PolyMet Mining

401(a)(2) Hearing

May 4, 2022

Project Overview

- PolyMet's Project = Essential Metals
- Project Location
- Distance from the FDL Reservation
- St. Louis River Flows

Key Metals for Clean Energy Transition

Project's estimated production over 20-year permit:

Ore
225 million tons

Copper
1.2 billion lb.

6,666,667
Electric Vehicles

-30.7 million
metrics tons of CO2

Nickel
170 million lb.

2,575,758
Electric Vehicles

-11.8 million
metrics tons of CO2

Cobalt
6.2 million lb.

688,889
Electric Vehicles

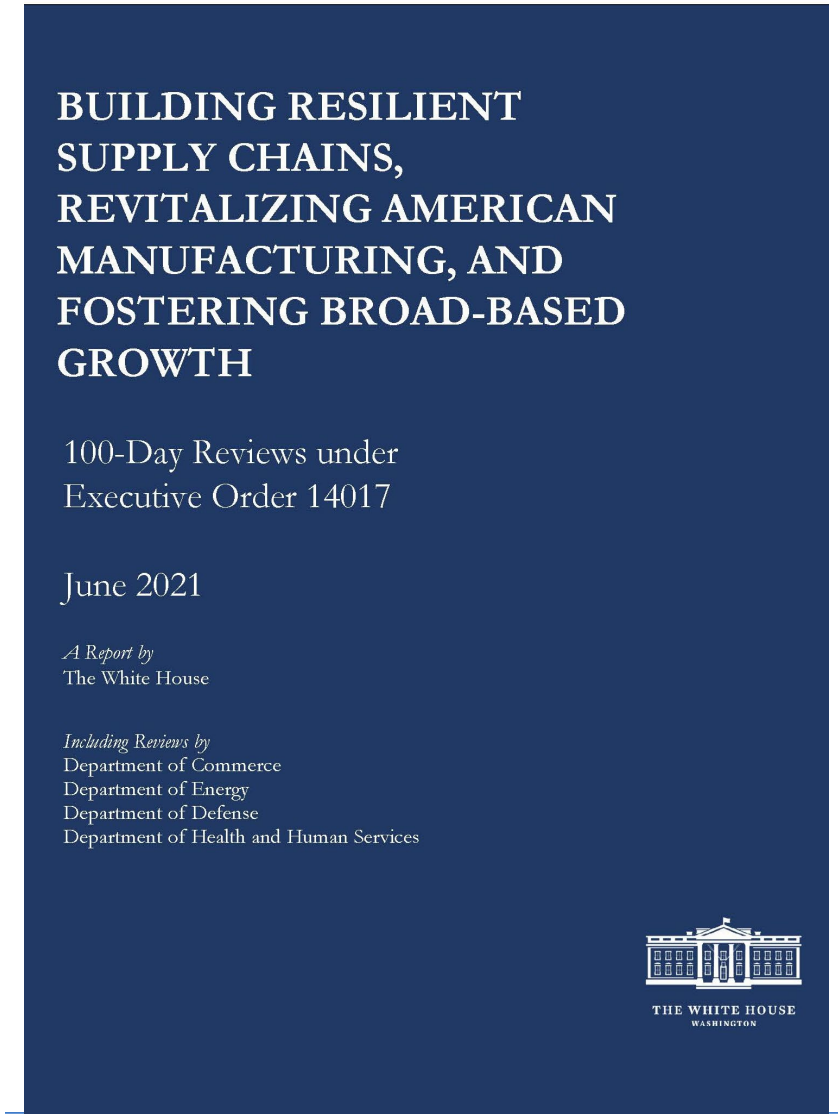
-3.2 million
metrics tons of CO2

PGMs
1.56 million oz.

"In the last 5,000 years, about 550 million tons of copper has been produced. The world will need about the same amount of copper in the next 25 years to meet global demand."

– World Bank, Climate Smart Mining, 2019

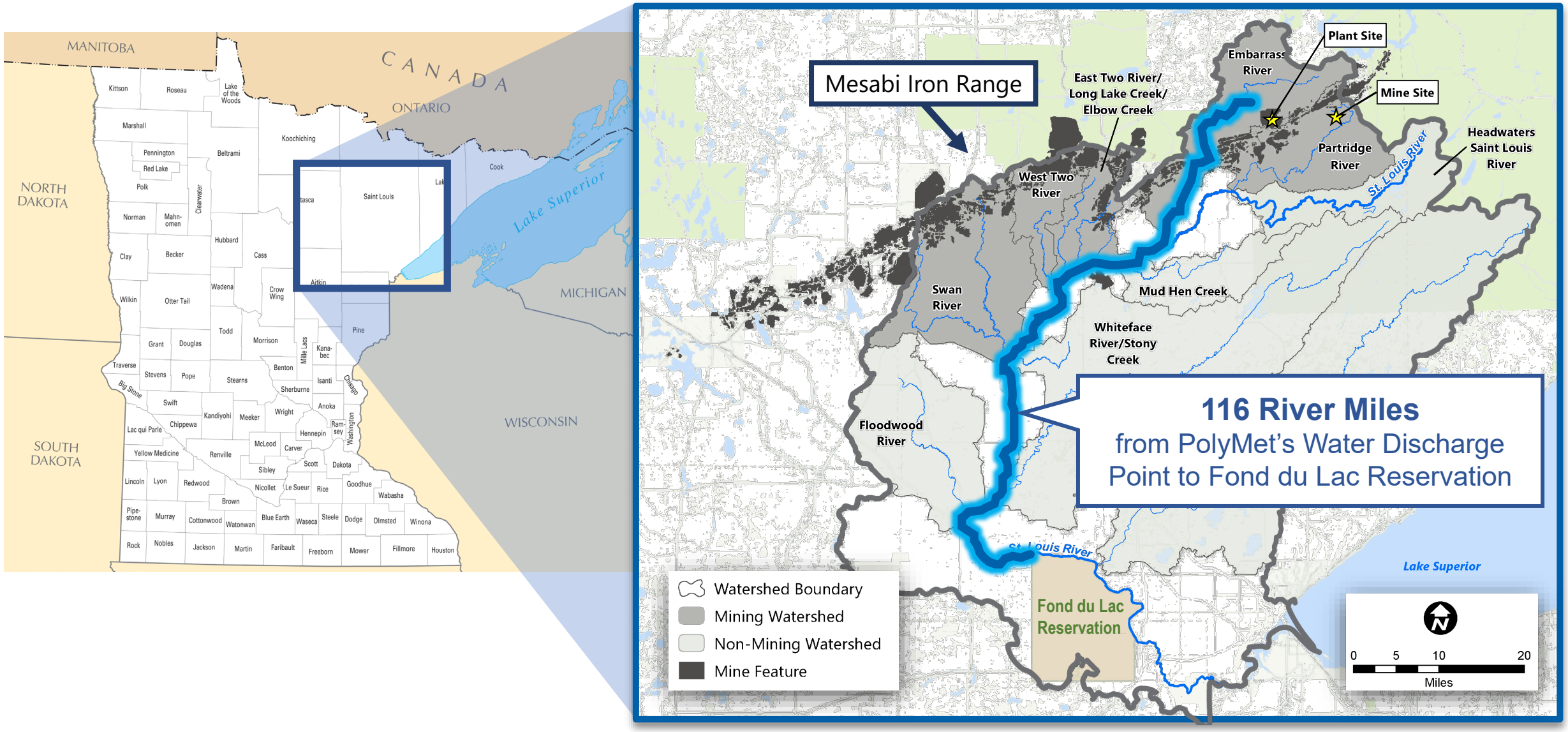
Biden Administration Actions



U.S. Supply Chains, EVs, and Renewable Energy

- White House Report on America's Supply Chains
  - Critical and strategic minerals and high-capacity batteries
- Transition to Electric Vehicles
  - Replace government's vehicle fleet with EVs
- Infrastructure plan includes $174 million for EV conversion
  - Wind energy projects
- Invocation of Defense Production Act
  - Boost domestic production of critical minerals

NorthMet Project Sits on the Iron Range



Distance from NorthMet Project to FDL Reservation

Distance Comparisons:

0 mi. 20 mi. 50 mi. 100 mi. 150 mi.

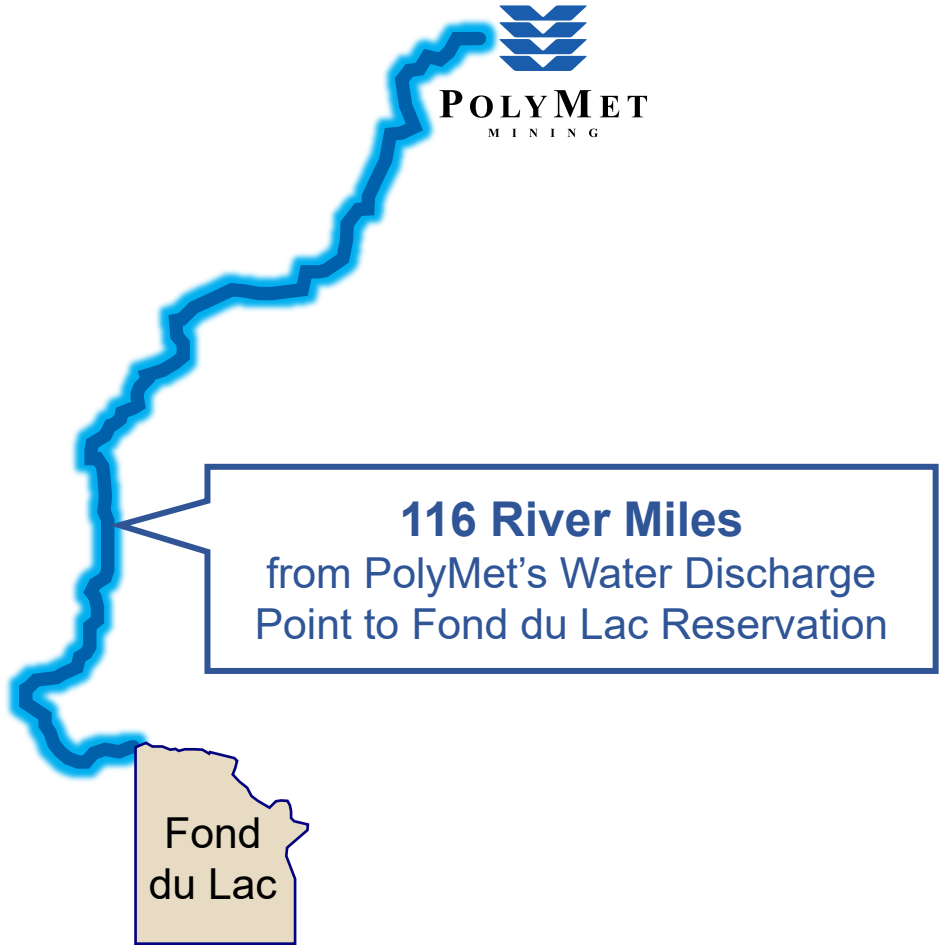
150 road miles: Duluth to St. Paul

120 road miles: L.A. to San Diego

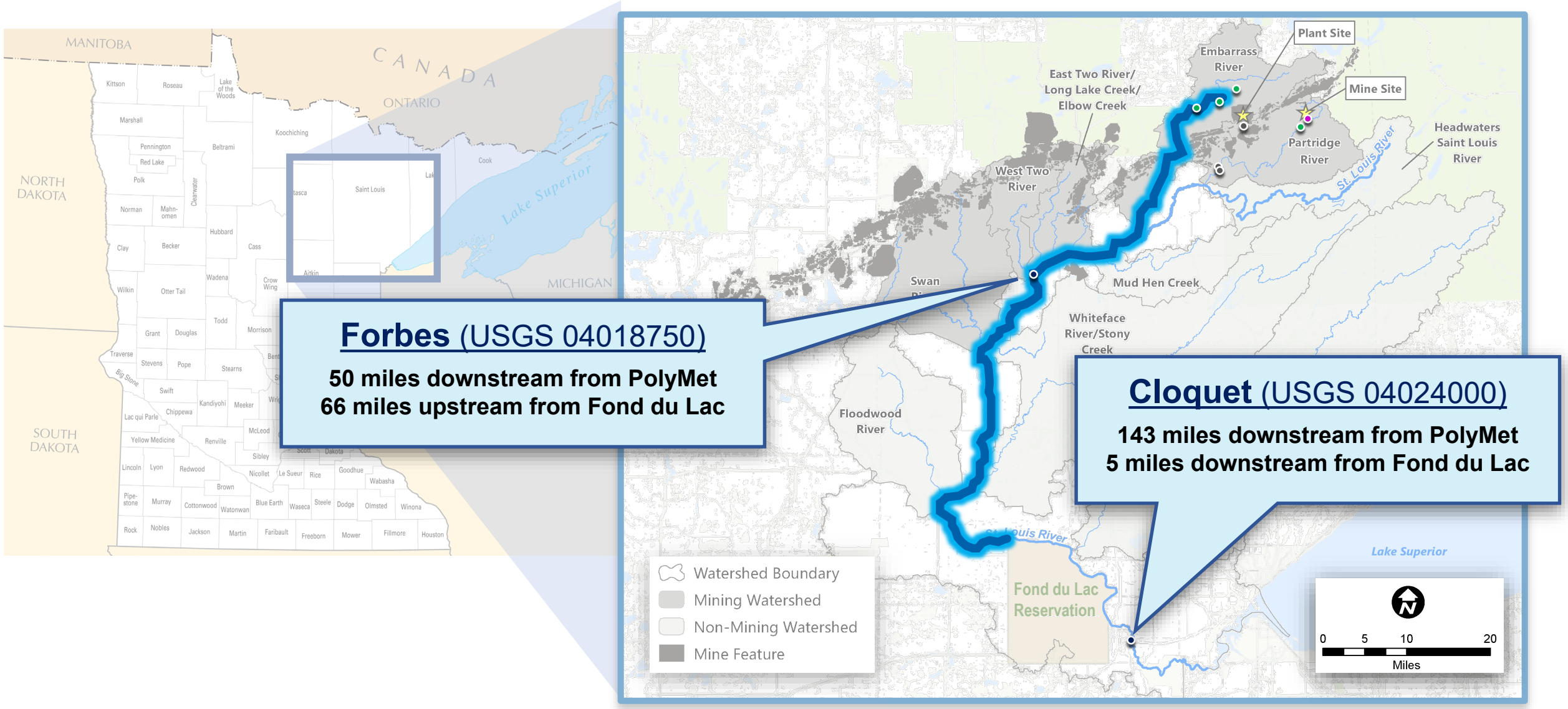
116 river miles: PolyMet to FDL

Fond du Lac

124 miles: Halfway to the International Space Station



401 / NPDES Permitting Evaluation Locations



Forbes (USGS 04018750)

50 miles downstream from PolyMet
66 miles upstream from Fond du Lac

Cloquet (USGS 04024000)

143 miles downstream from PolyMet
5 miles downstream from Fond du Lac

401 / NPDES Permitting Evaluation Locations

Forbes (USGS 04018750)

50 miles downstream from PolyMet
66 miles upstream from Fond du Lac

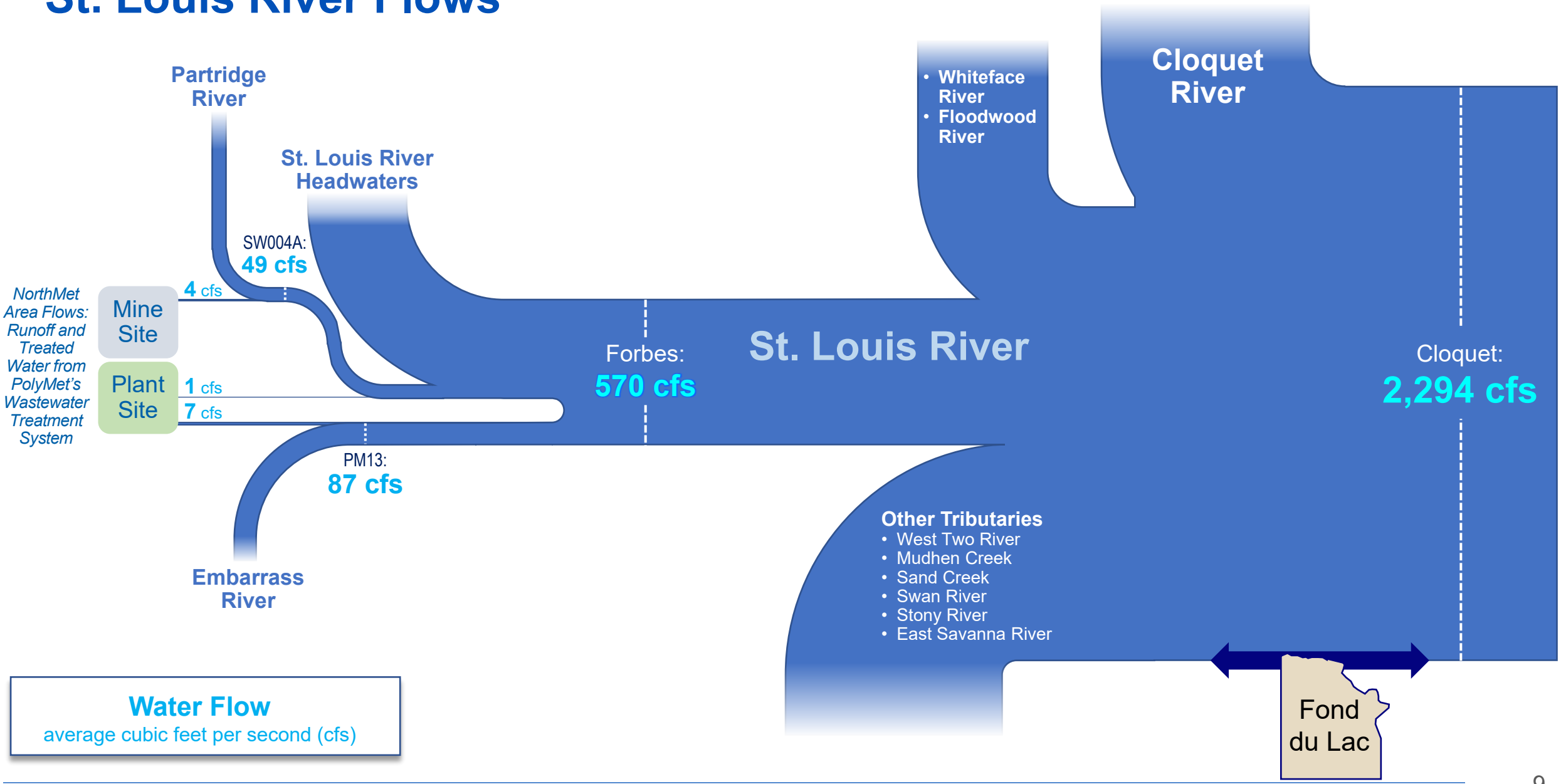
Flow: 570 cfs

Cloquet (USGS 04024000)

143 miles downstream from PolyMet
5 miles downstream from Fond du Lac

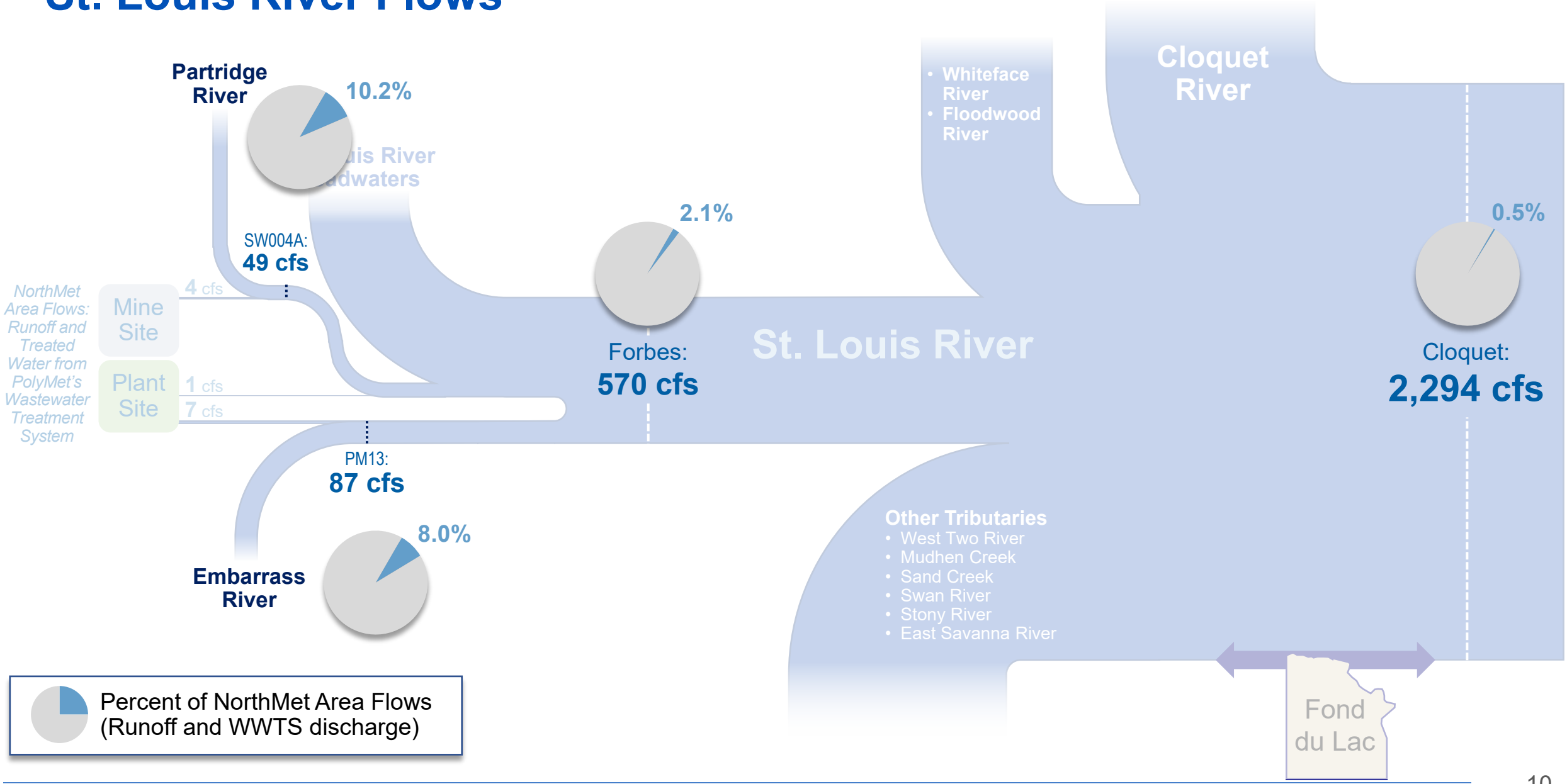
Flow: 2,294 cfs

St. Louis River Flows



Water Flow
average cubic feet per second (cfs)

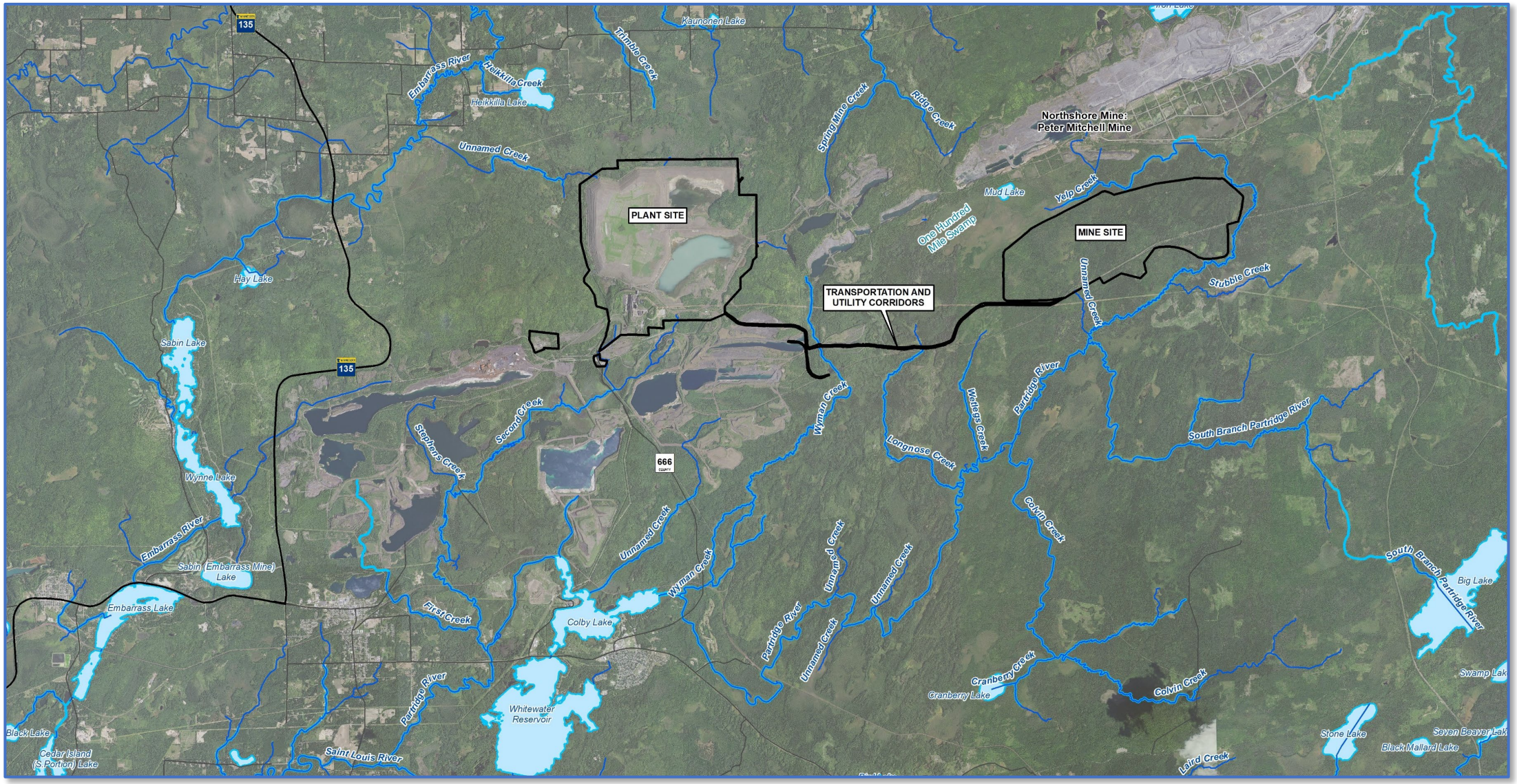
St. Louis River Flows



Existing Conditions Without PolyMet Project

- Legacy Site
- Water Quality Issues

Brownfield Plant Site Under Consent Decree



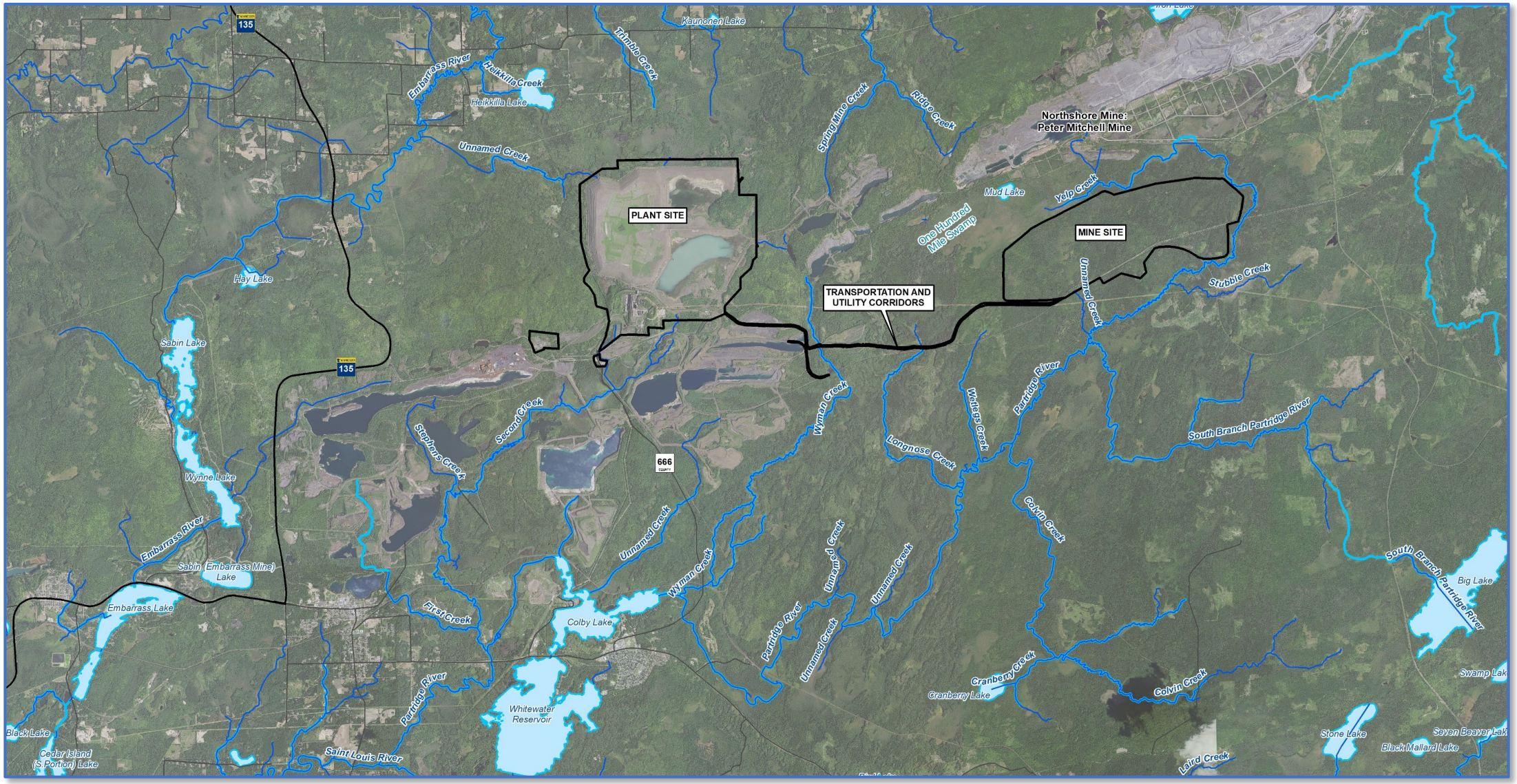
“Legacy” Water Quality Issues at Taconite Tailings Basin

- The taconite tailings basin at legacy plant site has been closed for over 20 years (operated 1957-2001)
- While covered under a consent decree, the tailings basin is a source of:
  - Sulfate: 200-300 mg/L
  - Specific conductance: 900-2,600 uS/cm

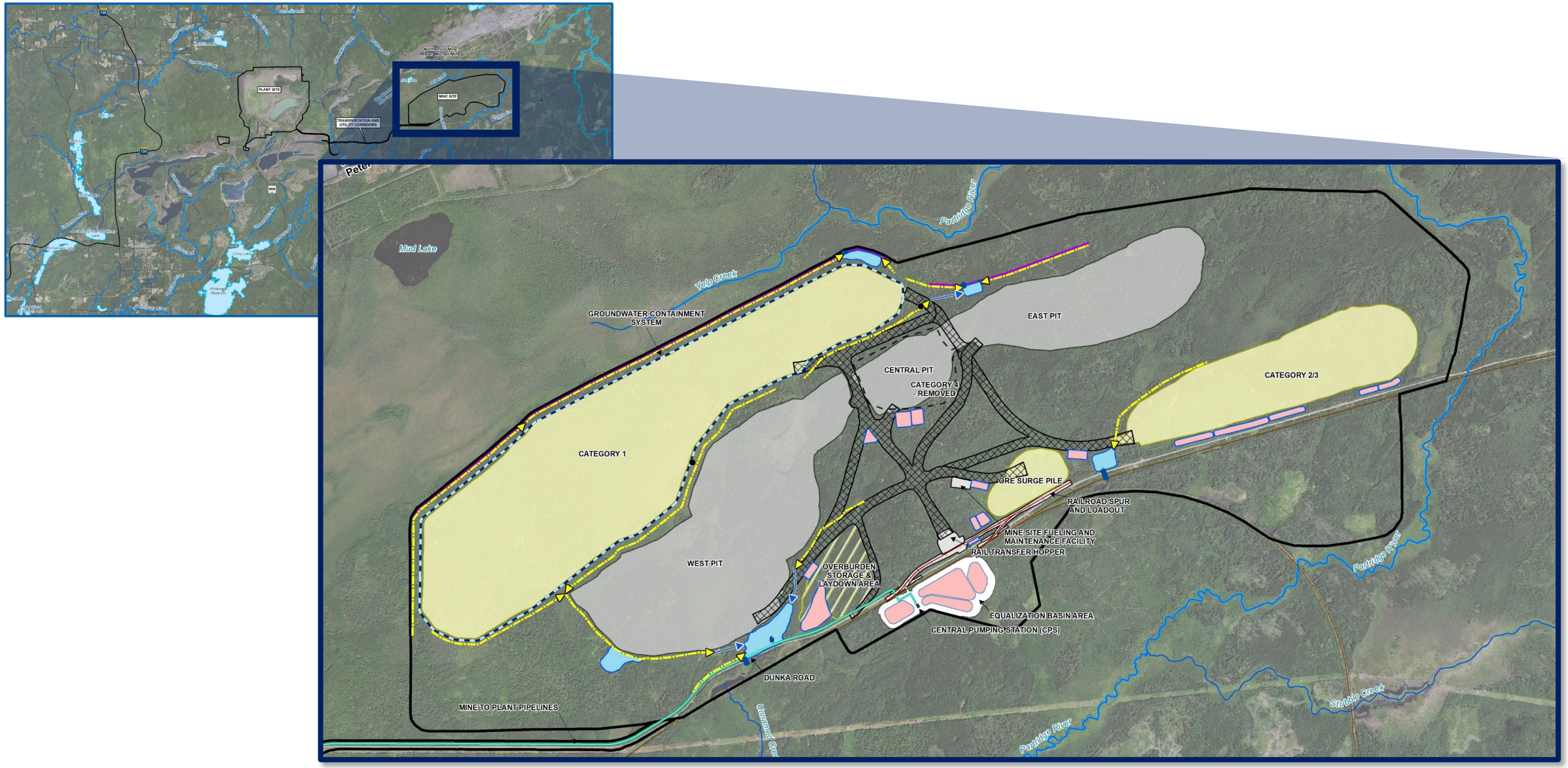
PolyMet Project Designed for Clean-Up

- Water Management
- Best Available Water Treatment
  - Membrane Technology

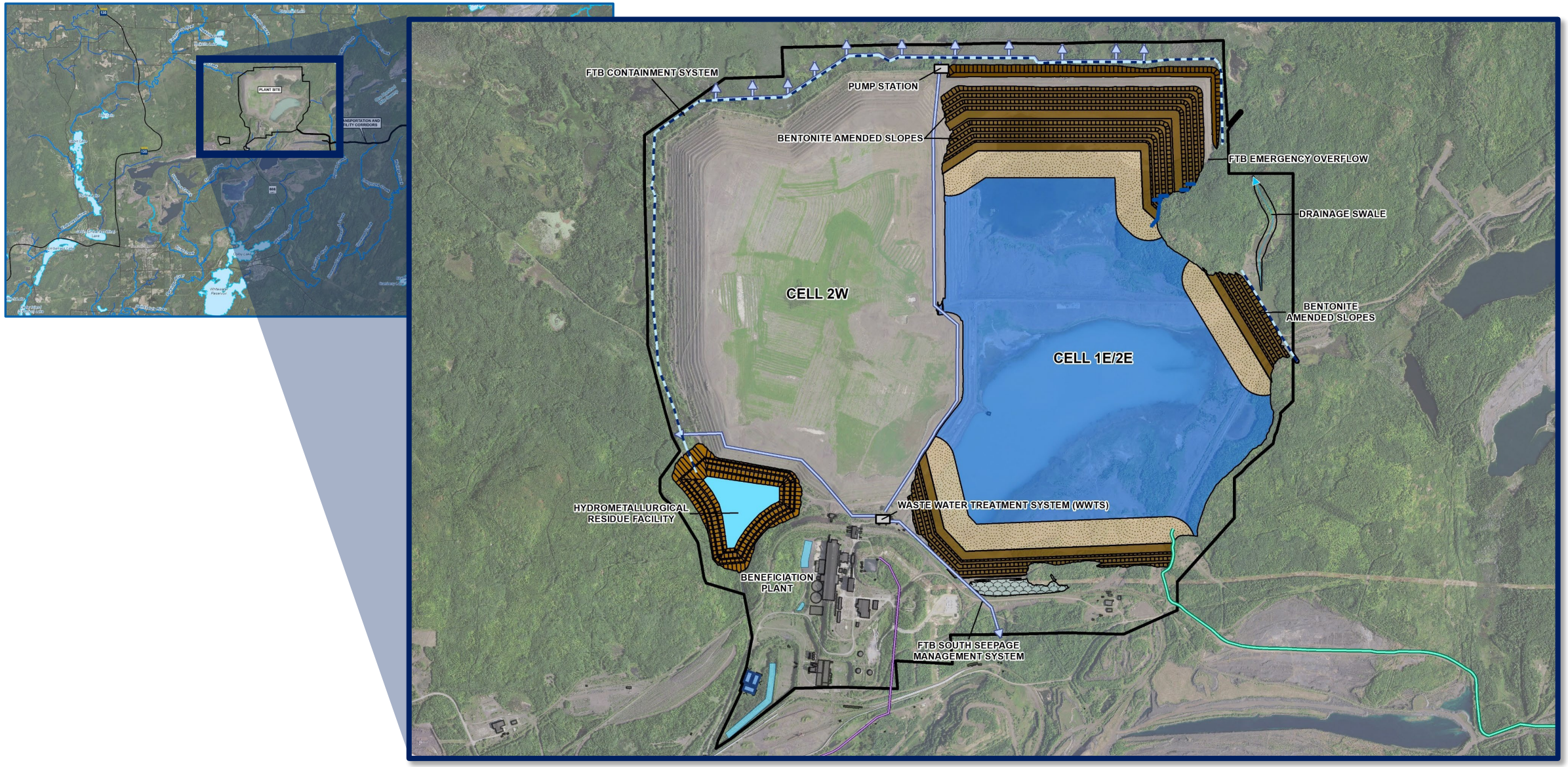
Project Includes Mine Site and Plant Site



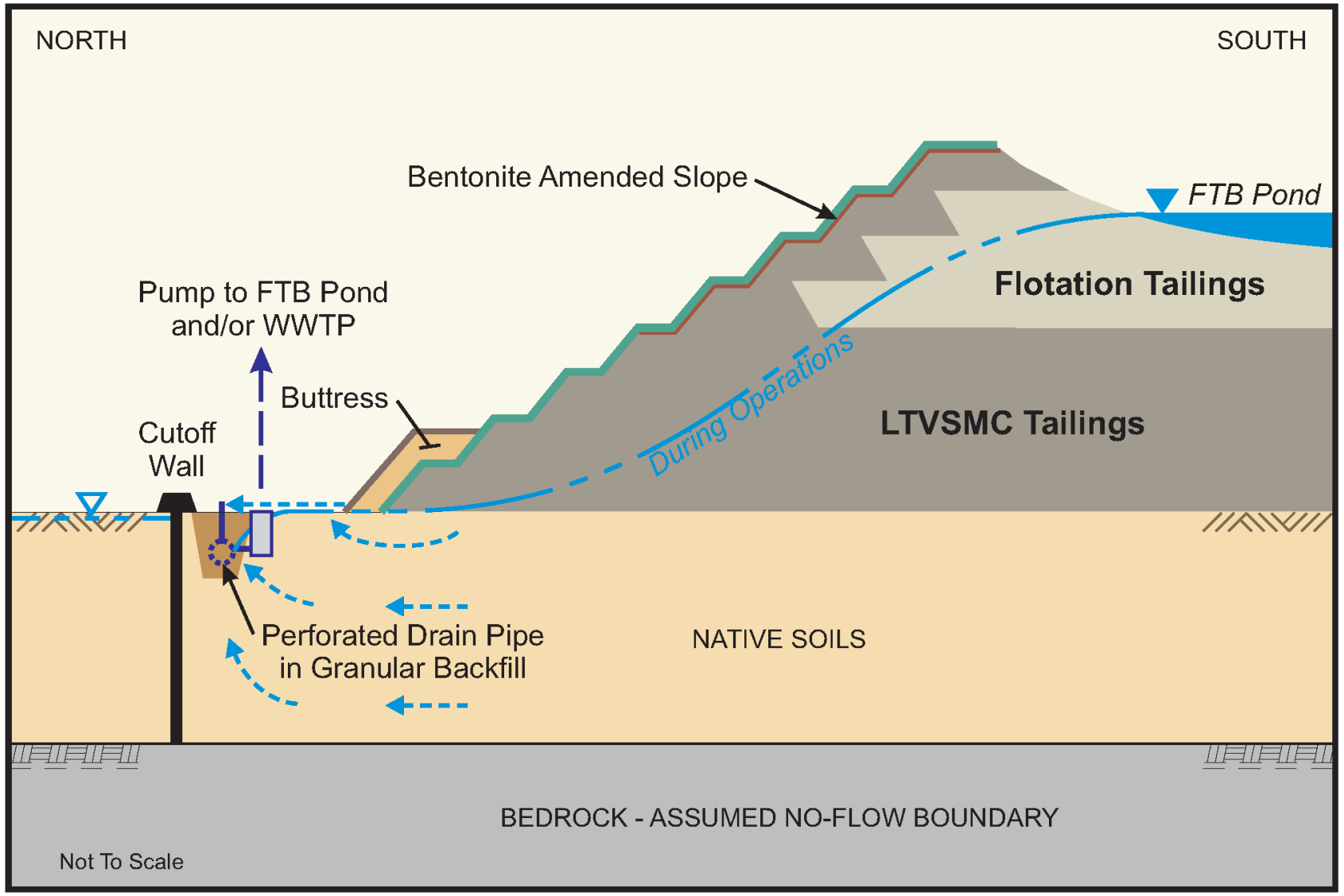
Mine Site


PLANT SITE
MINE SITE
TRANSPORTATION AND UTILITY CORRIDORS
Mud Lake
Yelp Creek
Partridge River
GROUNDWATER CONTAINMENT SYSTEM
EAST PIT
CENTRAL PIT
CATEGORY 4 - REMOVED
CATEGORY 2/3
CATEGORY 1
ORE SURGE PILE
RAILROAD SPUR AND LOADOUT
MINE SITE FUELING AND MAINTENANCE FACILITY
RAIL TRANSFER HOPPER
WEST PIT
OVERBURDEN STORAGE & LAYDOWN AREA
EQUALIZATION BASIN AREA
CENTRAL PUMPING STATION (CPS)
DUNKA ROAD
MINE TO PLANT PIPELINES
Unnamed Cr
Partridge River
Stubble Creek

Plant Site and Flotation Tailings Basin



PolyMet's Flotation Tailings Basin Design and Water Management



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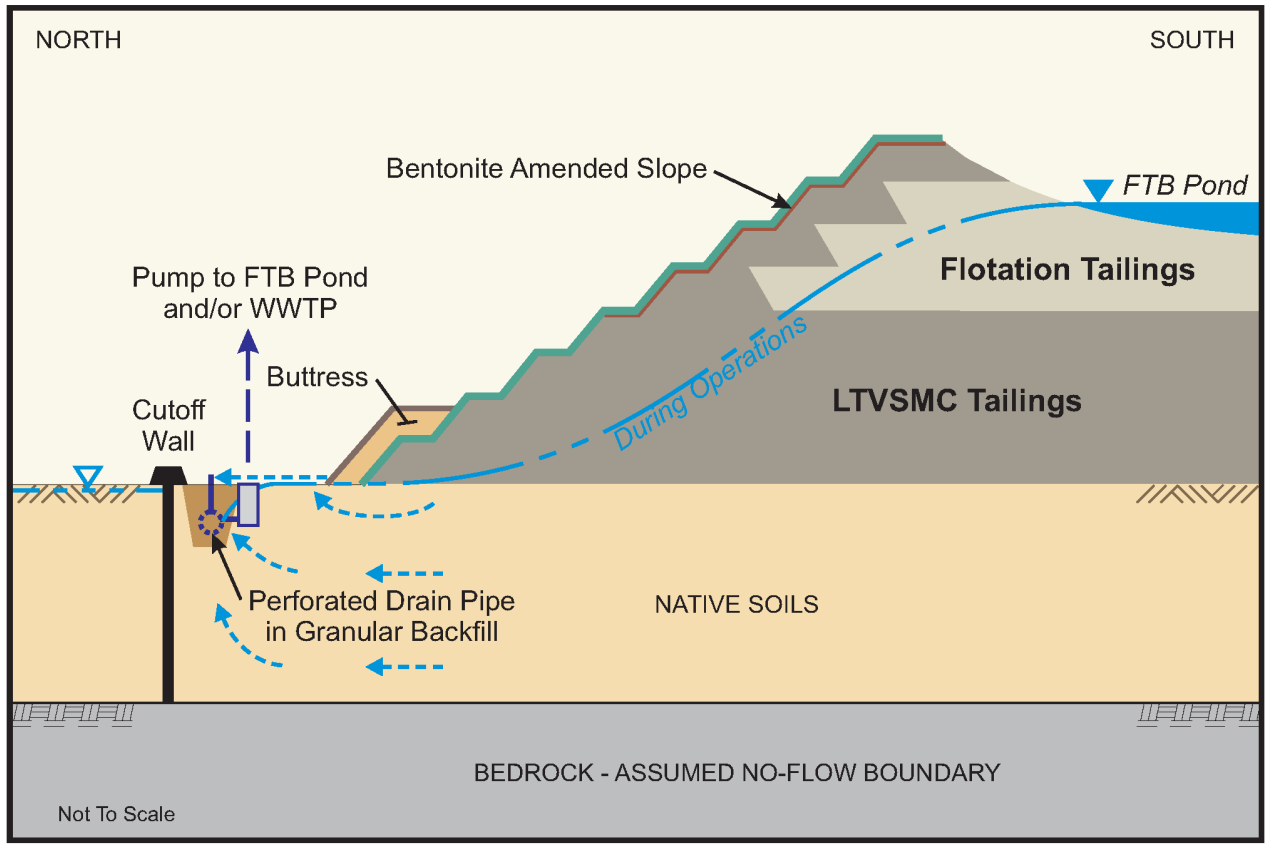


- PolyMet will collect and treat the tailings basin seepage and mine-impacted waters.
- PolyMet will use Colby Lake water for plant make-up water.
- These actions will reduce mercury loading, specific conductance, and sulfate loading to the St. Louis River watershed.
- Sulfate loading will be reduced by ***1,380,000 kg*** per year, totaling ***27.6 million kg*** over the 20-year life of the mine.

Water Treatment Pilot Plant

- Successful pilot plant with 3 million gallons treated
- Proven membrane treatment technology used worldwide, including drinking water and mining applications
- Meets existing wild rice sulfate standard and applicable standards for metals

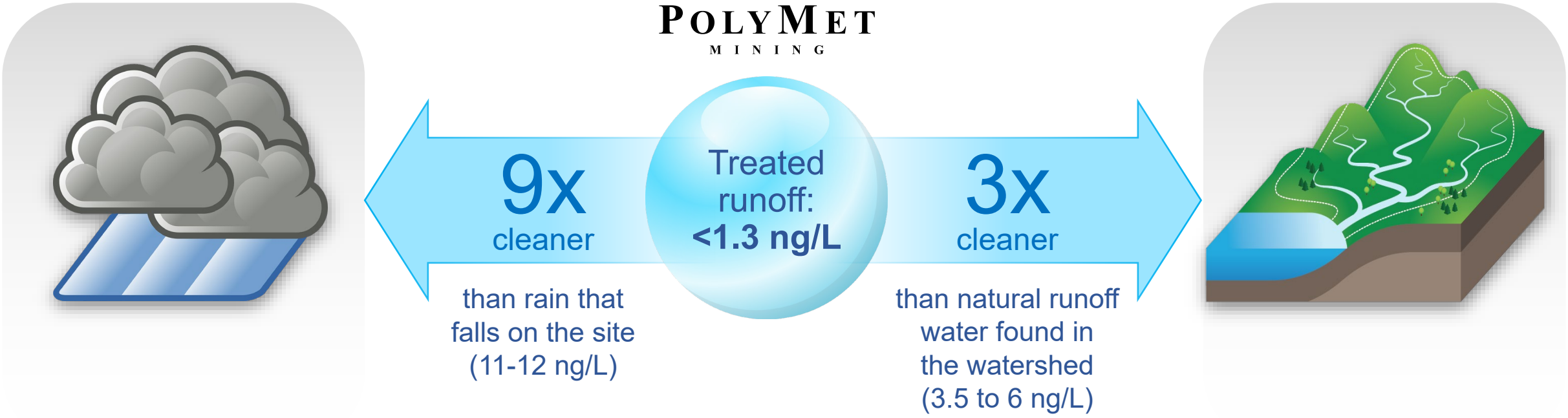
Sulfate

Wild Rice

The only project that will meet the strict Minnesota standard for wild rice that limits sulfate to 10 mg/L at end of pipe

- Standard is at the wild rice stand
- Nearest rice is 10 miles downstream
- Minnesota's drinking water standard is 250 mg/L sulfate

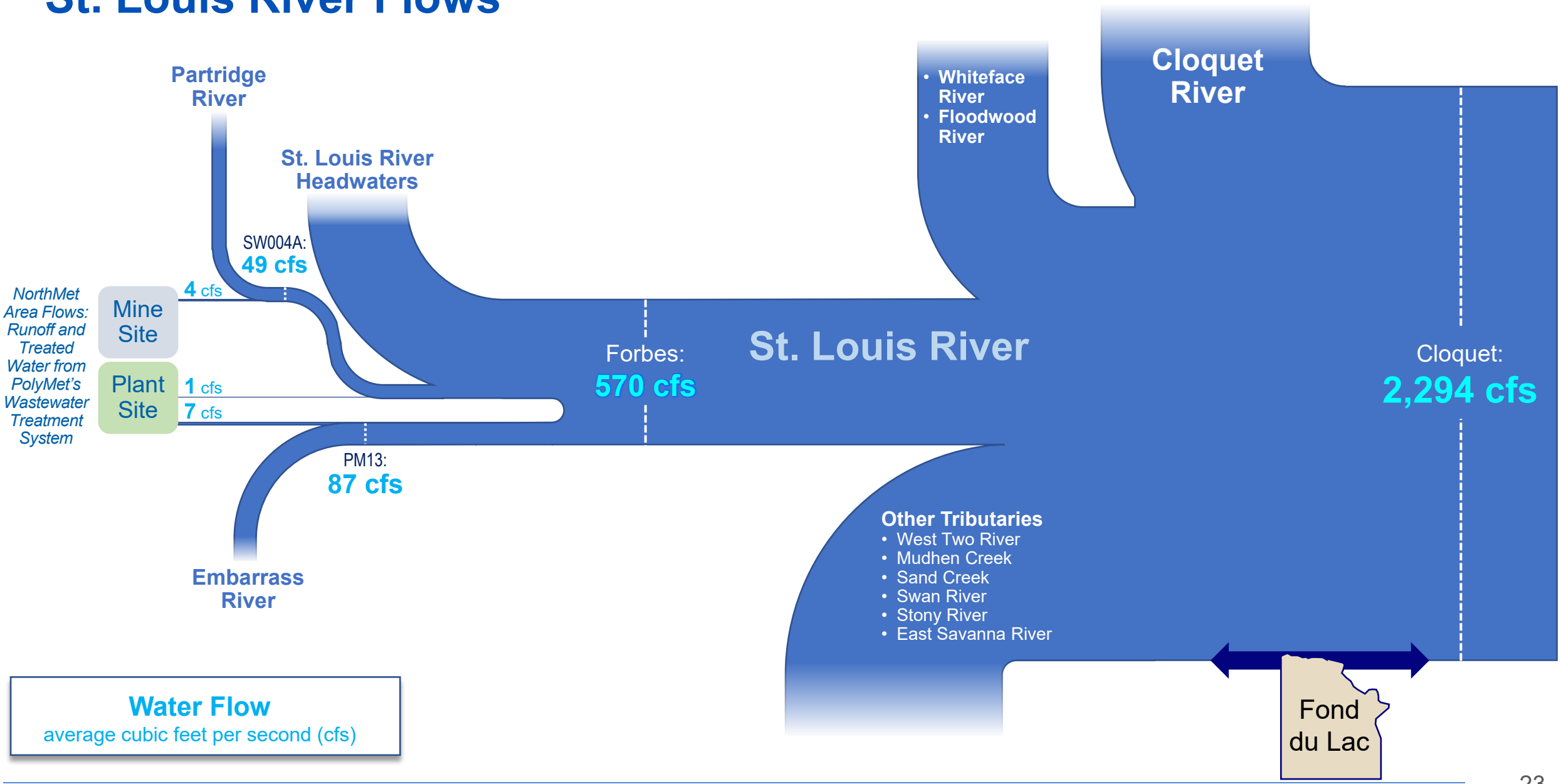
Project Treated Discharge Is Cleaner



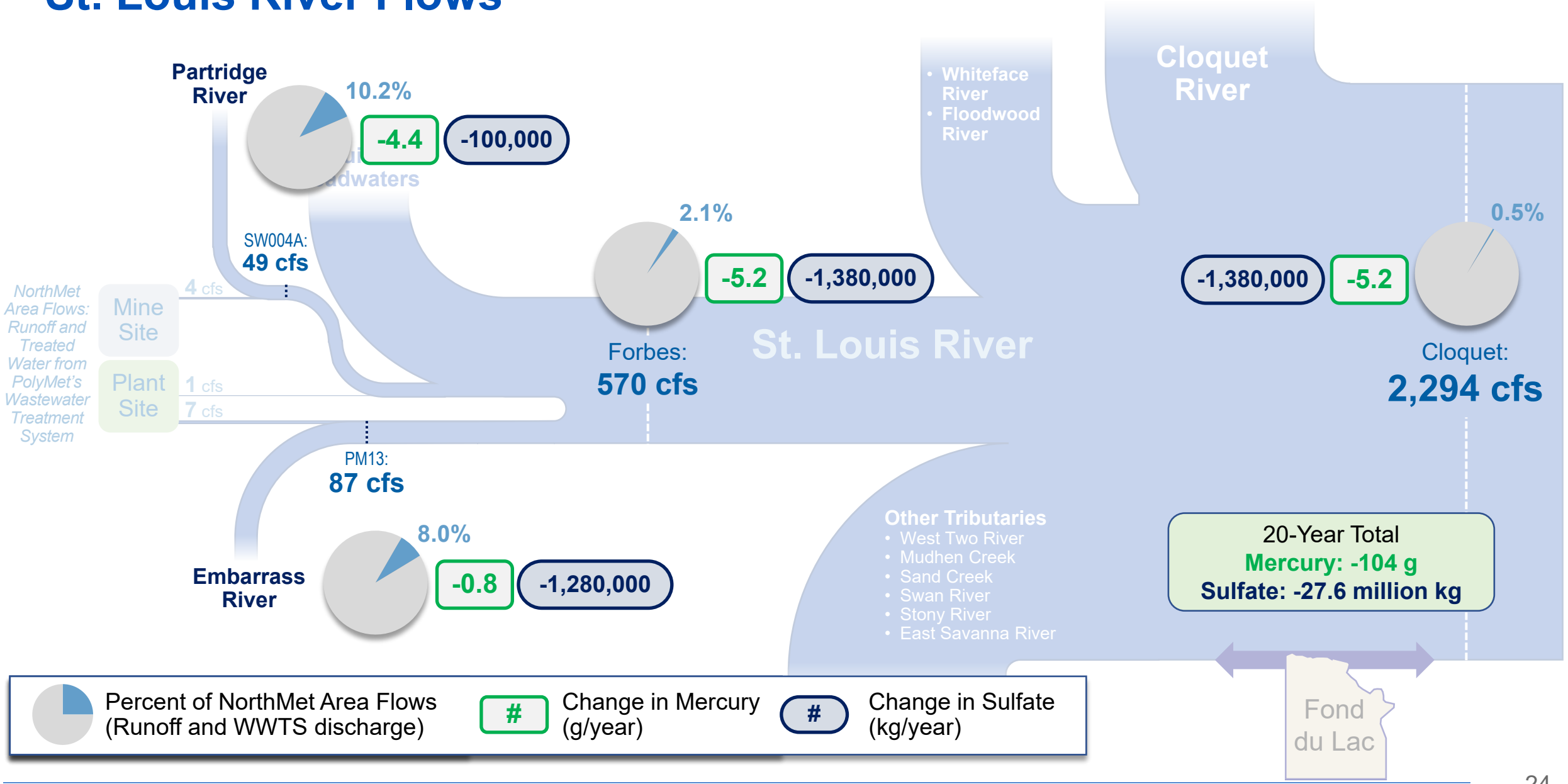
Mass Balance:

PolyMet is treating runoff (3.5-6 ng/L) from ~4,800 acres *down to <1.3 ng/L*

St. Louis River Flows



St. Louis River Flows



Project Reduces Sulfate, Mercury, and Specific Conductance

- Project's water management strategy improves water quality in the St. Louis River
- Project's water management actions are designed to remove mercury, sulfate, and specific conductance
- Most mercury load comes from rain, which we're collecting and treating
- Our wastewater treatment system is best available – membrane technology – to meet sulfate standard
- Design results in reductions of mercury and sulfate loads and specific conductance concentration

Responses to the Band's Claims

- Band's four main "violation of water quality" claims:
  - Sulfate
  - Mercury
  - Methylmercury
  - Specific Conductance
- Band ignores Project's water management and treatment system

Overview of Technical Experts

- **Steve Donohue (P.H., Foth)** will show how the primary source of mercury to the watershed is from precipitation, present analysis showing the project will not cause a measurable change to specific conductance or salinity, and explain the relationship between sulfate, mercury, and methylmercury.

- **Cliff Twaroski (Barr Engineering)** will summarize the detailed water modeling work that shows the project will decrease loading of sulfate, mercury, and methylmercury in the St. Louis River.

- **Greg Council (P.E., Tetra Tech)** will explain how the Band's assertions of indirect wetland impacts are significantly overstated, explain why the methods they state should have been used are not actually appropriate, and how the processes they state will cause concerns actual result in less methylmercury reaching the St. Louis River.

Steve Donohue, P.H., Foth

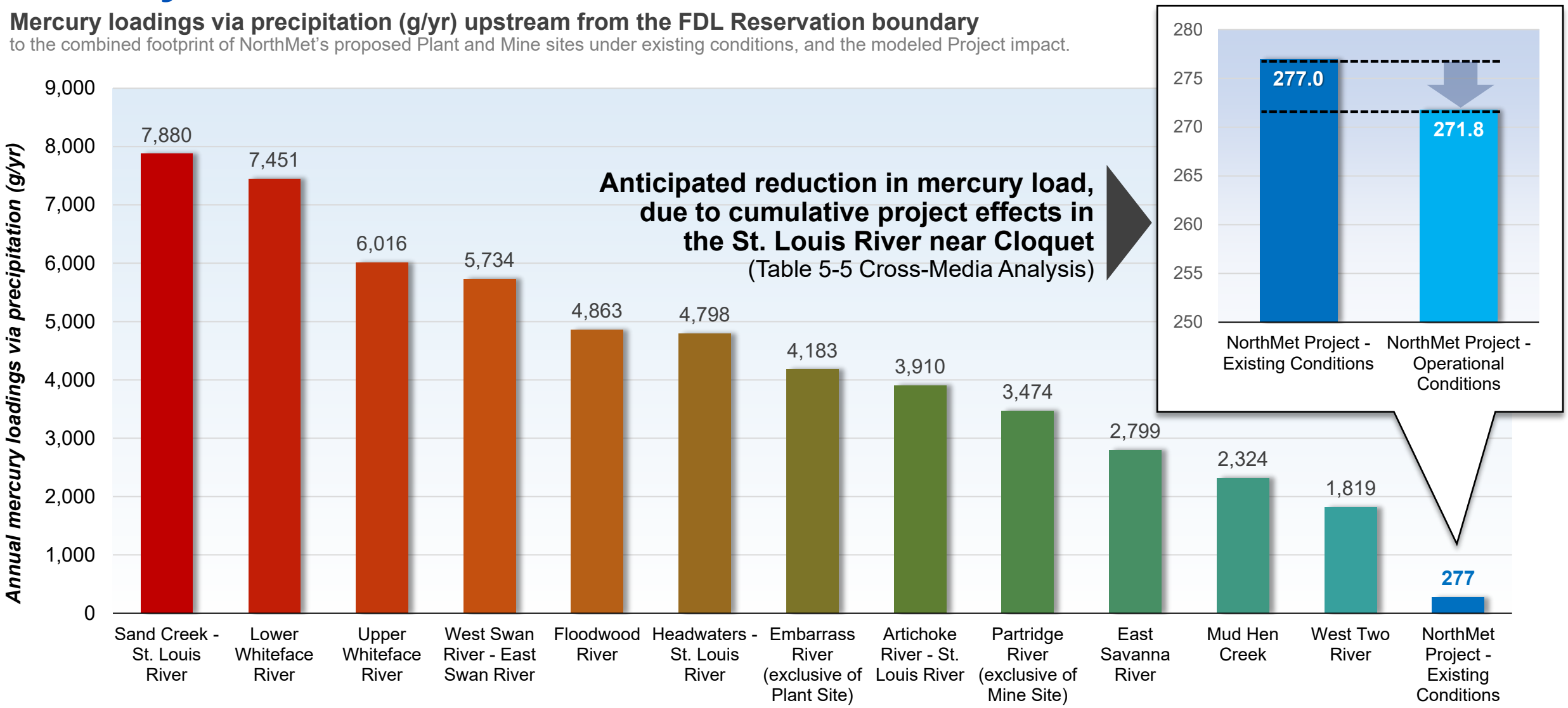
- Professional Hydrologist

Key Points

- Mercury loading in the St. Louis River is driven by precipitation
  - Project will reduce mercury and sulfate loading to St. Louis River
- Band's specific conductance standard will not be violated
  - Decrease in specific conductance
  - Decrease in salinity
- Water level fluctuations in wetlands will not alter generation of methylmercury

Mercury

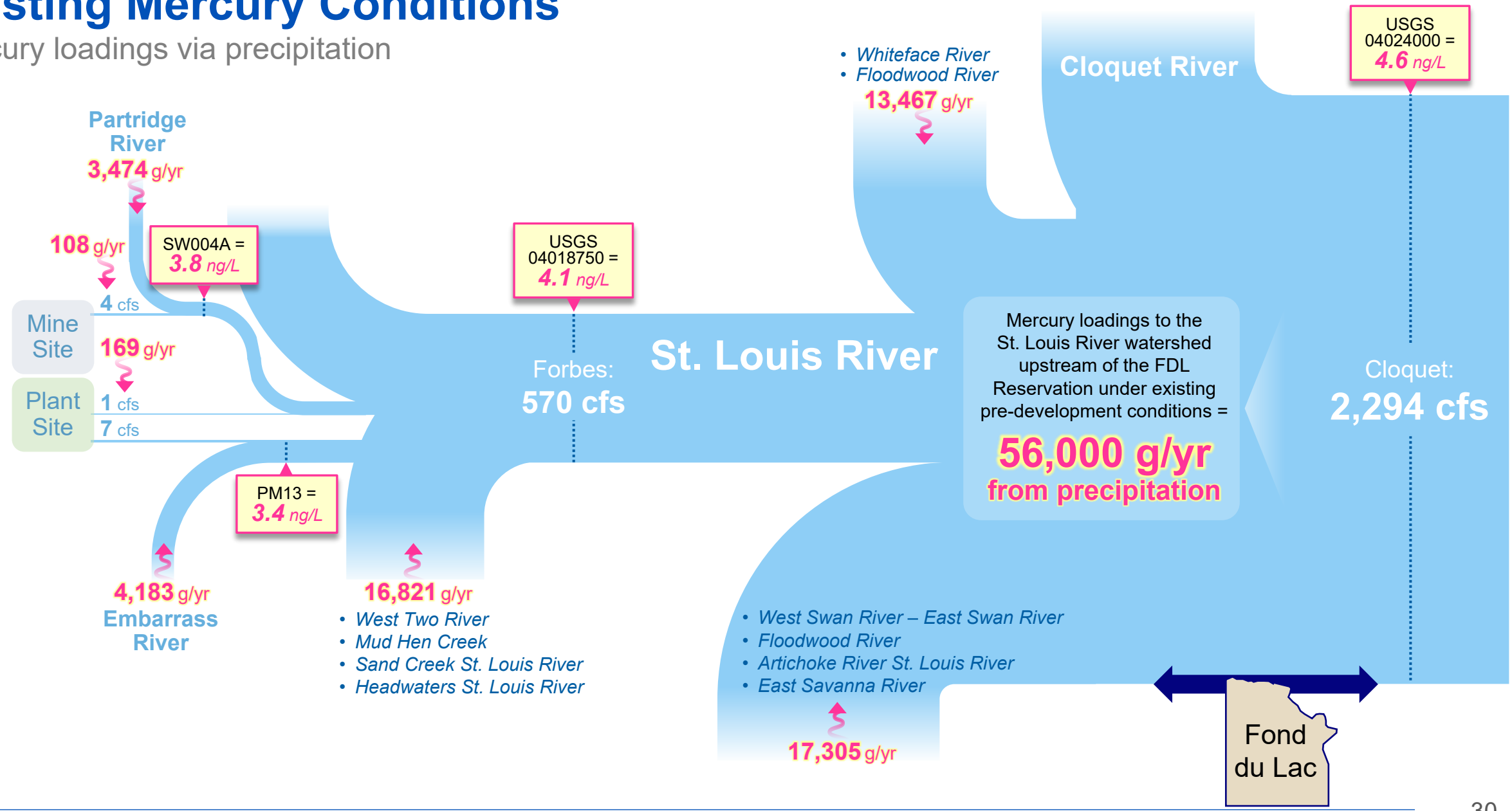
Mercury loadings via precipitation (g/yr) upstream from the FDL Reservation boundary
to the combined footprint of NorthMet's proposed Plant and Mine sites under existing conditions, and the modeled Project impact.



These loadings were calculated using the surface area of each watershed, an average precipitation of 29.8 inches/year (MDNR, 2015), and an average mercury concentration in rainwater of 11.7ng/L, as measured from 2010 to 2020 by the National Atmospheric Deposition Program at the Marcell Station, approximately 60 miles west of the Project (NADP NTN, 2022).

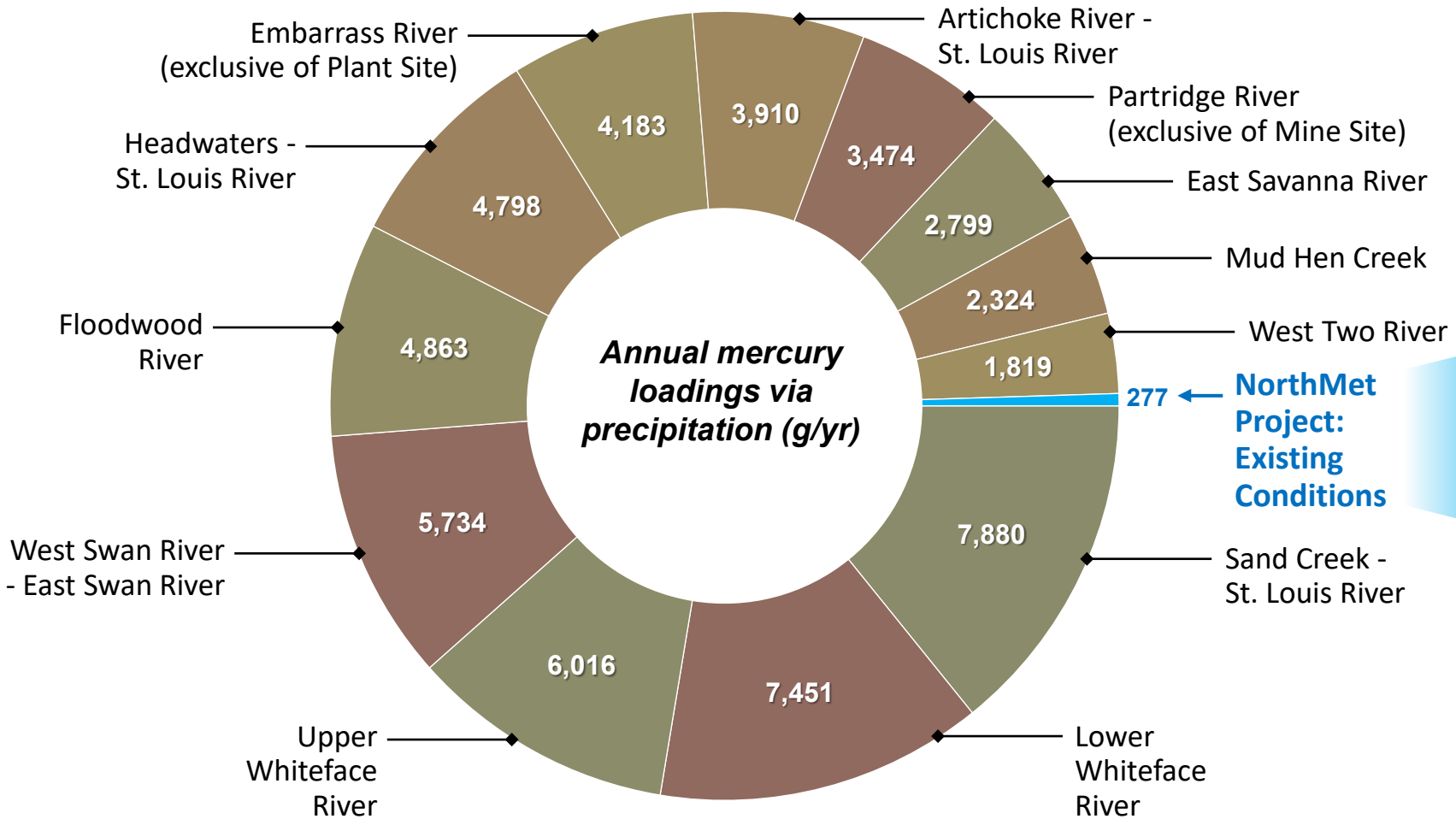
Existing Mercury Conditions

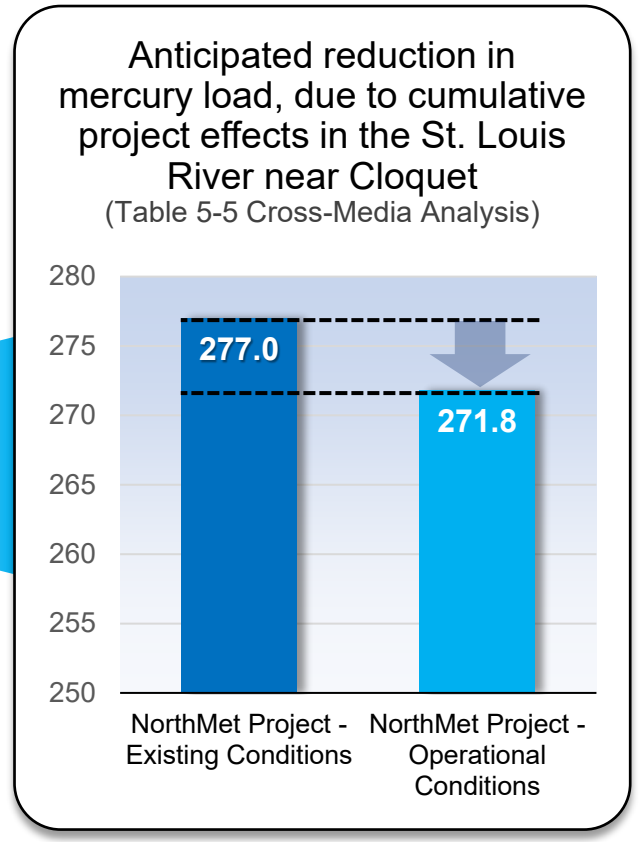
Mercury loadings via precipitation



Mercury

Annual mercury loadings via precipitation (g/yr) upstream from the FDL Reservation boundary





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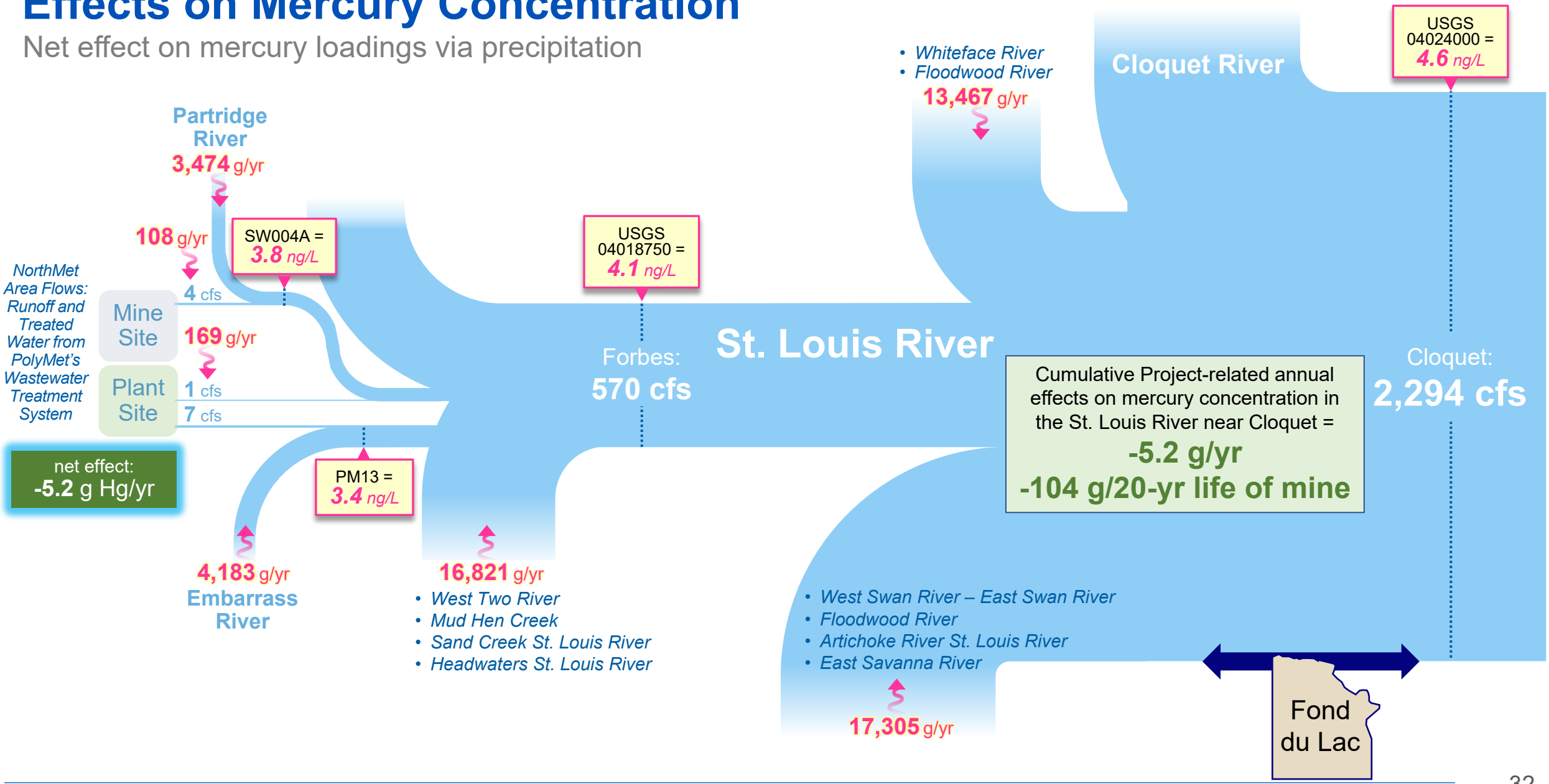
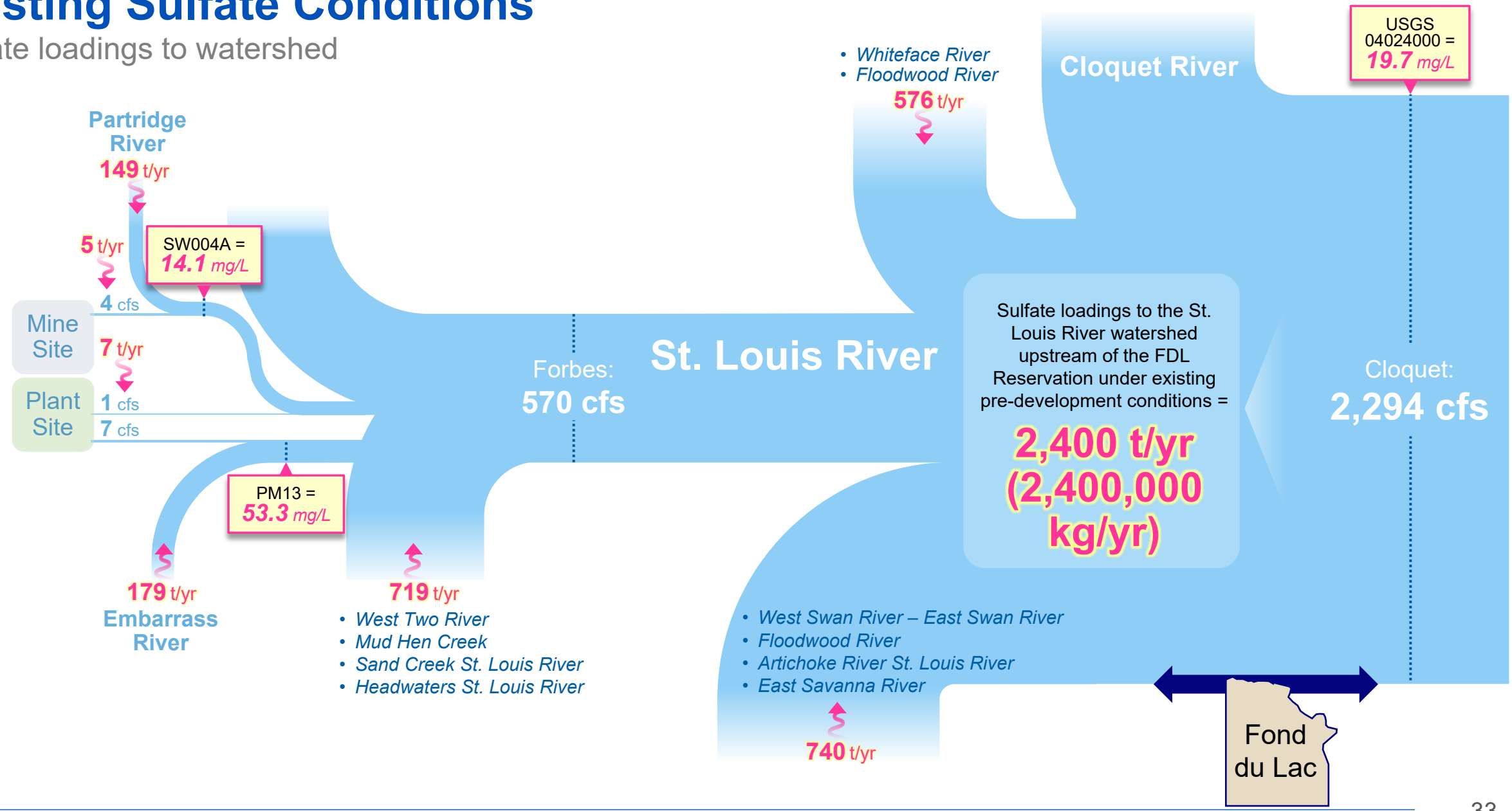
Effects on Mercury Concentration

Net effect on mercury loadings via precipitation



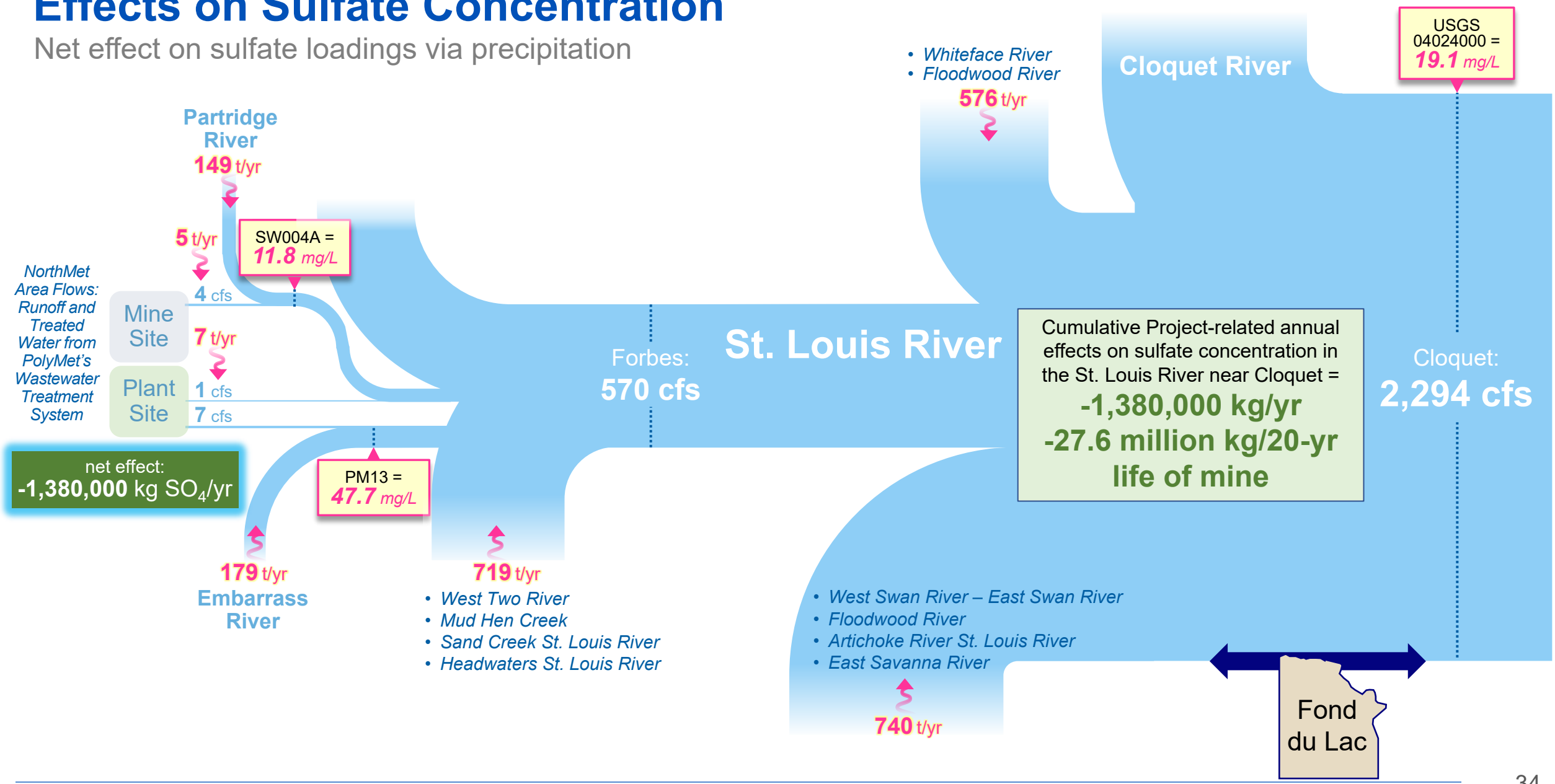
Existing Sulfate Conditions

Sulfate loadings to watershed



Effects on Sulfate Concentration

Net effect on sulfate loadings via precipitation



Specific Conductance and Salinity Allegations

- The Project will comply with the Band's water quality standard for specific conductance
- The Project will cause a reduction in specific conductance in the St. Louis River
- The Project will cause a reduction in salinity in the St. Louis River at Forbes
  - Sturgeon spawning area furthest upstream of the Fond du Lac Reservation

Project Discharges Will Not Violate the Band's Water Quality Standards for Specific Conductance

Specific Conductance

- The Band have established a water quality standard of **300 µS/cm @ 25°C**
- Baseline in the St. Louis River near Cloquet is **189 µS/cm @ 25°C**
- At peak Project operation, a **decrease** of **0.40 to 0.66 µS/cm @ 25°C** is estimated due to the Project

Project Incrementally Reduces Salinity in St. Louis River

Salinity

- The Band has noted that a salinity of **23 parts per thousand (ppt)** will impede sturgeon spawning
- Incremental effect on salinity from the Project is a **reduction** of **0.0007 – 0.0012 ppt** at Forbes
  - No impact on sturgeon spawning

Methylmercury

- Mercury methylation inhibited by reduction in sulfate loading from Project treatment activities
- Natural season fluctuations in water level in peat are a primary driver for mercury methylation; not drawdown

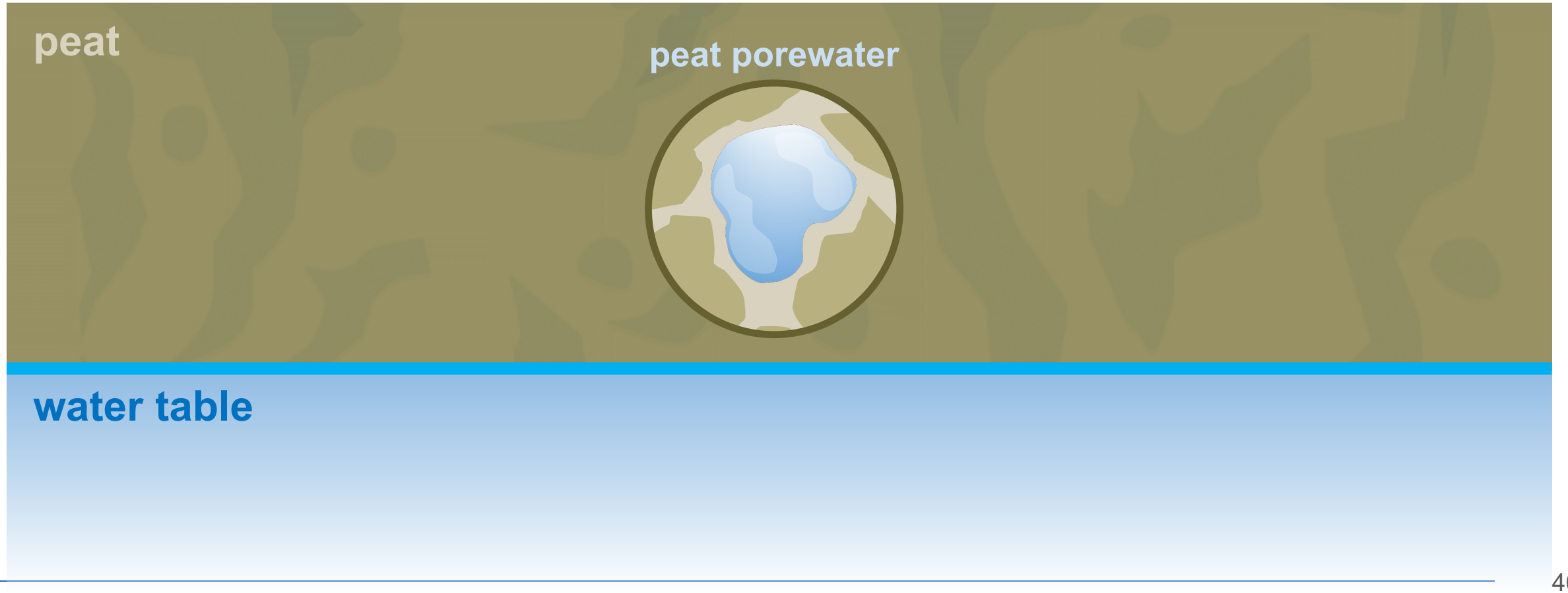
Project-Related Sulfate Reductions Inhibit Methylation of Mercury in Wetlands of the St. Louis River Watershed

Reduction in sulfate loading inhibits mercury methylation

- Band's allegations of increased mercury methylation predicated upon an increased sulfate loading
- Project-related activities, as discussed previously, will **reduce sulfate load** to the St. Louis River by **1,380,000 kg/yr and by 27.6 million kg/20-yr life of mine**

Effects of Precipitation, Sulfide Oxidation, and Methylation

Natural Cycle



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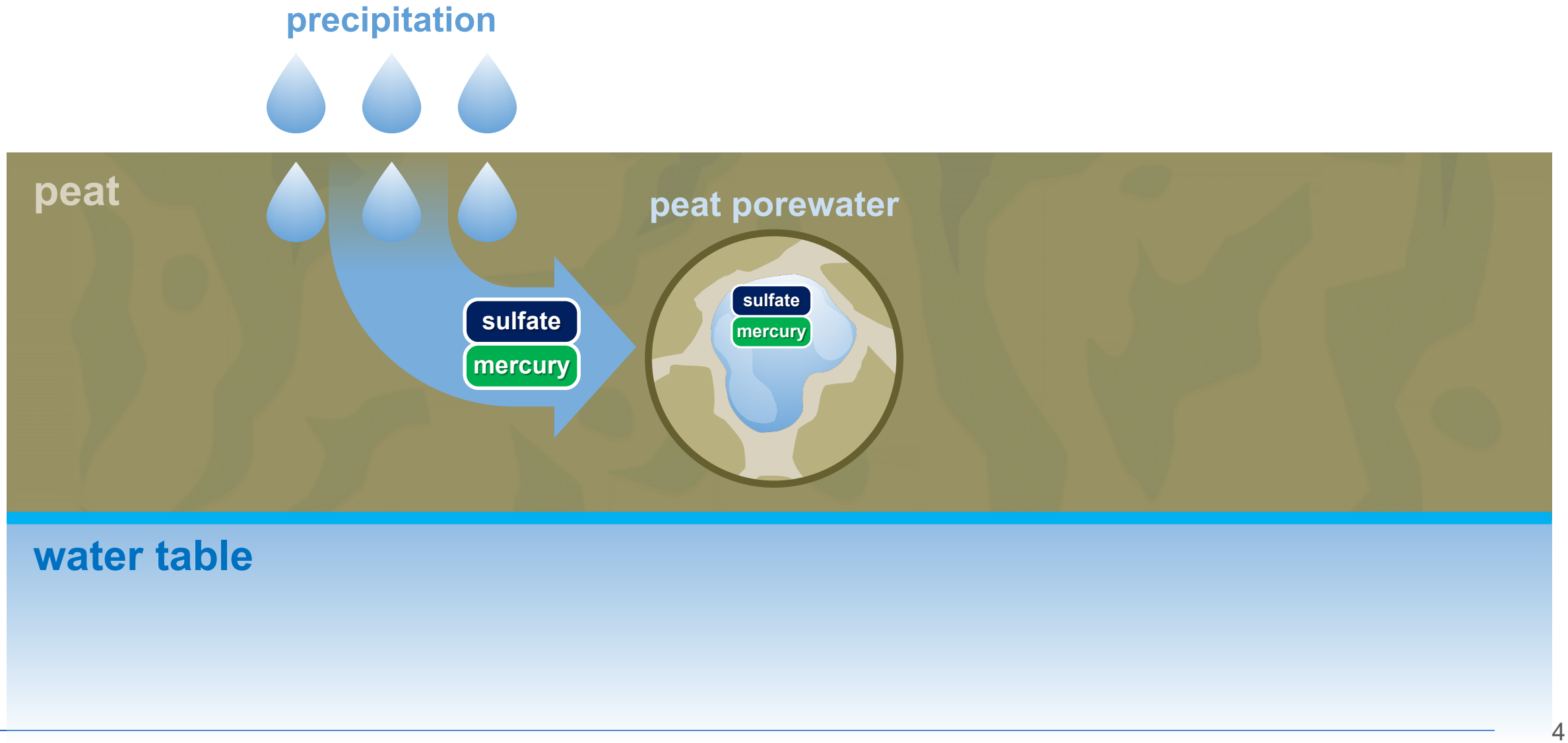

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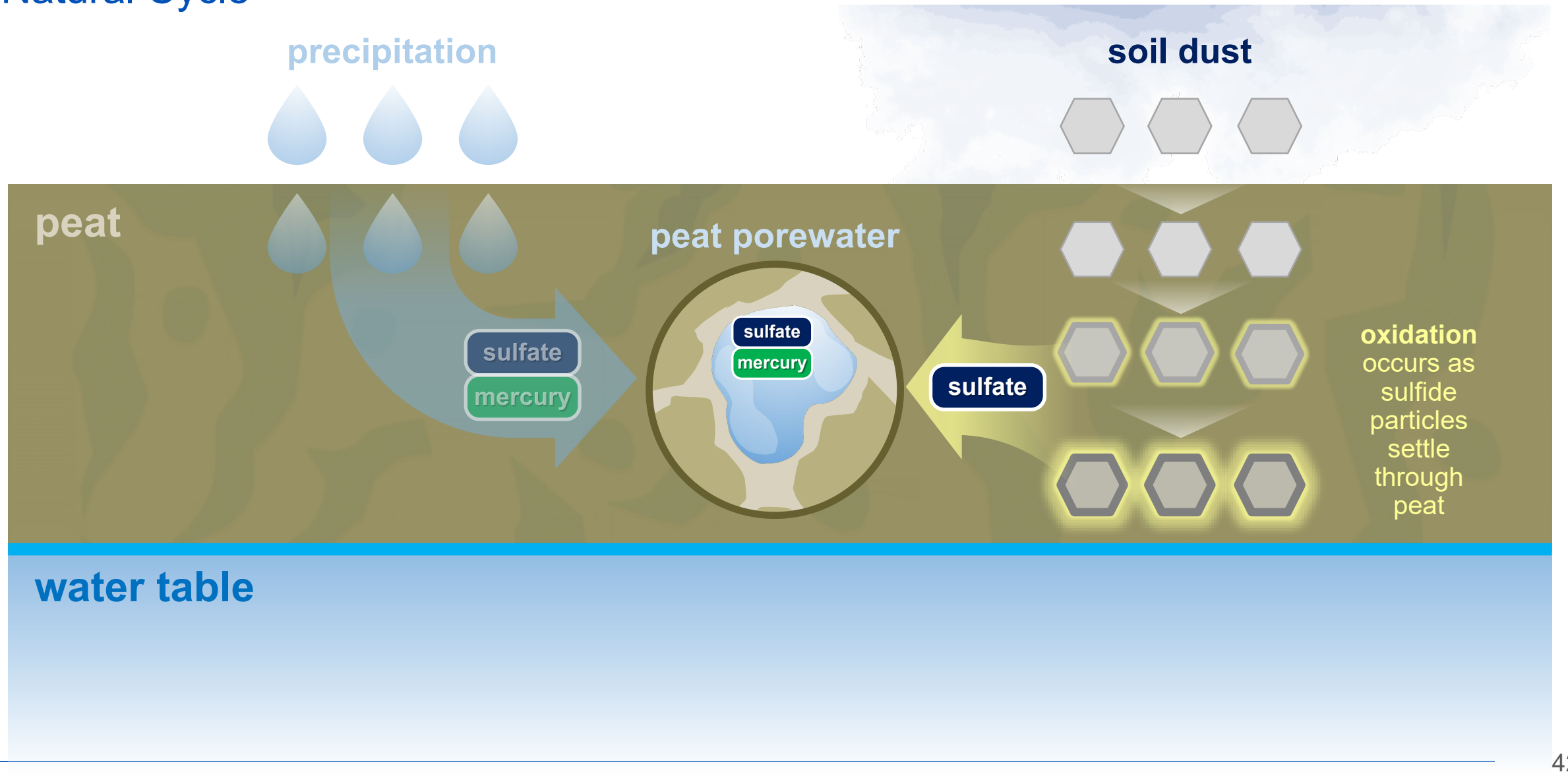

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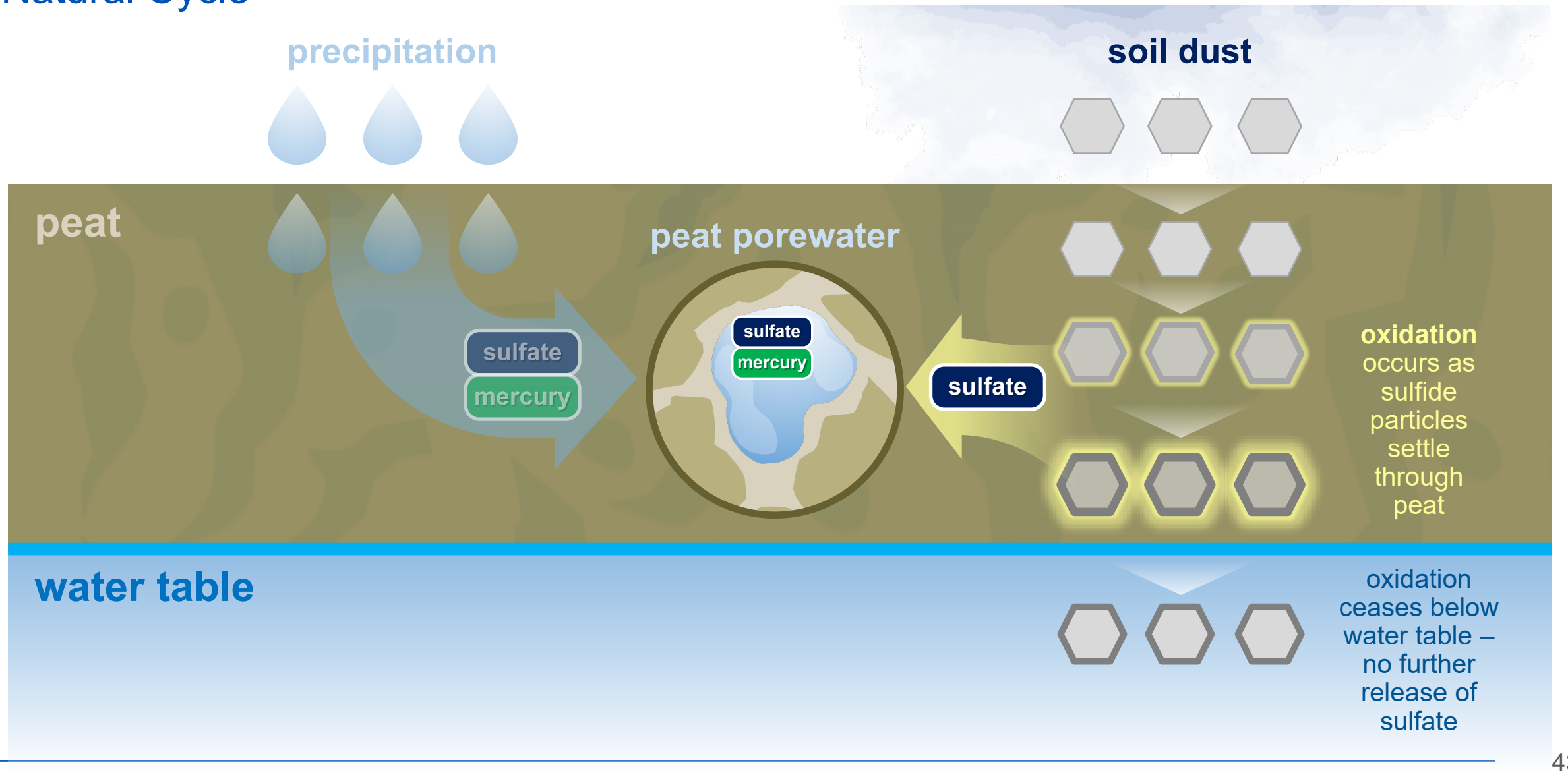

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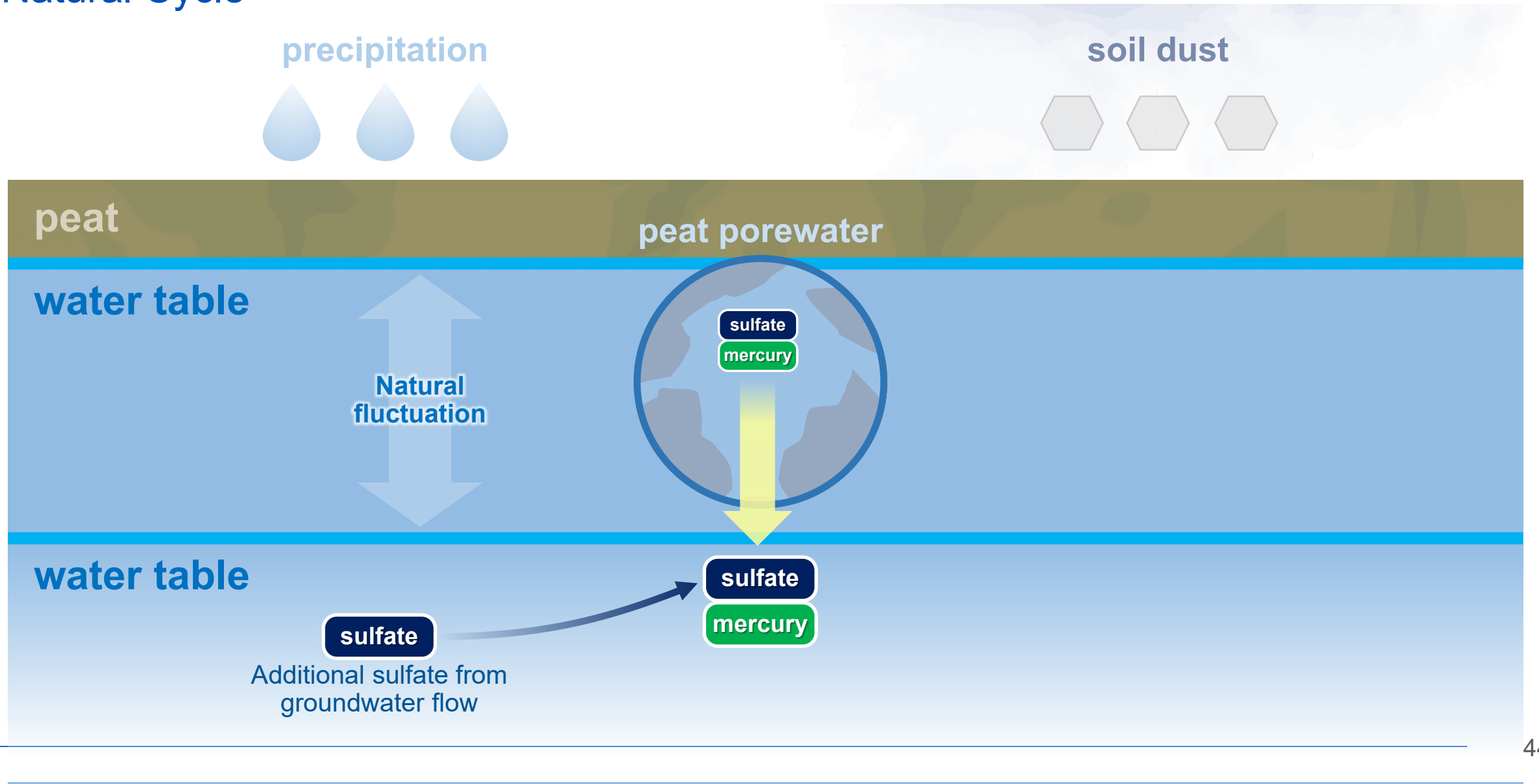

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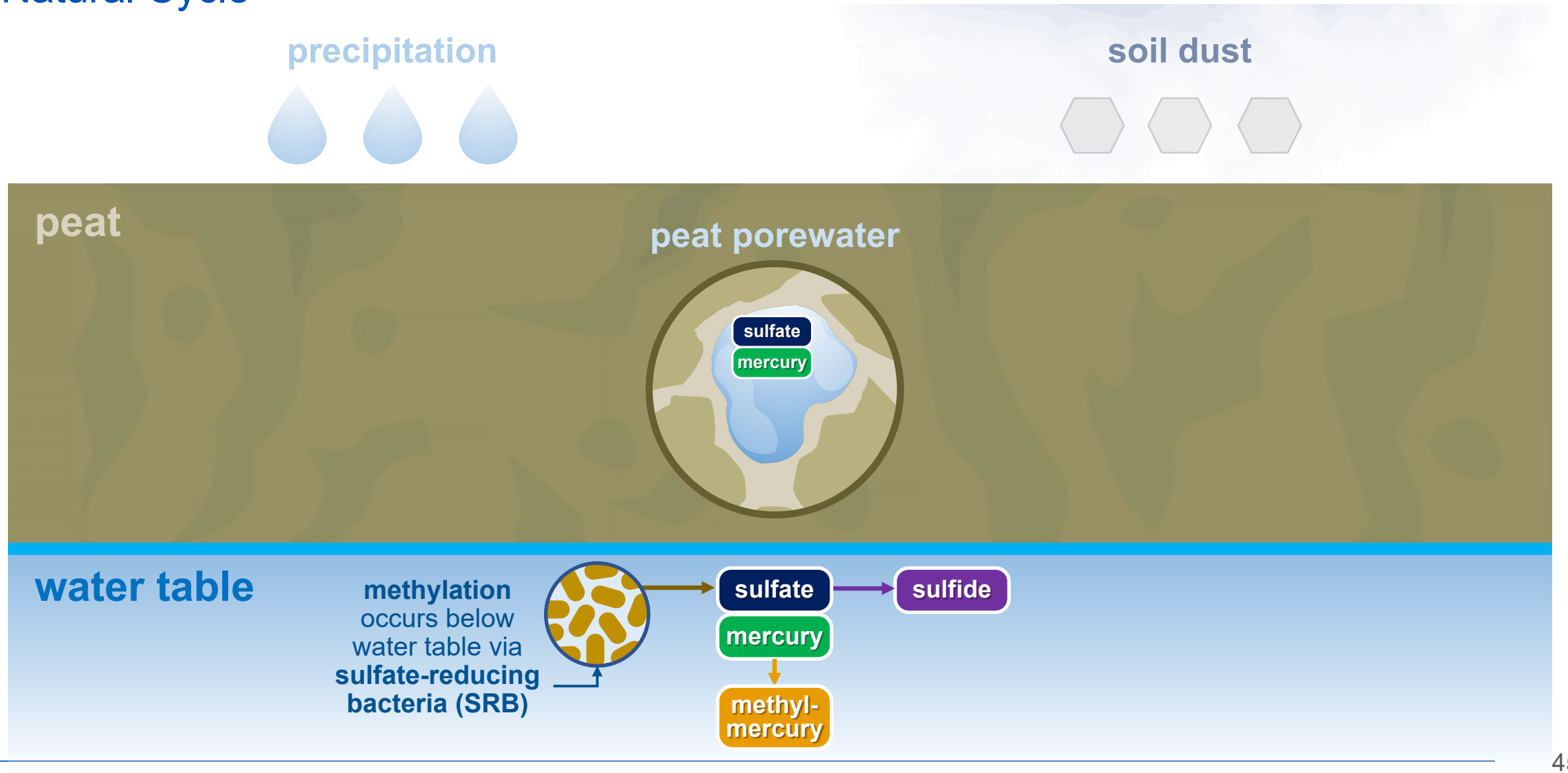

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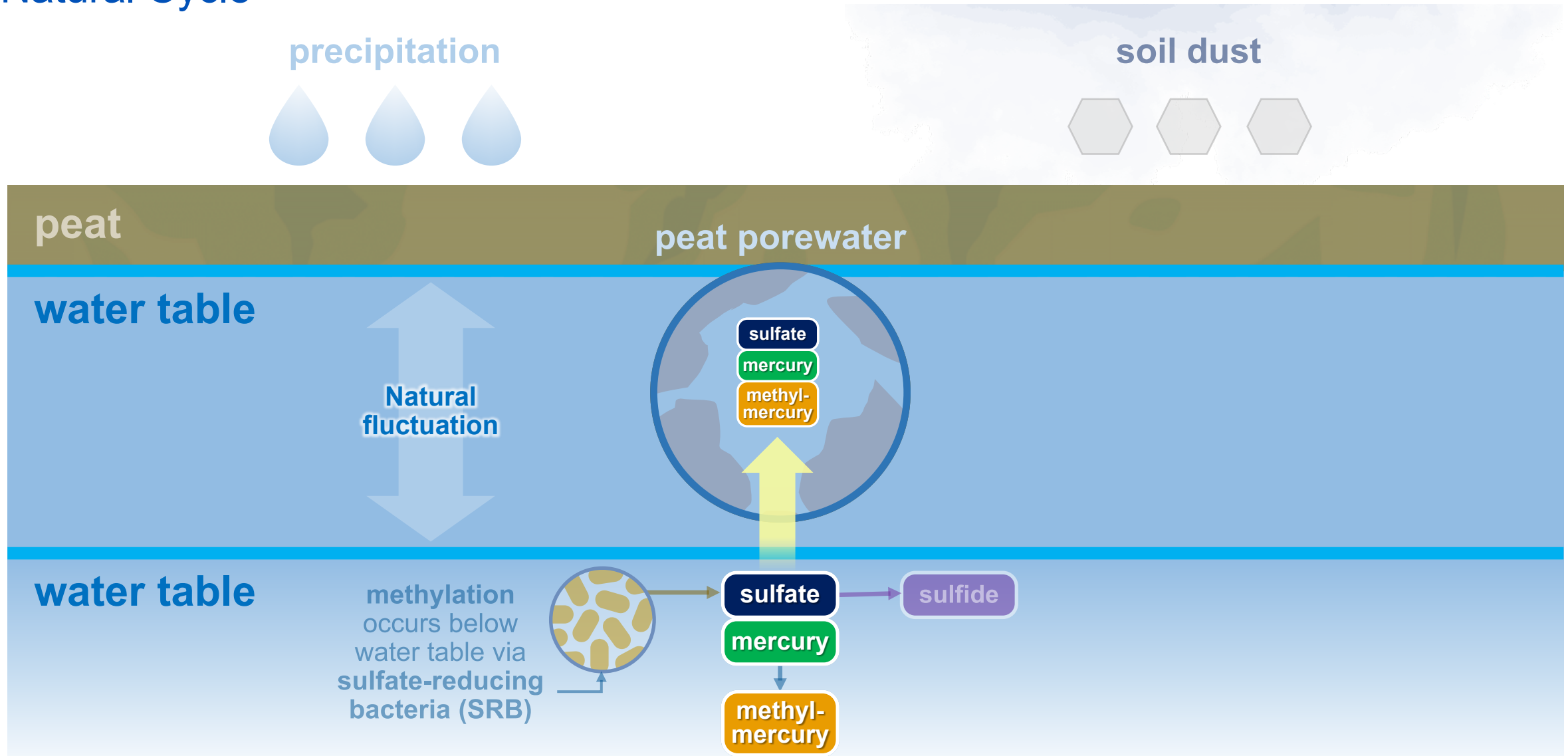

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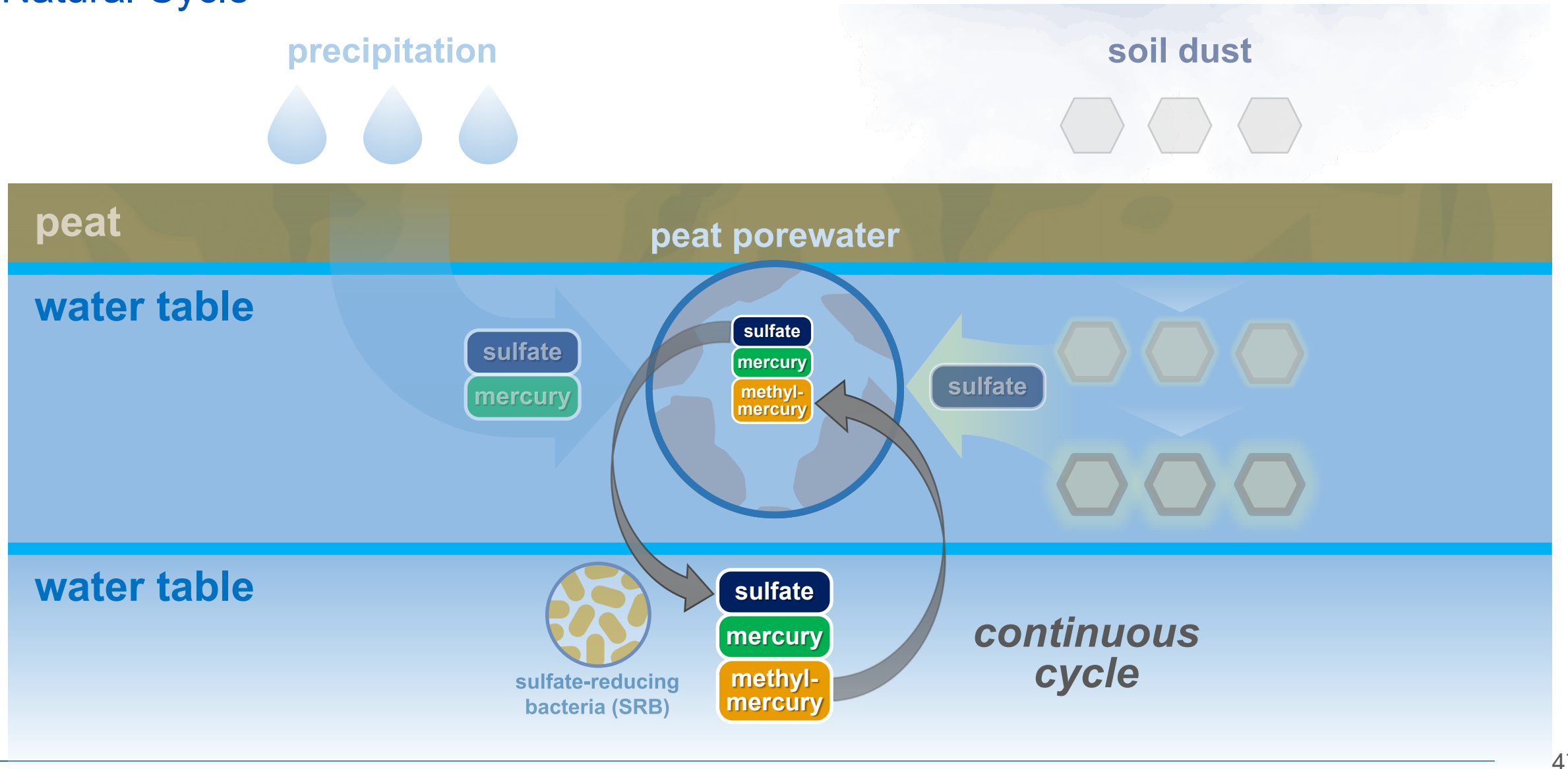


Summary

- Analysis of potential effects on water quality was quantitative and exhaustive in the scope of the evaluation
- Project will reduce loading of sulfate and mercury to St. Louis River
- No violation of the Band's water quality standard for specific conductance
- Reduction in specific conductance
- Reduction in salinity at Forbes
- No impact on sturgeon spawning
- Water level fluctuations in wetlands will not alter generation of methylmercury

Cliff Twaroski, Barr Engineering

- Senior Environmental Scientist

Key Points

- Detailed water modeling work shows the Project will decrease sulfate, mercury, and methylmercury in the St. Louis River
- Band doesn't account for Project's water management and treatment
- Even high flow and high concentration flushing events do not affect conclusions: Project reduces loading

Linkages: sulfate, mercury, methylmercury, organic matter, water flow

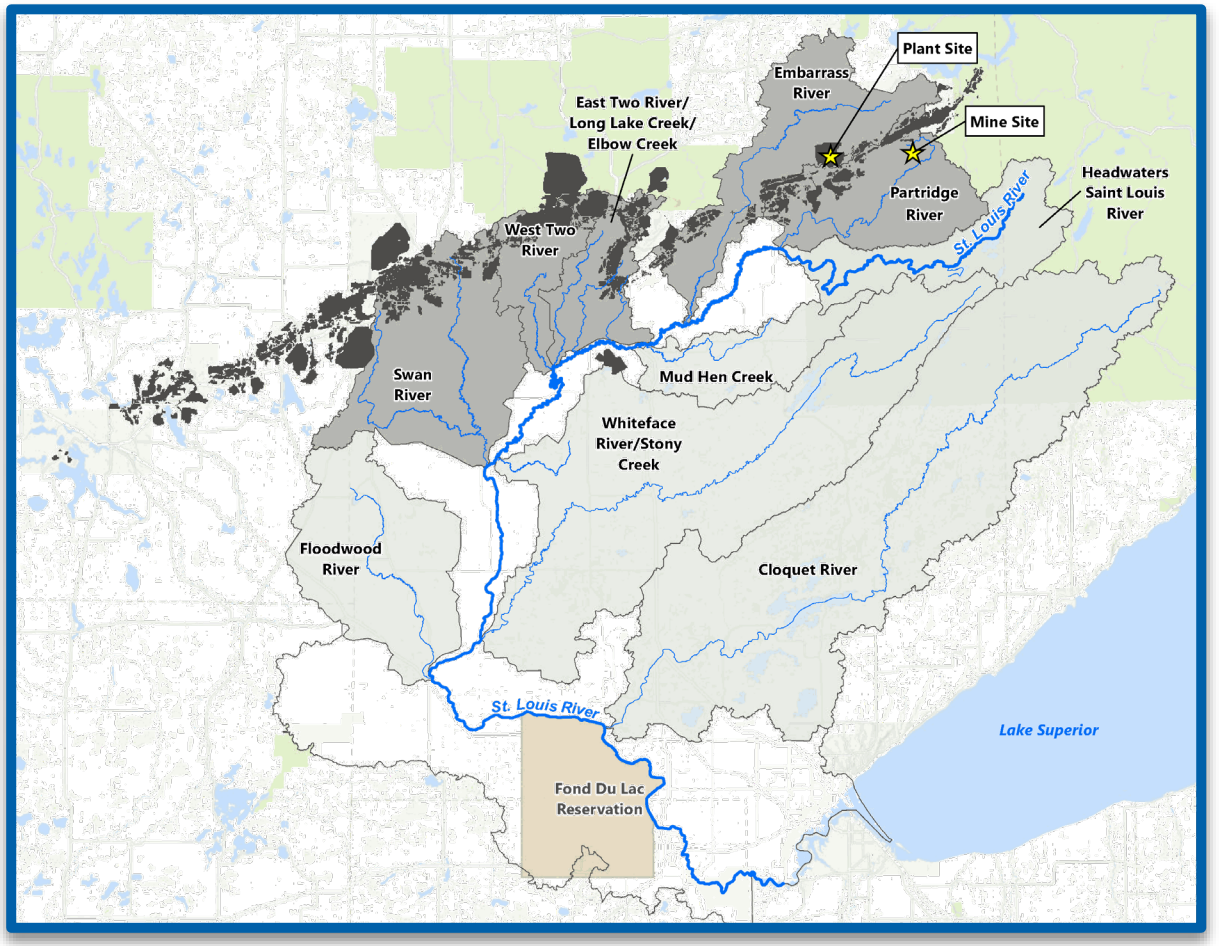
- Methylmercury formation in wetlands and lake sediments is linked to sulfate and mercury
- Export of mercury and methylmercury from wetlands linked to organic matter and water flow
  - Organic matter a carrier of both mercury and methylmercury
  - Increase water flows, increase organic matter export
- Fish uptake of methylmercury is linked to formation of methylmercury (sulfate and mercury) and export from wetlands to downstream surface waters
- These linkages form the framework for the discussion in upcoming slides

Sulfate and Methylmercury Linkage

- Sulfate-reducing bacteria methylate mercury
  - Mercury transformed to methylmercury
    - Occurs primarily in wetlands and lake sediments
    - Not so much in oxygenated flowing waters (i.e., channel flow in streams)
- Methylmercury in the food chain
  - Flushing of methylmercury from wetlands to surface waters
  - Biomagnification in food chain; currently, fish consumption advisories for St. Louis River
- MPCA: Sulfate load increase = Methylmercury export to downstream waters can increase
- Amount of sulfate is important
- MPCA: Sulfate load decrease = Mercury in fish decrease

Existing Conditions: Sulfate Contributions to Lower St. Louis River

Source of Sulfate	Load, average (kg/day)	Load, average (kg/year)
Mining watersheds	35,000	12,775,000
Former LTVSMC Tailings Basin	~3,100	~1,131,500
Future NorthMet Mine Site	~29	~10,700
Other mining areas	~31,871	~11,632,800
Non-mining watersheds	15,000	5,475,000
Sum	50,000	18,250,000
Non-mining contribution as percent of total	30%	30%



Existing Conditions: Methylmercury Loading to Lower St. Louis River

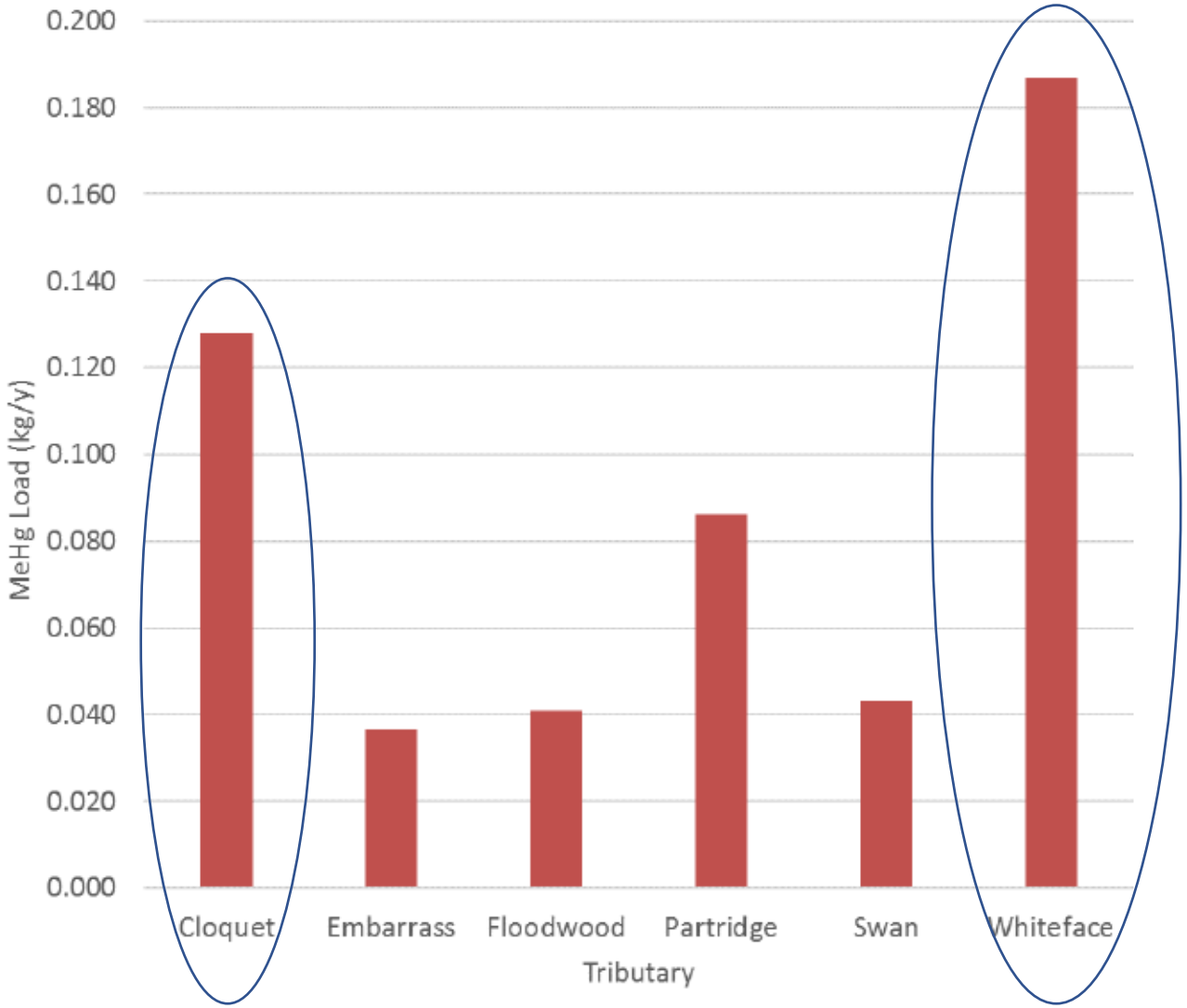
Project Area - Existing Conditions Load:

Seepage, to Embarrass River: <0.0001 kg/yr

Runoff, to Partridge River: ~0.002 kg/yr

Conclusions:

- Band does not acknowledge existing conditions loading
- Non-mining areas and watersheds contribute most to lower St. Louis River
- Project will have no effect on loading from 99.7% of St. Louis River watershed



Band Fails to Account for Project Water Management and Treatment

Total to Wetlands Tributary to Embarrass River

Parameter	Project additions (direct discharge)	Project subtractions (seepage containment)	Net Project effect
Water	5.4 cfs	5.1 cfs	**0.3 cfs (none; within ± 20%)**
Sulfate	48,000 kg/yr	– 313,000 kg/yr	**– 265,000 kg/yr (decrease)**
Mercury	12.7 g/yr	– 14.6 g/yr	**– 1.9 g/yr (decrease)**

Conclusions:

- Direct discharges from the Project mimic existing condition flows; ± 20% of existing conditions
- Wetlands to the north and west of the Tailings Basin will see load reductions due to Project water capture and treatment

Band Fails to Account for Project Water Management and Treatment

Total to Wetlands Tributary to Embarrass River

Parameter	Project additions (direct discharge)	Existing Conditions
Water	5.4 cfs 3,490,000 gallons/day	**5.1 cfs** 3,296,000 gallons/day

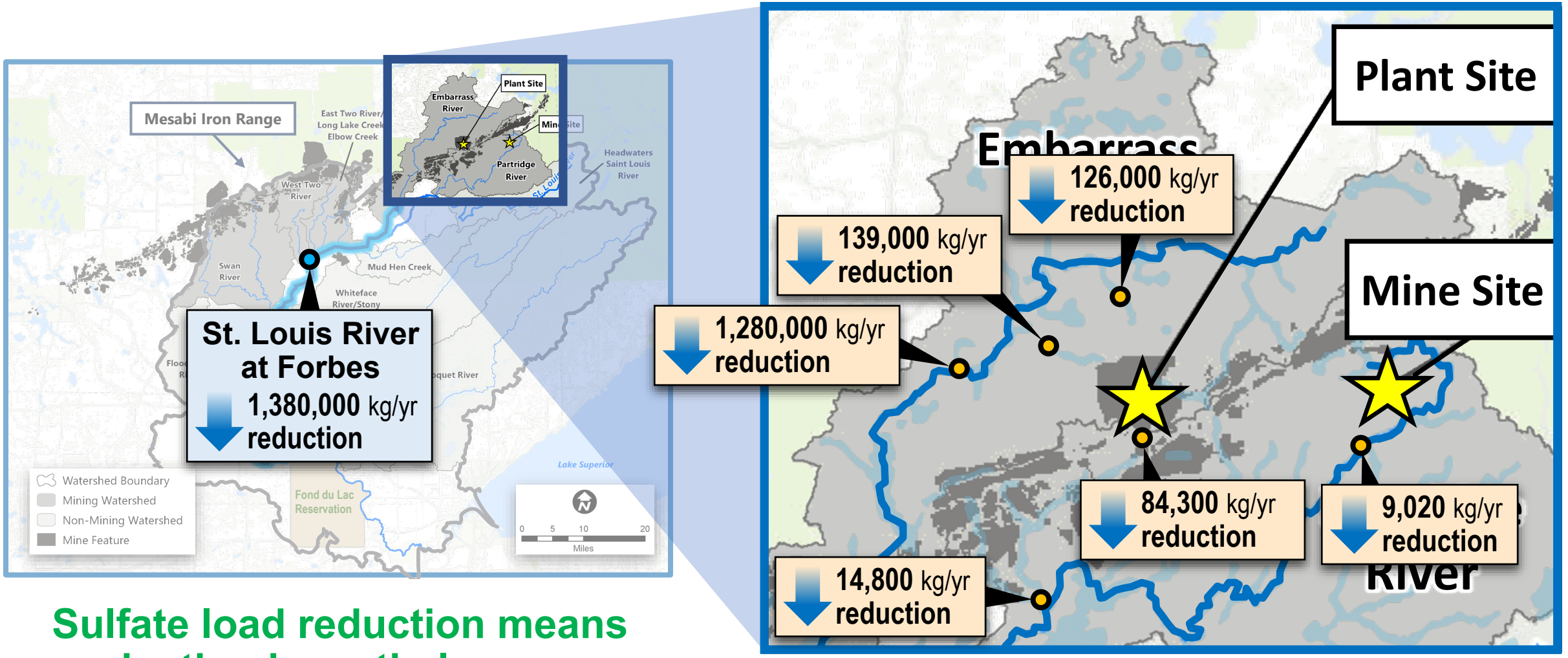
More about water loading to headwater wetlands

- Band claims Project will cause excess flushing of wetlands near Tailings Basin and will remove more organic matter than occurs in existing conditions
- Organic matter is a carrier of mercury and methylmercury; flush more organic matter and it will carry more mercury and methylmercury
- But WWTS discharge is required to mimic existing conditions flows; ± 20% of existing conditions

Conclusion:

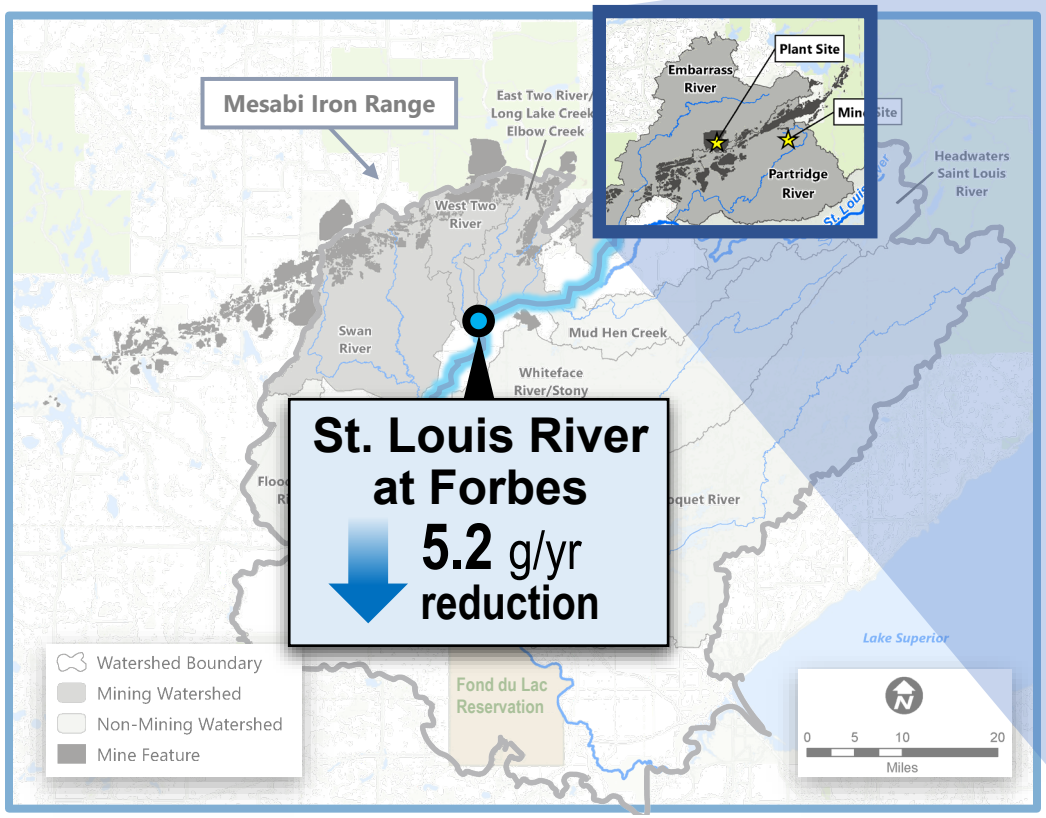
- Project in operation will not increase organic matter flushing from headwater wetlands near the Tailings Basin compared to existing conditions—water loading is not an issue

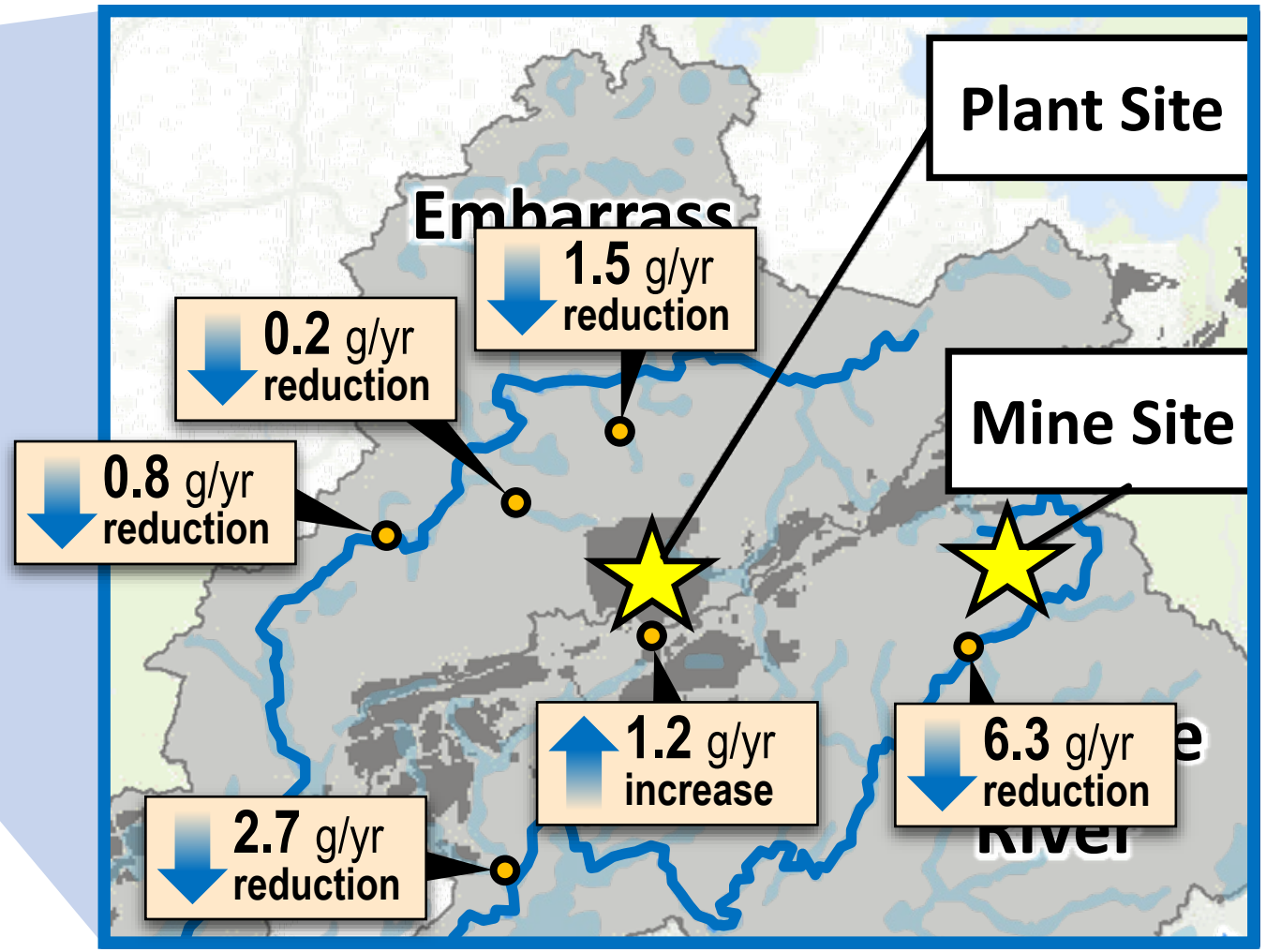
Overall Reduction in Cumulative Project Sulfate Loading to Embarrass and Partridge Rivers



Sulfate load reduction means reduction in methylmercury

Overall Reduction in Cumulative Project Mercury Loading to Embarrass and Partridge Rivers





Same reduction at Cloquet

PolyMet Conducted Additional Loading Evaluations

- Multiple evaluations indicate Project in operation decreases sulfate and mercury loading
  - Embarrass River, Partridge River, St. Louis River at Forbes and Cloquet
- Cross-media analysis showed potential atmospheric loading from Project air emissions to upper Embarrass River and upper Partridge River were small
  - No change expected in methylating environment
- Flushing events?

Parameter	Watershed	Load: Historic (wet+dry)	Load: Existing Conditions (wet+dry)	Project Load (wet+dry)	Project Load as Percent of Ex Cond Load
Sulfate ($g/m^2/yr$) Historic, 1980-82	Embarrass R at PM-13	~1.4	0.482	0.006	1.2%
	Partridge R at SW004a	~1.4	0.482	0.007	1.5%
Mercury ($\mu g/m^2/yr$) Historic, since 1950s	Embarrass R at PM-13	12.5	12.5	0.03 to 0.1	0.2% to 1%
	Partridge R at SW004a	12.5	12.5	0.01 to 0.06	0.1% to 0.5%

Even in high flow and high concentration flushing events, Project reduces mercury and methylmercury loading to St. Louis River

- Questions raised about export of excessive amounts of mercury and methylmercury to the lower St. Louis River during short-term flushing events
- One more loading scenario; flushing event: daily estimates, grams per day (g/day)
  - Existing conditions
    - Flows: annual maximum 7-day or 30-day mean flow
    - Mercury and methylmercury surface water concentrations reflect highest values reported
      - Embarrass River and Partridge River watersheds
      - St. Louis River, at Forbes and Cloquet
  - Project in operation reflects water capture and treatment

Even in high flow and high concentration flushing events, Project reduces mercury loading to St. Louis River

Calculation Component	Existing Conditions (g/day)	Project in Operation (g/day)	Net Change (g/day)
Net Loading from Project Area	1.213	0.164	**-1.048**
Load from Non-Project Areas to St. Louis River at Forbes	103.494	103.494	0
Load in St. Louis River at Forbes	104.707	103.658	**-1.048**
Load from Non-Project Areas to the St. Louis River at Cloquet	335.127	335.127	0
Total Load in St. Louis River at Cloquet	336.340	335.291	**-1.048**
Project Area Contribution as a % of Load at Cloquet	0.36%	0.05%	

Even in high flow and high concentration flushing events, Project reduces methylmercury loading to St. Louis River

Calculation Component	Existing Conditions (g/day)	Project in Operation (g/day)	Net Change (g/day)
Net Loading from Project Area	0.149	0.019	**-0.131**
Load from Non-Project Areas to St. Louis River at Forbes	13.271	13.271	0
Load in St. Louis River at Forbes	13.42	13.289	**-0.131**
Load from Non-Project Areas to the St. Louis River at Cloquet	25.607	25.607	0
Total Load in St. Louis River at Cloquet	25.756	25.625	**-0.131**
Project Area Contribution as a % of Load at Cloquet	0.58%	0.07%	

Summary

- Detailed water modeling work shows the Project will decrease sulfate, mercury, and methylmercury in the St. Louis River
- Band doesn't account for Project's water management and treatment
- Direct discharges will not increase loading of water, organic matter, sulfate, mercury, or methylmercury
  - WWTS discharge to headwater wetlands similar to existing conditions flow
    - No excess water loading
    - No excess flushing of organic matter
- Reducing loading in the headwaters region will not increase loading in downstream areas
- Even high flow and high concentration flushing events do not affect conclusions: Project reduces loading

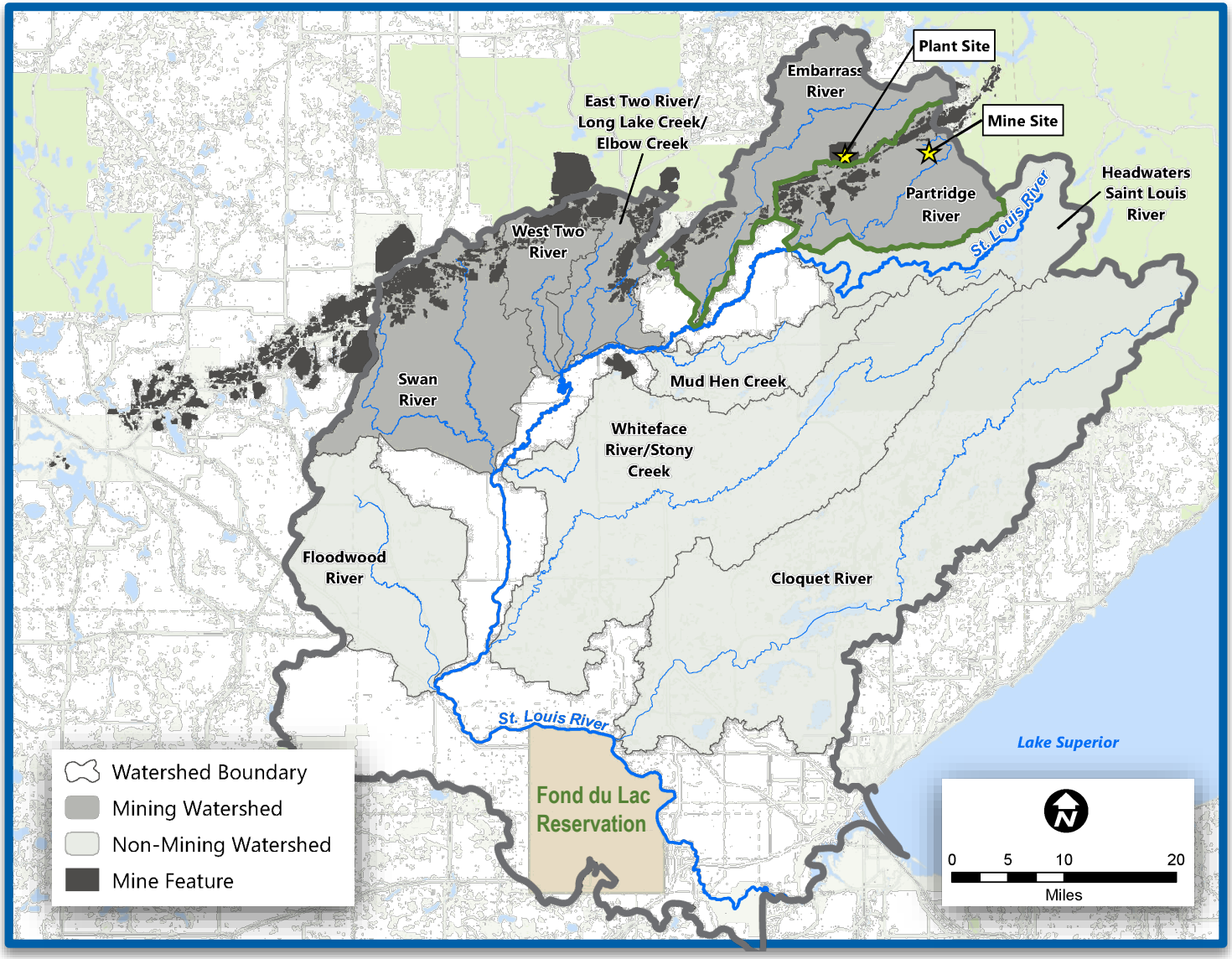
Greg Council, P.E., Tetra Tech

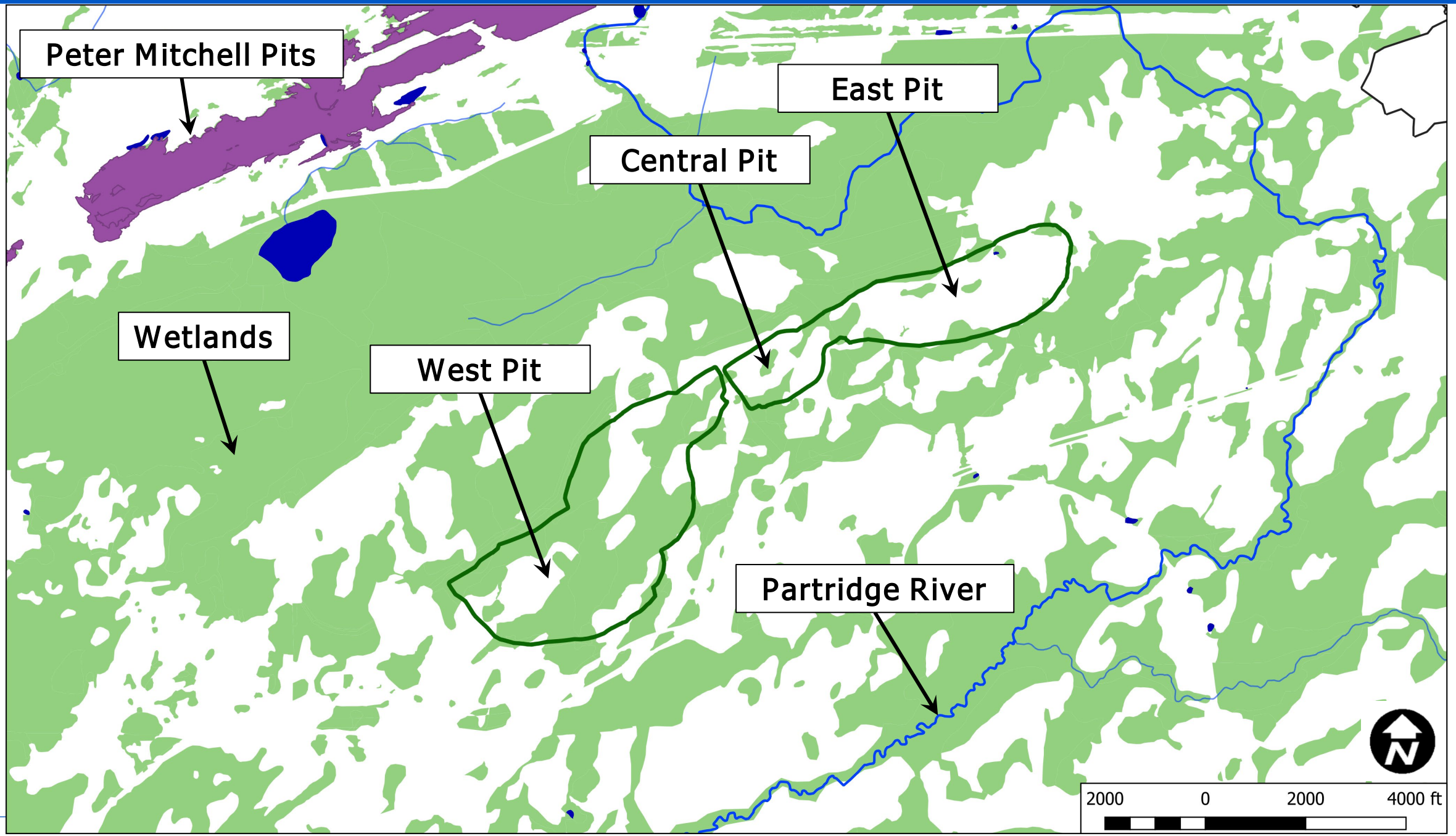
- Principal Engineer

Key Point

- Band's wetland drawdown claims are not possible

Project Location




Peter Mitchell Pits
East Pit
Central Pit
Wetlands
West Pit
Partridge River
2000
0
2000
4000 ft

Overview

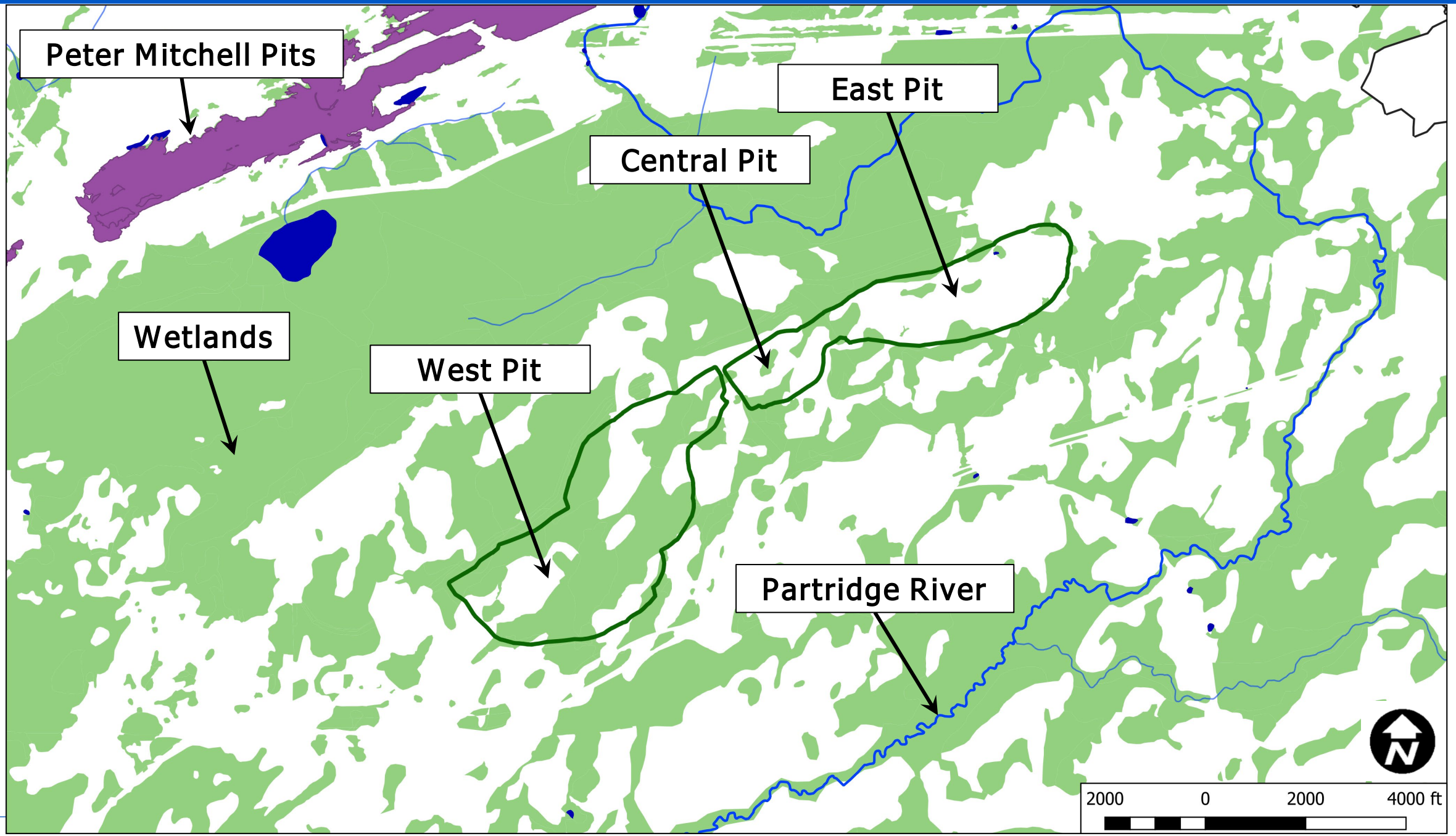
The Band's analysis of drawdown effects on water quality:

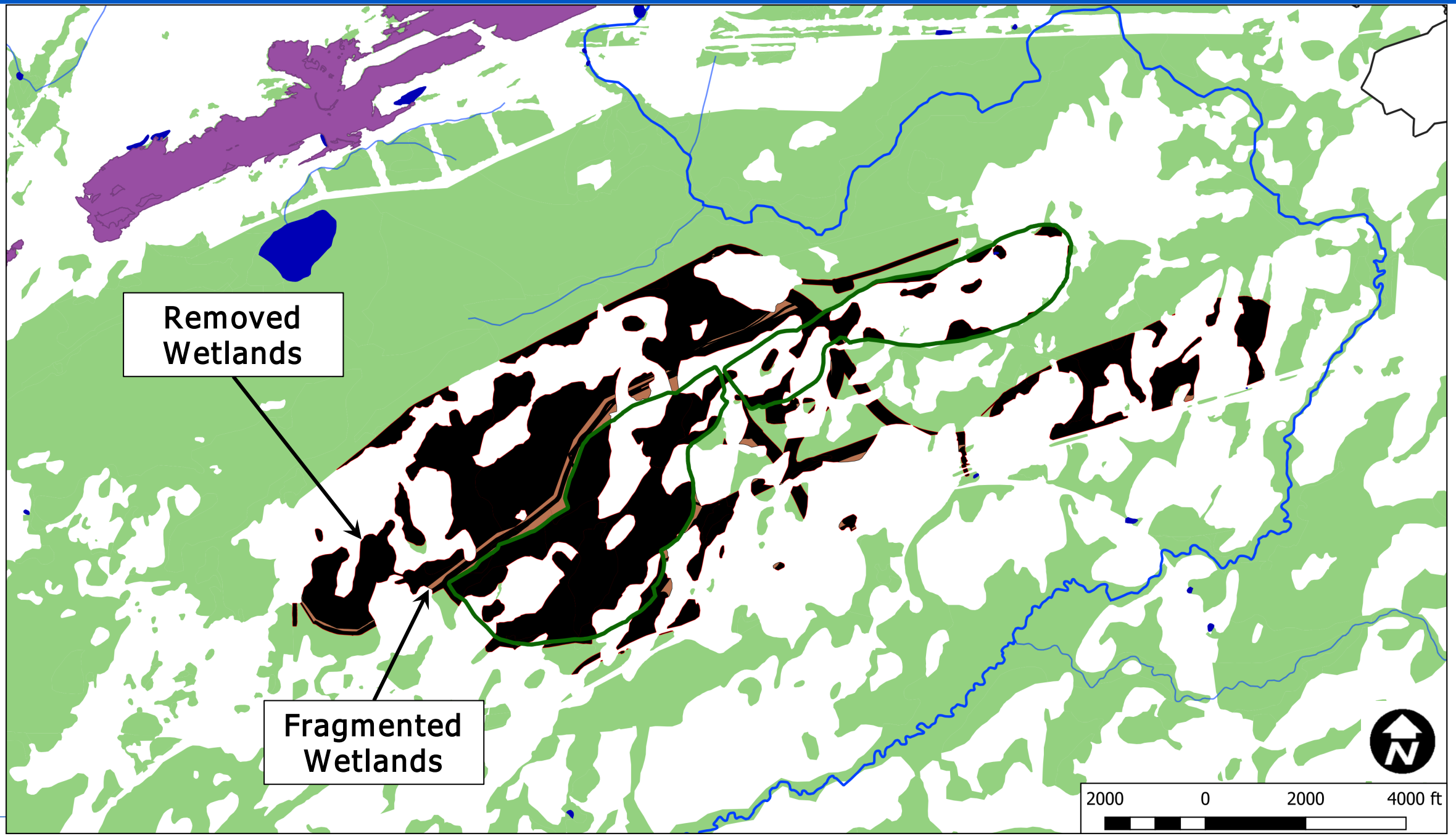
1. Fails to account for the removal of wetlands which will reduce generation of sulfate, mercury, and methylmercury;

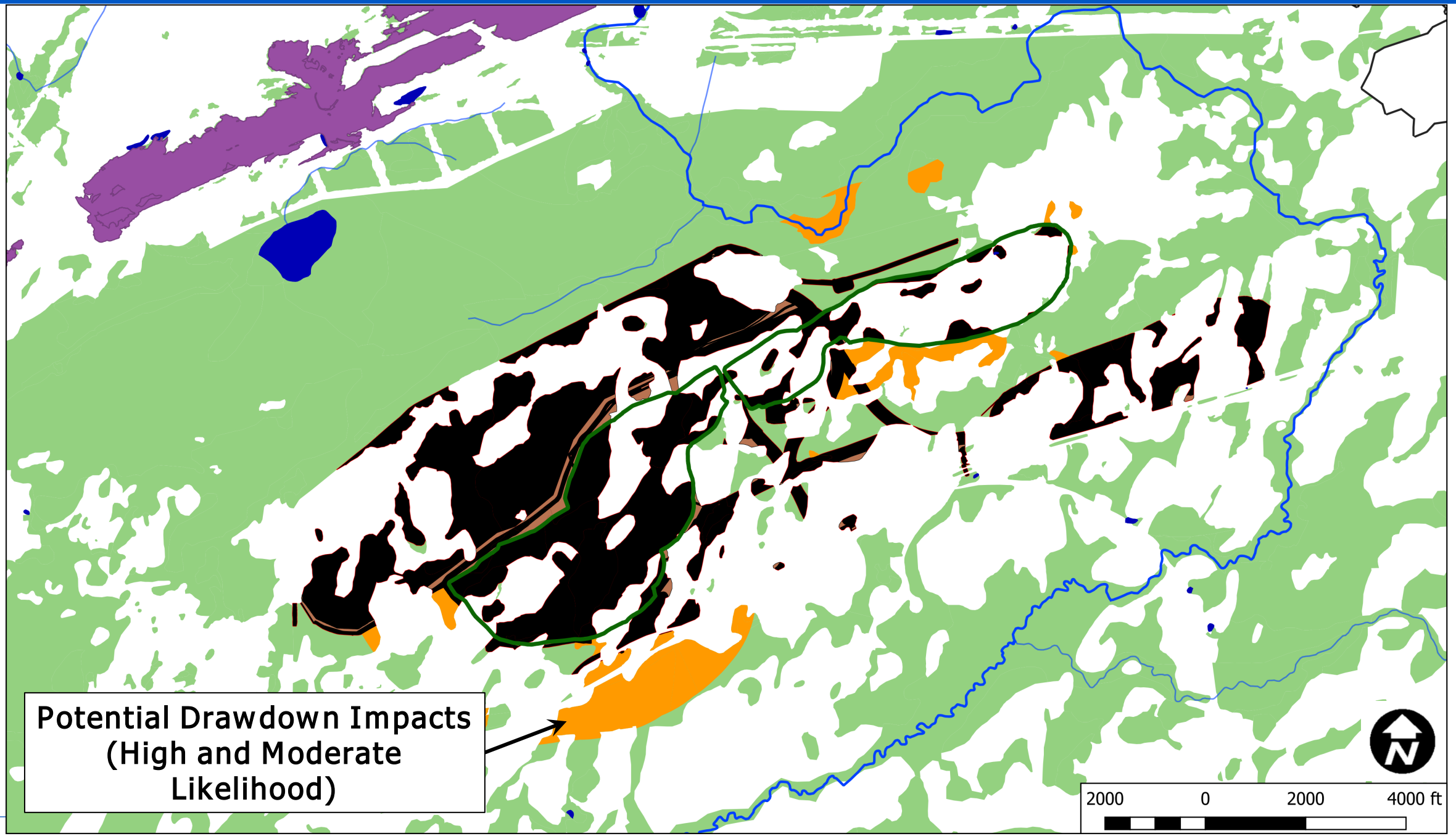
2. Overstates the aerial extent of drawdown and incorrectly implies that the generation of sulfate, mercury, and methylmercury in allegedly affected wetlands will more than offset the loss in sulfate, mercury, and methylmercury generation from directly affected (removed) wetlands;

3. Implies that MODFLOW groundwater modeling should have been used to directly calculate the extent of wetland desaturation, ignoring the limitations of groundwater modeling software for this purpose; and

4. Does not address hydrogeologic and geochemical factors that will mitigate loading of sulfate, mercury, and methylmercury to streams if and where drawdown-related impacts occur.


Peter Mitchell Pits
East Pit
Central Pit
Wetlands
West Pit
Partridge River
2000
0
2000
4000 ft

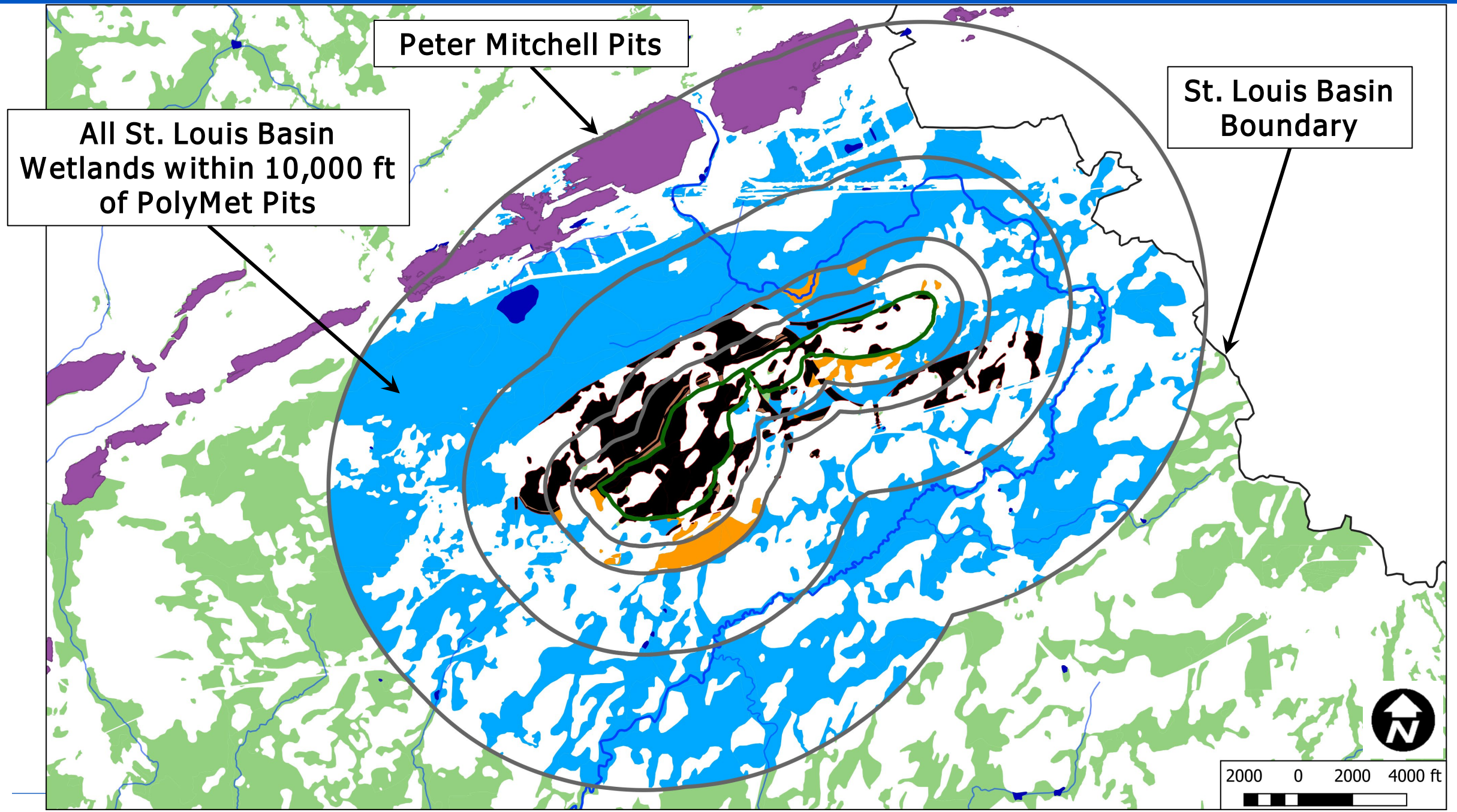

Removed Wetlands
Fragmented Wetlands
2000
0
2000
4000 ft


Potential Drawdown Impacts
(High and Moderate
Likelihood)
2000
0
2000
4000 ft

Wetland Areas with Project

- SO_4, Hg, MeHg mass loading from 749.5 acres of existing wetlands will be eliminated
  - Includes excavated and filled areas
  - Will result in decreased loading
- Area of remaining wetlands likely to be impacted by drawdown = 161.4 acres (moderate and high likelihood)
  - For impacted wetlands to offset removed wetlands, loads from impacted areas would have to increase to **560%** of present loading (i.e., 460% increase)

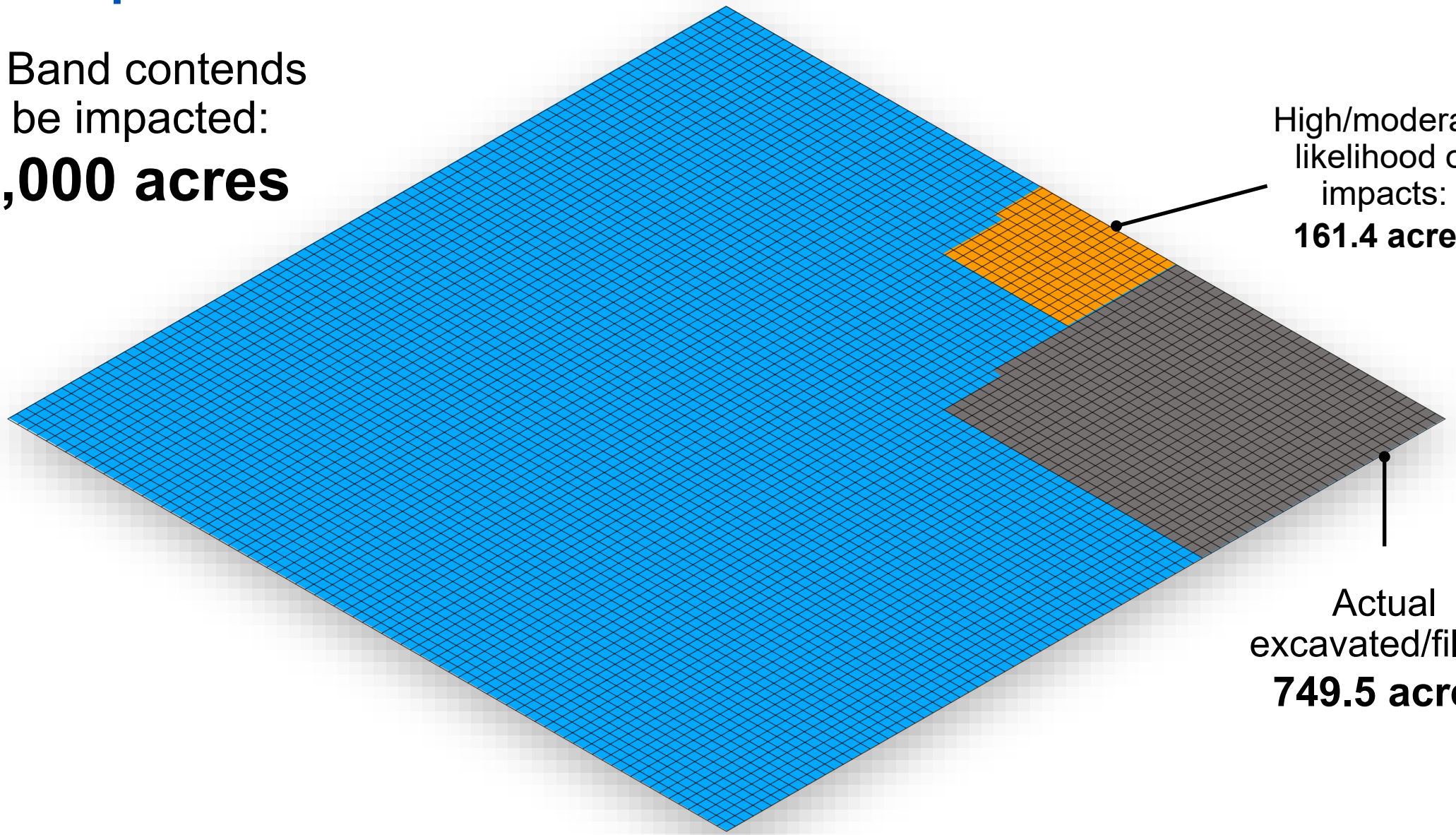
Type of Impact	Area (acres)
Direct	749.5
Fragmentation	26.5
Potentially Impacted by Drawdown (High and Moderate Likelihood)	161.4


Peter Mitchell Pits
All St. Louis Basin Wetlands within 10,000 ft of PolyMet Pits
St. Louis Basin Boundary
2000 0 2000 4000 ft

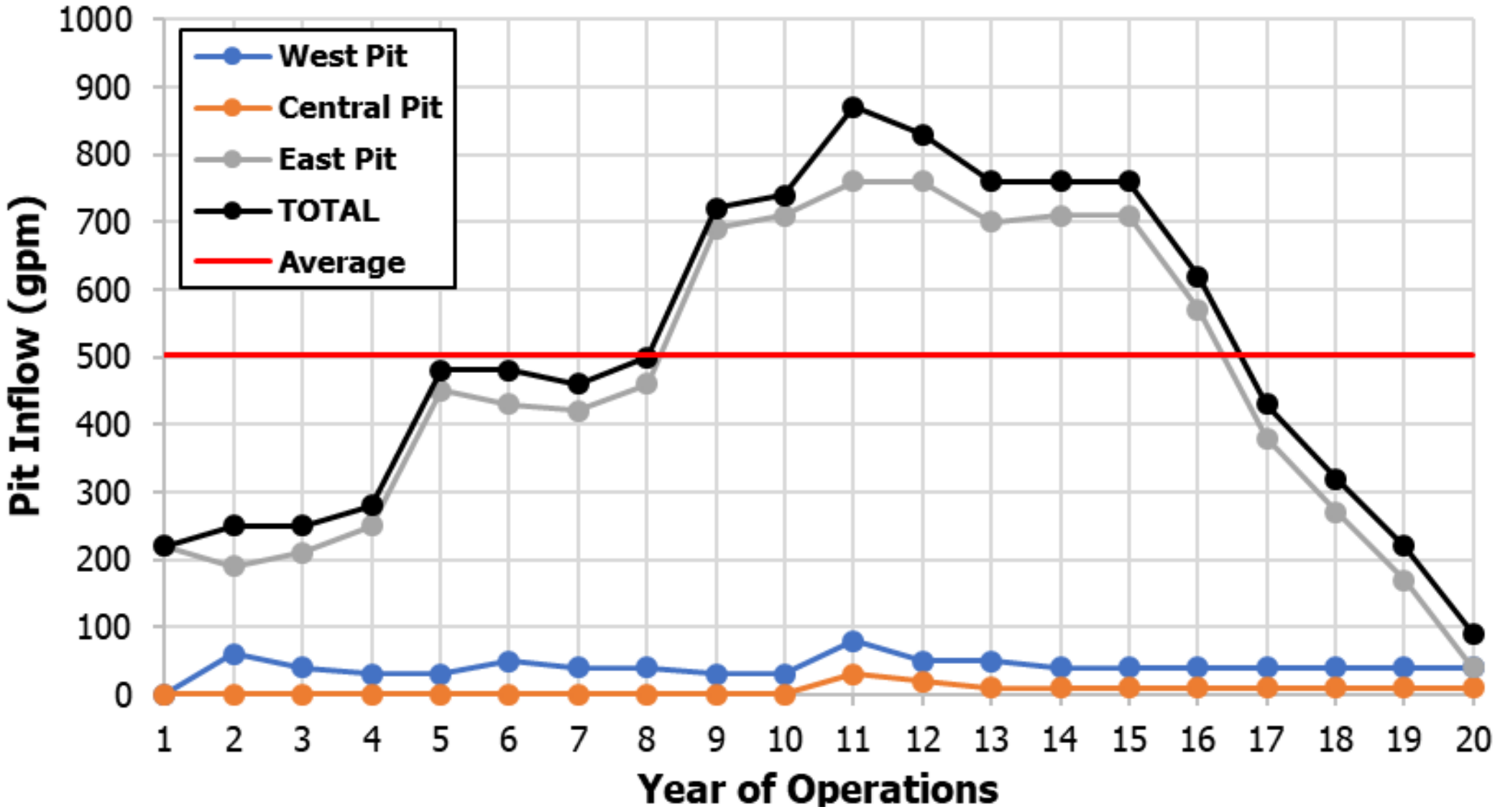
Area Comparison

Area Band contends will be impacted:

> 6,000 acres

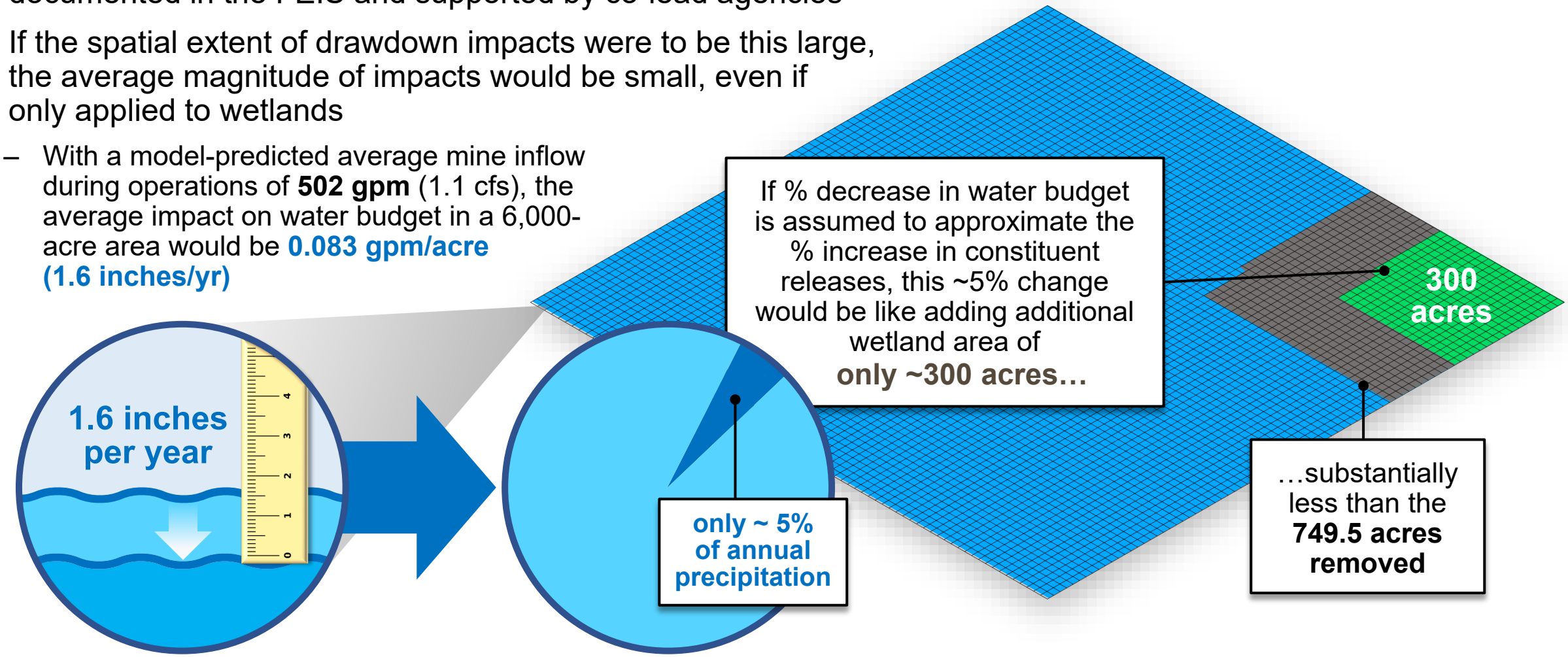


Pit Inflow Rates (FEIS)



Aerial Extent of Drawdown

- **The Band asserts that over 6,000 acres of wetlands will be impacted by drawdown,** which contradicts the analysis documented in the FEIS and supported by co-lead agencies
- If the spatial extent of drawdown impacts were to be this large, the average magnitude of impacts would be small, even if only applied to wetlands
  - With a model-predicted average mine inflow during operations of **502 gpm** (1.1 cfs), the average impact on water budget in a 6,000-acre area would be **0.083 gpm/acre (1.6 inches/yr)**



Use of MODFLOW to Simulate Wetlands

- MODFLOW was designed to be a groundwater flow simulator
  - Surface hydrologic processes are simplified substantially in MODFLOW
- Wetland hydrology is very complex, and important processes occur at a finer spatial scale (and often shorter time scale) than can be practically used for MODFLOW models
- Low permeability sediments in wetlands (e.g., peat) cause wetlands and groundwater to be less hydraulically connected
- Other wetland processes—sediment deposition, erosion, temporal damming of water, etc.—add additional challenges for simulation of wetland hydrology, especially with groundwater modeling software

Hydrogeochemical Conditions

For drawdown to mobilize mercury and increase methylation of mercury present in wetland sediments, these geochemical conditions is required:

a) Prolonged water table decline that introduces oxygen to previously saturated, anoxic, and sulfide-bearing sediments.

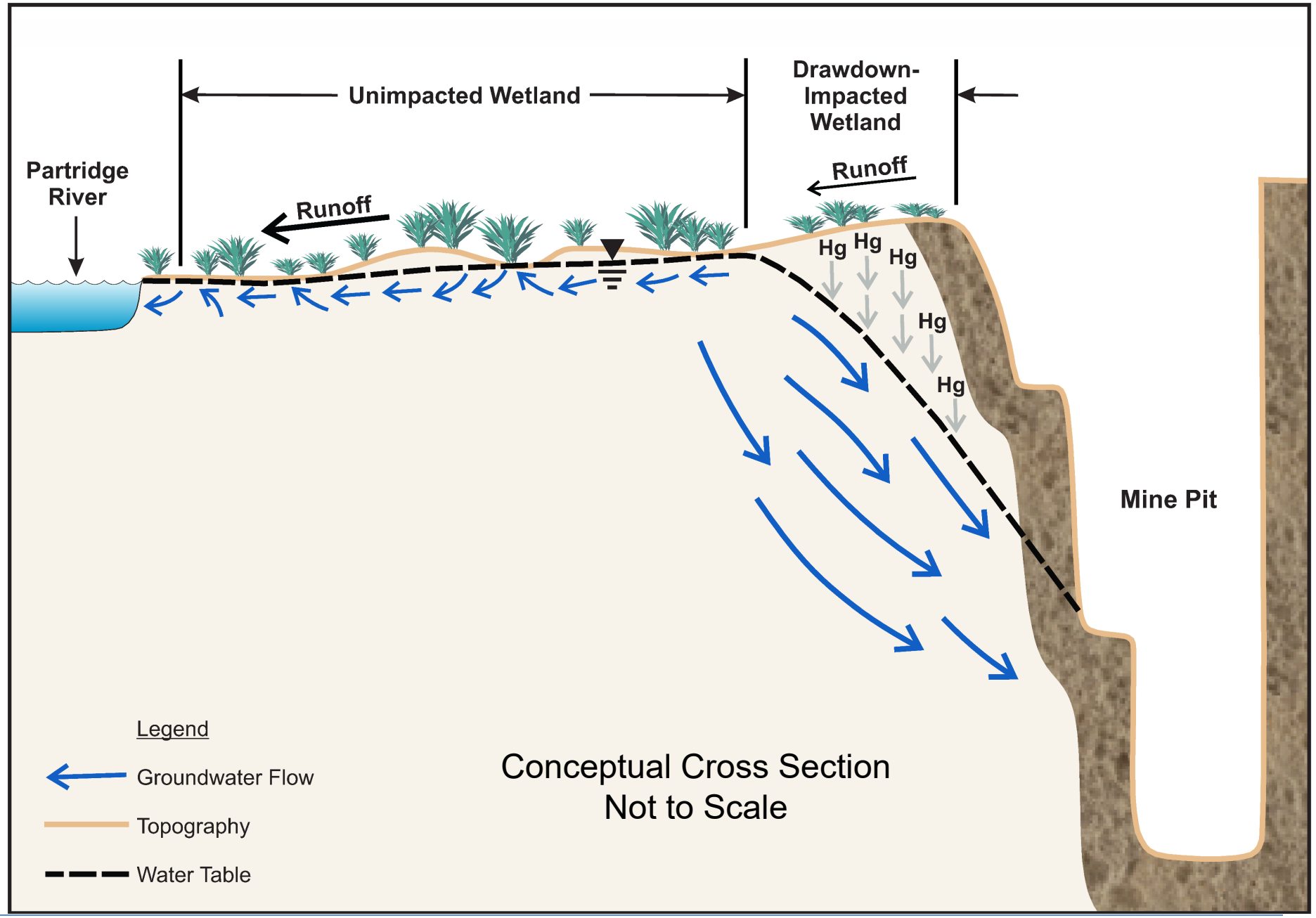
b) Oxidation of sulfide in sediments to sulfate.

c) Rising water table to re-saturate the sediments bearing the newly oxidized sulfate (or transport of the newly oxidized sulfate to a reducing environment).

d) Sufficient microbial activity to consume all electron acceptors that are more thermodynamically favorable than sulfate (i.e., dissolved oxygen, nitrate, manganese, and iron).

e) Sulfate reduction and mercury methylation by sulfate-reducing bacteria.

Hydro-Geo-Chemical Effects



Mass Loading to Surface Water

A. Impacts of drawdown on hydraulic gradients to surface water:

– Drawdown would reduce hydraulic gradients to surface waterbodies.

– Areas nearest mine pits where drawdown is likely to be greatest—and where sediment oxidation and mercury release/methylation increase is alleged—are also least likely to contribute soil water and groundwater to surface water.

Mass Loading to Surface Water

B. Impacts of drawdown on rainfall-runoff response:

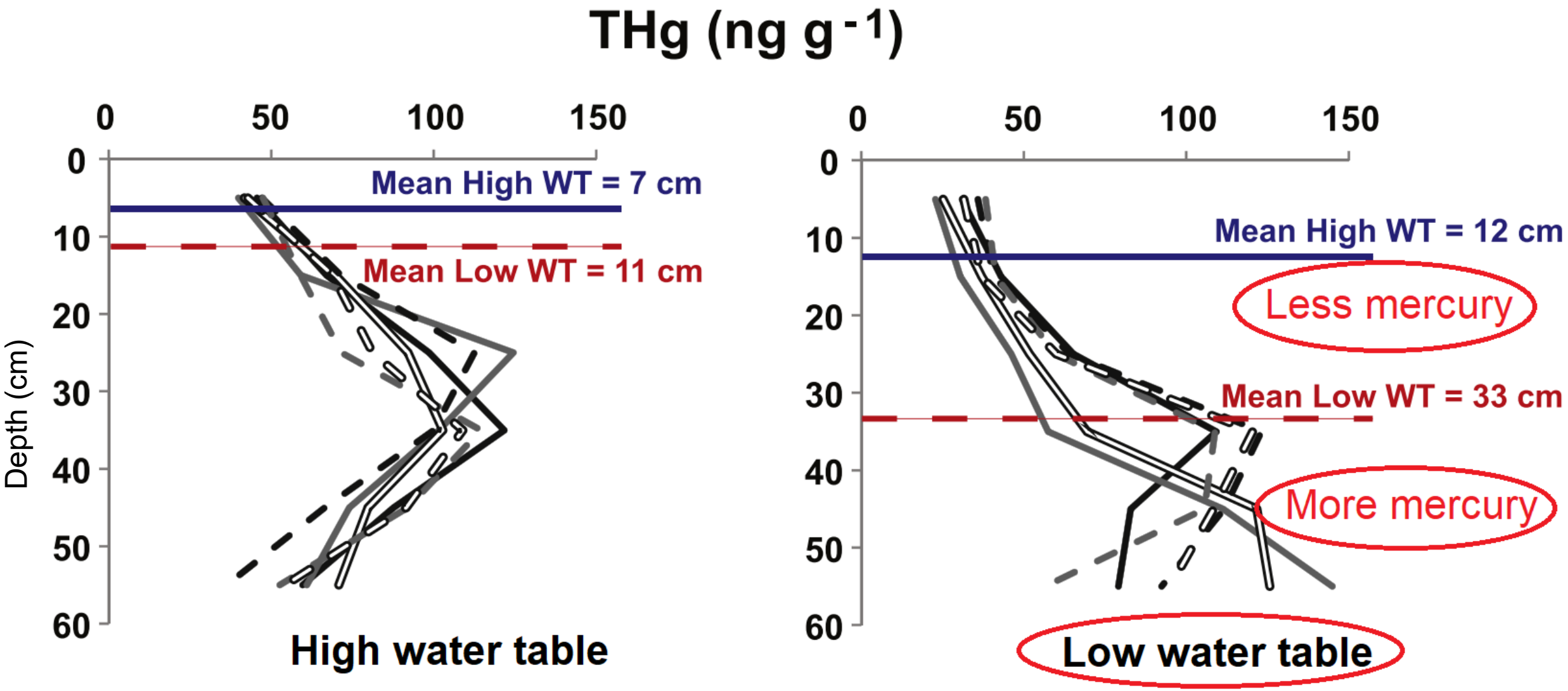
- Methylmercury mass loading to streams is highest during high-flow events, like spring snowmelt and summer rainfall events.
- Water table drawdown would lead to (1) greater infiltration of snowmelt and summer rainfall, and (2) less runoff and methylmercury loading to surface water.

Mass Loading to Surface Water

C. Vertical redistribution of mercury and methylmercury:

- Experiments have shown that lowering the water table in wetland sediments redistributes mercury and methylmercury from near-surface to deeper sediments (Haynes et al., 2019).
- Deeper sequestration of mercury and methylmercury makes export from wetlands to surface water less likely during high flow events (spring snowmelt and summer rainfall/runoff).

Total Mercury ("THg") in Soil Experiments



Source: Haynes, K.M., Kane, E.S., Potvin, L., Lilleskov, E.A., Kolka, R.K. and Mitchell, C.P., 2019. *Impacts of experimental alteration of water table regime and vascular plant community composition on peat mercury profiles and methylmercury production*. Science of the Total Environment, 682, pp. 611-622.

Mass Loading to Surface Water

D. Demethylation is a competing process with microbially-mediated mercury methylation:

- Mercury methylation is reversible, and demethylation is an important factor to consider when assessing mercury dynamics in wetland environments.
- A study notably cited numerous times in the Band's Analysis (Coleman Wasik et al., 2012) states that:
  - "Demethylation was a more important methylmercury loss process than desorption coupled with advective transport out of the system" and
  - "The finding that most of the MeHg lost … was likely due to in situ demethylation rather than export from the system implies that the majority of the MeHg produced in response to elevated sulfate deposition may not be transported to downstream aquatic systems."

Summary

- The Band's "Will Affect" Analysis misrepresents the impacts of the Project on:
  - Drawdown in wetlands, and
  - Project effects on sulfate, mercury, and methylmercury production and export to the Partridge River
- Part of the approved Project is that PolyMet will:
  - Monitor impacts on wetlands and surface water quality, and
  - Adapt the Project, as needed, to ensure current wetland conditions and water quality are preserved

Christie Kearney, P.E., PolyMet

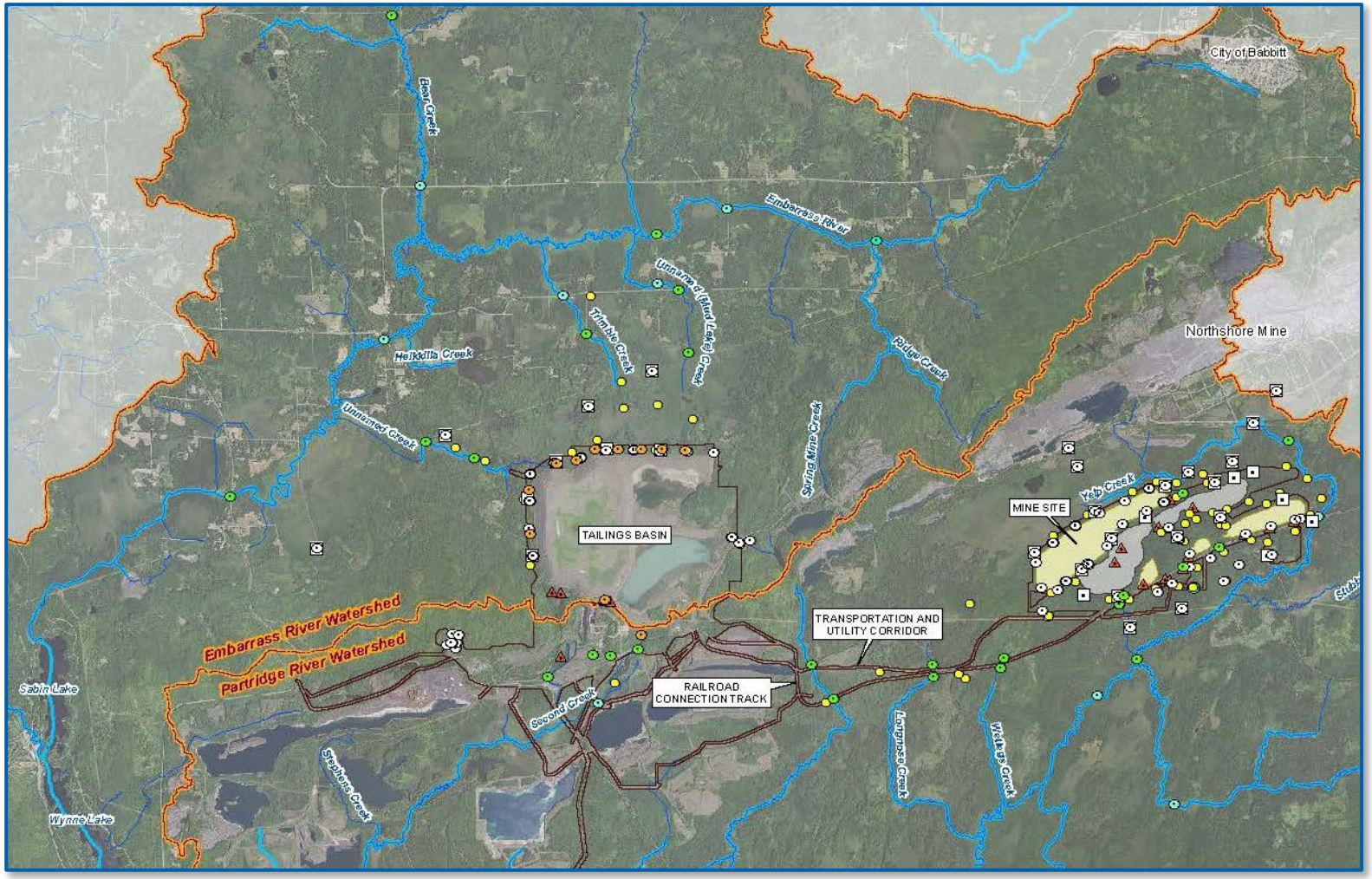
- Vice President of Environmental Affairs

Key Points

- Extensive, comprehensive monitoring
- Annual review of monitoring results
- Annual verification modeling and evaluation
- Adaptive management and mitigation

Comprehensive Water and Wetland Monitoring

All monitoring locations

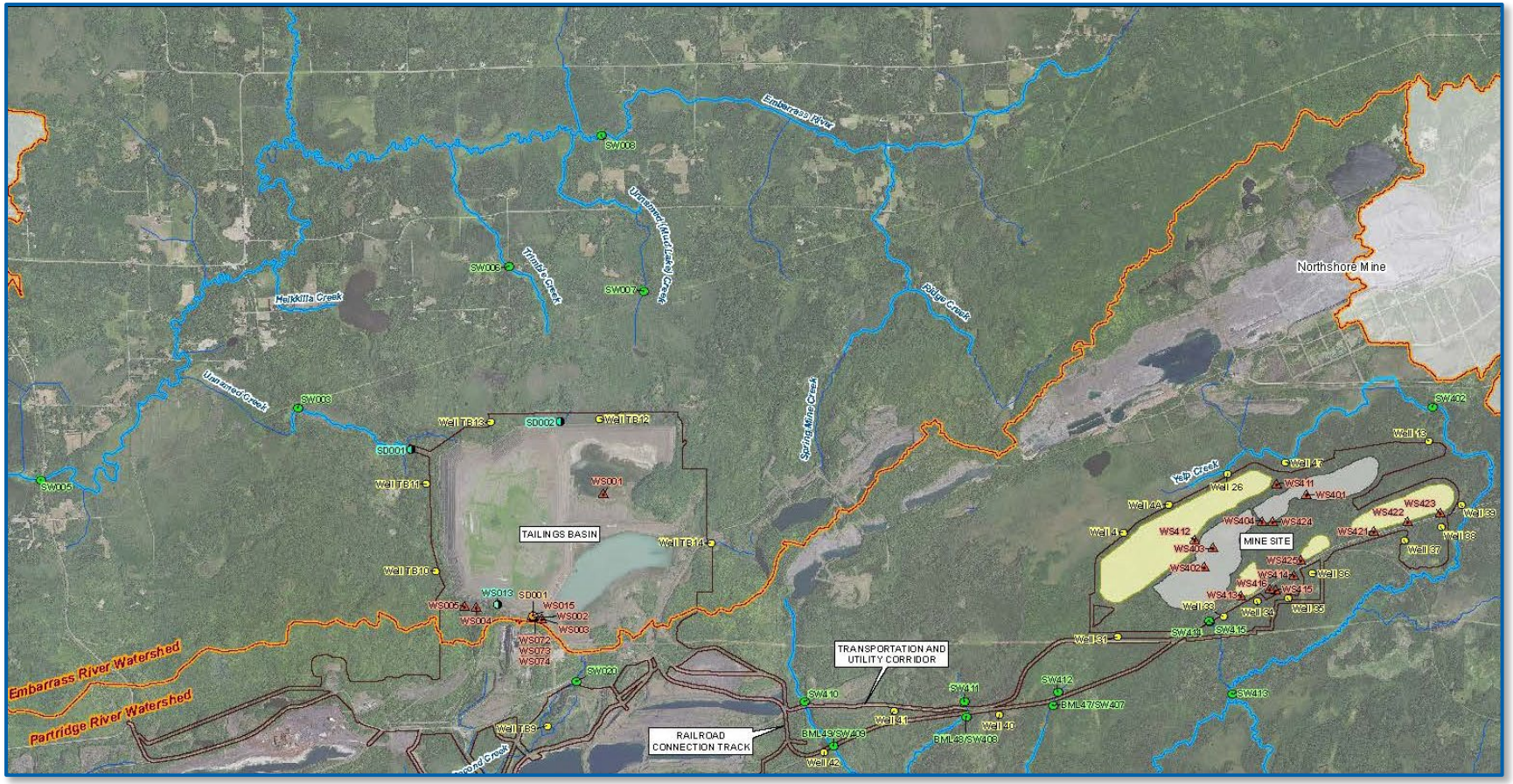


Monitoring locations	Count
Stream water quality	27
Streamflow	12
Groundwater	138
Wetlands	62
Industrial water collection	25
Treated water discharge	11
Macroinvertebrates/fish	5
Total	280

- Stream Water Quality
- Streamflow
- Treated Water Discharge
- Surficial Groundwater Well
- Bedrock Groundwater Well
- Wetland Monitoring Wells
- Industrial Water Collection

Comprehensive Water and Wetland Monitoring

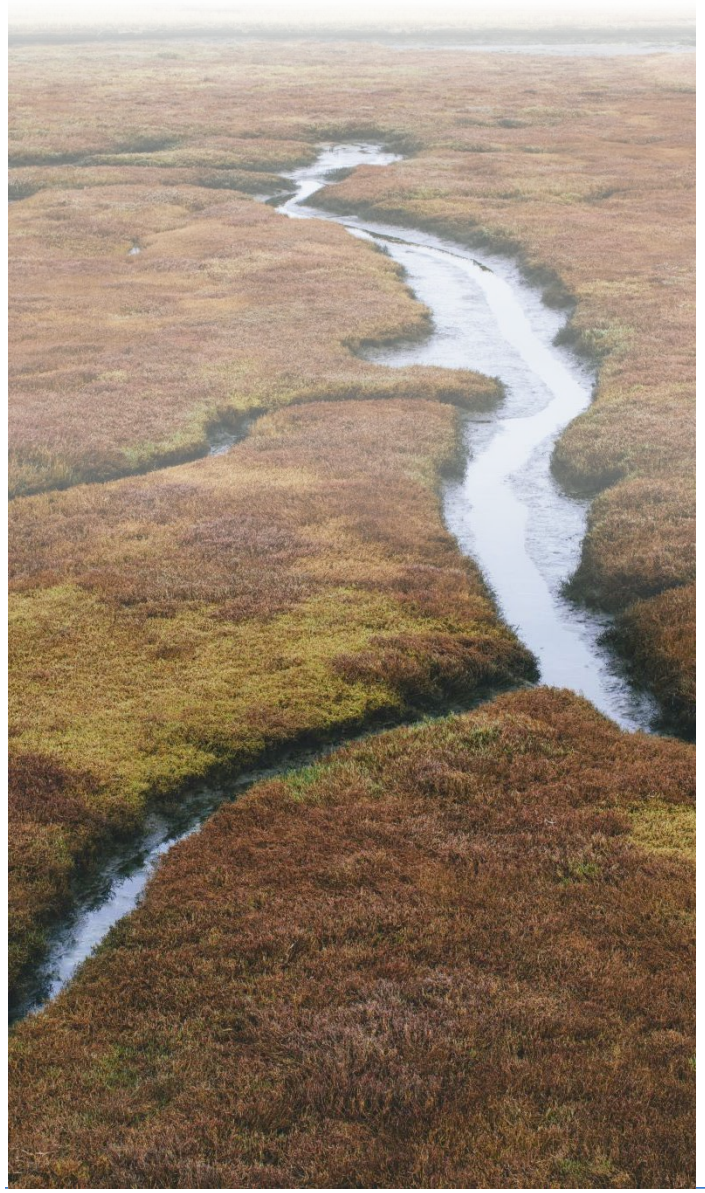
Mercury monitoring locations



Monitoring locations	Count
Stream water quality	16
Wetlands	22
Industrial water collection	25
Treated water discharge	3
Total	66

- Stream Water Quality
- Streamflow
- Surface Discharge
- Surficial Groundwater Well
- Bedrock Groundwater Well
- Wetland Monitoring Wells
- Waste Streams

Verification Permit Conditions



Annual Review of Monitoring Results

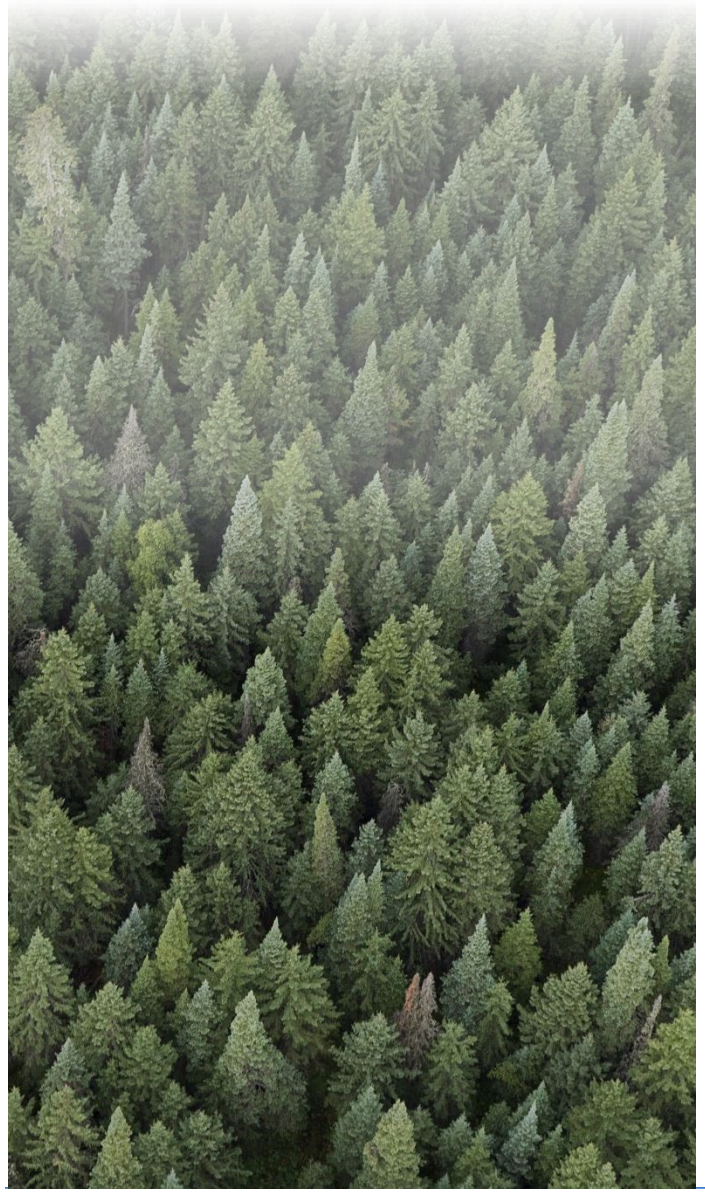
- Annual **potential indirect wetland impact assessment** to evaluate wetland water levels and vegetation (404, 401, WCA)
- Annual **evaluation of stream and wetland of interest water quality monitoring** data to evaluate against baseline values and Cross-Media Analysis results (401)
- Annual **groundwater (GW) evaluation** to assess monitoring results, suitability of monitoring network, spatial distribution of GW quality, and potential for north flow at mine (NPDES)
- Annual **comprehensive performance evaluation** to assess the performance of engineering controls and monitoring network (NPDES)
- Annual reports for Permit to Mine and water appropriation

Verification Permit Conditions

Annual Verification Modeling and Evaluation

- Assess the predictions of water quality and quantity
  - Compare them to actual observed monitoring data
- Verify previously predicted long-term impacts
  - Rerun the water models with actual observed data
- Determine if changes are needed to remedy unacceptable impacts
  - Implement adaptive management and contingency mitigations
- Every 5 years, re-evaluate underlying conceptual models
- Required by PTM, NPDES, and water appropriation permits

Verification Permit Conditions



Adaptive Management and Mitigation

- PolyMet proposed an adaptive management approach
  - Adaptive engineering controls could change as a result of monitoring and/or modeling results
  - Contingency mitigations were proposed that could be enacted
- Every major permit includes adaptive management processes and mitigation measures to evaluate and consider
  - 404 Permit: When changes are recognized, “monitoring report shall include recommendations for appropriate steps to respond to the documented change, to include additional monitoring, adaptive management, and/or compensatory mitigation.”
- Required by 401, NPDES, PTM, WCA, water appropriations

Summary

- The Project will not affect the quality of the Band's waters so as to violate any of the Band's water quality requirements

Summary

- The Project **will reduce sulfate and mercury loading and specific conductance concentration** in the St. Louis River.
- There are adequate controls in place, both in Project design and as permit requirements, **to ensure** that the Project **will not cause or contribute to a violate of water quality standards** for **sulfate, mercury, methylmercury or specific conductance (or any other water quality standard)** at the Fond du Lac Reservation on the lower St. Louis River, 116 river miles downstream.
- Among other things, verification permit conditions include:
  - Comprehensive monitoring
  - Annual verification modeling and evaluation
  - Adaptative management
  - Contingency and required mitigations

Summary

- The Project reuses existing infrastructure bringing the site up to modern standards and **cleaning up** legacy issues in the process.
- Currently only discharge in Minnesota that will meet the wild rice sulfate standard at end of pipe, which will result in a **significant reduction** of sulfate in the St. Louis River.
- PolyMet will produce metals that are **essential** for U.S. sustainability and energy goals and will be **one of the only U.S. sources** for nickel and cobalt which are essential for battery storage.
- The Project has undergone **extensive** joint state and federal environmental review and permitting processes with **unprecedented** community and tribal involvement.
- The Project meets the definition of responsible domestic mining called for in the **Defense Production Act**.

PolyMet Mining

401(a)(2) Hearing

May 4, 2022