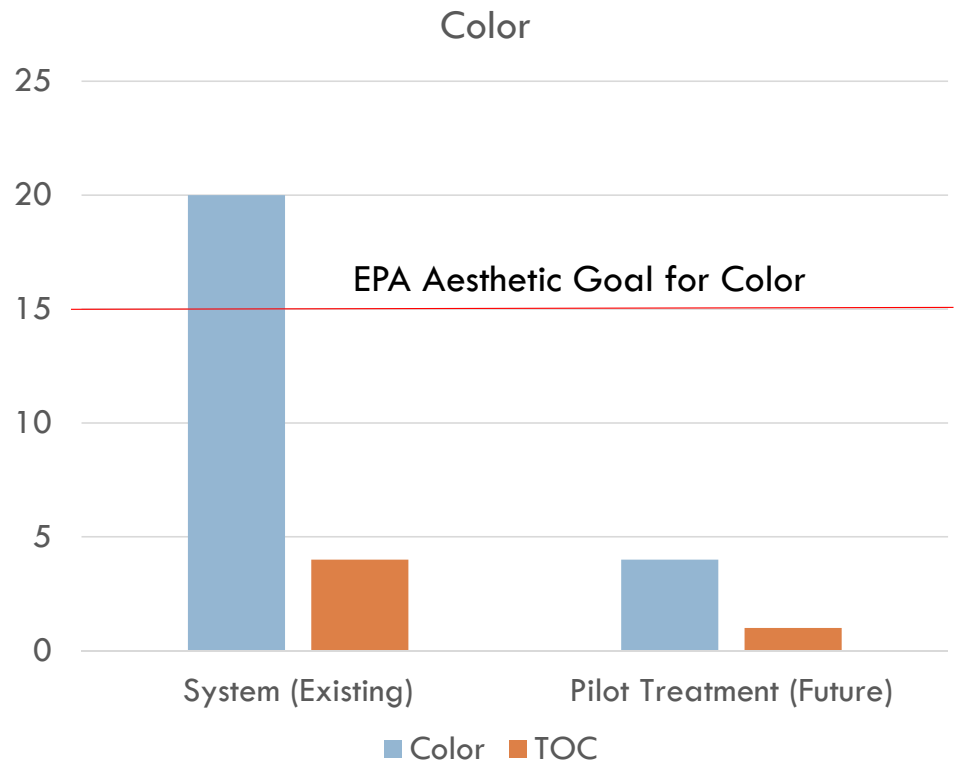



# Primary Project Objectives

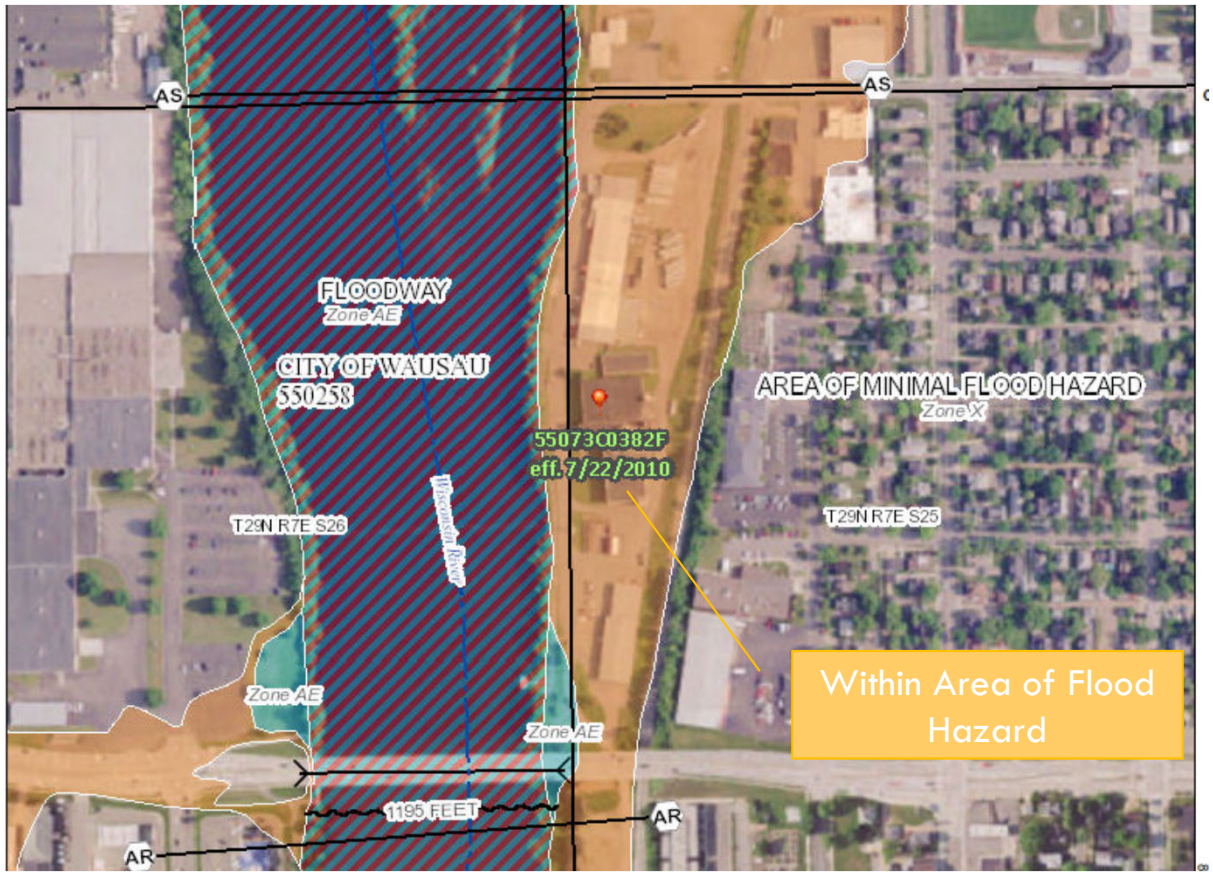
- Improve Water Quality
  - Manganese → Reduced staining/discoloration at consumer points of use
  - Color, TOC → Improved aesthetic experience and consumer confidence, reduced potential to form harmful disinfection byproducts
  - Virus Inactivation
  - Minimized Lead & Copper Levels at Consumer Taps (Lead services currently make up 37% of existing services)
- Address Site Risks → Reduced risk of groundwater contamination of stored treated water (WDNR Requirement)
- Upgrade Aging Infrastructure → Improved reliability: uninterrupted supply of high quality drinking water for Wausau

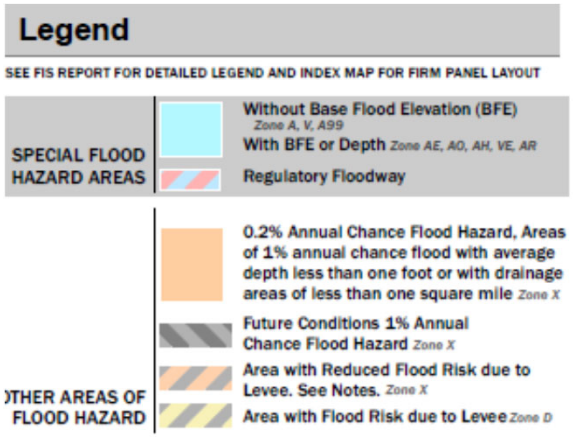
# Improving Water Quality



# Site Risk

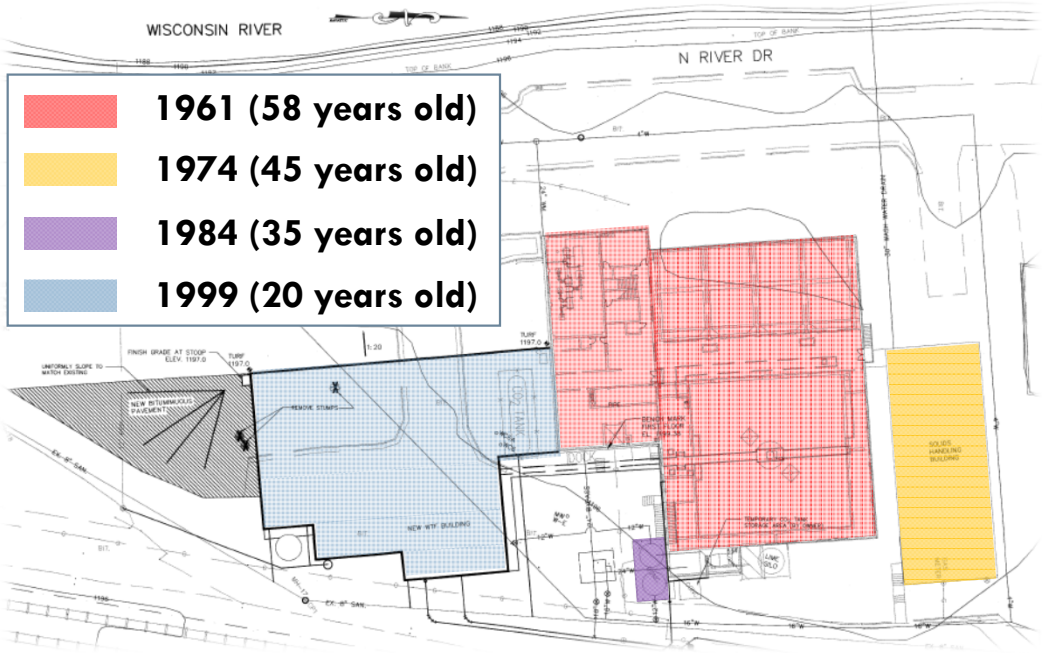



Current WDNR code limits facilities in floodplains to wells (no treatment or storage)

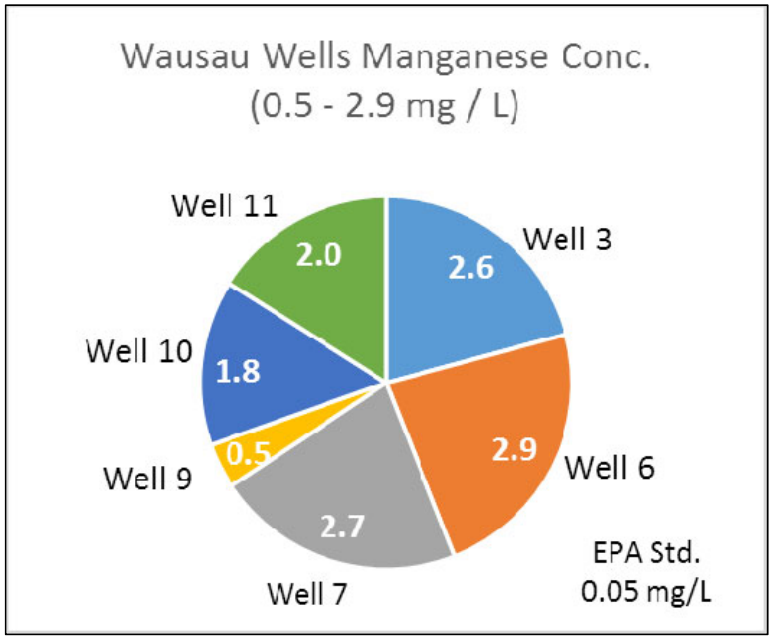
# Water Facilities Background

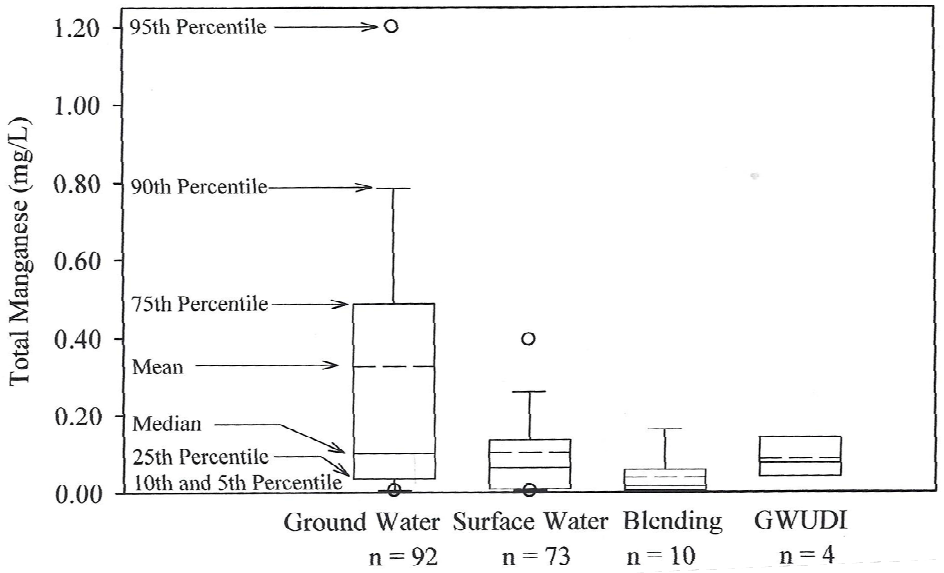
- Operation must be *efficient* and *reliable*
  - 3-person WTP staff (8 hr/d, 5 d/wk)
  - 10-person distribution system staff
  - ***Must*** *perform 24/7/365*
- Age of facilities is a factor for reliability
  - Filters and media are >50 years old
  - Controls are > 25 years old



# Wausau's Groundwater is Challenging to Treat

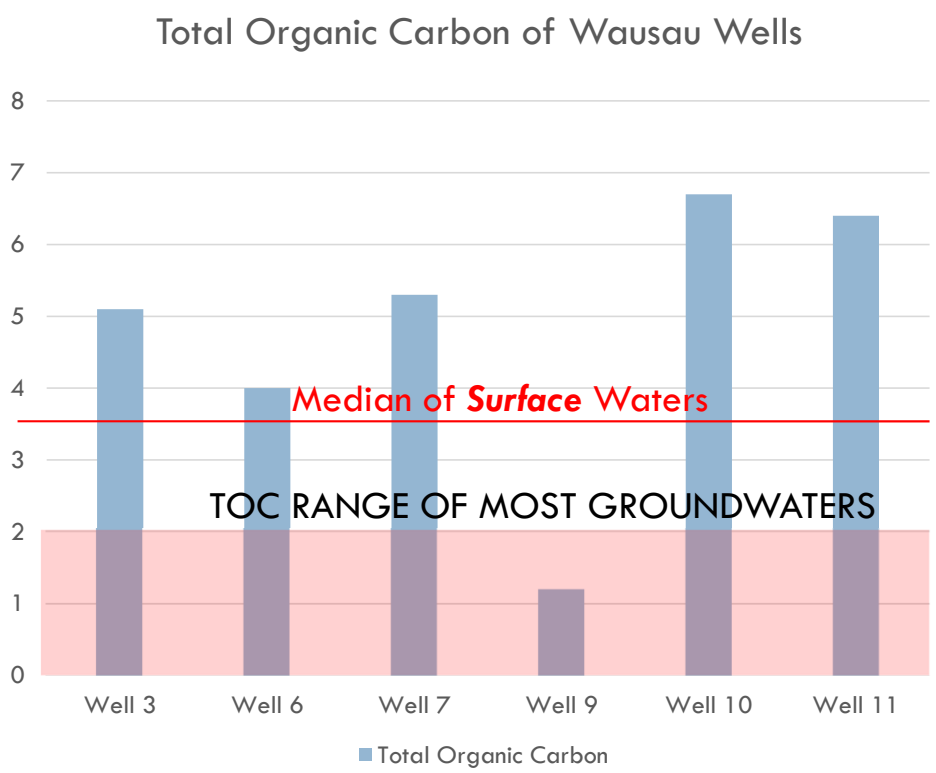
Wausau's raw water manganese levels can be more than twice this high




Average Source Water Mn Concentration Data from AWWA Research Foundation and American Water Works Foundation, *Occurrence of Manganese in Drinking Water and Manganese Control*, 2006

# Wausau's Groundwater is Challenging to Treat



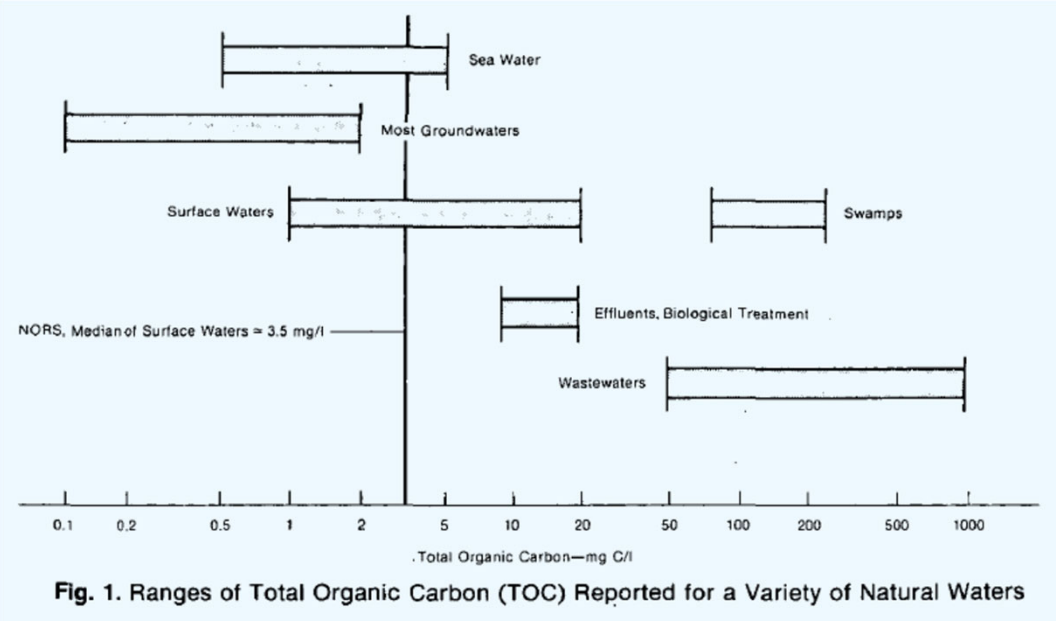




**Fig. 1.** Ranges of Total Organic Carbon (TOC) Reported for a Variety of Natural Waters

Source: M.C. Kavanaugh, Coagulation for Improved Removal of Trihalomethane Precursors, *Journal AWWA*, vol. 70, no. 11, Nov. 1978, p. 613.

# WTP Site Alternatives

# Upgraded Treatment Train has been Determined and Is Independent of Site Alternative

Legend:
- Existing
- Modified in Place
- New

Even at existing site, significant **new** or **modified** infrastructure is required to achieve project objectives and DNR requirements:


Iron and Manganese Removal

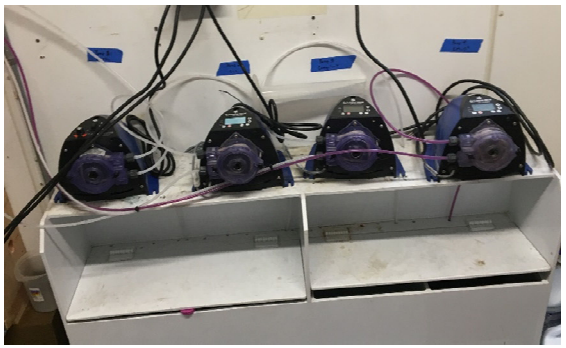
Removal of Color and Disinfection Byproducts / Byproduct Precursors

Disinfection, Storage, and Corrosion Control Treatment in Accordance with WDNR Requirements

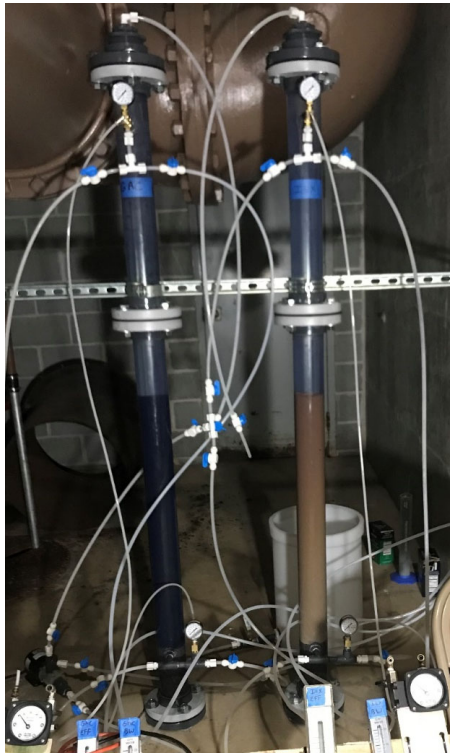
# Pilot Testing: Phase 1

- Identified top-performing replacement filter media
- Demonstrated viability of proposed treatment changes for:
  - Improved manganese removal
  - Improved color removal
  - Improved TOC removal


Filter Column (1 of 3)

Chemical Metering Pumps



GAC (Left) & Ion Exchange (Right) Columns

# WTP Upgrade Costs

| Item | Option 1: Upgrade Existing Plant | Option 2: Build New Plant at Improved Location |
|---|---|---|
| Water Treatment Plant[1] | $27,000,000 | $35,000,000 |
| Well & Distribution System Upgrades[2] | $2,900,000 | $5,900,000 |
| Total Capital[3] | $29,900,000 | $40,900,000 |

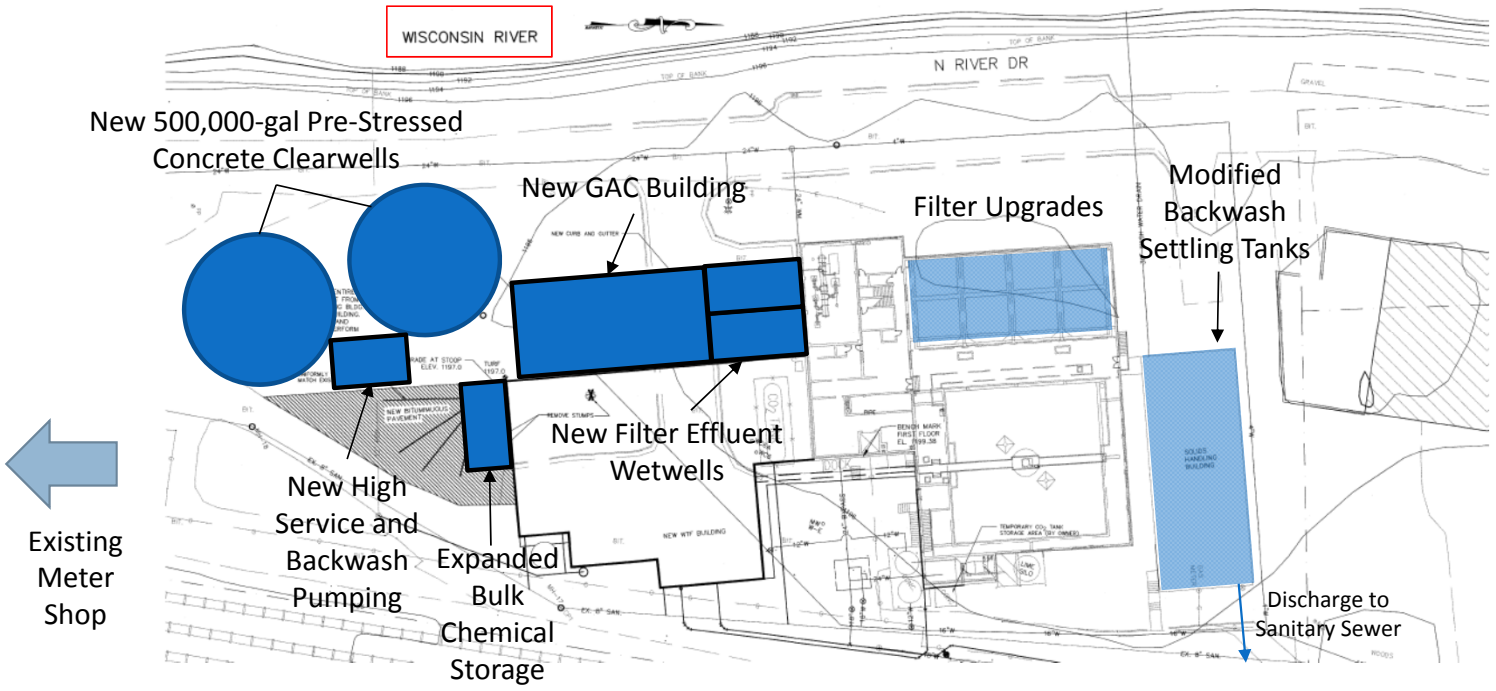
[2]Demo of existing facility and relocation of meter shop not included in Option 2 cost opinion

[1]Option 2 includes distribution system modifications to connect supply wells to new water treatment plant

[3]Includes engineering

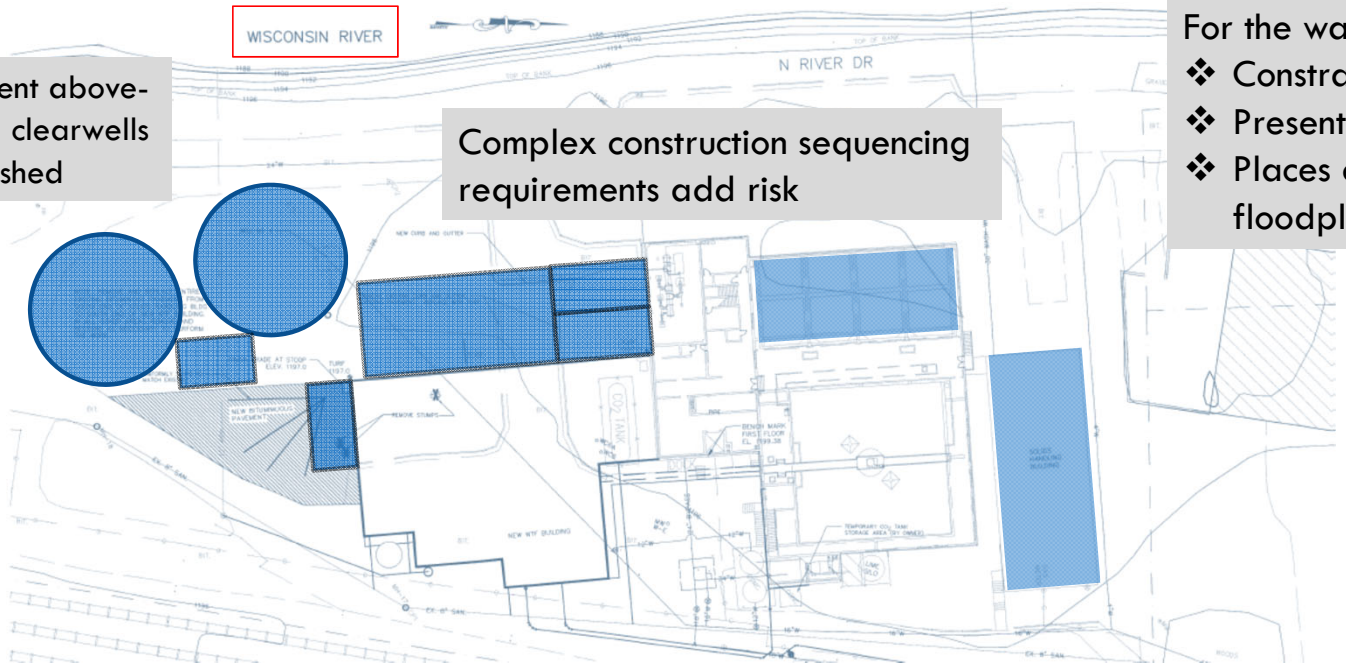
# Option1: WTP Upgrade at Existing Site

Conceptual Illustration:



# Option1: WTP Upgrade at Existing Site

Prominent above-ground clearwells in viewshed



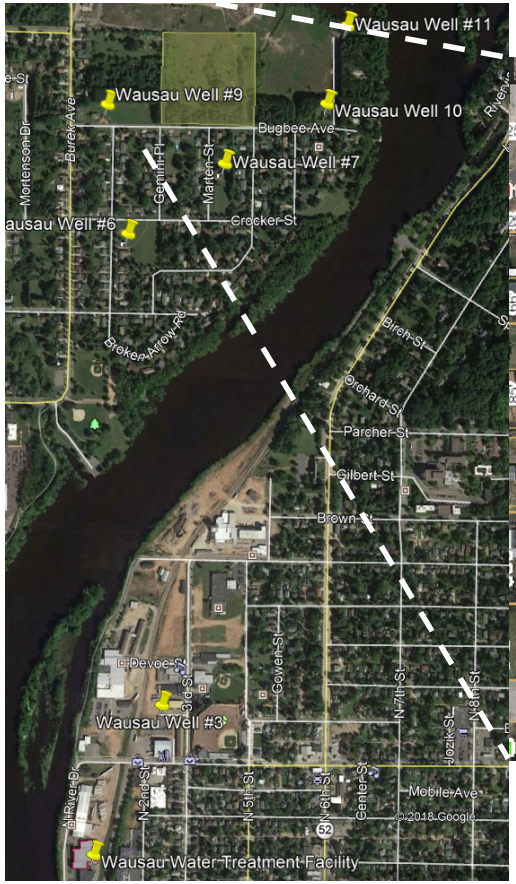

Complex construction sequencing requirements add risk

For the water utility, riverfront location:

- Constrains site expansion
- Presents potential flooding risk
- Places existing infrastructure within floodplain and water table

Existing Meter Shop

# Option 2: New WTP at Utility Owned Property (700 Bugbee Avenue)

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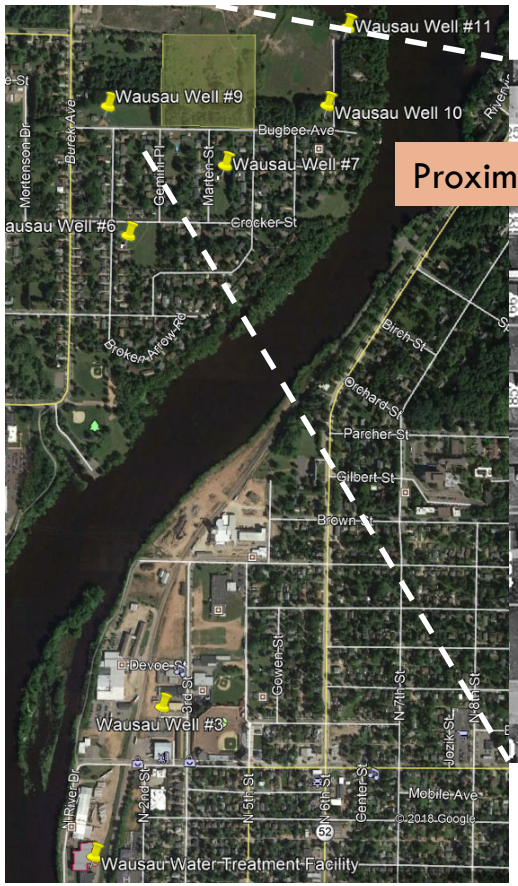
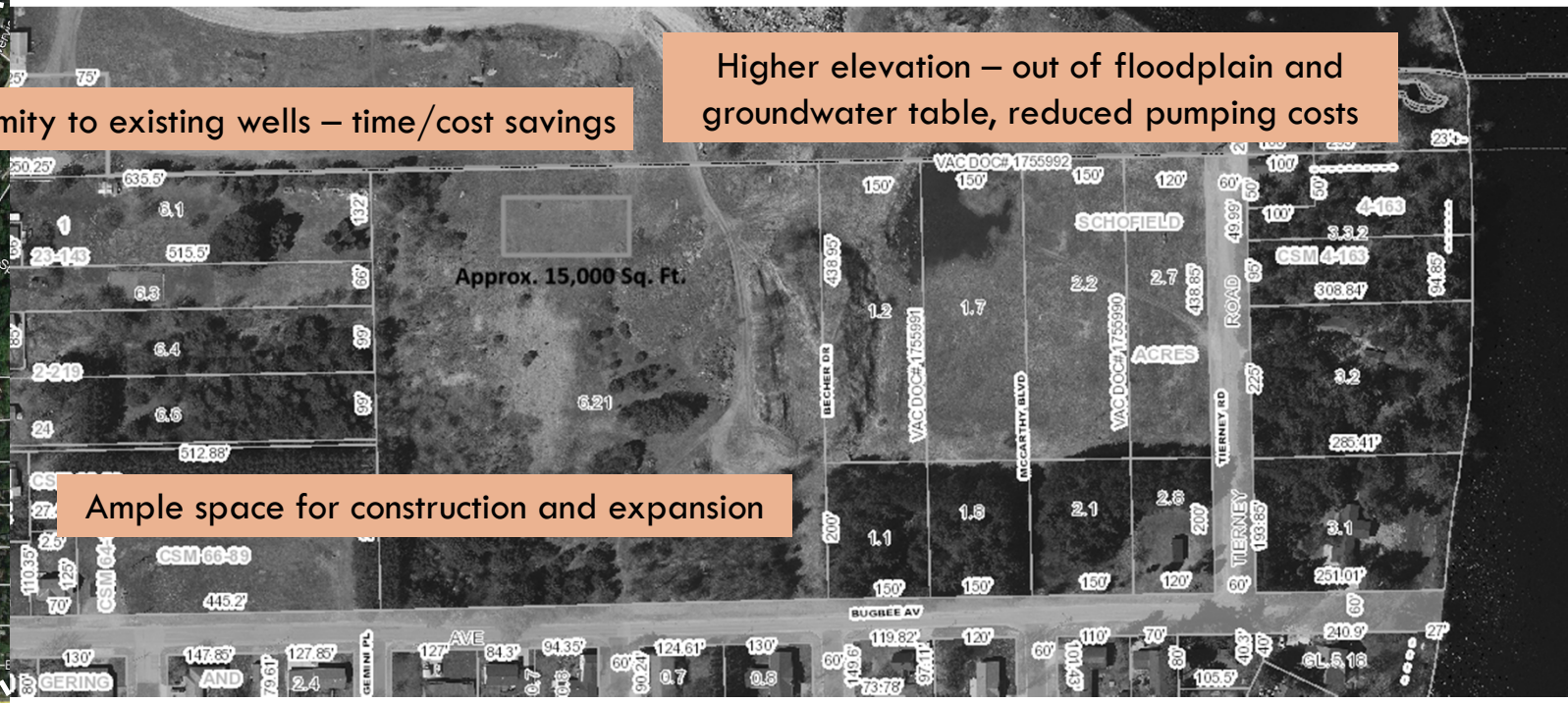



Proximity to existing wells – time/cost savings

Higher elevation – out of floodplain and groundwater table, reduced pumping costs

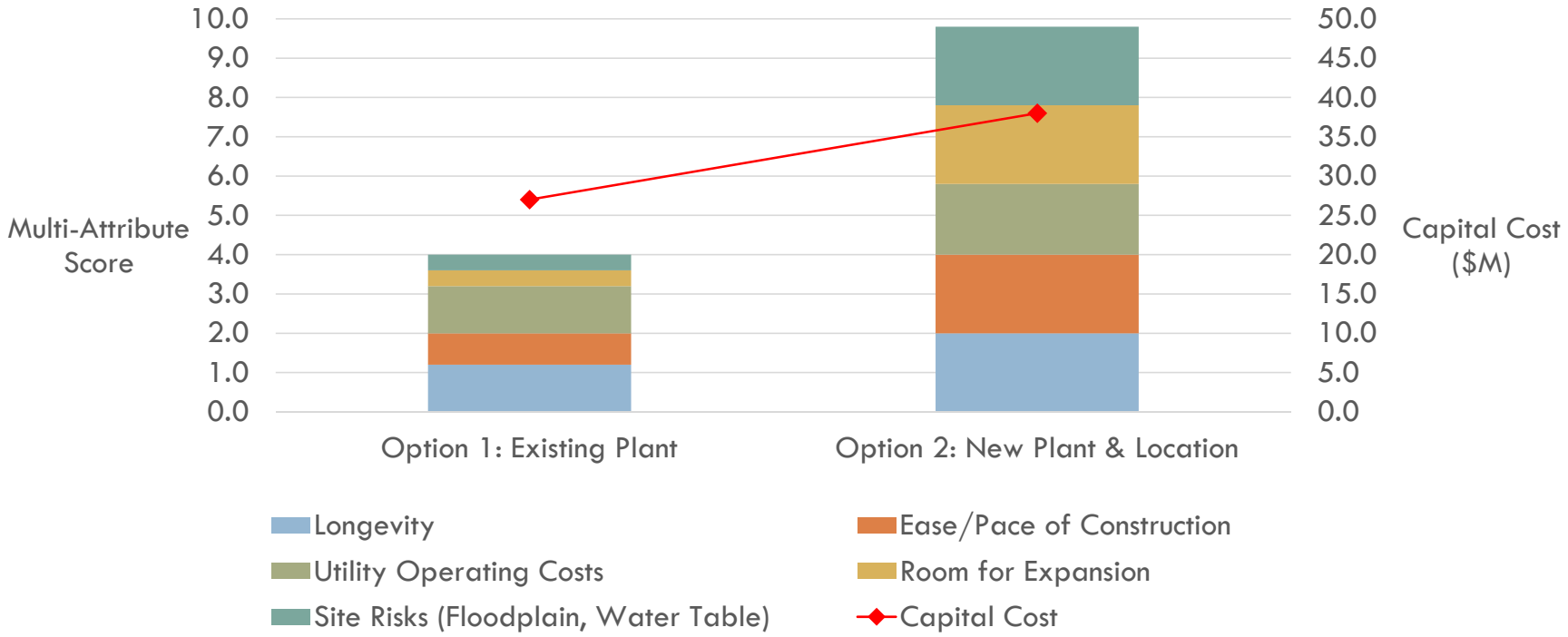
Ample space for construction and expansion

# Alternatives Comparison

| | | Score (1-10) | | Weighted Score | |
|---|---|---|---|---|---|
| Criteria | Weight | Option 1: Existing Plant | Option 2: New Plant & Location | Option 1: Existing Plant | Option 2: New Plant & Location |
| Longevity[1] | 20% | 6 | 10 | 1.2 | 2.0 |
| Ease/Pace of Construction[2] | 20% | 4 | 10 | 0.8 | 2.0 |
| Utility Operating Costs[3,4] | 20% | 6 | 9 | 1.2 | 1.8 |
| Room for Expansion | 20% | 2 | 10 | 0.4 | 2.0 |
| Site Risks (Floodplain, Water Table)[5] | 20% | 2 | 10 | 0.4 | 2.0 |
| Total | | | | 4.0 | 9.8 |

[1]Rehab will involve continued use of existing structures, some of which are nearly 60 years old
[2]Restricted space at site for new construction or construction staging; complicated construction staging to keep plant in service
[3]Reduced staff costs with consolidation of facilities, storage, and wells at new site; net reduction in pumping energy costs; reduction in building energy use
[4]Potential for reduced payments to City based on riverfront property vacancy for development
[5]New site is farther from river front and at higher elevation, well above groundwater table

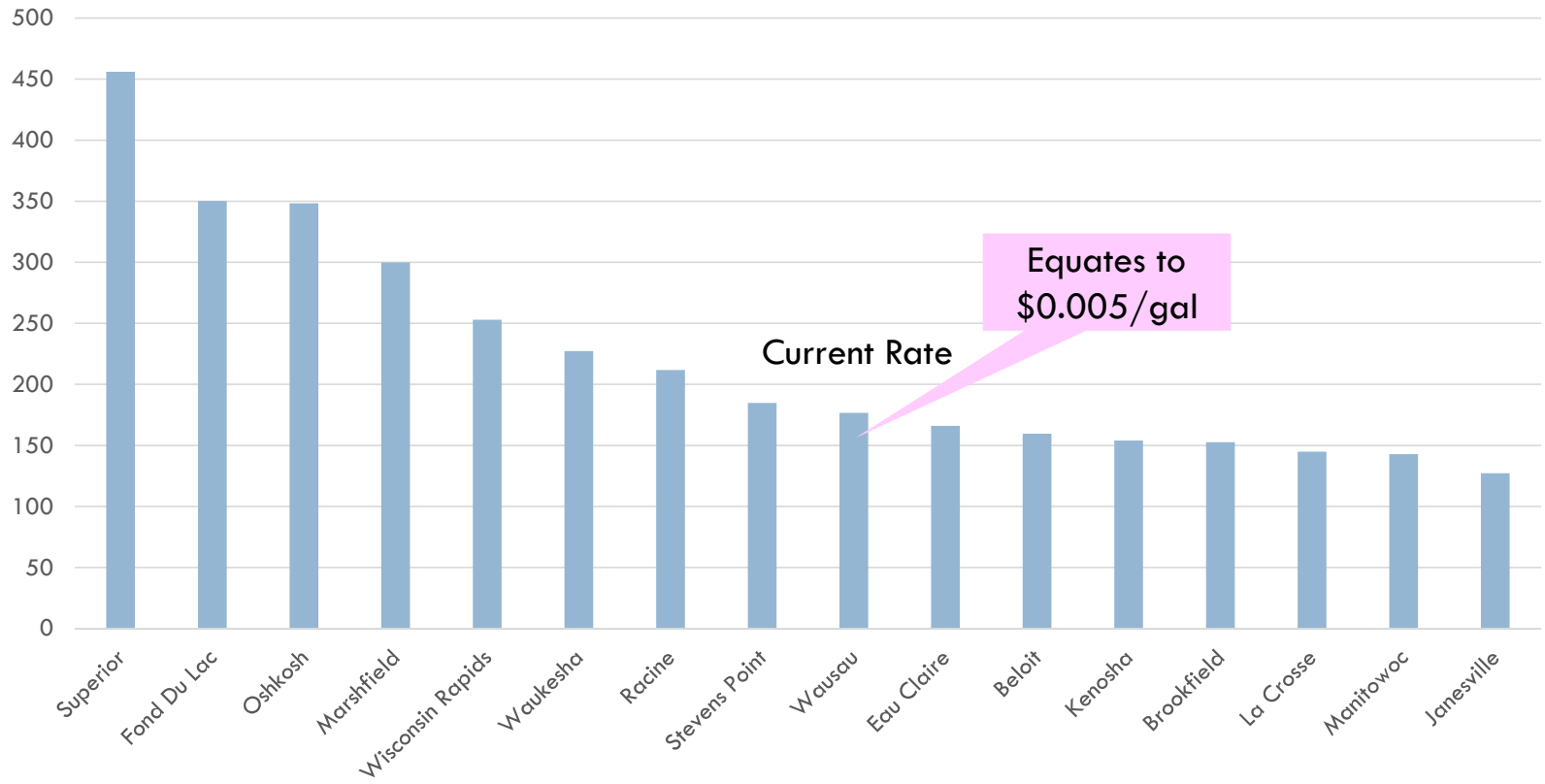
# Alternatives Comparison



# User Rate Perspective

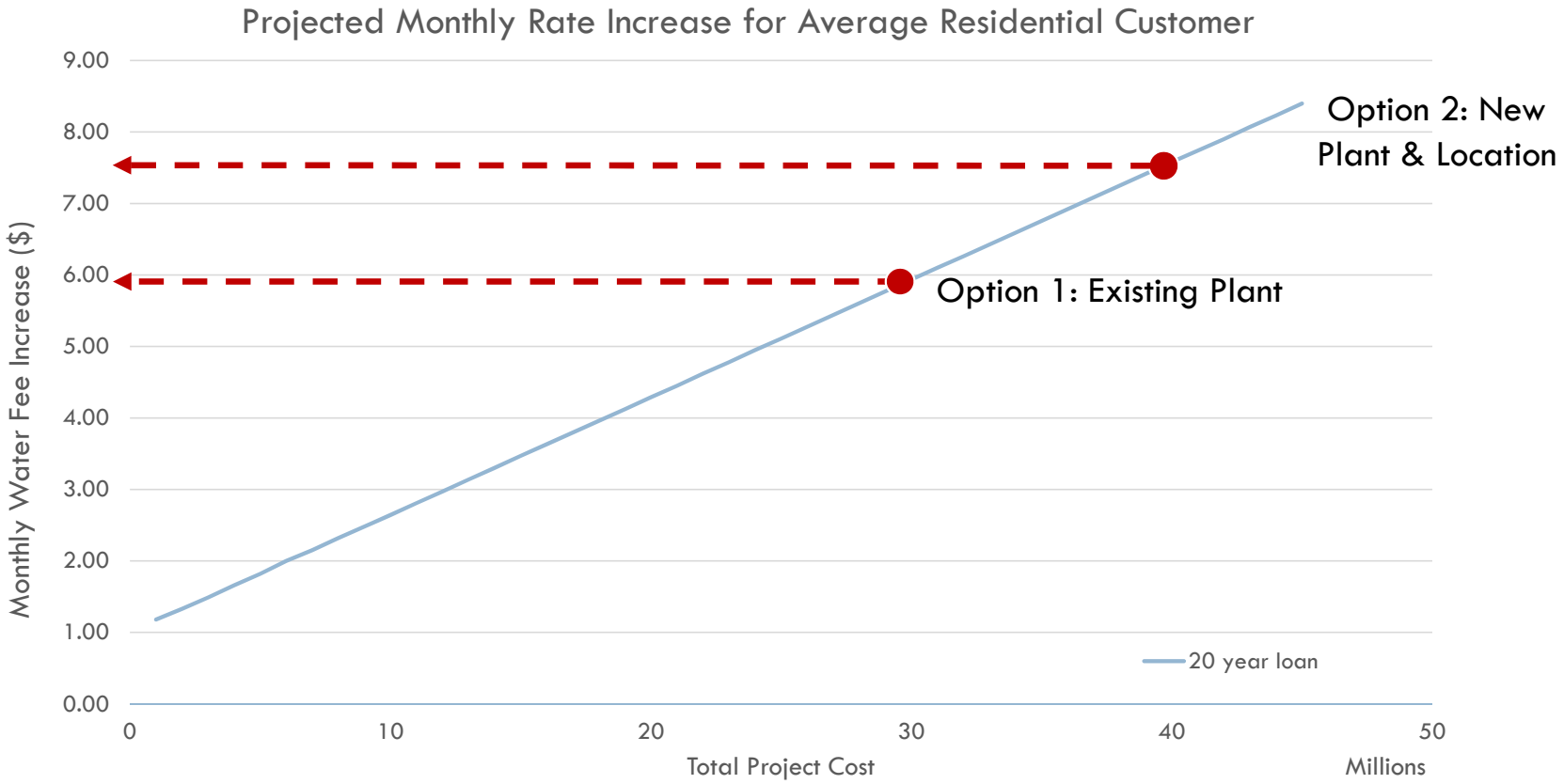
# Residential Water Rate Perspective

Annual Water Fee ($/yr)




All users at 37,300 gpy

# Residential Water Rate Implications



# Residential Water Rate Perspective

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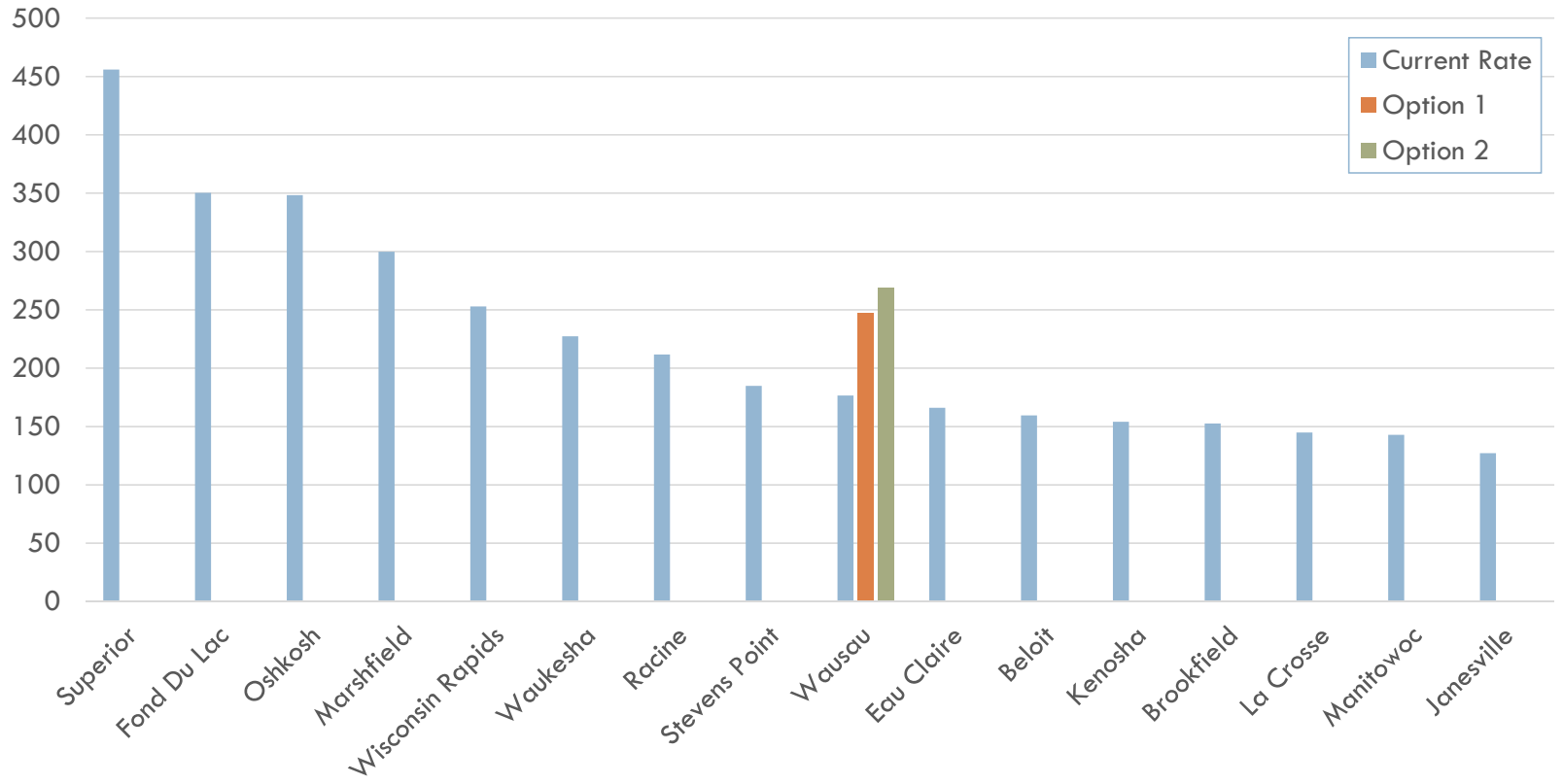
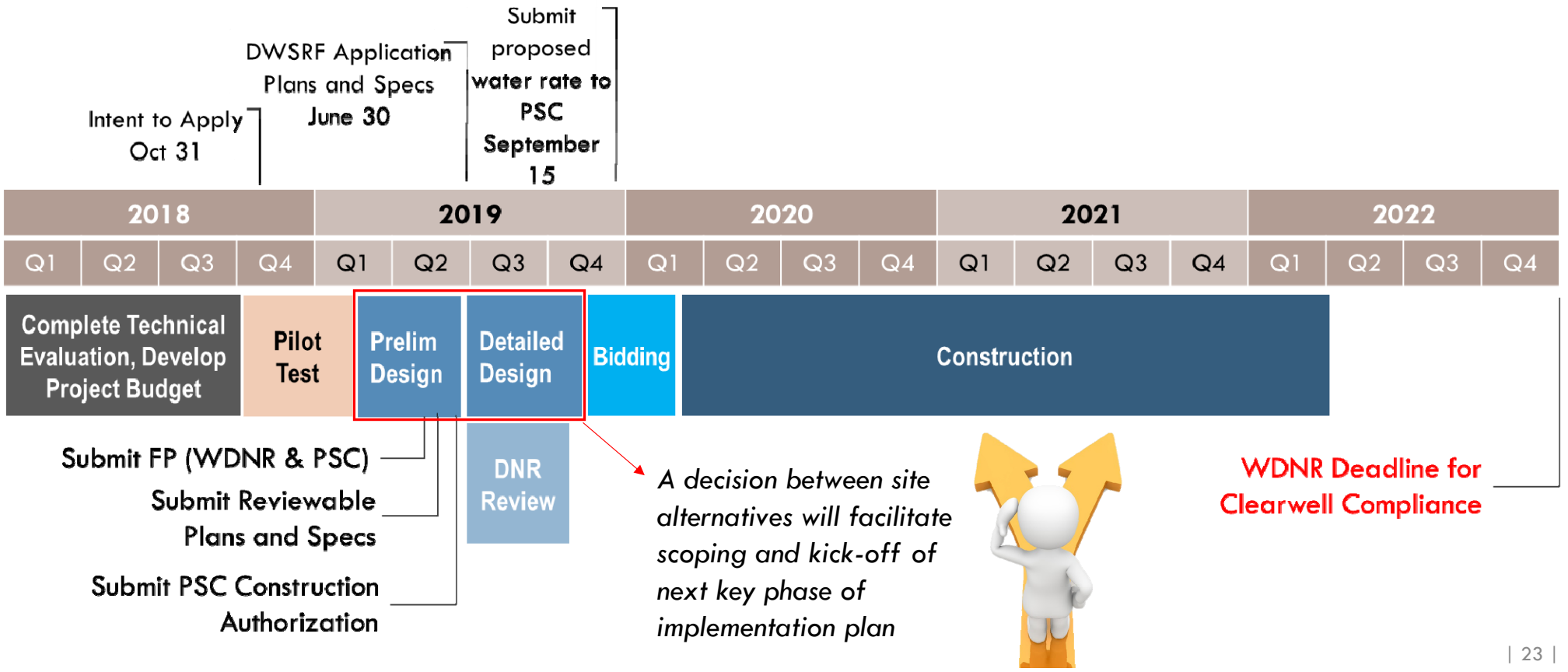



All users at 37,300 gpy

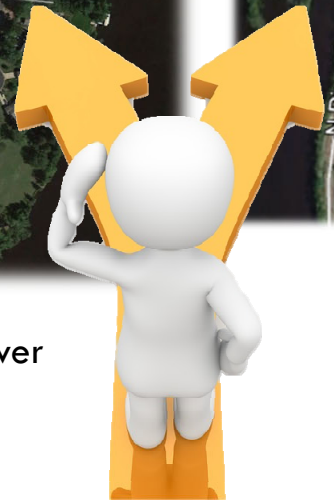
# Decision Point



# Decision Point

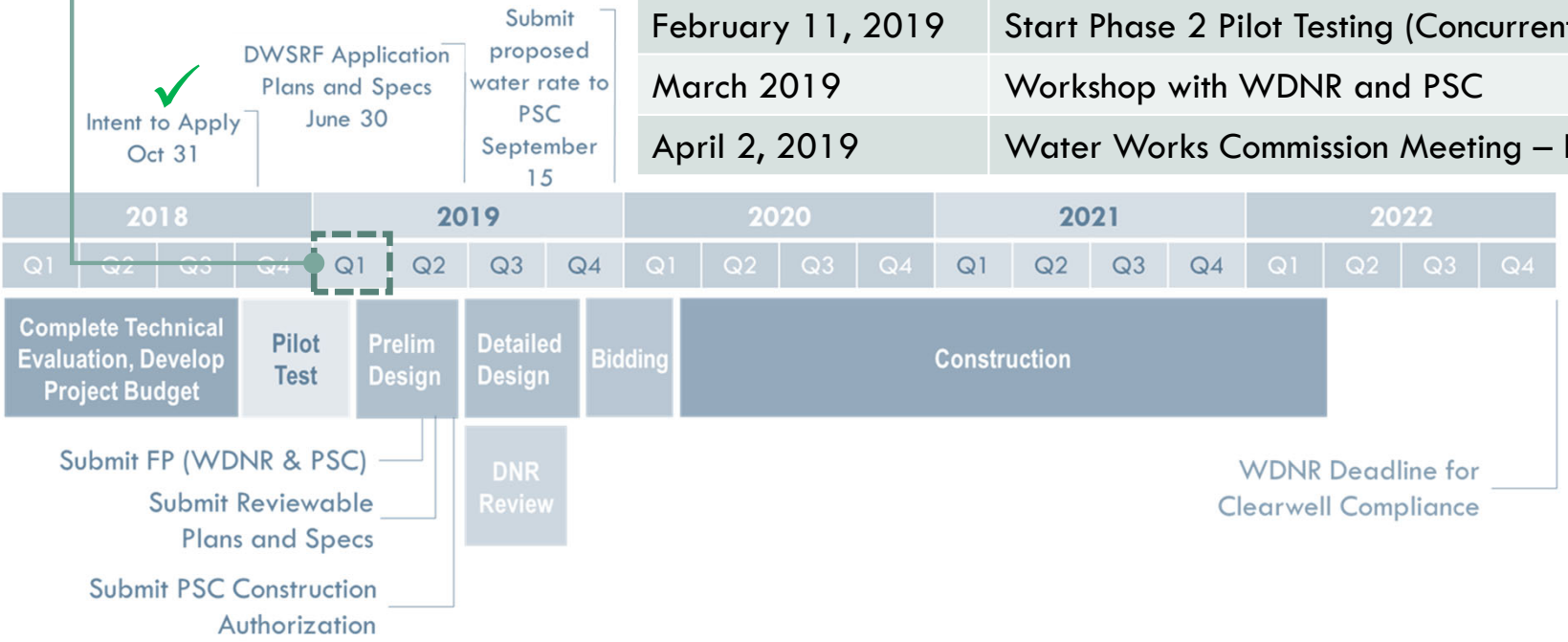

Build Brand New WTP on West Side of River


Rehabilitate and Upgrade Existing WTP



# Path Forward

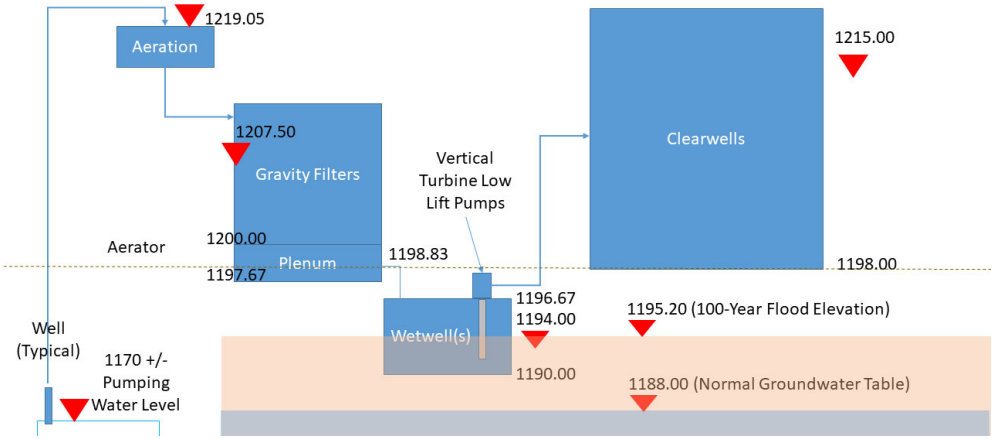
| Date | Milestone |
|---|---|
| January 8, 2019 | Water Works Commission Meeting – Determine WTP Location |
| February 5, 2019 | Start Preliminary Design |
| February 11, 2019 | Start Phase 2 Pilot Testing (Concurrent with Preliminary Design) |
| March 2019 | Workshop with WDNR and PSC |
| April 2, 2019 | Water Works Commission Meeting – Present Project Update |



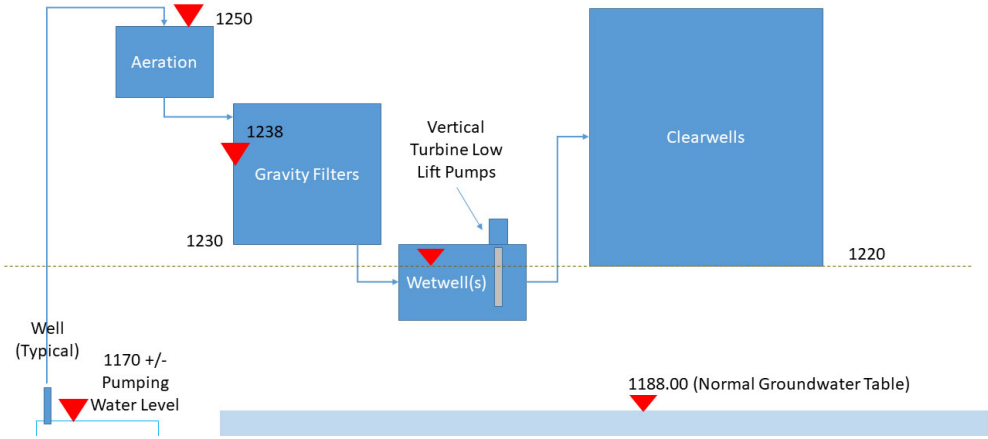
# Backup Information for Commission Purposes

# Water Treatment Plant Site Alternatives

## Water Conveyance – Existing Site




## Water Conveyance – New Site



# WTP Upgrade Costs

| | Option 1: Upgrade Existing Plant | Option 2: Build New Plant at Improved Location | |
|---|---|---|---|
| Chemical Storage and Feed | 2,300,000 | 2,200,000 | |
| Recarbonation Basins | 200,000 | 0 | |
| Aeration/Clarification | 0 | 5,300,000 | |
| Gravity Filters | 3,700,000 | 7,500,000 | |
| Filter Effluent Conveyance and Treatment | 10,700,000 | 10,700,000 | |
| Clearwell and Disinfection Improvements | 3,000,000 | 2,900,000 | |
| Pumping Upgrades | 1,900,000 | 1,800,000 | |
| Residual Handling and Disposal | 2,300,000 | 4,200,000 | |
| Instrumentation and Controls | 300,000 | 0 | |
| HVAC | 400,000 | 0 | |
| Distribution System Modifications | 0 | 3,000,000 | |
| Other Miscellaneous Improvements | 2,200,000 | 400,000 | |
| Total Capital Cost | 27,000,000 | 38,000,000 | |
| | | | |
| | | | |

# Pilot Testing: Phase 2

- Objectives:
  - Gain additional information to guide (new plant) sizing and chemical feed design
  - Assess impact of treatment process changes on release of lead and copper in City's distribution system
  - Compare alternative corrosion control treatment (CCT) strategies to obtain insight into optimal CCT for Wausau's future water quality

WDNR Requirement

- Scope:
  - 10 week equipment rental from Tonka Water
  - 2 weeks of Tonka Water technician service for start-up
  - 10 weeks of pilot operation by Becher Hoppe staff
  - Pilot summary report
  - February – April 2019 schedule