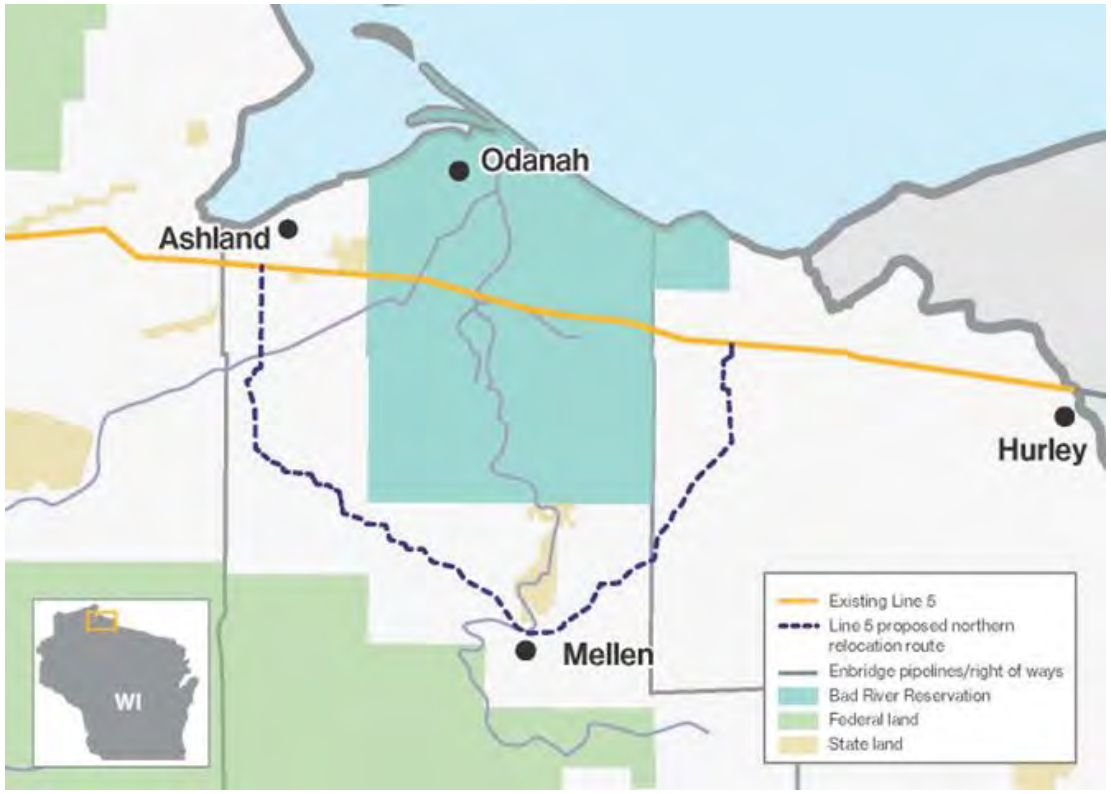
Line 5 Wisconsin Segment Relocation Project



Agenda

Presenters	Topics
Joe McGaver Environment Manager Enbridge **Tim Drake** Technical Director ERM	Line 5 WSRP Overview Project Planning Construction Key Topics
Ray Woulo Senior Hydrogeologist Barr Engineering Co.	Connectivity Hydrology and Hydrogeology Surface Flows
Matt Horn Business Unit Lead & Principal Scientist Tetratech	Bad River Water Quality Standards Project Relation to Bad River Water Quality Standards

Line 5 WSRP

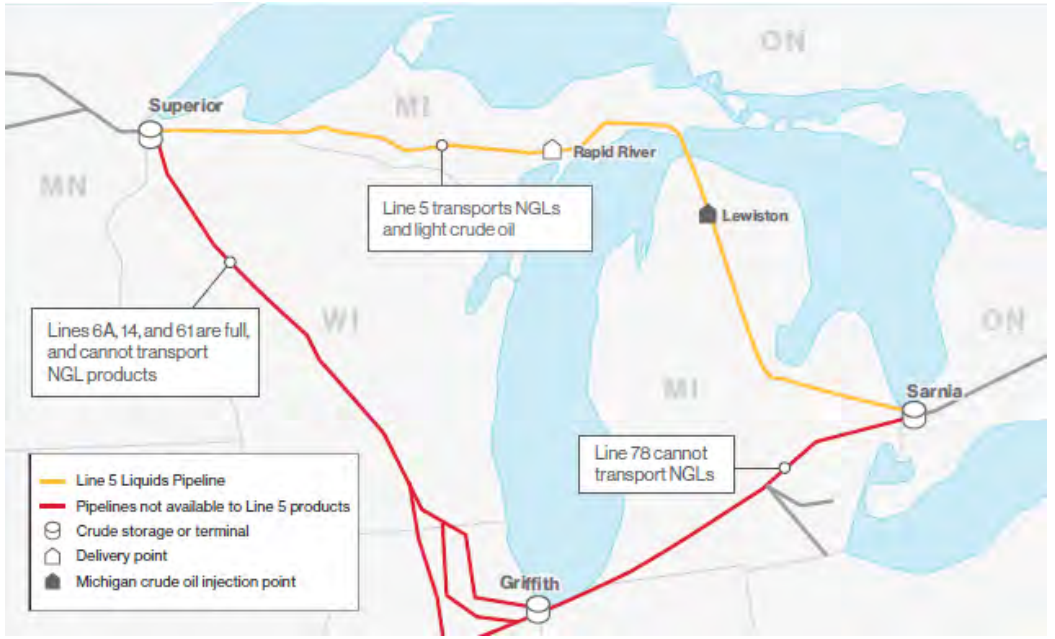
Line 5 WSRP will not have measurable impacts to Bad River Band Water Quality Standards

Demonstrated by:

- Project proximity to the Reservation
- Project Planning, Design, and construction practices
- Project Plans and Monitoring Activities during construction
- Hydrology and hydrogeology of the area
- Modeling and other scientific analysis

Pre-and Post-Construction Monitoring Plans to confirm

Line 5 General



Critical Energy Infrastructure:

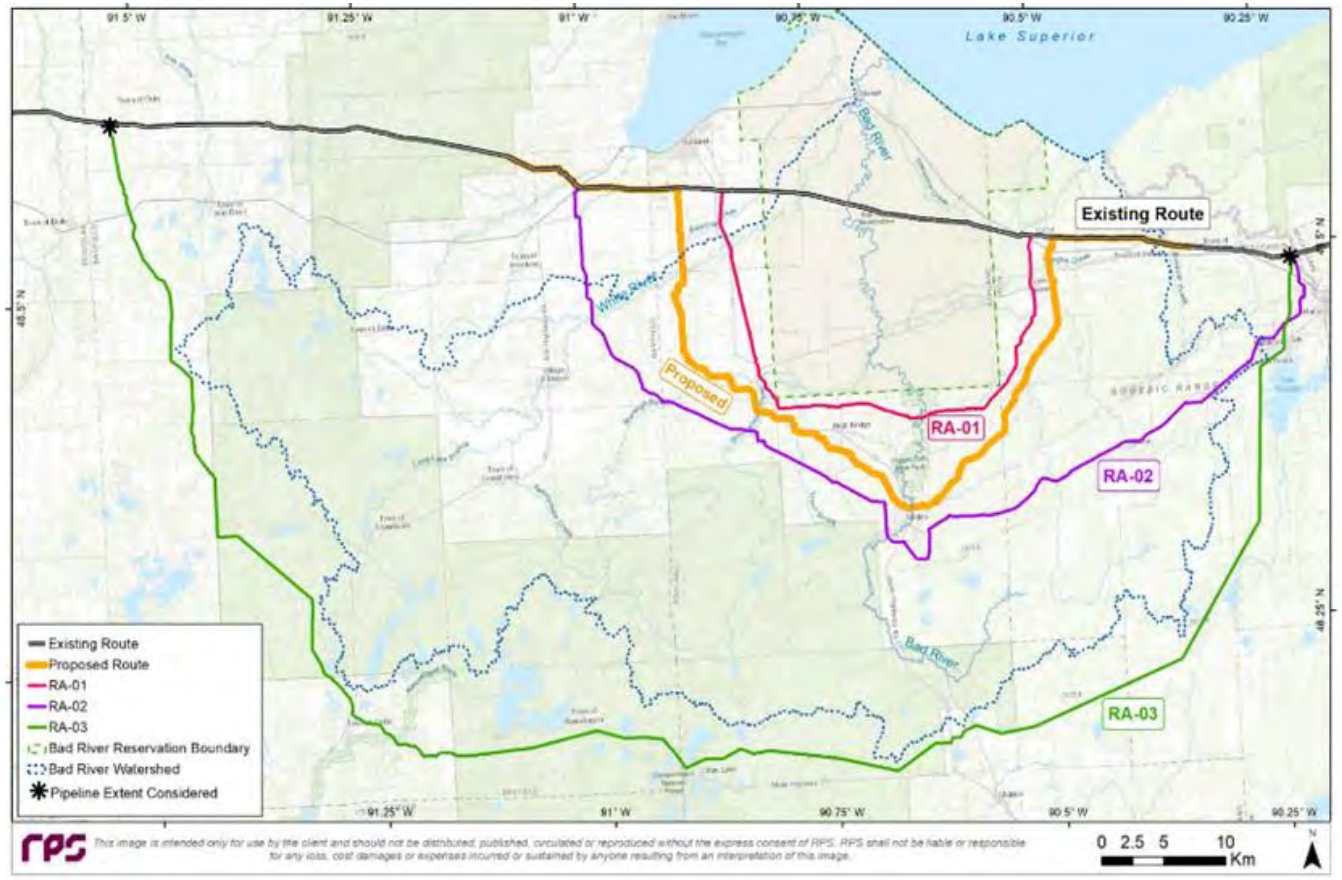
- 30” line runs for 645 miles from Superior, WI to Sarnia, Ontario
- Mixed service line delivers on average 540 Kbpd
  - Light Crude Oil
  - Natural Gas Liquid (NGL)
- Delivers to 10 refineries
- Delivers to 3 propane fractionation facilities
  - Provides propane to WI, MI UP, and MI

- Line 5 is uniquely designed to carry NGL products
- Line 78 cannot receive increased volumes because the connecting lines, Line 6A and Line 61, are currently at capacity and not designed for NGL transport
- Line 78 is also not designed to transport NGLs

Line 5 WSRP Construction - Routing

Macro Routing

- Analyzed different alternative routes
- Project proposed route least impactful
- Distance from Reservation Boundary
- Route outside watershed more impacts
- Additional factors:
  - Additional pump station requirements
  - Additional valve requirements
  - Additional electrical infrastructure needed
  - Additional energy usage



Selected route replaces 20 miles (12 miles within the Reservation) with ~42 miles of new 30” pipe

Line 5 WSRP Construction - Routing

Feature	Unit	Proposed	RA-01	RA-02	RA-03
Route Length	Miles	41.1	31.4	58	101.5
NWI Wetlands	Acres	30.1	26.1	51	363.2
NWI Forested Wetland	Acres	40.6	63.6	86.7	337
Forested Land Cover	Acres	410	316	620	1,391
Perennial Waterbody Crossings (WDH)	Number	17	13	36	38
Class I and II Trout Streams	Number	11	7	15	7
Wild and Scenic River	Number	0	0	0	1
Slopes Greater than 20 percent	Miles	7.6	8.7	3.9	8.2
Public Lands	Acres	107.7	42.0 *	51.5	895.3
*State Park					

Line 5 WSRP Construction - Routing

Micro Routing:

- Resource avoidance and minimization
- Use of publicly available data
- Use of field delineation data
- Follow existing utilities where practicable
- Route through open areas where practicable
- Avoid structures/high populations areas where practicable
- Minimize geological hazards (steep slopes)
- Minimize wetland crossing distance
- Minimize waterbody crossings
- Incorporate landowner preferences where practicable

Line 5 WSRP Overview

Distance from Reservation boundary:

- Closest point waterbody distance approx. 12 miles

Total Wetland Impacts:

- 0.02 acre of permanent wetland fill
- 101.12 acres temporary disturbance (includes 33.9 acres conversion from PFO or PSS to PEM

Waterbodies Crossed Total:

- 204 within the project workspace
- 62 crossed by access roads only
- 4 are associated with pipe yards, valve sites
- 138 within mainline construction corridor
- 72 crossed by trenching methods
- 36 within workspace, but not crossed

HDD Crossings:

- 30 crossed by HDD

Bay City Creek – Dry Cross

UNT Brunsweiler -Dry Cross

UNT Potato – Dry Cross

White River - HDD

Line 5 WSRP Overview

Waterbodies crossed total:

- 204 within Project workspace
- 62 crossed by temporary access roads only
  - 10 Perennial
  - 52 Intermittent and Ephemeral
- 4 are associated with pipe yards, valve sites
  - 0 Perennial
  - 4 Intermittent and Ephemeral
- 138 within mainline construction corridor; 30 crossed by HDD
  - 16 Perennial
  - 14 Intermittent and Ephemeral
- 72 crossed by trenching methods
  - 13 Perennial
  - 59 Intermittent and Ephemeral
- 36 within workspace, but not crossed
  - 9 Perennial
  - 27 Intermittent and Ephemeral

Bad River - HDD

Roadside ditch- Dry Cross

Potato River - HDD

UNT Deer Creek - Dry Cross

Line 5 WSRP Construction

- Horizontal Directional Drilling (HDD)
- Dry crossing for open cut waterbodies with water present
- Wetland crossing
- Erosion and sediment control
- Rock Blasting
- Invasive Species Plan
- Project Wetland Mitigation

Line 5 WSRP Construction - HDD

Project has 12 HDDs and One Direct Pipe

- HDD/Direct Pipe crossing of 6 miles of the Project (14.6%)
- 16 of the perennial streams crossed by these methods
- 13 perennial streams crossed by trenching methods

HDD Design

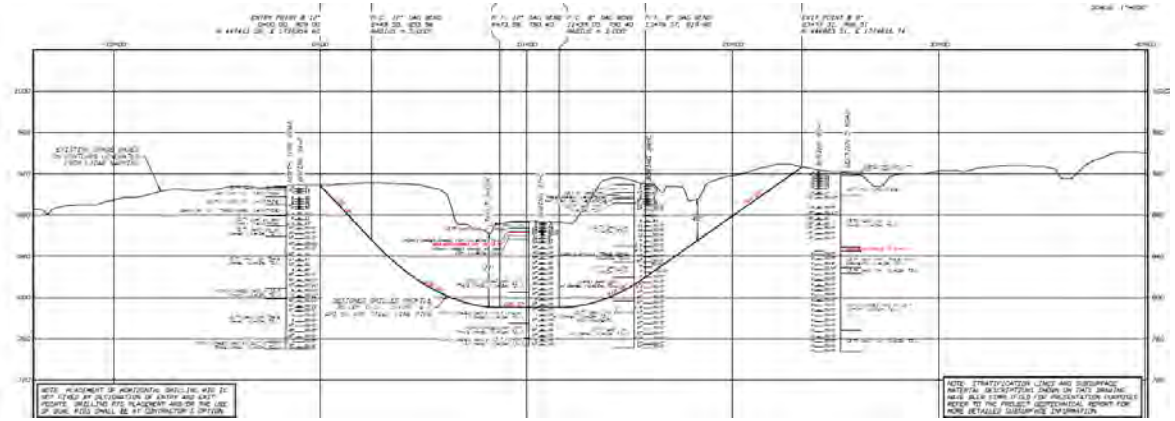
- Completed by one of the lead HDD design firms
- Soil confining safety factor of 2
- Designs reviewed after Line 3R
- WDNR Tech Standard Met
- WDNR approved additives

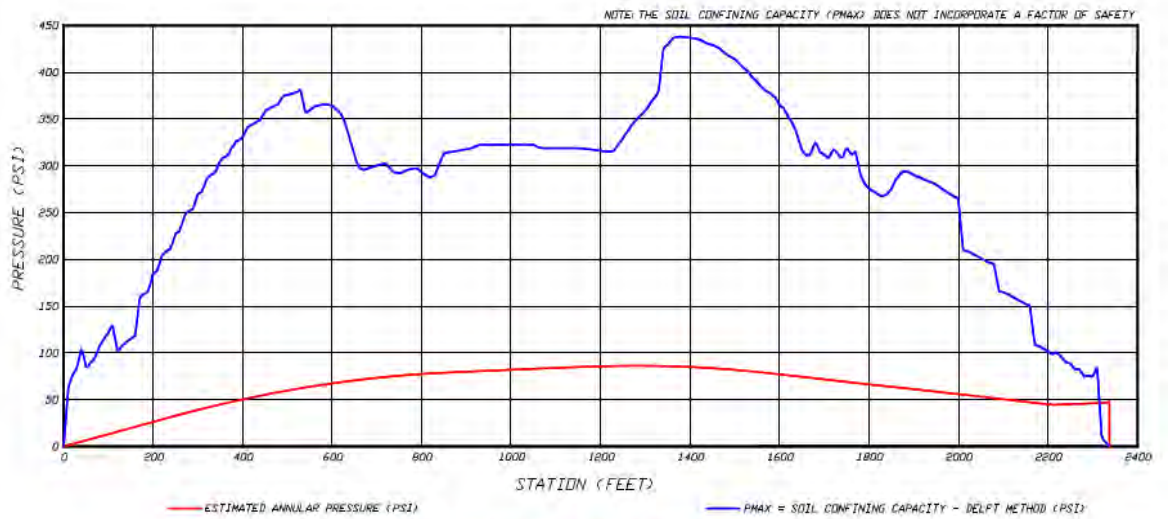
Inadvertent Returns

- Design
- Monitoring and Response Plans
- Drilling fluids – 95+% water, <5% Bentonite
- If occur typically at entry or exit points

Line 3R Aquifer breaches not from HDD

- Line 3R Aquifer breaches from sheetpiling
- Confined Aquifer and sheetpiling analysis completed
- Limited sheetpile here





HYDROFRACTURE PRESSURE CURVE

Line 5 WSRP Construction - HDD

HDD Crossing Method:

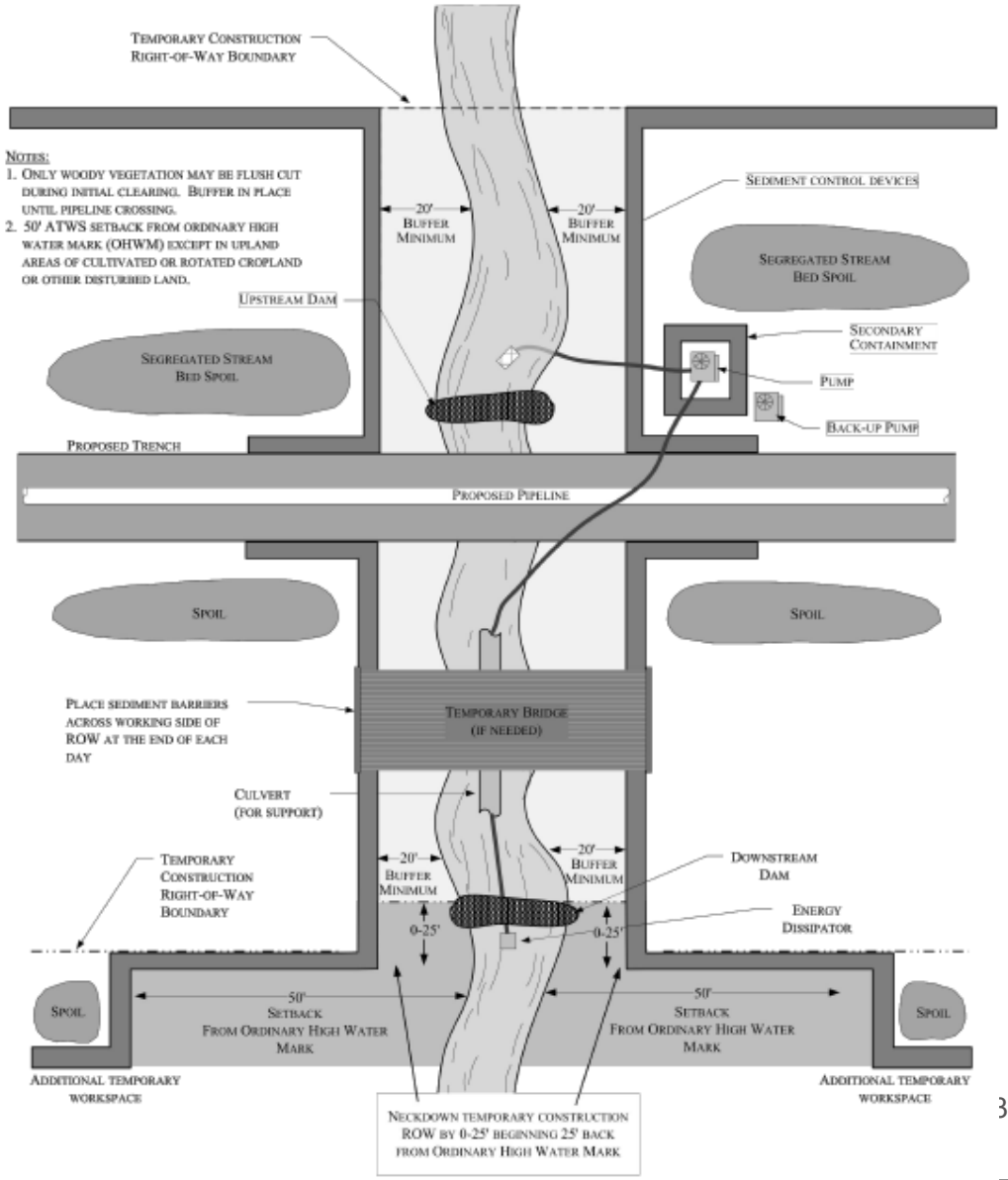
- Conduct HDD-specific training
- Prior to start of HDD team will review the plans, walk the HDD path, review inadvertent return protocols
- Limit clearing to 30-foot corridor with reduced clearing at select steep slope locations
- Monitoring of drilling activities
- Operator of drilling rig
- Monitoring fluid returns
- Monitoring drilling pressures
- Staff walking the drill path
- Environmental inspection staff
- Erosion Control Devices staged
- IR response plans

Line 5 WSRP Construction – Dry Crossings

Enbridge committed to crossing waterbodies using a dry crossing method when water was present.

Dry crossing method description:

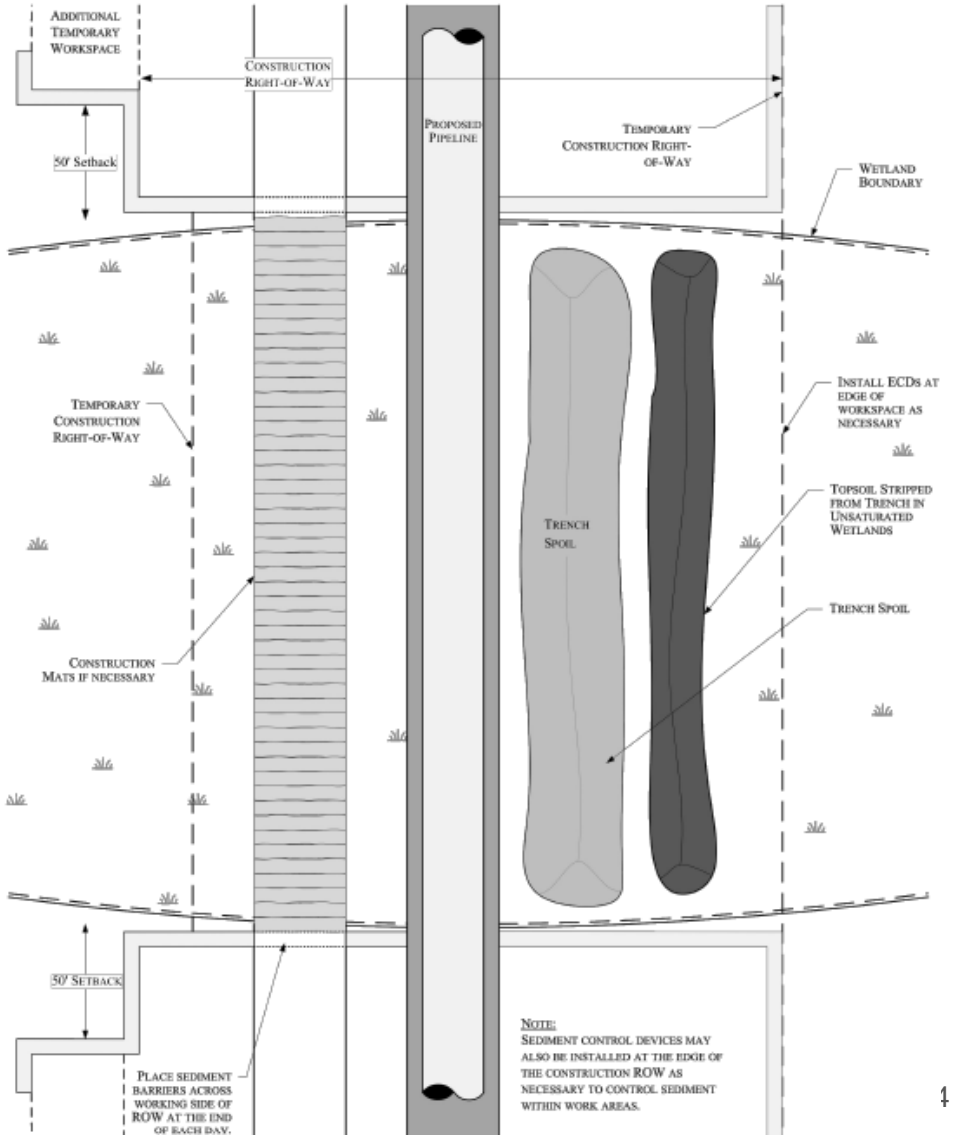
- Place pumps to maintain waterbody flow
- Install dams to isolate excavation area
- Dewater isolated area between the dams
- Complete construction within the dams
  - Excavated soil relayed out of waterbody
  - Segregate streambed soils from subsoils
  - Install pipeline
  - Backfill subsoil and then streambed material
  - Perennial streams civil survey prior to excavation and after backfill to return to preconstruction conditions
- Restoration of banks
- Remove dams and restore streamflow
- Monitoring plans in place



Line 5 WSRP Construction – Wetland Crossings

Wetland Crossing Method Description:

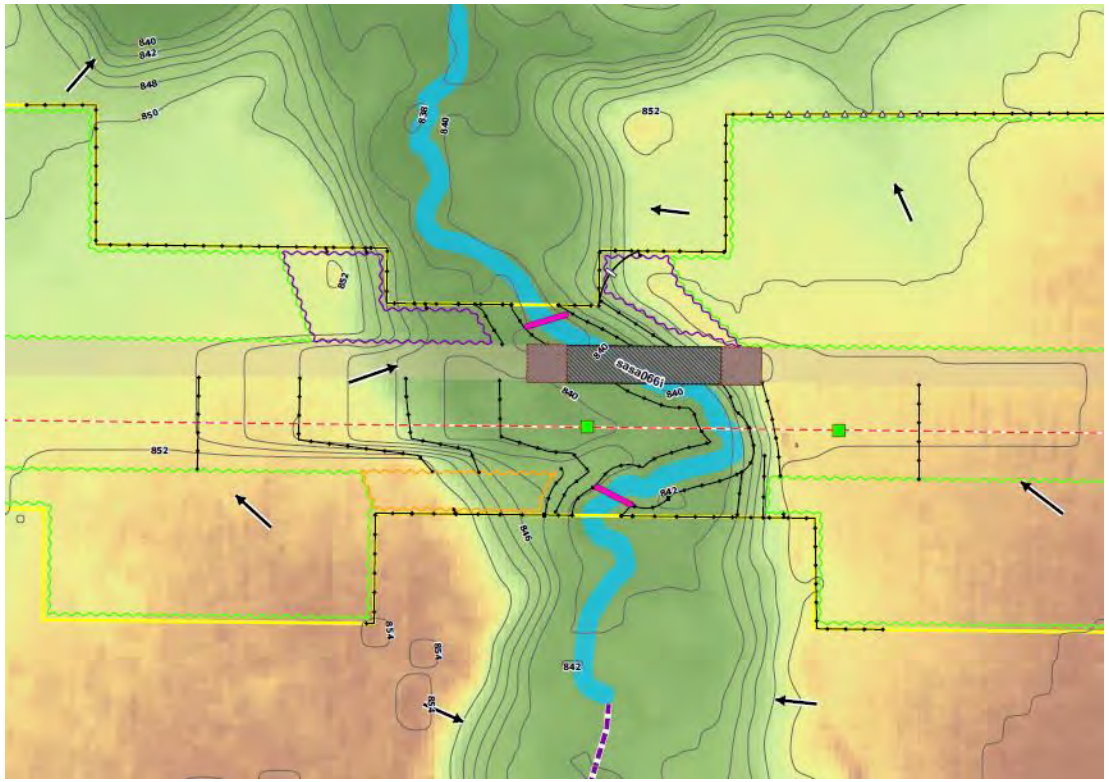
- Narrow construction workspace to 95 feet where practicable
- Install timber mat equipment path
- Segregate topsoil/organic soil from ditch line area
- Excavate subsoil
- Install pipeline segment
- Install trench breakers at the upland/wetland edges
- Backfill
- Restore topsoil/organic soil layer
- Allow minor crowning for settling
- Conduct post-construction monitoring in accordance with Project plans and permit conditions



Line 5 WSRP – Erosion and Sediment Control

Project-specific Erosion and Sediment Control Plan

- DNR general permit coverage received
- Plans include active construction protection
- Plans include post-construction protection
- Project-specific revegetation requirements
- Monitoring until revegetation success criteria met



Key Details:

- Install erosion and sediment controls prior to ground disturbance
- Maintain throughout construction
- Monitor, adjust, and repair/replace throughout construction
- Remove following final stabilization

Line 5 WSRP – Erosion and Sediment Control

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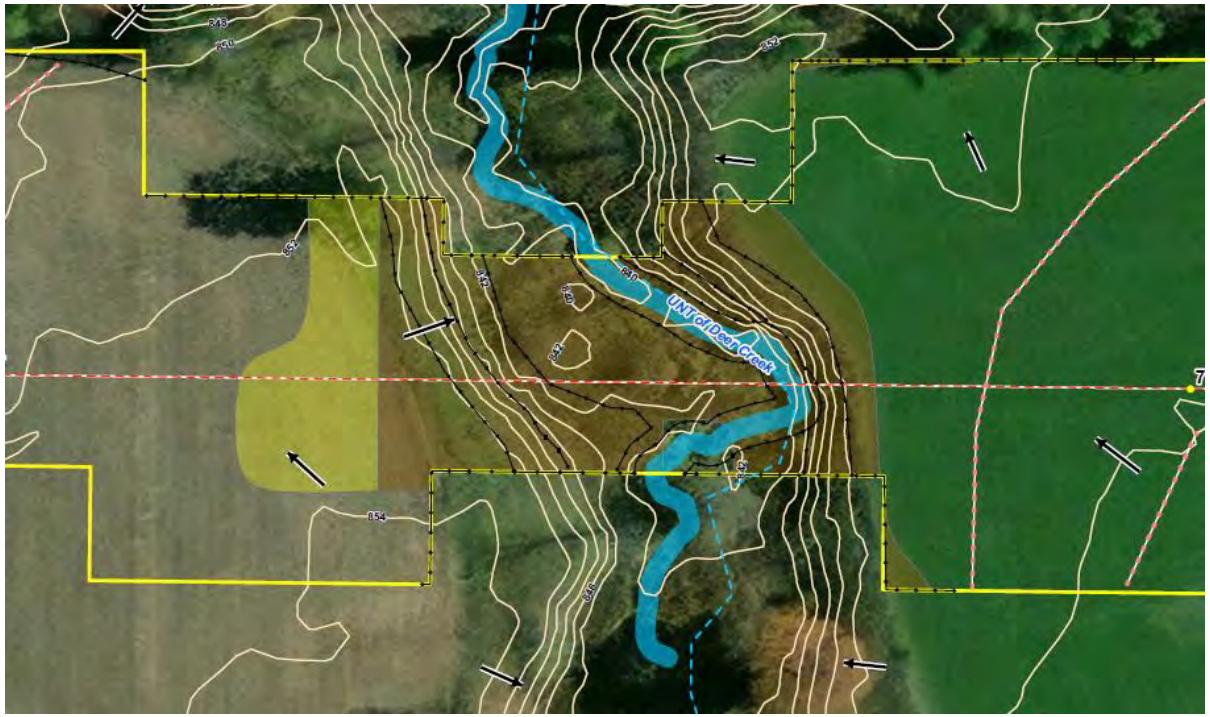

Key Details:

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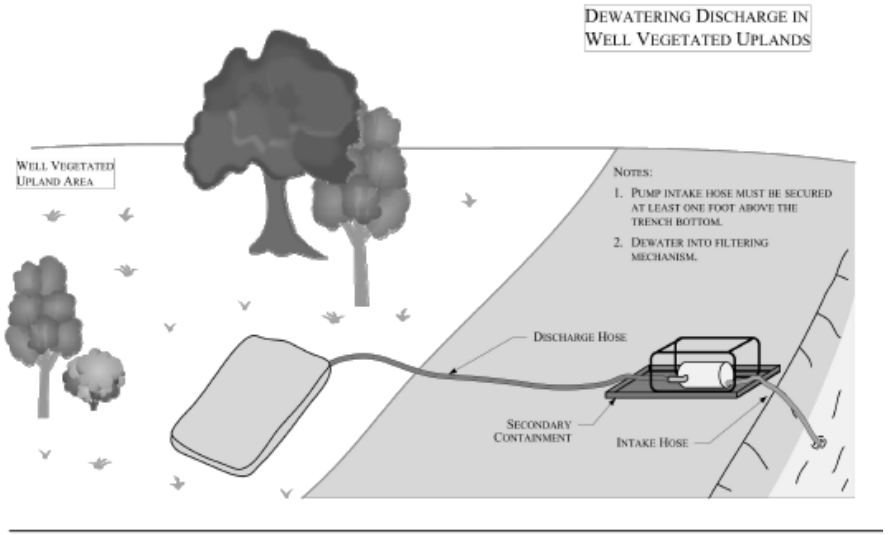
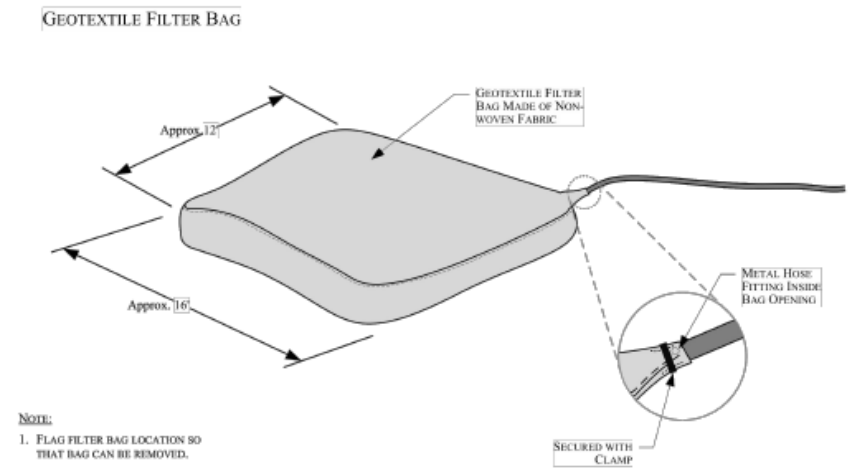
Line 5 WSRP – Dewatering

Dewatering will be conducted in accordance with the EPP and Technical Standards

- Conduct training prior to construction
- Assess volume and discharge rate
- Review potential dewatering locations with EIM prior to dewatering
- Elevate intake above trench bottom
- Discharge into filter bag or filtration structure
- Agency approved flocculants may be used
- Monitor discharge rate/treatment
- Make adjustments if/as necessary





Line 5 WSRP – Rock Blasting Planning

- Locating Potential Bedrock
  - Public data
  - Geotech borings
  - Hand probing and augering
  - Consultant review
- Rock removal method selection
  - Known rock type in the area
  - Removal time
- Pre-packaged blast material selection
- Construction – Blasting
  - Blast drilling on pipe trenchline
  - Bedrock depth and trench depth
  - Set blast charges as required
- Blasting in waterways will be within the dams

Line 5 WSRP – Invasive Species Plan

Project has surveyed for State-listed noxious and invasive species (WI CH NR 40 – Invasive Species List)

- Developed a Project-specific Invasive and Noxious Species Management Plan (INS Plan)
- INS Plan includes treatment of reed canary grass per WDNR request

Key Details:

- Pre-treatment of INS areas
- Equipment and personnel cleaning stations
- Segregation of topsoil in infested areas
- Post-construction monitoring and treatment as required

Line 5 WSRP – Water Quality Monitoring Plan

Project-specific Water Quality Monitoring Plan:

- Waterbodies – WQ Sampling
- Daily samples for 3 days following completion of the crossing
- Sample at 1 week following completion
- Sample at 1 month following completion
- Sample at 1 year following completion
- Sample at Year 2 and 5 following completion

Key Details:

- Restoration goals
- Macroinvertebrate sampling in select streams
- Ground water elevation monitoring in select wetlands

Line 5 WSRP – Restoration Monitoring Plan

Project-specific Wetland and Waterbody Restoration and Post-Construction Monitoring Plan:

- Wetlands – WQ Sampling
- Sample at 1 year following completion

Vegetation Restoration goals:

- Determine the status of wetland restoration
- Document where successful restoration has been achieved
- Identify additional mitigative measures that may be warranted if successful restoration has not been achieved
- Monitoring extends out to 15 years in select wetlands
- Augment reestablishment of trees in temporary workspace of forested wetlands by active planting

Line 5 WSRP Wetland Compensatory Mitigation

Wetland Compensatory Mitigation Plan

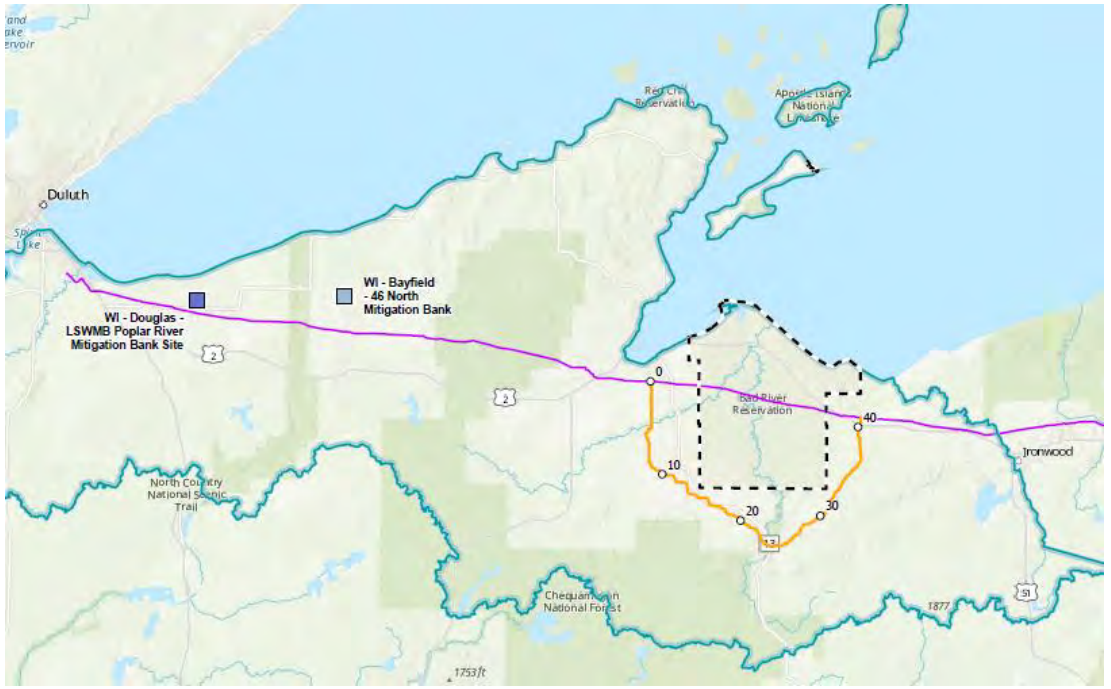
- One of Line 5 WSRP Plans reviewed and finalized
- Authorizations require/will require following the plan

Wetland Mitigation credits purchased in Lake Superior Basin

- Total mitigation credits purchased 48.85 credits
- Project loss of wetlands 0.02 acres
- Mitigation credits for temporary impacts, wetland type conversion, and permanent fill

Wetland Compensatory Mitigation Plan developed prior to additional commitment:

- Tree planting post construction – Added to restoration plan for temporary workspace areas in forested wetlands
- HDD Steep Slope Tree Clearing Reduction
- Includes mitigation for impacts that most likely will not occur



Hydrologic Connectivity of Project to Reservation

- Hydrogeologist and Professional Engineer – 40 years of experience
- BS Geological Engineering, Michigan Tech
- MS Geological Engineering, South Dakota School of Mines & Tech
- Computational hydrogeology, contaminant transport, wetland hydrology, groundwater-surface water interaction
- Pipeline hydrology and connectivity issues for L3 replacement project in Minnesota
- Designed remedies for uncontrolled artesian flows for L3 replacement project

Ray W. Wuolo
PG, PE, P. Geol. P. Eng.

Senior Hydrogeologist
Barr Engineering Co.

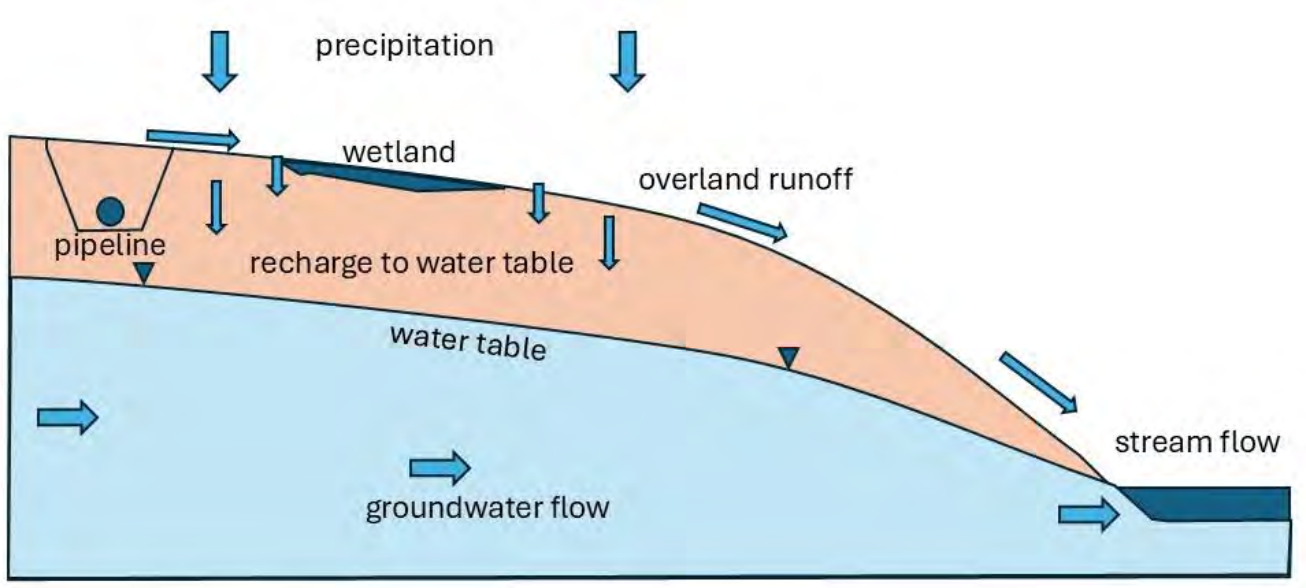
Hydrologic Connectivity of Project to Reservation

Hydrologic connectivity via surface flow

- Runoff is topographically controlled
- Runoff from Project must first flow overland to major streams before flowing to Reservation
- Existing topography of other features such as roads

Hydrologic connectivity via groundwater

- Infiltration and recharge to water table
- Streams gain flow from groundwater
- Areas of greatest groundwater contribution to stream flow is downstream of the Project (i.e., on the Reservation)



Hydrologic connectivity of Project to Reservation is indirect (except at stream crossings)

Hydrologic Connectivity of Project to Reservation

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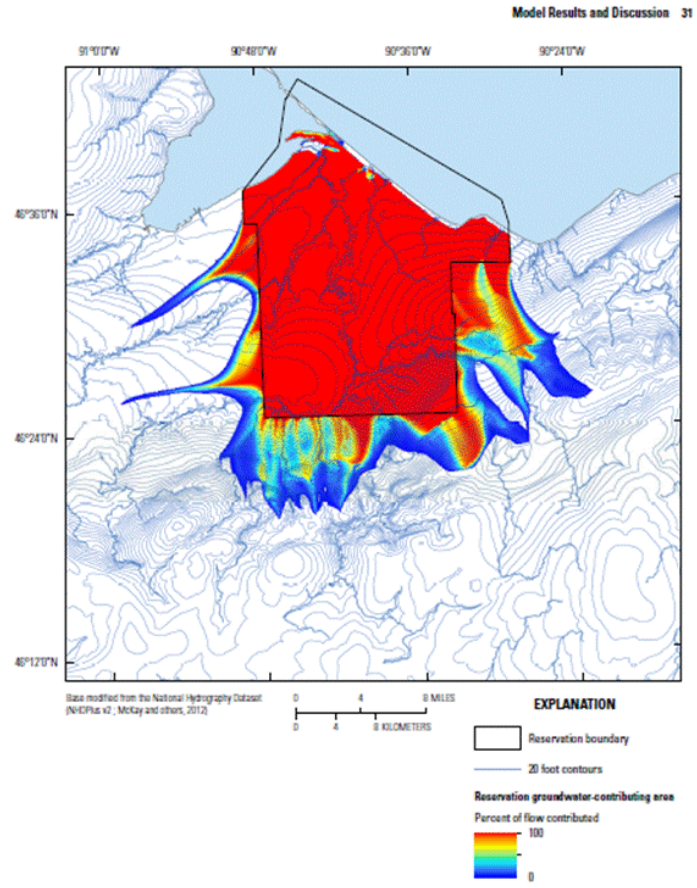


Figure 19. Area of contribution of groundwater flow to the Reservation, as calculated by FLOWSOURCE (Black and Foley, 2013).

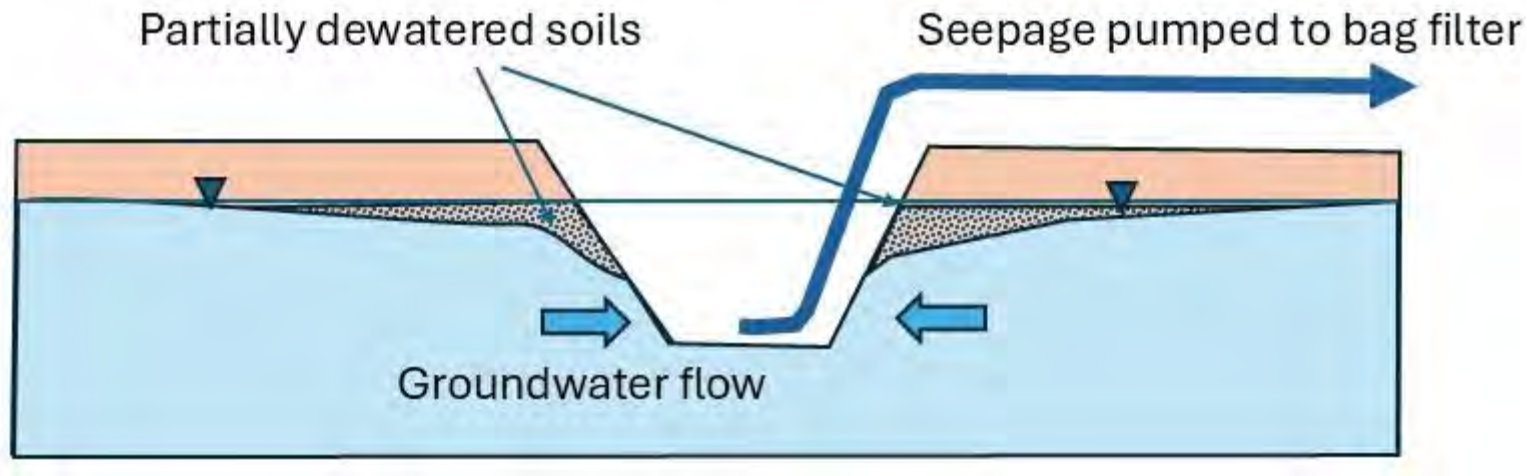
Hydrologic connectivity of Project to Reservation is indirect (except at stream crossings)

Construction – Trench Excavation

- Excavation nominally to depth of 7 feet
- Excavation is typically open 72 hours
- Topsoil and mineral soils segregated and returned in reverse order as backfill
- Low-rate pumping of seepage water from trench in some locations
- Limited use of sheet piling - used only where necessary to keep excavation open
- Best Management Practices (BMPs) to minimize disturbance and control

Construction – Temporary Trench Dewatering

- Short-term pumping of seepage water from trench
- Drawdown of water table small and localized to trench area and bounces back after pumping stops
- Seepage directed to BMPs (e.g., bag filters, etc.) to filter out sediment
- Rate of seepage dependent on permeability of soils



Groundwater flow will return to normal conditions within a day, and any change would not be measurable at the Reservation.

Hydrologic Connectivity of Project to Reservation

Hydrologic impacts are localized to excavation and short-term (i.e., days).

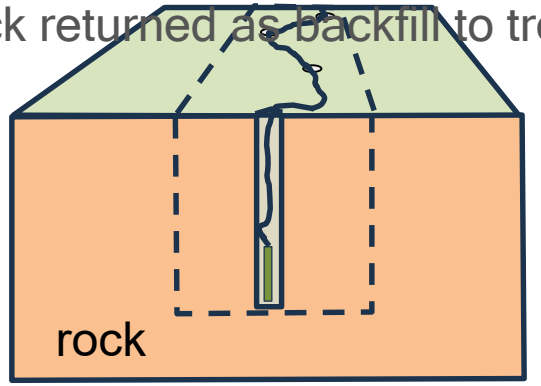
- Best Management Practices (BMPs) control sediment movement and erosion
  - Straw bales, biologs
  - Bag filters for water with fine sediment
  - Flocculants in bag filters for colloidal and smaller particles
- Delineated work and transit areas
- Topsoil will be stabilized

Trench excavation will not have impact on downstream waters because impacts are localized and short term (days).

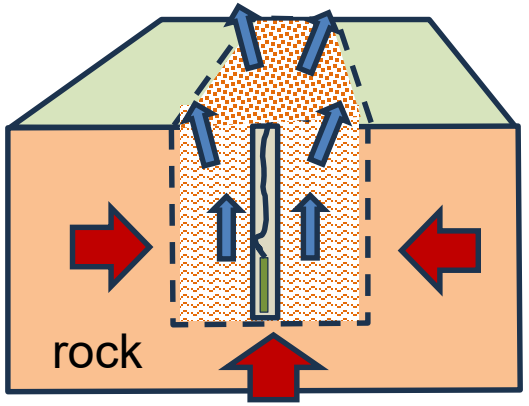
Line 5 WSRP – Trench Blasting Methods

Blasting used where bedrock is above the bottom of the trench (@ 7 feet below ground surface)

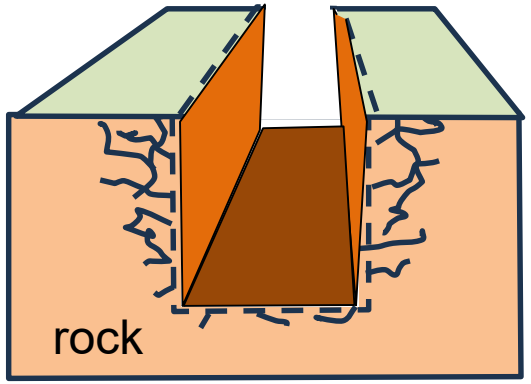
- Performed by experience personnel - precision techniques
- Blast fracturing limited in depth and lateral extent from blast line
- Packaged explosives used to prevent contact with water
- Blast rock returned as backfill to trench



Blast holes drilled to target depth of excavation. Blast holes offset along center line.



Blast energy directed to "relief" – i.e. upward to the ground surface. Blast energy constrained by opposing rock forces.



Blast rock excavated. Fracturing in adjacent rock limited to a few feet

Blasting will not cause change in groundwater flow conditions

Water Management During Trench Blasting

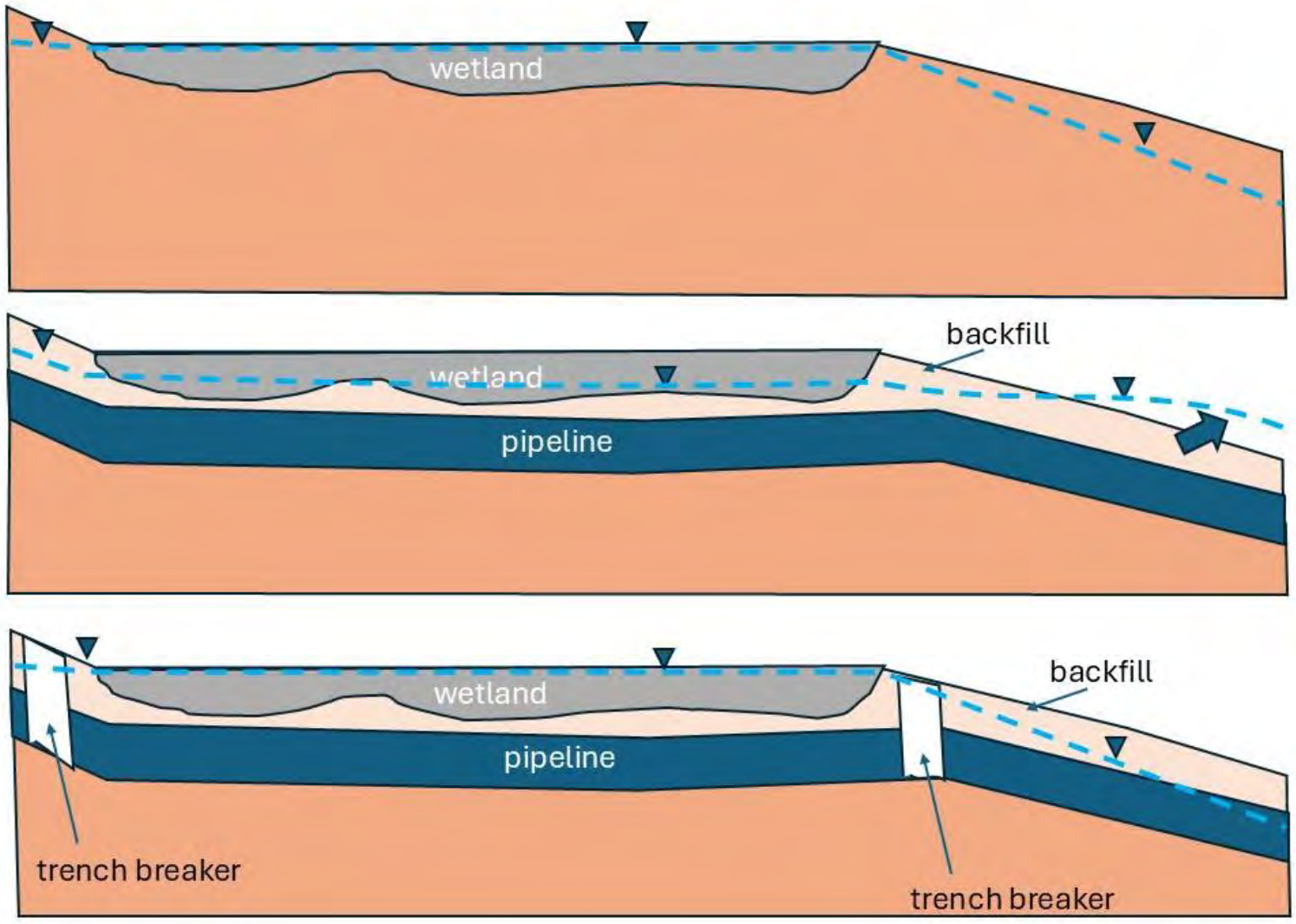
- ***BMPs (similar to those for trenching) will prevent any measurable impact to downstream waters due to surface runoff***
- Explosives in impermeable sheathing to prevent contact with water (prevents nitrates from leaching into water)
- Minimized “sleep time” of explosive in blast hole

- Trench blasting releases **little to no** nitrate to water
- Rock fracturing limited to a few feet adjacent to trench
- Trench blasting **will not affect** structures or wells

Example of packaged explosive with impermeable sheathing

Trench Breakers: permanent “dams” in the backfill

Trench Breakers prevent backfill from acting like a drain

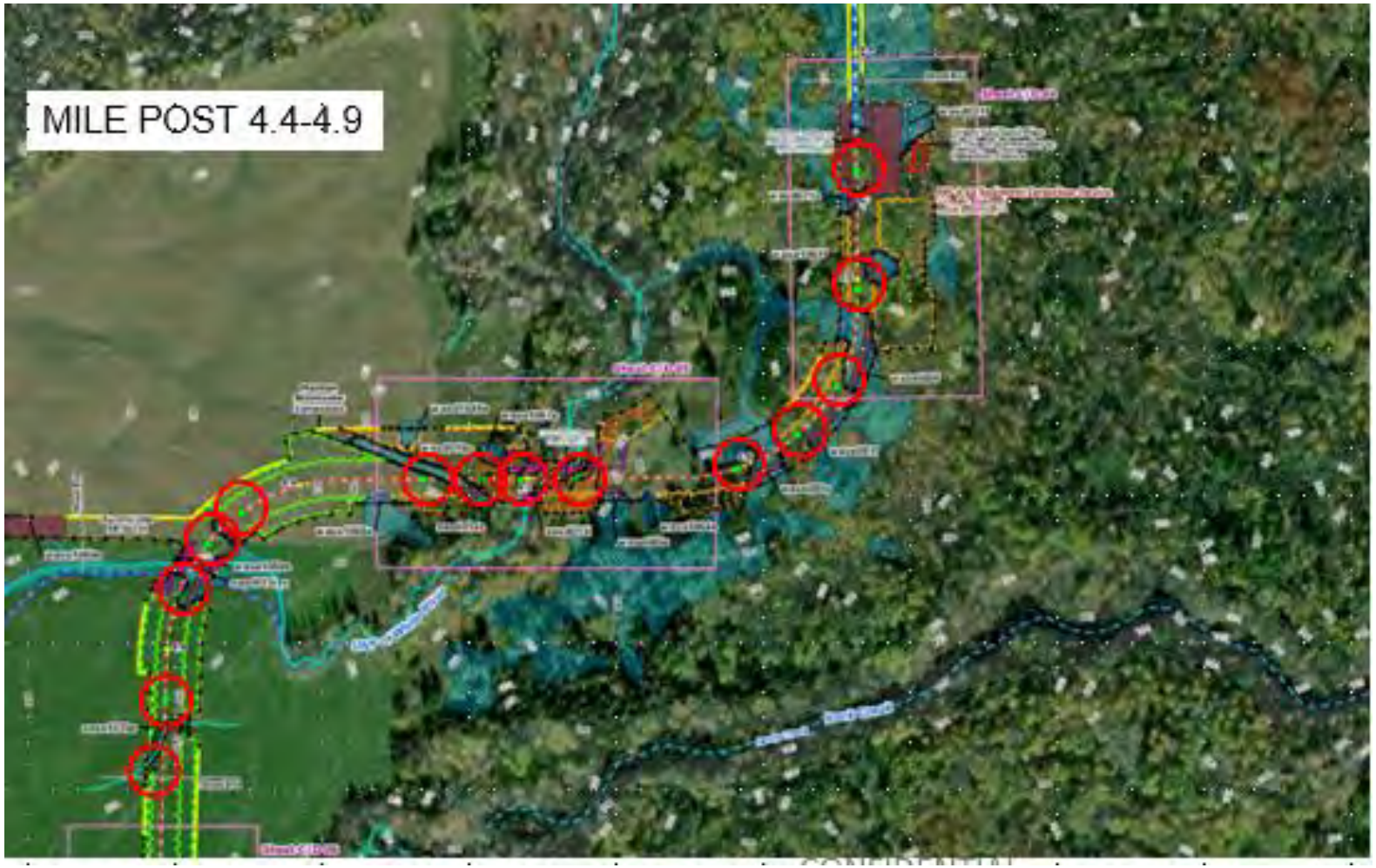


Pre-Construction

Post-Construction:
without Trench Breakers
(does not exist for Project)

Post-Construction:
with Trench Breakers returns
to Pre-Const. condition

Example of Trench Breaker Locations



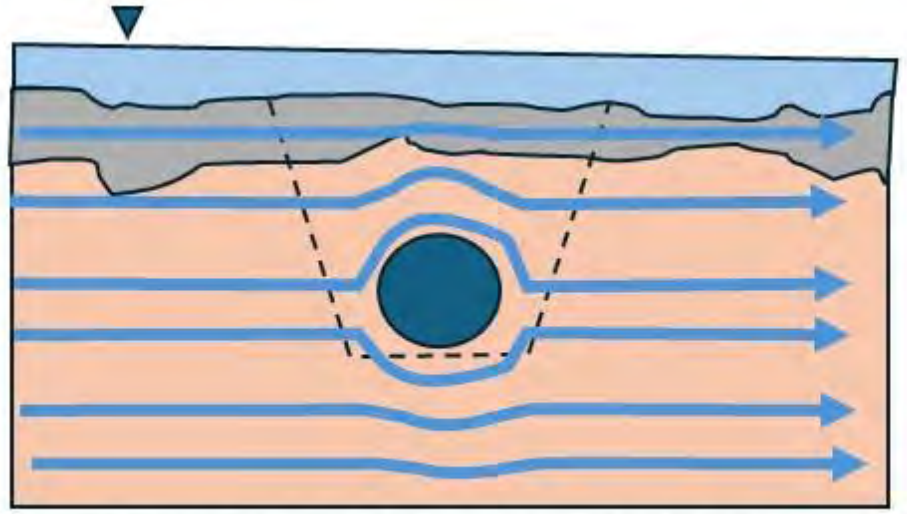
- On either side of wetlands
- On either side of stream crossings
- Top and bottom of steep slopes
- **Trench breakers prevent backfill from acting as acting as drain and maintains pre-construction groundwater flow conditions**

Legend: Trench breaker location

Impacts to Hydrologic Functionality of Wetlands

Project does not change existing hydrology of wetlands

- Groundwater flow direction and rate are not affected by pipeline installation
- Pipeline does not affect continuity of surface or subsurface flow from one side of the pipeline to the other in wetlands
  - Pipeline will not act as an "underground dam“
  - Pipeline backfill will not function as a "french drain“
  - Pipeline will not put in or take water out of wetlands
  - Pipeline will not change the topography or the water stage of wetlands
- Excavated wetland soils will be returned in the reverse order of excavation



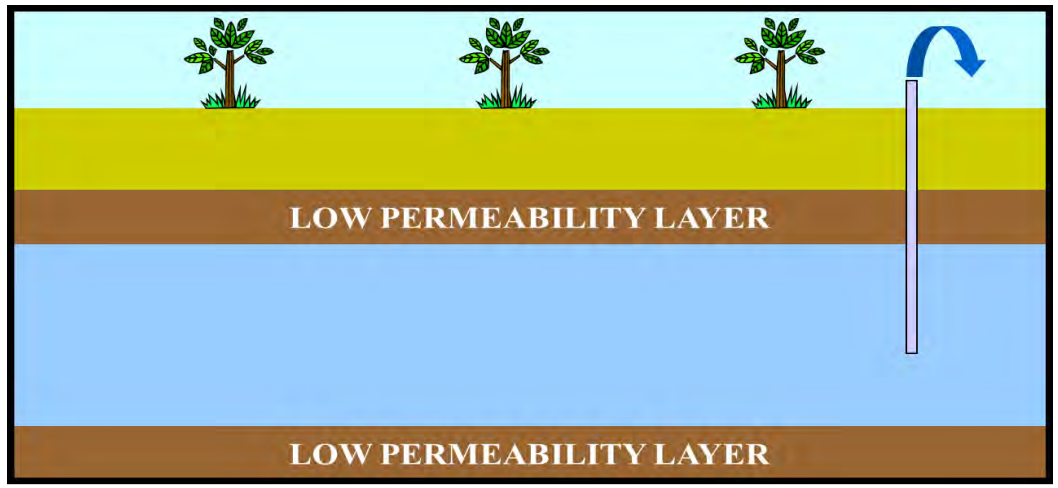
Groundwater flow around pipeline

Project will not affect the hydrology of wetlands and therefore, will not affect the wetland hydrologic functionality

Artesian Conditions

"Artesian conditions" (actually, flowing artesian conditions) develop where:

1) an aquifer is confined (potentiometric "head" is above the bottom of a low-permeability confining layer),
2) the "head" is above the ground surface, and
3) groundwater flows to the ground surface through a well or preferential flow path



* Artesian well example – not project related

Geotechnical Screening for Artesian Conditions

- Changes in topography (particularly slopes into river valleys)
- Areas with "high ground" within one mile
- Areas with wetlands or other water bodies at higher elevation within one mile
- Presence of groundwater-fed wetlands (fens) in vicinity of Project
- Nearby borings and wells that indicate the presence of:
  - Lower permeability layers deposited over high permeability layers at depths of 30 feet or less
  - Low permeability layers over shallow sand layers

- Project sections rated "LOW", "MEDIUM", "HIGH" potential
- Additional investigations conducted (borings) to further evaluate "MEDIUM" (there were no "HIGH" potential areas)

- **Based on evaluation, Artesian Conditions are not expected to be encountered**

Artesian Conditions Precautions During Construction

Trenching

- Very limited use of sheet piling will be required – soil conditions are favorable for conventional trenching without sheet piling
- Potential sheet pile areas are in low probability for artesian conditions
- Artesian conditions are not expected on the project at construction depths.

Blasting

- Fracture propagation laterally and with depth limited to a few feet around trench
- Artesian conditions typically do not develop in shallow bedrock

Summary of Impacts to Groundwater

No impacts from dewatering of trenches	• Short term (few hours to a few days) • Low pumping (only pump trench seepage as necessary) • Drawdown is temporary and localized around trench
No impacts from blasting	• Fracturing of surrounding rock limited to a few feet around blast trench • Methods and type of explosive will not result in nitrate contamination of water • Blasting will not affect nearby wells or other structures
Trench breakers will prevent seepage from wetlands and formation of seeps	
Pipeline will not act as a subsurface "dam" to impede groundwater flow	• Subsurface flow across pipeline in wetlands will not be affected
Artesian conditions are not expected along the Project	• Conditions are not favorable for the formation of shallow artesian conditions • Depth of excavation (trenching and blasting) < 7 feet • Use of sheet piling is limited

Impacts From Stream Crossing Construction

- HDD Crossing – no impacts to stream flows
- Dry crossings – no impacts to stream flow
- Trench crossings of flowing streams
  - Short-term (typically less than 8 hours)
  - Temporary dams (Biologs etc.) upstream and downstream of crossing
  - Stream flows routed around construction
  - Bag filters used, as necessary, to prevent sediment downstream
  - Turbidity monitored during construction

Stream flow, total suspended solids, and turbidity will not be affected in the Reservation

Hydrologic Impacts of Cleared ROW

Watershed	Area (miles^2)	Area (acres)
Lower Bad River	124	79,360
Marengo	217.5	139,200
Tyler Forks	79	50,560
Total	420.5	269,120

Upstream of Reservation: 144,465 acres

- Conversion of 118.4 acres of forest land to grassland
- **0.04%** of total watershed and **0.08%** of the portion of the watershed upstream of the Reservation

Effects of changes of 118.4 acres from forest to grassland

Runoff Rates:

- Manning's n for forest land: @ 1.5, Manning's n for grassland: @ 0.08 (Arcement and Schneider, 1989)
- Results in runoff rate for watershed upstream of Reservation will increase 0.02% to 0.04%

Recharge Rates to Groundwater:

- Difference in groundwater recharge rates between forest and grassland are very small and effect on groundwater flow, potentiometric levels, and baseflow to streams would be too small to measure

Timing of Spring Snowmelt:

- Recent study in Finland indicates that snowmelt in grassland takes approximately 40% less time than snowmelt in forests

Effects of changes of 118.4 acres from forest to grassland – snowmelt timing

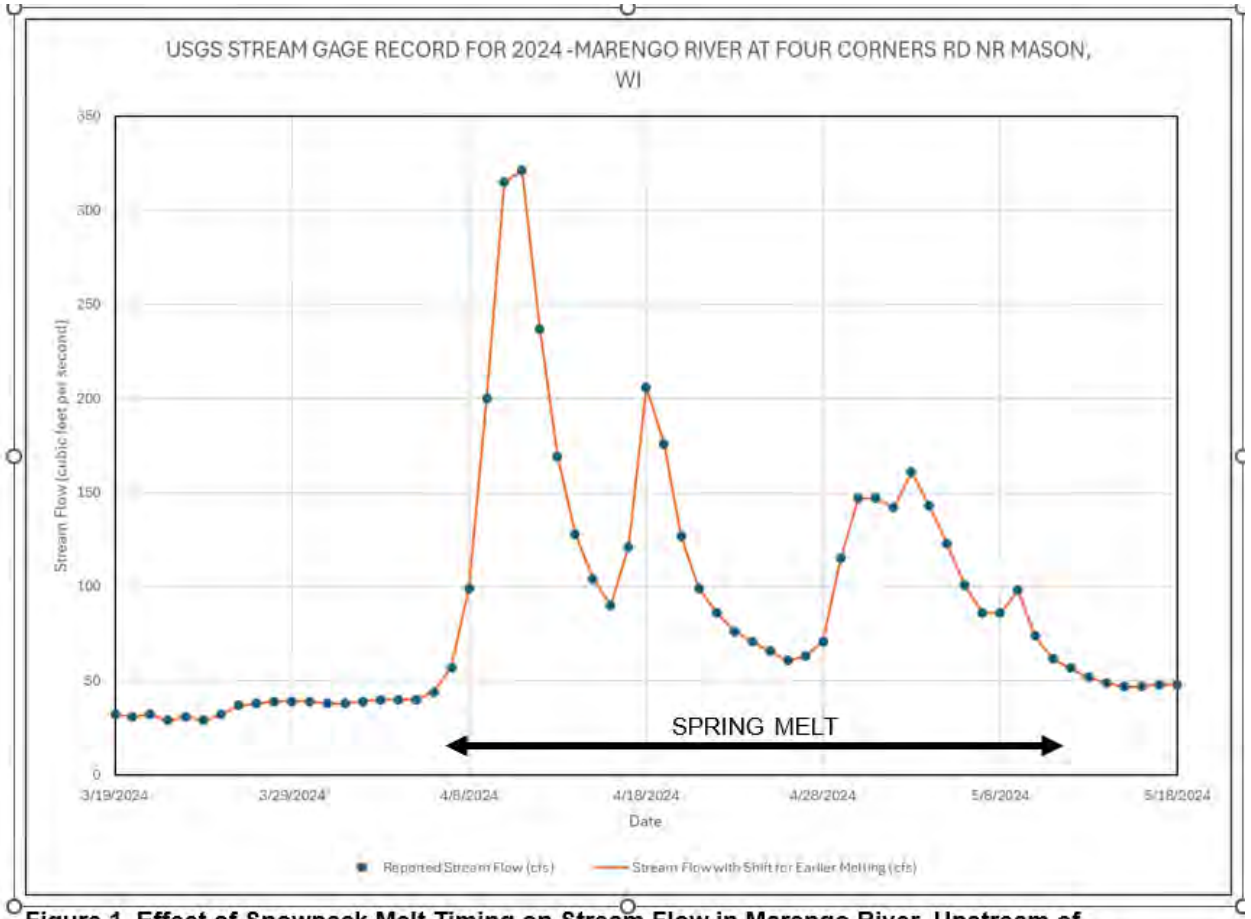


Figure 1 Effect of Snowpack Melt Timing on Stream Flow in Marengo River, Upstream of Reservation

- Changes in timing are too small to see any difference in stream flows (fractions of a cfs)
- In-stream temperatures will not change
- Stream flow timing, flow rates, and temperature of streams entering the Reservation will be not be impacted by the Project

Potential Mobilization of Contaminants

- **Runoff controls (during construction) and revegetation will prevent erosion and transport of sediment containing contaminants**
- **Short construction period (72 hours) prevents soil oxidation from taking place, preventing mobilization**
- **Less soil disturbance than agriculture, road construction, and logging in the watershed**

Mercury and Methylmercury in soil and groundwater	• Atmospheric deposition of mercury primarily from coal-fired power plants • Conversion from forest to grassland may result in more volatilization of mercury from soil to the atmosphere, but no detectable/measurable increases to water.
PFAS:	• Project does not use PFAS. • Atmospheric deposition of PFAS is a region-wide and world-wide phenomenon
Radionuclides:	• Bedrock (Freda Sandstone and other geologic units) not expected to have radium or other radionuclides • Wisconsin DNR has not identified this area as having radionuclides of concern.
Arsenic:	• Arsenic in soil and rock has not been identified as an issue in this part of Wisconsin by the DNR.

Invasive and Noxious Plant Transport

- Project ROW and work areas will be subject to pre-treatment for invasive and noxious plants per Invasive and Noxious Species Management Plan
- BMPs to control erosion, sedimentation, and suspended solids transport will provide additional controls on plant transport during construction
- Post-construction monitoring and as-needed treatment will continue for the life of the Project

- **Project will not increase invasive and noxious weed transport into the Reservation**
- **Because invasive and noxious weeds are being managed, they will have no effect on hydrology**

No Potential for Violating the Band's Water Quality Standards

- Flow rates, timing, and temperature of surface water flowing into the Reservation will not be affected because rates, timing and temperature at site of construction will not be affected
- Mercury, PFAS, nitrates, TSS, radionuclides, and other metals or pollutants will not increase in waters flowing into the Reservation
- Groundwater flow and water quality entering the Reservation or contributing to surface-water flows into the Reservation will not be impacted
- Invasive and noxious plant transport into the Reservation will be equal to or less than current conditions, not affecting hydrologic conditions
- ROW maintenance and monitoring will ensure that the Project will not cause violations of the Band's water-quality standards.

Other conditions not associated with the Project have the potential to have impacts on water-quality and hydrology (e.g., climate change, logging, agriculture, road construction/maintenance, development in the watershed, etc.)

Bad River Water Quality Standards and Project relation to Bad River Water Quality Standards

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Dr. Horn is a Principal Scientist, with 15 years of professional consulting experience. He specializes in unmitigated and response mitigated trajectory, fate, and effects modeling of liquids, gases, and solids. Working internationally, he provides a wide range of services for on-land and in-water releases, including freshwater (river and lake), estuarine, coastal, and offshore marine environments. He has led many large-scale projects that require numerous types of assessments, regulatory, tribal, stakeholder, and public engagement, strategies to effectively communicate complex technical topics, and navigates aspects of environmental law and legal challenges. Dr. Horn has provided evidence and expert testimony for numerous regulatory and legal hearings in Canada and the U.S. related to offshore exploration and development, pipelines, facilities & tank farms, offshore ports, and rail.

Bad River Water Quality Standards: Narrative Criteria

6) Narrative Criteria: *In addition to the other requirements of these Tribal water quality standards, the below Narrative Criteria apply to all waters of the Bad River Reservation. Failure to meet the below criteria constitutes an enforceable violations of these Tribal water quality standards, and no discharge that has the potential to create or support a violation of these Narrative Criteria shall be approved.*

i) Narrative criteria for aesthetic water quality. All waters (including wetlands) within the Reservation shall be free from substances, attributable to wastewater discharges or pollutant sources resulting from other than natural background conditions, that:

a) Settle to form objectionable deposits;
b) Float as debris, scum, oil, or other matter forming nuisances;
c) Produce objectionable color, odor, taste, or turbidity;
d) Cause injury to, are toxic to, or produce adverse physiological responses in humans, animals, or plants;
e) Produce undesirable or nuisance aquatic life;
f) Produce nutrients or other substances that stimulate algal growth producing objectionable algal densities, nuisance aquatic vegetation, dominance of any nuisance species instream, or cause nuisance conditions in any other fashion; or
g) Adversely affect the natural biological community of the waterbody.

Focus:

- Pollutants
- Radioactivity
- Water Quantity/Quality
- Hydrology
- Mineral
- Temperature

ii) General narrative criteria. These criteria apply to all waters of the Reservation (including wetlands) except as otherwise noted.

a) Pollutants shall not be present in concentrations that cause or may contribute to an adverse effect to human, plant, animal or aquatic life, or in quantities that may interfere with the normal propagation, growth and survival of indigenous aquatic biota. For toxic substances lacking published criteria, minimum criteria or values shall be calculated by the Tribe or U.S. EPA consistent with procedures specified at 40 CFR 132 Appendices A, B, C and D.
b) Levels of radioactivity shall not exceed levels expected in Tribal waters under natural background conditions.
c) Water quantity and quality that may limit the growth and propagation of, or otherwise cause or contribute to an adverse effect to wild rice, wildlife, and other flora and fauna of cultural importance to the Tribe shall be prohibited. This includes, but is not limited to, a requirement that sulfate levels shall not exceed concentrations causing or contributing to any adverse effects in waters, including those with a Wild Rice designated use.
d) Natural hydrological conditions supportive of the natural biological community, including all flora and fauna, and physical characteristics naturally present in the waterbody shall be protected to prevent any adverse effects.
e) Pollutants or human-induced changes to waters, the sediments of waters, or area hydrology that results in changes to the natural biological communities and wildlife habitat shall be prohibited. The migration of fish and other aquatic biota normally present shall not be hindered. Natural daily and seasonal fluctuations of flow (including naturally occurring seiche), level, stage, dissolved oxygen, pH, and temperature shall be maintained.
f) Existing mineral quality shall not be altered by municipal, industrial and in-stream activities or other waste discharges so as to in any way impair the designated uses for a water body.
g) Temperature – No measurable change (increase or decrease) in temperature from other than natural causes shall be allowed that causes or contributes to an adverse effect to the natural biological community. For those waters designated as a Cold Water Fishery, there shall be no measurable increase in temperature from other than natural causes.
h) The presence of pollutants in quantities that result in bioaccumulation in aquatic organisms that may cause or contribute to an adverse effect to consumers of aquatic organisms shall be prohibited.

Bad River Water Quality Standards: Numeric Criteria and Thresholds & Other Considerations

Temperature: from tree clearing (loss of shading)

Dissolved Oxygen: Unless otherwise demonstrated through a use attainability analysis or site-specific criterion that aquatic life cannot be supported, a water body capable of supporting aquatic life shall have a daily minimum dissolved oxygen standard of 5 mg/L in all cases except waters designated as a Cold Water Fishery. For those waters designated as a Cold Water Fishery, the dissolved oxygen shall have a daily minimum of 6 mg/L at any time and 8 mg/L when and where early life stages of cold water fish occur. These criteria will not apply to the Kakagon Sloughs, Bad River Sloughs, and wetlands due to their natural conditions.

pH: No change is permitted greater than 0.5 units over a period of 24 hours for other than natural causes. The change, upward or downward, shall not result in an adverse affect on aquatic biota, fish or wildlife.

Bacteriological WQ: The geometric mean of not less than 5 samples equally spaced over a 30-day period shall not exceed an E. coli count of 126 Colony Forming Units (CFU) per 100 milliliters (mL) for fresh waters. Any single sample shall not exceed an E. coli count of 235 CFU per 100 mL.

Total Nitrogen: from blasting residue

Turbidity: Shall not exceed 5 NTU over natural background turbidity when the background turbidity is 50 NTU or less, or turbidity shall not increase more than 10 percent when the background turbidity is more than 50 NTU.

Line 5 WSRP Historical Samples & Sampling

Bad River Band Sampling (2010-2022)

Number of samples collected:

- Temp = 17,472
- DO = 889
- pH = 976
- Total Nitrogen = 827
- Ammonia = 42
- TSS = 971
- NTU = 879

~20 stations

Including sampling from WDNR, USGS, GLIFWC

Enbridge Sampling (2023-2024)

Number of samples collected:

- Temp = 470
- DO = 470
- pH = 173
- Total Nitrogen = 308
- Ammonia = 308
- TSS = 175
- NTU = 173

Sampling along L5WSRP:

- 204 waterbodies
- 145 wetlands (435 monitored)

Meander Bank Stabilization Project (2025)

Line 5 WSRP Water Quality - Temperature

Natural Variability:

- Min: -0.2°C
- Max: 27.5°C
- Average: 15.3°C

Daily fluctuations can reach 17°F

Annual fluctuations > 50°F

Enbridge Field Sampling Data:

- In line with historical
- Limited time (season)

Sampling Location[∞]	Data Period	Number of Values Collected	Average Value (°C)	Minimum Value (°C)	Maximum Value (°C)	Standard Deviation of Values
White River	2010-2022	102	12.35	-0.13	23.63	8.05
White River (sampled by WDNR)		11	10.15	0.00	25.00	9.02
Deer Creek	2011-2022	43	11.65	-0.08	22.56	7.64
Marengo River at Riemer Road	2010-2022	78	11.62	-0.19	24.16	7.49
Marengo River at State Highway 13		91	10.82	-0.15	21.36	7.24
Marengo River at Government Road		142	11.83	-0.15	24.54	7.59
Brunsweiler River	2010-2022	89	11.43	-0.19	23.22	7.64
Trout Brook	2015-2016	13	10.73	0.01	18.78	7.41
Billy Creek	2015-2016	13	9.19	0.03	16.12	5.70
Bad River	2010-2022	115	10.63	-0.14	22.00	7.67
Bad River (sampled by USGS)	2012-2016	4	15.85	9.60	20.20	4.68
Gehrman Creek (by WDNR)	2012	7,104	15.88	3.79	23.48	-
Felcher Creek (by WDNR)	2012	9,432	15.27	6.17	24.16	-
Tyler Forks at Casey Sag Road (sampled by WDNR)	2015-2022	33	15.25	0.00	24.40	6.65
Tyler Forks at State Highway 169	2011-2022	60	9.85	-0.13	21.01	7.96
Tyler Forks at State Highway 169 (sampled by USGS)	2011	2	18.50	18.00	19.00	0.71
Tyler Forks at Copper Falls State Park (sampled by WDNR)	2011	9	11.46	0.00	20.80	8.79
Tyler Forks at Stricker Road (sampled by GLIFWC)	2011-2018	21	10.52	0.00	19.50	5.91
Tyler Forks at Stricker Road (sampled by USGS)		13	15.55	2.70	20.70	4.98
Potato River	2010-2022	97	11.76	-0.14	27.49	7.90
Statistics of Historic Data:	**2010-2022**	**17,472**	**15.3^**	**-0.2**	**27.5**	**min: 0.7 max: 9.0**
Enbridge field sampling along L5WSRP[&]	2023	164	15.01	7.2	19.2	-
	2024	306	14.84	7.6	28.5	-

^A volume-weighted average was calculated based upon the total number of values collected.
[∞]Historic sampling locations were sampled by the Band, except otherwise indicated. The last two rows include field sampling along the L5WSRP by Enbridge.
[&]The Enbridge field sampling campaign includes sampling in both waterbodies (204) wetlands (145) throughout the area.

Line 5 WSRP Water Quality - Temperature

- Tree removal and resulting loss of shade may increase solar insolation to adjacent waterways
  - 0.04% of watershed would be cleared to 50’ ROW, of which only a small fraction adjacent to waterway
  - 9-15m section of waterways (width of ROW)
  - Dependent on time of year/day, weather/cloud cover, orientation of waterway, etc.
- **Maximum anticipated temperature change of 0.018°F (WDNR, 2024, Appendix X, Part 2)**

Natural Variability:
Min: -0.2°C (32°F)
Max: 27.5°C (82°F)
Average: 15.3°C

Expected Effect from L5WSRP:

Negligible and unmeasurable change to Temperature

1) All L5WSRP construction activities will take place >2.1 km upstream from the Reservation boundary
2) The downstream reaches of waterbodies, such as within the Reservation, receives the cooler groundwater influx
3) The natural mixing over the downstream distance to the Reservation boundary, make any temperature change short-lived and unmeasurable, especially within the Reservation.

Line 5 WSRP Water Quality – Dissolved Oxygen

Natural Variability:

- Min: 0.64 mg/L
- Max: 89.90 mg/L
- Average: 11.02 mg/L

Enbridge Field Sampling Data:

- In line with historical
- Limited time (season)

Sampling Location[=]	Data Period	Number of Values Collected	Average Value (mg/L)	Minimum Value (mg/L)	Maximum Value (mg/L)	Standard Deviation of Values
White River	2010-2022	99	10.54	3.51	20.01	2.57
White River (sampled by WDNR)		12	11.63	7.30	15.00	2.37
Deer Creek	2011-2022	42	11.20	7.87	20.50	2.82
Marengo River at Riemer Road	2010-2022	77	10.28	3.50	19.02	2.41
Marengo River at State Highway 13		89	11.86	3.59	88.70	9.76
Marengo River at Government Road		141	10.88	3.60	89.90	7.11
Brunsweiler River	2010-2022	87	11.35	4.88	76.50	7.49
Trout Brook	2015-2016	13	11.26	7.10	14.41	2.46
Billy Creek	2015-2016	13	11.48	7.91	14.78	2.33
Bad River	2010-2022	114	11.00	3.74	27.71	3.07
Tyler Forks at Casey Sag Road (sampled by WDNR)	2015-2022	33	10.32	7.70	16.80	2.40
Tyler Forks at State Highway 169	2011-2022	60	11.09	7.15	19.50	2.94
Tyler Forks at Stricker Road (sampled by GLIFWC)	2011-2018	4	9.65	7.90	12.80	2.20
Tyler Forks at Copper Falls State Park (sampled by WDNR)	2011	9	11.40	8.90	15.20	2.64
Potato River	2010-2022	96	11.24	7.38	30.12	3.10
Statistics of Historic Data:	**2010-2022**	**889**	**11.02^**	**3.50**	**89.90**	**min: 2.20 max: 9.76**
Enbridge field sampling along L5WSRP[&]	2023	164	10.01	-	-	-
	2024	306	7.22	0.64	55.27	-

^A volume-weighted average was calculated based upon the total number of values collected.
[=]Historic sampling locations were sampled by the Band, unless otherwise indicated. The last two rows include field sampling along the L5WSRP by Enbridge.
[&]The Enbridge field sampling campaign includes sampling in both waterbodies (204) wetlands (145) throughout the area.

Line 5 WSRP Water Quality – Dissolved Oxygen

- DO in water column is extremely variable throughout any given day and dependent on temperature, atmospheric pressure, turbulence, wind, biological processes, respiration, decomposition, etc.
- With a free surface (i.e., not frozen) over which to exchange, DO moves between the water and the atmosphere rapidly
- **Maximum anticipated temperature change of 0.018°F (WDNR, 2024, Appendix X, Part 2) will result in DO change of approximately 0.01 mg/L or 0.09% saturation (at 47 °F).**

Natural Variability:

Min: 0.64°C mg/L
Max: 89.90 mg/L
Average: 11.02 mg/L

Numeric Criteria: 5, 6, 8 mg/L

Expected Effect from L5WSRP:

Negligible and unmeasurable change to DO

1) All L5WSRP construction activities will take place >2.1 km upstream from the Reservation boundary
2) Likely below detection limits, would be temporary in nature, and would be unlikely to cause ecological harm, promote algae growth, or result in any measurable change in the waterbody
3) The natural mixing and gas exchange over the downstream distance to the Reservation boundary, make any DO change unmeasurable within the Reservation

Line 5 WSRP Water Quality – pH

Natural Variability:

Min: 3.49

Max: 9.13

Average: 7.68

Enbridge Field Sampling Data:

In line with historical

Sampling Location[#]	Data Period	Number of Values Collected	Average Value	Minimum Value	Maximum Value	Standard Deviation of Values
White River	2010-2022	102	7.89	4.70	9.00	0.49
White River (sampled by WDNR)		11	7.75	6.80	8.40	0.45
Deer Creek	2011-2022	43	7.94	7.00	8.80	0.39
Marengo River at Riemer Road	2010-2022	76	7.61	3.99	8.62	0.59
Marengo River at State Highway 13		91	7.69	3.59	8.41	0.55
Marengo River at Government Road		142	7.72	3.49	9.00	0.51
Brunsweiler River	2010-2022	89	7.63	6.55	8.62	0.36
Trout Brook	2015-2016	13	7.92	7.43	8.36	0.29
Billy Creek	2015-2016	13	8.05	7.79	8.66	0.25
Bad River	2010-2022	115	7.59	6.41	8.98	0.40
Bad River (sampled by USGS)	2012-2016	12	7.45	7.00	7.90	0.35
Tyler Forks at Casey Sag Road (sampled by WDNR)	2015-2022	64	7.46	6.10	8.40	0.53
Tyler Forks at State Highway 169	2011-2022	60	7.54	6.18	9.13	0.50
Tyler Forks at Stricker Road (sampled by GLIFWC)	2011-2018	14	7.17	6.60	7.50	0.26
Tyler Forks at Stricker Road (sampled by USGS)		26	7.39	6.60	7.90	0.36
Tyler Forks at Copper Falls State Park (sampled by WDNR)	2011	9	7.40	6.40	8.50	0.68
Potato River	2010-2022	96	7.80	6.63	9.11	0.44
Statistics of Historic Data:	**2010-2022**	**976**	**7.68^**	**3.49**	**9.13**	**min: 0.25 max: 0.68**
Enbridge field sampling along L5WSRP[&]	2023	173	7.24	5.04	8.23	0.60
	2024	-	6.94	3.96	-	-

^A volume-weighted average was calculated based upon the total number of values collected.

[#]Historic sampling locations were sampled by the Band, unless otherwise indicated. The last two rows include field sampling along the L5WSRP by Enbridge.

[&]The Enbridge field sampling campaign includes sampling in both waterbodies (204) wetlands (145) throughout the area.

Line 5 WSRP Water Quality – pH

- pH in water column is variable, with observed **natural changes of 0.23 within a single hour**, as measured near the Meander Bank Stabilization Project Site in 2025.
- Drilling fluids/muds may contain small amounts of sodium carbonate (pH enhancer) and citric acid (pH reducer) to balance pH to between 8-10
  - Additives are approved by WDNR
  - Ratio is 0.013% by weight (0.5 kg sodium carbonate per 380 L water)
- Calculated change to pH <u>following inadvertent return</u>
  - Maximum release volume (final ream pass 240 m^3 @ 4m^3/min for 60 min), maximum pH (value of 10), medium watercourse (1.06 m^3/s; pH 7.5)
  - Assumed well-mixed conditions and ignores potential buffering capacity
  - **Conservative anticipated pH change of +0.03 (new pH of 7.53)**

Natural Variability:
Min: 3.49
Max: 9.13
Average: 7.68

Numeric Criteria: 0.5 in 24 hours

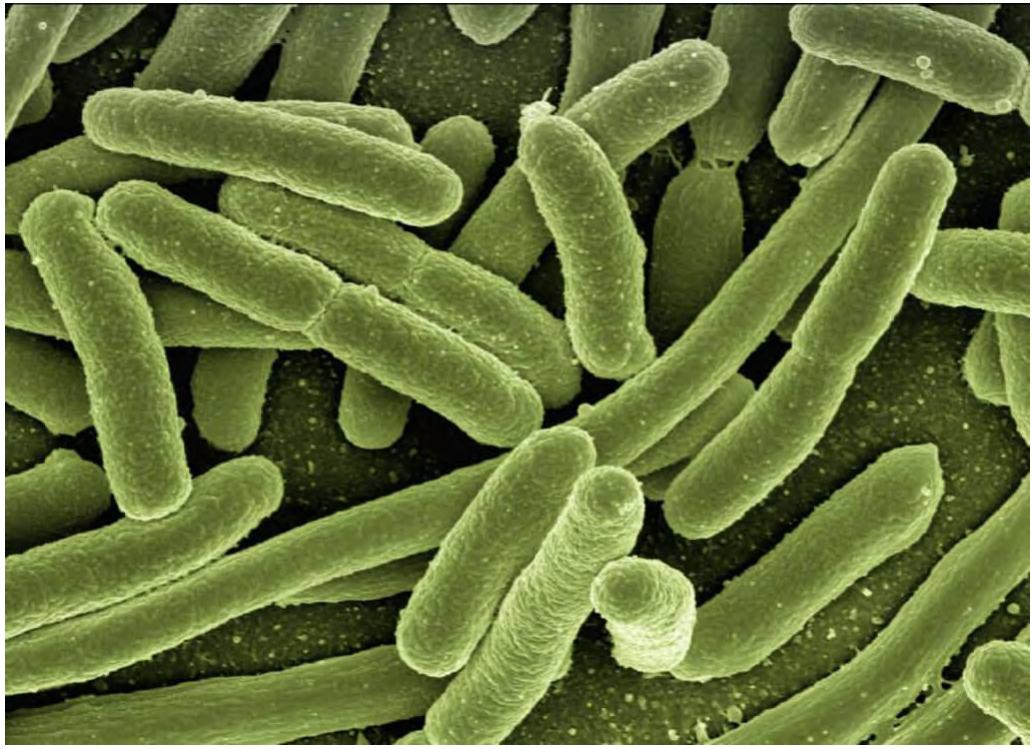
<u>Expected Effect from L5WSRP:</u>

Negligible and unmeasurable change to pH (assuming an inadvertent return happened)

1) HDD activities will take place >2.1 km upstream from the Reservation boundary
2) Likely below detection limits, and would not be sufficient to shift aqueous Ammonium/Ammonia balance enough (at pH 10) to result in ammonia

Line 5 WSRP Water Quality - Bacteria

Concern: safety of water for human activities like swimming and shell fishing based upon potential sources of fecal contamination such as Coliform bacteria like Escherichia coli (E. coli) and other coliphages from humans, pets, and wild animal waste.



Expected Effect from L5WSRP:

Negligible and unmeasurable change to bacteria

There are no known activities associated with L5WSRP that would alter bacteriological WQ

Line 5 WSRP Water Quality – Total Nitrogen

Natural Variability:
- Min: 0.04 mg/L
- Max: 5.6 mg/L
- Average: 0.74 mg/L

Enbridge Field Sampling Data:
- Higher than historical
- Location of sampling
- Timing of sampling

145 wetlands sampled
435 wetlands monitored
(adds variability)

Sampling Location[∞]	Data Period	Number of Values Collected	Average Value (mg/L)	Minimum Value (mg/L)	Maximum Value (mg/L)	Standard Deviation of Values
White River	2010-2022	81	1.06	0.13	4.8	1.13
White River (sampled by WDNR)		5	0.31	0.19	0.59	0.16
Deer Creek	2011-2022	36	0.94	0.07	5.6	1.48
Marengo River at Riemer Road	2010-2022	35	1.05	0.28	5.1	1.31
Marengo River at State Highway 13		72	0.69	0.16	2.9	0.67
Marengo River at Government Road		175	0.85	0.12	11	1.2
Brunsweiler River	2010-2022	55	0.7	0.28	3.1	0.61
Trout Brook	2015-2016	41	0.47	0.18	0.96	0.21
Billy Creek	2015-2016	35	0.39	0.13	1.2	0.32
Bad River	2010-2022	104	0.69	0.23	2.1	0.29
Tyler Forks at Casey Sag Road	2015-2022	24	0.7	0.47	1.2	0.21
Tyler Forks at State Highway 169	2011-2022	48	0.68	0.19	1	0.23
Tyler Forks at Copper Falls State Park	2011	4	0.68	0.41	0.93	0.25
Potato River	2010-2022	112	0.53	0.04	0.85	0.17
Statistics of Historic Data:	**2010-2022**	**827**	**0.74^**	**0.04**	**5.6**	**min: 0.17 max: 1.48**
Enbridge field sampling along L5WSRP[&]	2023	-	1.45	< 0.21 (LOD*)	30.3	-
	2024	>9	1.86	< 0.21 (LOD*)	15.9	-

*LOD refers to limit of detection. The minimum value of detection is provided and the field sample fell below this value.
^A volume-weighted average was calculated based upon the total number of values collected.
[∞]Historic sampling locations were sampled by the Band. The second entry for White River was sampled by WDNR. The last two rows include field sampling along the L5WSRP by Enbridge.
[&]The Enbridge field sampling campaign includes sampling in both waterbodies (204) wetlands (145) throughout the area.

Line 5 WSRP Water Quality – Ammonia

Natural Variability:

- Min: 0.02 mg/L
- Max: 0.22 mg/L
- Average: 0.04 mg/L

Enbridge Field Sampling Data

- Higher than historical
- Location of sampling
- Timing of sampling

Sampling Location[∞]	Data Period	Number of Values Collected	Average Value (mg/L)	Minimum Value (mg/L)	Maximum Value (mg/L)	Standard Deviation of Values
White River	-	7	0.02	0.02	0.04	0.01
Trout Brook	2015-2016	10	0.05	0.04	0.07	0.01
Billy Creek	2015-2016	10	0.07	0.03	0.22	0.06
Tyler Forks at Casey Sag Road	2015-2022	9	0.02	0.02	0.03	0.01
Tyler Forks at Copper Falls State Park	2011	4	0.03	0.02	0.06	0.02
Potato River	2010-2022	2	0.07	0.06	0.07	0.01
Statistics of Historic Data:	**2010-2022**	**42**	**0.04^**	**0.02**	**0.22**	**min: 0.01 max: 0.29**
Enbridge field sampling along L5WSRP[δ]	2023	-	0.03	< 0.14 (LOD*)	1.2	-
	2024	308	0.06	< 0.14 (LOD*)	1.2	-

*LOD refers to limit of detection. The minimum value of detection is provided and the field sample fell below this value.
^A volume-weighted average was calculated based upon the total number of values collected.
[∞]Historic sampling locations were sampled by the Band, except for White River, Tyler Forks (both locations), which were sampled by WDNR. The last two rows include field sampling along the L5WSRP by Enbridge.
[δ]The Enbridge field sampling campaign includes sampling in both waterbodies (204) wetlands (145) throughout the area.

Ammonia does not begin to be the predominant form in aqueous solution until the pH exceeds approximately 10

Line 5 WSRP Water Quality – Total Nitrogen

- TN in water column is extremely variable, depending on nutrient sources (natural and anthropogenic), time of day, season, precipitation, production, and decay.
- Blasting with a low residue gelatin dynamite may be required to break up bedrock and facilitate construction over an estimated 6 miles
  - 26 locations (7 perennial, 8 ephemeral, 11 intermittent)
  - 2.75 lbs (1.25 kg) gelatin dynamite per foot (0.3 m) of rock
  - Releases 1.01 kg of nitrogen gas per 1 meter of rock blasted
- Conservative maximum calculated change to TN following only 80% combustion yields 4.94% (w/w) or about 0.05 kg nitrogen
  - If all enters water in 1 minute, with average flow rate of 2.76 m3/s
  - TN increases by a **conservative maximum** **0.30 mg/L**
  - With more realistic efficiency, dry trench, and fill/excavation process, hyporheic flow
  - exchange over a day would be closer to **0.0002 mg/L** or a month **0.0000007 mg/L** elevation

TN Natural Variability:
Min: 0.04 mg/L
Max: 5.6 mg/L
Average: 0.74 mg/L

Expected Effect from L5WSRP: **Negligible and unmeasurable change to TN or Ammonia**

1) Blasting activities will take place >7.6 km upstream from the Reservation boundary
2) Likely below detection limits, would be temporary in nature, and would be unlikely to cause ecological harm, promote algae growth, or result in any measurable change in the waterbody
3) The natural mixing and productivity over the downstream distance to the Reservation boundary

Turbidity – Background Levels - TSS

Natural Variability:

- Min: 0.00 mg/L
- Max: 1,248 mg/L
- Average: 38.9 mg/L

Enbridge Field Sampling Data:

- **Higher** than historical
- Location of sampling
- Timing of sampling

Sampling Location[¤]	Data Period	Number of Values Collected	Average Value (mg/L)	Minimum Value (mg/L)	Maximum Value (mg/L)	Standard Deviation of Values
White River	2010-2022	115	68.34	0.00	743.10	124.80
White River (sampled by WDNR)		3	6.33	6.00	7.00	0.58
Deer Creek	2011-2022	46	66.14	2.40	1,248.00	194.47
Marengo River at Riemer Road	2010-2022	93	65.10	0.00	827.50	127.40
Marengo River at State Highway 13		100	38.99	0.00	500.00	78.72
Marengo River at Government Road		161	68.54	0.00	712.00	119.35
Brunsweiler River	2010-2022	89	24.08	0.20	514.00	63.18
Trout Brook	2015-2016	15	12.03	1.60	52.80	12.84
Billy Creek	2015-2016	15	31.89	4.40	199.00	47.22
Bad River	2010-2022	123	10.56	0.00	201.30	22.01
Tyler Forks at Casey Sag Road (sampled by WDNR)	2015-2022	12	6.71	2.00	41.00	11.09
Tyler Forks at State Highway 169	2011-2022	77	8.36	0.00	83.00	11.94
Tyler Forks at Stricker Road (sampled by GLIFWC)	2011-2018	5	5.60	4.00	7.00	1.14
Potato River	2010-2022	117	8.94	-0.60[ϕ]	98.00	13.07
Statistics of Historic Data:	**2010-2022**	**971**	**38.9^**	**0.0**	**1,248**	**min: 0.6 max: 194.5**
Enbridge field sampling along L5WSRP[&]	2023	175	303.4	< 0.49 (LOD*)	27,600	2,256.2
	2024	-	82.26	< 0.49 (LOD*)	3,080	-

*LOD refers to limit of detection. The minimum value of detection is provided and the field sample fell below this value.
^A volume-weighted average was calculated based upon the total number of values collected.
[¤]Historic sampling locations were sampled by the Band, except otherwise noted. The last two rows include field sampling along the L5WSRP by Enbridge.
[ϕ]Note the negative TSS (mg/L) may be a typographical error, human error, or fault of the measuring instrument and is excluded from the minimum value statistic.
[&]The Enbridge field sampling campaign includes sampling in both waterbodies (204) wetlands (145) throughout the area.

Turbidity – Background Levels - NTU

Natural Variability:

- Min: 0.00 NTU
- Max: 4,713 NTU
- Average: 67.44 NTU

Enbridge Field Sampling Data

- **Lower** than historical
- Location of sampling
- Timing of sampling

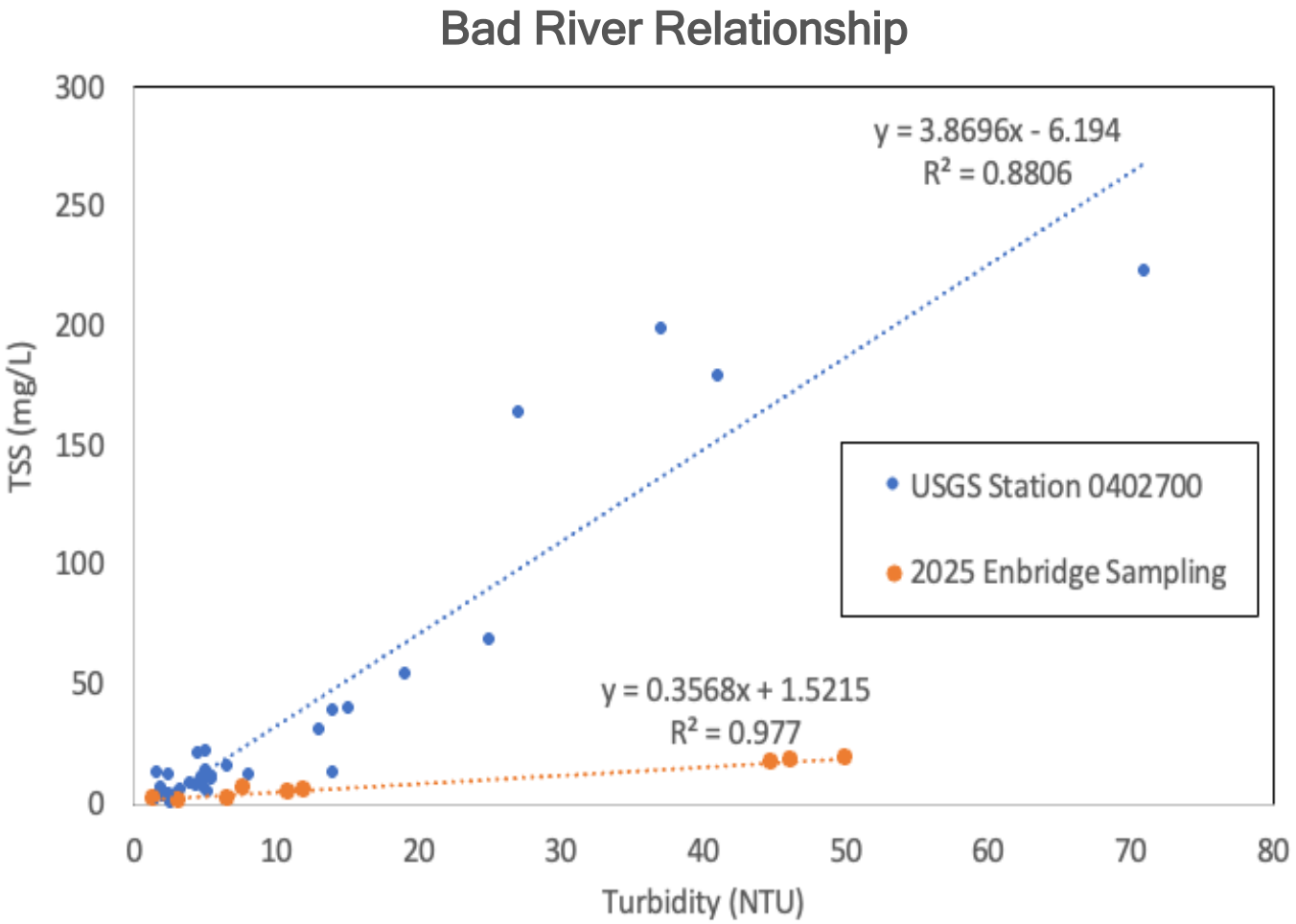
Sampling Location[∞]	Data Period	Number of Values Collected	Average Value (NTU)	Minimum Value (NTU)	Maximum Value (NTU)	Standard Deviation of Values
White River	2010-2022	101	158.56	0.00	2,640.00	313.05
Deer Creek	2011-2022	43	209.98	0.00	4,713.00	718.82
Marengo River at Riemer Road	2010-2022	77	96.42	0.00	3,071.00	354.37
Marengo River at State Highway 13		91	56.74	0.70	1,541.00	169.12
Marengo River at Government Road		140	89.18	3.41	1,939.00	209.68
Brunsweiler River	2010-2022	89	31.83	0.50	1,852.00	195.69
Trout Brook	2015-2016	13	12.12	1.10	69.40	18.90
Billy Creek	2015-2016	13	48.28	3.40	386.70	102.31
Bad River	2010-2022	114	13.98	0.10	676.70	64.39
Bad River (sampled by USGS)	2012-2016	5	5.06	3.10	6.80	1.31
Tyler Forks at Casey Sag Road (sampled by WDNR)	2015-2022	30	2.40	0.89	6.25	1.10
Tyler Forks at State Highway 169	2011-2022	60	26.20	0.25	839.50	111.46
Tyler Forks at Stricker Road (sampled by GLIFWC)	2011-2018	11	4.77	2.90	12.00	2.64
Potato River	2010-2022	92	24.28	0.00	566.90	97.04
Statistics of Historic Data:	**2010-2022**	**879**	**67.4^**	**0**	**4,713**	**min: 1.1 max: 718.8**
Enbridge field sampling along L5WSRP[&]	2023	173	34.25	0	1,029	111.2
	2024	-	47.41	0	668.03	-

^A volume-weighted average was calculated based upon the total number of values collected.
[∞]Historic sampling locations were sampled by the Band, except otherwise indicated. The last two rows include field sampling along the L5WSRP by Enbridge.
[&]The Enbridge field sampling campaign includes sampling in both waterbodies (204) wetlands (145) throughout the area.

NTU dependent on:

- WQ
- TSS
- Biological organisms (e.g., algae/phytoplankton)
- Other substances in the water column

Turbidity – Conversion of NTU to TSS



Construction Assessment

More conservative (Assessed 1, 19, 100, 200 mg/L)

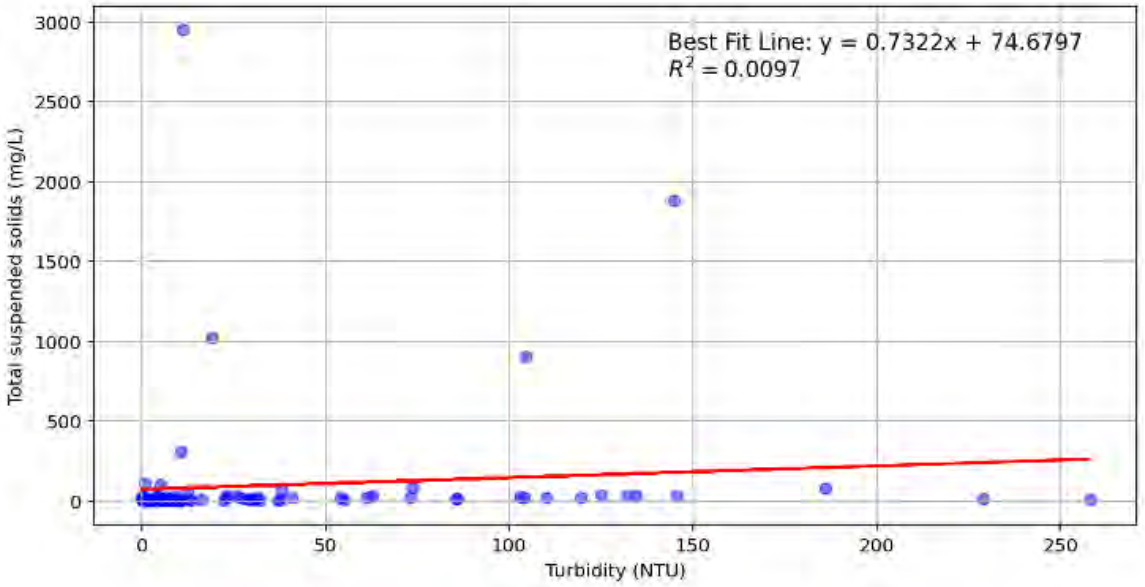
Blue - 5 NTU over background = **19.3 mg/L**

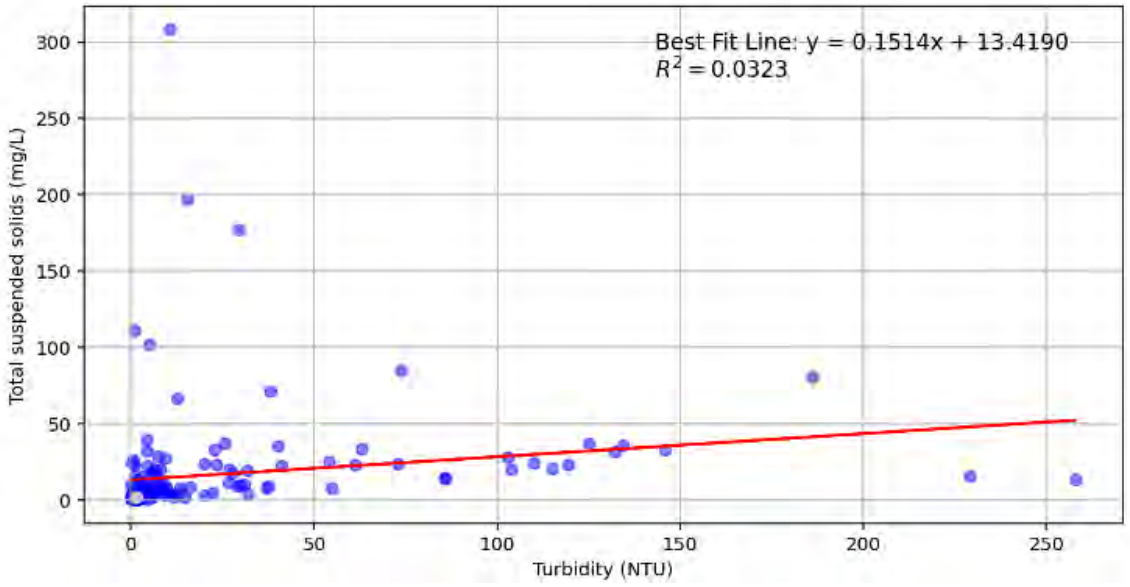
Orange - 5 NTU over background = **3.3 mg/L**

- Top relationship overestimates impacts by nearly **10x** when compared to 2025 sampling
- Likely more fines in 2025 sampling (not an annual relationship)

Turbidity – Conversion of NTU to TSS

Watershed-wide Relationship





- NTU to TSS relationship in 2023 across the watershed **does not** have a strong correlation
- Stronger relationship may exist for perennial waterbodies
- However, 76% of sampled streams were intermittent or ephemeral

Turbidity – Sediment Load – Bad River

Month	Hourly Median Load (MT)	Daily Median Load (MT)	2-Day Median Load (MT)	Monthly Minimum Load (MT)	Median of Monthly Average (MT)	Monthly Maximum (MT)
January	0.56	13.5	27.0	66.4	405	14,783
February	0.55	13.3	26.6	59.3	398	317,004
March	14.23	341.5	683.0	96.0	10,244	3,419,643
April	68.67	1,648.2	3,296.4	363.4	49,445	3,432,644
May	18.99	455.9	911.7	247.4	13,676	6,576,856
June	4.80	115.3	230.6	43.4	3,459	19,240,028
July	1.80	43.2	86.5	45.0	1,297	11,945,562
August	0.59	14.1	28.1	42.8	422	2,577,957
September	1.35	32.3	64.6	35.3	968	1,685,073
October	3.40	81.7	163.3	19.2	2,450	2,189,413
November	2.27	54.6	109.2	32.7	1,638	690,365
December	1.29	31.0	62.1	62.6	931	287,958
Annual MT from Daily:		86,290	Annual MT from Monthly:		85,330	-

Turbidity – Sediment Load – White River

Month	Hourly Median Load (MT)	Daily Median Load (MT)	2-Day Median Load (MT)	Monthly Minimum Load (MT)	Median of Monthly Average (MT)	Monthly Maximum (MT)
January	0.17	4.2	8.3	124.5	125	125
February	0.35	8.4	16.7	250.5	251	251
March	1.75	42.0	83.9	78.0	1,259	3,960
April	4.93	118.4	236.8	705.0	3,553	8,460
May	0.58	14.0	28.0	420.0	420	510
June	0.37	8.9	17.8	105.0	267	360
July	0.26	6.4	12.7	103.5	190	273
August	5.36	128.6	257.1	214.5	3,857	43,560
September	1.32	31.6	63.1	141.0	947	2,826
October	0.18	4.4	8.8	99.0	132	201
November	0.51	12.3	24.6	88.5	369	369
December	0.07	1.7	3.5	48.0	52	57
Annual MT from Daily:		11,612	Annual MT from Monthly:		11,422	-

Turbidity – Sediment Load – Beartrap Creek

Month	Hourly Median Load (MT)	Daily Median Load (MT)	2-Day Median Load (MT)	Monthly Minimum Load (MT)	Median of Monthly Average (MT)	Monthly Maximum (MT)
January	0.01	0.1	0.2	0.10	3.5	21.0
February	0.26	6.3	12.6	2.51	189.0	1909
March	0.07	1.6	3.2	4.58	48.6	393
April	0.52	12.5	24.9	6.39	373.8	4,522
May	0.70	16.8	33.6	1.42	503.5	14,822
June	0.09	2.1	4.1	1.33	61.9	2,808
July	0.00	0.04	0.07	0.60	1.1	3.2
August	0.00	0.01	0.03	0.04	0.4	5.3
September	0.00	0.00	0.00	0.01	0.03	0.16
October	0.50	12.1	24.2	3.43	363.3	4,900
November	0.00	0.00	0.01	0.05	0.14	0.35
December	-	-	-	-	-	-
Annual MT from Daily:		1,565	Annual MT from Monthly:		1,545	-

Turbidity – Trenched Crossings

PREVIOUS RPS MODELING	Dry Trenched Method Dam Removal	
	Small water courses	Medium water courses
Total Sediment Released (MT)	0.75	5.62
Release Duration*	20 hours	32 hours

*Note this assumes sediment density = 2650 kg/m^3, representative of quartz (conservatively overestimating metric tons because not accounting for pore water).

- Sediment load is **extremely variable**, TSS is the SI measure, NTU not a good analogue
- Sediment load was estimated for installation and removal of temporary dams
  - Small watercourse – **35% - 75x** (for stagnant waters)
  - Medium watercourse – **2.2-31.6%** of 2-day median load

Expected Effect from L5WSRP:

Measurable changes to TSS with exceedances lasting 4-10 hours (construction phase) in waters upstream of the Reservation, but none in the Reservation

1) 100's mg/L possible at release location
2) <19.3 mg/L in all modeled scenarios by 700 m downstream (small) or 100 m (medium)
3) <1 mg/L in all modeled scenarios by 1,000 m downstream (small) or 500 m (medium)
4) Trenching activities will take place >2.1 km upstream from the Reservation boundary, with no potential for effects within the Reservation

Annual Sediment Load:
- Bad River: 85,330 MT
- White River: 11,422 MT
- Beartrap Creek: 1,545 MT

2-Day Sediment Load:
- Bad River: 28.1-230.6 MT
- White River: 12.7-257.1 MT
- Beartrap Creek: 0.03-4.1 MT

Numeric Criteria: 5 NTU or 10%

Turbidity – Inadvertent Return

PREVIOUS RPS MODELING	Bad River Frac Outs	
	Pilot Hole	Final Ream Pass
Total Sediment Released (MT)	5.52	11.04
Release Duration*	1 hour	1 hour

*used tonnage provided in the Construction Assessment report, based on anticipated production rate and density of bentonite/fluid mixture, and a conservatively long release duration that is unlikely to occur (Horn, et al., 2022).

Average sediment released from IR:
20.4 kg
0.00204 MT
(450 gallons fluid)

- Sediment load is **extremely variable**, TSS is the SI measure, NTU not a good analogue
- Inadvertent return releases are **not planned events** and **may never occur**
  - Bad River (large) – **4.8-39%** of the 2-day median load
  - White River (medium) – **4.3-87%** of the 2-day median load
  - Beartrap Creek (small) – **2.8-380x** of the 2-day median load

Expected Effect from L5WSRP:

Measurable changes to TSS with exceedances lasting on the order of hours in waters upstream of the Reservation, but none in the Reservation (assuming an inadvertent return happened)

1) >20,000 mg/L possible at release location
2) 10-300 mg/L by 500m downstream
3) ~19.3 mg/L in all modeled scenarios by 1,000 m downstream
4) <1 mg/L in all modeled scenarios by 2,000 m downstream
5) HDD activities will take place >2.1 km upstream from the Reservation boundary, with no potential for effects within the Reservation

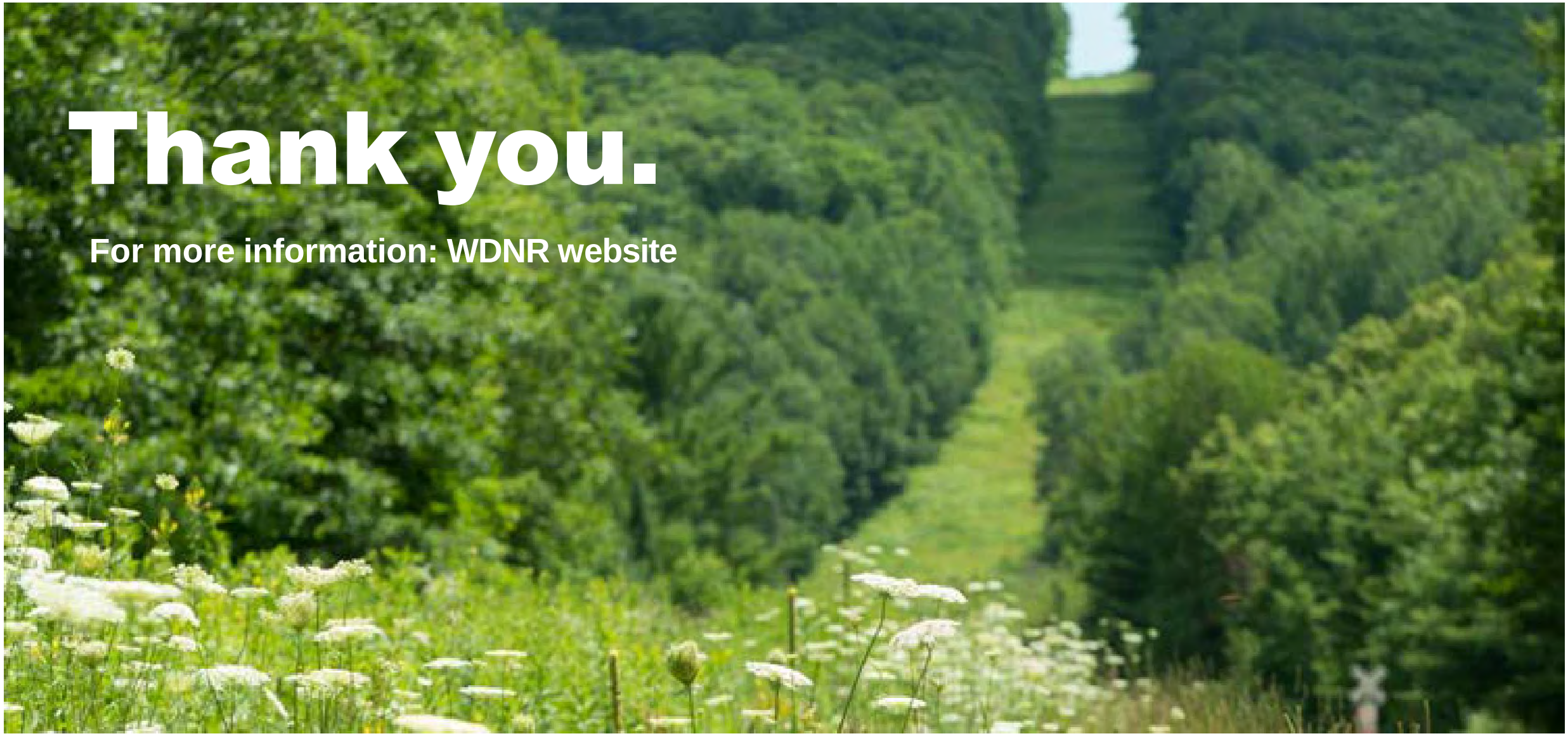
Annual Sediment Load:

Bad River: 85,330 MT
White River: 11,422 MT
Beartrap Creek: 1,545 MT

2-Day Sediment Load:

Bad River: 28.1-230.6 MT
White River: 12.7-257.1 MT
Beartrap Creek: 0.03-4.1 MT

Numeric Criteria: 5 NTU or 10%



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