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August 11, 2023

Commissioner Katrina Kessler
Jennifer Brentrup
Environmental Analysis and Outcomes
Minnesota Pollution Control Agency
520 Lafayette Road N.
St. Paul, MN 55155-4194

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RE: St. Louis River Watershed Mercury Total Maximum Daily Load Study

Dear Commissioner Kessler, Ms. Brentrup,

WaterLegacy submits these comments and attached Exhibits 1 through 11 in response to the current status of the Minnesota Pollution Control Agency (MPCA) St. Louis River Watershed Mercury Total Maximum Daily Load (TMDL) study. The MPCA's recognition that mining facilities must finally be required to achieve reductions in mercury air emissions is a positive step. However, in other respects, the direction that the TMDL study is taking is inadequate to restore impaired waters or to protect water quality, aquatic life, wildlife, and human health.

Based on review of the online shared documents and scientific understanding developed during the past fourteen years, WaterLegacy believes that the current direction of the mercury TMDL study will neither meet the external engagement goals for the project, the technical goals for the project, nor the legal requirements for a TMDL study under the federal Clean Water Act.

The current TMDL process lacks meaningful disclosure or collaborative engagement with members of the public. The current TMDL study process is scientifically inadequate in its failure to address the processes that result in the release of mercury from sediments and wetlands and the production and transport of methylmercury in the St. Louis River Watershed. It is reasonably foreseeable that its study methods will fail to result in implementation that will prevent increased mercury and methylmercury impairments, let alone restore mercury impaired waters. The underlying purpose of the TMDL— to ensure that levels of mercury in the water column and methylmercury in fish tissue in the St. Louis River Watershed will comply with state and tribal water quality standards—requires a more candid and robust approach.

1. MPCA Public Engagement is Neither Meaningful Nor Collaborative.

The MPCA stated the following goals for external engagement and communications in the Project charter for the SLR HG TMDL:[1] "Provide transparency about MPCA's approach and decisions"; "Provide a foundation of cooperative and meaningful engagement with a broad range of interested parties"; and "Provide advisors, partners, and stakeholders an opportunity to collaboratively discuss and contribute to the technical foundations of the TMDL." *Id*. at 3. Thus

[1] MPCA, St. Louis River Watershed Mercury TMDL Project Charter, Fall 2022, https://www.pca.state.mn.us/sites/default/files/wq-iw10-16a.pdf, Exhibit 1.

far, the MPCA has done none of the above. The most basic principles of meaningful engagement are that one provides a space for members of the public to provide their views without controlling the flow of information; one provides accurate and open disclosure of the government proposal on which engagement is sought; and one meaningfully considers altering the proposed course of action based on the communications with the public, not just financially interested "stakeholders."

MPCA's "public forums" have not allowed members of the community to speak to each other and MPCA staff in an open dialogue. Rather than have a meaningful discussion or collaboration, MPCA has constrained communications to prevent members of the public from raising their concerns or obtaining answers to their questions. The flaws in this process have been exacerbated by the MPCA's misleading communications to the public, which omit information about the biochemical processes related to sulfate pollution and methylmercury and misrepresent the way in which mining pollution will be "addressed" in the St. Louis River Watershed.

For example, MPCA's slide deck for the June 6, 2023 public forum answered the question "where does mercury come from?"[2] by identifying "atmospheric deposition," "land cover runoff," and "wastewater." *Id*. at 9. MPCA's public presentation then stated blandly that "sulfate can be important" for methylmercury production. *Id*. at 16. MPCA's primary communication to the public forum did not, for example, disclose to the public that addition of sulfate may affect both mercury release from sediments and production of methylmercury (Myrbo, *et al*. 2017).[3] These omissions foster an inaccurate perception of the sources of mercury and methylmercury and the effects of sulfate discharge, seepage, and air deposition in causing or contributing to impairments.

MPCA has specifically misrepresented to the public the relationships between inorganic mercury air deposition and toxic methylmercury contamination of fish. The flyer entitled "Minnesota's Statewide Mercury TMDL" provided at MPCA's first public forum began with the statement, "Mercury released into the air settles into water and accumulates in fish, making them unsafe for people to eat and damaging the ecosystem."[4] This is plainly inaccurate. Inorganic mercury from air deposition does not bioaccumulate and result in neurotoxic effects on humans consuming the fish unless mercury is methylated in a biochemical process.

MPCA's Frequently Asked Questions (FAQ) document provided at the second public forum is even more misleading. The document acknowledges that "the St. Louis River Watershed

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[2] MPCA, St. Louis River Watershed Mercury Total Maximum Daily Load Public Forum #2, slide deck, June 6, 2023, https://app.sharebase.com/#/document/884672/share/185--uenTdmttkGkGK3R5wTekbbZz1U, Exhibit 2 at 4.

[3] Myrbo, A, *et al*, Increase in Nutrients, Mercury, and Methylmercury as a Consequence of Elevated Sulfate Reduction to Sulfide in Experimental Wetland Mesocosms, J. Geophysical Research: Biogeosciences (2017), Exhibit 3 at 2775, Table 1.

[4] MPCA, Minnesota's Statewide Mercury TMDL, Public Forum #1 handout, Feb. 7, 2023, https://app.sharebase.com/#/document/791778/share/185--uenTdmttkGkGK3R5wTekbbZz1U, Exhibit 4.

mercury TMDLs will not quantify the effect of sulfate load reductions on mercury impairments."[5] However, the MPCA does not admit that sulfate loading in the watershed will not be analyzed in the TMDL study and that no sulfate load reductions will be required. MPCA's communications about the elephant in the room, the effects of mining discharge of sulfate to the St. Louis River Watershed, is a flat out misrepresentation. On this issue, the FAQ states:

> **Is the influence of mining on the St. Louis River Watershed mercury impairments being addressed?**
> Yes, the influence of sulfate discharges from mining is being addressed through point source discharge permits. Wastewater effluent from the mining industry can be high in sulfate, and sulfate is one of the many variables that is involved in mercury methylation. Reductions in sulfate may lower the potential for mercury methylation, which could lead to lower mercury concentrations in fish. *Id*. at 8.

The facts are contrary to this misrepresentation. Sulfate discharges from mining are not being addressed, let alone being addressed in a way that would reduce mercury in the water column or methylmercury in fish tissue impairments in the St. Louis River Watershed. MPCA has never limited sulfate discharges in point source discharge permits for mining in order to reduce mercury release or mercury methylation. MPCA has not enforced the only permits it has issued to avoid violating the wild rice sulfate standard (U.S. Steel 2011 Keetac permits), and sulfate discharge has consistently exceeded permit limits. MPCA repealed the specific conductance water quality standard that, if it had ever been enforced, would have required limits on sulfate more stringent than the 600 milligrams per liter (mg/L) water quality standard adopted by the MPCA in 2021. MPCA's 600 mg/L "limit" on sulfate, if applied in permits, would, in fact, allow increases in both mercury release from sediments and methylmercury production.

Meaningful public engagement requires that the MPCA inform the public that the TMDL will do nothing to address sulfate pollution that increases mercury release from sediments or production of methylmercury and nothing to address impacts of mining releases of sulfate.[6] Collaboration then requires that MPCA allow community members and tribal rightsholders, not just pollution sources, to communicate without strictures on topics or time and to obtain candid answers to any questions they may have about gaps in MPCA's proposal to address mercury impairments in the St. Louis River Watershed.

2. <u>The TMDL's Technical Approach is Scientifically Inadequate.</u>

MPCA's Project Charter emphasizes that its goal is to "[i]dentify the sources of methylmercury within the watershed." Exhibit 1 at 3. This goal has already been rejected in the technical approach for the St. Louis River Watershed TMDL study. That Technical Approach, authored by

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[5] MPCA, Frequently Asked Questions, St. Louis River Watershed Mercury TMDL June 2023, https://app.sharebase.com/#/document/899539/share/185--uenTdmttkGkGK3R5wTekbbZz1U, Exhibit 5 at 7.

[6] Release of iron from mining and the mercury methylation by iron-reducing bacteria may also contribute to methylmercury in fish tissue impairments in the St. Louis River Watershed.

Tetra Tech,[7] begins by acknowledging that the "source" of toxic methylmercury is not simply air deposition of inorganic mercury. The Technical Approach admits,

> Inorganic mercury in waterbodies is not a direct threat to aquatic life, wildlife, and human health. However, environmental processes, such as sulfate and iron reduction by bacteria in hypoxic sediments, create MeHg as a byproduct of organic carbon digestion. Low oxygen environment like peatlands in the watershed are hot spots for methylation. *Id.* at 8.

The TMDL Technical Approach further acknowledges, "Sulfate (SO_4^{2-}), an oxidized form of sulfur, is a waste product associated with iron mining that has led to elevated sulfate levels in this region . . . Sulfate-reducing microbes in low oxygen, organic matter rich sediment environments like wetlands, lake bottoms, and slow moving streams facilitate MeHg production." *Id.* Yet, the TMDL Technical Approach rejects any strategy that would "address sources that enhance methylation potential (such as sulfate loads from mining operations and atmospheric deposition)" in favor of only addressing the "transport and delivery of bioaccumulatable MeHg from source areas to waterbodies to control exposure levels." *Id*. at 17.

This problematic and exclusionary TMDL Technical Approach relies heavily on research led by the Minnesota Department of Natural Resources (DNR) and its explanations of the relationships between mercury, methylmercury, sulfate, and dissolved organic carbon. *Id*. at iii, 8-13, 17, 23, 32. The DNR is the state agency charged with promoting the development of mining and recognizing the benefits of mining. Minn. Stat. § 93.44. In fact, an internal email secured under the Minnesota Government Data Practices Act documents that the research effort led by DNR's Mike Berndt in 2011 and 2012 was funded by the Environmental and Iron Ore Cooperative Research programs ($400,000) and from a "consortium of mining companies" ($500,000).[8] Mr. Berndt explained in his 2011 memo to MPCA staff that this research was intended to be a "coordinated TMDL effort" with the MPCA and that a panel of taconite mining industry representatives "needs to be informed and allowed to have input on the studies to be conducted." *Id*. at 1. At very least, a more objective and robust analysis of the scientific literature is required.

The TMDL Technical Approach justifies its rejection of sulfate reduction as a cause of mercury methylation and transport citing an unpublished report by journalists (Hirshon *et al*., 2020) asserting that unidentified "environmental groups" question a sulfate reduction strategy. *Id*. at 17.[9] The Technical Approach does not cite research from the Marcell Experimental Forest, such as Coleman Wasik *et al*., 2012, which found methylmercury declined in a boreal peatland when

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[7] Tetra Tech, Technical Approach for the St. Louis River Watershed Mercury Total Maximum Daily Loads, June 7, 2022, not posted to MPCA ShareBase or available online, Exhibit 6.

[8] Berndt, Mike, email to Patrick Carey and Ed Swain, MPCA re Coordinated TMDL effort, Oct. 7, 2011, Exhibit 7 at 2.

[9] WaterLegacy does not agree with the position attributed to "many environmental groups" rejecting sulfate reduction as a strategy to reduce mercury and methylmercury impairments.

experimental sulfate deposition ceased and the peatland was allowed to recover. The graphic results of this experiment are shown below: [10]

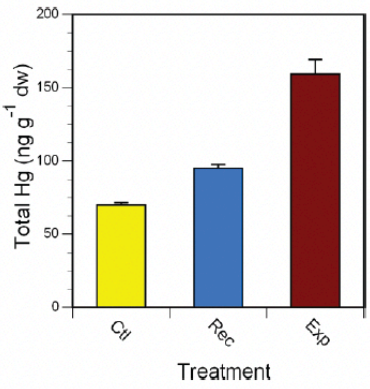

Figure 5. Dry-weight, Hg_T concentrations (±1 s.d.) in mosquito larvae (*Culex* spp.) in control (Ctl), recovery (Rec), and experimental (Exp) treatments in spring 2009.

Equally troubling, although the TMDL Technical Approach cites another Myrbo paper that addresses impacts of sulfate on wild rice, the Approach does not address Myrbo's 2017 paper (Exhibit 3) regarding effects of sulfate on increasing release of nutrients, DOC, and mercury and increasing mercury methylation, data from which is reproduced below:

Table 1
Summary of Effects of Experimentally Increased SO_4 Concentrations on SO_4 Reduction (Quantified as SO_4 Depletion), Organic Matter Mineralization, and Mercury Methylation

		Average of each sulfate treatment (n = 6 for each treatment)						Correlation with SO_4 depletion (Spearman)	
Variable	Matrix	Control	50	100	150	300	Max/Min	Rho	p value
Variables mainly associated with SO_4 reduction									
SO_4 (T-W mean mg SO_4 L^{-1})	sw	6.7^{a}	26.9^{ab}	58.5^{abc}	93.2^{BC}	206.5^{c}	31.0	0.93	<0.0001
SO_4 depletion (mg S cm^{-2})	sw	0.14^{a}	2.52^{ab}	3.63^{abc}	4.28^{BC}	6.90^{c}	48.5	1	
Pore water sulfide (µg S L^{-1})	pw	69^{a}	184^{a}	224^{a}	393^{b}	728^{b}	10.5	0.81	<0.0001
Pore water iron (µg L^{-1})	pw	$12{,}883^{a}$	$11{,}122^{ab}$	$6{,}808^{abc}$	$4{,}483^{BC}$	$3{,}032^{c}$	4.25	−0.82	<0.0001
AVS (mg S kg^{-1})	sed	102^{a}	483^{ab}	NA	826^{ab}	$1{,}413^{b}$	13.8	0.77	<0.0001
pH	pw	7.57^{a}	7.52^{a}	7.55^{a}	7.75^{a}	7.81^{a}	1.03	0.39	=0.03
H^+ ion (µmol L^{-1})	pw	0.027	0.030	0.028	0.018	0.015	1.72	0.39	=0.03
Variables mainly associated with mineralization of organic matter									
TOC (% dry mass)	sed	9.26^{a}	7.90^{a}	8.18^{a}	7.17^{a}	8.22^{a}	1.29	−0.34	=0.065
DIC (mg C L^{-1})	sw	28.9^{a}	47.2^{ab}	56.3^{BC}	56.7^{BC}	66.3^{c}	2.30	0.94	<0.0001
DOC (mg C L^{-1})	sw	16.3^{a}	21.4^{a}	26.8^{BC}	24.0^{abc}	28.3^{bc}	1.74	0.79	<0.0001
Total N (mg N L^{-1})	sw	1.42^{a}	1.75^{a}	2.35^{BC}	2.03^{abc}	2.57^{BC}	1.81	0.77	<0.0001
Ammonia (mg N L^{-1})	sw	0.09^{a}	0.09^{a}	0.10^{a}	0.10^{a}	0.16^{a}	1.70	0.38	=0.04
Total P (µg P L^{-1})	sw	13^{a}	16^{ab}	22^{ab}	21^{ab}	25^{b}	1.92	0.73	<0.0001
Available P (µg P g^{-1} resin)	Resin in sed	0.34^{a}	0.40^{a}	0.59^{ab}	0.92^{ab}	2.56^{b}	7.45	0.86	<0.0001
Total Hg (ng L^{-1})	sw	1.83^{a}	2.09^{a}	3.61^{ab}	3.25^{ab}	4.80^{b}	2.63	0.82	<0.0001
Variables mainly associated with Hg methylation									
Methylmercury (ng Hg L^{-1})	sw	0.20^{a}	0.49^{ab}	1.21^{b}	1.08^{b}	1.18^{b}	5.91	0.66	<0.0001
Inorganic Hg (ng L^{-1})	sw	1.63^{a}	1.60^{ab}	2.40^{abc}	2.17^{BC}	3.62^{c}	2.22	0.80	<0.0001
Percent methylmercury	sw	$11\%^{a}$	$23\%^{ab}$	$30\%^{b}$	$32\%^{b}$	$23\%^{ab}$	2.90	0.45	=0.02

Note. Matrix abbreviations: sw = surface water, pw = pore water, sed = bulk sediment. Averages with superscript letters in common are not significantly different at the 0.05 level.

[10] J.K. Coleman Wasik *et al.*, Methylmercury Declines in a Boreal Peatland When Experimental Sulfate Deposition Decreases, Environmental Science & Technology (2012), Exhibit 8 at F.

As shown above, addition of sulfate at concentrations well below the MPCA's 600 mg/L water quality standard can more than double the release of mercury to the water column and increase production of methylmercury six-fold. If sulfate were introduced to a waterbody that would otherwise achieve its maximum load for mercury or methylmercury, that sulfate addition would likely cause or contribute to violation of mercury water quality standards and impairment of beneficial use of the water for fish, wildlife, and human consumption.

It is not disputed that the most significant source of mercury in the St. Louis River Watershed is the historic air deposition of primarily inorganic mercury due to taconite mercury emissions within the airshed as well as fossil fuel combustion within and outside the region. Effects of biochemical processes, including sulfate release and deposition, inundation, and desiccation on this huge source of mercury must be analyzed in the TMDL study to understand mercury and methylmercury impairments and create the foundation for a meaningful implementation strategy.[11]

3. Inconsistency with Clean Water Act Requirements and Analyses.

Finally, the MPCA's TMDL Approach is inconsistent with the recent comprehensive analysis under the Clean Water Act of the sources and processes resulting in mercury and methylmercury impairments in the St. Louis River Watershed. In general, the Clean Water Act requires each state to periodically identify all waters within its borders that do not meet water quality standards. 33 U.S.C. § 1313(d). For each water placed on the impaired-waters list, the state is required to establish a TMDL for that water and submit it to the EPA for approval. *Id*.

A TMDL study must set requirements that result in compliance with water quality standards. "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical WQS with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." 40 C.F.R. § 130.7(c)(1). The TMDL process is not intended to be mechanistic, and TMDLs need not be limited to a single factor or pollutant. EPA regulations provide, "TMDLs may be established using a pollutant-by-pollutant or biomonitoring approach. In many cases both techniques may be needed. Site-specific information should be used wherever possible." *Id* at (c)(1)(i). If the scientific evidence establishes that sulfate loading increases mercury and methylmercury in the St. Louis River Watershed, a TMDL study or implementation plan that sets this factor aside will not achieve water quality standards and will not comply with the Clean Water Act.

In the case of the St. Louis River Watershed, recent scientific analysis by the Fond du Lac Band of Lake Superior Chippewa (the Band) and the U.S. Environmental Protection Agency (EPA)

[11] Other MPCA TMDL studies, such as the Big Sandy Lake and Lake Minnewawa TMDL Report, have analyzed "internal loading" from pollutants released from sediments, supporting subsequent implementation strategies for "internal load reduction." See Big Sandy Lake and Lake Minnewawa TMDL Report, April 2011, at 16, 46-48, 66, available at https://www.pca.state.mn.us/sites/default/files/wq-iw8-24e.pdf..

explains the factors that determine whether mercury and methylmercury water quality standards will be violated in the St. Louis River Watershed. In recent Clean Water Act Section 401(a)(2) proceedings pertaining to the PolyMet NorthMet Mine Project, the Band and the EPA performed an analysis of violation of mercury and methylmercury water quality standards which was then adopted by the U.S. Army Corps of Engineers (Army Corps) in revoking the PolyMet Clean Water Act Section 404 permit. This recent analysis, rather than the DNR's 2011 "coordinated effort" must be considered the state of the art in evaluating the sources of mercury and methylmercury impairment in the St. Louis River Watershed.

The Band's Clean Water Act Section 401(a)(2) "Will Affect" Analysis for the PolyMet NorthMet Mine Project detailed the impacts of sulfate discharge, sulfate seepage, sulfate deposition, and the destruction of and hydrological changes to wetlands that would result in increased mercury and the production, bioaccumulation, and transport of methylmercury.[12] The Band's analysis of the sources of mercury impairment was not limited to mercury in wastewater discharge or mechanical runoff from the site. For example, the Band concluded:

> Project-related changes in hydrology and the release of excess sulfate which stimulates the process of mercury methylation will enhance production of methylmercury both adjacent to the Project as well as more distal locations in the St. Louis River watershed and contribute to the load of methylmercury in surface waters . . .The degradation of Fond du Lac Reservation waters and wetlands will result in non-compliance with the Band's Designated Uses and Antidegradation Water Quality Standards. *Id.* at 5.

The EPA's Clean Water Act Section 401(a)(2) Evaluation and Recommendations concluded that "the CWA [Clean Water Act] Section 404 permit and MPCA's CWA Section 401 certification lack conditions sufficient to protect from mercury mobilization, methylation, and export at levels that would exceed the Band's water quality requirements."[13] The EPA, like the Band, did not attribute the violation of downstream standards only to mercury discharge and runoff. The EPA concluded, among other determinations,

> [T]he construction and operation of the NorthMet mine will alter the hydrology of some 6000 acres of wetlands, in addition to the approximately 939 acres of direct and fragmentation impacts. These wetland alterations, in addition to the loading of sulfates from the construction and operation of the NorthMet project, will both enhance methylation of mercury already present in the wetlands affected by the proposed mine and mobilize both total [mercury] and methylmercury in those same wetlands. The mercury mobilized as a result of these wetland alterations will

[12] Fond du Lac Band, Notification of Objection to the NorthMet Mine Project Section 404 permit and Clean Water Act Section 401(a)(2) "Will Affect" Analysis for PolyMet Mining, Inc.'s NorthMet Mine Project, August 3, 2021, Exhibit 9.

[13] EPA, Clean Water Act Section 401(a)(2) Evaluation and Recommendations with respect to the Fond du Lac Band's Objection to the Proposed Clean Water Act Section 404 Permit for the NorthMet Mine Project, April 29, 2022, Exhibit 10 at 2.

> be exported from the NorthMet project site via the streams adjacent to the affected wetlands at the NorthMet project site and be transported downstream to the Fond du Lac Reservation. This mercury will further exacerbate ongoing exceedances of the Band's mercury criterion of 0.77 ng/L and ongoing nonattainment of the Band's designated uses. *Id*. at 16.

The Army Corps revoked the Clean Water Act Section 404 permit for the PolyMet NorthMet Mine Project based on the scientific analyses of the sources and mobilization of mercury and methylmercury in the St. Louis River Watershed and in the downstream Fond du Lac Reservation waters conducted by the Band and the EPA.[14] The Army Corps summarized:

> The Corps can confirm it did not include any conditions on the CWA Section 404 permit to address potential mercury mobilization, methylation and export to downstream waters from adjacent wetlands. . .
>
> [G]iven the Corps' jurisdiction under CWA Section 404, the Band and EPA's water quality authorities, and the absence of any necessary permit conditions to ensure compliance with the applicable downstream water quality requirements of the Band as required by CWA Section 401 (a)(2), the Corps cannot reissue or modify the suspended permit. Consequently, the Corps must revoke the currently suspended CWA Section 404 permit. *Id*. at 3.

The EPA, the Army Corps, and the Fond du Lac Band, have determined under the Clean Water Act that wetland alterations and sulfate loading are determinative of violation of downstream water quality standards for mercury in the water column and methylmercury contamination of fish. A TMDL study of mercury and methylmercury in the St. Louis River Watershed that performed its modeling without considering these factors and all current scientific evidence, including the evidence upon which the Band and the EPA relied, would be fatally flawed from its inception.

Conclusion

WaterLegacy has taken the time to comment at this early stage of the TMDL development in the hope that the MPCA will open up a more meaningful and candid public engagement process and restructure its Technical Approach to consider critical factors that result in mercury and methylmercury impairments in the St. Louis River Watershed, including sulfate additions and hydrologic alterations.

Respectfully submitted,

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[14] Army Corps, Section 404 Permit Decision Memo for the PolyMet NorthMet Mine Project, June 7, 2023, Exhibit 11.