# Waukesha Great Lakes Water Project

## Root River Council
## February 27, 2017

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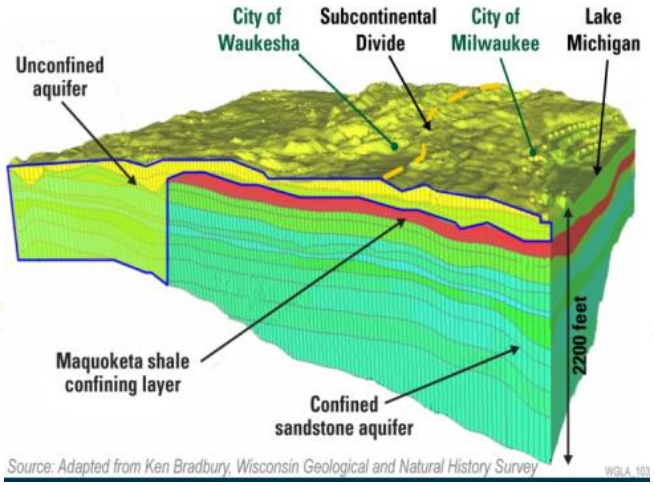
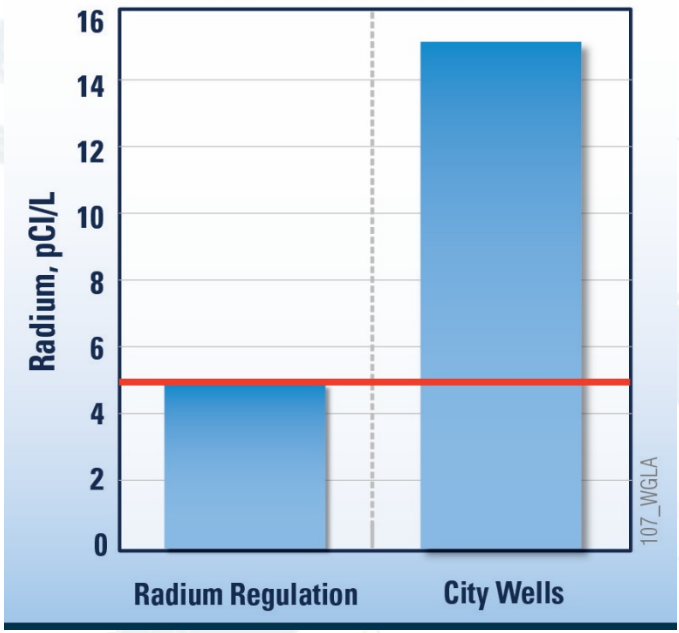
# Waukesha Project Overview

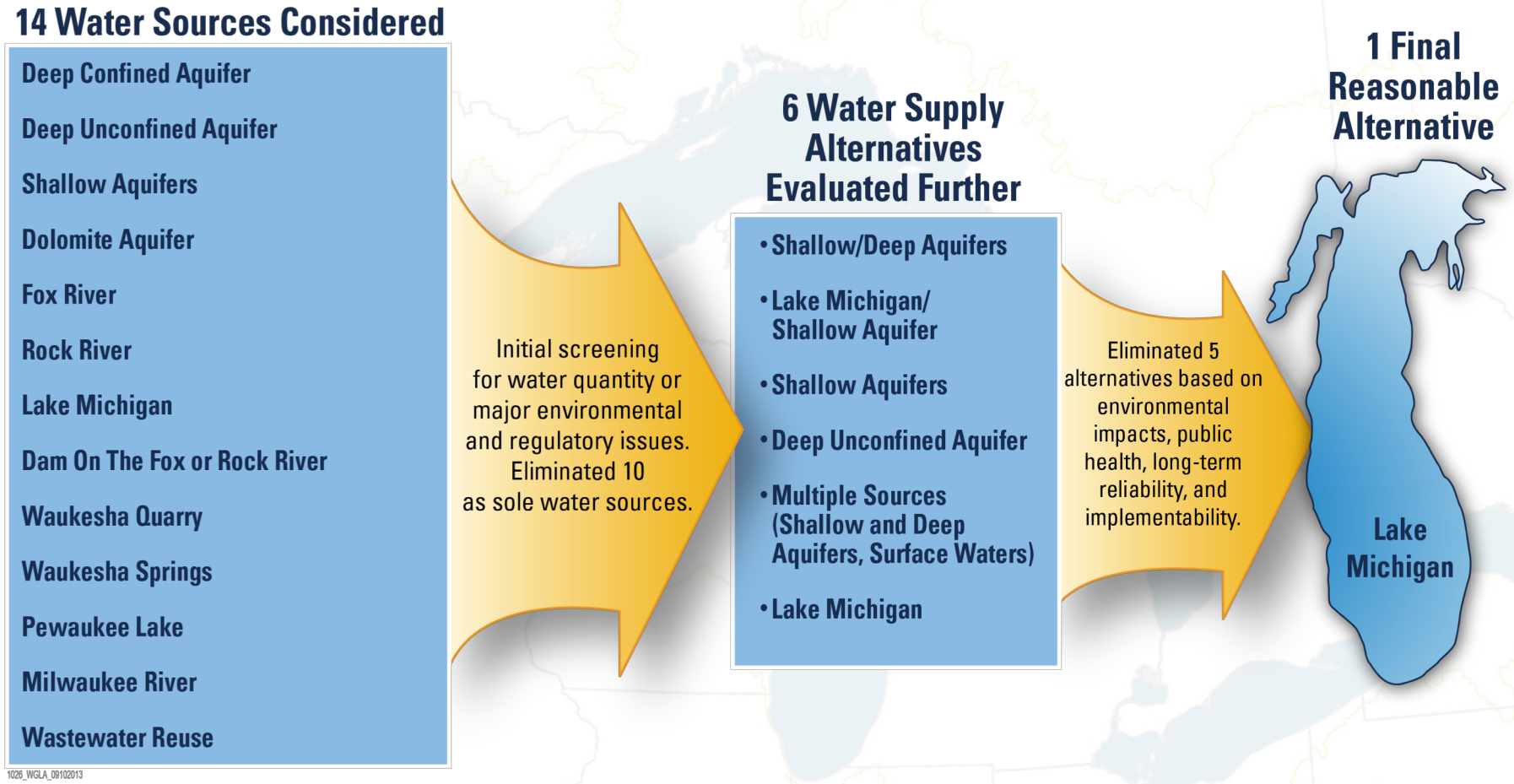
# Waukesha needs a new water supply

- EPA set radium standard at 5 pCi/l due to health risks. Waukesha deep aquifer wells are at 15 pCi/l, 3X the limit set by EPA.
- Waukesha ordered by court to comply with the radium standard by 2018.
- Deep groundwater levels have declined and capacity has decreased.
- Deep groundwater water quality is getting worse (high radium, salts, strontium). Several wells are no longer usable due to water quality issues.
- Deep groundwater is not sustainable due to high use by numerous communities and limited recharge.
- Pumping shallow wells also adversely impacts wetlands and streams. Water also has water quality issues (arsenic, chlorides, molybdenum).
- Even with conservation of existing supplies within the Mississippi River Basin, Waukesha does not have an adequate long-term supply.



# Lake Michigan is the only reasonable alternative

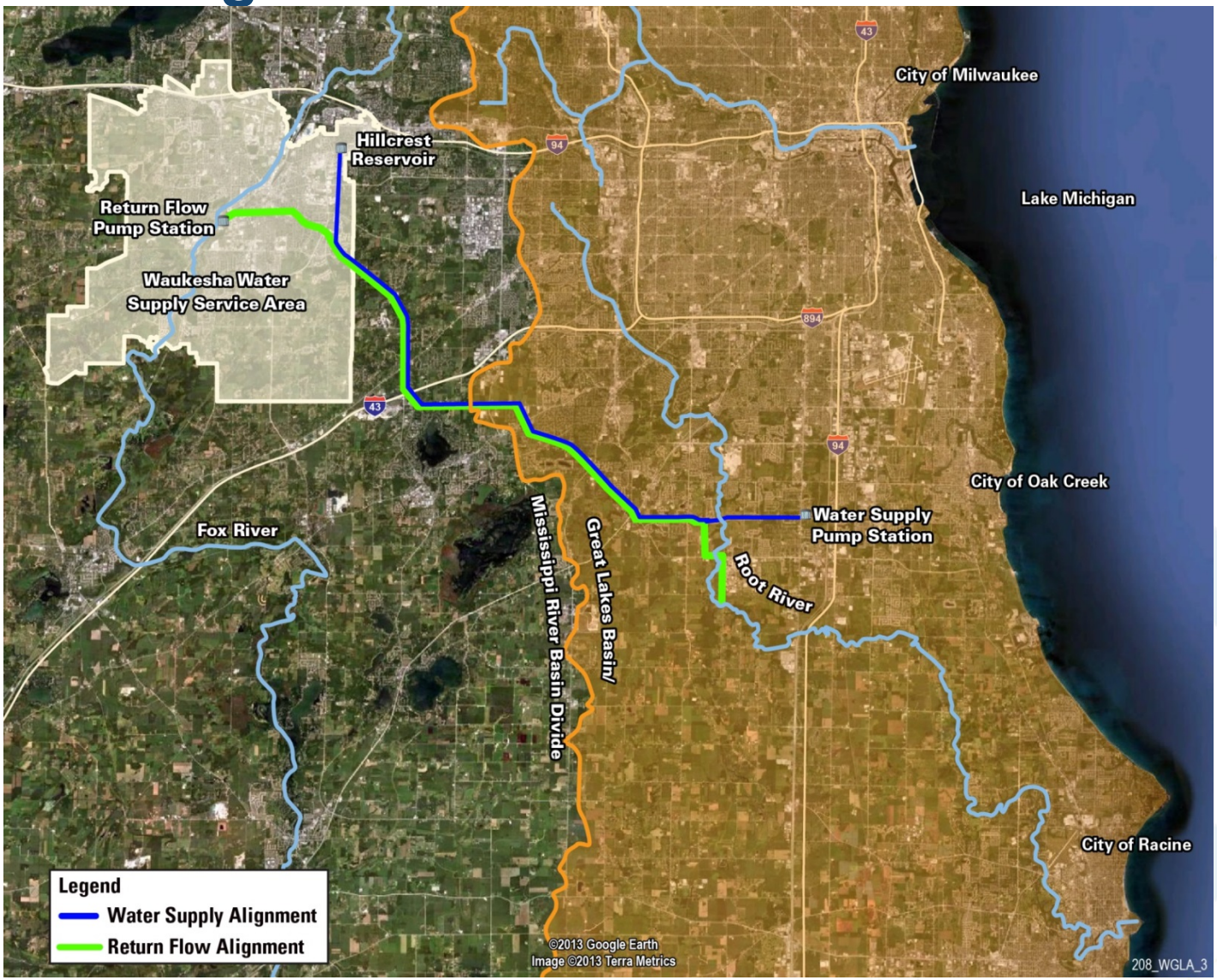


# Waukesha Application Process*

- Original Application Submitted to DNR – April, 2010
- Reformatted Application Submitted to DNR – October 14, 2013
- Waukesha Holds Informational Meetings
  - November, 2013 – Waukesha, Oak Creek, Racine and Milwaukee
- DNR Issues Draft EIS and Technical Review– June, 2015
  - DNR Analysis Performed at 8.5MGD on all Water Supply Alternatives
- Public Meetings and Comments on Draft EIS and Technical Review
  - June 2015 to August 2015
- Final WDNR Technical Review and EIS Issued – January, 2016
- Wisconsin Submittal to Regional Body – January, 2016
- Public comments – January 12 to March 14, 2016
- Michigan/Ontario Complete Technical Reviews – March, 2016
- 5 States/2 Provinces Submit Questions – March/April 2016
- Approval Granted – June, 2016

* Indicates Comments Received from outside Parties throughout the Process

# Lake Michigan Alternative



# Waukesha Has a Unique Set of Facts

- Waukesha needs a new water supply because groundwater quantity is limited, water quality is impaired, and continued use of existing supplies causes significant adverse environmental impacts.
- Cost-effective distance from the Great Lakes and using existing Great Lakes water supplier.
- Currently utilizing groundwater that is connected to the Great Lakes.
- Aquifer formation restricts recharge, contributing to groundwater decline.
- Naturally occurring groundwater contaminants (radium, total dissolved solids and strontium); under a court order to comply with Safe Drinking Water Act radium standard.
- A water conservation leader with conservation water rates, daytime sprinkling ban, financial incentives for fixture replacement, public education and more.
- Will return approximately 100% of the water to the Great Lakes .
- Return flow improves a Great Lakes tributary and the performance of a Great Lakes fish egg collection facility.
- Development of an EIS after years of thorough analysis and extensive public input.

# Return Flow

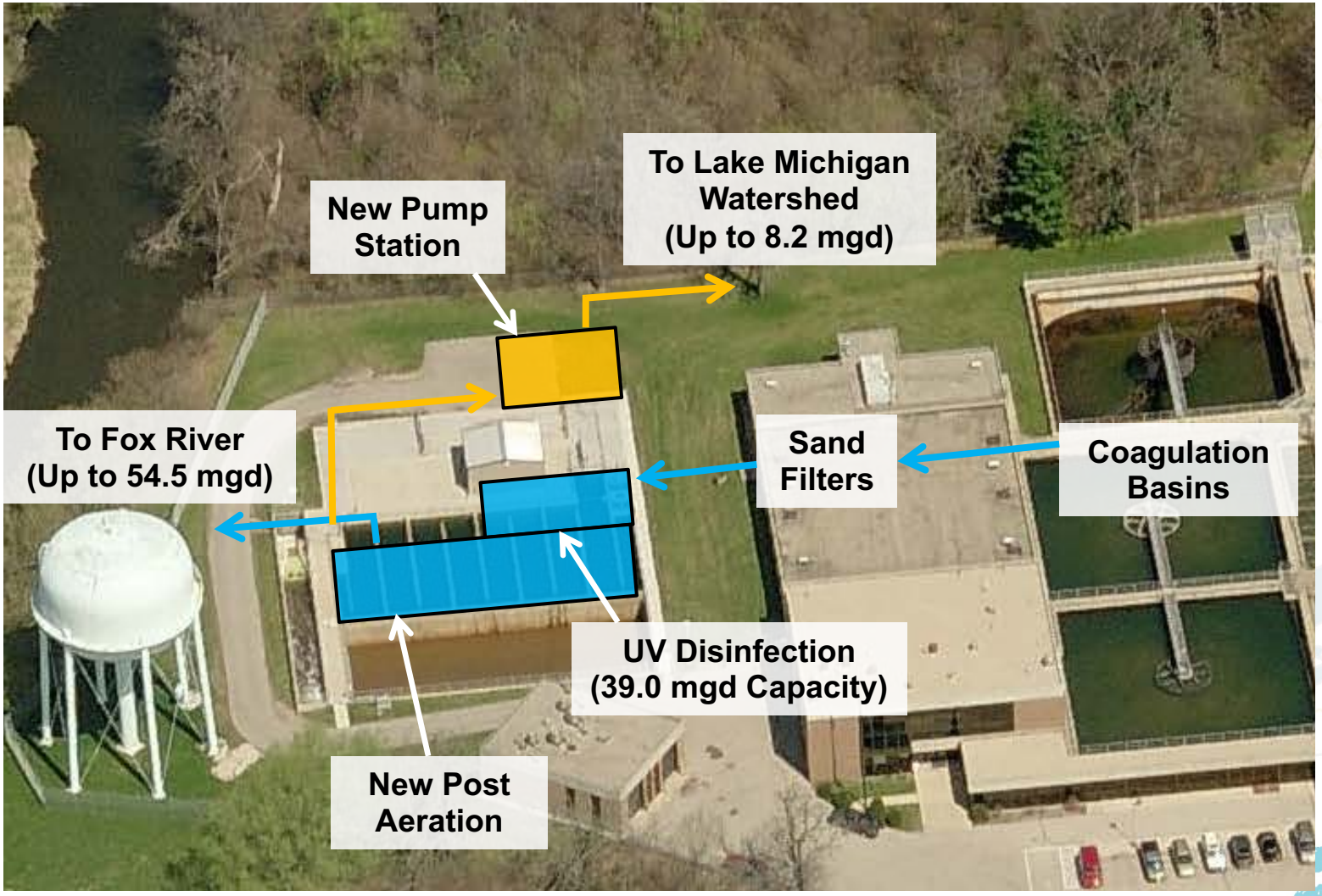
# Return Flow

- Wisconsin has more than 500 municipal wastewater treatment plants
  - 22 flow directly to the Great Lakes
  - 8 flow directly to inland lakes
  - 473 flow to rivers
- Return flow water quality will meet all WDNR and EPA requirements
  - WDNR permit limits include strict phosphorus standards

# Return Water Quality

- Currently treats to levels better than all permit requirements
- Advanced facility with Ultraviolet (UV) light disinfection and tertiary treatment, including dual media sand filters.
  - Few facilities in the State have effluent filtration

# Post-Secondary Treatment Flow Schematic



# Return Flow Water Quality

# Root River comparison (quantity and quality)

| Parameter | Return Flow Water Quality [a] | Permit Required Discharge Quality | Average Root River Water Quality |
|---|---|---|---|
| Biological Oxygen Demand (mg/L) | 1.8 | ≤5.7 to ≤10.0 | Approx. 2.4 |
| Total Suspended Solids (mg/L) | 1.2 | ≤10.0 | Approx. 10 to 27 |
| Dissolved Oxygen (mg/L) [more oxygen is better] | 9.2 | ≥7.0 | Approx. 5.5 to 9.9 |
| Total Phosphorus (mg/L) | <0.075 | ≤0.075 | Approx. 0.13 |
| Fecal Coliform (Counts/100mL) | 12 | ≤400 | Approx. 500 to 3,000 |

[a] Average Historical Waukesha Operation or Permit Limit

# Return Flow Water Quality

EXHIBIT 13

**Comparison of WDNR-Proposed WPDES Limits to Historical WWTP Performance and Other Direct and Tributary Lake Michigan Municipal Dischargers**

| | City of Waukesha Potential Return Flow | | (CEDARBURG WWTP JUNE 2013) | (GRAFTON WWTP DECEMBER 2013) | (RACINE WWTP DECEMBER 2019) | (MMSD WWTP DECEMBER 2017) |
|---|---|---|---|---|---|---|
| Water Quality Parameter | WDNR-Proposed Limit for Lake Michigan Tributary Return | Waukesha Historical Average[a] | Lake Michigan Tributary WWTP Discharger #1[b] | Lake Michigan Tributary WWTP Discharger #2[c] | Discharger Direct to Lake Michigan[d] | Discharger Direct to Lake Michigan[d] |
| Biological oxygen demand, mg/L | ≤ 5.7 to ≤ 10.0 | 1.8 | ≤ 10.0 to ≤ 15 | ≤ 30.0 monthly avg. | ≤ 30.0 monthly avg. | **≤ 30.0 monthly avg.** |
| Total suspended solids, mg/L | ≤ 10.0 | 1.2 | ≤15.0 | ≤ 30.0 monthly avg. | ≤ 30.0 monthly avg. | ≤ 30.0 monthly avg. |
| Dissolved oxygen, mg/L | ≥ 7.0 | 9.2 | ≥ 6.0 | ≥ 6.0 | No Limit | No Limit |
| Phosphorus, mg/L | ≤ 0.075[e] | 0.16 | ≤ 1.0 | ≤ 1.0 | ≤ 1.0 (See NR217.13(4)) | ≤ 0.22 (JI 6-mo. avg) ≤ 0.60 (SS 24-mo rolling avg) |
| Ammonia ($NH_3$-N), mg/L | ≤ 1.3 to ≤ 4.3 | < 1.0 | ≤ 3.3 to 6.4 monthly avg. | ≤ 6.3 to 12.0 monthly avg. | pH dependent; ≤ 1.8 to 39 daily max. | JI No Limit ≤ 27 (SS daily max) |
| Chlorides, mg/L | ≤ 395 | 477 | ≤ 570 | No limit | No limit | No limit |
| Temperature, °F (varies by month) | ≤ 49 to 81 | 53 to 70 | No Limit | No limit | No limit | No limit |

[a]October 1, 2002, to August 31, 2009. March 15, 2006 to May 1, 2013 for Chlorides. [b]WPDES Permit No. WI-0020222-08-0 [c]WPDES Permit No. WI-0020184-08-0 [d]WPDES Permit No. WI-0025194-07-1 [e]Water Quality Standard for Underwood Creek and the Root River. JI= MMSD Jones Island SS= MMSD South Shore

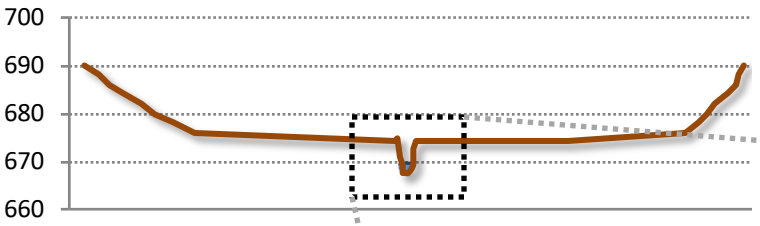
# Return Water Quality

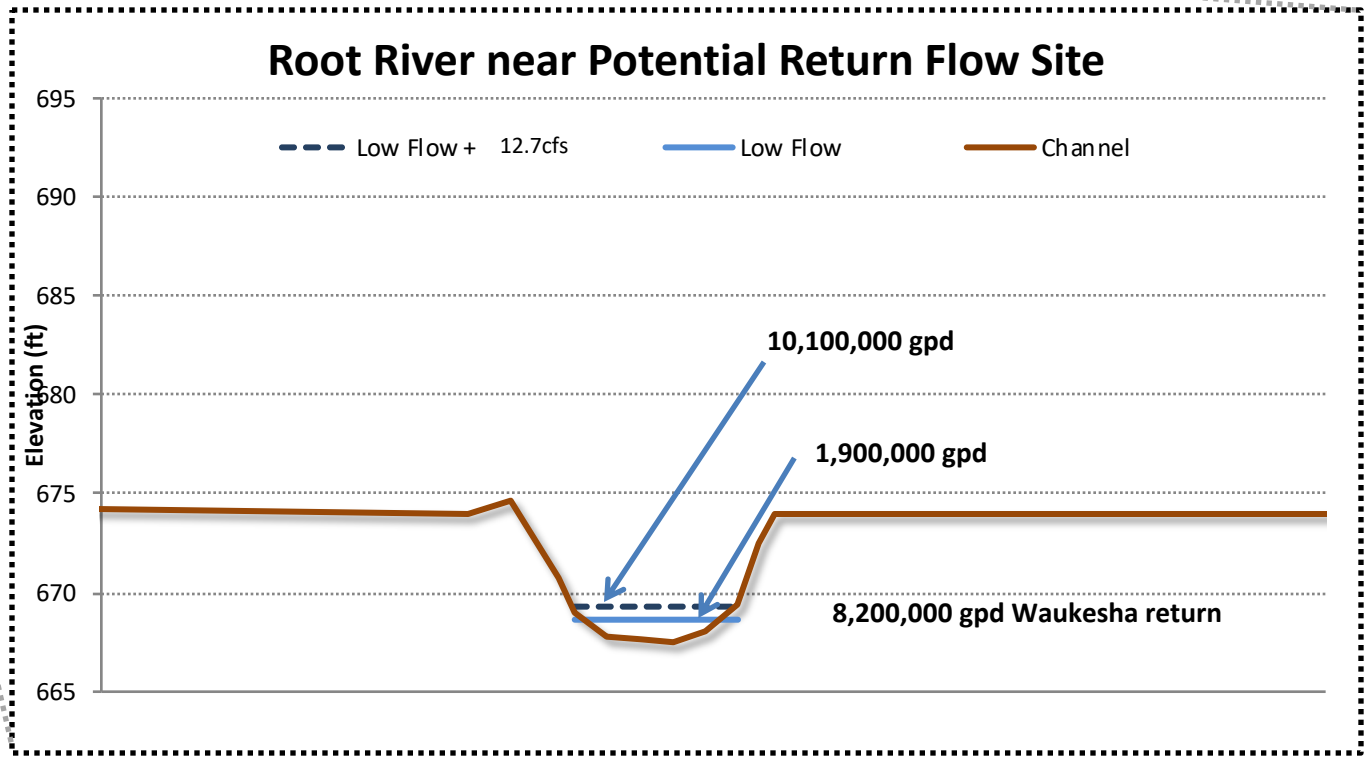
- Downstream of the potential return flow location Root River is “impaired”
  - Impairment results in very strict permit limits

| Impairment | Return Flow | Return Flow Effect |
|---|---|---|
| PCBs | Return flow will not have PCBs | None |
| Phosphorus | Return flow will have concentration less than the water quality standard | Will lower concentrations in Root River |
| Suspended Solids | Return flow will have concentration less than the water quality standard | Will lower concentrations in Root River |

# Return Flow Volume

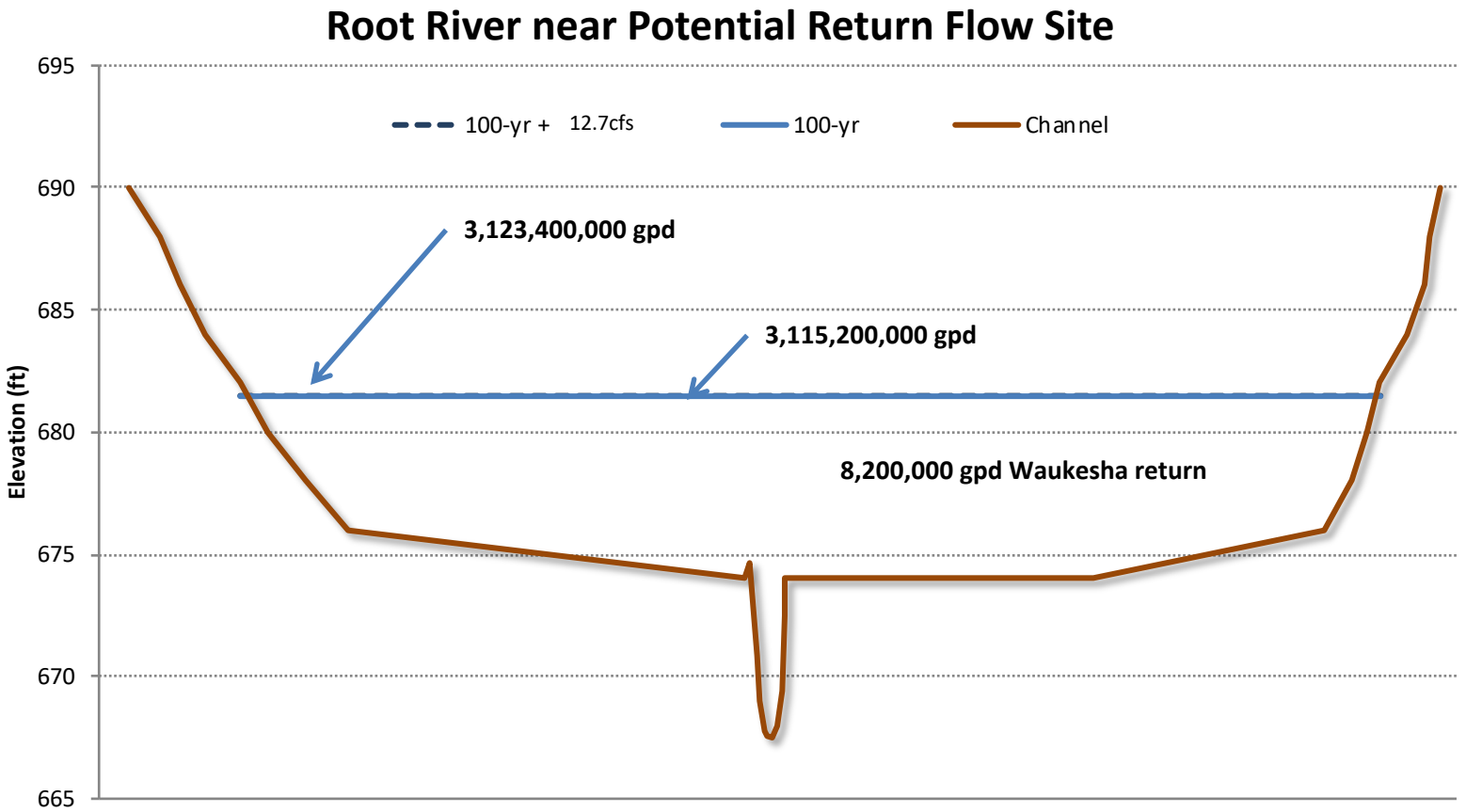
# Low River Flow with Average Return Flow



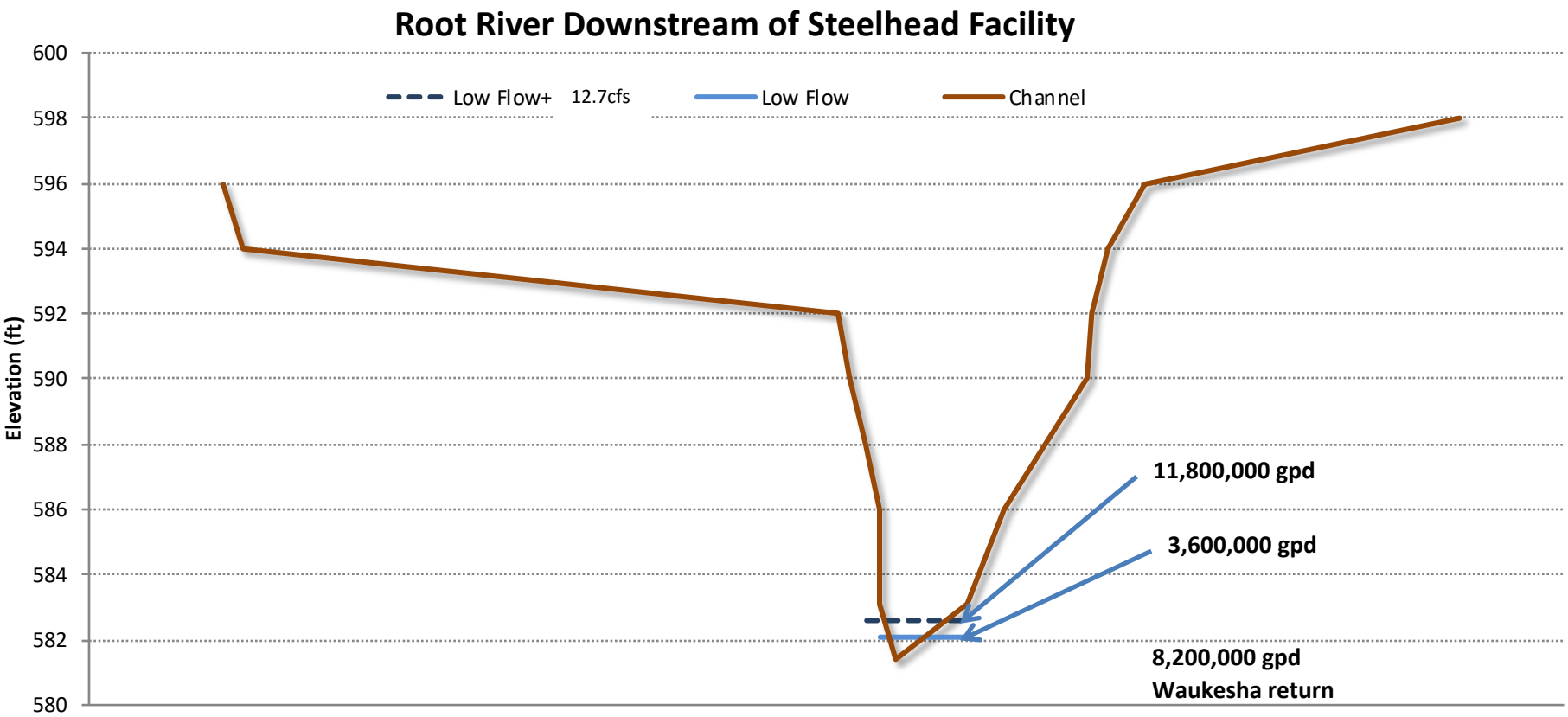

| Root River Flow Scenario | River Flow Rate (mgd) | Return Flow Rate (mgd) | River Flow Rate with Return Flow (mgd) | % Increase in River Flow Rate (%) | Increase water depth (in) | River Avg Velocity (fps) | River Avg Velocity with Return Flow (fps) |
|---|---|---|---|---|---|---|---|
| Low Flow | 1.9 | 8.2 | 10.1 | 423% | 6.6 | 0.07 | 0.27 |

# 100 year River Flow with Maximum Return Flow



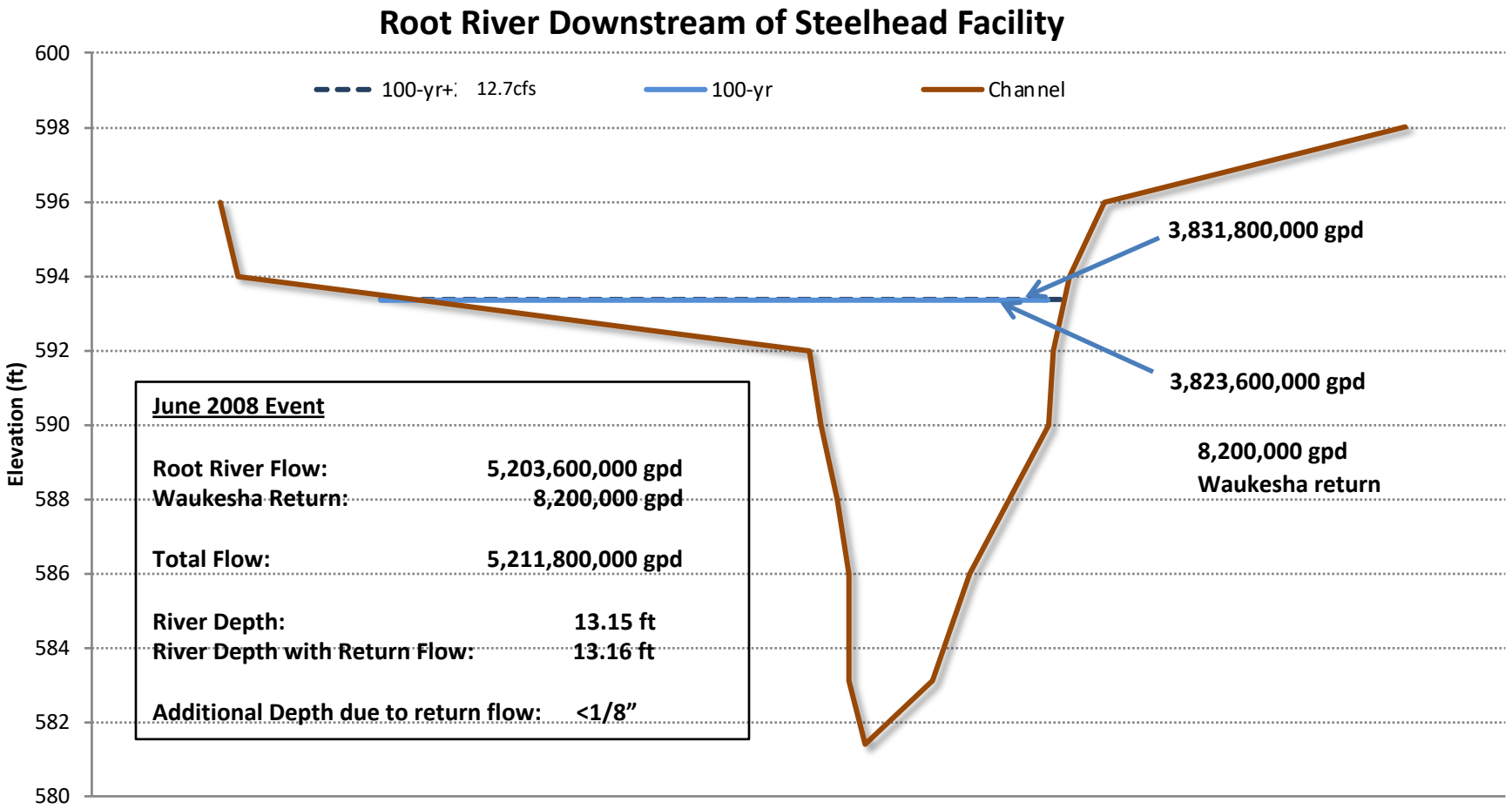

| Root River Flow Scenario | River Flow Rate (mgd) | Return Flow Rate (mgd) | River Flow Rate with Return Flow (mgd) | % Increase in River Flow Rate (%) | Increase water depth (in) | River Avg Velocity (fps) | River Avg Velocity with Return Flow (fps) |
|---|---|---|---|---|---|---|---|
| 100 Year Flow | 3,115.2 | 8.2 | 3,123.4 | 0.26% | 0.12 | 1.57 | 1.57 |

# Low River Flow with Average Return Flow




| Root River Flow Scenario | River Flow Rate (mgd) | Return Flow Rate (mgd) | River Flow Rate with Return Flow (mgd) | % Increase in River Flow Rate (%) | Increase in water depth (in) | River Avg Velocity (fps) | River Avg Velocity with Return Flow (fps) |
|---|---|---|---|---|---|---|---|
| Low Flow | 3.6 | 8.2 | 11.8 | 227% | 4.8 | 0.63 | 0.82 |

# 100 year River Flow with Maximum Return Flow




| Root River Flow Scenario | River Flow Rate (mgd) | Return Flow Rate (mgd) | River Flow Rate with Return Flow (mgd) | % Increase in River Flow Rate (%) | Increase in water depth (in) | River Avg Velocity (fps) | River Avg Velocity with Return Flow (fps) |
|---|---|---|---|---|---|---|---|
| 100 Year Flow | 3823.6 | 8.2 | 3831.8 | 0.21% | 0.12 | 5.04 | 5.05 |

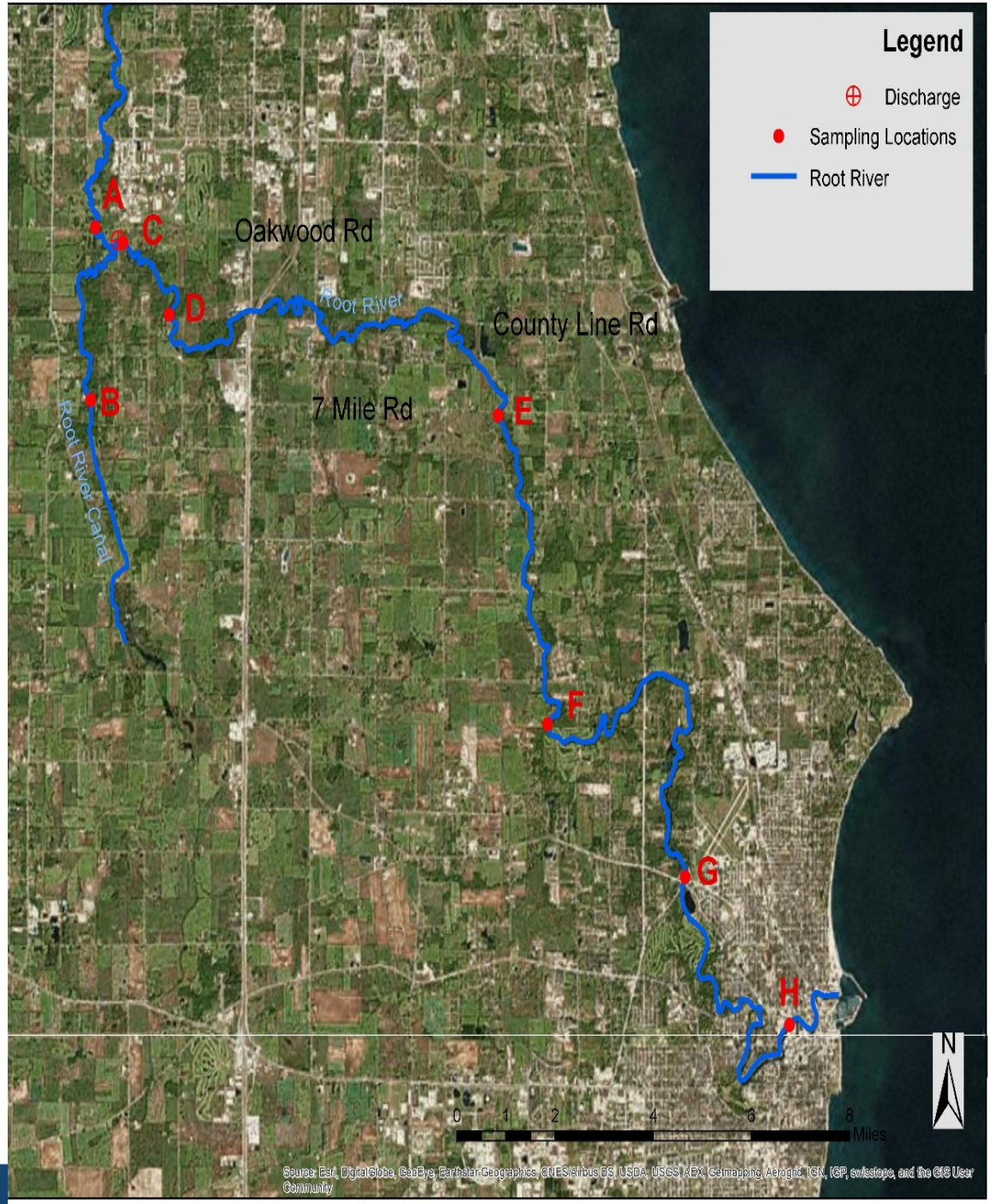
# Return Flow Sampling Plan

# Return Flow Sampling Plan Goals

- Support baselining the river for pre-return flow water quality and biological conditions.
- Provides Information regarding Wisconsin Pollution Discharge Elimination System (WPDES) return flow permitting
- Supports site specific information on river flow and water quality conditions that may be used to determine return flow water quality limits
- Supports understanding pre-return flow river water quality downstream of the return flow location
- Complements publicly available data from entities such as SEWRPC, MMSD, USGS, DNR, City of Racine, as well as the Root River Restoration Plan, which was used to develop the plan
- Consulted with USGS, UW-Parkside and DNR to develop the plan

# Summary of Root River Sampling Plan Collaborators

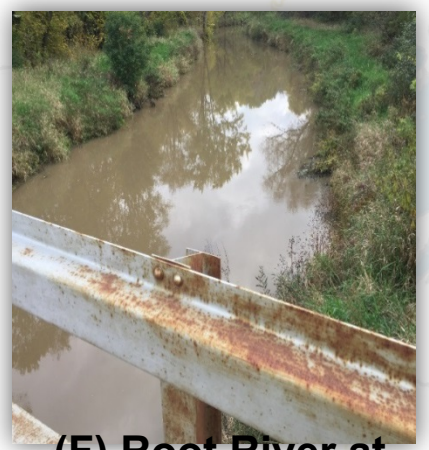
| University of Wisconsin – Parkside | |
|---|---|
| Dr John. Skalbeck, Program Director | UW-Parkside will collect grab water samples for laboratory analysis, and in-situ field water quality measurements. UW-Parkside will also conduct the habitat assessment, macroinvertebrate sampling, and fish sampling for the Root River Monitoring Plan. |
| Dr. Jessica Orlofske, Sampling Director | |
| Ms. Laura Schulz, Water Sampling Manager | |
| Dr. Mike Pauers, Fish Sampling Manager | |
| Dr. Daryl Sauer, Laboratory Operations Director | |
| Dr. Lori Allen, Analytical Director | |
| **United States Geological Survey** | |
| Dr. Rob Waschbusch, Hydrologist and PI | USGS will manage an automated water quality data sonde that will measure multiple parameters hourly. |


Legend
Discharge
Sampling Locations
Root River
A
C
D
B
E
F
G
H
Oakwood Rd
Root River
County Line Rd
7 Mile Rd
Root River Canal
N
0 1 2 4 6 8
Miles
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

# Sampling Sites

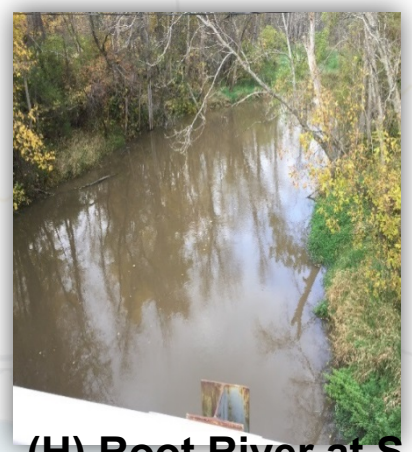
**(A) Root River at Oakwood Rd**

**(B) Root River Canal at 7 Mile Rd**



**(C) Root River on 60th St Bridge at return flow outfall**

**(D) Root River at County Line Rd**



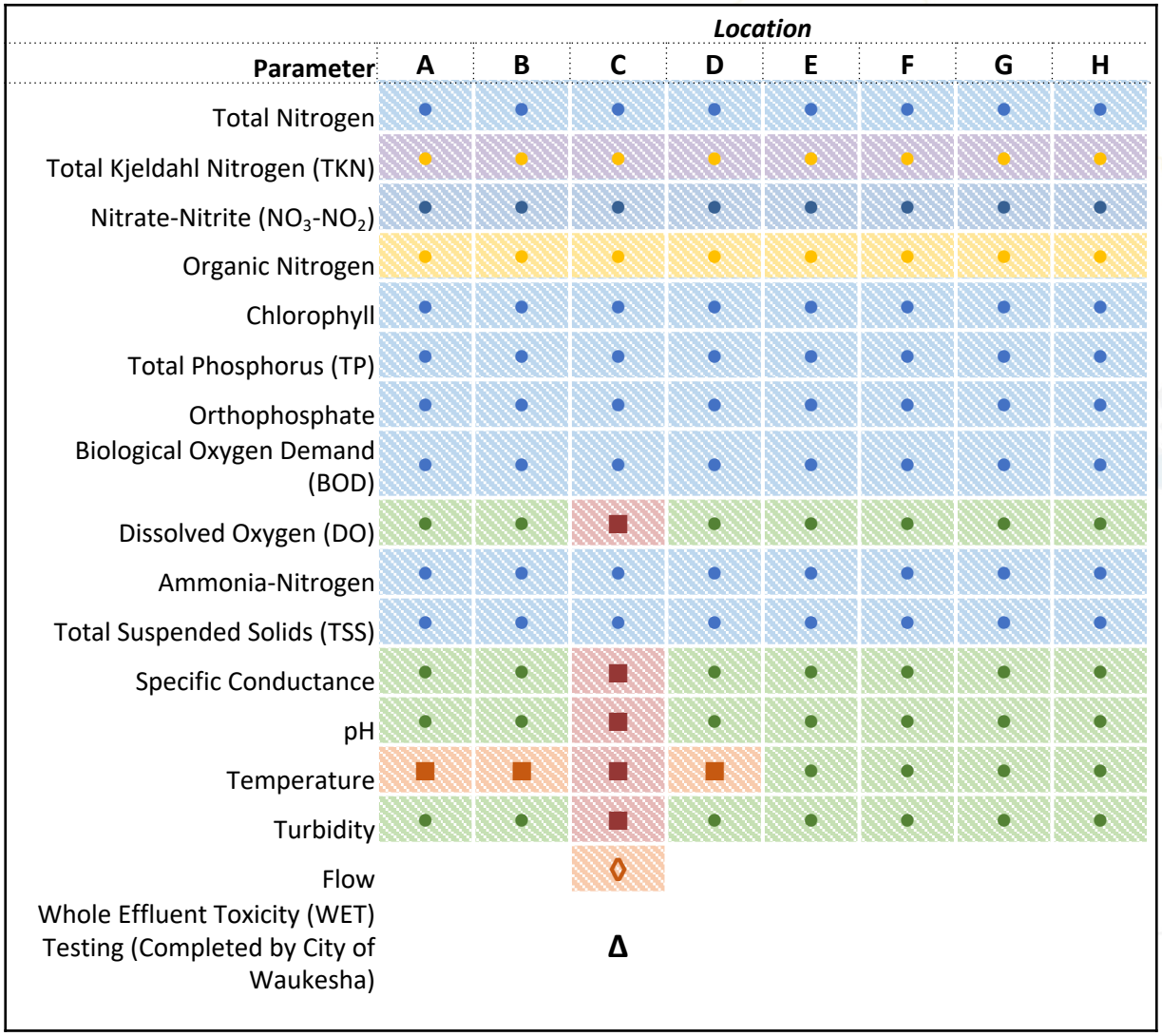
**(E) Root River at 7 Mile Rd**

**(F) Root River at Johnson Park**

**(G) Root River downstream of Horlick Dam**

**(H) Root River at S Marquette St**

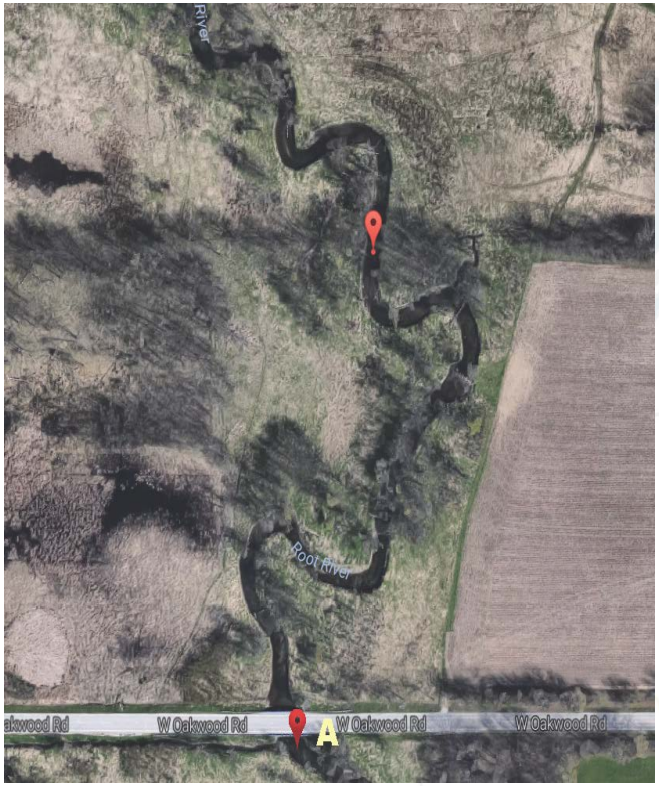
# Water Quality Sampling

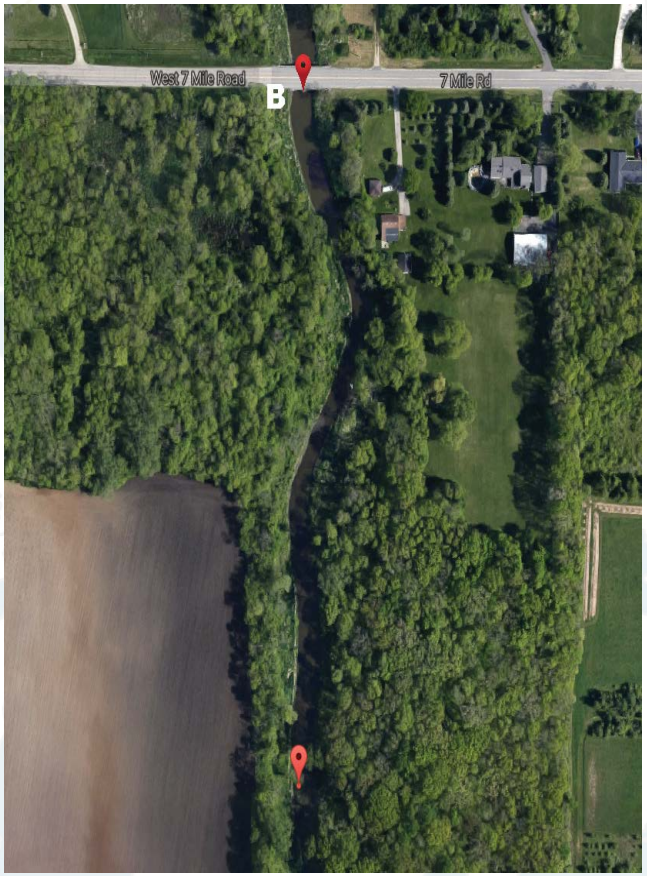


# Biological Monitoring

- Shall be conducted at sites A-D to evaluate macroinvertebrate and fish populations and habitat conditions.
- Scientific Collectors Permit for sampling fish and benthic macroinvertebrates
- Habitat Assessment
  - *Guidelines for Evaluating Habitat of Wadable Streams* (WDNR, 2002).
  - Only during the first sampling event
  - Habitat Assessment Form to be completed
- Macroinvertebrate sampling
  - *Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams* (WDNR, 2000).
- Fish sampling
  - *Guidelines for Assessing Fish Communities of Wadable Streams in Wisconsin* (WDNR, 2001).

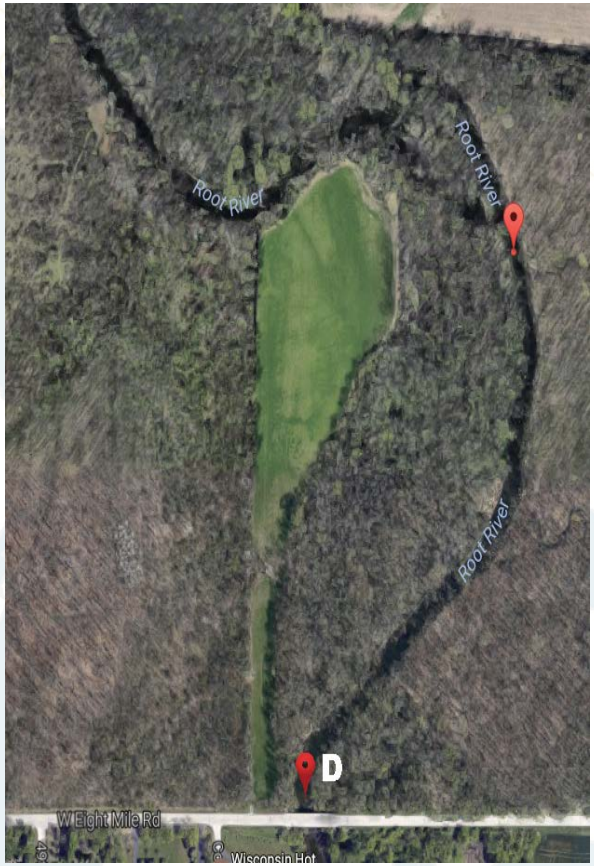
# Biological Reach Maps




*Biological sampling methodology shall follow a reach length that is 35 times the width of the river.*

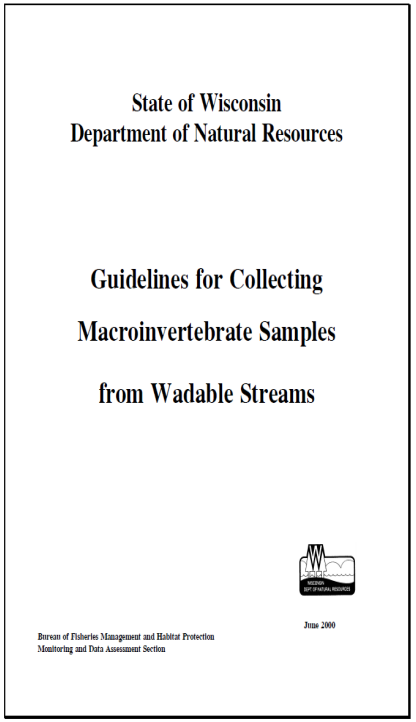
# Biological Reach Maps (cont.)


*Biological sampling methodology shall follow a reach length that is 35 times the width of the river.*

# Macroinvertebrate Sampling

- Sampling twice per year
  - September through early October
  - November
- Analysis will be conducted by UW-Parkside laboratory, headed by Dr. Jessica Orlofske, who is state-certified in taxonomic identification and enumeration
- Coordination with fish sampling and water quality sampling for awareness of disturbance conditions and to ensure representative data collection



State of Wisconsin
Department of Natural Resources

Guidelines for Collecting

Macroinvertebrate Samples

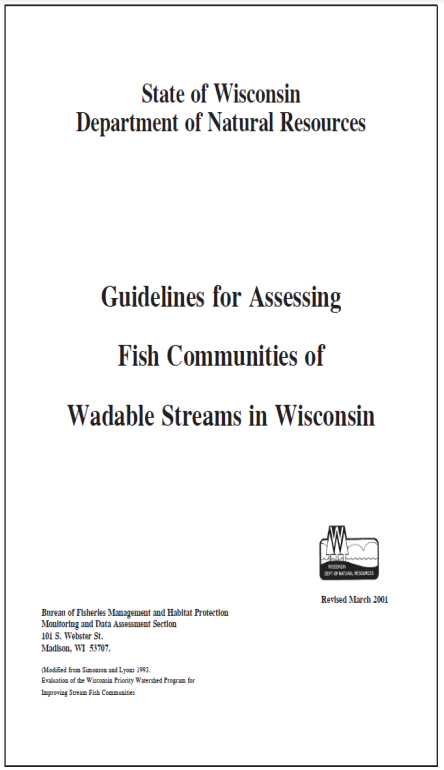
from Wadable Streams

June 2000

Bureau of Fisheries Management and Habitat Protection
Monitoring and Data Assessment Section

# Fish Sampling

- Sampling twice per year
  - June through late August
  - November
- WDNR will participate in each sampling event to oversee fish taxonomy.
- Fish Index of Biotic Integrity (IBI) shall include 10 metrics and 2 correction factors
  - Species richness and composition
  - Trophic and reproductive function
  - Fish abundance and condition
- Analysis will be conducted by Dr. Mike Pauers, Adjunct Curator of Fishes and Ichthyology Research Fellow
- Coordination with macroinvertebrate sampling and water quality sampling for awareness of disturbance conditions and to ensure representative data collection



State of Wisconsin
Department of Natural Resources

Guidelines for Assessing

Fish Communities of

Wadable Streams in Wisconsin

Revised March 2001

Bureau of Fisheries Management and Habitat Protection
Monitoring and Data Assessment Section
101 S. Webster St.
Madison, WI 53707.

(Modified from Simonson and Lyons 1993.
Evaluation of the Wisconsin Priority Watershed Program for
Improving Stream Fish Communities

# Thank You

**Dan Duchniak, P.E.**

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