Line 5 Reroute

Clean Water Act Section 401(a)(2) Hearing

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WRIGHT WATER ENGINEERS, INC.

Professional Background

Ian Paton

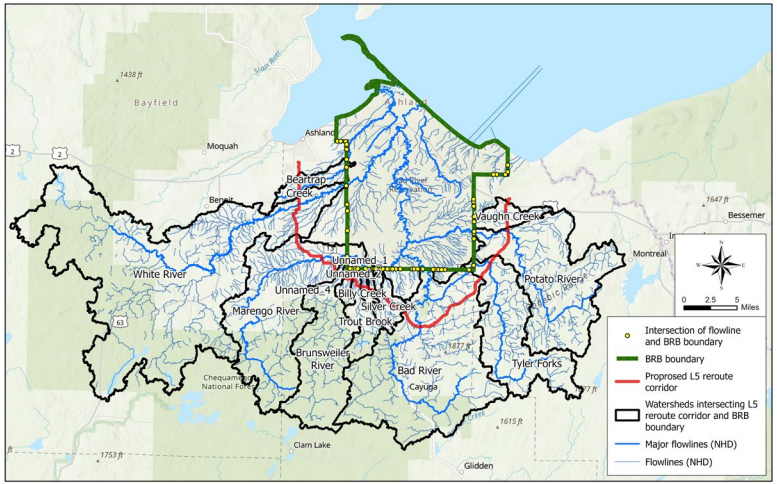
- Senior Water Resources Engineer, Wright Water Engineers, Inc.
- M.S. Civil Engineering (University of Colorado, Boulder)
- Professional Engineer, registered in 3 states (including Wisconsin)
- Certified Professional in Erosion and Sediment Control
- Certified Floodplain Manager
- 30+ years of experience in water resources engineering, including hydrology, water quality modeling, erosion and sediment transport

Natalie Collar

- Senior Hydrologist, Wright Water Engineers, Inc.
- Ph.D. Civil and Environmental Engineering (Colorado School of Mines)
- M.S. Watershed Science, B.S. Biology (University of California, Santa Barbara)
- Certified Floodplain Manager
- 12+ years of experience in water resources engineering including disturbance hydrology, statistical hydrology, spatial analysis, remote sensing, atmospheric science, aquatic ecology, and sedimentology

What was the general focus of this evaluation?

Evaluate the Following Effects from the Line 5 Reroute Project (L5R):



Bad River Reservation boundary	Green
L5R alignment	Red
Water features (streams/rivers)	Blue
Watershed boundaries	Black

1) <u>Hydrologic effects - from L5R land use changes</u>

- Will L5R land use changes alter the hydrology of waterbodies where they flow on to the Bad River Reservation?

2) <u>Water quality effects - from L5R Horizontal Directional Drilling (HDD) Inadvertent Releases (IRs)</u>

- Will HDD IRs from L5R construction have a reasonable potential to violate the water quality standard for increased turbidity for the Bad River Band of the Lake Superior Chippewa Tribe?

3) <u>Water quality effects - from L5R ROW erosion</u>

- Will erosion from land disturbance along the L5R construction Right-of-Way (ROW) have a reasonable potential to exceed the Wisconsin Department of Natural Resources erosion threshold and water quality standards for the Bad River Band of the Lake Superior Chippewa Tribe?

Hydrologic effects of L5R Project

Describe anticipated land use changes associated with L5R Project relevant to the evaluation

L5R ROW corridor:

- 41 miles long
- 95 feet wide (wetland areas)
- 120 feet wide (upland areas)
- Additional width (staging areas)
- 930 acres total disturbance

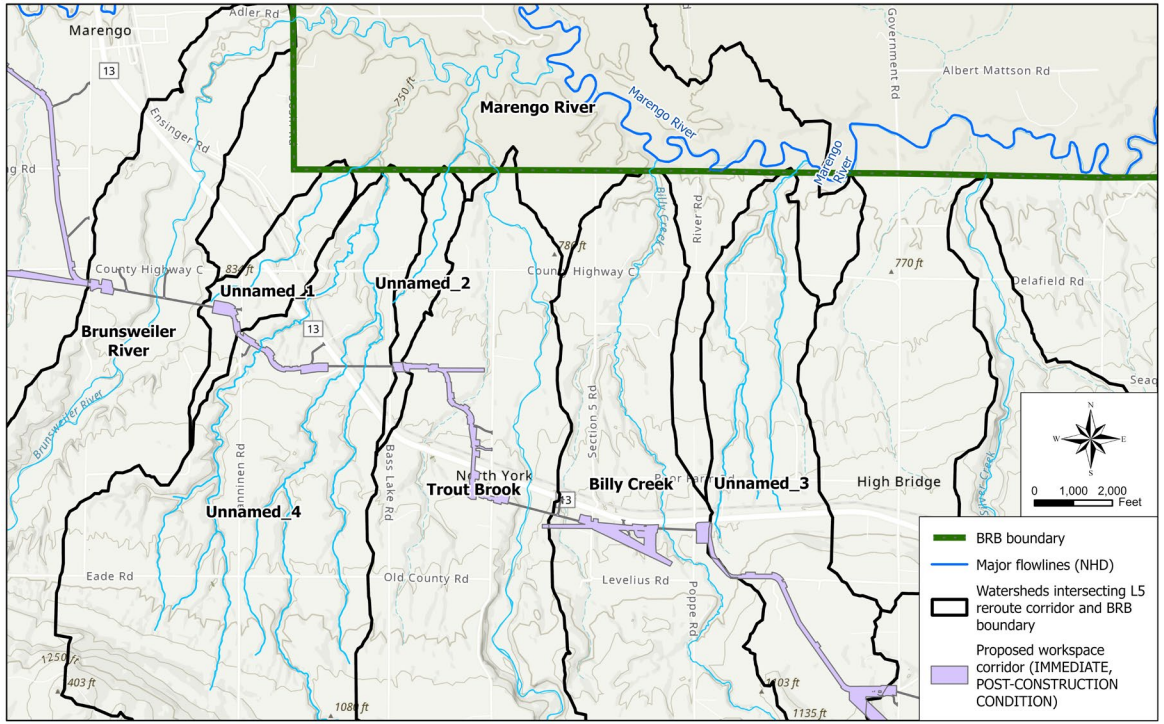
(Values are approximate)

During initial construction phase:

- Trees removed with heavy machinery
- Vegetation cleared

During ongoing maintenance:

- ROW brush cleared approx. every 5 yrs
- Limits tree and shrub growth



Southwest corner of BRB Reservation (green). Proposed L5R construction corridor (purple).

Source:
USACE Enbridge Line 5 Wisconsin Segment Relocation Project, Draft EA (2024)
WDNR Final EIS: Proposed Line 5 Relocation Project (2024)

What effects might the land use changes from L5R have on hydrology and sediment production and transport?

Current conditions along proposed L5R corridor:

- Vegetation:
  - Dense mixed deciduous-evergreen forest

  Effect of L5R Project:
  Removing the dense vegetation will reduce the volume of precipitation intercepted by the forest canopy

- Forest floor
  - Covered with thick litter and duff layers

  Effect of L5R Project:
  Removing the litter and duff layers will reduce surface storage and surface roughness and increase soil erosion from rain splash impacts

  Heavy machinery used for construction and maintenance will compact soils, which will reduce soil infiltration rates and increase runoff

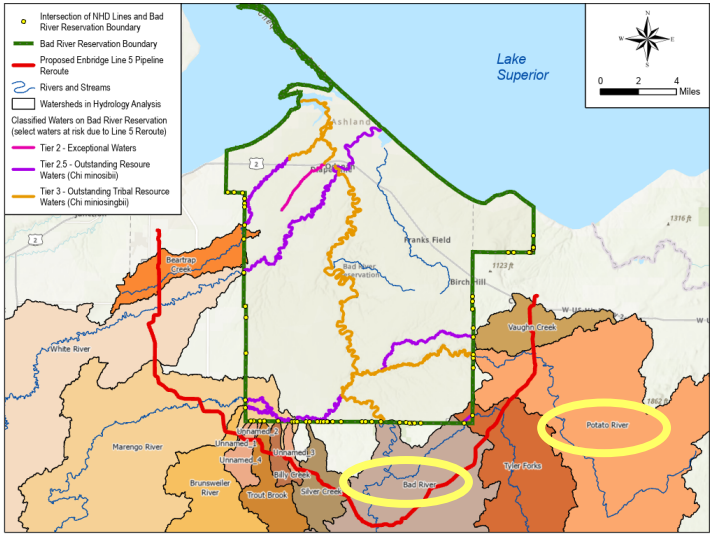
What effects might these land use changes have on hydrology and sediment production and transport? *(cont'd)*

- Red clay soils are known for high erosion potential and comprise a large portion of the L5R Project area

- Erosional features (e.g., rills, gullies) on exposed banks along the proposed L5R Project route have been observed in these soil types during field observations

- Result of removing forest canopy and litter and duff layers, as proposed:
  - **Increased (↑) runoff peak rates and runoff volumes**
  - **Increased (↑) erosion and sediment transport into receiving streams**

How are those effects **relevant** to the Bad River Band's Waterbody Classifications?



The Bad River and Potato River are both designated as Tier 3 Outstanding Tribal Resource Waters (OTRWs).

The OTRW designation states:

"No new or increased discharges or alterations of the background conditions are allowed to Outstanding Tribal Resource Waters; however, a short-term temporary (no more than 6 months, and no more than necessary) lowering of water quality may be provided…that such discharge will arise entirely from one of the following…"

1) Maintenance/repair of existing roads, bridges, boat landings, culverts, septic systems, or other similar structures; construction of buildings, wells, roads, or other similar structures.

2) Response actions undertaken to alleviate a release into the environment of hazardous substances, pollutants, or contaminants which may pose an imminent and substantial danger to public health or welfare.

3) Actions undertaken to restore culturally important species and their habitats.

New infrastructure construction - not listed as an allowable activity for short-term lowering of water quality to OTRW.

Describe the **engineering calculations** performed to estimate the effects of the L5R project on hydrology

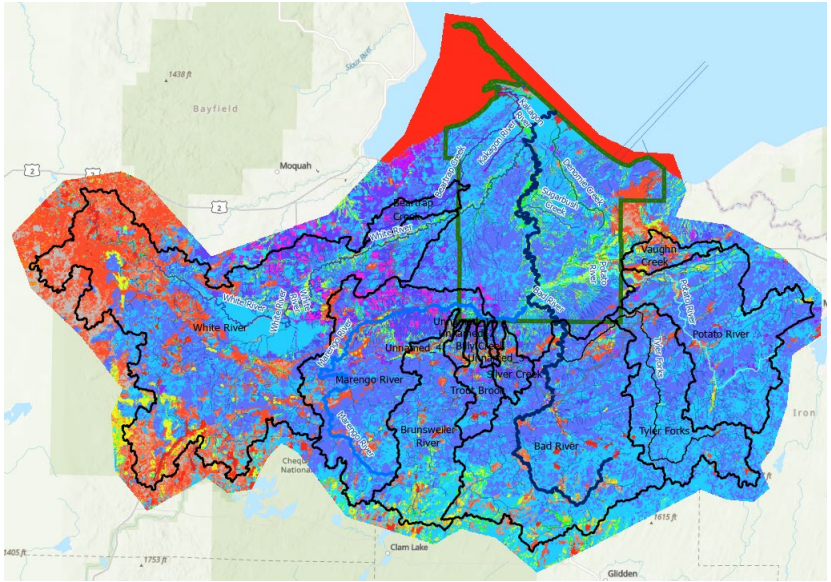
General procedure:

- Use NRCS SCS Curve Number (CN) method
  - Estimate conceptual changes to the 2-year/24-hour peak runoff caused by the L5R Project construction
  - CN is a widely used engineering methodology

- Estimate changes in flow rates for:
  - WATERSHED-SCALE ANALYSIS:
    Major watersheds entering the Bad River Reservation
  - SUBBASIN-SCALE ANALYSIS:
    Subset - smaller subbasins within watersheds

- Checked the reasonableness of the CN model results:
  - WinTR-55 model
  - Graphical Discharge Method
  - Regression-based peak flow estimates
    (for pre-construction condition using USGS Streamstats)

Curve Number (CN) raster



Describe the **engineering calculations** performed to estimate the effects of the L5R project on hydrology *(cont'd)*

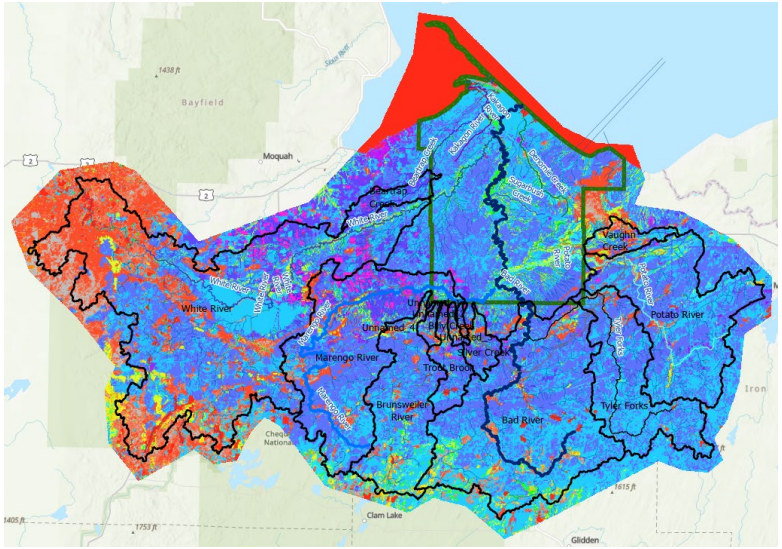
- Analysis compared "pre-construction" runoff conditions with two L5R "post-construction" scenarios:

- "Post-construction" L5R watershed condition scenarios:

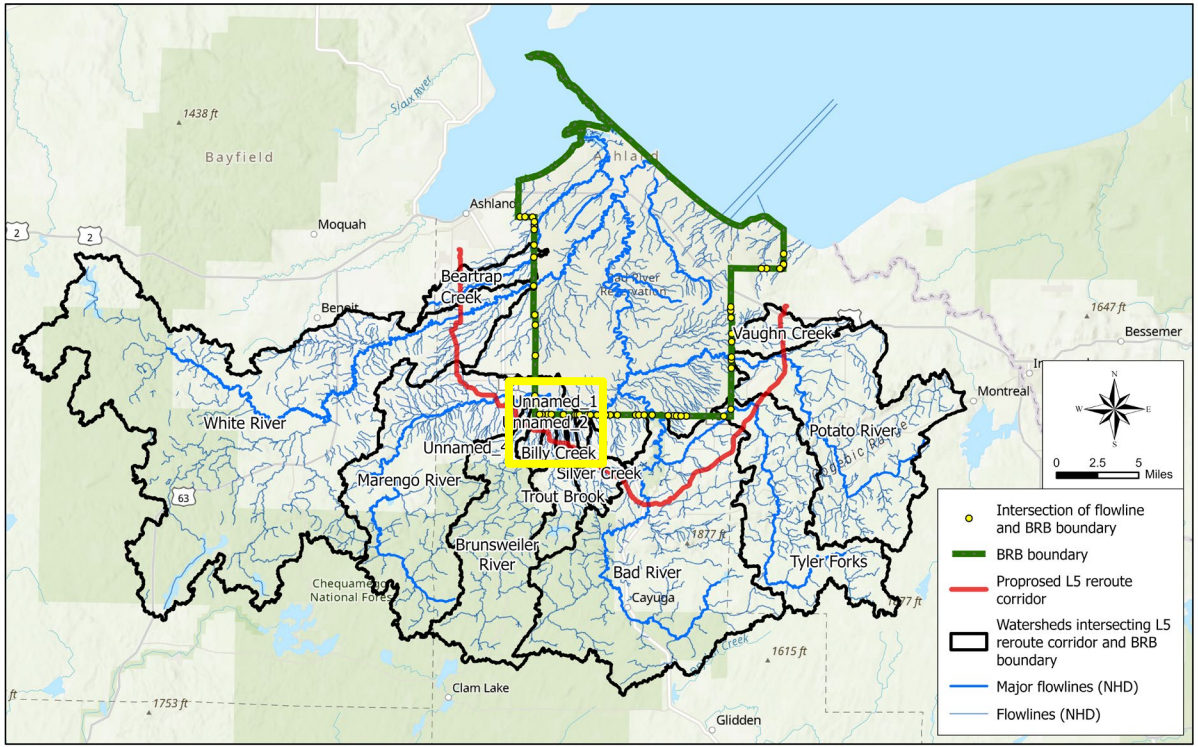
  1) Low range estimate of hydrologic effects
  Shrub/scrub vegetation with no soil compaction
  ("more conservative [lesser impacts] estimate")

  2) High range estimate of hydrologic effects
  Herbaceous/grassland with soil compaction
  ("more probable impact estimate")

Curve Number (CN) raster



What are the estimated **watershed-scale** impacts the L5R project could have on hydrology in the Bad River Band Reservation?



Bad River Reservation boundary	Green
L5R alignment	Red
Water features (streams/rivers)	Blue
Watershed boundaries	Black

15 Watersheds Evaluated

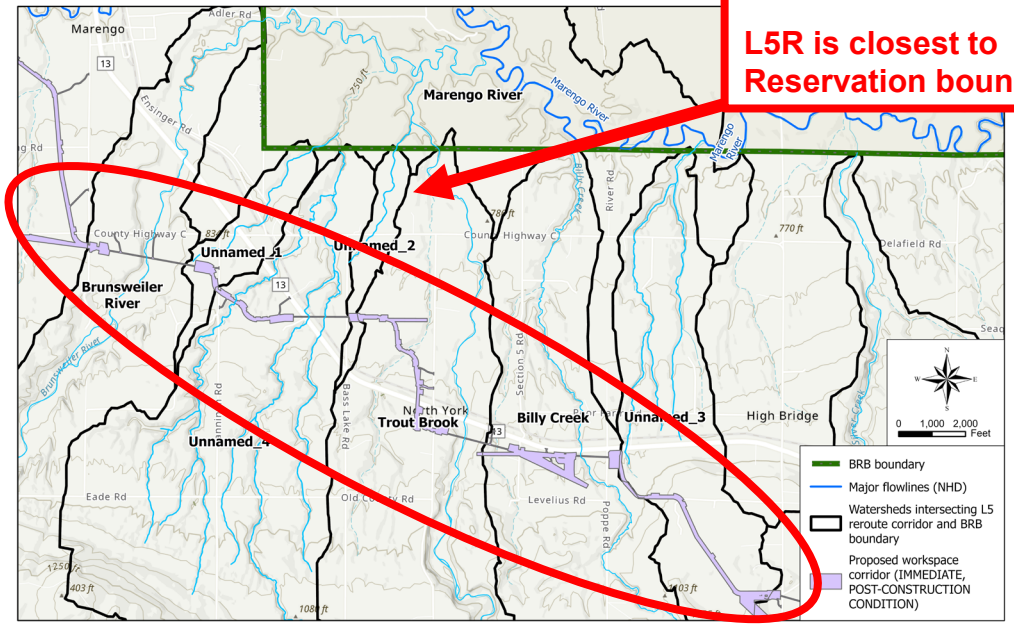
Watershed Name	Area Upstream from BRB Reservation Boundary (mi^2)
Bad River	153.4
Beartrap Creek	11.2
Billy Creek	2.6
Brunsweiler River	61.7
Marengo River	108.1
Potato River	96.4
Silver Creek	9.2
Trout Brook	14.9
Tyler Forks	62.4
Unnamed_1	0.3
Unnamed_2	0.2
Unnamed_3	1.3
Unnamed_4	3.5
Vaughn Creek	11.4
White River	275.4

Smallest watersheds

Largest proportional impacts from the L5R disturbance

What are the estimated **watershed-scale** impacts the L5R project could have on hydrology in the Bad River Band Reservation? *(cont'd)*

Zoomed in view
Southwest corner of Bad River Reservation



Bad River Reservation boundary	Green
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15 Watersheds Evaluated

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Vaughn Creek	11.4
White River	275.4

Smallest watersheds

Largest proportional impacts from the L5R disturbance

What are the estimated **watershed-scale** impacts the L5R project could have on hydrology in the Bad River Band Reservation? *(cont'd)*

Watershed Name	Area (mi^2)	Pre-disturbance 2-year/24-hour Discharge (cfs)	Post-construction 2-year/24-hour Discharge [shrub/scrub scenario, most conservative] (% difference from pre-disturbance)	Post-construction 2-year/24-hour Discharge [herbaceous/grasslands with compaction scenario, more likely] (% difference from pre-disturbance)
Bad River	153.4	3,623	<0.1%	0.1%
Beartrap Creek	11.2	334	0.1%	0.2%
Billy Creek	2.6	57	0.4%	0.9%
Brunsweiler River	61.7	1,461	<0.1%	<0.1%
Marengo River	108.1	2,627	<0.1%	0.1%
Potato River	96.4	2,445	<0.1%	0.1%
Silver Creek	9.2	223	0.2%	0.7%
Trout Brook	14.9	410	<0.1%	0.1%
Tyler Forks	62.4	1,653	0.1%	0.1%
Unnamed_1	0.3	9	0.4%	1.3%
Unnamed_2	0.2	6	0.1%	0.5%
Unnamed_3	1.3	21	1.4%	4.2%
Unnamed_4	3.5	74	0.1%	0.2%
Vaughn Creek	11.4	148	0.5%	1.1%
White River	275.4	3,911	<0.1%	<0.1%

Watershed-scale Key findings:

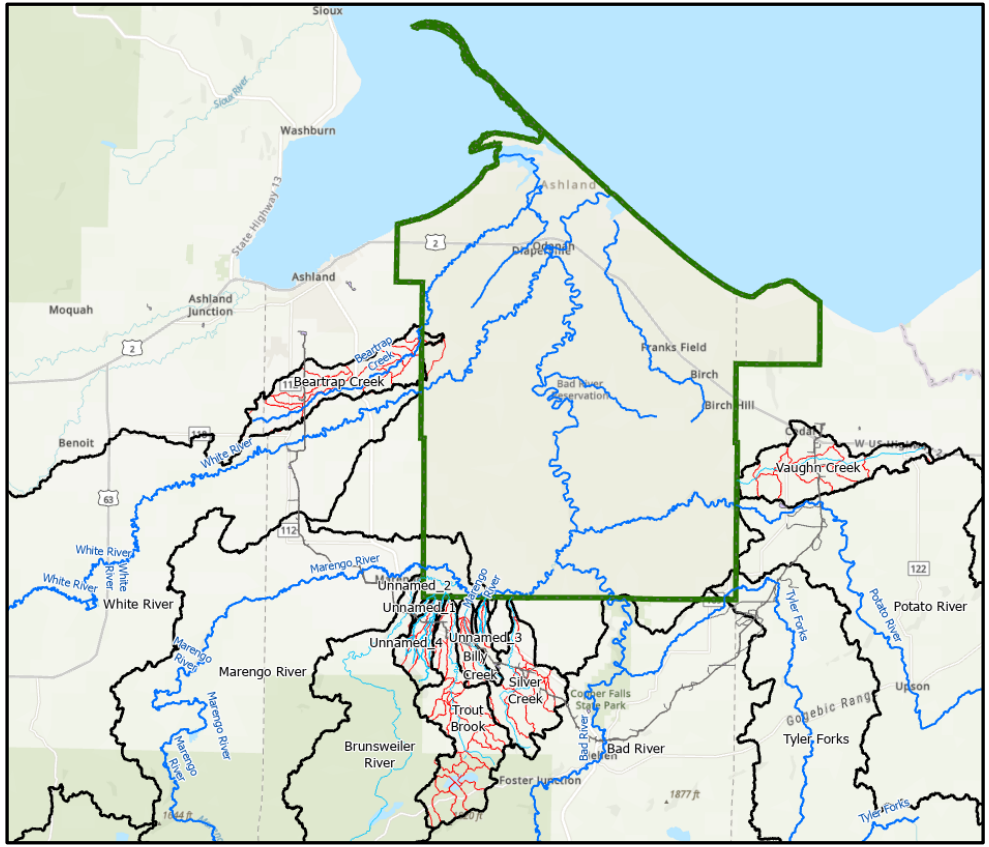
- **Low range estimate of effects**
  (*L5R ROW converted to shrub/scrub land cover type with no soil compaction*):

  The 2-year/24-hour peak flow increase:
  <0.1 to **~1.4%**
  at Reservation boundary (depending on basin).

- **High range estimate of effects**
  (*L5R ROW converted to herbaceous/grassland land cover type with soil compaction*):

  The 2-year/24-hour peak flow increase:
  <0.1 to **~4%**
  at Reservation boundary (depending on basin).

What are the estimated **subbasin-scale** impacts the L5R project could have on hydrology in the Bad River Band Reservation?

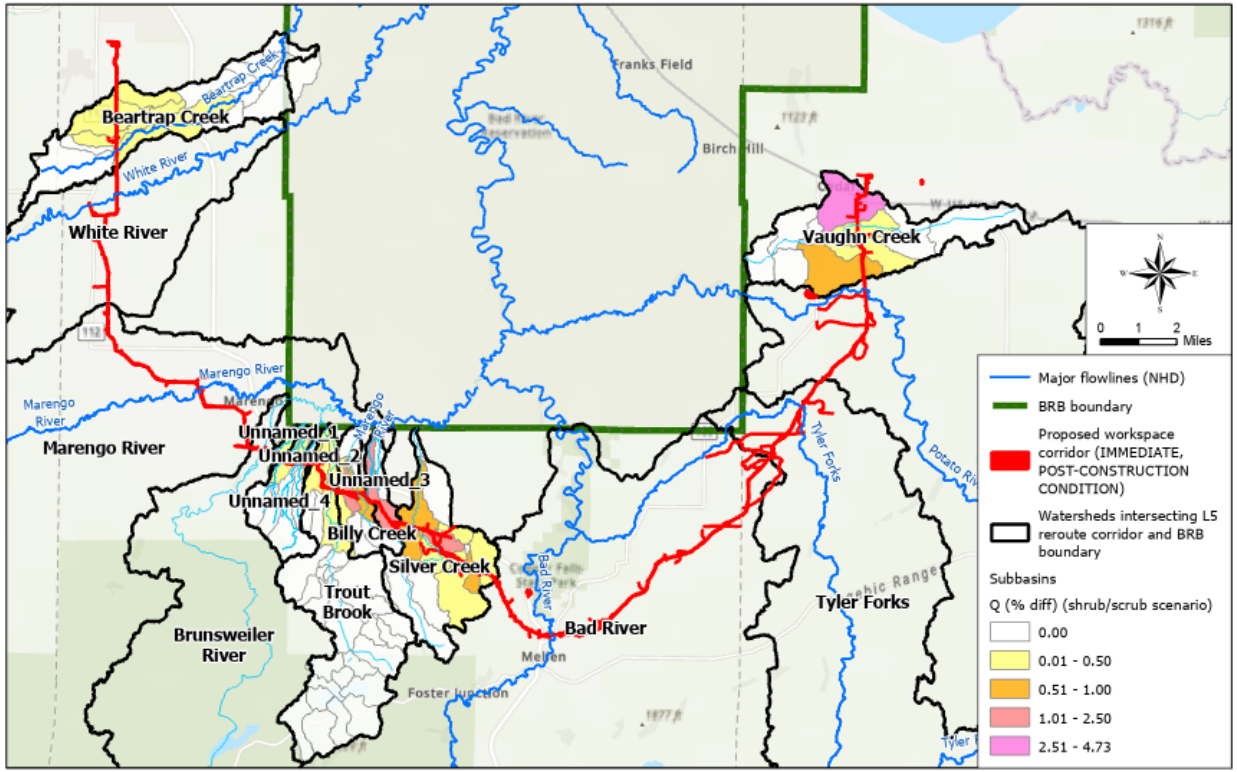


Sub-basin scale hydrology was modeled using HEC-HMS

- Sub-basin boundaries shown in red

- Purpose: Estimate changes in runoff in individual sub-basins that intersect the proposed L5R

What are the estimated **subbasin-scale** impacts the L5R project could have on hydrology in the Bad River Band reservation? *(cont'd)*

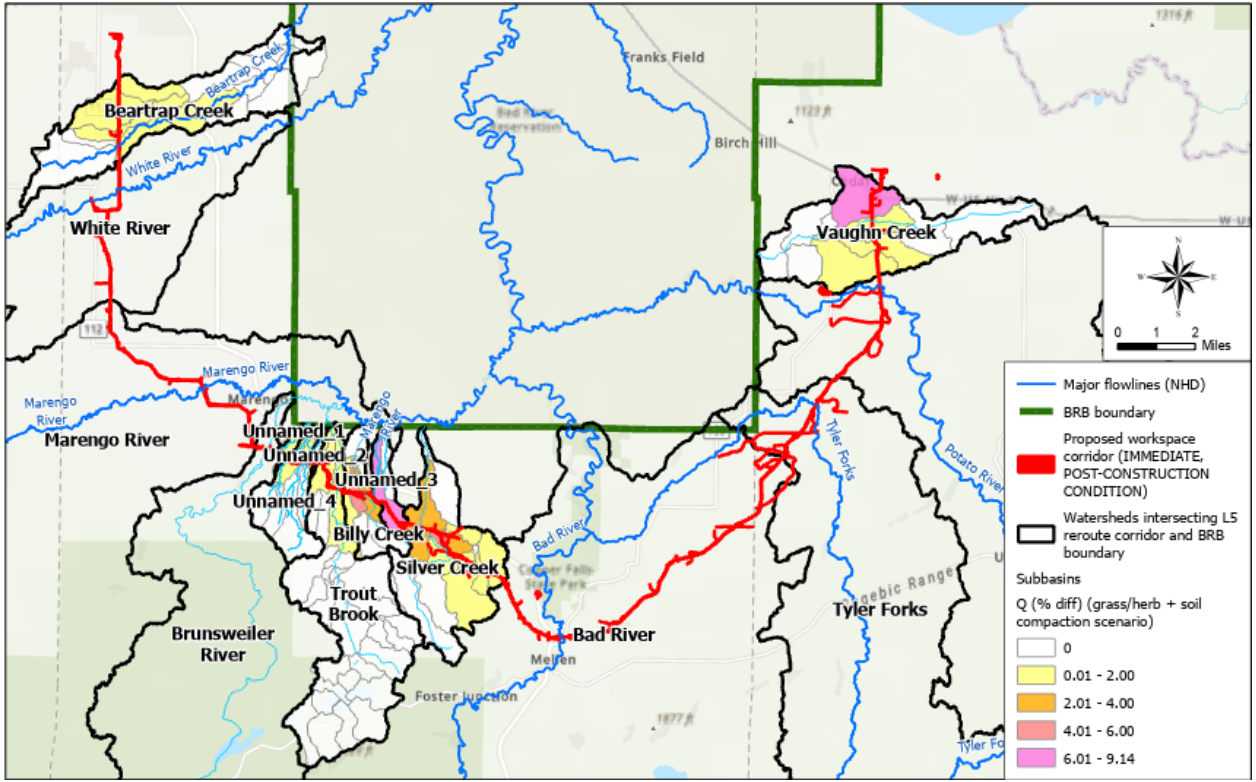


Percent difference of pre- and post-construction 2-year/24-hour discharge estimates by subbasin for the shrub/scrub post-construction scenario with no soil compaction (most conservative, lesser impact scenario).

Sub-basin scale Key findings:

- **Low range [lesser impact] modeling scenario** (*ROW converted to shrub/scrub land cover type with no soil compaction*):
- The 2-year/ 24-hour peak flow is estimated to increase by **<0.1** to **~5%** in individual subbasins.

What are the estimated **subbasin-scale** impacts the L5R project could have on hydrology in the Bad River Band reservation? *(cont'd)*



Percent difference of pre- and post-construction 2-year/24-hour discharge estimates by subbasin for herbaceous/grassland post-construction scenario (more probable).

Sub-basin scale Key findings:

- **High range modeling scenario** (*ROW converted to herbaceous/grassland land cover type with soil compaction*):

- The 2-year/24-hour peak flow is estimated to increase by **<0.1** to **~9%** in individual subbasins.

Key Point - Sub-basins

- Increased potential for localized impacts

- Increased runoff and sedimentation

SUMMARY: How are these hydrologic effects relevant to the subject of 401(a)(2) and the Bad River Band reservation specifically?

- **Conceptual understanding:**
  - Compacting soils reduces infiltration rates
  - Converting forest to a cleared condition reduces initial abstractions (i.e., storage of rainfall)
  - These changes:
    - Increase runoff (peaks and volumes)
    - Increase exposure of soil to erosion
    - Increase potential for sediment transport

- **Engineering calculations show:**
  - While minor, the L5R Project will cause real (i.e., not *de minimus*) changes to hydrology
    - Model findings are supported by conceptual understanding / literature
  - In particular - increased potential for localized impacts
    - Increased runoff and associated sedimentation

SUMMARY: How are these hydrologic effects relevant to the subject of 401(a)(2) and the Bad River Band reservation specifically? *(cont'd)*

- **How are these findings relevant to 401(a)(2) and the Bad River Band specifically:**
  - Assessment of L5R effects on hydrology and associated sediment transport on the Bad River Band Reservation does not appear to have been addressed by the USACE's evaluation of the project's impacts.

  - **These changes to the hydrology would not comply with the Band River Band's Outstanding Tribal Resource Water standard of "No new or increased discharges or alterations of the background conditions…"**

    - As well as not complying with other narrative standards.

Potential effects of **HDD inadvertent releases** associated with L5R Project on **sediment transport** and **water quality**

What is the problem with an inadvertent release (IR) from Horizontal Directional Drilling (HDD) potentially occurring?

- **Enbridge acknowledges HDD IRs are not uncommon**
  - "Inadvertent returns are not unusual or unexpected" [1]

[1]https://www.enbridge.com/media-center/media-statements/l3r-nontoxic-drilling-mud-part-of-hdd-process.

Adverse effects from an HDD IR can be substantial

HDD IR in Ohio, Tuscawaras River
Rover Pipeline Project (not Enbridge project)
Approx. 2,000,000 gallons of drilling mud released
(Photo source: Ohio EPA, 2017)

What is the problem with an inadvertent release (IR) from Horizontal Directional Drilling (HDD) potentially occurring? *(cont'd)*

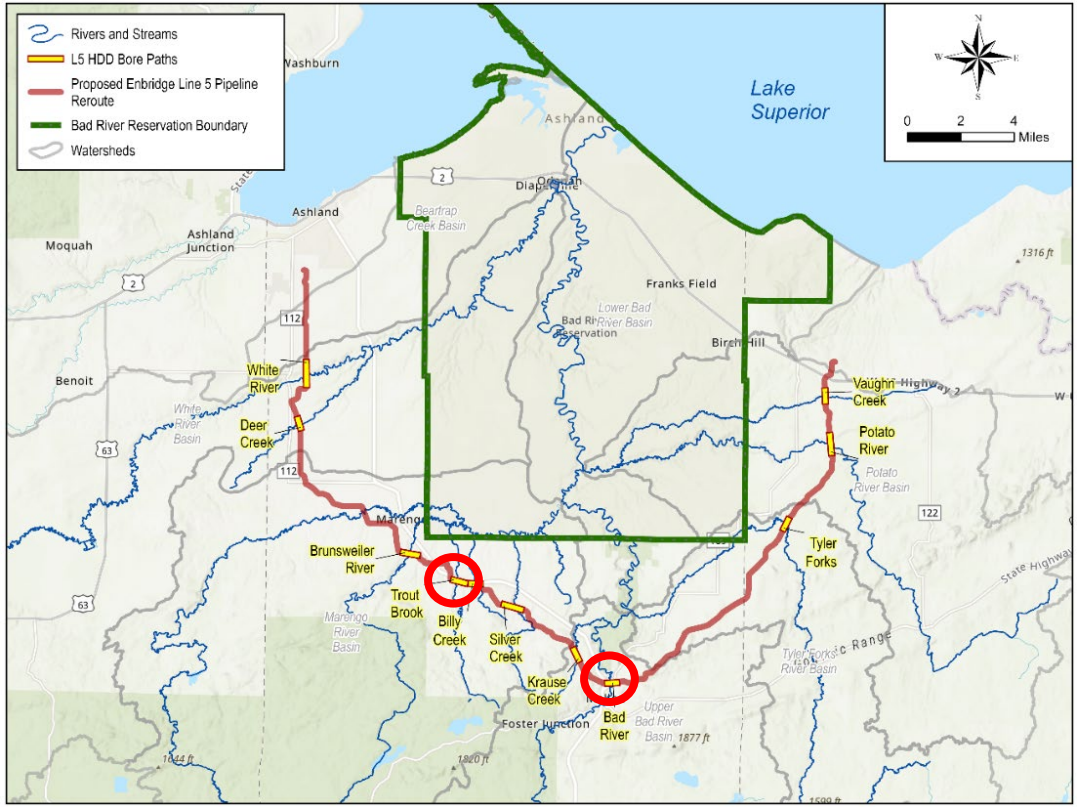
- **Other Enbridge Pipeline Projects Have Had Numerous HDD Inadvertent Returns (IRs):**
  - Line 3 Replacement Project – Minnesota, in 2021:
    - 28 separate IRs (multiple IRs at some HDD sites)[(2)]
    - Volumes of drilling mud released:
      - Range from 10 gallons up to 6,000 to 9,000 gallons

- **Line 3 – The Projected Likelihood that HDD IRs Would Occur**

"Enbridge's technical engineers have evaluated each crossing for the best method to use (open cut, push pull, HDD, dry crossing, etc.), and have determined based on soil types and prior knowledge of pipeline crossings that the above-mentioned sites are at low risk for an undetected inadvertent release of HDD drilling mud (commonly referred to as a "frac out") to occur."[(3)]

[(2)]Enbridge Line 5 Wisconsin segment relocation project. Wisconsin Department of Natural Resources Appendix 18, Aquifer Analysis and HDD designs (Revised). 9/26/24.
[(3)] Enbridge Line 3 Replacement Project. License for Utility to Cross Public Waters No. UWAT011547. Minnesota Department of Natural Resources.

How many HDDs are proposed along the L5R project and where are they?



- **HDDs planned for 11 water crossings on L5R**

- **HDDs vary in distance from Bad River Reservation boundary:**
  - Bad River HDD: 12.3 miles
  - Trout Brook HDD: 2.0 miles

Other underground crossings proposed using Direct Boring method
- Not addressed in this discussion.

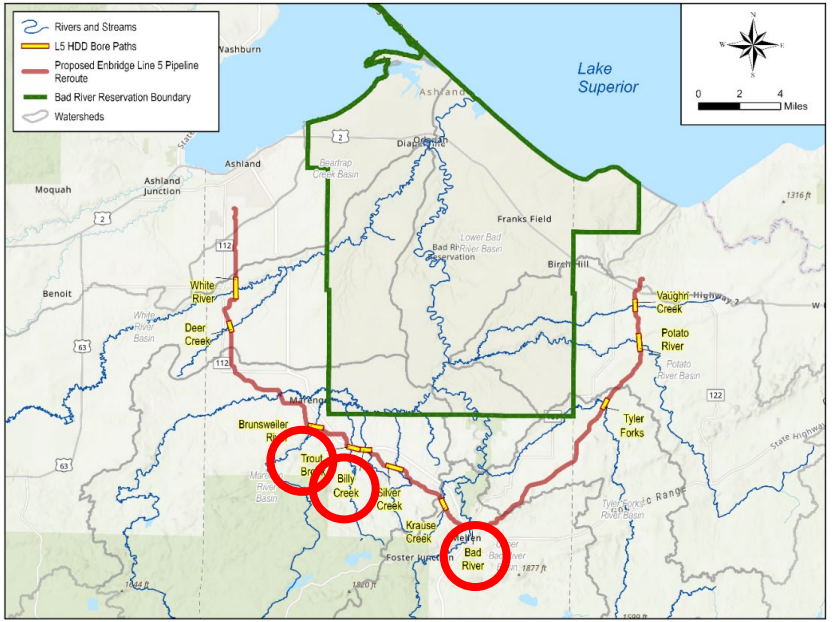
How do the watercourses differ that are proposed to be crossed by HDD?

Three examples:

Bad River
Mean annual flow rate
224 cfs

Trout Brook
Mean annual flow rate
15 cfs

Billy Creek
Mean annual flow rate
3 cfs



Estimated flow rates at BRB Reservation boundary

What is the water quality standard for the Bad River Reservation at most risk of being violated by an HDD inadvertent release?

Bad River Band's Water Quality Standard (Part E.7.iii):

"Turbidity shall not exceed 5 NTU over natural background (when natural background is 50 NTU or less). When natural background is greater than 50 NTU, turbidity shall not increase more than 10% above background levels."

(NTU: Nephelometric Turbidity Unit)

What scenarios for an HDD IR were evaluated by Enbridge?

Evaluation of HDD IR water quality effects by Enbridge consultant:

Watercourse:	Bad River
Flow Rate Conditions:[1]	Low flow Average flow High flow
HDD Inadvertent Release Volumes:	Pilot Hole IR: 120 m^3 (31,700 gal.) Final Ream IR: 240 m^3 (63,400 gal.)

[1] The specific Bad River flow rates used for the different HDD IR modeling scenarios are not listed in the model report: Enbridge Line 5 Wisconsin Segment Relocation Project. 22-P-216493. Construction Assessment: Sediment Discharge Monitoring Report. February 13, 2023.

What scenarios for an HDD IR were evaluated by Enbridge? *(cont'd)*

Results for HDD IR for the Bad River - from Enbridge Consultant:

Sediment Discharge Monitoring Report, p. 74:

"By 2,000 m (or 2 km) downstream, TSS predictions for all scenarios were below the calculated threshold of 19 mg/L identified for this study. Therefore, TSS concentrations would likely fall below this threshold by the time suspended sediments reached the Reservation boundary (approximately 19.5 km downstream from the Proposed Route crossing)."

(Note: 19 mg/L TSS was calculated by Enbridge consultant as approximately equal to 5 NTU Bad River water quality standard for increased turbidity)

What issues are there with applying Enbridge's HDD IR analysis to the overall potential impacts from HDD IRs for the L5R project?

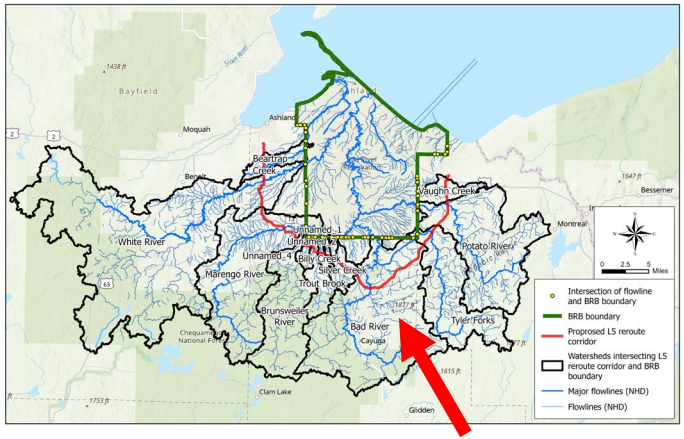
Two main concerns

1) The analysis is for the Bad River HDD location only which is not a "conservative" scenario.
(There are 11 proposed HDD locations)

i) Bad River average flow rates are higher

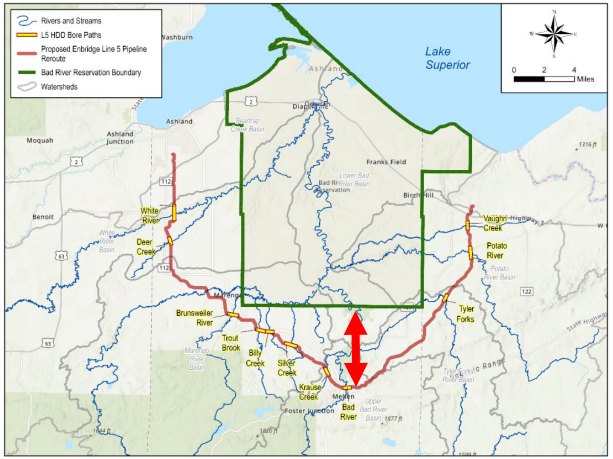
- The Bad River watershed is larger than other HDD locations (except for White River).

- Higher flow in the Bad River provides greater dilution than other HDD locations (except the White River).



ii) The Bad River HDD location is further away from the Reservation boundary than all the other HDD locations

- Bad River HDD location provides greater time for suspended solids to settle out from an HDD IR before reaching the Reservation boundary compared to other HDD locations.



Examples
Distance from BRB Reservation boundary:

Bad River HDD: 12.3 miles

Billy Creek HDD: 2.2 miles

(Distances are approximate)

What issues are there with applying Enbridge's HDD IR analysis to the overall potential impacts from the L5R project? *(cont'd)*

Two main concerns (cont'd)

2) TSS/turbidity relationship analysis
Uses TSS and turbidity data from 1987 to 1993 from a Bad River USGS gage to determine the maximum allowable increase in TSS to comply with the Bad River Band's water quality standard for turbidity (an allowable increase up to 5 NTU).

Concern:
The TSS/NTU relationship for the Bad River cannot be assumed to be applicable to other watercourses.

The TSS/NTU relationship is well documented to vary widely from one watercourse to another:

> *"It should also be noted that the proportionality of the linear relationship represented as the ratio of TSS to turbidity (in terms of mg/L over NTU) varied between 0.64~3.4 as determined through our literature search."*

- p. 16, *Understanding and Complying with Storm Water Mitigation Guidelines from the EPA*. Wisconsin Department of Transportation. March 2015.

What type of independent assessment was conducted regarding the potential for an HDD IR to violate the Bad River Band's water quality standards?

- Mass balance analysis that accounts for:
  - Advection
  - Particle settling
  - Dispersion

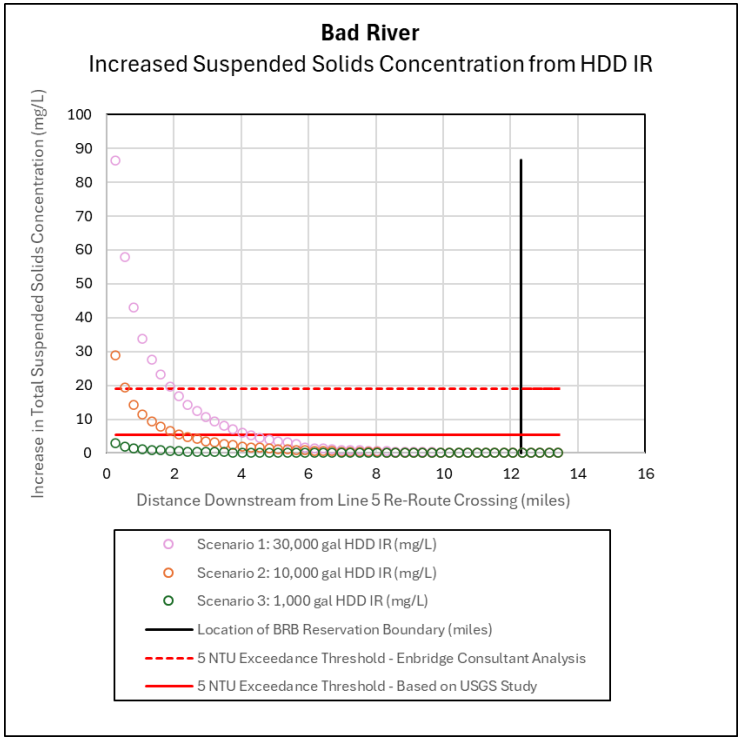
- Scenarios for drilling mud volumes released:
  - 1,000 gallons (in range of Line 3 HDD IRs)
  - 10,000 gallons (approx. 1,000 gallons above largest estimated HDD IR for Line 3)
  - 30,000 gallons (> 3 x largest Line 3 HDD IR; in range of other larger HDD IRs)

- Flow rates in watercourses used:
  - Mean annual flow rate for each water course (baseline scenario)
  - Other flow rates (approx. 3 times average flow) – to evaluate effect of other flow conditions.

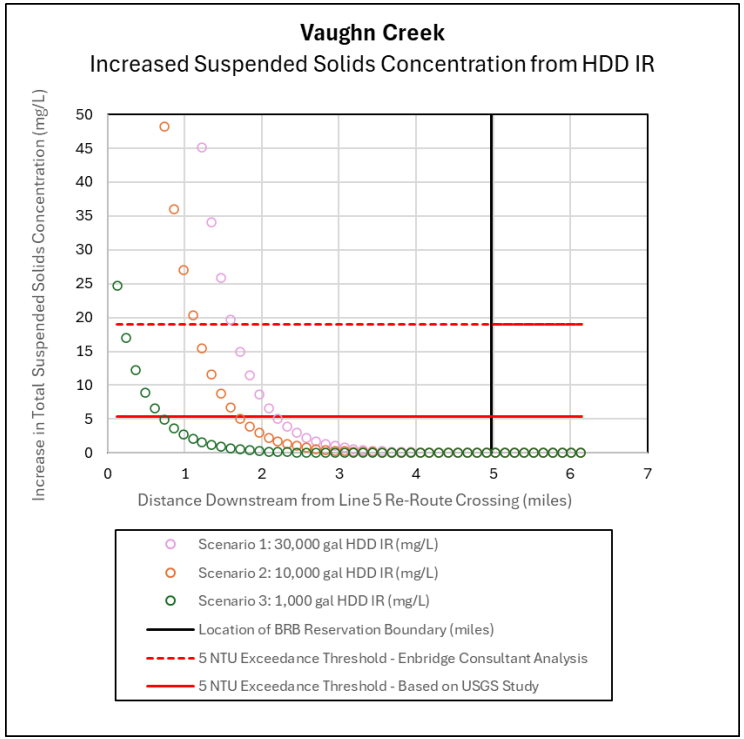
- Results show trends between different HDD IR scenarios and compliance with the Bad River turbidity standard

What type of independent assessment was conducted regarding the potential for an HDD IR to violate the Bad River Band's water quality standards? *(cont'd)*

- Our calculations found that an HDD IR <u>was not</u> predicted to exceed the Band's 5 NTU standard for increased turbidity for scenarios evaluated for:



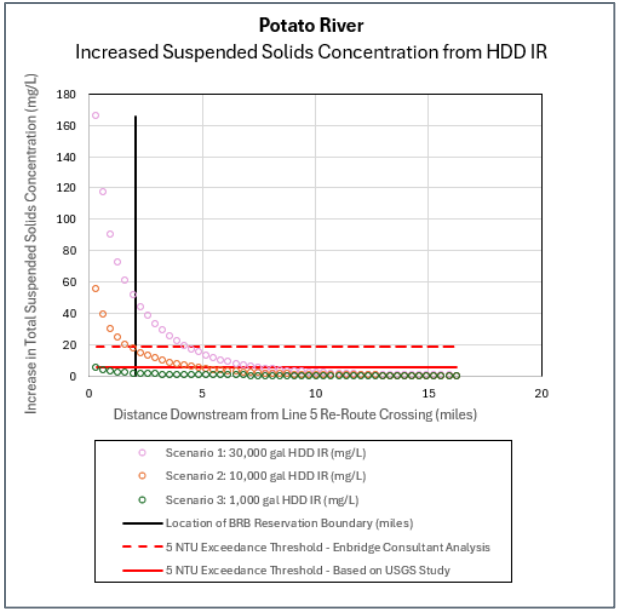
(Bad River mean annual flow rate evaluated: 224 cfs)



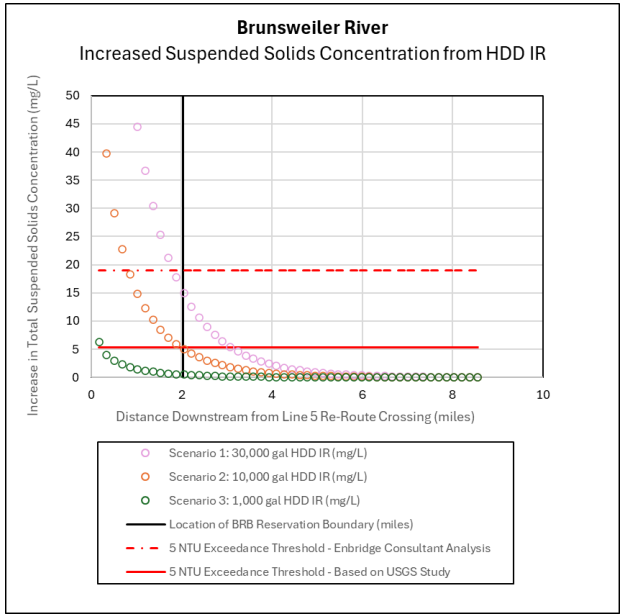
(Vaughn Creek mean annual flow rate evaluated: 12 cfs)

What type of independent assessment was conducted regarding the potential for an HDD IR to violate the Bad River Band's water quality standards? *(cont'd)*

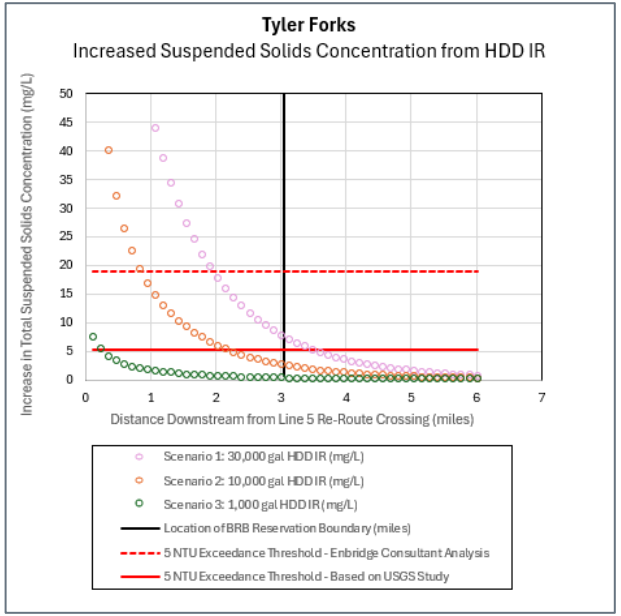
- However, for other streams, our calculations found that an HDD IR <u>was</u> predicted to exceed the Band's 5 NTU standard for increased turbidity for scenarios evaluated (flow conditions and IR volumes) for:



(Potato River: mean annual flow rate evaluated : 99 cfs)



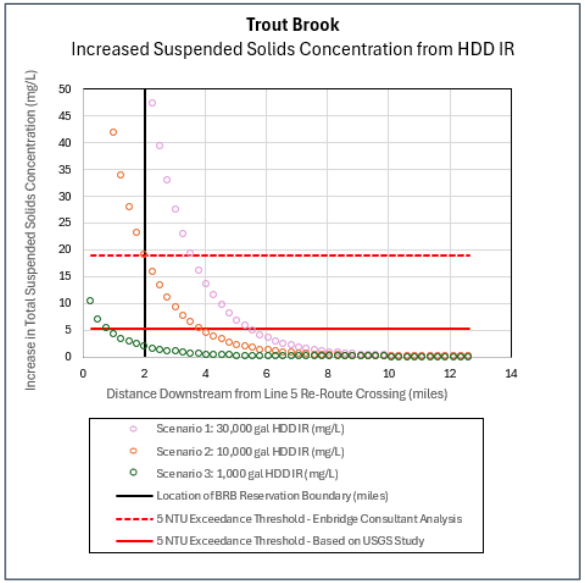
(Brunsweiler River: mean annual flow rate evaluated: 63 cfs)



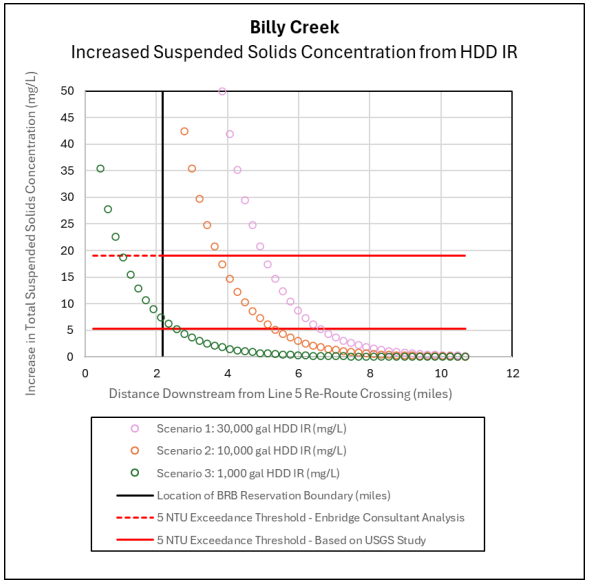
(Tyler Forks: mean annual flow rate evaluated: 67 cfs)

What type of independent assessment was conducted regarding the potential for an HDD IR to violate the Bad River Band's water quality standards? *(cont'd)*

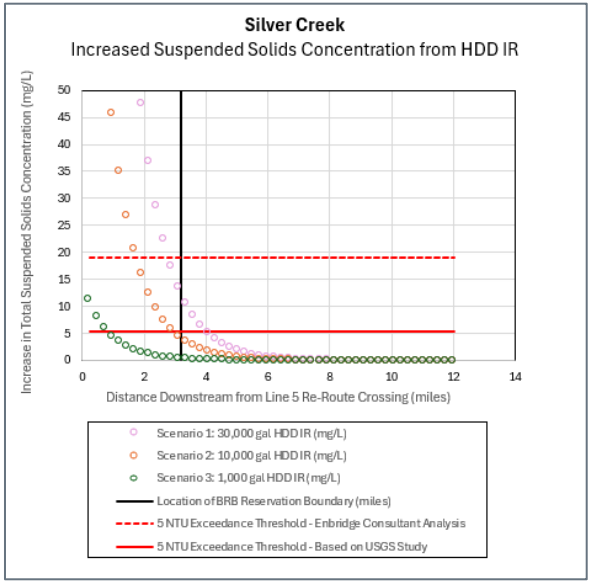
- In addition, our calculations found that an HDD IR was predicted to exceed the Band's 5 NTU standard for increased turbidity for other scenarios evaluated (varying flow rates in streams):



(Trout Brook flow rate evaluated: 45 cfs; mean annual flow rate: 15 cfs)



(Billy Creek flow rate evaluated: 10 cfs; mean annual flow rate: 3 cfs)



(Silver Creek flow rate evaluated: 30 cfs; mean annual flow rate: 9 cfs)

Summary of Findings – HDD IR Analysis

- The HDD evaluation provided by Enbridge's consultant only evaluates an HDD IR into the Bad River. [1]
  - Evaluating only the Bad River is not a "conservative scenario"
  - The Bad River has larger flows (with greater dilution) than the other watercourses proposed to have HDD (except for the White River)
  - The Bad River HDD location is further away from the Bad River Reservation boundary than the other proposed HDD locations (providing more time for solids to settle out from an HDD IR)
  - The TSS/turbidity ratio used for the Bad River should not be assumed to apply to other watercourses
    - Literature shows the TSS/turbidity ratio is often lower than the value used for the Enbridge analysis
    - This means the allowable increase in TSS could be lower in other watercourses to comply with the Bad River water quality standard for increase in turbidity

[1] Sediment Discharge Monitoring Report, February 2023

Summary of Findings – HDD IR Analysis *(cont'd)*

- Our analysis findings:
  - An HDD IR was not found to exceed the Band's 5 NTU standard for increased turbidity for the scenarios evaluated (flow conditions and IR volumes) for:
    - Bad River
    - Vaughn Creek
  - However, HDD IR scenarios for several other watercourses were found to have increased suspended solids in the range of a projected exceedance of the Band's 5 NTU standard for increased turbidity (based on a range of flow conditions in the streams). These watercourses are:
    - Potato River
    - Brunsweiler River
    - Trout Brook
    - Billy Creek
    - Silver Creek
    - Tyler Forks

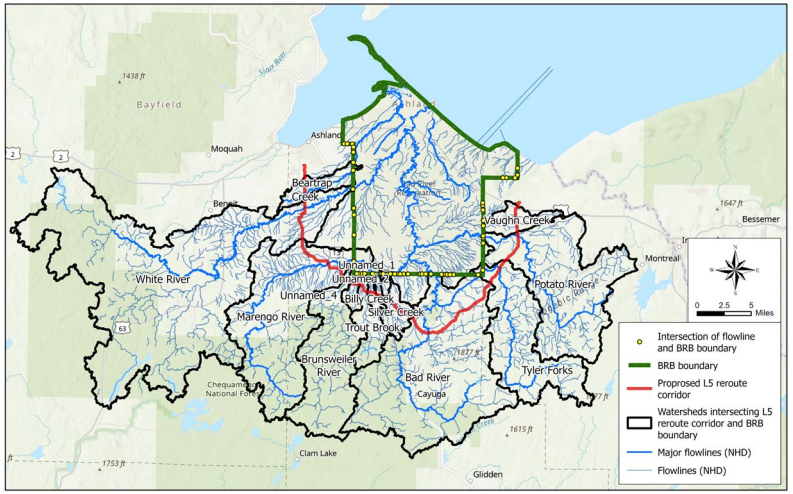
Potential effects of **soil disturbance** from L5R Project on **water quality**

Why is there concern about the potential for water quality impacts from erosion in upland areas disturbed by the L5R construction?

Numerous Water Bodies Crossed by L5R Project(1)

- 72 water bodies crossed - regulated by USACE

- 191 water bodies crossed - not regulated by USACE
  - 125: Main line construction
  - 62: Access roads
  - 3: Yards
  - 1: Mainline valve installation



- Crossings include 136 streams and rivers(2)

<u>Numerous water crossings</u>
- High potential for water quality impacts from erosion
- Both during and after construction, while vegetation is being reestablished

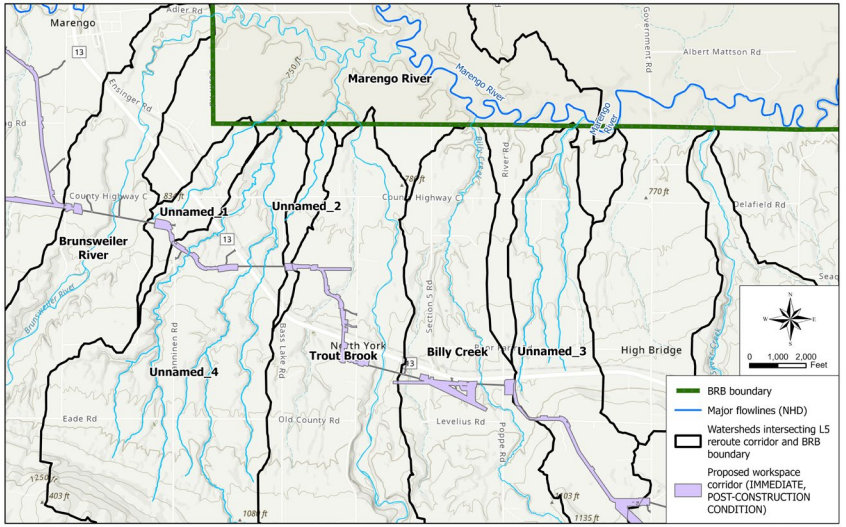
(1) USACE Draft Environmental Assessment, Enbridge Line 5 Wisconsin Segment Relocation Project, May 20, 2024. p. 14.
(2) Wisconsin Department of Natural Resources EIS, Appendix B.

Why is there concern about the potential for water quality impacts from erosion in upland areas disturbed by the L5R construction? *(cont'd)*

L5R Right-of-Way (ROW) corridor:

- 41 miles long
- 95 feet wide (wetland areas)
- 120 feet wide (upland areas)
- Additional width (staging areas)
- 930 acres total

(Values are approximate)



L5R ROW Disturbance as % of Watershed Area

Examples:

Watershed Name	Watershed Area (mi^2)	L5R Disturbance Area (acres)	Disturbed Portion of Watershed (%)
Brunsweiler River	61.7	6.6	0.01%
Trout Brook	14.9	24.7	0.3%
Billy Creek	2.6	30.9	1.5%

What was the scope of the analysis by Enbridge regarding water quality impacts from erosion?

- The evaluation by Enbridge's consultant addresses water quality impacts from short-term sedimentation effects from temporary dams used for crossing water bodies:[1]
  - Small crossings
    (Sediment discharged for 2 hours for the installation and 2 hours for the removal of the dam)
  - Medium watercourses
    (Sediment discharged for 5 hours for the installation and 5 hours for the removal of the dam)
  - Compliance with the Bad River Reservation turbidity standard is based on the same TSS/turbidity relationship applied to all watercourses (allowable increase of 19 mg/L TSS)
- **The assessment does not address:**
  - Erosion from disturbed upland areas occurring for 41 miles of ROW involving disturbance of approximately 930 acres
  - Long-term effects of erosion from disturbed areas
  - The varying relationship between TSS and turbidity for different streams and rivers

[1] Source: Sediment Discharge Monitoring Report, February 2023.

Did any reviewing agencies identify information gaps with the scope of the erosion analysis by Enbridge?

Yes - Wisconsin DNR noted the omission in the analysis provided in the Sediment Discharge Monitoring Report (2023):

As stated in the State of Wisconsin Department of Natural Resources (DNR) Environmental Impact Statement (EIS) (2024):

"…RPS's modeling of sediment discharge to streams is focused on sediment from stream crossings. The modeling does not address potential sources of sediment to streams from upland soil erosion. To address this information gap, the DNR adapted its Soil Loss and Sediment Discharge Tool (SLSD) for use with GIS software to model the relative risk of sediment discharge from these areas."

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Did any reviewing agencies identify information gaps with the scope of the erosion analysis by Enbridge? *(cont'd)*

The Wisconsin DNR Soil Loss and Sediment Discharge Tool:

"…estimates erosion based on the duration of construction, slope, slope length, surface condition (including erosion control BMPs), rainfall, and implementation of standard erosion control practices."

What were the results of the independent erosion calculations conducted by the Wisconsin Department of Natural Resources?

Two scenarios with varying periods of construction duration were evaluated:

1) Short Duration Scenario
- Construction from March 31 to July 18 (106 days)

Results:

Approximately **1%** of all mile markers exceed the WDNR sediment yield threshold of 5 tons/acre.
(Mile markers at 0.1-mile resolution)

2) Long Duration Scenario
- Construction from March 31 to December 31 (272 days)

Results

- Approximately **25%** of all mile markers exceed the WDNR sediment yield threshold of 5 tons/acre.

The likelihood of exceeding the Wisconsin DNR's erosion threshold of 5 tons/acre threshold is much greater with the Long Duration scenario.

Extending the duration of construction results in substantially higher sediment yields from the erosion of upland areas.

This increases the risk of violating the Bad River Band's water quality standards.

What were the results of the independent erosion calculations conducted by the Wisconsin Department of Natural Resources? *(cont'd)*

Highest Projected Total Sediment Yield Regions Along Proposed L5R

(adapted from WDNR, Final EIS Table 5.6-7)

Waterbody Name	Contributing Area ID	Stream Crossings	Sediment Loss: Short Duration Scenario *(tons)*	Sediment Loss: Long Duration Scenario *(tons)*
Unnamed tributary: Billy Creek	126	sasc025i sasc025i_x sasb1004e sasb1002	17.3	68.9
Unnamed tributary: Billy Creek	125	sasc028e sasc026e	9.7	38.5
Unnamed tributary: Scott Taylor Creek	169	sasv018i	5.6	22.1
Unnamed tributary: Silver Creek	149	sasa071p_x1 sasa071p_x1	5.4	21.3
Unnamed tributary: Marengo River	76	sase1015i	4.5	17.8

Projected sediment yield
Est. range: 17 – 69 tons
(into area tributary to Billy Creek)

Est. 10 – 38 tons

- Short duration scenario: Based on Enbridge's stated construction duration described in their Environmental Protection Plan: March 31 – July 18 [106 days]).
- Long duration scenario: March 31 – December 31 [272 days]).

What were the results of the independent erosion calculations conducted by the Wisconsin Department of Natural Resources? *(cont'd)*

Highest Projected Total Sediment Yield Regions Along Proposed L5R
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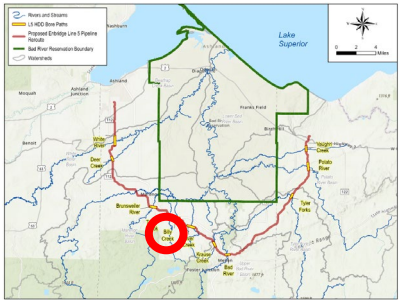
- Short duration scenario: Based on Enbridge's stated construction duration described in their Environmental Protection Plan: March 31 – July 18 [106 days]).
- Long duration scenario: March 31 – December 31 [272 days]).

Billy Creek
Mean annual flow rate:
3 cfs



Downstream impacts to water quality on the Bad River Reservation:

Most substantial along small waterbodies where the L5R is closest to the Reservation

What were the results of the independent erosion calculations conducted by the Wisconsin Department of Natural Resources? *(cont'd)*

Wisconsin DNR Final EIS (p. 312):

"Disturbance areas that are likely to exceed five tons per acre per year of sediment discharge would be required to reduce the potential discharge through the implementation of additional erosion and sediment control measures and limitations on bare ground durations to the maximum extent practicable."

What were the results of the independent erosion calculations conducted by the Wisconsin Department of Natural Resources? *(cont'd)*

- **WDNR erosion calculations show impacts for an extended duration**

  - Enbridge's evaluation of compliance with the Bad River turbidity standard is problematic (for small and medium water crossings) because:

    - Water quality impacts are evaluated only for short-term effects during construction

    - Again, the TSS/turbidity relationship for the Bad River is incorrectly applied:

      - The 19 mg/L TSS increase threshold calculated for the Bad River is applied to all small and medium watercourses

What were the results of the independent erosion calculations conducted by the Wisconsin Department of Natural Resources? *(cont'd)*

Issues Related to WDNR Findings

- Compliant implementation and maintenance of erosion control measures on large projects is difficult, particularly for:
  - 41-mile construction corridor
  - Crossing of 136 streams and rivers + other waterbodies
  - 26 WDNR Permit Conditions for Erosion and Sediment Control Practices